PROJECT MANUAL

Sexton Auditorium
Lansing, MI

102 Mc Pherson Ave, Lansing, MI 48915

Friday, November 21, 2025

Auditorium Renovation and HVAC Upgrades

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

Architect
Kingscott Associates, Inc
950 Trade Centre Way #130
Portage, MI 49002

Mechanical & Electrical Engineer
Strategic Energy Solutions, Inc.
4000 W Elevation Mile Rd
Berkley, MI 48072

Owner
Lansing School District
519 W. Kalamazoo St.
LANSING, MI

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

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AIA Documents are not included in this specification, but are part of the contract documents, copies may be obtained from the Construction Manager

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SECTION 00025

Project:	**Sexton Auditorium** Project Description
Owner:	**Lansing School District** 519 W. Kalamazoo St. Lansing, MI 48933
Architect/Engineer:	**Kingscott Associates, Inc** 950 Trade Centre Way #130 Portage, MI 49002
Construction Manager:	The Christman Company 208 N. Capitol Avenue Lansing, MI 48933-1357 517-482-1488

Lansing School District will receive sealed proposals for all work categories as described in the Project Manual for the Lansing School District Project: SB-0071 – Sexton Auditorium. Proposal must be received at the Lansing School District Purchasing Office, ATTN: Jon Laing, 519 W. Kalamazoo St., Room 208 Lansing, Michigan before **Thursday, December 18, 2025 at 2:00 PM.** The Lansing School District will not consider late, faxed or electronic mail 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 included in the sealed envelope clearly marked WORK CATEGORY NO._____, and shall be identified with the project name, work category name and the bidder's name and address.

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.

All contractors bidding on work must be bondable and must include with their bid the cost for furnishing a Co-Obligee Labor and Material Payment Bond and a Co-Obligee Performance Bond. This cost shall NOT be included in the base bid, and shall be considered added to the base bid should the Owner require. On the proposal form the contractor will identify a cost to be deducted from their bid should bonds not be required.

There will be an in-person pre-bid conference at on Tuesday December 2nd, 2025 at 10:00 AM conducted by the Construction Manager. It is strongly recommended that contractors attend the pre-bid conference.

Attendees must be present by 10:00AM to gain access to a guided tour of the project hosted by the construction manager at the muster point indicated on the following page.

PRE-BID START POINT - GUIDED TOUR STARTING PROMPTLY AT 10:00AM 12/2/2025



Please click here to get directions to the site meeting point if needed.

RFI's

All questions are to be directed to projects@lansingschools.net.

No direct contact with the Owner or Architect is requested. All pre-bid RFI's must be submitted by December 5th. RFI's submitted after the deadline will not be guaranteed to receive a response.

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.

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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 one (1) year 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.

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.

2. The project will start Approximately February 1., 2026 and complete by the start of the following Academic Year per Lansing School District, and adhere to the following milestones.

Activity Description	Start Date	Completion Date
Demolition in Auditorium	2/1/2026	3/15/2026
Overhead ductwork Auditorium	4/01/2026	4/15/2026
In-wall Auditorium Ductwork	4/16/2026	5/01/2026
Drywall Finishing	5/10/2026	5/25/2026
Painting	5/26/2026	6/09/2026
New Auditorium Seating	7/15/2026	7/31/2026
Auditorium Mechanical Ventilator Startup & Commissioning	6/09/2026	8/20/2026

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
01	Selective Demolition	**Division 00, Division 01, 024119**
12	Structural Steel, Deck, Stairs/Misc Steel	**Division 00, Division 01, Division 05, 078123, 078423, 078413, 079200 , 116133**
20	General Carpentry/Millwork/Doors	**Division 00, Division 01, 042000, 078123, 078413 079200, 061000, 062023, 081113, 081416, 087100, 092216, 092900, 099124, 099600, 098413, 101423.16**
23	Carpet & Resilient Tile	**Division 00, Division 01, 079200, 096400, 096513, 096723, 096813, 099300**
25	Theatrical Seating & Equipment	**Division 00, Division 01, 079200, 116133 116163, 126100, 266100**
27	Mechanical Systems	**Division 00, Division 01, 072100, 075323, 078123, 079200, 089119, Division 23**
28	Electrical Systems	**Division 00, Division 01, 078123, 079200, Division 26, 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. Contractors shall be aware of the Owner's occupancy of the building during construction between January – June. Construction activities shall be done in a manner to limit disturbance with Owner's operations, including limiting unreasonable noise, and disturbances.
5. The General Contractor will provide all first floor shoring as noted on the structural drawings. Shoring shall be installed ahead of any lifts, or heavy equipment/work taking place on the first floor.
   A. Contractors shall submit all equipment/material information to the Construction Manager, and review work conditions to verify lifts, materials, equipment, etc., does not exceed maximum loading for the first floor of the auditorium, roof, or balcony.
   B. The Construction manager will only provide shoring for the First Floor. None will be provided for additional floors. Contractors shall review the site conditions and ensure their ability to reach overhead work is in accordance with Christman safety requirements and MIOSHA.
6. 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.
7. 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.
8. 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.
9. Contractors shall provide own lifts suitable to be used on the first floor per the structural plans and loads, lifts must not exceed the maximum loading capacity of the floor.
10. 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.

11. Prior to commencing with installation, verify all field conditions and measurements and report any discrepancies to the Construction Manager.

12. 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.

13. 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.

14. 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.

15. 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.

16. 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.

17. 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.

18. 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.

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

20. 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.

21. 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.

22. 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.

23. 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.

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

25. 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.

26. 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.

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

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

29. 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. 01 – Demolition

Work Included:

The subcontractor shall timely perform all Demolition 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:

Refer to WC Index

Work Category Notes:

1. A pre-construction survey shall be conducted by the Owner in order to quantify, test, and verify asbestos containing materials. The results of this survey will be this work categories responsibility to demolish, abate, and remove. This WC will be responsible to set up all enclosures, provide all services, equipment, labor, material, etc., as required for the removal of asbestos containing materials during prior to construction taking place. During the course of construction, any additional asbestos materials discovered shall be removed by this WC funded via WC allowance.
   A. Third party testing for Hazardous materials by Others (Owner), including air monitoring and sampling. This WC shall work with Owner's hygienist team during abatement/removal process, and notify Owner, Construction manager, and hygienist at a minimum of 72 hours prior to any abatement activities in order to ensure hygienists can be present to perform air monitoring.
2. Complete demolition and off-site disposal of all items of work as shown and/or specified except as noted below. Includes all architectural, structural, mechanical, and electrical demolition. Removals to include, but not limited to, concrete walls, saw-cutting of concrete and masonry walls/foundations, steel framing, existing equipment, cabinets, ceilings, flooring, piping, conduit, etc. Includes all labor, material, accessories, and equipment to complete this work.
3. Coordinate scheduling and sequencing of this work with mechanical, electrical, and other contractors for power and utility shutdowns, capping, and continuation of utility services as required. Coordinate scheduling and sequencing of work with other trades. Contractor shall acknowledge and adhere to the construction schedule and sequencing.
4. Furnish and install all hoisting, scaffolding, temporary platforms, chutes, etc., as required for the performance of this work.
   A. 3 construction lifts will be provided by the Construction Manager for communal use between contractors. Coordination for use of these lifts is essential, and considered a daily task.
5. Final clean-up of this work includes broom sweeping.
6. Remove and relocate all items designated to be returned to owner to a location on site as determined by the owner and/or general contractor.
7. Provide, maintain and remove barricades, signage, and other safety precautions that may be required where removal of equipment and/or structure leaves unsafe conditions.
8. Coordinate cutting of masonry openings with the general trades contractor where saw-tooth cutting is required.
   A. WC20 and WC27 shall participate in laying out new openings and penetrations in masonry walls where

required, this WC shall cut and demolish walls, provide temporary shoring as necessary to support structures during demolition process, removal will be by others.

9. Provide, maintain, and remove temporary partitions, dust control, and negative exhaust for work adjacent to occupied buildings. Take precautions and provide measures to protect the public and fellow workers during the performance of this work. Protect existing structures, utilities / drains, equipment, flooring, and other finishes from damage during the performance of this contract.

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 WC shall remove all seating indicated to be demolished/removed.
2. This WC shall cut and demolish all drywall/plaster on the cheekwalls indicated to be removed.

Related Work by Others:

1. Cutting and capping of utilities by WC 26, 27, and 28.
2. Lighting equipment and specialty theatrical systems to be removed/demolished by WC25 as described in WC25. Items not clearly indicated to be removed by WC25 shall be the responsibility of this contractor.
3. Mechanical equipment called to be demolished and removed will be cut/capped and made safe by WC27 and WC28.

Allowances:

This Contractor shall include in their Base Bid a Construction Manager's allowance of $100,000. Reference Section 01020 for specific instructions on allowances.

This allowance will be utilized for all demolition and abatement of known or unknown hazardous materials as required for the course of construction.

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. 01

Work Category No. 12 - Structural Steel

Work Included:

The subcontractor shall timely perform all Structural Steel, 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:

Refer to WC Index

Work Category Notes, including, but not limited to:

1. Furnish and install all structural steel, steel joists, floor decking, cellular floor decking, roof deck, miscellaneous metals, sump pans, ornamental metals, grating, steel stairs, ladders, cages, metal fabrications, sump pans, leveling plates, shear studs, guardrails, etc., indicated by the contract documents (not just limited to the structural drawings) or as required for a complete installation, including labor, materials, equipment, adhesives, fasteners and accessories.
    a. Wood stairs & associated handrails by WC20.
2. Coordinate with WC01 on demolition activities.
    a. Where temporary removal and shoring is required to get new structural members installed, this WC shall remove, shore, and provide all required temporary measures to provide a full and complete installation.
    b. The first floor will be structurally shored by the Construction Manager and 4 articulating boom lifts will be placed for communal use among trade contractors, if this WC requires additional access, hoisting, or other services, this WC shall provide all additional equipment and protections necessary to provide a complete installation including craning and hoisting equipment for roof access.
3. Furnish only all embedded items including, but not limited to, steel lintels, angles, stair nosings, anchor bolts, pipe bollards, etc., indicated by the contract documents (not limited to the structural drawings).
4. All specified coating for ferrous metals, galvanized metals, and aluminum are required and are the responsibility of this work category. Field touch up of shop paint as required. Shop preparation and painting of all structural and miscellaneous metals as indicated on the contract drawings.
5. Submittal of all required detailing to allow for architect/engineer review and approval, corrections, fabrication, and delivery without impacting the construction schedule.
6. Provide all necessary welding and mill certificates as required by the contract documents or as requested by the Construction Manager.
7. Field dimensions and measurements as required for this work. Prior to fabrication and erection contractor shall verify existing conditions and anchor bolt locations through means of a qualified surveying company to field survey the site and submit results to the construction manager for review. Any errors or discrepancies need to be identified in writing. Corrections will be made by the contractor responsible for the original installation. Cost for all field visits/surveying must be in proposal.
8. This contractor shall provide the construction manager with all necessary crane/hoisting information (size). This information will be used to prepare the site for the equipment mentioned by this contractor.

Four weeks prior to site mobilization, 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, material testing program and scheduling.

9. Temporary water and power **will not** be provided for the work of this subcontract. Subcontractors should make provisions for portable generators and welders as required to perform their work.

    a. Existing site power and water services will remain active during the course of construction, if additional utility service, water, power, etc., is required for this scope of work, this WC shall provide their own supplemental utilities.

10. For areas shown to receive paint, intumescent paint, or spray-on fireproofing, this subcontractor shall ensure metal decking and steel framing is free of oils or any other materials that could jeopardize adhesion of spray-on fireproofing or paint.

11. During the duration of this contract, this contractor is responsible for protecting (approved by the project superintendent) the existing building from smells/odors created during the welding of the new steel to existing steel, weather protection at tie in points, including areas where new steel and existing steel are being attached, and fire protection / fire watch needed for welding operations.

12. Furnish, install and maintain safety barricades for this work at all times. If this subcontractor creates an opening or leading edge that creates a fall hazard, perimeter protection/guardrails shall be promptly installed by this subcontractor. Fall protection shall satisfy all safety requirements. If this subcontractor requires existing fall protection to be removed or modified, seek prior approval from the Construction Manager, adjust fall protection as needed and promptly restore fall protection to original condition. Once this subcontractor has completed respective work, an inspection of all perimeter protection shall be conducted by the Construction Manager, and all identified deficiencies shall be corrected by this subcontractor. Perimeter roof protection/guardrails similar to above, shall be furnished and installed by this subcontractor, constructed and located, as approved by the Construction Manager prior to installation. All perimeter guardrails/protection shall be removed by others as permanent walls and details are constructed.

    a. Roof flagging to be provided by WC 27, the above note is specific to work by this contractor, if any, requires additional supports at different elevations, or specific locations outside the scope of WC27, if any.

13. Coordinate penetrations and related framing with other trades during detailing phase. Provide framing plans to mechanical for verification.

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 WC shall provide and maintain all flagging on the perimeter of the roof as required for this scope of work, and the scope of work of WC27. Removal upon completion of construction activities as directed by the Construction Manager.

Related Work by Others:

1. Reference Sections 00210 and 01019 for testing requirements and responsibilities.
2. Light gauge framing by WC 21.
3. Installation of embeds furnished by WC 12.

4. Handrails at stage stairs by WC20, this WC to provide all other handrails and tubesteel rails, including temporary rails at openings either created or existing.

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. 12

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:

Refer to WC 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. Furnish and install wood blocking, FRT, sheets, boards, plywood, etc. for required materials that are to be installed by this work category.
4. If in-wall backing/blocking is required by a specific manufacturer for products included as part of this Work, though not specifically shown within the documents, i.e. architectural millwork, handrails, wall trim, misc. accessories, etc., Subcontractor to furnish and install blocking for a complete installation.
5. Furnish and install concrete expansion joints and associated fire stop as specified. Shop drawings required immediately for this work.
6. Provide non-combustible wood blocking in walls for wall mounted accessories and equipment installed by Owner/others shown or specified.
7. Furnish and install folding doors, including above ceiling misc. iron support to receive folding doors.
8. Furnish and install doors, frames, and hardware. Furnish only and coordinate delivery of frames to be received and installed by others. Electric strikes, magnetic hold-opens, power transfer units will be installed by others – WC-28. Coordinate deliveries, installation instructions & wiring diagrams directly with WC-28. Card readers and power supply, shall be furnished and installed by Owner.
9. All interior finish carpentry, architectural woodwork, shelving and millwork. Provide all sealants to adjacent surfaces, including dissimilar materials. Coordinate counter top support spacing with WC 27 under lavatory guards and lavatory installation.
10. Furnish and install wall protection systems and PLAM wall coverings.
11. Furnished and installed all window sills.
12. Furnish and install all solid-surface materials and grommets as indicated.
13. Furnish and install all wall protection, handrail, corner guards, and crash rail.
14. All architectural hardware for cabinets supplied by this Work Category.
15. All fabricated materials are to be shop assembled to the greatest extent possible before shipping to the job site.

16. Furnish and install handrails, corner guards, and stairs.
17. All required temporary enclosures, materials, shoring, etc., to perform the demolition of the existing wall systems. Temporary enclosures must be weather tight.
18. Protect from damage existing finish work that is to remain.
19. Furnish and install sealants for all materials installed by this contractor such as cabinets, counters, sills, PLAM, metal trims, etc.
20. 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. Provide all door removal, sanding, staining, and refinishing services on doors noted to be refinished.
   A. Owner to review, operate and approve refinishing services for all doors prior to acceptance for this scope of work. Any adjustments or rework required to make doors operational shall be considered base-bid.
2. This WC shall provide all painting, staining, millwork, carpentry work, drywall, taping, finishing, etc., as required for a full and complete finish. Painting shall be done in accordance with specifications, and be no less than 3 coats – Primer, 1st Coat, 2nd Coat.
3. All patching and repairs of existing walls as noted to be by this work category, including any additional plaster/lathe required to make complete repairs and restorations.
4. Freestanding temporary construction use fire extinguishers to be provided by this WC as required for safe working conditions, inspected and maintained by this WC.
5. This WC shall provide temporary doors for use by the construction manager as indicated on the site logistics plan. Include removal at the conclusion of construction activities as directed by the Construction Manager.
6. All cold formed metal framing to be by this work category, including framing of bulkheads, finishing, and painting for a full and complete finish and installation. Caulking to adjacent surfaces where required shall be provided.
7. Provide and install all caulking where required at the conclusion of this WC scope of work, including all doors, frames, millwork, trim repair, etc., as required.
8. Coordinate scheduling and sequencing of work with other trades. Contractor shall acknowledge and adhere to the construction schedule and sequencing.
9. This WC shall provide and install new stairs on the left and right of stage, including associated handrails. Demolition of existing stairs by WC01. Match stair assembly and wood to new stage makeup, including staining and materials as similar as possible.
   A. This WC only to install handrails at stairs leading to the stage, all other handrails to be by WC 12.

Related Work by Others:

1. Dumpsters by Construction Manager

2. Refinishing of stage, including sanding and staining by WC23.
3. Demolition of "Cheek walls" up to 9' where indicated on drawings by WC01, this WC shall frame, drywall, and restore cheek walls upon completion of MEP installation.
4. Independent testing and inspections by Owner.
5. Roof mechanical equipment curbs by WC 27.
6. Temporary heat by Construction Manager.
7. All structural steel framing by WC 12.

Allowances:

This Contractor shall include in their Base Bid a Construction Manager's allowance of $40,000. 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. 20

Work Category No. 23 – Carpet and Resilient Flooring

Work Included:

The subcontractor shall timely perform all Carpet and Resilient 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:

Refer to WC Index

Work Category Notes:

1. Furnish and install all carpet, resilient tile and sheet flooring, hardwood flooring, as required for a complete installation, including resilient and carpet wall base, stair nosings, treads, or risers, adhesives, seam welding, seam sealing, floor patching, skim coating, floor leveling, feathering, final cleaning and/or vacuuming.
2. Furnish and install all transition and reducer strips between different floor types.
3. Provide additional temporary lighting as required for proper installation.
4. Furnish and install materials necessary to match finishes in existing tie-in areas and at different floor types.
5. Install and maintain protection of flooring until substantial completion. Remove and final clean after substantial completion.
6. Responsible for repairs for damage to wall finishes and other adjacent surfaces caused by carpet installation.
7. At the completion of removal for all theatrical seating, this WC shall ensure removal is patched, review floor flatness, and any minor leveling, sloping, or other surface preparation shall be conducted prior to installation of flooring materials.
8. Concrete floors are original to the building. This subcontractor shall provide all surface prep, including scraping, sanding, filling, feathering, etc. for a complete installation and assume at base bid that the surface will require preparations prior to flooring install.
9. 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. This Work Category shall provide all sanding, filling, touchup required on the stage as indicated on the project drawings. Staining to be provided by this WC, coordinate with WC20 for stair installation, staining of stairs to be by this WC.
2. All flooring transitions and transition strips by this WC.
3. All resilient/rubber base by this work category, including caulking/patching required to ensure a full and complete installation.
4. All flooring, including refinishing and new, to be provided by this WC, including all surface prep and installation. Upon completion of flooring, this WC shall provide and install RAM Board paperboard

protection, including taped joints and taped ends for protection from future contractors work.

Related Work by Others:

1. Construction and installation of stair risers to stage to be by WC20.
2. Demolition of stairs and stair risers to be by WC01.
3. Substrate will be broom cleaned by WC01 upon completion of removal of theatrical seating. Time shall be given to other follow-on trades as indicated by the project schedule, this WC shall provide a final cleaning prior to installation of flooring, and protect finish flooring with paper board, taped joints at the conclusion of installation. Final cleaning of flooring after installation by Construction Manager.
4. Fixed seating by others, this WC shall coordinate the installation of flooring where required with WC25 to ensure flooring is installed either prior to, or after theatrical seating where access and logic is appropriate.

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.

Intent for allowance is to fund any extreme patching required on this project for the stage, and 1st floor seating area. Areas indicated to have extreme patching from existing damage shall be discussed with the construction manager, and include any patching greater than 2" in narrowest dimension, and ¼" in depth.

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. 23

Work Category No. 25 - Theatrical Equipment & Furnishings

Work Included:

The subcontractor shall timely perform all Theatrical Equipment & Furnishings 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:

Refer to WC Index

Work Category Notes:

1. Furnish and install all theatrical rigging systems, theatrical lighting systems, auditorium seating, commissioning, testing, and adjusting of all equipment required to be installed by this work category
2. This WC shall coordinate with WC12 on structural steel requirements and installations, this WC shall provide all rigging equipment that attaches to or is supported by structural steel provided by and installed by WC 12.
3. Provide coordination drawings for work by other trades showing location of backing, supports, electrical connections, etc.
4. Daily clean up and legally dispose of all construction debris related to this Work Category.
5. All software, communication cabling, and audio/visual equipment shall be provided by and installed by this work category.
6. This WC shall provide own lifts and lifting work.

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 WC shall provide all selective demolition/removal of existing audio/visual equipment as indicated on the project documents. WC28 will make-safe all electrical disconnections, this WC shall selectively remove and either turnover to owner where indicated or dispose of existing furnishings.

Related Work by Others:

1. Installation of structural steel supports by WC 12.
2. Electrical tie-in to be provided by WC28, this WC shall install all equipment as indicated in the notes and specification index, and allow WC28 availability to hook up or tie in final electrical connections.
3. Demolition of existing seating by WC01.

Allowances:

This Contractor shall include in their Base Bid a Construction Manager's allowance of $5,000. 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. 25

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:

Refer to WC Index

Work Category Notes:

1. Furnish and install all mechanical and plumbing systems, including domestic water, sanitary and vent, compressed air, hydronic piping, water heaters, boilers, unit heaters, unit ventilators, air handling units, chillers, cooling towers, VAV boxes, mechanical louvers, radiant heat systems, humidifiers, condensate, heat exchangers, ductwork, insulation, plumbing fixtures, drains, 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, 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. Furnish drawings showing size and location of concrete pads required for mechanical equipment to Construction Manager. Installation of these pads is by W.C. 10.
5. 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.
6. 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.
7. 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.
8. Furnish all hoisting, lifting, scaffolding and handling of all materials required to complete this work category.
9. The Electrical, Fire Protection, and Mechanical Contractors will be required to coordinate in a formal coordination process to accomplish the rough-in and final layout as required and specified in Section 1049. Any relocation required to coordinate work will be done at no additional cost to the Owner. All contractors are required to furnish layout and coordination prints for their work prior to these meetings

allowing the team to be better prepared at each coordination meeting. Detailers will be provided by this contractor to accomplish this coordination. These meetings shall be coordinated with the construction manager and shall be held on-site.

10. Provide and install mechanical equipment tags, pipe identification and other required identification of signage related to his work.

11. Furnish and install all roof curbs and necessary or required auxiliary steel framing for equipment supplied under this W.C. This includes any auxiliary steel required at roof openings not shown on the structural drawings, or for pipe hangers and plenum stiffeners.

12. 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. This WC shall remove roofing material and membranes in accordance with structural drawings to expose, and assess existing roof composite conditions match Structural drawings and engineer assumptions of existing conditions. Removal will also be required to locate and install new roof equipment installed by this WC.

2. This WC shall provide and install all roofing materials and roofing installation to repair and patch roof for final conditions.

3. Provide flagging on roof for this scope of work, and all other trades on site. Include maintenance of flagging until roof work is complete, and removal upon direction of Construction Manager.

4. All roof penetrations shall be made by this WC, including all repairs, temporary enclosures, and temporary measures to ensure all penetrations, roof curbs, etc., are watertight by the end of the day. This WC shall be responsible for all roofing. Temporary measures must be maintained to ensure no water intrusion during the course of construction, and all existing roof warranties are maintained.

Related Work by Others:

1. Power supply to mechanical equipment by W.C. 28.

2. Installation of access panels/doors by W.C. 20.

Allowances:

This Contractor shall include in their Base Bid a Construction Manager's allowance of $50,000. 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. 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:

Refer to WC Index

Work Category Notes:

1. Furnish and install all electrical systems, including power, lighting, site 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.
    a. Cabling for all theatrical systems by WC25, this WC shall provide all communication, low voltage, and control wiring for mechanical units, heaters, and all other required equipment.
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. Prior to demolition of existing equipment, this WC shall cut and make safe equipment for others to remove.
5. Furnish drawings showing size and location of concrete pads indicated on the drawings for electrical equipment to the Construction Manager. Installation of these pads is by W.C. 10. All excavation, backfill and compaction related to this W.C. Suitable backfill will be required by this trade and this contractor will be responsible for removal (from site) of all unsatisfactory fill in accordance with the documents.
6. 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.
7. 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.
8. 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.
9. Furnish all hoisting, lifting, scaffolding and handling of all materials required to complete this work category.

10. The Electrical, Fire Protection, and Mechanical Contractors will be required to coordinate in a formal coordination process to accomplish the rough-in and final layout as required and specified in Section 1049. Any relocation required to coordinate work will be done at no additional cost to the Owner. All contractors are required to furnish layout and coordination prints for their work prior to these meetings allowing the team to be better prepared at each coordination meeting. Detailers will be provided by this contractor to accomplish this coordination. These meetings shall be coordinated with the construction manager and shall be held on-site.
11. Provide and install panel labeling, identification and other required identification of signage related to his work.
12. 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.
13. 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, Owner furnished items, etc. Verify construction documents have been coordinated with power requirements of equipment prior to installation of devices.
14. Install all electrical disconnects for all mechanical equipment furnished to the site by W.C. 27.

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 WC shall provide temporary lighting for general use during the duration of construction.

Related Work by Others:

1. Installation of access panels/doors by W.C. 20
2. Site utilities to transformers/cabinets by Utility Company.
3. Temperature Control wiring and conduit associated with the mechanical systems by W.C. 27.
4. Installation of Theatrical Equipment and communication wiring by WC25. WC28 shall provide power and final connections for all equipment.

Allowances:

This Contractor shall include in their Base Bid a Construction Manager's allowance of $25,000. 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 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?
- ☐ Sworn & Notarized Familial Affidavit for Lansing School District included with your proposal?
- ☐ Sworn & Notarized Familial Affidavit for Kingscott and Christman included with your proposal?
- ☐ Non-Discrimination Certification included in your proposal?
- ☐ Requested alternates & unit prices quoted?
- ☐ All information (proposal, bond, etc.) Submitted in duplicate?
- ☐ Proposal submitted in sealed envelope per specifications?
- ☐ Affidavit of Bidder – Non-Collusion included with your proposal?
- ☐ Iran Sanctions Certificate and Act Certificate included in your
- ☐ proposal?
- ☐ Legal Status of Bidder Certificate included in your proposal?

TRADE CONTRACT PROPOSAL FORM

WORK CATEGORY NO. 00 and _____ Date: _____

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

Re: Sexton Auditorium
102 Mc Pherson Ave, Lansing, MI 48915

All:

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 00 & _____indicated in accordance with the Work Category Description and the Contract Documents for a
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 ($_____) shall be added to the base bid should the owner wish to have Payment & Performance Bonds required for this project..

EXPERIENCE MODIFICATION RATING (EMR):

List the EMR for your firm as determined by your insurance carrier for the past three (3) years, noting the effective date and EMR.

2025 EMR: _____, 2024 EMR: _____, 2023 EMR: _____

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:_____

TRADE CONTRACT PROPOSAL FORM

WORK CATEGORY NO. 00 and _____ Date: _____

TIME AND MATERIAL RATES:

Labor rates listed below include the Cost of labor including 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	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%.

MANDATORY ALTERNATES:

Reference Specification Section 01100 for alternate descriptions.

Mandatory Alternate #1 Paint ILO PLAM Add/Deduct $_____

Mandatory Alternate #2 Fabric Wrapped AWP12A & AWP13A Add/Deduct $_____

UNIT PRICES:

Zonolite/Block Insulation	$_____/CFT
Floor Tile	$_____/SF
Floor Tile & Mastic	$_____/SF
Pipe Chase Pipe Insulation (with demolition)	$_____/LF
Pipe Chase Mudded Fittings ct. (with demolition)	$_____/Fitting
Glass Block window mortar (per window assembly)	$_____/Assembly
Chalkboards/Glue Pods	$_____/Chalkboard
Cement Caulk on Exterior Block Windows	$_____/SF

TRADE CONTRACT PROPOSAL FORM

WORK CATEGORY NO. 00 and _____ Date: _____

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."

SUBCONTRACT AGREEMENT TERMS:
By submission of this bid form, the undersigned accepts all terms and conditions of The Christman Company Subcontract included in this Project Manual. Bidder is advised that The Christman Company reserves the right, in its sole discretion, to reject or declare any bid as non-responsive based on failure to accept the Subcontract without modification. Proposed edits to the Subcontract, if any, must be identified in the space below or on a referenced attachment. Requests for edits subsequent to submission of bids will not be considered.

BIDDER'S CERTIFICATE:

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

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

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

An individual doing business as _____

Date: _____
Signature: _____
Title: _____
Street Address: _____
City, State, Zip Code _____
Phone: _____
Fax: _____
Email: _____

CHRISTMAN
BUILDING SINCE 1894

Subcontractor Prequalification

As part of the procurement process (inclusion on bid lists, eligibility for subcontract award) we ask our trade contractor partners to follow a Prequalification process. This process is intended to help align trade contractors with the projects and work scopes that best match their capabilities and resources and to create the best possibility for success. Christman's Prequalification process includes:

- ❑ Registering with Christman's Sub Service Center
- ❑ Completing the Prequalification Survey, including submission of the following:
  - Most recent audited Financial Statements
  - Interim Financial Statements, to the extent available
  - Current Work-in-progress (WIP) and Backlog Report
  - Sample Certificate of Insurance (COI) showing all insurance coverages
  - Current EMR including effective date
  - Letter from Surety with project bond limit & current available bonding capacity

During Prequalification and post-bid review, additional information may be requested, or follow-up discussions may be required, prior to approval of an award.

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: _____

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 Kingscott Associates and or The Christman Company.

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: _____

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 ____

CHRISTMAN
SINCE 1894

Contractor Guarantee

Project: _____
Job No.: _____
Owner: _____
A/E: _____
Date: _____

Contractor: NAME
ADDRESS

We, the undersigned, hereby guarantee that all work accomplished and materials provided under the above-named contract or subcontract is in accordance with the terms of the contract documents as prepared by The Christman Company and the Architect/Engineer, including all addenda, change orders, and clarifications issued.

All work under the above-named contract or subcontract shall be guaranteed against defective material and workmanship for a period of **two (2)** years after **SUBSTANTIAL COMPLETION DATE**; correction of any deficiencies or defective work developing during this period shall be undertaken following the receipt of notice by the Owner; and such work shall be made good by this trade contractor or sub-trade contractor at his own expense.

Contractor: _____
By: _____
Signature: _____
Address: _____
_____
Telephone: _____
_____

SAMPLE GUARANTEE

DATE: Friday, November 21, 2025

PROJECT: Sexton Auditorium

OWNER: Lansing School District

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The American Institute of Architect (AIA) "General Conditions of the Contract for Construction" - AIA Document A201/2007 is a part of this contract, and is incorporated herein by reference as fully as if here set forth for bidding purposes and will be set forth at length in the contract. The General Conditions are modified by the Supplementary General Conditions as specified herein.

All references to the "Standard form of General Conditions" are hereinafter used in these specifications shall refer to the above documents.

END OF SECTION

THE CHRISTMAN COMPANY

SUPPLEMENTARY GENERAL CONDITIONS

AIA A201 -2007

Dated January 19, 2010; Revised 1/15/15

These Supplementary General Conditions modify the AIA A201 General Conditions, 2007 version, the Contract between the parties and all of the Contract Documents incorporated therein by reference as follows;

The terms and conditions of these Supplementary General Conditions shall control over all other Contract Documents in the event of any ambiguity or inconsistency.

Section 1.1.1 shall be amended as follows:

The first sentence is amended to read: "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, The Christman Company Supplementary General Conditions AIA A201-2007 dated January 19, 2010 and revised 1/15/2015, 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.

Section 1.2.1 shall be amended as follows:

In the first line, strike "The intent of the Contract Documents is to", and substitute "The Contract Documents shall".

Section 3.3.1:

Strike "solely" from the last sentence.

Section 3.5 shall be modified as follows:

Delete "and Architect" in the first line. Revise "and will be free from defects" to "and will be free from defects caused by Contractor or any one of its subcontractors or suppliers." All Contractor's warranties provided for Owner-furnished equipment or equipment installed by Contractor as called for in the Contract Documents shall be limited to labor for the installation, and Owner's warranty rights are otherwise limited to the manufacturer's warranties. There are no warranties of merchantability or fitness for a particular purpose and the parties all agree that the Uniform Commercial Code has no application to this contract as this is a labor and services intensive contract.

Section 3.10.2:

Strike the last line in Section 3.10.2.

Section 3.12.11:

Insert "Under no circumstances shall this Section 3.12 or any other section of this Agreement be read or interpreted to create design obligations or responsibilities on behalf of Contractor."

Section 3.18.1 shall be amended as follows:

Delete "Architect, Architect's consultants, and agents" and change "employees of any of them" to "employees of the Owner."

Delete "regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder."

Section 9.10.2 shall be amended as follows:

This Section 9.10.2 shall not apply to liens recorded as a result of the Owner's failure to make timely payment as required under the Contract Documents.

Delete "and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner" stated in (2) in the first sentence.

Section 11.1.3 shall be amended as follows:

Delete the second sentence in Section 11.1.13.

Insert at the end of Section 11.1.3 "The Contractor shall provide written notification to the Owner of the cancellation or expiration of any insurance required by Section 11.1. The Contractor shall provide such written notice within five (5) business days of the date the Contractor is first aware of the cancellation or expiration, or is first aware that the cancellation or expiration is threatened or otherwise may occur, whichever comes first."

Section 11.3.6 shall be amended as follows:

Delete the third sentence in Section 11.3.6.

Replace with "The Owner shall provide written notification to the Contractor of the cancellation or expiration of any insurance required by Section 11.3. The Owner shall provide such written notice within five (5) business days of the date the Owner is first aware of the cancellation or expiration, or is first aware that the cancellation or expiration is threatened or otherwise may occur, whichever comes first."

Section 15.2.5:

Strike the last sentence in Section 15.2.5.

Section 15.4 Arbitration:

Strike Section 15.4 Arbitration.

END OF SECTION

Printed on Fri Nov 21, 2025 at 10:41 am EST

Job #: 221125-180 LSD - Sexton Auditorium Renovation

Lansing, Michigan 48915

The Christman Company

CD Set (11/18/25)

Drawing No.	Drawing Title	Revision	Drawing Date	Received Date	Set
General					
G0.1	TITLE SHEET	1	11/18/2025	11/18/2025	CD Set (11/18/25)
G0.2	DATA SHEET	0	11/18/2025	11/18/2025	CD Set (11/18/25)
Structural					
S0.1	STRUCTURAL NOTES	0	11/18/2025	11/18/2025	CD Set (11/18/25)
S1.1	AUDITORIUM AND FAN ROOM FRAMING PLANS	0	11/18/2025	11/18/2025	CD Set (11/18/25)
S2.1	AUDITORIUM SECTIONS AND DETAILS	0	11/18/2025	11/18/2025	CD Set (11/18/25)
Demolition					
D1.1	FIRST FLOOR AUDITORIUM DEMOLITION PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
D1.2	SECOND FLOOR AUDITORIUM DEMOLITION PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
D1.3	THIRD FLOOR & FAN ROOM AUDITORIUM DEMOLITION PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
Architectural					
A0.1	FIRST FLOOR COMPOSITE PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
A0.3	CODE COMPLIANCE PLANS	1	11/18/2025	11/18/2025	CD Set (11/18/25)
A0.5	ROOF PLAN	0	11/18/2025	11/18/2025	CD Set (11/18/25)
A1.1	FIRST FLOOR & PARTIAL SECOND FLOOR AUDITORIUM PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
A1.3	THIRD FLOOR & FAN ROOM AUDITORIUM PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
A1.21	FIRST FLOOR EQUIPMENT PLAN	0	11/18/2025	11/18/2025	CD Set (11/18/25)
A1.31	SECOND & THIRD FLOOR EQUIPMENT PLAN	0	11/18/2025	11/18/2025	CD Set (11/18/25)
A2.1	FIRST & SECOND FLOOR AUDITORIUM REFLECTED CEILING PLAN	0	11/18/2025	11/18/2025	CD Set (11/18/25)
A2.3	THIRD FLOOR AUDITORIUM REFLECTED CEILING PLAN	0	11/18/2025	11/18/2025	CD Set (11/18/25)
A2.30	INTERIOR PARTITION TYPES	0	11/18/2025	11/18/2025	CD Set (11/18/25)
A3.3	BUILDING SECTIONS & DETAILS	1	11/18/2025	11/18/2025	CD Set (11/18/25)
A6.1	DOOR SCHEDULE & OPENING ELEVATIONS	0	11/18/2025	11/18/2025	CD Set (11/18/25)
A8.1	FIRST FLOOR COLOR LAYOUT PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
A8.11	SECOND & THIRD FLOOR COLOR LAYOUT PLAN	0	11/18/2025	11/18/2025	CD Set (11/18/25)
A9.1	INTERIOR ELEVATIONS	1	11/18/2025	11/18/2025	CD Set (11/18/25)
Mechanical					
M0.0	MECHANICAL GENERAL INFORMATION	1	11/18/2025	11/18/2025	CD Set (11/18/25)
M1.4	ROOF MECHANICAL PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
M4.0	ENLARGED MECHANICAL PLANS	1	11/18/2025	11/18/2025	CD Set (11/18/25)
M4.1	ENLARGED MECHANICAL PLANS	1	11/18/2025	11/18/2025	CD Set (11/18/25)
M5.0	MECHANICAL DETAILS	1	11/18/2025	11/18/2025	CD Set (11/18/25)
M5.1	MECHANICAL DETAILS	1	11/18/2025	11/18/2025	CD Set (11/18/25)

The Christman Company

Drawing No.	Drawing Title	Revision	Drawing Date	Received Date	Set
M6.0	MECHANICAL SCHEDULES	1	11/18/2025	11/18/2025	CD Set (11/18/25)
M6.1	MECHANICAL SCHEDULES	1	11/18/2025	11/18/2025	CD Set (11/18/25)
M8.0	CONTROL DIAGRAMS	1	11/18/2025	11/18/2025	CD Set (11/18/25)
M8.1	CONTROL DIAGRAMS	0	11/18/2025	11/18/2025	CD Set (11/18/25)
MD1.0	LOWER LEVEL MECHANICAL DEMOLITION PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
MD1.1	FIRST FLOOR MECHANICAL DEMOLITION PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
MD1.2	SECOND FLOOR MECHANICAL DEMOLITION PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
MD1.3	THIRD FLOOR MECHANICAL DEMOLITION PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
MD1.4	ROOF MECHANICAL DEMOLITION PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
MH1.0	LOWER LEVEL MECHANICAL HVAC PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
MH1.1	FIRST FLOOR MECHANICAL HVAC PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
MH1.2	SECOND FLOOR MECHANICAL HVAC PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
MH1.3	THIRD FLOOR MECHANICAL HVAC PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
Electrical					
E0.0	ELECTRICAL GENERAL INFORMATION	1	11/18/2025	11/18/2025	CD Set (11/18/25)
E0.1	LIGHTING SCHEDULES	1	11/18/2025	11/18/2025	CD Set (11/18/25)
E4.0	ENLARGED POWER PLANS	0	11/18/2025	11/18/2025	CD Set (11/18/25)
E6.0	PANEL SCHEDULES AND DETAILS	1	11/18/2025	11/18/2025	CD Set (11/18/25)
E7.0	ELECTRICAL RISER DIAGRAM	1	11/18/2025	11/18/2025	CD Set (11/18/25)
ED1.0	LOWER LEVEL POWER DEMOLITION PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
ED1.1	FIRST FLOOR POWER DEMOLITION PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
ED1.2	SECOND FLOOR POWER DEMOLITION PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
ED1.3	THIRD FLOOR & STAGE CATWALK POWER DEMOLITION PLANS	1	11/18/2025	11/18/2025	CD Set (11/18/25)
ED2.1	FIRST FLOOR LIGHTING DEMOLITION PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
ED2.2	SECOND FLOOR LIGHTING DEMOLITION PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
ED2.3	THIRD FLOOR & STAGE CATWALK LIGHTING DEMOLITION PLANS	1	11/18/2025	11/18/2025	CD Set (11/18/25)
EL1.0	LOWER LEVEL LIGHTING PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
EL1.1	FIRST FLOOR LIGHTING PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
EL1.1F	FIRST FLOOR LIGHTING PLAN - FLOOR	1	11/18/2025	11/18/2025	CD Set (11/18/25)
EL1.2	SECOND FLOOR LIGHTING PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
EL1.3	THIRD FLOOR & STAGE CATWALK LIGHTING PLANS	1	11/18/2025	11/18/2025	CD Set (11/18/25)
EP1.0	LOWER LEVEL POWER PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
EP1.1	FIRST FLOOR POWER PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
EP1.2	SECOND FLOOR POWER PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
EP1.3	THIRD FLOOR & STAGE CATWALK POWER PLANS	1	11/18/2025	11/18/2025	CD Set (11/18/25)
EP1.4	ROOF POWER PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
Theatrical Seating					
TS1.1	AUDIENCE SEATING PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)

The Christman Company

Drawing No.	Drawing Title	Revision	Drawing Date	Received Date	Set
TS3.1	AUDIENCE SEATING SECTION	1	11/18/2025	11/18/2025	CD Set (11/18/25)
Theatrical Rigging					
TR0.0	THEATRICAL RIGGING SYMBOL KEY & NOTES	0	11/18/2025	11/18/2025	CD Set (11/18/25)
TR1.1	THEATRICAL RIGGING PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TR1.4	THEATRICAL RIGGING PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TR3.1	THEATRICAL RIGGING CENTERLINE SECTION	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TR3.2	THEATRICAL RIGGING TRANSVERSE SECTION	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TR3.3	THEATRICAL RIGGING TRANSVERSE SECTION	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TR3.4	THEATRICAL RIGGING TRANSVERSE SECTION	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TR3.5	THEATRICAL RIGGING TRANSVERSE SECTION	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TR3.6	THEATRICAL RIGGING TRANSVERSE SECTION	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TR5.1	THEATRICAL RIGGING DETAILS	0	11/18/2025	11/18/2025	CD Set (11/18/25)
TR5.2	THEATRICAL RIGGING DETAILS	0	11/18/2025	11/18/2025	CD Set (11/18/25)
TR6.1	THEATRICAL RIGGING RISER DIAGRAM	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TR6.2	THEATRICAL RIGGING SCHEDULE	0	11/18/2025	11/18/2025	CD Set (11/18/25)
Theatrical Lighting					
TL0.0	THEATRICAL LIGHTING SYMBOL KEY & NOTES	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TL1.1	THEATRICAL LIGHTING FIRST FLOOR PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TL1.2	THEATRICAL LIGHTING SECOND FLOOR PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TL1.3	THEATRICAL LIGHTING THIRD FLOOR PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TL1.4	THEATRICAL LIGHTING STAGE LOFT PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TL4.1	THEATRICAL LIGHTING ENLARGED PLAN	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TL5.1	THEATRICAL LIGHTING DETAILS	0	11/18/2025	11/18/2025	CD Set (11/18/25)
TL5.2	THEATRICAL LIGHTING DETAILS	0	11/18/2025	11/18/2025	CD Set (11/18/25)
TL5.3	THEATRICAL LIGHTING DETAILS	0	11/18/2025	11/18/2025	CD Set (11/18/25)
TL5.4	THEATRICAL LIGHTING RACK ELEVATIONS	0	11/18/2025	11/18/2025	CD Set (11/18/25)
TL6.1	THEATRICAL LIGHTING RISER DIAGRAM	1	11/18/2025	11/18/2025	CD Set (11/18/25)
TL6.2	THEATRICAL LIGHTING SCHEDULES	0	11/18/2025	11/18/2025	CD Set (11/18/25)

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 Austin Brown 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 must abide by prevailing wage rates. Refer to wage rates table included at the end of this section.
5. Background Checks – Each contractor is responsible to run an ICHAT background report on all their employees that will be working on the jobsite. The report needs to be sent to the Construction Manager prior to arriving onsite.
6. Construction Waste Management And Disposal – Review Spec Section 017419 Construction Waste Management And Disposal.
7. General Commissioning Requirements – Review Spec Section 019113 General Commissioning Requirements.
8. Indoor Air Quality Management Plan – During Construction. Comply with site specific IAQ Management Plan for this project.
9. Parking – Parking will be on site, in the areas indicated on the logistics plan.
10. 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.
11. 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.
12. 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.

FINAL UNRESTRICTED RELEASE: Marking: Reviewed

MAKE CORRECTIONS NOTED: Marking: Approved as Noted

REVISE AND RESUBMIT: Marking: Revise and Resubmit

REJECTED: Marking: Rejected

13. Building Information Modeling (BIM) – The use of BIM and Building Information Modeling is not required on this project.

14. Projects Website – This project will utilize Procore for the below information;

    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. Notice of commencement
    i. MSDS

15. Submittal Uploads – All submittals must be submitted to The Christman Company via the Project 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.

    Your submittals folder can be found under the Submittals tab. You then will find your appropriate WC#. The original PDF documents should then be uploaded to the "Submittals in For Approval" folder. You will then send an email to austin.brown@christmanco.com to notify the Construction Manager that the upload is complete. The Construction Manager will then take over the process for that submittal; once the review process (by the Construction Manager, Architect and Owner) is complete, the Construction Manager will upload the reviewed submittal to the "Reviewed Submittals" folder.

16. 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. Schedule of value

items must not exceed $100,000, unless a specific item (for instance, a roof top HVAC unit costing $110,000) cannot be furnished for less than $100,000.

17. Application for payment – Create and Submit the Pay Application through the Trade Contractor Portal. Payment period: Pay applications are 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.

18. Change Management – Refer to Sections 01150 and 01019 for definitions, but the following change management documents will be utilized on this project: Project Revisions and Field Directives.

19. 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.

20. Hoisting – There will be no provided hoisting, all trades with roof top work must provide a crane plan to the construction manager for review 72 hours prior to mobilizing crane or hoisting equipment on site.

21. Existing Facilities – Portable toilets will be utilized for the project, furnished by the construction manager. Trades are not permitted to utilize existing facilities.

22. 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.

23. 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.

24. 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.

25. Layout – There will be no control points provided by the construction manager, trades are required to provide own layout and surveying as necessary.

26. 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.

27. 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's 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.

xiii. FTP Site – An FTP site is set up for bidders to use. Please email austin.brown@christmanco.com to access the FTP site, project documents can also be obtained by the owner on their website.

28. 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.

29. Drug Testing – Drug testing must be completed within 8 hours of an incident resulting in removal from the project site including injuries and accidents, near-misses, etc.

30. 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.

31. 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.

32. 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.

33. Phasing – There is no specific phasing for this project, work must be completed prior to the start of the school year of 2026. Contractors must abide by the project schedule, and construction manager's coordination meetings.

34. Pre-bid RFI's – RFI's MUST BE SUBMITTED TO Projects@Lansingschools.net BY FRIDAY, DECEMBER 5th AT 5:00PM. RFI'S AND QUESTIONS SUBMTITED AFTER THIS DEADLINE WILL NOT BE GUARANTEED AN ANSWER/RESPONSE.

35. 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.

36. Hazardous Materials – There is no known quantifiable hazardous materials. WC01 will be responsible for the removal of and demolition of any found hazardous materials upon notification.

37. Regulatory Requirements – Applicable Codes can be found on sheet A0.3 in addition to all local municipalities and ordinances.

38. Alternates – See below

    1. Painted columns 3Form Cardinal Mobile
        a. Deduct alternate: Paint
        b. Base Bid: Plastic Laminate wrapped columns with metal trim at exposed edges.
    2. Auditorium wall panels

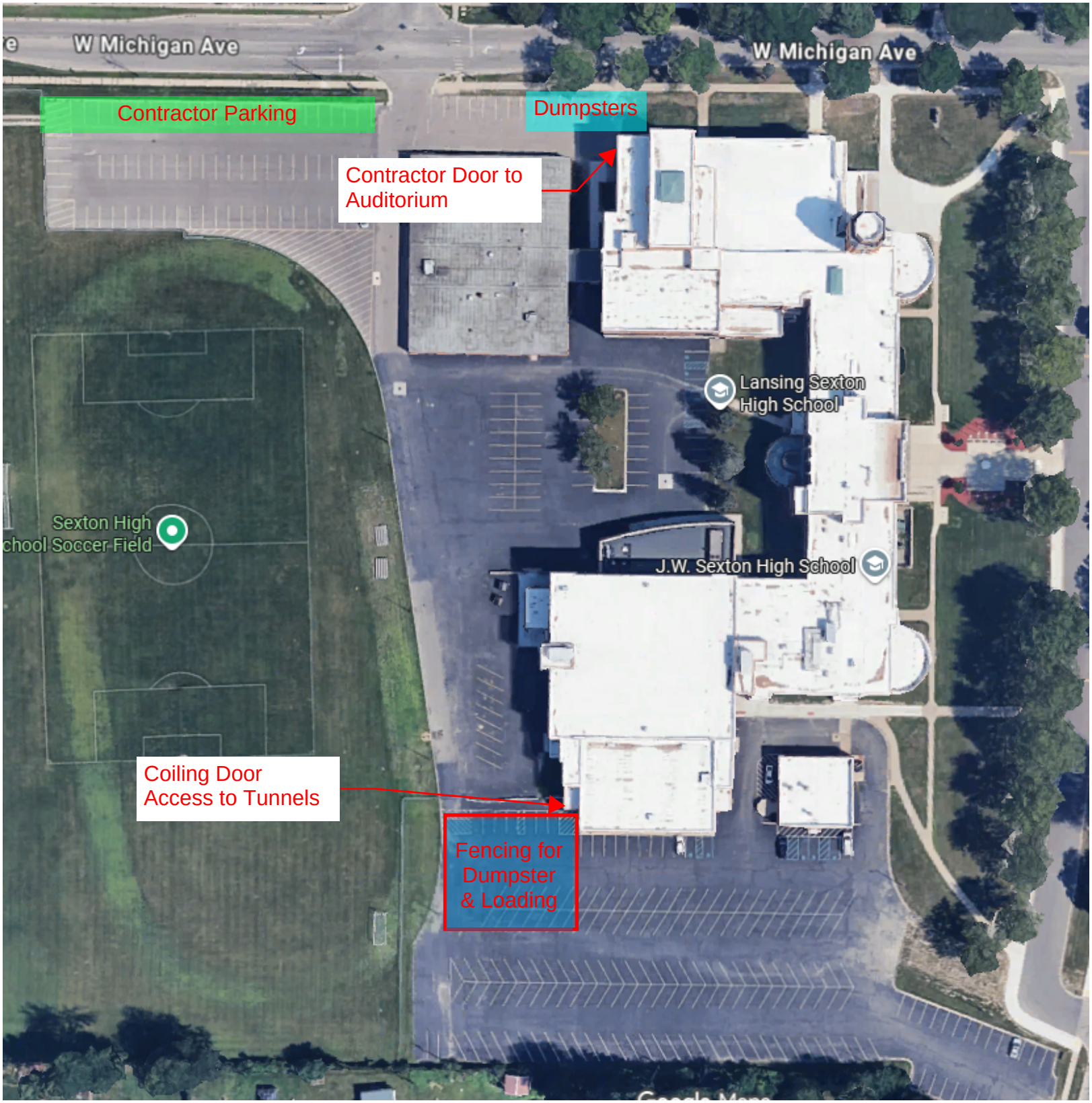
a. Add alternate: Fabric wrapped plywood "dummy" panels. (AWP-12A & AWP-13A) See interior elevations and spec section 098413 for additional information
b. Base bid: Omit

39. Sealant Schedule - Sealants are to be installed as listed in the schedule below. If sealants are required by the specification for a specific system that is are not listed, then the Trade Contractor installing the product shall be responsible for the associated caulking.

Sealant Schedule		
Item to be sealed	Responsible WC	Comments
Door Frames	20	
Plumbing and mechanical items	27	
Glazing Systems	20	
Masonry Systems	20	
Countertops	20	
Roofing Systems	20	
Top of Base	23	

End of Special Provisions Section 00210

Exterior Logistics Plan



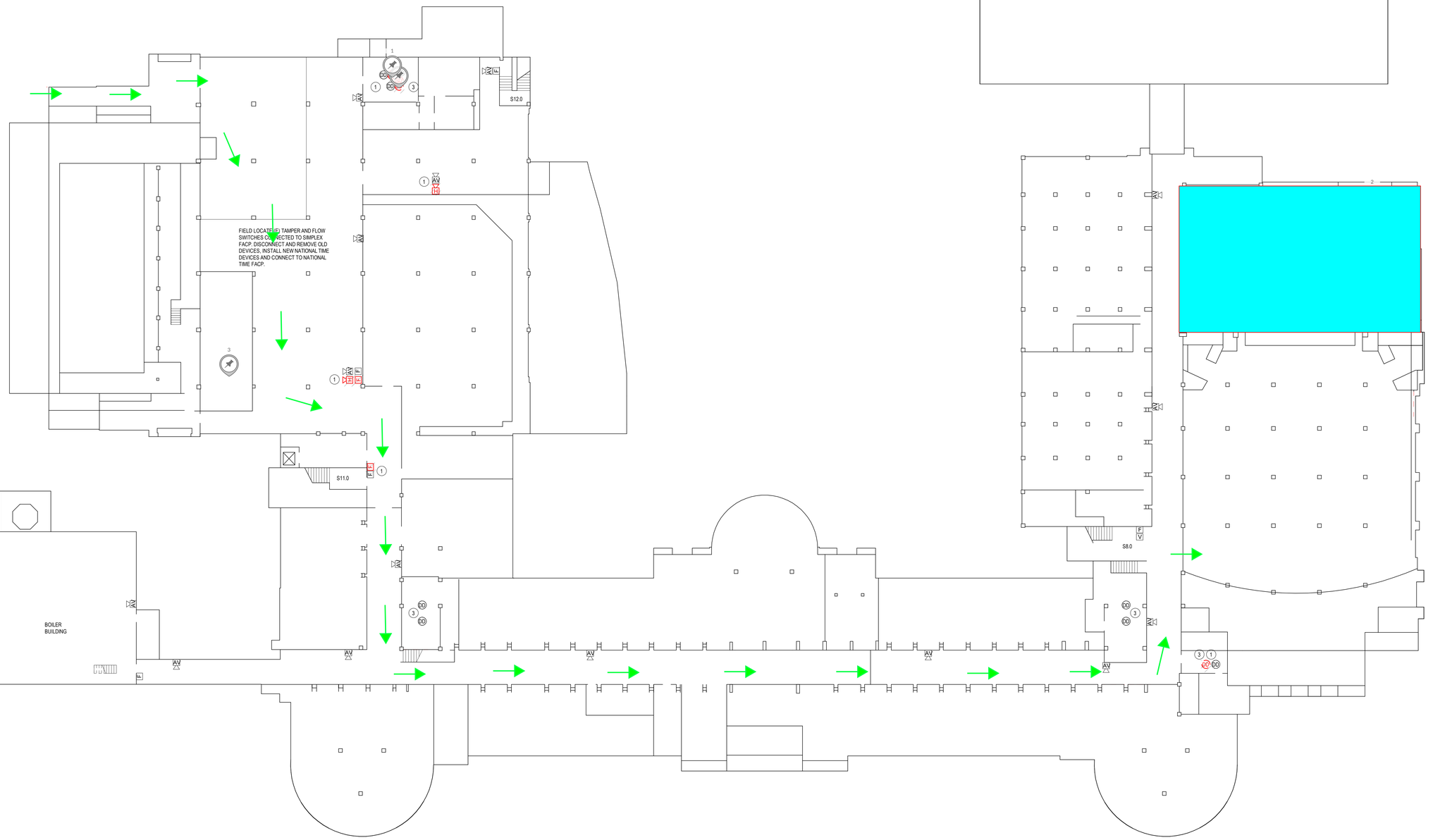
WE RECYCLE
THE BAR BELOW SHOWS GRAYSCALE FROM WHITE TO SOLID BLACK
WHITE

Tunnel Access Logistics Plan

- For the area under the stage (highlighted in blue), this can only be accessed from the stage area above.
- The rest of the tunnel area, we can only access from the SW corner of the site (where the green areas begin). There is an overhead coiling door at this location and then a steep ramp down to the tunnels.

FIRE ALARM KEYNOTES

1. DISCONNECT AND REMOVE EXISTING SIMPLEX DEVICE AND REPLACE WITH NEW NATIONAL TIME DEVICE.
2. DISCONNECT AND REMOVE EXISTING SIMPLEX DEVICE. PROVIDE A BLANK FACE PLATE. PAINT TO MATCH EXISTING SURFACE.
3. PROVIDE REQUIRED DUCT DETECTORS IN EXISTING MECHANICAL UNIT.
4. PROVIDE A NEW FIRE ALARM PANEL TO REPLACE THE EXISTING SIMPLEX PANEL.
5. PROVIDE DOOR HOLD DEVICES FOR CORRIDOR DOORS. INSTALL NEW SMOKE DETECTORS INTERCONNECTED TO DOOR HOLDS, ONE EACH SIDE OF DOOR WITHIN 60'.
6. CONNECT NEW CORRIDOR SMOKE DETECTORS TO EXISTING NATIONAL TIME PANEL IN AREA. (ANNEX: CORRIDOR 100R, FIRST FLOOR: ROOM 121).



TUNNEL LEVEL FLOOR PLAN
NOT TO SCALE

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LANSING SCHOOL DISTRICT
J.W. SEXTON HIGH SCHOOL FIRE ALARM UPGRADE
102 McPHERSON AVE LANSING, MI 48915

FIRE ALARM PLAN - TUNNEL LEVEL

REVISIONS

REV	DESCRIPTION	DATE

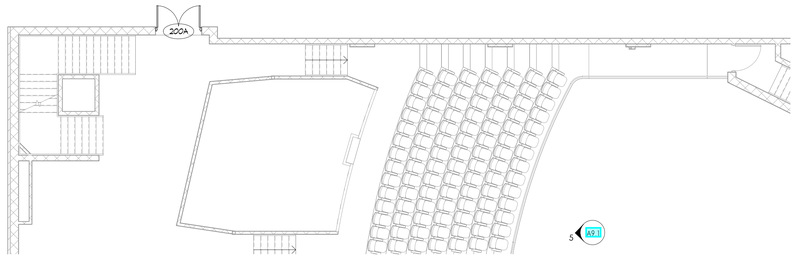
PROJ. #: 210384
DATE: 21 DEC 2021
SHEET
E-100

CONSTRUCTION DOCUMENTS

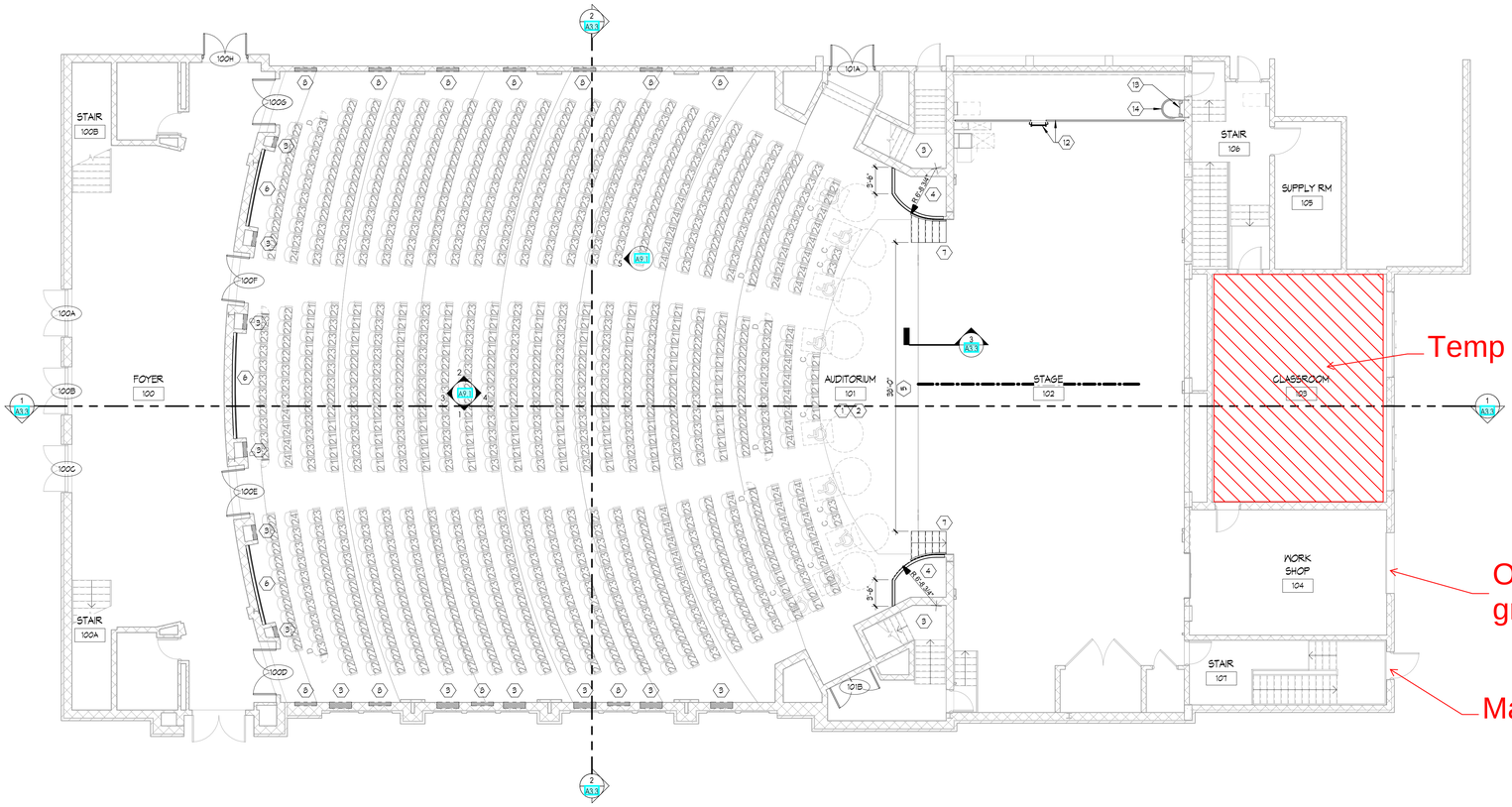
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DESIGNED BY: Designer
CHECKED BY: Checker APPROVED BY: Approver

First Floor Logistics Plan

- An item of note is that the overhead coiling door is not at ground level. It is roughly 4' above ground.



2 PARTIAL SECOND FLOOR AUDITORIUM FLOOR PLAN
1/8" = 1'-0"



1 FIRST FLOOR AUDITORIUM FLOOR PLAN
1/8" = 1'-0"

ARCHITECTURAL GENERAL NOTES

1. XX INDICATES CONSTRUCTION DOCUMENT ROOM NUMBERS.
2. REFER TO THEATRICAL PLANS FOR SEATING, EQUIPMENT, CURTAINS, AND RIGGING SYSTEMS.
3. REFER TO COLOR LAYOUT PLANS FOR FLOOR FINISH PATTERNS AND COLORS.
4. REFER TO ENLARGED PLANS FOR ADDITIONAL NOTES AND DIMENSIONS.
5. MASONRY CONTRACTOR TO INSTALL LOOSE LINTELS FOR MISCELLANEOUS OPENINGS NOT INDICATED ON DRAWINGS BUT REQUIRED FOR MECHANICAL, ELECTRICAL, THEATRICAL EQUIPMENT OR OTHER ITEMS THAT PASS THROUGH A WALL. STEEL LINTELS SHALL BE SUPPLIED BY THE STEEL CONTRACTOR.
6. REFER TO TITLE SHEET FOR FLOOR PLAN SYMBOLS LEGEND.

ARCHITECTURAL PLAN KEYNOTES

1. NEW FIRST FLOOR SEATING, REFER TO THEATRICAL PLANS
2. PATCH & REPAIR FLOOR AT AREAS OF REMOVED FLOOR GRILLES. NEW FLOOR INFILL WITH METAL JOIST, ACOUSTICAL INSULATION, AND DENSE DECK - REFER TO STRUCTURAL AND MECHANICAL
3. PATCH & REPAIR EXISTING WALL & CEILING FINISH AS REQUIRED.
4. NEW 2X4 STUD CONSTRUCTION STAGE CHEEK WALLS. RADIUS TO MATCH EXISTING WOOD TRIM ABOVE, CONTRACTOR TO V.I.F. REFER TO COLOR PLAN.
5. REPLACE FRONT STAGE, REFER TO SHEET A3.3.
6. 3-5/8" MTL STUD WALL UP TO CEILING W/ ACOUSTICAL BATT INSULATION. 1-1/2" HAT CHANNELS AND ONE LAYER GYPSUM BD UP TO 3'-6"UP TO REFER TO INTERIORS PLAN FOR ACOUSTICAL WALL TREATMENT.
7. NEW WOOD FRAMED STAIR AND HANDRAIL. STAIR TREADS TO MATCH ADJACENT STAGE AREA FLOORING.
8. NEW WALL LOUVER. PATCH & REPAIR EXISTING WALL AFFECTED BY MECHANICAL DEMOLITION.
9. INFILL EXISTING OPENINGS TO MATCH EXISTING ADJACENT SURFACES. NEW 4" FACE BRICK ON 8" CMU WALL INFILL. TOOTH IN MASONRY UNITS.
10. NEW MECHANICAL EQUIPMENT. COORDINATE WITH MECHANICAL DRAWINGS.
11. NEW FLOOR INFILL WITH METAL JOIST, ACOUSTICAL INSULATION, AND DENSE DECK - REFER TO STRUCTURAL.
12. NEW METAL LADDER TO LOADING GALLERY W/ OSHA GUARDRAIL 36"H.
13. NEW STAINLESS STEEL LADDER CABLE FALL ARREST FOR FIXED LADDERS, DIRECT ATTACH TO LADDER. INCLUDE CONSTRUCTION STYLE POSITIONING HARNESS, BACK & SIDE D-RINGS. PROVIDE (2) FULL BODY HARNESSES (SIZE BY OWNER).
14. PROVIDE LOCK & RESTRICTION SIGNAGE AT EXISTING CAGED LADDER.

KINGSCOTT
PORTAGE | CHELSEA | GRAND RAPIDS | ROYAL OAK

J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

ISSUANCES	DATE
BID & CONSTRUCTION	11/07/2025

KEY PLAN

N

JOB NO. 2616.11

SHEET TITLE
FIRST FLOOR & PARTIAL SECOND FLOOR AUDITORIUM PLAN

SHEET NO.
A1.1

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Autodesk Docs://LSD Sexton HS Auditorium Improvement/Lansing Sexton HS_Auditorium_Archi_2025.rvt

Third Floor Logistics Plan

- The only way into the 3rd floor mechanical space is via the corridor. This corridor will also be occupied by students during school hours. WC 20 to provide temp walls and door per the plan to keep construction and students separated as much as possible. There is an elevator that construction can use, location shown on this plan.

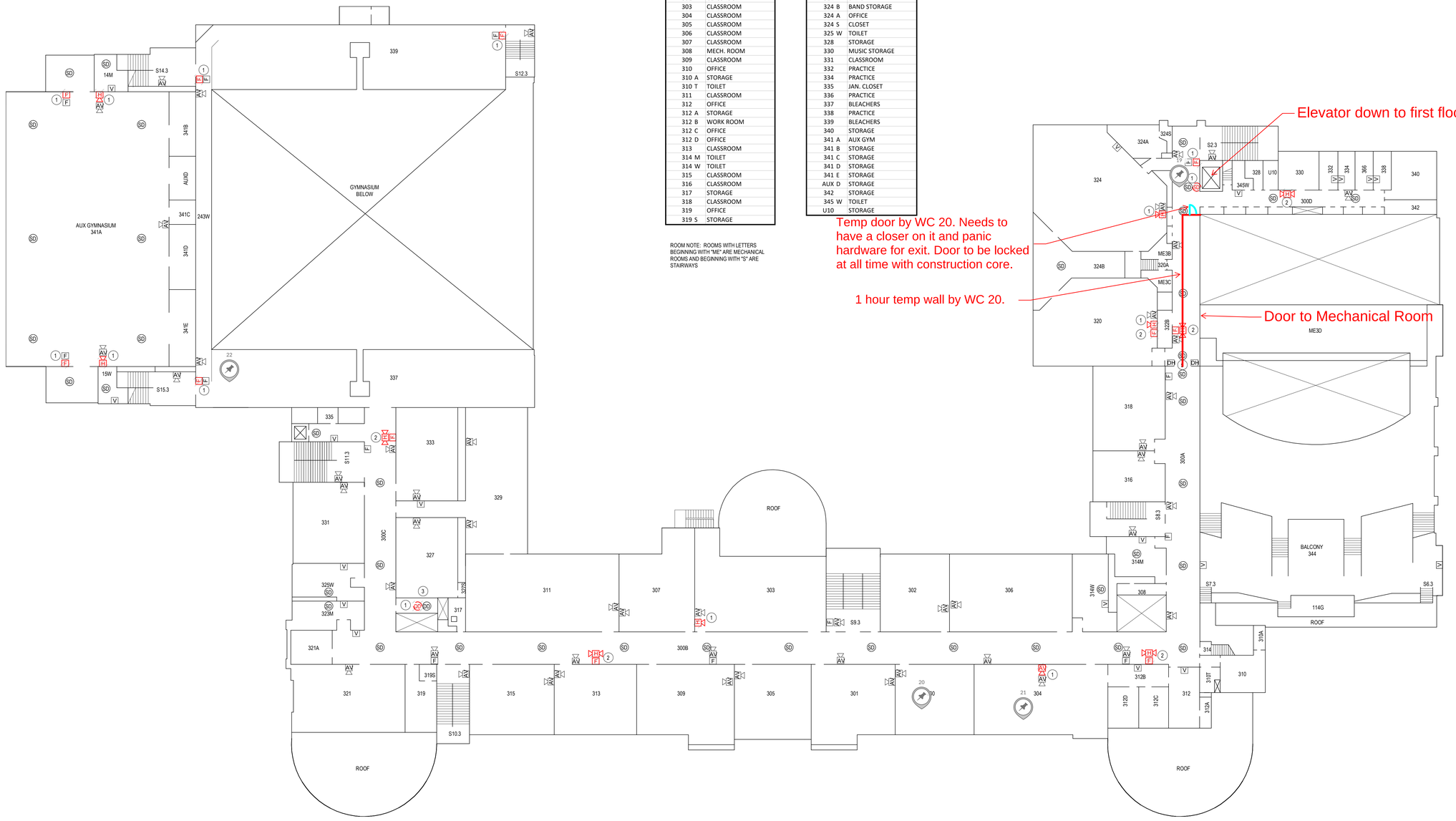
FIRE ALARM KEYNOTES

1. DISCONNECT AND REMOVE EXISTING SIMPLEX DEVICE AND REPLACE WITH NEW NATIONAL TIME DEVICE.
2. DISCONNECT AND REMOVE EXISTING SIMPLEX DEVICE. PROVIDE A BLANK FACE PLATE. PAINT TO MATCH EXISTING SURFACE.
3. PROVIDE REQUIRED DUCT DETECTORS IN EXISTING MECHANICAL UNIT.
4. PROVIDE A NEW FIRE ALARM PANEL TO REPLACE THE EXISTING SIMPLEX PANEL.
5. PROVIDE DOOR HOLD DEVICES FOR CORRIDOR DOORS. INSTALL NEW SMOKE DETECTORS INTERCONNECTED TO DOOR HOLDS, ONE EACH SIDE OF DOOR WITHIN 60".
6. CONNECT NEW CORRIDOR SMOKE DETECTORS TO EXISTING NATIONAL TIME PANEL IN AREA. (ANNEX: CORRIDOR 100R, FIRST FLOOR: ROOM 121).

ROOM #	ROOM TYPE
300	CLASSROOM
300 A	CORRIDOR
300 B	CORRIDOR
300 C	CORRIDOR
300 D	CORRIDOR
301	CLASSROOM
302	CLASSROOM
303	CLASSROOM
304	CLASSROOM
305	CLASSROOM
306	CLASSROOM
307	CLASSROOM
308	MECH. ROOM
309	CLASSROOM
310	OFFICE
310 A	STORAGE
310 T	TOILET
311	CLASSROOM
312	OFFICE
312 A	STORAGE
312 B	WORK ROOM
312 C	OFFICE
312 D	OFFICE
313	CLASSROOM
314 M	TOILET
314 W	TOILET
315	CLASSROOM
316	CLASSROOM
317	STORAGE
318	CLASSROOM
319	OFFICE
319 S	STORAGE

ROOM #	ROOM TYPE
320	CHOIR
320 A	CHOIR STORAGE
321	CLASSROOM
321 A	STORAGE
322 B	TOILET
323 M	TOILET
324	BAND
324 B	BAND STORAGE
324 A	OFFICE
324 S	CLOSET
325 W	TOILET
328	STORAGE
330	MUSIC STORAGE
331	CLASSROOM
332	PRACTICE
334	PRACTICE
335	JAN. CLOSET
336	PRACTICE
337	BLEACHERS
338	PRACTICE
339	BLEACHERS
340	STORAGE
341 A	AUX GYM
341 B	STORAGE
341 C	STORAGE
341 D	STORAGE
341 E	STORAGE
AUX D	STORAGE
342	STORAGE
345 W	TOILET
U10	STORAGE

ROOM NOTE: ROOMS WITH LETTERS BEGINNING WITH "ME" ARE MECHANICAL ROOMS AND BEGINNING WITH "S" ARE STAIRWAYS



THIRD LEVEL FLOOR PLAN
NOT TO SCALE

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LANSING SCHOOL DISTRICT
J.W. SEXTON HIGH SCHOOL FIRE ALARM UPGRADE
102 McPHERSON AVE LANSING, MI 48915

FIRE ALARM PLAN - THIRD LEVEL

REVISIONS

REV	DESCRIPTION	DATE

PROJ. #: 210384
DATE: 21 DEC 2021
SHEET
E-103

CONSTRUCTION DOCUMENTS

THE BAR BELOW SHOWS GRAYSCALE FROM WHITE TO SOLID BLACK
WE RECYCLE

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DESIGNED BY: Designer
CHECKED BY: Checker APPROVED BY: Approver

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
3.1 Power Equip. Operator - Highway & Heavy	**11/01/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$71.46	$94.57	$117.67
Apprentice: Level 1 0 - 6 Months	$57.61	$73.79	$89.97
Apprentice: Level 2 7 -12 Months	$59.93	$77.28	$94.61
Apprentice: Level 3 13 - 18 Months	$62.23	$80.73	$99.21
Apprentice: Level 4 19 - 24 Months	$64.54	$84.19	$103.83
Apprentice: Level 5 25 - 30 Months	$66.85	$87.66	$108.45
Apprentice: Level 6 31 - 36 Months	$69.15	$91.10	$113.05

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
3.2 Power Equip. Operator - Highway & Heavy	**11/01/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$70.31	$92.84	$115.37
Apprentice: Level 1 0 - 6 Months	$56.81	$72.59	$88.37
Apprentice: Level 2 7 -12 Months	$59.06	$75.97	$92.87
Apprentice: Level 3 13 - 18 Months	$61.31	$79.35	$97.37
Apprentice: Level 4 19 - 24 Months	$63.56	$82.72	$101.87
Apprentice: Level 5 25 - 30 Months	$65.81	$86.09	$106.37
Apprentice: Level 6 31 - 36 Months	$68.06	$89.47	$110.87

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
3.3 Power Equip. Operator - Highway & Heavy	**11/01/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$63.58	$82.75	$101.91
Apprentice: Level 1 0 - 6 Months	$52.10	$65.53	$78.95
Apprentice: Level 2 7 -12 Months	$54.02	$68.41	$82.79
Apprentice: Level 3 13 - 18 Months	$55.92	$71.26	$86.59
Apprentice: Level 4 19 - 24 Months	$57.84	$74.14	$90.43
Apprentice: Level 5 25 - 30 Months	$59.75	$77.00	$94.25
Apprentice: Level 6 31 - 36 Months	$61.67	$79.89	$98.09

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
3.4 Power Equip. Operator - Highway & Heavy	**11/01/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$63.02	$81.91	$100.79
Apprentice: Level 1 0 - 6 Months	$51.70	$64.93	$78.15
Apprentice: Level 2 7 -12 Months	$53.59	$67.76	$81.93
Apprentice: Level 3 13 - 18 Months	$55.48	$70.60	$85.71
Apprentice: Level 4	$57.36	$73.42	$89.47
Apprentice: Level 5 25 - 30 Months	$59.25	$76.25	$93.25
Apprentice: Level 6 31 - 36 Months	$61.13	$79.07	$97.01

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
3.5 Power Equip. Operator - Highway & Heavy	**11/01/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$44.80	$60.98	$77.15
Apprentice: Level 1 0 - 6 Months	$35.09	$46.42	$57.73
Apprentice: Level 2 7 -12 Months	$36.71	$48.84	$60.97
Apprentice: Level 3 13 - 18 Months	$38.33	$51.27	$64.21
Apprentice: Level 4 19 - 24 Months	$39.95	$53.71	$67.45
Apprentice: Level 5 25 - 30 Months	$41.57	$56.13	$70.69
Apprentice: Level 6 31 - 36 Months	$43.18	$58.55	$73.91

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
4.1 Power Equip. Operator - Commercial	**10/31/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$71.22	$94.21	$117.19
Apprentice: Level 1 0 - 6 Months	$57.43	$73.52	$89.61
Apprentice: Level 2 7 - 12 Months	$59.73	$76.97	$94.21
Apprentice: Level 3 13 - 18 Months	$62.03	$80.42	$98.81
Apprentice: Level 4 19 - 24 Months	$64.32	$83.86	$103.39
Apprentice: Level 5 25 - 30 Months	$66.62	$87.31	$107.99
Apprentice: Level 6 31 - 36 Months	$68.92	$90.76	$112.59

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
4.2 Power Equip. Operator - Commercial	**10/31/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$70.93	$93.77	$116.61
Apprentice: Level 1 0 - 6 Months	$57.22	$73.21	$89.19
Apprentice: Level 2 7 - 12 Months	$59.51	$76.65	$93.77
Apprentice: Level 3 13 - 18 Months	$61.80	$71.52	$89.80
Apprentice: Level 4 19 - 24 Months	$64.07	$83.48	$102.89
Apprentice: Level 5 25 - 30 Months	$66.36	$86.92	$107.47
Apprentice: Level 6 31 - 36 Months	$68.64	$90.33	$112.03

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
4.3 Power Equip. Operator - Commercial	**11/01/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$70.11	$92.55	$114.97
Apprentice: Level 1 0 - 6 Months	$56.66	$72.37	$88.07
Apprentice: Level 2 7 - 12 Months	$58.90	$75.73	$92.55
Apprentice: Level 3 13 - 18 Months	$61.14	$79.09	$97.03
Apprentice: Level 4 19 - 24 Months	$63.38	$82.45	$101.51
Apprentice: Level 5 25 -30 Months	$65.63	$85.82	$106.01
Apprentice: Level 6 31 - 36 Months	$67.87	$89.18	$110.49

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
4.4 Power Equip. Operator - Commercial	**11/01/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$69.25	$91.25	$113.25
Apprentice: Level 1 0 - 6 Months	$56.05	$71.45	$86.85
Apprentice: Level 2 7 - 12 Months	$58.25	$74.75	$91.25
Apprentice: Level 3 13 -18 Months	$60.45	$78.06	$95.65
Apprentice: Level 4 19 - 24 Months	$62.65	$81.35	$100.05
Apprentice: Level 5 25 - 30 Months	$64.85	$84.66	$104.45
Apprentice: Level 6 31 -36 Months	$67.05	$87.96	$108.85

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
4.5 Power Equip. Operator - Commercial	**11/01/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$68.28	$89.80	$111.31
Apprentice: Level 1 0 - 6 Months	$55.37	$70.44	$85.49
Apprentice: Level 2 7 -12 Months	$57.53	$73.68	$89.81
Apprentice: Level 3 13 - 18 Months	$61.83	$80.12	$98.41
Apprentice: Level 5 25 - 30 Months	$63.98	$83.35	$102.71
Apprentice: Level 6 31 - 36 Months	$66.13	$86.58	$107.01

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
4.6 Power Equip. Operator - Commercial	**11/01/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$66.57	$87.24	$107.89
Apprentice: Level 1 0 - 6 Months	$54.17	$68.64	$83.09
Apprentice: Level 2 7 -12 Months	$56.24	$71.74	$87.23
Apprentice: Level 3 13 - 18 Months	$58.30	$74.82	$91.35
Apprentice: Level 4 19 -24 Months	$60.37	$77.93	$95.49
Apprentice: Level 5 25 - 30 Months	$62.44	$81.04	$99.63
Apprentice: Level 6 31 - 36 Months	$64.50	$84.13	$103.75

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
4.7 Power Equip. Operator - Commercial	**11/01/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$59.26	$67.72	$84.72
Apprentice: Level	$54.15	$68.61	$83.05
Apprentice: Level 1 0 - 6 Months	$49.05	$60.95	$72.85
Apprentice: Level 2 7 -12 Months	$50.76	$63.52	$76.27
Apprentice: Level 3 13 - 18 Months	$52.46	$66.07	$79.67
Apprentice: Level 5 25 - 30 Months	$55.85	$71.16	$86.45
Apprentice: Level 6 31 - 36 Months	$57.55	$73.71	$89.85

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
4.8 Power Equip. Operator - Commercial	**11/01/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$58.23	$74.72	$91.21
Apprentice: Level 1 0 - 6 Months	$48.34	$59.88	$71.43
Apprentice: Level 2 7 -12 Months	$49.99	$62.37	$74.73
Apprentice: Level 3 13 - 18 Months	$51.63	$64.82	$78.01
Apprentice: Level 4 19 - 24 Months	$53.29	$67.31	$81.33
Apprentice: Level 5 25 - 30 Months	$54.93	$69.78	$84.61
Apprentice: Level 6 25 - 30 Months	$56.59	$72.27	$87.93

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
Articulated Hauler	**10/28/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$63.02	$81.91	$100.79
Apprentice: Apprentice Level 1	$51.70	$64.93	$78.15
Apprentice: Apprentice Level 2	$53.59	$67.76	$81.93
Apprentice: Apprentice Level 3	$55.48	$70.60	$85.71
Apprentice: Apprentice Level 4	$57.36	$73.42	$89.47
Apprentice: Apprentice Level 5	$59.25	$76.25	$93.25
Apprentice: Apprentice Level 6	$61.13	$79.07	$97.01

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
Asbestos abatement worker or environmental remediation worker	**11/01/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$56.20	$73.24	$90.28
Apprentice: Trainee 600 hours +1 year	$43.12	$55.01	$66.90

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Boilermaker			**10/29/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$79.64	$119.12	$158.58
Apprentice: 1st Period	$58.07	$86.78	$115.44
Apprentice: 2nd Period	$59.89	$89.50	$119.08
Apprentice: 3rd Period	$61.81	$92.24	$122.74
Apprentice: 4th Period	$63.50	$94.91	$126.30
Apprentice: 5th Period	$65.26	$97.54	$129.82
Apprentice: 6th Period	$68.89	$103.00	$137.08
Apprentice: 7th Period	$72.46	$108.36	$144.22
Apprentice: 8th Period	$76.07	$113.77	$151.44

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
Boom Truck	**10/28/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$70.31	$92.84	$115.37
Apprentice: Apprentice Level 1	$56.81	$72.59	$88.37
Apprentice: Apprentice Level 2	$59.06	$75.97	$92.87
Apprentice: Apprentice Level 3	$61.31	$79.35	$97.37
Apprentice: Apprentice Level 4	$63.56	$82.72	$101.87

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
Bricklayer	**10/29/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$62.02	$78.47	$94.91
Apprentice: Apprentice Level 1	$42.58	$52.77	$62.95
Apprentice: Apprentice Level 2	$44.48	$55.62	$66.75
Apprentice: Apprentice Level 3	$46.38	$58.47	$70.55
Apprentice: Apprentice Level 4	$48.29	$61.33	$74.37
Apprentice: Apprentice Level 5	$50.19	$50.19	$50.19
Apprentice: Apprentice Level 6	$52.09	$67.03	$81.97
Apprentice: Apprentice Level 7 & 8	$53.99	$69.88	$85.77

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
Carpet layers (linoleum)	**11/03/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$53.72	$70.77	$87.81
Apprentice: Level 1	$43.49	$55.42	$67.35
Apprentice: Level 2	$45.20	$57.99	$70.77
Apprentice: Level 3	$48.61	$63.10	$77.59
Apprentice: Level 4	$52.02	$68.22	$84.41

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Cement Mason			**10/29/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$55.92	$71.23	$86.54
Apprentice: Apprentice Level 1	$41.58	$52.92	$64.26
Apprentice: Apprentice Level 2	$43.32	$55.53	$67.74
Apprentice: Apprentice Level 3	$45.05	$58.13	$71.20
Apprentice: Apprentice Level 4	$46.79	$60.74	$74.68
Apprentice: Apprentice Level 5 & 6	$48.52	$63.33	$78.14

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Drywall Taper			**10/31/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$51.67	$68.44	$85.21
Apprentice: Apprentice Level 1	$39.93	$50.83	$61.73
Apprentice: Apprentice Level 2	$43.29	$55.87	$68.45
Apprentice: Apprentice Level 3	$48.32	$63.42	$78.51

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Drywall Taper			**11/01/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$51.64	$67.18	$82.72
Apprentice: Level 1	$39.21	$48.54	$57.86
Apprentice: Level 2	$45.42	$57.85	$70.28
Apprentice: Level 3	$48.53	$62.52	$76.50

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Electrician			**10/31/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$85.79	$115.70	$145.60
Apprentice: Apprentice Level 1	$49.08	$60.64	$72.18
Apprentice: Apprentice Level 2	$55.89	$70.85	$85.80
Apprentice: Apprentice Level 3	$61.86	$79.81	$97.74
Apprentice: Apprentice Level 4	$67.85	$88.79	$109.72
Apprentice: Apprentice Level 5	$73.83	$97.77	$121.68
Apprentice: Apprentice Level 6	$79.81	$106.74	$133.64

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Additional Jurisdiction Detail: Townships of Onondaga, Leslie, Stockbridge and Bunker Hill ONLY.

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Electricians			**10/31/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$76.37	$100.11	$123.85
Apprentice: Apprentice Level 1	$32.70	$43.72	$54.07
Apprentice: Apprentice Level 2	$35.07	$46.93	$58.80
Apprentice: Apprentice Level 3	$39.74	$52.80	$65.86
Apprentice: Apprentice Level 4	$53.90	$69.34	$84.76
Apprentice: Apprentice Level 5	$56.28	$72.90	$89.51
Apprentice: Apprentice Level 6	$58.64	$76.45	$94.25

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Additional Jurisdiction Detail: All Locations not specified in Ingham County

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Elevator Constructors			**11/01/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$110.76	$143.49	$176.21

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Glaziers			**10/31/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$56.55	$76.37	$96.20
Apprentice: Level 1	$40.70	$52.61	$64.50
Apprentice: Level 2	$44.66	$58.55	$72.42
Apprentice: Level 3	$48.63	$64.50	$80.36
Apprentice: Level 4	$52.59	$70.44	$88.28

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
Ground Person	**11/01/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$50.85	$72.32	$93.78

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Heating and frost Insulators			**11/03/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$52.00	$68.89	$85.77
Apprentice: 1st year	$26.38	$33.69	$40.99
Apprentice: 2nd year	$30.15	$38.92	$47.68
Apprentice: 3rd year	$33.92	$44.15	$54.37
Apprentice: 4th year	$37.70	$49.39	$61.08
Apprentice: 5th year	$41.48	$54.63	$67.78

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Friday for cancelled work in a 4 10 schedule

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
Ironworker	**10/31/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$75.42	$93.70	$111.97
Apprentice: Apprentice Level 1	$57.42	$70.40	$83.37
Apprentice: Apprentice Level 2	$59.59	$73.12	$86.64
Apprentice: Apprentice Level 3	$61.54	$75.43	$89.32
Apprentice: Apprentice Level 4	$64.59	$79.40	$94.20
Apprentice: Apprentice Level 5	$67.64	$83.36	$99.07
Apprentice: Apprentice Level 6	$75.42	$93.70	$111.97

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
Laborer, Common - Commercial	**11/04/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$46.28	$62.55	$78.81
Apprentice: Apprentice Level 1	$38.15	$45.45	$56.02
Apprentice: Apprentice Level 2	$39.77	$47.57	$58.84
Apprentice: Apprentice Level 3	$41.40	$49.68	$61.66
Apprentice: Apprentice Level 4	$44.65	$53.91	$67.29

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
Laborer, Common - Highway & Heavy	**11/05/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$48.27	$62.46	$76.64
Apprentice: Level 1	$41.09	$51.73	$62.37
Apprentice: Level 2	$42.51	$53.86	$65.21
Apprentice: Level 3	$43.92	$55.98	$68.03
Apprentice: Level 4	$46.76	$60.24	$73.71

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
Laborer, Landscaping	**11/03/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$36.87	$49.23	$61.58
Apprentice: Apprentice Level 1	$30.69	$39.96	$49.22
Apprentice: Apprentice Level 2	$31.93	$41.82	$51.70
Apprentice: Apprentice Level 3	$33.16	$43.66	$54.16
Apprentice: Apprentice Level 4	$35.63	$47.37	$59.10

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
Laborer, Skilled - Highway & Heavy	**11/05/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$49.27	$63.96	$78.64
Apprentice: Apprentice Level 1	$41.84	$52.86	$63.87
Apprentice: Apprentice Level 2	$43.31	$55.06	$66.81
Apprentice: Apprentice Level 3	$44.68	$57.16	$69.64
Apprentice: Apprentice Level 4	$47.71	$61.66	$75.61

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Landscaping equipment			**10/28/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$39.09	$52.56	$66.02

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
Lineman	**10/30/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$76.81	$111.26	$145.70
Apprentice: Level 1 0-1000 hours	$49.26	$69.94	$90.60
Apprentice: Level 2 1001-2000 Hours	$52.71	$75.11	$97.50
Apprentice: Level 3 2001-3000 Hours	$56.15	$80.28	$104.38
Apprentice: Level 4 3001-4000 hours	$59.60	$85.44	$111.28
Apprentice: Level 5 4001-5000 Hours	$63.04	$90.60	$118.16
Apprentice: Level 6 5001-6000 Hours	$66.48	$95.77	$125.04
Apprentice: Level 7	$69.93	$100.94	$131.94

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
Low Voltage Technician	**10/30/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$57.92	$78.07	$98.22
Apprentice: Apprentice Level 1	$37.77	$47.85	$57.92
Apprentice: Apprentice Level 2	$41.80	$53.89	$65.98
Apprentice: Apprentice Level 3	$45.83	$59.94	$74.04
Apprentice: Apprentice Level 4	$49.86	$66.00	$82.10
Apprentice: Apprentice Level 5	$53.91	$72.07	$90.20
Apprentice: Apprentice Level 6	$55.92	$75.08	$94.22

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Additional Jurisdiction Detail: Townships of Onondaga, Leslie, Stockbridge and Bunker Hill ONLY.

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Millwright			**11/05/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$82.65	$126.09	$165.30
Apprentice: Level 1	$60.79	$91.21	$121.58
Apprentice: Level 2	$68.09	$102.15	$136.18
Apprentice: Level 3	$75.36	$113.05	$150.72
Apprentice: Level 4	$79.01	$118.54	$158.02

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Off-Road Truck			**10/29/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$63.02	$81.91	$100.79
Apprentice: Apprentice Level 1	$51.70	$64.93	$78.15
Apprentice: Apprentice Level 2	$53.59	$67.76	$81.93
Apprentice: Apprentice Level 3	$55.48	$70.60	$85.71
Apprentice: Apprentice Level 4	$57.36	$73.42	$89.47
Apprentice: Apprentice Level 5	$59.25	$76.25	$93.25
Apprentice: Apprentice Level 6	$61.13	$79.07	$97.01

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Painter			**10/31/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$50.90	$67.19	$83.48
Apprentice: Apprentice Level 1	$37.87	$47.65	$57.42
Apprentice: Apprentice Level 2	$41.13	$52.54	$63.94
Apprentice: Apprentice Level 3	$44.38	$57.41	$70.44
Apprentice: Apprentice Level 4	$47.64	$62.30	$76.96

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Painter			**10/31/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$46.79	$61.17	$75.54
Apprentice: Apprentice Level 1	$35.29	$43.92	$52.54
Apprentice: Apprentice Level 2	$38.17	$48.24	$58.30
Apprentice: Apprentice Level 3	$41.04	$52.54	$64.04
Apprentice: Apprentice Level 4	$43.92	$56.86	$69.80

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Pipefitters—Steamfitters			**11/03/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$71.77	$107.66	$143.54
Apprentice: Level 1 0 - 6 Months	$46.31	$69.47	$92.62
Apprentice: Level 10 55 - 60 Months	$67.14	$100.71	$134.28
Apprentice: Level 2 7 -12 Months	$48.62	$72.93	$97.24
Apprentice: Level 3 13 - 18 Months	$50.94	$76.41	$101.88
Apprentice: Level 4 19 - 24 Months	$53.25	$79.88	$106.50
Apprentice: Level 5 25 - 30 Months	$55.57	$83.36	$111.14
Apprentice: Level 6 31 - 36 Months	$57.88	$86.82	$115.76
Apprentice: Level 7 37 - 42 Months	$60.20	$90.30	$120.40
Apprentice: Level 8 43 - 48 Months	$62.51	$93.77	$125.02
Apprentice: Level 9 49 - 54 Months	$64.83	$97.25	$129.66

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Plasterer			**10/29/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$58.97	$74.78	$90.58
Apprentice: Apprentice Level 1	$44.44	$56.09	$67.74
Apprentice: Apprentice Level 2	$46.24	$58.79	$71.34
Apprentice: Apprentice Level 3	$48.03	$61.48	$74.92
Apprentice: Apprentice Level 4	$49.83	$64.18	$78.52
Apprentice: Apprentice Level 5 & 6	$51.63	$66.88	$82.12

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Plumbers			**10/31/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$71.77	$107.66	$143.54
Apprentice: Level 1 6 Months	$46.31	$69.46	$92.62
Apprentice: Level 10 5 years - 5.5 Years	$67.14	$100.71	$134.28
Apprentice: Level 3 1 Year - 1.5 Years	$50.94	$76.41	$101.88
Apprentice: Level 4 1.5 Years - 2 years	$53.25	$79.88	$106.50
Apprentice: Level 5 2 Years- 2.5 Years	$55.57	$83.36	$111.14
Apprentice: Level 6 2.5 Years - 3 Years	$57.88	$86.82	$115.76
Apprentice: Level 6 Months - 1 Year	$48.62	$72.93	$97.24
Apprentice: Level 7 3 Years - 3.5 Years	$60.20	$90.30	$120.40
Apprentice: Level 8 3.5 Years - 4 Years	$62.51	$93.77	$125.02
Apprentice: Level 9 4.5 Years - 5 Years	$64.83	$97.25	$129.66

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
Roofer/Waterproofer	**10/31/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$54.39	$71.47	$88.54
Apprentice: 3rd Class Apprentice	$42.80	$54.45	$66.10
Apprentice: Apprentice Level 1	$38.80	$48.54	$58.27
Apprentice: Apprentice Level 2	$40.91	$51.65	$62.38
Apprentice: Apprentice Level 3	$42.96	$54.61	$66.26
Apprentice: Apprentice Level 4	$44.93	$57.62	$70.31
Apprentice: Apprentice Level 6	$49.18	$63.89	$78.59

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Saturday is the makeup day and shall be paid at the straight time rate until over forty hours apply

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Sheet Metal Workers			**10/31/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$67.48	$86.53	$105.58
Apprentice: 1st Year Apprentice	$36.88	$48.31	$59.74
Apprentice: 2nd Year Apprentice	$38.98	$51.37	$63.75
Apprentice: 3rd Year Apprentice	$45.95	$59.29	$72.62
Apprentice: 4th Year Apprentice	$50.14	$65.38	$80.62

Four 10-hour days allowed? - No

Make Up Day Allowed? - No

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name			Last Updated
Sprinkler Fitters			**11/03/2025**
Wage Rates	**Straight Time**	**Time and a Half**	**Double Time**
Journeyman	$60.34	$78.45	$96.56
Apprentice: Class 1	$24.57	$32.72	$40.87
Apprentice: Class 10	$52.07	$68.37	$84.67
Apprentice: Class 2	$26.38	$35.43	$44.49
Apprentice: Class 3	$39.14	$49.10	$59.06
Apprentice: Class 4	$40.95	$51.82	$62.68
Apprentice: Class 5	$43.01	$54.78	$66.55
Apprentice: Class 6	$44.82	$57.49	$70.17
Apprentice: Class 7	$46.63	$60.21	$73.79
Apprentice: Class 8	$48.45	$62.94	$77.43
Apprentice: Class 9	$50.26	$65.65	$81.05

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

Prevailing Wage Rates for State Of Michigan Funded Projects

Official Rate Schedule

Ingham

Classification Name	Last Updated
Tunnel Miner	**11/03/2025**

Wage Rates	Straight Time	Time and a Half	Double Time
Journeyman	$52.82	$70.02	$87.22
Apprentice: Level 1	$44.22	$57.12	$70.02
Apprentice: Level 2	$45.94	$59.70	$73.46
Apprentice: Level 3	$47.66	$62.28	$76.90
Apprentice: Level 4	$51.10	$61.35	$75.66

Four 10-hour days allowed? - Yes

Make Up Day Allowed? - Yes

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

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 Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor air intakes

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 $150,000. 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

013000 SUBMITTALS

1. SHOP DRAWINGS, PRODUCT DATA & SAMPLES

1.1 DESCRIPTION OF REQUIREMENTS

A. GENERAL:

a. This Section specifies requirements for submittals including shop drawings, product data, samples and other miscellaneous work related submittals. Shop drawings, product data samples and other work related submittals are required to amplify, expand and coordinate the information contained in the Contract Documents.

b. Shop drawings are technical drawings and data that have been specially prepared for this project, including but not limited to the following items:

- Fabrication and installation drawings.
- Setting diagrams.
- Shopwork manufacturing instructions.
- Templates.
- Patterns.
- Coordination drawings (for use on site).
- Schedules.
- Design mix formulas.
- Contractor's engineering calculations.

c. Standard information prepared without specific reference to a project is not considered to be shop drawings.

d. Product data includes standard printed information on manufactured products that has not been specially prepared for this project, including but not limited to the following items:

- Manufacturer's product specifications & installation instructions.
- Standard color charts.
- Catalog cuts.
- Roughing-in diagram and templates.
- Standard wiring diagrams.
- Printed performance curves.
- Operational range diagrams.
- Mill reports.
- Standard product operating and maintenance manuals.

e. Samples are physical examples of work, including but not limited to the following items:

- Partial sections of manufactured or fabricated work.
- Small cuts or containers of materials.
- Complete units of repetitively used materials.
- Swatches showing color, texture and pattern.

- Color range sets.
- Units of work to be used for independent inspection and testing.

a. Mock-ups are special forms of samples, which are too large or otherwise inconvenient for handling in the manner specified for transmittal or sample submittals.

b. Miscellaneous submittals are work related, non-administrative submittals that do not fit in the three previous categories, including, but not limited to the following:

- Specially prepared and standard printed warranties.
- Maintenance agreements.
- Workmanship bonds.
- Survey data and reports.
- Project photographs.
- Testing and certification reports.
- Record drawings.
- Field measurement data.
- Operating and maintenance manuals.
- Keys and other security protection devices.
- Overrun stock.

1.2 SUBMITTAL PROCEDURES

1.2.1 Coordination: Coordinate the preparation and processing of submittals with the performance of the work. Coordinate each separate submittal with other submittals and related activities such as testing, purchasing, fabrication, delivery and similar activities that require sequential activity.

Coordinate the submittal of different units of interrelated work so that one submittal will not be delayed by the Architect/Engineer's need to review a related submittal.

The Architect/Engineer reserves the right to withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.

1.2.2 Listing: Prepare a separate listing showing principal submittals and their initial submittal dates as required for coordination of the work. Organize the listing by the related specification number sequence. Submit the listing within 30 days of the date of commencement of the work.

1.2.3 Coordination of Submittal Times: Prepare and transmit each submittal to the Construction Manager sufficiently in advance of the scheduled performance of related work and other applicable activities.

Transmit different kinds of submittals for the same unit of work so that processing will not be delayed by the Architect/Engineer's need to review submittals concurrently for coordination.

1.2.4 Review Time: Allow sufficient time so that the installation will not be delayed as a result of the time required to properly process submittals, including time for resubmittal, if necessary.

a. Allow 15 working days for the Architect/Engineer's initial processing of each submittal. Allow a longer time period where processing must be delayed for coordination with subsequent submittals. The Architect/ Engineer will advise the Construction Manager promptly when it is determined that a submittal being processed must be delayed for coordination.

b. Allow 10 working days for reprocessing each submittal.

c. No extension of time will be authorized because of the Trade Contractor's failure to transmit submittals to the Construction Manager sufficiently in advance of the work.

1.2.5 Submittal Transmittal: Transmit each submittal from the Trade Contractor to the Construction Manager, by use of a submittal form. Submittals received from sources other than the Trade Contractor will be returned to the sender "without action".

1.2.6 Submittal Form: The form required to be used for transmittal of submittals will be provided to the Trade Contractor by the Construction Manager.

a. Record relevant information and requests for data on the submittal form. On the form, or on a separate sheet attached to the form, record deviations from the requirements of the Contract Documents, if any, including minor variations and limitations.

1.3 SPECIFIC SUBMITTAL REQUIREMENTS

1.3.1 General: Specific submittal requirements for individual units of work are specified in the applicable specification section. Comply with the requirements specified herein for each type of submittal.

1.4 SHOP DRAWINGS

1.4.1 Shop Drawings: Information required on shop drawings includes, dimensions, identification of specific products and materials which are included in the work compliance with specified standards and notations of coordination requirements with other work. Provide special notation of dimensions that have been established by field measurement. Highlight, encircle or otherwise indicate deviations from the contract documents on the shop drawings.

1.4.2 Coordination Drawings: Provide coordination drawings where required for the integration of the work, including work first shown in detail on shop drawings or product data. Show sequencing and relationship of separate units of work, which must interface in a restricted manner to fit in the space provided, or function as indicated. Coordination drawings are considered shop drawings and must be definitive in nature.

1.4.3 Do not distribute shop drawing copies without an appropriate final "Action" marking by the Architect/Engineer to be used in connection with the work.

1.4.4 PREPARATION: Submit newly prepared information, drawn to accurate scale. Indicate

the name of the firm that prepared each shop drawing and provide appropriate project identification in the title block.

1.4.5 Do not reproduce contract documents as the basis of shop drawings.

1.4.6 SUBMITTAL:

a. One of the prints returned will be marked up and maintained by the Trade Contractor as a "Record Document".

1.5 PRODUCT DATA

1.5.1 PRODUCT DATA: General information required specifically as product data includes manufacturer's standard printed recommendations for application and use, compliance with recognized standards of trade associations and testing agencies, and the application of their labels and seals (if any), special notation of dimensions which have been verified by way of field measurement, and special coordination requirements for interfacing the material, product or system with other work.

1.5.2 PREPARATION: Collect required product data into a single submittal for each unit of work or system. Mark each copy to show which choices and options are applicable to the project. Where product data has been printed to include information on several similar products, some of which are not required for use on the project, or are not included in this submittal, mark the copies to show clearly that such information is not applicable.

1.5.3 SUBMITTALS: Product data submittal is required for information and record and to determine that the products, materials and systems comply with the provisions of the contract documents.

1.5.4 SUBMITTAL: The Architect/Engineer will retain one copy, the Owner's Representative one copy and will return the others marked with "Action" and corrections as required.

a. Do not submit product data or allow its use on the project, until compliance with the requirements of the contract documents has been confirmed by the Trade Contractor.

1.5.5 FINAL DISTRIBUTION: Furnish copies of product data to trade contractors, suppliers, fabricators, manufacturers, installers, governing authorities and others as required for proper performance of the work.

1.5.6 INSTALLATION COPY: Do not proceed with installation of materials, products and systems until a copy of product data applicable to the installation is in the possession of the installer. Do not permit the use of unmarked copies of product data in connection with the performance of the work.

1.6 SAMPLES

1.7.1 Submit samples for the Architect/Engineer's visual review of general generic kind, color, pattern, and texture, and for a final check of the coordination of these characteristics with

other related elements of the work.

Samples are also submitted for quality control comparison of these characteristics between the final sample submittal and the actual work as it is delivered and installed.

a. Refer to individual sections of these specifications for additional sample requirements.

b. Documentation required specifically for sample submittals includes a generic description of the sample, the sample source, the product name or manufacturer, compliance with governing regulations and recognized standards.

1.7.2 PREPARATION: Where possible provide samples that are physically identical with the proposed material to be incorporated in the work; provide full scale, fully fabricated samples, cured and finished in the manner specified. Where variations in color, pattern, or texture are inherent in the material represented by the sample, submit not less than 4 units, which show the approximate limits of variations. Where samples are specified for the Architect/Engineer's selection of color, texture or pattern, submit a full set of available choices for the material or product.

a. Refer to individual sections of these specifications for samples, which, because of their relatively high cost or other special considerations, are intended to be returned to the Contractor for incorporation in the work. Such samples must be in an undamaged condition at the time of use. On the transmittal form to the Architect/Engineer, indicate such special requests regarding the disposition of sample submittals.

1.7.3 DISTRIBUTION OF SAMPLES: Maintain the final submittal sets of samples, last returned by the Architect/Engineer, at the project site, available for quality control comparisons throughout the course of performing the work. In addition, final submittal sets may be used to obtain final acceptance of the work associated with each set.

Prepare and distribute additional sets of samples to subcontractors, suppliers, fabricators, manufacturers, installers, governing authorities, and others as required for proper performance of the work. Show final distribution on transmittal forms.

a. Mockups and similar samples specified in individual work sections are special types of samples. Comply with sample submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.7 MISCELLANEOUS SUBMITTALS

1.7.1 INSPECTION AND TEST REPORTS: Process inspection and test reports in accordance with Product Data requirements.

1.7.2 WARRANTIES: Refer to Section 01740 for specific general requirements on warranties, product bonds, workmanship bonds and maintenance agreements. In addition to copies desired for the Trade Contractor's use, furnish at least 2 executed copies of such warranties, bonds or agreements. Provide at least 2 additional copies where required for maintenance manuals.

1.7.3 STANDARDS: Where submittal of a copy of standards is indicated, submit at least 2 copies of standards for the Architect/Engineer's use. Where workmanship, whether at the project site or elsewhere is governed by a standard, furnish additional copies of the standard to fabricators, installers and others involved in the performance of the work.

1.7.4 CLOSEOUT SUBMITTALS: Refer to Section 01700 and to individual sections of these specifications for specific submittal requirements of project closeout information, materials, tools, and similar items.

1.7.5 RECORD DOCUMENTS: Furnish set of original documents as maintained on the project site. Along with original marked up record drawings provide electronic copies of marked up drawings.

1.7.6 OPERATING AND MAINTENANCE DATA: Unless specified otherwise, furnish at least 4 bound copies of operating data and maintenance manuals, and one electronic copy.

1.7.7 MATERIALS AND TOOLS: Refer to individual sections of these specifications for required quantities of spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units to be submitted.

1.7.8 GENERAL DISTRIBUTION: Provide additional distribution of submittals to subcontractors, suppliers, fabricators, installers, governing authorities, and others as necessary for the proper performance of the work. Include such additional copies of submittals in the transmittal to the Architect/ Engineer where the submittals are required to receive "Action" marking before final distribution. Record distributions on transmittal forms.

1.8 ARCHITECT/ENGINEER'S ACTION:

1.8.1 GENERAL: The Architect/Engineer will review each submittal, mark with appropriate "Action", and where possible return within 10 working days of receipt. Where the submittal must be held for coordination the Architect/Engineer will so advise the Trade Contractor via the Construction Manager without delay.

1.8.2 ACTION STAMP: The Architect/Engineer will stamp each submittal to be returned with a self explanatory action stamp, appropriately marked to indicate whether the submittal returned is for unrestricted use, final but restricted use (as marked), must be revised and resubmitted (use not permitted) or without action (as explained on the transmittal form). Refer to Section 00210 for action stamp markings.

1.8.3 FINAL UNRESTRICTED RELEASE: Where the submittals are marked as follows, the work may proceed provided it complies with the requirements of the contract documents; acceptance of the work will depend upon that compliance.

1.8.4 MAKE CORRECTIONS NOTED: When the submittals are marked as follows, the work may proceed provided it complies with both the Architect's/ Engineer's notations or corrections on the submittal and with the requirements of the contract documents; acceptance of the work will depend on that compliance.

1.8.5 REVISE AND RESUBMIT: When the submittals are marked as follows, the work may proceed provided it complies with both the Architect's/Engineer's notations or corrections on the submittal and with the requirements of the contract documents, acceptance of the work will depend on that compliance. Revise the submittal and resubmit for Architect's/Engineer's verification of compliance.

1.8.6 REJECTED: When the submittal is marked as follows, do not proceed with the work including purchasing, fabrication, delivery, or other activity. Revise the submittal or prepare a new submittal in activity. Revise the submittal or prepare a new submittal in accordance with the Architect's/Engineer's notations stating the reasons for returning the submittal; resubmit the submittal without delay. Repeat if necessary to obtain a different action marking. Do not permit submittals with the following marking to be used at the project site, or elsewhere where work is in progress.

END OF SECTION

013000 SUBMITTALS

1. SHOP DRAWINGS, PRODUCT DATA & SAMPLES

1.1 DESCRIPTION OF REQUIREMENTS

A. GENERAL:

a. This Section specifies requirements for submittals including shop drawings, product data, samples and other miscellaneous work related submittals. Shop drawings, product data samples and other work related submittals are required to amplify, expand and coordinate the information contained in the Contract Documents.

b. Shop drawings are technical drawings and data that have been specially prepared for this project, including but not limited to the following items:

- Fabrication and installation drawings.
- Setting diagrams.
- Shopwork manufacturing instructions.
- Templates.
- Patterns.
- Coordination drawings (for use on site).
- Schedules.
- Design mix formulas.
- Contractor's engineering calculations.

c. Standard information prepared without specific reference to a project is not considered to be shop drawings.

d. Product data includes standard printed information on manufactured products that has not been specially prepared for this project, including but not limited to the following items:

- Manufacturer's product specifications & installation instructions.
- Standard color charts.
- Catalog cuts.
- Roughing-in diagram and templates.
- Standard wiring diagrams.
- Printed performance curves.
- Operational range diagrams.
- Mill reports.
- Standard product operating and maintenance manuals.

e. Samples are physical examples of work, including but not limited to the following items:

- Partial sections of manufactured or fabricated work.
- Small cuts or containers of materials.
- Complete units of repetitively used materials.
- Swatches showing color, texture and pattern.

- Color range sets.
- Units of work to be used for independent inspection and testing.

a. Mock-ups are special forms of samples, which are too large or otherwise inconvenient for handling in the manner specified for transmittal or sample submittals.

b. Miscellaneous submittals are work related, non-administrative submittals that do not fit in the three previous categories, including, but not limited to the following:

- Specially prepared and standard printed warranties.
- Maintenance agreements.
- Workmanship bonds.
- Survey data and reports.
- Project photographs.
- Testing and certification reports.
- Record drawings.
- Field measurement data.
- Operating and maintenance manuals.
- Keys and other security protection devices.
- Overrun stock.

1.2 SUBMITTAL PROCEDURES

A. Coordination: Coordinate the preparation and processing of submittals with the performance of the work. Coordinate each separate submittal with other submittals and related activities such as testing, purchasing, fabrication, delivery and similar activities that require sequential activity.

Coordinate the submittal of different units of interrelated work so that one submittal will not be delayed by the Architect/Engineer's need to review a related submittal.

The Architect/Engineer reserves the right to withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.

B. Listing: Prepare a separate listing showing principal submittals and their initial submittal dates as required for coordination of the work. Organize the listing by the related specification number sequence. Submit the listing within 30 days of the date of commencement of the work.

C. Coordination of Submittal Times: Prepare and transmit each submittal to the Construction Manager sufficiently in advance of the scheduled performance of related work and other applicable activities.

Transmit different kinds of submittals for the same unit of work so that processing will not be delayed by the Architect/Engineer's need to review submittals concurrently for coordination.

D. Review Time: Allow sufficient time so that the installation will not be delayed as a result of the time required to properly process submittals, including time for resubmittal, if

necessary.

a. Allow 15 working days for the Architect/Engineer's initial processing of each submittal. Allow a longer time period where processing must be delayed for coordination with subsequent submittals. The Architect/ Engineer will advise the Construction Manager promptly when it is determined that a submittal being processed must be delayed for coordination.

b. Allow 10 working days for reprocessing each submittal.

c. No extension of time will be authorized because of the Trade Contractor's failure to transmit submittals to the Construction Manager sufficiently in advance of the work.

E. Submittal Transmittal: Transmit each submittal from the Trade Contractor to the Construction Manager, by use of a submittal form. Submittals received from sources other than the Trade Contractor will be returned to the sender "without action".

F. Submittal Form: The form required to be used for transmittal of submittals will be provided to the Trade Contractor by the Construction Manager.

a. Record relevant information and requests for data on the submittal form. On the form, or on a separate sheet attached to the form, record deviations from the requirements of the Contract Documents, if any, including minor variations and limitations.

1.3 SPECIFIC SUBMITTAL REQUIREMENTS

A. General: Specific submittal requirements for individual units of work are specified in the applicable specification section. Comply with the requirements specified herein for each type of submittal.

1.4 SHOP DRAWINGS

A. Shop Drawings: Information required on shop drawings includes, dimensions, identification of specific products and materials which are included in the work compliance with specified standards and notations of coordination requirements with other work. Provide special notation of dimensions that have been established by field measurement. Highlight, encircle or otherwise indicate deviations from the contract documents on the shop drawings.

B. Coordination Drawings: Provide coordination drawings where required for the integration of the work, including work first shown in detail on shop drawings or product data. Show sequencing and relationship of separate units of work, which must interface in a restricted manner to fit in the space provided, or function as indicated. Coordination drawings are considered shop drawings and must be definitive in nature.

a. Do not distribute shop drawing copies without an appropriate final "Action" marking by the Architect/Engineer to be used in connection with the work.

C. Preparation: Submit newly prepared information, drawn to accurate scale. Indicate the name of the firm that prepared each shop drawing and provide appropriate project identification in the title block.

a. Do not reproduce contract documents as the basis of shop drawings.

D. Submittal:

a. One of the prints returned will be marked up and maintained by the Trade Contractor as a "Record Document".

1.5 PRODUCT DATA

A. Product Data: General information required specifically as product data includes manufacturer's standard printed recommendations for application and use, compliance with recognized standards of trade associations and testing agencies, and the application of their labels and seals (if any), special notation of dimensions which have been verified by way of field measurement, and special coordination requirements for interfacing the material, product or system with other work.

B. Preparation: Collect required product data into a single submittal for each unit of work or system. Mark each copy to show which choices and options are applicable to the project. Where product data has been printed to include information on several similar products, some of which are not required for use on the project, or are not included in this submittal, mark the copies to show clearly that such information is not applicable.

C. Submittals: Product data submittal is required for information and record and to determine that the products, materials and systems comply with the provisions of the contract documents.

The Architect/Engineer will retain one copy, the Owner's Representative one copy and will return the others marked with "Action" and corrections as required.

a. Do not submit product data or allow its use on the project, until compliance with the requirements of the contract documents has been confirmed by the Trade Contractor.

D. Final Distribution: Furnish copies of product data to trade contractors, suppliers, fabricators, manufacturers, installers, governing authorities and others as required for proper performance of the work.

E. Installation Copy: Do not proceed with installation of materials, products and systems until a copy of product data applicable to the installation is in the possession of the installer. Do not permit the use of unmarked copies of product data in connection with the performance of the work.

1.6 SAMPLES

A. Submit samples for the Architect/Engineer's visual review of general generic kind, color, pattern, and texture, and for a final check of the coordination of these characteristics with

other related elements of the work.

Samples are also submitted for quality control comparison of these characteristics between the final sample submittal and the actual work as it is delivered and installed.

a. Refer to individual sections of these specifications for additional sample requirements.

b. Documentation required specifically for sample submittals includes a generic description of the sample, the sample source, the product name or manufacturer, compliance with governing regulations and recognized standards.

B. Preparation: Where possible provide samples that are physically identical with the proposed material to be incorporated in the work; provide full scale, fully fabricated samples, cured and finished in the manner specified. Where variations in color, pattern, or texture are inherent in the material represented by the sample, submit not less than 4 units, which show the approximate limits of variations. Where samples are specified for the Architect/Engineer's selection of color, texture or pattern, submit a full set of available choices for the material or product.

a. Refer to individual sections of these specifications for samples, which, because of their relatively high cost or other special considerations, are intended to be returned to the Contractor for incorporation in the work. Such samples must be in an undamaged condition at the time of use. On the transmittal form to the Architect/Engineer, indicate such special requests regarding the disposition of sample submittals.

C. Distribution of Samples: Maintain the final submittal sets of samples, last returned by the Architect/Engineer, at the project site, available for quality control comparisons throughout the course of performing the work. In addition, final submittal sets may be used to obtain final acceptance of the work associated with each set.

Prepare and distribute additional sets of samples to subcontractors, suppliers, fabricators, manufacturers, installers, governing authorities, and others as required for proper performance of the work. Show final distribution on transmittal forms.

a. Mockups and similar samples specified in individual work sections are special types of samples. Comply with sample submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.7 MISCELLANEOUS SUBMITTALS

A. Inspection and Test Reports: Process inspection and test reports in accordance with Product Data requirements.

B. Warranties: Refer to Section 01740 for specific general requirements on warranties, product bonds, workmanship bonds and maintenance agreements. In addition to copies desired for the Trade Contractor's use, furnish at least 2 executed copies of such warranties, bonds or agreements. Provide at least 2 additional copies where required for maintenance manuals.

C. Standards: Where submittal of a copy of standards is indicated, submit at least 2 copies of standards for the Architect/Engineer's use. Where workmanship, whether at the project site or elsewhere is governed by a standard, furnish additional copies of the standard to fabricators, installers and others involved in the performance of the work.

D. Closeout Submittals: Refer to Section 01700 and to individual sections of these specifications for specific submittal requirements of project closeout information, materials, tools, and similar items.

E. Record Documents: Furnish set of original documents as maintained on the project site. Along with original marked up record drawings provide electronic copies of marked up drawings.

F. Operating and Maintenance Data: Unless specified otherwise, furnish at least 4 bound copies of operating data and maintenance manuals, and one electronic copy.

G. Materials and Tools: Refer to individual sections of these specifications for required quantities of spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units to be submitted.

H. General Distribution: Provide additional distribution of submittals to subcontractors, suppliers, fabricators, installers, governing authorities, and others as necessary for the proper performance of the work. Include such additional copies of submittals in the transmittal to the Architect/ Engineer where the submittals are required to receive "Action" marking before final distribution. Record distributions on transmittal forms.

1.8 ARCHITECT/ENGINEER'S ACTION:

A. General: The Architect/Engineer will review each submittal, mark with appropriate "Action", and where possible return within 10 working days of receipt. Where the submittal must be held for coordination the Architect/Engineer will so advise the Trade Contractor via the Construction Manager without delay.

B. Action Stamps: The Architect/Engineer will stamp each submittal to be returned with a self-explanatory action stamp, appropriately marked to indicate whether the submittal returned is for unrestricted use, final but restricted use (as marked), must be revised and resubmitted (use not permitted) or without action (as explained on the transmittal form). Refer to Section 00210 for action stamp markings.

C. Final Unrestricted Release: Where the submittals are marked as follows, the work may proceed provided it complies with the requirements of the contract documents; acceptance of the work will depend upon that compliance.

D. Make Corrections Noted: When the submittals are marked as follows, the work may proceed provided it complies with both the Architect's/ Engineer's notations or corrections on the submittal and with the requirements of the contract documents; acceptance of the work will depend on that compliance.

E. Revise and Resubmit: When the submittals are marked as follows, the work may proceed

provided it complies with both the Architect's/Engineer's notations or corrections on the submittal and with the requirements of the contract documents, acceptance of the work will depend on that compliance. Revise the submittal and resubmit for Architect's/Engineer's verification of compliance.

F. Rejected: When the submittal is marked as follows, do not proceed with the work including purchasing, fabrication, delivery, or other activity. Revise the submittal or prepare a new submittal in activity. Revise the submittal or prepare a new submittal in accordance with the Architect's/Engineer's notations stating the reasons for returning the submittal; resubmit the submittal without delay. Repeat if necessary to obtain a different action marking. Do not permit submittals with the following marking to be used at the project site, or elsewhere where work is in progress.

2.0 LEED ACTION SUBMITTALS

2.1 General: Submit additional LEED submittals as required.

A. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.

B. LEED Documentation Submittals:

a) Reference 018113 - Sustainable Design Requirements: Comply with requirements specified
b) Reference Section 018119 Air Quality Control
c) Reference Section 018119-1 TCC IAQ Management Plan During Construction
d) Number of Copies: Submit Electronic Copies of LEED submittals, unless otherwise indicated. Reference Section 013300-1 TCC LEED Materials Submittal Form which is required for DIVISION 2 through Division 10 and Division 32 and Division 33.
e) Material Safety Data Sheets (MSDSs) for LEED Certification: Submit information necessary to show compliance with LEED certification requirements, which will be the limit of the Architect's review. Architect will not review non-LEED submittals that include MSDSs and will return the entire submittal for re-submittal.
f) Credit IEQ 3.2: Indoor Air Quality During Before Occupancy
    a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
    b. Product data for filtration media used during flush-out and during occupancy.

OR

    a. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.
g) Credit IEQ 4.1: Adhesives and Sealants
    a. Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used.

b. Complete schedule to document the quantities of all adhesives, sealants, paints and coatings that are applied onsite and fall within the building weather barrier.

h) Credit IEQ 4.2: Paints and Coatings
   a. Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used.
   b. Complete schedule to document the quantities of all adhesives, sealants, paints and coatings that are applied onsite and fall within the building weather barrier.

i) Credit IEQ 4.3: Low Emitting Flooring Systems
   a. Complete schedule and collect supporting documentation (letters from manufacturers, product literature, etc.) for all carpet and hard surface flooring products used in the building.
   b. Submit completed schedules and supporting product literature to the Architect for review at least 14 days prior to ordering.

j) Credit IEQ 4.4: Composite Wood Products
   a. Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

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.

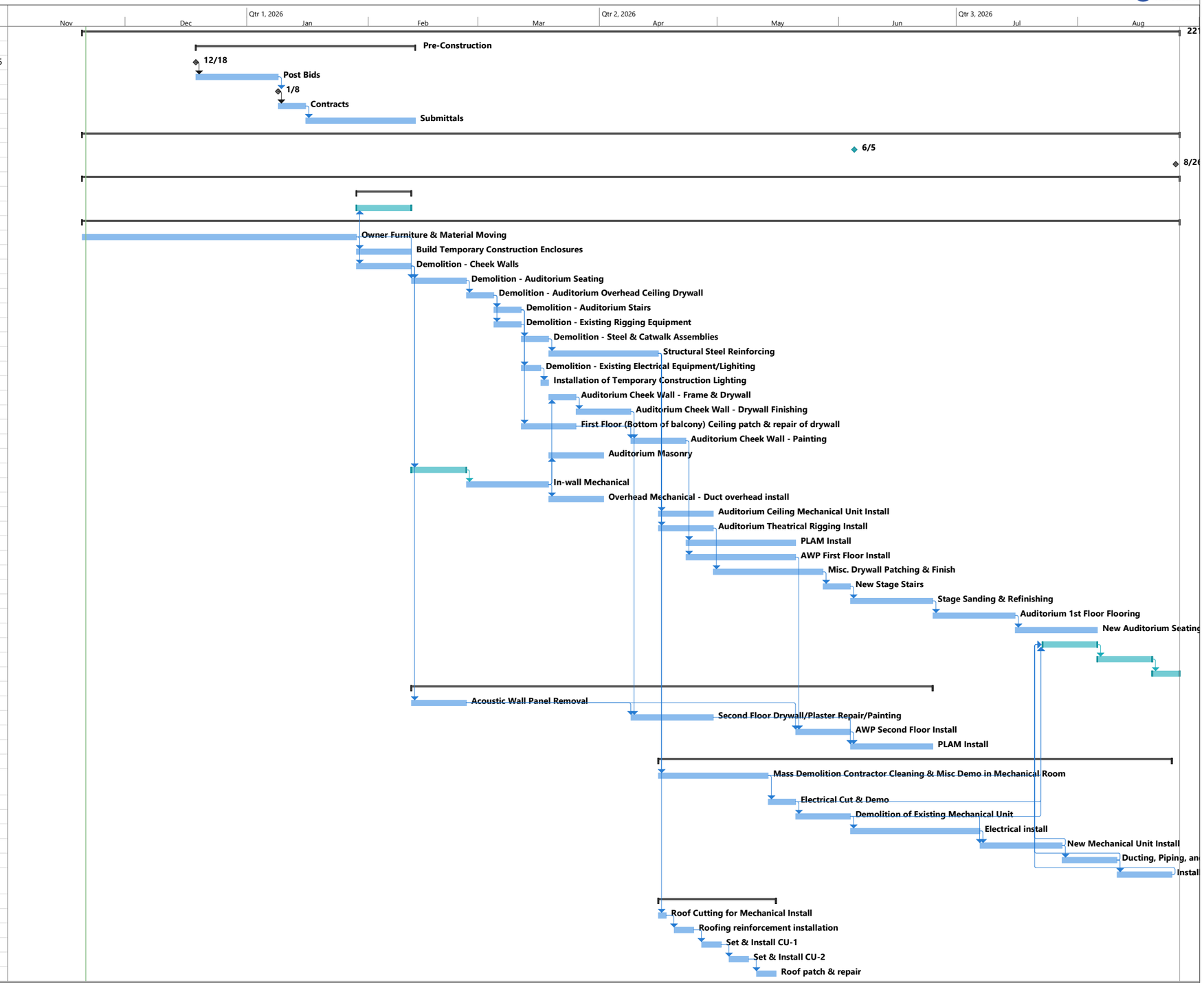
END OF SECTION

CHRISTMAN SINCE 1894

Sexton Auditorium Construction Schedule

Lansing School District

ID	Task Name	Duration	Start	Finish
1	**221125-180 - Sexton Auditorium**	**200 days**	**11/20/2025**	**8/26/2026**
2	**Pre-Construction**	**40 days**	**12/18/2025**	**2/12/2026**
3	Bids Due	0 days	12/18/2025	12/18/2025
4	Post Bids	15 days	12/19/2025	1/8/2026
5	Awards	0 days	1/8/2026	1/8/2026
6	Contracts	5 days	1/9/2026	1/15/2026
7	Submittals	20 days	1/16/2026	2/12/2026
8	**Owner Milestones**	**200 days**	**11/20/2025**	**8/26/2026**
9	Last Day of School - Spring 2026	0 days	6/5/2026	6/5/2026
10	First Day of School - Fall 2026	0 days	8/26/2026	8/26/2026
11	**Construction**	**200 days**	**11/20/2025**	**8/26/2026**
12	**Basement**	**10 days**	**1/29/2026**	**2/11/2026**
13	Construction of Platform/Shoring Posts for 1st Floor Reinforcem	10 days	1/29/2026	2/11/2026
14	**First Floor**	**200 days**	**11/20/2025**	**8/26/2026**
15	Owner Furniture & Material Moving	50 days	11/20/2025	1/28/2026
16	Build Temporary Construction Enclosures	10 days	1/29/2026	2/11/2026
17	Demolition - Cheek Walls	10 days	1/29/2026	2/11/2026
18	Demolition - Auditorium Seating	10 days	2/12/2026	2/25/2026
19	Demolition - Auditorium Overhead Ceiling Drywall	5 days	2/26/2026	3/4/2026
20	Demolition - Auditorium Stairs	5 days	3/5/2026	3/11/2026
21	Demolition - Existing Rigging Equipment	5 days	3/5/2026	3/11/2026
22	Demolition - Steel & Catwalk Assemblies	5 days	3/12/2026	3/18/2026
23	Structural Steel Reinforcing	20 days	3/19/2026	4/15/2026
24	Demolition - Existing Electrical Equipment/Lighiting	3 days	3/12/2026	3/16/2026
25	Installation of Temporary Construction Lighting	2 days	3/17/2026	3/18/2026
26	Auditorium Cheek Wall - Frame & Drywall	5 days	3/19/2026	3/25/2026
27	Auditorium Cheek Wall - Drywall Finishing	10 days	3/26/2026	4/8/2026
28	First Floor (Bottom of balcony) Ceiling patch & repair of drywall	10 days	3/12/2026	3/25/2026
29	Auditorium Cheek Wall - Painting	10 days	4/9/2026	4/22/2026
30	Auditorium Masonry	10 days	3/19/2026	4/1/2026
31	Leadtime for Mechanical In-Wall - Duct Fabrication	10 days	2/12/2026	2/25/2026
32	In-wall Mechanical	15 days	2/26/2026	3/18/2026
33	Overhead Mechanical - Duct overhead install	10 days	3/19/2026	4/1/2026
34	Auditorium Ceiling Mechanical Unit Install	10 days	4/16/2026	4/29/2026
35	Auditorium Theatrical Rigging Install	10 days	4/16/2026	4/29/2026
36	PLAM Install	20 days	4/23/2026	5/20/2026
37	AWP First Floor Install	20 days	4/23/2026	5/20/2026
38	Misc. Drywall Patching & Finish	20 days	4/30/2026	5/27/2026
39	New Stage Stairs	5 days	5/28/2026	6/3/2026
40	Stage Sanding & Refinishing	15 days	6/4/2026	6/24/2026
41	Auditorium 1st Floor Flooring	15 days	6/25/2026	7/15/2026
42	New Auditorium Seating	15 days	7/16/2026	8/5/2026
43	Mechanical & Electrical Commissioning	10 days	7/23/2026	8/5/2026
44	Punchlist	10 days	8/6/2026	8/19/2026
45	Owner Move-In	5 days	8/20/2026	8/26/2026
46	**Second Floor**	**95 days**	**2/12/2026**	**6/24/2026**
47	Acoustic Wall Panel Removal	10 days	2/12/2026	2/25/2026
48	Second Floor Drywall/Plaster Repair/Painting	15 days	4/9/2026	4/29/2026
49	AWP Second Floor Install	10 days	5/21/2026	6/3/2026
50	PLAM Install	15 days	6/4/2026	6/24/2026
51	**Third Floor**	**93 days**	**4/16/2026**	**8/24/2026**
52	Mass Demolition Contractor Cleaning & Misc Demo in Mechanical Room	20 days	4/16/2026	5/13/2026
53	Electrical Cut & Demo	5 days	5/14/2026	5/20/2026
54	Demolition of Existing Mechanical Unit	10 days	5/21/2026	6/3/2026
55	Electrical install	23 days	6/4/2026	7/6/2026
56	New Mechanical Unit Install	15 days	7/7/2026	7/27/2026
57	Ducting, Piping, and Misc Accessories in Mech Rm. Install	10 days	7/28/2026	8/10/2026
58	Installation of Misc. Mechanical Equipment - Hot Water Heaters, Pumps	10 days	8/11/2026	8/24/2026
59	**Roof**	**22 days**	**4/16/2026**	**5/15/2026**
60	Roof Cutting for Mechanical Install	2 days	4/16/2026	4/17/2026
61	Roofing reinforcement installation	5 days	4/20/2026	4/24/2026
62	Set & Install CU-1	5 days	4/27/2026	5/1/2026
63	Set & Install CU-2	5 days	5/4/2026	5/8/2026
64	Roof patch & repair	5 days	5/11/2026	5/15/2026



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.

F. PERMANENT HVAC SYSTEM: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures.

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

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017419 CONSTRUCTION WASTE MANAGEMENT

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. 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:
1. Salvaging non-hazardous demolition and construction waste.
2. Recycling non-hazardous demolition and construction waste.
3. Disposing of non-hazardous demolition and construction waste.

B. Related Sections include the following:

1. 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.

3. Division 02 Section "Structure Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements[, and for disposition of hazardous waste].

4. Division 02 Section "Selective Structure Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.

5. Division 04 Section "Unit Masonry" for disposal requirements for masonry waste.

6. Division 04 Section "Stone Masonry" for disposal requirements for excess stone and stone waste.

7. 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. 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.

1.4 ACTION SUBMITTALS

1. Not required.

1.5 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:

1. 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.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.6 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.

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.

1. 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.

1. 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.

1. 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:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. 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:

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

D. 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 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

1.4 RECYCLING DEMOLITION WASTE

1.5 RECYCLING CONSTRUCTION WASTE

END OF SECTION

Waste Management Plan

The Construction Manager has hired Knight Transfer Services, Inc. to implement the Waste/Recycling Plan for this project. All reports will be generated and maintained through Knight Transfer Services, Inc.

Project: Sexton Auditorium

Contact: The Christman Company

Date: _____

1. Overview

1.1 General

The owner has established that this project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination or other factors shall be employed. Of the inevitable waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized.

1.2 Purpose of the Waste Management Plan

The purpose of this waste management plan is to:

1. Provide direction for the Construction Manager and subcontractors with regard to the handling of waste materials throughout the construction project.

2. Identify licensed haulers and processors of recyclables and markets for salvaged materials.

1.3 Goals of the Waste Management Plan

2. Application of the Waste Management Plan

3.2 Handling Procedures

3. Job Site Training and Plan Implementation

3.1 Plan Distribution and Instruction

The Contractor shall distribute copies of the Waste Management Plan to the Construction Manager and each Subcontractor. One copy of the plan shall be posted on the jobsite at all times. The Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse and return methods to be used by all parties at the appropriate stages of the project.

3.2 Storage of Materials

All materials stored on-site shall be protected from inclement weather, breakage, contamination, etc. to minimize the amount of unnecessary waste generated during construction.

3.3 Separation Facilities

The Contractor shall create and clearly label a specific area to facilitate separation of materials for potential recycling, salvage, reuse and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.

3.4 Hazardous Wastes

Hazardous wastes shall be separated, stored and disposed of according to local regulations.

4. Submittals

4.1 Progress Reporting

The Contractor shall submit a copy of the *Waste Management Plan Progress Report* with each Application for Progress Payment. Failure to submit the Progress Report shall render the Application for Payment incomplete and delay progress payment.

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

SECTION 018119-1 INDOOR AIR QAULITY (IAQ) MANAGEMENT PLAN – DURING CONSTRUCTION

A. RELATED SECTIONS – 018119 INDOOR AIR QUALITY

B. OBJECTIVE

a. 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.

C. PLAN

a. 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.
b. 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.
c. 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.

D. DEFINITIONS

a. 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.
b. 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.
c. Particulates: Dust, dirt, smoke, concrete dust, masonry dust, drywall dust, wood dust, silica, fiberglass and other airborne solid matter.

E. INDOOR AIR QUALITY BEST MANAGEMENT PRACTICES

a. HVAC Protection During Construction

i. Isolate HVAC system in an area where work is being done to prevent contamination of duct system.
ii. 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.
iii. If possible, avoid using permanently installed air handlers for temporary heating/cooling during construction – particularly during demolition.
iv. Do not store construction or waste materials in the mechanical room.
v. 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.
vi. When the system is off, all supply ducts, equipment and openings should be sealed with plastic for further protection.

vii. 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.
viii. Filtration media must have a Minimum Efficiency Reporting Value (MERV) of 8.
ix. 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.

b. Source Control During Construction

i. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins
ii. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units.
iii. Seal holes, pipes, conduits, and punctures.
iv. Subcontractors to use low emitting products as specified. When limited resources are available, materials should be used that have the low toxicity emissions available.
v. Use electrically powered equipment when feasible and switch from diesel to bottled gas for equipment such as generators or fork lifts.
vi. 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.
vii. 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.
viii. Concrete floor sealing, block sealing and waterproofing - utilize fans, open windows, and respirators.
ix. 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).
x. 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.
xi. If exhausting the pollution sources is not feasible, the use of a portable air cleaner may be effective.

c. Pathway Interruption

i. Contain construction waste before transport in tightly covered containers.
ii. Cover transport receptacles or carts. Tape covering unless solid lid.
iii. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave work site
iv. All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area.
v. 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.

vi. 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.
vii. Depending on the weather conditions, ventilate using 100% outside air to exhaust contaminated air directly to the outside during installation of VOC-emitting materials.
viii. Depressurize the work area allowing the air pressure differential between construction and clean areas to contain dust and odors.

d. Housekeeping

i. Isolate areas with high particulate concentration using solid physical barriers from floor to ceiling (plastic sheeting or similar).
ii. 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.
iii. Control dust and particulate concentration with wetting agents or sweeping compounds.
iv. If vacuum cleaners are being used for cleaning activities, use high efficiency particulate air filters in them.
v. Remove spills of high VOC-emitting materials immediately.
vi. Use low-toxic cleaning supplies for surfaces, equipment and worker's personal use.
vii. 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.
viii. 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.
ix. When performing sanding operations for gypsum board assemblies, provide the following protection:
x. Isolate the space
xi. Provide plastic sheet separation during sanding
xii. Close and seal all air system devices and ductwork
xiii. Sequence construction to avoid contamination of other spaces with gypsum dust
xiv. Provide worker protection

e. Scheduling

i. 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.
ii. 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.
iii. 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).
iv. 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.

v. Upon completion of construction, replace all filtration media immediately prior to occupancy.

vi. After construction ends consideration should be given for conducting a baseline indoor air quality testing procedure for the affected space in the building.

f. Final Cleanup at Project Completion

i. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Prevention & Control Department and thoroughly cleaned by the owner's Environmental Services Dept.

ii. Remove barrier material carefully to minimize spreading of dirt and debris associated with construction.

iii. Contain construction waste before transport in tightly covered containers.

iv. Cover transport receptacles or carts. Tape covering unless solid lid.

v. Vacuum work area with HEPA filtered vacuums.

vi. Wet mop area with cleaner/disinfectant.

vii. Upon completion, restore HVAC system where work was performed.

F. DESCRIPTION OF REQUIRED INFECTION CONSTROL PRECAUSTIONS BY CLASS

	During Construction Project	Upon Completion of Project
CLASS I	**1. Execute work by methods to minimize raising dust from construction operations.** **2. Immediately replace a ceiling tile displaced for visual inspection**	**1. Clean work area upon completion of task.**
CLASS II	**1. Provide active means to prevent airborne dust from dispersing into atmosphere.** **2. Water mist work surfaces to control dust while cutting.** **3. Seal unused doors with duct tape.** **4. Block off and seal air vents.** **5. Place dust mat at entrance and exit of work area** **6. Remove or isolate HVAC system in areas where work is being performed.**	**1. Wipe work surfaces with cleaner/disinfectant.** **2. Contain construction waste before transport in tightly covered containers.** **3. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area.** **4. Upon completion, restore HVAC system where work was performed.**

CLASS III	**1. Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system.** **2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins.** **3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units.** **4. Contain construction waste before transport in tightly covered containers.** **5. Cover transport receptacles or carts. Tape covering unless solid lid.**	**1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Prevention & Control Department and thoroughly cleaned by the owner's Environmental Services Department.** **2. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction.** **3. Vacuum work area with HEPA filtered vacuums.** **4. Wet mop area with cleaner/disinfectant.** **5. Upon completion, restore HVAC system where work was performed.**

CLASS IV	1. Isolate HVAC system in area where work is being done to prevent contamination of duct system. 2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 4. Seal holes, pipes, conduits, and punctures. 5. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave work site. 6. All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area.	1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Prevention & Control Department and thoroughly cleaned by the owner's Environmental Services Dept. 2. Remove barrier material carefully to minimize spreading of dirt and debris associated with construction. 3. Contain construction waste before transport in tightly covered containers. 4. Cover transport receptacles or carts. Tape covering unless solid lid. 5. Vacuum work area with HEPA filtered vacuums. 6. Wet mop area with cleaner/disinfectant. 7. Upon completion, restore HVAC system where work was performed.

G. BUILING KEY

H. BUILDING FLUSH OUT

a. 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*

I. MANAGEMENT AND ENFOREMENT PLAN

b. Indoor air quality management activities shall include:
   i. Contractor / Subcontractor shall identify, implement and document measures to achieve the indoor air quality management objectives.
   ii. Contractor / Subcontractor shall be responsible for the supervision of on-site indoor air quality management activities on a daily basis.
   iii. Contractor / Subcontractor shall coordinate the indoor air quality management tasks with subcontractors to ensure timely and orderly progress of the work.

iv. Contractor / Architect will conduct an indoor air quality management inspection and identify necessary repairs.
v. Contractor / Subcontractor shall maintain an indoor air quality inspection log to document observations, deficiencies and corrective actions.
vi. Contractor / Subcontractor shall be responsible for preparing indoor air quality management documentation and submittals as detailed herein.
vii. Contractor / Subcontractor shall be responsible for selecting products/materials that meet the requirements specified herein.
viii. Contractor shall reporting indoor air quality management progress to the LEED Administrator.

c. Construction Manager:
   i. 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.

d. Photo Documentation
   i. 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.

e. Architect
   i. Review compliance with plan during weekly site visits.

f. Owner
   i. Reserves the right at any time to verify compliance and request a team meeting to review project safety goals at his/her discretion.

J. RESOURCES

g. 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

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.

Sample

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.

Sample

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.

Sample

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.

Sample

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.

Sample

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.

Sample

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.

Sample

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.

Sample

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.

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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.

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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.

Sample

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.

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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

Sample

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.

Sample

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.

Sample

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.

Sample

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.

Sample

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

Sample

[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

Sample

TECHNICAL SPECIFICATIONS

FOR

J.W. SEXTON HS AUDITORIUM REMODEL
LANSING SCHOOL DISTRICT
LANSING, MICHIGAN

NOVEMBER 07, 2025

A/E NO. 2616-11

OWNER
LANSING SCHOOL DISTRICT
519 WEST KALAMAZOO STREET
LANSING, MICHIGAN 48933
(517) 755-1000

ARCHITECTS/ENGINEERS
KINGSCOTT ASSOCIATES, INC
259 EAST MICHIGAN AVENUE, SUITE 308
KALAMAZOO, MICHIGAN 49007
(269) 381-4880

CONSTRUCTION MANAGER
THE CHRISTMAN COMPANY
208 NORTH CAPITOL AVENUE
LANSING, MICHIGAN 48604
(517) 482-1488

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SECTION 012300
ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

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

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

1.4 PROCEDURES

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

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

B. Execute accepted alternates under the same conditions as other Work of the Contract.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Painted columns 3Form Cardinal Mobile

1. Deduct Alternate: Paint
2. Base Bid: Plastic Laminate wrapped columns with metal trim at exposed edges.

B. Alternate No. 2: Auditorim Wall Panels

1. Add Alternate: Fabric Wrapped plywood “Dummy” Panels. (AWP-12A & AWP-13A). See Interior Elevations and spec section 098413 for additional information.
2. Base Bid: Omit

END OF SECTION 012300

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: Filled out by Contractor

Title:

Signature: _____

Notary:

County:

Date Commission Expires:

Name:

Signature: _____ Filled out by Contractor and Notary used from Contractor

Reviewed By: Construction Manager, Inc.

Date:

Print Name: Filled out by Construction Manager

Signature: _____

Reviewed By: Kingscott Associates, Inc.

Date:

Print Name: Filled out by Architect

Signature: _____

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)

SAMPLE

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

_____

_____

_____

_____

Approved by: _____ Date:_____

Email form to Project Architect hburnham@kingscott.com

TERMS AND CONDITIONS ON DISTRIBUTION AND USE OF ELECTRONIC FILES
At your request, Kingscott Associates, Inc. (Kingscott) will provide electronic files related to subject to the following terms and conditions.

Kingscott's electronic files are compatible with Autocadd. Kingscott makes no representation as to the compatibility of these files with your hardware or your software.

NOTICE: THESE ELECTRONIC FILES ARE NOT CONTRACT DOCUMENTS.
These electronic files are not Contract Documents. Significant differences may exist between these electronic files and corresponding hard copy contract documents due to addenda, change order or other revisions. Kingscott makes no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the contract documents prepared by Kingscott and electronic files, the contract documents shall govern. You are responsible for determining if any conflict exists. By your use of these electronic files, you are not relieved of your duty to fully comply with the contract documents. Including and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with that of the contractors for the project.

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Due to the inherent hazards of electronic distribution, there may be delays, omissions or inaccuracies in these electronic files. Kingscott and its affiliates, agents, consultants, contractors, servants and employees cannot and do not warrant the accuracy, completeness, currentness, non-infringement, merchantability or fitness for a particular purpose of the files. Neither Kingscott, nor any of its affiliates, agents, consultants, contractors, servants or employees shall be liable to you or anyone for any loss, injury, decision made of action taken in reliance on these electronic files, or for any consequential, special or similar damages, whether based on breach of contract, negligence or any other legal theory.

WARRANTIES DISCLAIMED; "AS IS"
These electronic files are provided on an "as is" basis.

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In no event shall Kingscott or its consultants, contractors, agents, servants or employees be liable for any damages, including without limitation, special, loss or profits, indirect or consequential damages, or any damages whatsoever, whether in an action on contract, negligence or any other legal or equable theory, arising out of or in connection with the use or performance of these files. Your sole remedy will be the return of the service fee, and/or replacement of the electronic files, at the election of Kingscott.

LIMITATIONS ON USE; WAIVER OF LEGAL AND EQUABLE CLAIMS
Data contained on these electronic files is part of Kingscott's instruments of service and shall not be used by you or anyone else receiving this data through or from you for any purpose other than as a convenience in the preparation of shop drawings for the referenced project. Any other use or reuse by you or by others will be at your sole risk and without liability or legal exposure to Kingscott. You agree to make no claim or hereby waive, to the fullest extent permitted by law, any legal or equable claim or cause of action of any nature against Kingscott, its officers, employees, agents or subconsultants which may arise out of or in connection with your use of the electronic files.

INDEMNIFICATION
You agree to the fullest extent permitted by law, indemnify and hold harmless, Kingscott from all claims, damages, losses and expenses, including attorney's fees arising out of or resulting from your use of these electronic files. Because of the potential that the information presented on the electronic files can be modified, unintentionally or otherwise, Kingscott reserves the right to remove all indicia of its ownership and/or involvement for each electronic display. These electronic files are for the exclusive use of the addressee and shall not be transferred to a second party without the written consent of Kingscott.

Kingscott will furnish to you electronic files after the completion of the Electronic Media Authorization Form. Under no circumstances, shall a delivery of the electronic files for use by you, be deemed a sale by Kingscott.

SECTION 014000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Authority, Construction Manager**,** or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate those actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
   1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
   2. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.

1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data : For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.

6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.9 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

    1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

    1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
    2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

    1. Contractor responsibilities include the following:

        a. Provide test specimens representative of proposed products and construction.
        b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.

a. Allow seven days for initial review and each re-review of each mockup.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed unless otherwise indicated.

L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings or as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1.10 QUALITY CONTROL

A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

C. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority , Construction Manager**,** and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, Commissioning Authority , Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.

5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Architect, Commissioning Authority, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner and as follows:

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 017300
EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Installation of the Work.
2. Cutting and patching.
3. Progress cleaning.
4. Protection of installed construction.
5. Correction of the Work.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

a. Primary operational systems and equipment.
b. Air or smoke barriers.
c. Mechanical system piping and ducts.
d. Control systems
e. Electrical wiring systems.
f. Operating systems of special construction Division 13 Sections.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Equipment supports.
d. Piping, ductwork, vessels, and equipment.
e. Noise- and vibration control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of utilities and construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of construction affecting the Work.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect through Construction Manager in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CUTTING AND PATCHING

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of Work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
5. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.4 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.6 CORRECTION OF THE WORK

A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Restore permanent facilities used during construction to their specified condition.

D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 024119
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of a building or structure.
2. Demolition and removal of selected site elements.

B. Related Requirements:

1. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

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

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

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

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

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

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

1.6 CLOSEOUT SUBMITTALS

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

1.7 QUALITY ASSURANCE

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

1.8 FIELD CONDITIONS

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

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

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

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

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

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

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

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

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

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

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

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

1. Arrange to shut off indicated utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.

d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

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

1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."

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

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

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

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

3.4 SELECTIVE DEMOLITION, GENERAL

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

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

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

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

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

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

E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing so that building interior remains watertight and weathertight. See Section 075323 for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

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

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

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

END OF SECTION 024119

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.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 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. Provide elevation views of all reinforced walls showing bar spacing, bars around openings, wall ends, etc.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:

1. Standard CMU (to match existing).
2. Standard brick (to match existing).

D. Samples for Verification: For each type and color of the following:

1. Standard CMU (to match existing).
2. Standard brick (to match existing).

1.4 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.
2. Cementitious materials.
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.

1.5 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.

1.6 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.

1.7 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.
2. Provide square-edged units for outside corners unless otherwise indicated.

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. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 4950 psi.
2. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested in accordance with ASTM C67.
3. Efflorescence: Provide brick that has been tested in accordance with ASTM C67 and is rated "not effloresced."
4. 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.
5. Application: Use where brick is exposed unless otherwise indicated.
6. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.
7. Color and Texture: As selected by Architect (to match existing).

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. 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.

G. Aggregate for Mortar: ASTM C144.

H. Aggregate for Grout: ASTM C404.

I. 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.

J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.

K. 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. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: hot-dip galvanized steel or stainless steel wire.
2. Tie Section: Triangular-shaped wire tie, hot-dip galvanized steel or stainless steel wire.

E. 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.

F. 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.

G. 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. 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. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay CMU masonry in running bond and brick veneer one-third running bond to match existing; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. 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.

D. 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.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. 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.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. 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.
4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

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 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods as follows:

1. Individual Metal Ties: Provide ties as indicated installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 12 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

    a. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) ties.
    b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) ties to allow for differential movement regardless of whether bed joints align.

2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.

    a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes or tab-type reinforcement.
    b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.
    c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.

3. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Bond wythes of cavity walls together using bonding system indicated on Drawings.

C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

D. Parge cavity face of backup wythe in a single coat approximately 3/8 inch thick. Trowel face of parge coat smooth.

E. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as indicated.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 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.

3.8 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.

3.9 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.

3.10 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.

3.11 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.

3.12 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.

3.13 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.

3.14 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.

3.15 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 051200
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural-steel materials.
2. Shrinkage-resistant grout.
3. Shear stud connectors.

B. Related Requirements:

1. Section 099123 "Interior Painting", and Section 099600 "High-Performance Coatings" for painting requirements.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.

B. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1 for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).

C. Delegated Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, fabricator, shop-painting applicators, and testing agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural-steel materials, including chemical and physical properties.

E. Survey of existing conditions.

F. Source quality-control reports.

G. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.

C. Shop-Painting Applicator Qualifications: Qualified in accordance with AISC's Sophisticated Paint Endorsement P1, Endorsement P2, Endorsement P3, or to SSPC-QP 3.

D. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
2. ANSI/AISC 341.
3. ANSI/AISC 360.
4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:

1. Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.

    a. Use Load and Resistance Factor Design; data are given at factored-load level.

C. Moment Connections: Type FR, fully restrained.

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A992 or ASTM A572, Grade 50.

B. Channels, Angles, M-Shapes: ASTM A36

C. Plate and Bar: ASTM A36

D. Cold-Formed Hollow Structural Sections: ASTM A500, Grade C.

E. Steel Pipe: ASTM A53, Type E or Type S, Grade B.

F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers; all with plain finish.

B. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

2.4 RODS

A. Unheaded Anchor Rods: ASTM F1554, Grade 36 or ASTM F1554, Grade 55, weldable.

1. Configuration: Straight.
2. Nuts: ASTM A563 heavy-hex carbon steel.
3. Plate Washers: ASTM A36 carbon steel.
4. Washers: ASTM F436, Type 1, hardened carbon steel.
5. Finish: Plain.

B. Threaded Rods: ASTM A36

1. Nuts: ASTM A63 heavy-hex carbon steel.
2. Washers: ASTM A36 carbon steel.
3. Finish: Plain.

2.5 PRIMER

A. Steel Primer:

1. Comply with Section 099123 "Interior Painting", and Section 099600 "High-Performance Coatings"
2. SSPC-Paint 23, latex primer.
3. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanized-Steel Primer:

1. Etching Cleaner: MPI#25, for galvanized steel.
2. Galvanizing Repair Paint: ASTM A780.

2.6 SHRINKAGE-RESISTANT GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.7 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.

3. Identify high-strength structural steel in accordance with ASTM A6 and maintain markings until structural-steel framing has been erected.
4. Mark and match-mark materials for field assembly.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 3.

F. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1 and manufacturer's written instructions.

G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.

H. Welded-Steel Door Frames: Build up welded-steel doorframes attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated on Drawings.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.8 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.9 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels and welded door frames attached to structural-steel frame and located in exterior walls.

2.10 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces unless indicated to be painted.
6. Corrosion-resisting (weathering) steel surfaces.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

1. SSPC-SP 2.
2. SSPC-SP 3.

C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner.

D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

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

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

C. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1 and manufacturer's written instructions.

3.5 REPAIR

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780.

B. Touchup Painting:

1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

2. Cleaning and touchup painting are specified in Section 099123 “Interior Painting”, and Section 099600 "High-Performance Coatings"

C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1.
3. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:

    a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
    b. Conduct tests according to requirements in AWS D1.1 on additional shear connectors if weld fracture occurs on shear connectors already tested.

END OF SECTION 051200

SECTION 054000
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior non-load-bearing wall framing.
2. Ceiling joist framing.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Cold-formed steel framing materials.
2. Interior non-load-bearing wall framing.
3. Vertical deflection clips.
4. Single deflection track.
5. Double deflection track.
6. Drift clips.
7. Ceiling joist framing.
8. Post-installed anchors.
9. Power-actuated anchors.
10. Sill sealer gasket.
11. Sill sealer gasket/termite barrier.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud

Association, the Steel Framing Industry Association, the Steel Stud Manufacturers Association, or the Supreme Steel Framing System Association.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI S202.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on Drawings.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

a. Interior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft.

3. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

a. Upward and downward movement of 3/4 inch.

B. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing complies with AISI S100, AISI S200, AISI S240, and ASTM C955.

C. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.2 COLD-FORMED STEEL FRAMING MATERIALS

A. Framing Members, General: Comply with AISI S100, AISI S200, AISI S240, and ASTM C955 for conditions indicated.

B. Steel Sheet: ASTM A1003, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: As required by structural performance.
2. Coating: G60 or equivalent.

C. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A653, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G60.

2.3 INTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 33 mils (0.0329 inch).
2. Flange Width: 1-5/8 inches.
3. Section Properties: As required by structural performance.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 33 mils (0.0329 inch).
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips, Interior: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 43 mils (0.0428 inch).
2. Flange Width: 1 inch plus the design gap for one-story structures.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

a. Minimum Base-Metal Thickness: 43 mils (0.0428 inch).
b. Flange Width: 1 inch plus the design gap for one-story structures.

2. Inner Track: Of web depth indicated, and as follows:

a. Minimum Base-Metal Thickness: 43 mils (0.0428 inch).
b. Flange Width: Dimension equal to sum of outer deflection track flange width plus 1 inch.

F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.4 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, punched with standard holes, or punched with enlarged service holes, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 33 mils (0.0329 inch).
2. Flange Width: 1-5/8 inches, minimum.
3. Section Properties: As required by structural performance.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole-reinforcing plates.
11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36, zinc coated by hot-dip process according to ASTM A123.

B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex-headed bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153, Class C or mechanically deposition according to ASTM B695, Class 50.

C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design

load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC193, ICC-ES AC58, or ICC-ES AC308 as appropriate for the substrate.

1. Uses: Securing cold-formed steel framing to structure.
2. Type: Torque-controlled expansion anchor, Torque-controlled adhesive anchor, or adhesive anchor.
3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

D. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780, MIL-P-21035B, or SSPC-Paint 20.

B. Cement Grout: Portland cement, ASTM C150, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C1107, and with a fluid consistency and 30-minute working time.

D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

E. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

F. Sill Sealer Gasket/Termite Barrier: Minimum 68-mil nominal thickness, self-adhering sheet consisting of 64 mils of rubberized asphalt laminated on one side to a 4-mil-thick, polyethylene-film reinforcement, and with release liner on adhesive side; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.
1. Physical Properties:

a. Peel Adhesion: 17.0 lb/in of width when tested in accordance with ASTM D412.
b. Low-Temperature Flexibility: Pass at minus 25 deg F when tested in accordance with ASTM D146.

c. Water Vapor Permeance: 0.05 perm maximum when tested in accordance with ASTM E96, Method B.
d. Resistance to Termite Penetration: Comply with ICC-ES AC380.

2.8 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.

C. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

D. Install sill sealer gasket/termite barrier in accordance with manufacturer's written instructions at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop fabricated (“panelized”) for field installation, or it may be field assembled (“stick-built”).

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire

integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 INSTALLATION OF INTERIOR NONLOADBEARING WALL FRAMING

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated on Shop Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to studs and anchor to building structure.
4. Connect drift clips to cold-formed steel metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

1. Install solid blocking at centers indicated on Shop Drawings.

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 INSTALLATION OF JOIST FRAMING

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.

C. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.

D. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.

1. Install web stiffeners to transfer axial loads of walls above.

E. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:

1. Joist-Track Solid Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
2. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

F. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

G. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 INSTALLATION TOLERANCES

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

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

3.7 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 055000
METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal Ladders.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Pipe guards.
5. Loose bearing and leveling plates for applications where they are not specified in other Sections.

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

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Division 04 Section "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

B. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Qualification Data: For qualified professional engineer.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

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

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

B. Steel Tubing: ASTM A 500, cold-formed steel tubing.

C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

D. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: As indicated.
2. Material: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is on exterior of building or in contact with masonry.

D. Machine Screws: ASME B18.6.3.

E. Plain Washers: Round, ASME B18.22.1.

F. Lock Washers: Helical, spring type, ASME B18.21.1.

G. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

H. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

I. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

J. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

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

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. Galvanize shelf angles located in exterior walls.

C. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

A. General:

1. Comply with ANSI A14.3 unless otherwise indicated.
2. For elevator pit ladders, comply with ASME A17.1.

B. Steel Ladders:

1. Space siderails 18 inches apart unless otherwise indicated.
2. Space siderails of elevator pit ladders 12 inches apart.
3. Siderails: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges.
4. Rungs: 3/4-inch- diameter steel bars.
5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
6. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
7. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than ¾ inch in least dimension.
8. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
9. Galvanize exterior ladders, including brackets and fasteners.

2.9 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

2.10 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

2.11 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

2.12 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.13 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

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

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

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

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

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.3 INSTALLING METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

1. Do not fill removable bollards with concrete.

B. Anchor bollards in concrete. Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.

C. Fill bollards solidly with concrete, mounding top surface to shed water.

1. Do not fill removable bollards with concrete.

3.4 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

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

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 055213
PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel railings.
2. Railing gates at the level of exit discharge.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Manufacturer's product lines of mechanically connected railings.
2. Handrail brackets.
3. Shop primer.
4. Intermediate coats and topcoats.
5. Metal finishes.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For delegated design professional engineer.

B. Welding certificates.

C. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

   a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
   b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

   a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
   b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch (38-mm) clearance from inside face of handrail to finished wall surface.

2.3 STEEL RAILINGS

A. Tubing: ASTM A500/A500M (cold formed) or ASTM A513/A513M, Type 5.

B. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

C. Plates, Shapes, and Bars: ASTM A36/A36M.

D. Cast Iron Fittings: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

2.4 FASTENERS

A. Fastener Materials:

1. Ungalvanized-Steel Railing Components: Plated steel fasteners complying with ASTM F1941/ASTM F1941M, Class Fe/Zn 5 for zinc coating.

B. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Handrail Brackets: Cast iron center of handrail 2-1/2 inches (63.5 mm) from face of railing or wall.

B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.

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

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

D. Intermediate Coats and Topcoats: Provide products that comply with Section 099123 "Interior Painting."

2.6 FABRICATION

A. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

B. Form work true to line and level with accurate angles and surfaces.

C. Gates: Form gates from steel tube of same size and shape as top rails, with infill to match guards. Provide with cam-type, self-closing hinges for fastening to wall and overlapping stop with rubber bumper to prevent gate from opening in direction opposite egress.

D. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.

3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #2 welds; good appearance, completely sanded joint, some undercutting and pinholes okay.

E. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

F. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

I. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
2. Coordinate anchorage devices with supporting structure.

J. For removable railing posts, fabricate slip-fit sockets from stainless steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height.

1. Provide socket covers designed and fabricated to resist being dislodged.
2. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

K. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.7 STEEL AND IRON FINISHES

A. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, hot-dip galvanize anchors to be embedded in exterior concrete or masonry.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3.

C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1 for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated railings with universal shop primer unless indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.

1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.2 ANCHORING POSTS

A. Anchor posts to metal surfaces with flanges, angle type, or floor type, as required by conditions, connected to posts and to metal supporting members.

B. Install removable railing sections, where indicated on Drawings, in slip-fit stainless steel sockets cast in concrete.

3.3 ATTACHING RAILINGS

A. Attach handrails to walls with wall brackets, except where end flanges are used. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.

B. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.

C. Install railing gates level, plumb, and secure for full opening without interference.

D. Touchup Painting:

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

3.4 CLEANING

END OF SECTION 055213

SECTION 055313
BAR GRATINGS

1.1 SUMMARY

A. Section Includes:

1. Metal bar gratings.
2. Grating frames and supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, sections, and attachment details.

C. Delegated Design Submittals: For gratings, including manufacturers' published load tables and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates:
1. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
2. Welding certificates.

B. Delegated design engineer qualifications.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Delegated Design Engineer: A professional engineer who is legally qualified to practice in Michigan where Project is located and who is experienced in providing engineering services of the type indicated.
2. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:

a. AWS D1.1/D1.1M.
b. AWS D1.3/D1.3M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design gratings.

B. Structural Performance: Gratings to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Walkways and Elevated Platforms Other Than Exits: Uniform load of 60 lbf/sq. ft. (2.87 kN/sq. m).
   2. Limit deflection to L/360 or 1/4 inch (6.4 mm), whichever is less.

2.2 METAL BAR GRATINGS

A. Metal Bar Grating Standards: Comply with NAAMM MBG 531 and NAAMM MBG 532.

B. Welded Steel Grating MBG-#1:

   1. Bearing Bar Spacing: 15/16 inch (24 mm) o.c.
   2. Bearing Bar Depth: As required to comply with structural performance requirements.
   3. Bearing Bar Thickness: As required to comply with structural performance requirements.
   4. Crossbar Spacing: 2 inches (51 mm) o.c.
   5. Traffic Surface: Serrated.
   6. Steel Finish: Shop primed.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
   1. Provide stainless steel fasteners for fastening stainless steel.

If retaining "Post-Installed Anchors" Paragraph below, indicate loads on Drawings and verify safety factors with Project's structural engineer.

B. Post-Installed Anchors: Torque-controlled expansion or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

2.4 MISCELLANEOUS MATERIALS

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

2.5 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

B. Steel Bars for Bar Gratings: ASTM A36/A36M or steel strip, ASTM A1011/A1011M or ASTM A1018/A1018M.

C. Wire Rod for Bar Grating Crossbars: ASTM A510/A510M.

D. Uncoated Steel Sheet: ASTM A1011/A1011M, structural steel, Grade 30 (Grade 205).

2.6 FABRICATION

A. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

B. Fit exposed connections accurately together to form hairline joints.

2.7 STEEL FINISHES

A. Finish gratings, frames, and supports after assembly.

B. Shop prime gratings, frames, and supports unless otherwise indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

B. Fit exposed connections accurately together to form hairline joints.

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

3.2 INSTALLATION OF METAL BAR GRATINGS

A. Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.3 REPAIR

A. Repair Painting:

1. Wire brush and clean rust spots, welds, and abraded areas on prime-painted gratings immediately after installation, and apply repair paint with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

    a. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

END OF SECTION 055313

SECTION 061000
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Wood blocking and nailers.
4. Plywood backing panels.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

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

1. Factory mark each piece of lumber with grade stamp of grading agency.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

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

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

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

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

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

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

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

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

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

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

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

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.

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

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

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

1. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.

1. Application: Interior partitions not indicated as load bearing.
2. Species:

    a. Southern pine or mixed southern pine; SPIB.
    b. Northern species; NLGA.
    c. Eastern softwoods; NeLMA.
    d. Western woods; WCLIB or WWPA.

B. Framing Other Than Non-Load-Bearing Partitions: No. 2 grade.

1. Application: Framing other than interior partitions not indicated as load bearing.
2. Species:

    a. Hem-fir (north); NLGA.
    b. Southern pine; SPIB.
    c. Douglas fir-larch; WCLIB or WWPA.
    d. Southern pine or mixed southern pine; SPIB.
    e. Spruce-pine-fir; NLGA.
    f. Douglas fir-south; WWPA.
    g. Hem-fir; WCLIB or WWPA.
    h. Douglas fir-larch (north); NLGA.
    i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. Exposed Framing: Hand-select material for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

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

2.5 ENGINEERED WOOD PRODUCTS

A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D5456 and manufactured with an exterior-type adhesive complying with ASTM D2559.

2.6 MISCELLANEOUS LUMBER

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

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

6. Grounds.

B. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any species.

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

1. Mixed southern pine or southern pine.
2. Eastern softwoods.
3. Northern species.
4. Western woods.

2.7 PLYWOOD BACKING PANELS

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

2.8 FASTENERS

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

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or of Type 304 stainless steel.

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

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

2.9 METAL FRAMING ANCHORS

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

1. Use for interior locations unless otherwise indicated.

B. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

2.10 MISCELLANEOUS MATERIALS

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

B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

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

D. Adhesives for Gluing to Concrete: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

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

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

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

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

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

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

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

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

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

3.2 PROTECTION

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

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

END OF SECTION 061000

SECTION 062023
INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

B. Revise subparagraphs below to suit Project and to distinguish interior finish carpentry from items made from wood but specified in Section 064200 “Wood Paneling,”Section 064013 “Exterior Architectural Woodwork,” or Section 064023 “Interior Architectural Woodwork.”
   1. Plastic Laminate Panels
   2. Column Wrapped Paneling
   3. Reveal moldings.

C. Related Requirements:

   1. Section 061053 "Miscellaneous Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for framing exposed to view.
   2. Section 099300 “Staining and Transparent Finishing” for wood finishing.

1.3 DEFINITIONS

A. MDF: Medium Density Fiber Board

1.4 ACTION SUBMITTALS

A. Samples for Verification:

   1. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. for lumber and 8 by 10 inches for panels.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

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

1.6 FIELD CONDITIONS

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

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

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

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and the following grading rules:

1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."
2. NHLA: National Hardwood Lumber Association, "Rules for the Measurement and Inspection of Hardwood & Cypress."
3. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."
4. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."
5. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, "Grading Rules for West Coast Lumber."
6. WWPA: Western Wood Products Association, "Western Lumber Grading Rules."

B. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

C. Softwood Plywood: DOC PS 1.

2.2 PANELING

A. PLAM finished Stage and side walls **(PLAM-1)**:

1. Face: (PLAM-1) Plastic Laminate –Formica – Bleched Legno 8845-58
2. Backing: (1) layer of 5/8 inch thick MDF laminated, on existing support.
3. Thickness: 5/8 inch.
4. Glue Bond: Type II (interior).
5. Finish: Match Architect's samples.

B. PLAM finished Columns **(PLAM-1)**:

1. Face: (PLAM-1) Plastic Laminate –Formica – Bleched Legno 8845-58
2. Backing: (1) layer of 5/8 inch thick MDF laminated, on existing support.
3. Thickness: 5/8 inch.
4. Glue Bond: Type II (interior).
5. Finish: Match Architect's samples.

2.3 REVEAL MOLDINGS

Acceptable Manufacturer: Fry Reglet Corporation – 1377 Stonefield Court – Alpharetta, GA 30004 – Phone: 800-237-9773 – Fax: 800-200-4397

1. Material: Extruded aluminum.
2. Profile: Manufacturers standard corner trim
3. Finish: Black

2.4 MISCELLANEOUS MATERIALS

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

B. Paneling Adhesive: Comply with paneling manufacturer's written recommendations for adhesives.

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

2.5 FABRICATION

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

1. Interior standing and running trim except shoe and crown molds.
2. Wood-board paneling.

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

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

3.2 PREPARATION

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

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

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

B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

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

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.

1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
2. Install trim after gypsum-board joint finishing operations are completed.
3. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 PANELING INSTALLATION

A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings. Install with uniform tight joints between panels.

1. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners. Space fasteners and adhesive as recommended by panel manufacturer.
2. Conceal fasteners to greatest practical extent.
3. Arrange panels with grooves and joints over supports. Fasten to supports with nails of type and at spacing recommended by panel manufacturer. Use fasteners with prefinished heads matching groove color.

3.6 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.7 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes, if any.

3.8 PROTECTION

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

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

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

END OF SECTION 062023

SECTION 072100
THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Foam-plastic board insulation.
2. Glass-fiber blanket.
3. Glass-fiber board insulation.
4. Spray polyurethane foam insulation.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for insulation installed in cavity walls and masonry cells.

1.3 SUBMITTALS

A. Material Compliance Certificate: Submit completed Material Compliance Certificate as described in Specification Section 013300 – Architect’s Submittal Procedures”.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

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

B. Protect foam-plastic board insulation as follows:

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

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

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

a. Dow Chemical Company (The).
b. Owens Corning.

2. Type VI, 40 psi.

B. Adhesive for Bonding Insulation:
1. Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.2 GLASS-FIBER BLANKET

A. Glass-Fiber Blanket, Unfaced: ASTM C665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.

B. Glass-Fiber Blanket, Polypropylene-Scrim-Kraft Faced: ASTM C665, Type II (nonreflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).

C. Glass-Fiber Blanket, Kraft Faced: ASTM C665, Type II (nonreflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).

2.3 GLASS-FIBER BOARD INSULATION

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

1. CertainTeed Corporation.
2. Johns Manville.
3. Owens Corning.

B. Unfaced, Glass-Fiber Board Insulation: ASTM C 612, Type IA; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84, passing ASTM E 136 for combustion characteristics.

1. Nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.

2.4 SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

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

a. BASF Corporation.
b. NCFI Polyurethanes.

2. Minimum density of 1.5 lb/cu. ft, thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F.

2.5 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

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

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

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

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

3.3 PROTECTION

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

END OF SECTION 072100

SECTION 075323
ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING (EPDM)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. EPDM membrane roofing system, including all components specified.

B. Disposal of demolition debris and construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.

C. Comply with the published recommendations and instructions of the roofing membrane manufacturer, at http://manual.fsbp.com.

D. Commencement of work by Contractor shall constitute acknowledgement by Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.2 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 for definition of terms related to roofing work not otherwise defined in the section.

B. LTTR: Long Term Thermal Resistance, as defined by CAN-ULC S770.

1.3 REFERENCE STANDARDS

A. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2008.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2012.

C. ASTM D1079 - Standard Terminology Relating to Roofing, Waterproofing, and Bituminous Materials; 2010.

D. ASTM D1621 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics; 2010.

E. ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2008.

F. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

H. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.

I. CAN-ULC-S770 - Standard Test Method Determination of L-Term Thermal Resistance Of Closed-Cell Thermal Insulating Foams; 2009.

J. PS 1 - Structural Plywood; 2009.

K. PS 20 - American Softwood Lumber Standard; 2005.

L. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2003. (ANSI/SPRI ES-1)

1.4 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
   1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
   2. Notify Architect well in advance of meeting.

1.5 SUBMITTALS

A. Product Data:
   1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.
   2. Where UL or FM requirements are specified, provide documentation that shows that the roofing system to be installed is UL-Classified or FM-approved, as applicable; include data itemizing the components of the classified or approved system.
   3. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.

B. Shop Drawings: Provide: Layout of the new Tapered Insulation system at the drain.
   1. The roof membrane manufacturer's standard details customized for this project for all relevant conditions, including flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations, and drains.
   2. For tapered insulation, provide project-specific layout and dimensions for each board. Tapered Shop Drawings shall be by the roofing manufacturer or his designated trained and approved design house.
   3. Contractor shall confirm slope at sever ponded area designated on the plan and provide a detailed plan to alleviate the ponded water with new additional tapered insulation.
   4. Contractor shall confirm conditions where Barrel Metal Roofs at the two front entrance canopies meet the tapered insulation maximum heights and provide a plan to control the heights and intersection of these two conditions.

C. Samples: Submit samples of each product to be used.

D. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications.

E. Pre-Installation Notice: Copy to show that manufacturer's required Pre Installation Notice (PIN) has been accepted and approved by the manufacturer.

F. Executed Warranty.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Roofing installer shall have the following:
   1. Current Firestone Master Contractor status.
   2. Current Firestone Partners in Quality Contractor status.
   3. Fully staffed office within 100 miles of the job site.
   4. At least five years experience in installing specified system.
   5. Capability to provide payment and performance bond to building owner.
   6. Capability to provide a payment performance bond.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.

B. Store materials clear of ground and moisture with weather protective covering.

C. Keep combustible materials away from ignition sources.

1.8 WARRANTY

A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

B. Warranty: Limited Warranty covering membrane, roof insulation, and other indicated components of the system, for the term indicated.
   1. Limit of Liability: No dollar limitation.
   2. Scope of Coverage: Repair leaks in the roofing system caused by:
      a. Ordinary wear and tear of the elements.
      b. Manufacturing defect in Firestone brand materials.
      c. Defective workmanship used to install these materials.
      d. Damage due to winds up to 55 mph (88 km/h).
   3. Not Covered:
      a. Damage due to winds in excess of 55 mph (88 km/h).
      b. Damage due hurricanes or tornadoes.
      c. Hail.
      d. Intentional damage.
      e. Unintentional damage due to normal rooftop inspections, maintenance, or service.

C. Metal Roof Edging: Full-system warranty for roof edge system, covering blow-off from winds up to 72 mph .

D. Metal Roof Edging with Exposed Decorative Fascia: Provide 20 year warranty for painted finish covering color fade, chalk, and film integrity.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. A. Acceptable Manufacturers - Roofing Systems:
   1. Firestone Building Products (Basis of Design Product)
   2. Carlisle Company.
   3. Versico.
   4. Johns Manville.

B. Manufacturer of Insulation and Cover Boards: Same manufacturer as roof membrane.

C. Manufacturer of Metal Roof Edging: Same manufacturer as roof membrane.
   1. Metal roof edging products by other manufacturers are not acceptable.
   2. Field- or shop-fabricated metal roof edgings are not acceptable.

2.2 ROOFING SYSTEM DESCRIPTION

A. Roofing System: Ethylene-propylene-diene-monomer (EPDM) single-ply membrane.
   1. Membrane Attachment: Fully adhered.
   2. Warranty: Full system warranty; Firestone 20-year Red Shield Limited Warranty covering membrane, roof insulation, and membrane accessories.
   3. Comply with applicable local building code requirements.
   4. Provide assembly having Underwriters Laboratories, Inc. (UL) Class A Fire Hazard Classification.

2.3 EPDM MEMBRANE MATERIALS

A. Roofing and Flashing Membrane: **WHITE**, cured synthetic single-ply membrane composed of ethylene propylene diene terpolymer (EPDM) with the following properties:
   1. Reinforcement: None; membrane complying with ASTM D 4637 Type I.
   2. Thickness: 0.060 inch (1.5 mm).
   4. Nominal Thickness Tolerance: Plus/minus 10 percent.
   5. Sheet Width: Provide the widest available sheets to minimize field seaming.
   6. Acceptable Product: RubberGard Platinum EPDM Membrane by Firestone.
   7. Acceptable Product: RubberGard Non-Reinforced Low Slope Fire Retardant EPDM Membrane by Firestone.

B. Membrane Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

C. Flashing Membrane: Self-curing, non-reinforced membrane composed of nonvulcanized EPDM rubber, complying with ASTM D 4811 Type II, and with the following properties:
   1. Thickness: 0.055 inch (1.4 mm).
   2. Acceptable Product: RubberGard EPDM FormFlash by Firestone.

D. Self-Adhesive Flashing Membrane: Semi-cured 45 mil EPDM membrane laminated to 35 mil (0.9 mm) EPDM tape adhesive; QuickSeam Flashing by Firestone.

E. Pre-Molded Pipe Flashings: EPDM, molded for quick adaptation to different sized pipes; Firestone EPDM Pipe Flashing.

F. Self-Adhesive Lap Splice Tape: 35 mil (0.9 mm) EPDM-based, formulated for compatibility with EPDM membrane and high-solids primer; QuickSeam Splice Tape by Firestone.

G. Splice Adhesive: Synthetic polymer-based, formulated for compatibility with EPDM membrane and metal surfaces; SA-1065 Splice Adhesive by Firestone.

H. Bonding Adhesive: Neoprene-based, formulated for compatibility with EPDM membrane and wide variety of substrate materials, including masonry, wood, and insulation facings; Bonding Adhesive BA-2004 by Firestone.

I. Adhesive Primer: Synthetic rubber based primer formulated for compatibility with EPDM membrane and tape adhesive, with VOC content less than 2.1 lb/gal (250 g/L); QuickPrime Plus LVOC by Firestone.

J. Seam Edge Treatment: EPDM rubber-based sealant, formulated for sealing exposed edges of membrane at seams; Lap Sealant HS by Firestone.

K. Pourable Sealer: Two-part polyurethane, two-color for reliable mixing; Pourable Sealer by Firestone.

L. Water Block Seal: Butyl rubber sealant for use between two surfaces, not exposed; Water Block Seal by Firestone.

M. Metal Plates and Strips Used for Fastening Membrane and Insulation: Steel with Galvalume coating; corrosion-resistance meeting FM 4470 criteria.

N. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches (33 mm) wide by 0.10 inch (2.5 mm) thick; Firestone Termination Bar by Firestone.

O. Roof Walkway Pads: EPDM, 0.30 inch (7.6 mm) thick by 30 by 30 inches (760 by 760 mm) with EPDM tape adhesive strips laminated to the bottom; QuickSeam Walkway Pads by Firestone.

2.4 ROOF INSULATION

A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with black glass reinforced mat laminated to faces, complying with ASTM C1289 Type II Class 1, with the following additional characteristics:
   1. Thickness: As indicated elsewhere Tapered and Flat roof insulation Systems.
   2. Size: 48 inches (1220 mm) by 96 inches (2440 mm), nominal.
      a. Exception: Insulation to be attached using adhesive or asphalt may be no larger than 48 inches (1220 mm) by 48 inches (1220 mm), nominal.
   3. R-Value (LTTR):
      a. 1.0 inch (25 mm) Thickness: 6.0, minimum.
      b. 1.25 inch (32 mm) Thickness: 7.5, minimum.
      c. 1.5 inch (38 mm) Thickness: 9.0, minimum.
      d. 1.75 inch (44 mm) Thickness: 10.5, minimum.
      e. 2.0 inch (51 mm) Thickness: 12.1, minimum.
      f. 3.0 inch (76 mm) Thickness: 18.5, minimum.
      g. 4.0 inch (102 mm) Thickness: 25.0, minimum.
   4. Compressive Strength: 20 psi (138 kPa) when tested in accordance with ASTM C1289.
   5. UL-Classified and FM-approved for direct to steel deck and wood Deck applications.
   6. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
   7. Recycled Content: 19 percent post-consumer and 15 percent post-industrial, average.
   8. Acceptable Product: ISO 95+ GL Polyisocyanurate Insulation by Firestone.

B. Insulation Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

2.5 METAL ACCESSORIES

A. Metal Roof Edging and Fascia: Continuous metal edge member serving as termination of roof membrane and retainer for metal fascia; watertight with no exposed fasteners; mounted to roof edge nailer.
   1. Refer to 076200 Sheet Metal Flashing and Trim for additional requirements to Wind Performance:
      a. Membrane Pull-Off Resistance: 100 lbs/ft, minimum, when tested in accordance with ANSI/SPRI ES-1 Test Method RE-1, current edition.
      b. Fascia Pull-Off Resistance: At least the minimum required when tested in accordance

with ANSI/SPRI ES-1 Test Method RE-2, current edition.

c. Provide product listed in current Factory Mutual Research Corporation Approval Guide with at least FM 1-90 rating.

2. Description: Two-piece; extruded aluminum T-shaped edge member securing top and bottom edges of flat-faced formed metal fascia.
3. Fascia Face Height: See Drawings.
4. Edge Member Height Above Nailer: 1-1/4 inches (31 mm).
5. Functional Characteristics: Fascia retainer supports while allowing for free thermal cycling of fascia.
6. Aluminum Bar: Continuous 6063-T6 alloy aluminum extrusion with pre-punched slotted holes; miters welded; injection molded EPDM splices to allow thermal expansion.
7. Anchor Bar Cleat: 20 gage, 0.036 inch (0.9 mm) G90 coated commercial type galvanized steel with pre-punched holes.
8. Fasteners: Factory-provided corrosion resistant fasteners, with drivers; no exposed fasteners permitted.
9. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, scuppers, and end caps; minimum 14 inch long legs on corner pieces.
10. Accessories: Provide matching brick wall cap, downspout, extenders, and other special fabrications as shown on the drawings.

2.6 ACCESSORY MATERIALS

A. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated.
   1. Width: 3-1/2 inches (90 mm), nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it.
   2. Thickness: Same as thickness of roof insulation.

PART 3 - INSTALLATION

3.1 GENERAL

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.

B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.

C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.

D. Perform work using competent and properly equipped personnel.

E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.

F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold

weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F (15 to 25 degrees C).

G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
   1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
   2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
   3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.

H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.

I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.2 EXAMINATION

A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.

B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.

C. Examine roof substrate to verify that it is properly sloped to drains.

D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

3.3 PREPARATION

A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.

C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch (6 mm) wide with fill material acceptable insulation to membrane manufacturer.

D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

E. Wood Nailers: Provide wood nailers at all perimeters and other locations where indicated on the drawings, of total height matching the total thickness of insulation being used.

3.4 SINGLE-PLY MEMBRANE INSTALLATION

A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.

B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.

C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.

D. Install membrane adhered to the substrate, with edge securement as specified.

E. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.

F. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches (1:6) using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
   1. Exceptions: Round pipe penetrations less than 18 inches (460 mm) in diameter and square penetrations less than 4 inches (200 mm) square.
   2. Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing manufacturer.

3.5 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
   1. Follow roofing manufacturer's instructions.
   2. Remove protective plastic surface film immediately before installation.
   3. Install water block sealant under the membrane anchorage leg.
   4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
   5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
   6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
   7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.

C. Roofing Expansion Joints: Install as recommended by roofing manufacturer.

D. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches (200 mm) high above membrane surface.
   1. Use the longest practical flashing pieces.
   2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
   3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
   4. Provide termination directly to the vertical substrate as shown on roof drawings.

E. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
   1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.

2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches (50 mm) deep, with at least 1 inch (25 mm) clearance from penetration, sloped to shed water.
3. Structural Steel Tubing: If corner radii are greater than 1/4 inch (6 mm) and longest side of tube does not exceed 12 inches (305 mm), flash as for pipes; otherwise, provide a standard curb with flashing.
4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.
5. High Temperature Surfaces: Where the in-service temperature is, or is expected to be, in excess of 180 degrees F (82 degrees C), protect the elastomeric components from direct contact with the hot surfaces using an intermediate insulated sleeve as flashing substrate as recommended by membrane manufacturer.

3.6 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).

C. Perform all corrections necessary for issuance of warranty.

3.7 CLEANING

A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.

B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.

C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.8 PROTECTION

A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION 075323

SECTION 078123
INTUMESCENT FIREPROOFING

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. Intumescent fire protection material.

1.3 SUBMITTALS

A. Manufacturer's Data: Submit manufacturer's specifications, including certification as may be required to show material compliance with contract documents.

1.4 QUALITY ASSURANCE

A. Manufacturer - Company specializing in manufacturing fire protection products.

B. The intumescent fire resistive material shall be manufactured under the Follow- Up Service program of UL or ULC and bear the UL and/or ULC label (mark).

C. Applicator - A firm with expertise in the installation of fire resistive or similar materials. This firm shall be recognized or otherwise approved by fire resistive material supplier.

D. Product - The product shall be approved by the architect and applicable authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the project in manufacturer's unopened packages, fully identified as to trade name, type and other identifying data. Packaged materials shall bear the appropriate labels, seals and UL label (mark) for fire resistive ratings and shall be stored at temperature between 45º F - 100º F (7º C -38º C), in a dry interior location away from direct sunlight. PROTECT FROM FREEZING.

B. PROJECT/ SITE CONDITIONS:

1. When the temperature at the job site is less than 50º F (10º C), a minimum substrate and ambient temperature of 50º F (10º C) shall be maintained prior to, during, and a minimum of 72 hours after application. If necessary for job schedule, the General Contractor shall provide enclosures and heat to maintain proper temperatures and humidity levels in the application areas.

2. In enclosed areas, ventilation must not be less than 4 complete air exchanges per hour until the material is dry.

3. Relative humidity shall not exceed 75% throughout the total period of application and drying for the intumescent fire resistive material, and must not exceed 75% throughout the application and drying for the protective decorative topcoat.

C. SEQUENCING AND SCHEDULING:

1. Applicator shall cooperate in the coordination and scheduling of fire protection work to avoid delays in job progress.

2. The installation of piping, ducts, conduit or other suspended equipment shall not commence until the application of the thin-film fire resistive material is complete in that area.

PART 2 - PRODUCTS

2.1 INTUMESCENT FIRE PROTECTION SYSTEM

A. Basis of Design: The intumescent fire resistive material shall be Contego HS® Intumescent RFB as supplied by Contego International Inc.

B. Intumescent fire resistive material shall be applied in accordance with drawings and/or specifications, and shall have been tested in accordance with the procedures of UL 263 or ASTM E119 or CAN/ULC S101. Contego HS® Intumescent RFB or Contego Original® Intumescent RFB.

PART 3 - EXECUTION

3.1 PREPARATION

A. All surfaces to receive thin-film fire resistive material shall be clean, dry and free of oil, grease, loose mill scale, dirt, dust or other materials which would impair bond of the thin-film fire resistive material to the surface. Any cleaning of the surfaces to receive fire resistive material shall be the responsibility of the General Contractor or steel erector, as outlined in the structural steel section.

B. Confirm compatibility of surfaces to receive thin-film fire resistive material. Steel surfaces shall be primed with a compatible primer approved by the thin-film fire resistive material manufacturer.

C. Provide masking, drop cloths or other suitable coverings to prevent overspray onto surfaces not intended to be coated with intumescent coating.

3.2 APPLICATION

A. The thin-film fire resistive material shall be applied at the required dry film thickness per the appropriate design number.

3.3 MOCK UP

A. Before proceeding with the work, the applicator shall apply the thin-film fire resistive material to a section witnessed by the architect's or owner's representative. The application shall be subject to their approval and shall be used as a guide for texture and thickness of finished work.

3.4 CLEAN UP AND REPAIR

A. Upon completion of installation, all excess material, overspray and debris shall be cleared and removed from the job site.

B. All patching of and repair to thin-film fire resistive material, due to damage by other trades, shall be performed under this section and paid for by the trade responsible for the damage. Patching shall be performed by applicators recognized or otherwise approved by the manufacturer.

3.5 INSPECTION AND TESTING

A. In addition to continuous Wet Film Thickness checks performed by applicator during application, the installed intumescent material shall be inspected by a qualified independent testing laboratory for thickness in accordance with the AWCI Technical Manual 12-B “Standard Practice For The Testing and Inspection Of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide”, Second Edition, before application of the topcoat, if applicable.

B. The results of the above tests shall be made available to all parties at the completion of each area and approved prior to the application of topcoat, if applicable.

END OF SECTION 078123

SECTION 078413
PENETRATION FIRESTOPPING

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. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.5 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. A/D Fire Protection Systems Inc.
2. Grace Construction Products.
3. Hilti, Inc.
4. Johns Manville.
5. Nelson Firestop Products.
6. NUCO Inc.
7. Passive Fire Protection Partners.
8. RectorSeal Corporation.
9. Specified Technologies Inc.
10. 3M Fire Protection Products.
11. Tremco, Inc.; Tremco Fire Protection Systems Group.
12. USG Corporation.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls and fire partitions. Refer to Code Compliance Plan.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. Horizontal assemblies include floor/ceiling assemblies.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

F. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

G. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:

    a. Slag-wool-fiber or rock-wool-fiber insulation.
    b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Fillers for sealants.

2. Temporary forming materials.

3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

D. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

F. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

G. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 079200
JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Mildew-resistant joint sealants.
5. Polysulfide joint sealants. Butyl joint sealants.
6. Acoustical joint sealants.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

B. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

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

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.

3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:

1. Architectural sealants shall have a VOC content of 250 g/L or less.
2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.

C. Low-Emitting Interior Sealants: Sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

2.4 URETHANE JOINT SEALANTS

A. Urethane, M, NS, 50, T, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Uses T and NT.

2.5 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. STPE, Mildew Resistant, S, NS, 50, NT: Mildew-resistant, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

2.6 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.

2.7 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

2.8 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide the following:

    a. Pecora Corporation; AC-20 FTR or AIS-919.
    b. USG Corporation; SHEETROCK Acoustical Sealant.

2.9 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM 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. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.10 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 performance of the Work.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.

c. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 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, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

    a. Construction joints in cast-in-place concrete.
    b. Control and expansion joints in unit masonry.
    c. Joints in dimension stone cladding.
    d. Joints between metal panels.
    e. Joints between different materials listed above.
    f. Perimeter joints between materials listed above and frames of doors windows and louvers.
    g. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, M, NS, 50, T, NT
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

    a. Control and expansion joints in tile flooring.

2. Joint Sealant: Urethane, S, P, 50, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Tile control and expansion joints.
c. Vertical joints on exposed surfaces of unit masonry.
d. Joints on underside of plant-precast structural concrete planks.

2. Joint Sealant: Urethane, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.

2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Concealed mastics.

1. Joint Locations:

a. Aluminum thresholds.
b. Sill plates.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Butyl-rubber based
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Location:

a. Acoustical joints where indicated.

2. Joint Sealant: Acoustical
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Interior standard steel doors and frames.

B. Related Requirements:

1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings in accordance with NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.3 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, and glazing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Ceco Door; AADG, Inc.; ASSA ABLOY.
2. Curries, AADG, Inc.; ASSA ABLOY Group.
3. Pioneer Industries; AADG, Inc.; ASSA ABLOY.
4. Steelcraft; Allegion plc.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.
2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
3. At vertical exit enclosures and exit passageways450 deg F

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A.

1. Doors:
   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches.
   c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch.
   d. Edge Construction: Model 1, Full Flush.
   e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
   f. Core: Manufacturer's standard.
2. Fire-Rated Core: Manufacturer's standard.
3. Frames:
   a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch.
   b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
   c. Construction: Full profile welded.

2.4 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
3. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

2.5 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

G. Glazing: Comply with requirements in Section 088000 "Glazing."

2.6 FABRICATION

A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.7 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11 .

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
   a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.

b. Install frames with removable stops located on secure side of opening.

2. Fire-Rated Openings: Install frames in accordance with NFPA 80.
3. Floor Anchors: Secure with postinstalled expansion anchors.
   a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
4. Solidly pack mineral-fiber insulation inside frames.
5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.

1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8 .
2. Fire-Rated Doors: Install doors with clearances in accordance with NFPA 80.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 REPAIR

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

C. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.

D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 081416
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Sections:

1. Division 08 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.

    a. Provide samples for each species of veneer and solid lumber required.
    b. Provide samples for each color, texture, and pattern of plastic laminate required.
    c. Finish veneer-faced door samples with same materials proposed for factory-finished doors.

3. Louver blade and frame sections, 6 inches long, for each material and finish specified.
4. Frames for light openings, 6 inches long, for each material, type, and finish required.

D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors and wood paneling from single manufacturer.

B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated" or WDMA I.S.1-A, "Architectural Wood Flush Doors."

1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10C.

1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

D. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:

1. Algoma Hardwoods, Inc.; a Masonite company
2. Eggers Industries. VT Industries Company
3. Graham; an Assa Abloy Group company.
4. Marshfield Door Systems, Inc. a Masonite company.
5. Mohawk Flush Doors, Inc.; a Masonite company.
6. Oshkosh Architectural Door Company.
7. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. WDMA I.S.1-A Performance Grade:

1. Extra Heavy Duty unless otherwise indicated:
2. Heavy Duty: general staff office area doors not located on corridors.

B. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.

a. 5-inch top-rail blocking, in doors indicated to have closers.
b. 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.

C. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:

    a. 5-inch top-rail blocking.
    b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
    c. 5-inch midrail blocking, in doors indicated to have armor plates.
    d. 5-inch midrail blocking, in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 FINISH

A. Interior Solid-Core Doors for general use:

1. Grade: Custom with Grade A faces.
2. Species: Match Existing Select XXXXXXX
3. Exposed Vertical and Top Edges: Same species as faces.
4. Core: Particleboard.
5. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.

2.4 LOUVERS AND LIGHT FRAMES

A. Metal Louvers:

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

    a. Air Louvers Inc.
    b. Anemostat; a Mestek company.
    c. Hiawatha Incorporated.
    d. L & L Louvers, Inc.
    e. LL Building Products, Inc.; a division of GAF Materials Corporation.
    f. Louvers & Dampers, Inc.; a Mestek company.
    g. McGill Architectural Products.

2. Basis of design: Anemostat AFDL
3. Frame: 18 ga. steel
4. Blade Type: 16 ga. Vision-proof, inverted V.
5. Metal Finish: Hot-dip galvanized steel with baked-enamel- or powder-coated finish.

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory.

C. Finish doors at factory that are indicated to receive transparent finish. Field finish doors indicated to receive opaque finish.

D. Finish doors at factory where indicated in schedules or on Drawings as factory finished.

E. Transparent Finish:

1. Grade: Premium.
2. Finish: WDMA TR-6 catalyzed polyurethane.
3. Staining: Match Existing
4. Effect: Semi-filled finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

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

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.

    a. Comply with NFPA 80 for fire-rated doors.

2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
3. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 08 71 00 – DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical door hardware.
2. Field verification, preparation and modification of existing doors and frames to receive new door hardware.

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section “Alternates” for alternates affecting this section.
2. Division 06 Section “Rough Carpentry”
3. Division 06 Section "Finish Carpentry”
4. Division 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:

    a. “Metal Doors and Frames”
    b. “Flush Wood Doors”
    c. “Stile and Rail Wood Doors”

6. Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.

1.02 REFERENCES

A. UL, LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:

    a. Comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.
    b. Review drawings and Sections from related trades to verify compatibility with specified hardware.
    c. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.

    a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

3. Door Hardware Schedule:

    a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
    b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
    c. Indicate complete designations of each item required for each opening, include:
        1) Door Index: door number, heading number, and Architect's hardware set number.
        2) Quantity, type, style, function, size, and finish of each hardware item.
        3) Name and manufacturer of each item.
        4) Fastenings and other pertinent information.
        5) Location of each hardware set cross-referenced to indications on Drawings.
        6) Explanation of all abbreviations, symbols, and codes contained in schedule.
        7) Mounting locations for hardware.
        8) Door and frame sizes and materials.
        9) Degree of door swing and handing.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:

    a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
    b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:

    a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    b. Catalog pages for each product.
    c. Final approved hardware schedule edited to reflect conditions as installed.
    d. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:

    a. fire door assemblies, in compliance with NFPA 80.
    b. required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

    a. For door hardware: DHI certified AHC or DHC.
    b. Can provide installation and technical data to Architect and other related subcontractors.
    c. Can inspect and verify components are in working order upon completion of installation.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:

    a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
    b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:

    a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
    b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Accessibility Requirements:

    a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Pre-installation Conference

a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Inspect and discuss preparatory work performed by other trades.
c. Review required testing, inspecting, and certifying procedures.
d. Review questions or concerns related to proper installation and adjustment of door hardware.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer’s original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware and keying with Owner's security consultant.

D. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer’s published listings.

a. Mechanical Warranty
1) Exit Devices
a) Von Duprin: 10 years
2) Closers
a) LCN 4000 Series: 30 years

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: “No Substitute.”

1. Where “No Substitute” is noted, submittals and substitution requests for other products will not be considered.

B. Approval of alternate manufacturers and/or products other than those listed as “Scheduled Manufacturer” or “Acceptable Manufacturers” in the individual article for the product category are only to be considered by official substitution request in accordance in section 01 25 00.

C. Approval of products from manufacturers indicated in “Acceptable Manufacturers” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.

1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
2. Use materials which match materials of adjacent modified areas.
3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.03 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

2. Acceptable Manufacturers:

a. Select
b. Pemko

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.

4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.04 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

   a. Von Duprin 98/35A series

2. Acceptable Manufacturers and Products:

   a. Sargent 19-43-GL-80 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to “KEYING” article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer’s approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.

16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.
17. Special Options:

    a. Rim Exit Devices: provide devices with damper-controlled re-latching to reduce operational noise. Where lever trim is specified, provide damper controlled lever return.

2.05 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer and Product:

    a. Best

2. Acceptable Manufacturers and Products:

    a. No Substitute

B. Requirements:

1. Provide interchangeable cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision.

2.06 KEYING

A. Scheduled System:

1. Existing factory registered system:

    a. Provide cylinders/cores 0-Bitted for Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28.

B. Requirements:

1. Permanent Keying: Provided by Owner.

2.07 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

    a. LCN 4040XP series

2. Acceptable Manufacturers and Products:

    a. Sargent 281 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
11. Through-bolt all wood door closers.

2.08 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:

    a. Ives

2. Acceptable Manufacturers:

    a. Trimco
    b. Rockwood

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.09 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:

a. Zero International

2. Acceptable Manufacturers:

a. National Guard
b. Reese
c. Pemko

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.10 FINISHES

A. Finish: BHMA 626/652 (US26D); except:

1. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
2. Protection Plates: BHMA 630 (US32D)
3. Door Closers: Powder Coat to Match
4. Weatherstripping: Clear Anodized Aluminum
5. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Where on-site modification of doors and frames is required:

1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
2. Field modify and prepare existing doors and frames for new hardware being installed.
3. When modifications are exposed to view, use concealed fasteners, when possible.
4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:

    a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
    b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
    c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.03 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer’s instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

J. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

L. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

M. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

N. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

O. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

P. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

Q. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.04 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.05 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.06 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

Hardware Group No. 01

For use on Door #(s):
100D 100E 100F 100G

Each to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY	628	IVE
2	EA	DUMMY PUSH BAR	350-DT-990	626	VON
2	EA	SURFACE CLOSER	4040XP HCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	GASKETING	870AA-S	AA	ZER
2	EA	DOOR BOTTOM	369AA-Z49	AA	ZER
1	EA	MEETING STILE	555AA	AA	ZER
1	EA	MEETING STILE	55AA	AA	ZER
2	EA	MOUNTING BRACKET	870SPB		ZER

Hardware Group No. 02

For use on Door #(s):
101B

Each to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY	628	IVE
2	EA	FIRE EXIT HARDWARE	QM-9827-L-BE-F-LBR-03-499F - AUXILIARY FIRE LATCH (AS REQ'D)	626	VON
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	GASKETING	8144S	BK	ZER
1	EA	MEETING STILE	8217S	BK	ZER

Hardware Group No. 03

For use on Door #(s):
100H 101A 200A

Each to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY	628	IVE
1	EA	FIRE EXIT HARDWARE	QM-9827-EO-F-LBR-499F - AUXILIARY FIRE LATCH (AS REQ'D)	626	VON
1	EA	FIRE EXIT HARDWARE	QM-9827-NL-OP-F-LBR-110MD-499F - RHRA	626	VON
1	EA	RIM CYLINDER	1E72 (LESS CORE)	626	BES
1	EA	PERMANENT CORE	CONTRACTOR SUPPLIED - TO BE COMBINATED BY OWNER		BES
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	GASKETING	8144S	BK	ZER
1	EA	MEETING STILE	8217S	BK	ZER

Hardware Group No. 04

For use on Door #(s):
100B

Each to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PANIC HARDWARE	QM-9827-EO-LBR	626	VON
1	EA	PANIC HARDWARE	QM-9827-NL-LBR - RHRA	626	VON
1	EA	RIM CYLINDER	1E72 (LESS CORE)	626	BES
1	EA	PERMANENT CORE	CONTRACTOR SUPPLIED - TO BE COMBINATED BY OWNER		BES
2	EA	SURFACE CLOSER	4040XP HCUSH - CLOSER ACCESSORIES (AS REQ'D) BALANCE OF HARDWARE TO REMAIN	689	LCN

NOTES:
1) FIELD VERIFY EXISTING CONDITIONS. VERIFY/COORDINATE PREPS ON EXISTING DOORS AND FRAMES TO ENSURE THE COMPATIBILITY OF NEW HARDWARE PRIOR TO ORDER OF NEW MATERIALS. PROVIDE FIELD MODIFICATIONS AND/OR NECESSARY FILLERS (PAINT TO MATCH WHERE EXISTING IS PREVIOUSLY PAINTED), REINFORCEMENTS AND FASTENERS, COMPATIBLE WITH EXISTING MATERIALS REQUIRED FOR MOUNTING NEW SPECIFIED HARDWARE AND TO COVER EXISTING DOOR AND FRAME PREPARATIONS.

Hardware Group No. 05

For use on Door #(s):
100A 100C

Each to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PANIC HARDWARE	QM-9827-DT-LBR - RHRA	626	VON
1	EA	PANIC HARDWARE	QM-9827-EO-LBR	626	VON
2	EA	SURFACE CLOSER	4040XP HCUSH - CLOSER ACCESSORIES (AS REQ'D) BALANCE OF HARDWARE TO REMAIN	689	LCN

NOTES:
1) FIELD VERIFY EXISTING CONDITIONS. VERIFY/COORDINATE PREPS ON EXISTING DOORS AND FRAMES TO ENSURE THE COMPATIBILITY OF NEW HARDWARE PRIOR TO ORDER OF NEW MATERIALS. PROVIDE FIELD MODIFICATIONS AND/OR NECESSARY FILLERS (PAINT TO MATCH WHERE EXISTING IS PREVIOUSLY PAINTED), REINFORCEMENTS AND FASTENERS, COMPATIBLE WITH EXISTING MATERIALS REQUIRED FOR MOUNTING NEW SPECIFIED HARDWARE AND TO COVER EXISTING DOOR AND FRAME PREPARATIONS.

END OF SECTION 087100

SECTION 089119
FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fixed extruded-aluminum louvers.

B. Related Requirements:

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

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.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on tests performed according to AMCA 500-L.

B. Sample warranties.

1.4 QUALITY ASSURANCE

1.5 WARRANTY

A. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

A. Basis of Design – Greenheck ESD-403 Fixed Louver

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Louvers 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 are considered to act normal to the face of the building.

1. Wind Loads:

a. Determine loads based on pressures as indicated on Drawings.

B. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

2.3 FIXED EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Drainable-Blade Louver, Extruded Aluminum **L-1**:
1. Louver Depth: **4 inches (100 mm)**.
2. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm).
3. Mullion Type: Exposed.
4. Louver Performance Ratings:

a. Free Area: Not less than 8.0 sq. ft. (0.74 sq. m) for 48-inch- (1220-mm-) wide by 48-inch- (1220-mm-) high louver.

In "Point of Beginning Water Penetration" Subparagraph below, usually retain 900 to 1050 fpm (4.6 to 5.3 m/s) for 4-inch (100-mm) louvers and 950 to 1100 fpm (4.8 to 5.6 m/s) for 6-inch (150-mm) louvers.

b. Point of Beginning Water Penetration: Not less than 1000 fpm (5.1 m/s).
c. Air Performance:

5. 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: Insect screening.

B. Louver Screen Frames: Same type and form of metal as indicated for louver to which screens are attached.

C. Louver Screening for Aluminum Louvers:
1. Insect Screening, Stainless Steel: 18-by-18 (1.4-by-1.4-mm) mesh, 0.009-inch (0.23-mm) wire.

2.5 MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B209 (ASTM B209M), 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.

First option in first subparagraph below specifies flush heads; second option specifies raised heads.

1. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use 300 series stainless steel fasteners.

D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, fabricated from stainless steel components, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing according to ASTM E488/E488M conducted by a qualified testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

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.

B. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, [**AA-M12C22A41, Class I, 0.018 mm**] [**AA-M12C22A31, Class II, 0.010 mm**] or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate and place louvers 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. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

D. Protect unpainted galvanized- and nonferrous-metal surfaces that are 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.

3.2 ADJUSTING

A. Restore louvers 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.

END OF SECTION 089119

SECTION 092216
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes non-load-bearing steel framing members for the following applications:

1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to **5** times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

a. Type: Postinstalled, chemical anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Acoustical Spring isolation Hangers: See drawings for type and locations.

D. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

E. Wind Uplift Braces: Provide rigid uplift braces or hangers as required.

F. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

G. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of minimum 0.053 inch and minimum 1/2-inch- wide flanges.

1. Depth: 2-1/2 inches or as required for spans and wind uplift.

H. Furring Channels (Furring Members) for Exterior Soffits:

1. Cold-Rolled Channels: Minimum 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges, 1/2 inch deep. Hat shaped.
2. Steel Studs and Runners: ASTM C 645.

a. Minimum Base-Metal Thickness: Minimum 20 gauge.
b. Depth: As indicated on Drawings and as required for spans.

I. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. USG Corporation; Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0312 inch.
2. Depth: As indicated on Drawings.

B. Slip-Type Head Joints: Where indicated, providethe following:

1. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

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

a. Fire Trak Corp.; Fire Trak System.
b. Grace Construction Products; FlameSafe FlowTrak System.
c. Metal-Lite, Inc.; The System.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.0312 inch.

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0312 inch.
2. Depth: As indicated on Drawings.

F. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:

1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

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

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to steel roof deck.
5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

1. Space studs as follows:

    a. Single-Layer Application: 16 inches o.c., unless otherwise indicated.
    b. Multilayer Application: 16 inches o.c., unless otherwise indicated.
    c. Tile backing panels: 16 inches o.c., unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb, unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

D. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 092216

SECTION 092900
GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.

B. Related Sections include the following:

1. Division 06 Section "Rough Carpentry" for wood framing and furring that supports gypsum board.
2. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board.
3. Division 09 painting Sections for primers applied to gypsum board surfaces.

1.3 SUBMITTALS

A. Material Compliance Certificate: Submit completed Material Compliance Certificate as described in Specification Section 013300 – Architect's Submittal Procedures.

1.4 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

1.5 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

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

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

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

a. American Gypsum; Firebloc Type C.
b. CertainTeed Corp.; ProRoc Type C.
c. Georgia-Pacific Gypsum LLC; Fireguard C.
d. Lafarge North America Inc.; Firecheck Type C.
e. National Gypsum Company; Gold Bond Fire-Shield C.
f. USG Corporation; Firecode C Core.

B. Regular Type:

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

C. Type X:

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

D. Abuse-Resistant Type: Manufactured to produce greater resistance to surface indentation, through-penetration (impact resistance), and abrasion than standard, regular-type and Type X gypsum board.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.

E. High-Impact Type: Manufactured with Type X moisture resistant core fiberglass reinforced for greater resistance to through-penetration (impact resistance).

1. Core: 5/8 inch thick.

F. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.

2.3 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board:

1. Complying with ASTM C 1178/C 1178M.

a. Product: Subject to compliance with requirements, provide "DensShield Tile Guard" by G-P Gypsum.

2. Complying with ASTM C1177/C 1177M.

a. Product: Subject to compliance with requirements, provide "DensArmor Plus Interior Guard" by G-P Gypsum.

3. Core: 5/8 inch, Type X.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Paper-faced galvanized steel sheet.
2. Shapes:

a. Cornerbead.
b. U-Bead: J-shaped; exposed short flange does not receive joint compound.
c. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

E. Joint Compound for Exterior Applications:

1. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

D. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.

J. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Regular Type: As indicated on Drawings.
2. Type X: Where required for fire-resistance-rated assembly.

3. Abuse-Resistant Type: All wall surfaces from floor to 8’-0” above finished floor and all ceilings below 9’-0” above finished floor unless noted as high-impact location. See partition types for additional locations.
4. High-Impact Type: Storage rooms, non-tile toilet room walls and all corridor walls from floor to 8’-0” above finished floor, Locker room ceilings, and as indicated on Drawings.
5. Moisture- and Mold-Resistant Type: Ceilings in Toilet rooms, shower areas, janitor closets, kitchen areas, and as indicated on Drawings. Walls in janitor closets, kitchen areas, and as indicated on drawings.
6. Combination wall boards: Provide combination of Type-X, moisture resistant, abuse resistant and impact resistant where more than one requirement is listed for a use.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 APPLYING TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings and according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. U-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile and Panels that are substrate for acoustical tile and Where indicated on Drawings.
3. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.

    a. Primer and its application to surfaces are specified in other Division 09 Sections.

E. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

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

END OF SECTION 092900

SECTION 096400
WOOD FLOORING RE-FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Field-re-finished wood flooring.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 FIELD-RE-FINISHED WOOD FLOORING

A. Solid-Wood Flooring, Field-Re-finished: Kiln dried to 6 to 9 percent maximum moisture content; tongue and groove and end matched; with backs channeled.
1. Grade and Species: Maple

B. Urethane Finish System: Complete solvent-based, oil-modified system of compatible components that is recommended by finish manufacturer for application indicated.
1. Stain: Penetrating and nonfading type.

a. Color: Black.

2. Floor Sealer: Pliable, penetrating type.
3. Finish Coats: Formulated for multicoat application on wood flooring.

C. Wood Filler: Compatible with finish system components and recommended by filler and finish manufacturers for use indicated. If required to match approved Samples, provide pigmented filler.

2.2 ACCESSORY MATERIALS

A. Fasteners: As recommended by manufacturer, but not less than that recommended in NWFA's "Installation Guidelines."

PART 3 - EXECUTION

3.1 FIELD RE-FINISHING

A. Machine-sand flooring to remove offsets, ridges, cups, and sanding-machine marks that are noticeable after finishing. Vacuum and tack with a clean cloth immediately before applying finish.

1. Comply with applicable recommendations in NWFA's "Installation Guidelines."
2. The specifications for sanding and refinishing a wood floor involve a structured approach to ensure the best results. Here are the key points to be followed:
3. Grit Sequence: Start with 60 grit for heavy removal of old finish and deep scratches, followed by 100 grit for intermediate smoothing and scratch refinement, and finish with 220 grit for final smoothness before staining or sealing.
4. Safety Precautions: Always wear proper safety equipment, cover light fixtures and all equipment on the Stage, and ensure the work area is clean and safe.
5. Testing Finish: Use a teaspoon of water to test if the finish is still intact. If it soaks in within ten seconds and shows deep crossgrain scratches, the finish is gone and full refinishing may proceed.

B. Fill and repair wood flooring defects to insure a smooth and safe surface.

C. Apply floor-finish materials in number of coats recommended by finish manufacturer for application indicated, but not less than one coat of floor sealer and three finish coats.

1. Apply stains to achieve an even color distribution matching approved Samples.
2. For water-based finishes, use finishing methods recommended by finish manufacturer to minimize grain raise.

D. Cover wood flooring before finishing.

E. Do not cover wood flooring after finishing until finish reaches full cure, and not before seven days after applying last finish coat.

3.2 PROTECTION

A. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.

1. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096400

SECTION 096513
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rubber base.
2. Vinyl molding accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Coordinate mockups in this Section with mockups specified in other Sections.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 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 F or more than 95 deg F , in spaces to receive resilient products 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. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RUBBER BASE (RB-1)

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

1. Johnsonite; a Tarkett company.

B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).

1. Style and Location:
   a. MW 20 K AMBASSADOR

C. Thickness: 0.125 inch.

D. Height: 4 inches

E. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.

F. Outside Corners: Job formed .

G. Inside Corners: Job formed .

H. Colors: #20 Charcoal

2.2 RUBBER BASE (RB-2)

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

1. Johnsonite; a Tarkett company.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset)

1. Style and Location: Johnsonite Baseworks
   a. Style B, Cove: Install at back of house areas. Refer to sheet A8.1 for location.

C. Thickness: 0.125 inch.

D. Height: 6”

E. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Colors: 40 Black

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 resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. 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 materials are the same temperature as space where they are to be installed.

1. At least 72 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
   a. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
   a. Miter or cope corners to minimize open joints.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096723
RESINOUS 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. This Section includes one resinous flooring system, one with epoxy body with broadcast aggregates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Samples for Verification: For each resinous flooring system required, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project.

C. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

D. Maintenance Data: For resinous flooring to be included in maintenance manuals.

1.4 QUALITY ASSURANCE

A. No request for substitution shall be considered that would change the generic type of floor system specified (i.e. Epoxy double broadcast quartz-based system. Equivalent materials of other manufactures may be substituted only on approval of Architect or Engineer. Request for substitution will only be considered if submitted 10 days prior to bid date. The request will be subject to specification requirements described in this section.

B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.
   1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

2. The contractor shall have completed at least 10 projects of similar size and complexity.

C. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Provide secondary materials, including patching and filling material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

D. Manufacturer Field Technical Service Representatives: Resinous flooring manufacturer shall retain the services of Field Technical Service Representatives who are trained specifically in installing the system to be used on the project.

1. Field Technical Services Representatives shall be employed by the system manufacture to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.

E. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 48-inch- (1200-mm-) square floor area selected by Architect.

F. Pre-installation Conference:

1. The general contractor shall arrange a meeting not less than thirty days prior to starting work.

2. Attendance:

a. General Contractor

b. Architect/Owner's Representative.

c. Manufacturer/Installer's Representative.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with unbroken seals, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements are allowed.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

1. Maintain material and substrate temperature between 65 and 85 deg F (18 and 30 deg C) during resinous flooring application and for not less than 24 hours after application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

D. Concrete substrates shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring

1.7 WARRANTY

A. The manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of (1) full years from the date of installation or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (1) full year from date of installation. A sample warranty letter must be included with a bid package or the bid may be disqualified.

PART 2 - PRODUCTS

2.1 RESINOUS FLOORING

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, (Basis of Design Stonshield SLT). systems must comply with double broadcasting of quartz.

B. Products: Subject to compliance with requirements:

1. Stonhard, Inc.; Stonshield SLT.
Contact: Adam Deaton, 419-806-5119, adeaton@stonhard.com

C. System Characteristics:

1. Color and Pattern: Stonhard standards – ASH.
2. Wearing Surface: Medium.
3. Overall System Thickness: 2mm

D. System Components: Manufacturer's standard components that are compatible with each other and as follows:

1. Primer:

    a. Material Basis; Stonhard Standard Primer
    b. Resin: Epoxy.
    c. Formulation Description: 2 component 100 percent solids.
    d. Application Method: Squeegee back roll.
    e. Number of Coats: One.

2. Broadcast Media:

    a. Material Basis: Stonshield quartz aggregate.
    b. Type: Pigmented.
    c. Finish: Medium.
    d. Number of Coats: One.
    e. Pattern: Tweed.

3. Undercoat:

    a. Material Basis: Stonkote CE4.
    b. Resin: Epoxy
    c. Formulation Description: 2 component 100% solids, UV Stable.
    d. Type: Clear.
    e. Finish: Gloss.
    f. Number of Coats: One.

4. Broadcast Media:

    a. Material Basis: Stonshield quartz aggregate
    b. Type: Pigmented.
    c. Finish: Medium.
    d. Number of Coats: One.
    e. Pattern: Tweed.

5. Sealer:

    a. Material Basis: Stonkote CE4.
    b. Resin: Epoxy
    c. Formulation Description: 2 component, UV stable, 100% solids.
    d. Type: Clear.
    e. Finish: Gloss.
    f. Number of Coats: one.
    g. Texture level: Medium.

E. System Physical Properties: Provide a resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 9,000 psi after 7 days per ASTM C 579.
2. Tensile Strength: 1,600 psi per ASTM C 307.
3. Flexural Modulus of Elasticity: 4,000 psi per ASTM C 580.
4. Water Absorption: 0.1% per ASTM C 413.
5. Coefficient of Thermal Expansion: 1.8 x 10^{-5} mm/ ºC mm per ASTM C 531.
6. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch (1.6-mm) permanent indentation per MIL-D-3134.
7. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch (1.6 mm) per MIL-D-3134.
8. Abrasion Resistance: 0.08 gm maximum weight loss per ASTM D 4060.
9. Flammability: Self-extinguishing per ASTM D 635.
10. Hardness: 85 to 90, Shore D per ASTM D 2240.
11. Bond Strength: 400 psi, 100 percent concrete failure per ACI 503R.

2.2 ACCESSORY MATERIALS

A. Floor Flatness: Where needed, use a troweled epoxy mortar to correct slab/ substrate flatness. Recommended product: Stonclad GS.

B. Primer: Type recommended by manufacturer for substrate and body coats indicated. Formulation Description: Stonhard Standard Primer, 100% solids.

C. Waterproofing Membrane: Where directed, type recommended by manufacturer for substrate and primer and body coats indicated. Formulation Description Only if application above grade, Stonproof ME7.

D. Moisture Mitigation: Type recommended and produced by resinous flooring manufacturer. Install in areas where moisture vapor emission exceeds allowable rates for specified flooring. Install Stonfil OP2, a 3-component, polymer modified grout, or Primer 150, a two-component, high-solids, moisture mitigating epoxy primer.

E. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated. Formulation description: Stonset PM5 or Stonset TG5.

F. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated. Allowances should be included for Stonflex MP7 joint fill material.

PART 3 - EXECUTION

3.1 PREPARATION

Revise paragraph below to suit resinous flooring system selected. Some systems are moisture tolerant; consult manufacturers for guidance.

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Mechanically prepare substrates as follows:

a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
b. Comply with ASTM C 811 requirements, unless the manufacturer’s written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
3.
4. Verify that concrete substrates are dry.

a. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 75 percent.
b. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 7 lb of water/1000 sq. ft. of slab in 24 hours.
c. Perform additional moisture tests recommended by the manufacturer. Proceed with application only after substrates pass testing.

5. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

D. Use patching and filling material to fill holes and depressions in substrates according to manufacturer's written instructions.

E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Allowances should be included for Stonflex MP7 joint fill material.

3.2 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.

2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.

    a. Apply joint sealant to comply with manufacturer's written recommendations.

B. Apply primer where required by resinous system, over prepared substrate at manufacturer's recommended spreading rate.

C. Broadcast: Immediately broadcast quartz silica aggregate into the primer using manufacturer's specially designed spraycaster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.

D. Undercoat: Remove any irregularities by lightly abrading and vacuuming the floor surface. Mix and apply undercoat with strict adherence to manufacturer's installation procedures and coverage rates.

E. Broadcast: Immediately broadcast quartz silica aggregate into the undercoat using manufacturer's specially designed spraycaster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.

F. Apply topcoat(s) in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.3 TERMINATIONS

A. Chase edges to “lock” the coating system into the concrete substrate along lines of termination.

B. Penetration Treatment: Lap and seal coating onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.

C. Trenches: Continue coating system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.

D. Treat floor drains by chasing the coating to lock in place at point of termination.

3.4 JOINTS AND CRACKS

A. Treat control joints to bridge potential cracks and to maintain monolithic protection.

B. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

C. Discontinue floor coating system at vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by the manufacturer for traffic conditions and chemical exposures to be encountered.

3.5 FIELD QUALITY CONTROL

A. Material Sampling: Owner may at any time and any numbers of times during resinous flooring application require material samples for testing for compliance with requirements.

1. The owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in the presence of Contractor.
2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.6 CLEANING, PROTECTING, AND CURING

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 18 hours.

B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.

C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer

END OF SECTION 096723

SECTION 096813
TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Modular carpet tile.

B. Related Requirements:

1. Section 096513 "Resilient Base and Accessories"

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
   a. Review delivery, storage, and handling procedures.
   b. Review ambient conditions and ventilation procedures.
   c. Review subfloor preparation procedures.
   d. Dry layout for approval of coursing of carpet modules

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- long Samples.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

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.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups at locations and in sizes shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. 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: 10 years from date of Substantial Completion.
    a. EDIT PER MANUFACTURER OR CLIENT REQUIREMENTS

PART 2 - PRODUCTS

2.1 CARPET TILE CPT-1

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

1. J&J Invision; J&J Industries, Inc.

B. Color: 3319 Scarlet

C. Pattern: 7199 Chromatics

D. Fiber Content: 100 percent nylon 6, 6

E. Fiber Type: Encore BCF (with recycled content)

F. Stitches: 12.3 stiches/ in

G. Gage: 1/12 (4.72 rows/cm)

H. Total Weight: 30 oz/sy

I. Primary Backing/Back coating: Manufacturer's standard material

J. Secondary Backing: Manufacturer's standard material

K. Backing System: Nexus

L. Size: 24”x24”

M. Installation: Ashlar

N. Applied Treatments:

1. Soil-Resistance Treatment: Manufacturer's standard treatment
2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
    a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

O. Performance Characteristics:

1. Appearance Retention Rating: 3.5 minimum according to ASTM D7330.
2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
3. Dry Breaking Strength: Not less than 100 lbf according to ASTM D2646.
4. Tuft Bind: Not less than 10 lbf according to ASTM D1335.
5. Delamination: Not less than 3.5 lbf/in. according to ASTM D3936.
6. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
8. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
9. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
10. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, 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.

1. 1. Installer shall utilize 5#/ rated adhesive minimum up to 10# rating per field conditions and moisture testing to maintain project schedule.

C. Metal Transitions and edge strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; half-hard brass exposed-edge material.

1) MT-1: SchluterVinpro-U (Black.) at Carpet To Epoxy

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 1000 sq. ft. , and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
   a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
   b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
   c. Perform additional moisture tests recommended in writing by adhesive and carpet 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 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.

1. 1. Contractor shall review substrate for adherence to manufacturer's requirements. Inform construction manager of non-conformance. Do not install until rectified.

B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive .

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns .

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.

I. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

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 09 84 13
FIXED SOUND-ABSORPTIVE PANELS

PART 1 - GENERAL

1.02 RELATED WORK

A. This section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.03 REFERENCES

A. ASTM C423 – Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

B. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials

1.04 SYSTEM DESCRIPTION

A. Fabric-wrapped sound absorbing fiberglass panels constructed for direct mounting to walls or ceilings

B. Fabric-wrapped sound absorbing impact-resistant fiberglass panels constructed for direct mounting to walls or ceilings

C. Fabric-wrapped plywood “dummy” panels constructed for direct mounting to walls.

1.05 SYSTEM PERFORMANCE

A. The materials shall have the following minimum Noise Reduction Coefficient (NRC) performance when tested as a complete finished manufactured system in the A-mounting configuration per ASTM E795:

1. Fabric-wrapped sound absorbing fiberglass panels
    a. 1 inch thick - NRC 0.75

2. Fabric-wrapped sound absorbing impact-resistant fiberglass panels
    a. 1-1/8 inches thick – NRC 0.80
    b. 2-1/8 inches thick – NRC 0.90
    c. 4-1/8 inches thick – NRC 1.00

B. As tested by an independent laboratory in accordance with ASTM E84, the fire hazard classification shall be the following for all materials covered in this section:

1. A flame spread rating between 0 and 25

2. A smoke developed rating between 0 and 450

1.06 SUBMITTALS

A. Submit detailed shop drawings showing edge profile, elevations for all installations with arrangement of joints and notations as to where dye lot changes occur

B. Provide a minimum 88 square inch sample and fastener system sample including edge profile, panel components, fastener type, finishes and panel layout

C. Provide installation instructions

D. Provide independent laboratory test reports performed in accordance with ASTM C423 containing octave band sound absorption coefficients and NRC rating

E. Provide manufacturer's letters of conformance certifying the sound absorption coefficients, NRC rating and fire hazard classification for items to be installed

F. Provide copies of the manufacturer's standard warranty against defective workmanship, operation and materials for a period of at least one year from date of final acceptance

1.07 QUALITY ASSURANCE

A. The supplied products are to be of a manufacturer who regularly engages in the production of such units and who issues complete catalog data on such products

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site in the manufacturer's original unopened packaging with identification labels

B. Store materials at temperature and humidity conditions as recommended by the manufacturer

C. Protect materials from damage

PART 2 - PRODUCTS

2.01 MATERIALS (AWP-1 THROUGH AWP-11 & AWP-14)

A. Construct panels with sufficient strength to withstand normal handling, transportation, installation, and operational stresses.

B. Size panels per the drawings and with a minimum number of panels and field modification.

C. Fabric-wrapped sound absorbing impact-resistant fiberglass wall panels, manufactured units

1. Thickness: as indicated on drawings

2. Edge detail: pencil

3. Finish material

a. Refer to finish schedule for fabric and color

b. Fabric must be sufficiently acoustically transparent and adhered to the substrate in a manner to achieve the minimum NRC requirement of Paragraph 1.4 when tested as an assembled panel

4. Sound absorbing core

a. Core shall be inert, mildew resistant, vermin-proof glass fiber with a minimum density of 6 pounds per cubic foot to suit the sound absorption performance required

b. A compressed glass fiber face sheet of 10 to 20 pounds per cubic foot and nominally 1/8 inch thick shall be adhered to the core fiberglass. Face sheet shall be mildew resistant, vermin-proof glass fiber.

c. Core and face sheet shall be encapsulated in polyethylene bagging when installed in environments where the relative humidity will be above 50%

5. Hardware

a. Mechanical clips

b. "J" molding for cut edges or fabric wrap per manufacturer's instructions

6. Acceptable products

a. High Impact HardSide Acoustical Wall Panels by Kinetics Noise Control

b. Fabric IR by Conwed

c. Model H.I.R. #1 by Decoustics

d. Acousti-Tack (ATF) by G&S Acoustics

e. Other approved equal

2.2 Fabric Wrapped Plywood Wall Unit (**DUMMY PANEL: AWP-12A/13A & AWP-12B/13B**)

B. Sound-Absorbing Wall Panel: Manufacturer's standard panel construction consisting of wood fibers.

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

i. Custom
ii. Panel Shape: Flat.
iii. Mounting: Back mounted with standard impaling clips metal clips or bar hangers, secured to substrate.
iv. Composition: ½" plywood wrapped with fabric to other panels
v. Finish: Surface appearance shall be consistent from panel to panel.
vi. Color: See acoustical wall panel schedule on Equipment plans
vii. Corner Detail in Elevation: Square
viii. Mounting between Panels: 6"
ix. Acoustical Performance: NA
x. Panel Width: As indicated on Drawings.
xi. Panel Height: As indicated on Drawings.

PART 3 - EXECUTION

3.01 PREPARATION

A. Examine construction conditions to receive specified work and proceed only when conditions are satisfactory for installation per the manufacturer’s instructions.

B. Space must be enclosed and protected from the weather.

C. All wet work must be completed and nominally dry before installation.

D. Building must be closed to the weather and a temperature range of 60 to 85 degrees Fahrenheit and not more than 50% humidity achieved.

3.02 INSTALLATION

A. Install all components in strict accordance with manufacturer’s instructions, product technical bulletins, and approved shop drawings.

B. Do not install materials with damage, imperfections, poor color match or other deficiencies. Replace with acceptable material as directed by owner.

C. Protect surfaces from soiling and damage. Clean lightly soiled exposed surfaces in compliance with manufacturer's instructions. Repair minor finish damage as recommended by manufacturer. Remove and replace work which cannot be successfully cleaned or repaired to permanently eliminate evidence of damage.

D. Coordinate with obstructions such as fixtures, HVAC equipment, and fire suppression system.

E. Locate and space panels per the drawings.

END OF SECTION 09 84 13

SECTION 099124
INTERIOR PAINTING (MPI STANDARDS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete masonry units (CMUs).
2. Galvanized metal.
3. Wood.
4. Gypsum board.
5. Plaster.
6. Cotton or canvas insulation covering.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming structural steel.
2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
3. Section 099300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.
4. Section 099600 "High-Performance Coatings" for tile-like coatings.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
   a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
   b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
   a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, provide one of the products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: See schedule at the end of part 3.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Wood: 15 percent.
2. Gypsum Board: 12 percent.
3. Plaster: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Plaster Substrates: Verify that plaster is fully cured.

E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

F. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

G. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 7/NACE No. 4.
2. SSPC-SP 11.

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

G. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 INSTALLATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in occupied spaces:
   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.
   g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   h. Other items as directed by Architect.
2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

A. CMU Substrates:

1. High-Performance Architectural Latex System, MPI INT 4.2D:
   a. Block Filler: Latex, interior/exterior, MPI #4.
   b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
   c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 2) , MPI #138.

B. Galvanized-Metal Substrates:

   a. Alkyd Dry-Fall System (Cementitious Primer): INT 5.3P (PER MPI 2020)

   b. Prime Coat: Primer, galvanized, cementitious: MPI #134 (PER MPI 2020)
   c. Topcoat: Dry fall, alkyd, flat , MPI #55.

C. Wood Substrates:

1. Latex Porch and Floor Enamel System:
   a. Prime Coat: Primer sealer, alkyd, interior.
      1) Equal to Sherwin Williams Kem Lustrial.
   b. Intermediate Coat: Floor paint, latex, matching topcoat.
   c. Topcoat: Floor paint, latex, low gloss
      1) Equal to Sherwin Willams Kem Lustrial.

D. Gypsum Board Substrates:

1. High-Performance Architectural Latex System, MPI INT 9.2B:
   a. Prime Coat: Primer sealer, latex, interior, MPI #50.
   b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
   c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 2), MPI #138.

E. Cotton or Canvas and ASJ Insulation-Covering Substrates: Including pipe and duct coverings .

1. Alkyd System , MPI INT 10.1B:
   a. Prime Coat: Primer sealer, latex, interior.
      1) MPI #107 (PER MPI 2020)
   b. Intermediate Coat: Alkyd, interior, matching topcoat.
   c. Topcoat: Alkyd, interior, flat (MPI Gloss Level 1) , MPI #49.

3.6 INTERIOR PAINTING SCHEDULE RELATED TO LOCATION

a. Gypsum Ceiling & Bulkheads; High Performance Architectural Latex (Satin) Gloss Level 3.
b. Exposed Metal Ceilings; Waterborne Dry Fall (Flat) Gloss Level 2.
c. Walls (Typical); See Specification 099600 High Performance Coatings
d. Walls (Stage Areas noted on Color Plans & Above Masking Line at Auditorium House) High Performance Architectural Latex (Flat) Gloss Level 2
e. Steel Door and Borrowed Light Frames; See Specification 099600 High Performance Coatings.

3.7 COLOR SCHEDULE

	TAG	MANUFACTURER	COLOR	COMMENT
A.	P-1	SHERWIN WILLAMS	7069 IRON ORE	WALLS
B.	P-2	SHERWIN WILLIAMS	7592 SUNDRIED TOMATO	COLUMNS, ACCENT WALLS
C.	P-3	SHERWIN WILLIAMS	7004 SNOWBOUND	STAIRWELLS
D.	P-4	SHERWIN WILLIAMS	7069 IRON ORE	CEILINGS
	P-5	SHERWIN WILLIAMS	6258 TRICORN BLACK	STAGE, DOORS & FRAMES

END OF SECTION 099124

SECTION 099300
STAINING AND TRANSPARENT FINISHING

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. Existing Stage flooring to be sanded and refinished per specification. All existing wood floor finish to be removed to provide a bare wood for re-finishing.

B. Section includes surface preparation and application of wood stains and transparent finishes on the following substrates:

1. Interior Substrates:
   a. Dressed lumber (finish carpentry or woodwork).

1.3 DEFINITIONS

A. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Verification: For each type of finish system and in each color and gloss of finish required.

1. Submit Samples on representative samples of actual wood substrates, 8 inches square or 8 inches long.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.

4. Label each Sample for location and application area.

C. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials , from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Stains and Transparent Finishes: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each finish system indicated and each color selected to verify preliminary selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.
   a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
   b. Other Items: Architect will designate items or areas required.
2. Final approval of stain color selections will be based on mockups.
   a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures less than 5 deg F above the dew point, or to damp or wet surfaces.

C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Behr Process Corporation.
2. Benjamin Moore & Co.
3. Coronado Paint; Benjamin Moore Company.
4. PPG Paints.
5. Pratt & Lambert.
6. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, provide one of the products listed in wood finish systems schedules for the product category indicated.

2.2 MATERIALS, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. Wood stage floor:

1. Manufacturer: Sherwin Williams
2. Stain: Minwax Wood Finish (Oil-Based)
3. Stain Colors: Black
4. Apply a top coat of clear sealant to preserve the stain and wood.
5. Note: Apply as many coats as possible to achieve the darkest floor.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Interior Wood Substrates: 10 percent, when measured with an electronic moisture meter.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with finish application only after unsatisfactory conditions have been corrected.

1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Sanding and refinishing: Machine sand with coarse, medium and fine grades of sandpaper to achieve a level, smooth uniform surface without ridges or cups. Remove sanding dust by tack or vacuum.

B. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

C. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.

1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

D. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.

1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.

E. Interior Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
3. Sand surfaces exposed to view and dust off.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dry.

3.3 APPLICATION

A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for finish and substrate indicated.
2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.

3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 INTERIOR WOOD -FINISH-SYSTEM SCHEDULE

A. Wood Substrates:

1. Alkyd Varnish over Stain System MPI INT 6.3D:
   a. Stain Coat: Stain, semitransparent, for interior wood, MPI #90.
   b. First Intermediate Coat: Alkyd, sanding sealer, clear, MPI #102.
   c. Second Intermediate Coat: Varnish matching topcoat.
   d. Topcoat: Varnish, interior, gloss (MPI Gloss Level 6), MPI #75.
2. Moisture-Cured Clear Polyurethane System MPI INT 6.3X:
   a. Prime Coat: Moisture-cured polyurethane matching topcoat.
   b. Intermediate Coat: Moisture-cured polyurethane matching topcoat.
   c. Topcoat: Varnish, polyurethane, moisture cured, gloss (MPI Gloss Level 6) MPI #31.

   Stain Color To match laminate: Formica Bleached Legno – 8845/58

END OF SECTION 099300

SECTION 099600
HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of high-performance coating systems on the following substrates:

1. Interior Substrates:
   a. Concrete masonry units (CMUs).
   b. Steel.
   c. Gypsum board.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming of structural steel with primers specified in this Section.
2. Section 055213 "Pipe and Tube Railings" for shop priming pipe and tube railings with coatings specified in this Section.
3. Section 099124 "Interior Painting" for general field painting.
4. Division 3 for concrete sealer.

1.3 DEFINITIONS

A. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

B. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

C. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

D. MPI Gloss Level 3: 10-25 at 60 degrees, according to ASTM D523

E. MPI Gloss Level 4:20-35 at 60 degrees, according to ASTM D523

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Visibly indicating color tint change per coat
4. Label each coat of each Sample.
5. Label each Sample for location and application area.

C. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials , from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Coatings: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each coating system.
    a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft..
    b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
    a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior High-Performance Coating Schedule or Interior High-Performance Coating Schedule for the coating category indicated.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
3. Products shall be of same manufacturer for each coat in a coating system.

C. Colors: As indicated in color schedule at the end of Specification Section 099124.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Fiber-Cement Board: 12 percent.
2. Masonry (Clay and CMUs): 12 percent.
3. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Plaster Substrates: Verify that plaster is fully cured.

E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

F. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.

1. Clean surfaces with pressurized water. Use pressure range of 100 to 600 psi at 6 to 12 inches.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer [.] but not less than the following:

1. SSPC-SP 6/NACE No. 3.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Contractor shall touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. CMU Substrates:

1. Epoxy-Modified Latex System MPI INT 4.2K :
    a. Block Filler: Block filler, latex, interior/exterior , MPI #4.
    b. Intermediate Coat: Epoxy-modified latex, interior, matching topcoat.
    c. Topcoat: Waterbased Light Industrial Coating (MPI Gloss Level 3), MPI #151

B. Steel Substrates:

1. Water Based Light Industrial Coating MPI INT 5.1N:
    a. Prime Coat: Primer, Epoxy, Anti-corrosive, for metal MPI #101.
    b. Intermediate Coat: Epoxy-modified latex, interior, matching topcoat.
    c. Topcoat: Waterbased Light Industrial Coating (MPI Gloss Level 3), MPI #151
        1) Finish on Stage & Masking areas
    d. Topcoat: Waterbased Light Industrial Coating (MPI Gloss Level 5), MPI #153 (**TYPICAL**)

C. Gypsum Board Substrates:

1. Water Based Light Industrial Coating MPI INT 9.2L:
    a. Prime Coat: Primer sealer, latex, interior, MPI #50.
    b. Intermediate Coat: Epoxy-modified latex, matching topcoat.
    c. Topcoat: Waterbased Light Industrial Coating (MPI Gloss Level 3), MPI #151

D. Refer to paint location & color schedules at the end of specification section 099124.

END OF SECTION 099600

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): As indicated on drawings.

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 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. Provide back plate for signs to be mounted on glass

2.4 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 .

2.5 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. Provide new room signage as indicated on drawings.

END OF SECTION 101423.16

SECTION 116133
THEATRICAL RIGGING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. The work in this section includes Theatrical Rigging (TR) systems and equipment within the following spaces and associated support areas:

1. Sexton Auditorium

B. Section Includes

1. Major Systems and Equipment: furnish and install the following major elements and associated accessories:

a. Counterweight Rigging System
b. Motorized Stage Electric Linesets with cable management
c. Motorized Front of House Electric Linesets with cable management
d. Rigging Control System
e. Proscenium Safety Curtain
f. Stage Traveler Track assemblies
g. Stage Draperies
h. Relocation of existing center loudspeaker cluster
i. Miscellaneous rigging equipment and accessories

2. Work Results:

a. Provide all hardware and software required for a complete and working theatrical rigging system as described herein.
b. Provide fully coordinated and engineered equipment, installation, supervision and commissioning for systems and associated accessories as required for each space.
c. Provide supervision of Theatrical Rigging Systems low voltage signal cable pulling, termination and testing by the Division 26 Electrical Contractor.
d. Provide coordination of conduit, backboxes and AC power wiring provided by the Division 26 Electrical Contractor.
e. Provide all material, components, accessories and services required to provide the work as specified herein, elsewhere in the Contract Documents and/or as shown on related drawings.
f. Consult and coordinate with other affected work and contractors throughout the course of the work contained herein.

3. Delegated Design:

a. Provide design for the means of fastening, suspension and support of the work of this Section.

b. Provide all material, components, accessories and services required to provide the work as specified herein, elsewhere in the Contract Documents and/or as shown on related Drawings.

C. Products Supplied but Not Installed Under This Section

1. The following equipment supplied under this Section shall be terminated under Division 26:

   a. Operating gallery LED index lights
   b. Multi-cable for fixed electric battens
   c. Rigging control system devices including but not limited to control panels, limit switches, detection and safety devices
   d. Low Voltage/Control Wireways for automated hoists
   e. Line Voltage Wireways for automated hoists

2. Termination of control system conductors shall be made by Division 26 under the direct onsite supervision of the Contractor.
3. If not internal to the equipment, controls, safety and limit switch devices are installed under this Section. Final terminations to the devices are made under Division 26.

D. Related Requirements

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications apply to this Section.
2. Examine Contract Documents for requirements that directly affect or are affected by work of this Section. A list of those Documents and Sections includes, but is not limited to the following:

   a. Division 01 – General Requirements
   b. Division 03 – Concrete
   c. Division 04 – Masonry
   d. Division 05 – Metals
   e. Division 09 – Finishes
   f. Division 11 – Equipment

      1) Section 116163 – Theatrical Lighting Systems

   g. Division 21 – Fire Suppression
   h. Division 22 – Plumbing
   i. Division 23 – Heating, Ventilating and Air Conditioning
   j. Division 26 – Electrical

      1) Section 266100 – Theatrical Systems Electrical Requirements

         a) General requirements for all Electrical work, including installation of system cable trays, terminal cabinets, empty conduit, junction/pull boxes and back boxes for system devices and panels (Division 26).
         b) Electrical terminations (AC power and grounding only) to all equipment racks and AC power receptacles (Division 26).
         c) Provision and installation of all conduit and back boxes (Division 26).
         d) Electrical services and main circuit protection (Division 26).
         e) Distribution system equipment (Division 26).

f) Conduit, wire, pull boxes, junction boxes and miscellaneous hardware and components as required for a complete electrical installation.
g) Terminations and testing of system continuity.

k. Division 27 – Communications

1) Structured cabling systems
2) At common facility panels, coordinate receptacles for building standard communications systems.

l. Division 28 – Electronic Safety and Security

1.2 PRICE AND PAYMENT PROCEDURES

A. Refer to Division 01 – General Requirements for information regarding price and payment procedures.

B. Unit Prices

1. Provide price to Owner for five year maintenance agreement on winches. Price to include emergency site service (post warranty period), one one-day session of additional operator training per year, and replacement of parts due to failure under normal usage.

1.3 REFERENCES

A. Abbreviations:

1. The following abbreviations and acronyms are relevant to this Section and are in addition to those defined in Division 01 – General Requirements:

a. MCC – Motor Control Center
b. ACC – Automation Control Console
c. MCR – Motion Control Rack
d. SWL – Safe Working Load

B. Definitions:

1. The following definitions are relevant to this Section and are in addition to those defined in Division 01 – General Requirements:

a. In all cases where a device or a part of equipment is referred to in a singular manner within the contract documents, it is intended that such a reference shall include all devices required to complete the installation in accordance with the project documents.
b. “Architect”: All references to the “Architect”, Kingscott, will refer to the process by which the indicated action or decision regarding the work in this section will be administered. All such actions shall be initiated with or by the Architect, who will disseminate all pertinent information and documents to, as well as coordinate all efforts and site visits with, the Theatre Consultant and all other project consultants who may have design responsibility relating to the work in this section.
c. “Theatre Consultant”: Apeiro Design, Inc. The Theatre Consultant will be party to all actions and decisions regarding the work in this section.

d. “Other Project Consultants”: Acoustical Consultant, Electrical Engineer, Structural Engineer, or Mechanical Engineer as is applicable to a particular issue.
e. “Contractor”: Manufacturer / Installer responsible for the fabrication and installation of the work contained in this section.

1) Contractors involved with other work shall be indicated with a specific trade preceding the word “Contractor” (i.e. General, Electrical, etc.).

f. "Owner": Authorized personnel representing Lansing School District.
g. “Furnish”: Purchase and/or fabricate and deliver to project site.
h. “Install”: Physically install the items in their proper location(s) on the project site.
i. “Provide”: Furnish and install.

2. Definitions of Technical Terms:

a. “Safe Working Load”: The load that can be applied to the system by the end user.
b. “System Load”: Sum of the Safe Working Load and the weight of the load carrying device. The maximum load which can be safely handled by the machinery installation under normal operating conditions, not taking dynamic forces into consideration.
c. “Dynamic Force”: Forces exerted on the structure or machine that are the result of the movement patterns of the load and system component parts.
d. “Design Load”: Sum of the System Load and the loads due to dynamic forces.
e. “Category 0 Stop”: An uncontrolled stop resulting from loss of power to the machine actuators at any time during its movement.
f. “Category 1 Stop”: A controlled stop that allows power to the machine actuators to achieve a safe stop, and then removes power from the machine actuators when the stop is achieved.
g. “Category 2 Stop”: A controlled stop that leaves power left available to the machine actuators.
h. “Initial Limit”: The mechanical limit switch connected to the electrical system in such a manner as to prevent further movement in the over travel direction. It shall be a Category 2 stop and allow the user to operate the system in the opposite direction.
i. “Ultimate Limit”: The mechanical limit switch is a positive break mechanical limit switch, which executes a Category 1 stop. NOTE: The Ultimate Limit switch shall be located in such a manner that, should the Initial Limit fail to operate, if the machinery strikes the Ultimate Limit at maximum speed all components of the machine shall come to a complete stop before the over travel results in mechanical damage.
j. “Fleet Angle”: The angle formed between the wire rope and the centerline of a sheave or drum as the wire rope traverses to another sheave or fixed point.
k. “Zero Fleet Winch”: A hoist in which the line pays off the drum at the exact same location at all times, thereby maintaining a fleet angle of zero (0) degrees.

C. Reference Standards:

1. Reference Division 01 for general project references and standards.
2. References to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies will refer to the latest edition of such publications adopted and published prior to submittal of the bid. All such codes and standards will be considered a part of this specification as if they were fully included herein.
3. If an applicable code or standard permits work of lesser quality or extent than this specification, then this specification and the related drawings will govern.
4. Comply with national, state and local codes.
5. Comply with national, state and local labor regulations and requirements.

6. The following standards apply to the work of this Section. It remains the Contractor's responsibility to confirm and comply with all industry standards that are applicable to the work of this Section.

   a. ASTM International

      1) ASTM A36 for structural steel shapes
      2) ASTM A47 for malleable iron casting
      3) ASTM A48 for gray iron casting
      4) ASTM A1011 for side plates

   b. American National Standards Institute (ANSI):

      1) ANSI B18.2.1&2 for square and hex bolts and nuts
      2) ANSI-Z535 – System load and safety signage
      3) ANSI E1.6-1 Entertainment Technology – Powered Hoist Systems
      4) ANSI E1.4-1 Entertainment Technology – Manual Counterweight Rigging Systems
      5) ANSI E1.22 Entertainment Technology – Fire Safety Curtain Systems

   c. American Iron and Steel Institute (AISI):

      1) AISI 1045 for steel shafts

   d. National Fire Protection Association (NFPA)

      1) NFPA 70 - National Electrical Code

   e. National Electrical Manufacturers Association (NEMA)

      1) NEMA WC 63.1 (2005) Twisted Pair Premise Voice and Data Communications Cables
      2) NEMA WC 66 (2001;Errata 2003) Category 6 and Category 7 100 Ohm Shielded and Unshielded Twisted Pairs

   f. Underwriters Laboratories Incorporated (UL)

      1) UL/IEC 61508A Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems
      2) UL 1666 (2000; Rev thru Jul 2002) Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
      3) UL 467 (2004) Standard for Grounding and Bonding Equipment
      4) UL 50 (2003; R 2005) Standard for Enclosures for Electrical Equipment
      5) UL 508 Standard for Industrial Control Equipment
      6) UL 969 (1995; rev Thru Dec 2006) Marking and Labeling Systems

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. The Contractor is required through drawings, memos and meetings to properly coordinate the work with the other sections as necessary to complete the work of this section.

B. Pre-installation Meeting:

1. Refer to Division 01 - General Requirements for information regarding pre-installation meeting with the General Contractor.

C. Sequencing

1. The installation of the equipment in this section shall be coordinated with other work which may be in conflict with or which must be completed before the work in this section may be installed, including:

a. Installation of associated structural steel (see Structural Drawings)
b. Installation of associated electrical work (see Electrical Drawings)
c. Installation of HVAC work in ceilings (see Mechanical Drawings)
d. Painting
e. Finishing of floors and finishes
f. Electromechanical and electronic equipment installation shall proceed after environmental site conditions are met. Refer to paragraph 1.10-B for class requirements.

1.5 ACTION SUBMITTALS

A. All submittals shall be submitted in accordance with Division 01.

B. All submittals shall be submitted in a timely manner, allowing sufficient time for adequate review and possible resubmittals without jeopardizing project schedule.

C. Submittals will be reviewed, accepted and field dimension verified prior to proceeding with the fabrication of the work in this section.

D. All submittals shall leave space available for review stamps and comments.

E. Provide insurance against loss or damage during shipment. Furnish certifications of such coverage to the General Contractor not less than 60 calendar days prior to the shipment of any equipment.

F. Review all pertinent project Contract Documents. Following this review, provide to the Architect and General Contractor any additional information required to make a fully functioning system. In addition, the Manufacturer shall indicate maximum accepted wire size as it relates to termination points on their equipment.

G. Verify wire type, count, and routing for all required data wiring between all components to allow for proper conduit sizing and routing by Division 26. Verify and coordinate all line voltage power input required by systems components that shall be provided under Division 26.

H. Product Data

1. Where standard manufacturer parts are used, submit current product literature describing component, manufacturer's recommended applications, load ratings, safety factors and dimensions. The data shall include all information which indicates compliance with the specifications herein.
2. Clearly indicate specific component and applicable options.

I. Shop Drawings

1. Provide shop drawings in PDF format with sheets sized so that drawing elements are appropriately scaled and easily read.
2. Include a cover sheet with a drawing index including sheet number and title for each sheet in the set.
3. Provide complete, fully dimensioned, large-scale detailed drawings of all major components. Note all work by others in the vicinity which may affect work of this Section.
4. Provide requisite schematics, plans and sections indicating assembly and installation of components.
5. Provide indications by arrow and boxed caption of all variations from contract drawings and specifications, except where variation is indicated as acceptable.
6. Provide power requirements, one-line riser diagrams and installation circuit diagrams for electrical equipment. Show all required wire sizes and counts between all components. These shall be provided within 30 days of Contract Award.
7. Indicate all elements with appropriate safety factors and/or safety equipment.
8. Indicate recommended load limits for each element in the system with loading requirements.
9. Indicate Safe Working Load for each element in the system with loading requirements.
10. Provide a full Bill of Materials to be supplied, including quantities, manufacturer's part number, reference to applicable drawings, etc.

J. Samples

1. Submit sample items including, but not limited to:

    a. Samples of drapery tracks and associated hardware.

2. Additional samples must be submitted within 14 days of Architect's written request.

K. Delegated Design Submittals

1. Provide drawings and calculations meeting the review requirements of the authorities having jurisdiction, stamped and wet signed by a Professional Engineer licensed in the project jurisdiction for work of the specific type performed.
2. Engineered drawings shall be provided to the Architect and Theatre Consultant for review of coordination and compliance to this Section.
3. Engineered drawings shall be provided to the Structural Engineer of record for this project. The engineer of record will review the loads imposed on the structure by this equipment and compare those loads to allowable structural loading.
4. Engineered drawings shall be provided to the Authority Having Jurisdiction for this facility. The AHJ will review the drawings for compliance with local codes. In all cases code compliance is the responsibility of the Contractor.

L. Test and Evaluation Reports

1. Test Reports

    a. Winches: Provide a load testing report for every winch and component part installed in the automated system based on Safe Working Load.

        1) Static loading of primary brake to 1.25 x SWL for a minimum of 10 minutes
        2) Static loading of secondary brake to 1.25 x SWL for a minimum of 10 minutes
        3) Dynamic test of primary brake to 1.1 x SWL (drop test)
        4) Dynamic test of secondary brake to 1.1 x SWL (drop test)
        5) Full speed E-Stop test with 1.0 x SWL

6) Test all limits at full speed with 1.0 x SWL

M. Source Quality Control Submittals

1. The Contractor shall supply as part of the submittal process the following Source Quality Control documents which must contain, at minimum:

a. Serial number of hoist
b. Motor drive serial number
c. Batch number of major components
d. Name of person conducting the QC test
e. Date the test was conducted
f. List of mechanical tests conducted
g. List of electrical tests conducted

N. Special Procedure Submittals

1. Installation/Erection Plan

a. The Contractor shall supply as part of the submittal process the following Installation/Erection Plan documents which must contain, at minimum:

1) Required path to site of work, including maximum loads applied to floor in that path
2) Maximum size and weight of pieces to be moved along the path
3) Required erection machinery, including lifts, hoists, etc., including the maximum loads applied to the floor and lift points in the erection area
4) Erection Plan: the plan shall outline the construction methods, erection sequence, erection bracing, temporary bracing if required, equipment required and other engineering details necessary for shipping, erecting and maintaining stability of the equipment detailed in this section

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents:

1. Submit documents in accordance with Division 01 – General Requirements
2. At the time of acceptance testing, submit three (3) hard copies and PDF format electronic files of parts lists and maintenance instruction sheets.
3. Within 60 days of acceptance testing, submit one (1) hard set and PDF format electronic files of “as built and approved” drawings showing all equipment as installed. These drawings shall include all adjustments made during the checkout process.
4. Submit operation and maintenance manuals with the “as built and approved” drawings. Each manual shall be bound in an individual binder with the project name on the front cover and system identification on the spine. Included with binder shall be a PDF format electronic version of the manual materials on a portable storage device. The manuals shall include:

a. Complete parts list for all equipment and telephone numbers for the authorized parts and service distributors.
b. Instructions as to the safe operation for all equipment.
c. Recommended maintenance schedule for component parts that may need periodic replacement or maintenance.

d. Recommendations for cleaning, maintaining and touch-up of all finished surfaces.
e. Where specific elements do not require manuals, instruction sheets as to care and handling shall be provided.
f. Certificates as required herein.
g. Warranties as required herein.

B. Maintenance Contract

1. Refer to 3.10 – Maintenance.
2. Submit maintenance contract proposal for Owner and Theatre Consultant review no later than one month prior to substantial completion.

C. Submit verification that all punch list items have been rectified. Such written verification will be required for project closeout and initiation of the warranty period.

D. The record documents shall be reviewed by the Architect and all modifications to the documents stemming from this review shall be made as required.

E. Above submissions are required as a condition for final approval of the work.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts

1. Furnish the following user-serviceable components as spare parts for major electronics assemblies:

a. Furnish 3 spare fuses of each type in the system
b. Furnish 1 spare breaker of each type in the system
c. Furnish 4 spare keys of each type in the system

B. Extra Stock Materials:

1. Deliver stock of maintenance material to Owner. Furnish the following to match those installed and taken from the same production run, packaged with protective covering for storage and identified with appropriate labels:

a. Furnish 12 compression sleeves of each type in the system.
b. Furnish 4 shackles of each type in the system.
c. Furnish 12 thimbles of each type in the system.
d. Furnish 12 bolts and nylock nuts of each type in the system.
e. Furnish 12 lockwashers of each type in the system.
f. Furnish 4 turnbuckles of each type in the system.
g. Furnish 1 master track carrier of each type in the system.
h. Furnish 4 other track carriers of each type in the system.

1.8 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Refer to Division 01 – General Requirements.

B. Qualifications

1. Manufacturers

a. The Manufacturer shall own and operate their own manufacturing facility for the fabrication of theatrical rigging equipment and be regularly engaged in the fabrication of such equipment. Fabrication of such equipment shall comprise no less than 90% of the Manufacturer's business.

2. Installers / Integrators

a. The systems and equipment under this Section shall be provided through single pre-approved Contractor who is a factory authorized dealer, integrator and servicer of all of the equipment specified herein and meets the following requirements.
b. The Contractor shall have been continuously engaged in the integration and installation of theatrical rigging systems for no less than five years and shall have provided complete engineering and installation services on a minimum of five projects of similar scope and complexity in the past five years.
c. Project Manager: The Contractor's Project Manager shall be qualified and have experience in projects of similar size and scope. The Project Manager shall have binding authority to represent and act for the Contractor. The Project Manager shall be the primary conduit for all information between the supplier of this equipment and the General Contractor. All information given to the Project Manager shall be considered as given to the Contractor.
d. The Contractor shall have, at the time of bid, a current Contractor's License and shall know, understand, and have the required documentation to work in the State of Michigan. This license shall be maintained throughout the course of work of this contract.

C. Contractor is responsible for proper installation, operation and safety of all component equipment.

1. Equipment must be procured as specified. Non-specified items may be procured from any nationally recognized manufacturer.
2. Metalworking may be done by others. Responsibility in all respects shall be that of the Contractor.
3. The Contractor shall verify all system design loads.

D. Contractor is responsible for the complete integration and engineering of all systems described herein. Contractor shall confirm project details and, if necessary, suggest modifications to the criteria established herein in order to maintain the design intent.

E. Errors and omissions within the Contract Documents shall not relieve the Contractor and the General Contractor of the responsibility for providing a properly functioning installation of the system as described herein.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage and handling shall be coordinated with the General Contractor and shall meet all requirements described in Division 01.

B. Packing, Shipping, Handling and Unloading

1. All equipment shall be appropriately and substantially packed for shipment.
2. All equipment containers shall clearly indicate the equipment contained, “front”, “top”, “fragile”, the project name, and theatre site allocation. Include packing and shipping lists for each container.
3. All shipping costs to the job site are the responsibility of the Contractor. The shipping method/company is at the total discretion of the Contractor in order to meet the published project schedules.

C. Acceptance at Site

1. Coordinate responsibility for acceptance of material and equipment at job site with the General Contractor.
2. The Contractor shall be responsible for acceptance of the Theatrical Rigging System components at the job site, confirming that all quantities and counts are correct and for keeping accurate logs and records of such information.

D. Storage and Protection

1. Upon delivery, the materials shall be stored under cover in a clean, dry and secured location, off the ground. Delivered materials which are damaged or otherwise not suitable for installation shall be removed from the job site and replaced with acceptable materials.
2. Replace, at no additional expense to the Owner, all equipment and materials which are damaged or lost during storage or handling.

1.10 SITE CONDITIONS

A. Existing Conditions

1. Verify all conditions at job site. Promptly report variations and obstructions to the Architect. All additions and/or corrections are to be requested prior to fabrication.

B. Environmental Requirements

1. Equipment is classified according to its susceptibility to construction conditions that may affect its operation. Classes shall be defined by the following paragraphs:

a. Class 1:

1) Cable and distribution apparatus, structural elements, electrical back boxes, face plates, terminal boxes, and empty equipment rack frames may be stored in weather protected spaces under "normal" construction site conditions provided that no electronic components are contained within devices, storage boxes are sturdy and well-sealed, and equipment is protected with imperforate inner plastic sheeting.
2) Contractor may install this class of equipment in weather-protected spaces under "normal" construction site conditions provided that equipment is protected from dust and moisture by sturdy imperforate plastic sheeting and completely covered with corrugated cardboard held securely in place by duct tape. Cardboard covers shall not be removed until area is broom cleaned. Under no circumstances shall equipment remain uncovered overnight during installation or while work which causes high dust or moisture levels in area of placement is taking place.

b. Class 2:

1) Control panels, spare parts, test and other equipment (except as listed under Class 3) not subject to damage by concrete dust or dirt shall be stored and protected per Class 1 devices.
2) Contractor shall not install equipment in this class until area of installation is broom cleaned, "blown" clean with pressurized air, mopped, air conditioned and secure. Contractor may install control panels with electronic components under Class 1 conditions, but electronic components must be removed and not installed until area of installation meets Class 2 conditions.

c. Class 3:

1) Control consoles, filled equipment racks and other electronic equipment shall not be shipped to site until the rack and control rooms are finished, air conditioned, dust free, broom and mop cleaned, secure, and in all respects complete and ready for occupation.
2) This class of equipment shall not be unpacked until the system is complete in all other respects. Under no circumstances may any equipment in this class be removed from the rack and control rooms into or through spaces which are not cleaned, air conditioned, and complete.

C. Field Measurements

1. Field measurements shall be taken prior to preparation of final shop drawings and prior to fabrication to ensure proper fitting of work. Allow for adjustments during installation whenever taking field measurements.
2. Should field measurement of site conditions alter the design or installation of system elements from the approved shop drawings, revised shop drawings shall be reissued for review.

1.11 WARRANTY

A. Comply with the warranty requirements of Division 01 and the following.

B. The Contractor shall warrant materials and workmanship of systems and equipment installed as free of defects. The Contractor shall guarantee in writing the repair or replacement within 14 days of any item found defective during a period of one (1) year following date of final acceptance. Ordinary wear and defects due to improper usage are excepted.

C. The Contractor shall warrant the workmanship of the installation services provided under this Section for a period of one (1) year following the date of final acceptance. Ordinary wear and damage due to improper usage are excepted.

D. During the warranty period, all emergency conditions where systems failures may be hazardous or may cause severe hardship or cancellation of performances shall be responded to within 24 hours. Immediate action shall be undertaken to ensure the safety of the audience and the performers.

E. During the Warranty Period, for each product that uses software, furnish manufacturer’s software updates to the Owner for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. To establish comparative standards of quality the systems and equipment described herein shall be furnished by the manufacturers listed herein:

1. Counterweight Rigging Systems

a. ETC Rigging

2. Motorized Hoists & Control System

a. ETC Rigging

3. Track Systems

a. Automatic Devices Company (ADC)
b. H & H Specialties Inc

4. Draperies

a. Rose Brand
b. Stage Decoration and Supplies

B. Manufacturers shall provide the Warranty and Maintenance services specified herein as applicable to their products.

C. Manufacturers shall engineer, design, produce shop drawings and fabricate all custom equipment required in this section.

2.2 SYSTEMS DESCRIPTION

A. The following performance spaces shall contain the major system components as listed below and as shown on the TR-series drawings:

1. Sexton Auditorium

a. Counterweight System:

1) Structural performance for this entire system must be fully documented under the direct supervision of a Structural Engineer registered in the State of Michigan. The Contractor's engineer shall design and/or select all elements and their connections to meet or exceed the International Building Code.
2) The rigging system shall include provisions for basic hanging, shifting and storing of scenery, stage draperies, masking and elements of the stage lighting systems.
3) The rigging system is highly integrated with the structural steel of the fly tower. See structural Drawings and Specifications for details.

4) The counterweight system shall be a single purchase, “tee” bar guide as detailed in the drawings. See drawings for layout. Operation of the counterweight system shall be from locking rail on the stage floor. The battens shall travel as indicated on the drawings.

b. Proscenium Safety Curtain

1) Straight lift proscenium safety curtain with lineshaft winch, smoke pocket, pull station, rate of rise detector, fusible links, and associated hardware.

c. Fixed Electric Multi-Cable and Cable Management

1) Cable management system for managing multi-cables to fixed electric battens.

d. Traveler Track assemblies

1) Traveler tracks shall be furnished for manual, bi-parting, back-packing curtains.

e. Rigging Control System

1) Provide a control system for the motorized theatrical rigging equipment as indicated on the drawings and as detailed herein.
2) Additional control system components:

a) Control points and E-Stop
b) Hand held control pendant
c) Control pendant receptacles
d) Control for all motors herein

f. Draperies

1) Main Drape and Border

a) Decorative lined velour curtains located at the proscenium

2) Stage Masking Draperies

a) Legs: velour curtains hung from traveler tracks
b) Borders: velour curtains hung from system pipe battens
c) Travelers: velour curtains hung from traveler tracks

3) Cyclorama

a) White leno-cloth cyclorama hung from system pipe batten
b) Bottom pipe

B. State of the Art Development

1. The Contractor shall furnish only the manufacturer's latest developed appropriate products. In cases where product development from a specified manufacturer surpasses the criteria of this specification, the Contractor shall inform the Architect and make the newer product available to the Owner for acceptance. In no case shall discontinued or obsolete equipment be acceptable. Should a newer product be suggested as a substitution for a discontinued product, or for a product that is in process of being phased out of production, that newer product shall be offered to the Owner at no additional cost.
2. Should product recall by the Manufacturer require temporary or permanent replacement of a product specified under this section, the Contractor shall notify the Owner at the earliest reasonable time and shall arrange to replace the product in question at the earliest possible time.
3. Equipment found defective or subject to recall prior to scheduled installation shall not be delivered to the job site.
4. Equipment defect or intended recall shall not relieve the Contractor from his contractual obligation with regard to delivery schedule of product. In this circumstance, notification shall be made to the Architect by express carrier. Arrangement for alternate product shall be made at this time.
5. Under no circumstances shall arrangement for alternate product necessarily require the Owner to accept superseded equipment except on a temporary basis.

C. Substitutions

1. All requests for variations from the specified materials and products will be reviewed by the Architect according to the procedures outlined in Division 01.
2. All requests for substitutions must be submitted in a timely manner, so as not to adversely impact the project schedule.
3. Substitutions will only be accepted if, in the opinion of the Architect, the product is an equal to the specified product. No substitutions may be made without written acceptance from the Architect. All substitutions made prior to this acceptance are at the sole risk of the Contractor.
4. A substitution must be a product of equal design, construction and performance. The Contractor must submit all pertinent information required to substantiate that the product is equal. The Contractor must submit all additional information, including test data, which may be requested in order for the Architect to fully evaluate the substitution. The burden of proof is solely on the Contractor.
5. All additional expenses of any kind with respect to substitution(s) shall be borne by the Contractor. This shall include, but not be limited to, all fees and expenses incurred by the Architect and other related Consultants for evaluation of the substitution and subsequent integration into the project should the substitution be taken and/or additional costs of other contractors related to the substitution(s).

2.3 MATERIALS

A. General

1. All equipment and components shall be new and complete. No used or reconditioned equipment shall be acceptable unless otherwise noted.
2. All equipment and components shall be factory tested prior to shipping.
3. All equipment to have pertinent labels.

B. Materials shall conform to the following minimum standard specifications:

1. AISI 1045 for steel shafts

2. ASTM A36 for structural steel shapes
3. ASTM A47 for malleable iron casting
4. ASTM A48 for gray iron casting
5. ASTM A1011 for side plates
6. ANSI B18.2.1&2 for square and hex bolts and nuts

C. Hardware

1. All mounting hardware to be included.
2. All bolts and fasteners must be Grade 5 or better.
3. All bolted attachments to have lock washers or other self-locking fasteners.

D. Electrical

1. All internal wiring shall be factory completed and clearly marked. All field connections shall be by compression connector, terminal strip or other device specified herein. All terminal strip connections shall be clearly labeled as to terminal designation. Insulated wire ferrules are to be used whenever possible for wire termination. Wire nut splices not permitted.
2. All wire sizes and insulation to comply with Underwriters Laboratory and all applicable standards and local codes.
3. All wiring to be harnessed and bound. No loose or randomly routed wires shall be permitted.

E. Design Factors

1. Overhead rigging elements to be designed with a mechanical safety factor of their minimum breaking strength.

    a. Wire rope: 8:1
    b. Terminating hardware: 5:1
    c. Batten clamps: 5:1

2. All drive components shall be designed with a safety factor 3X.
3. Bearings shall be designed with a 2X rating, full speed / 2000 hours.

F. Draperies

1. In all cases, fabrics are to be “first quality”. In no case shall “seconds” or re-dyed fabric be acceptable.
2. All velour fabric to be free of crush marks, nap irregularities, and any other abnormal markings
3. Fabrics shall be vat-dyed with no variation of color or pigment impregnation. There shall be no evidence of streaking or color variation. Verification of fabric quality is the responsibility of the fabricator prior to sewing.
4. Materials shall be either IFR polyester to conform to local, state, and national codes. Affidavits from fabric manufacturer, jobber or other agent required to attest flame resistance of the fabrics and methods used shall accompany drapery upon delivery. Duplicate copies shall be sewn to a normally accessible but hidden corner of each piece of drapery goods.

    a. Provide a 100 square inch cutaway sample of drapery fabric and lining sewn adjacent to flame resistance certification on rear for use in Fire Marshall testing.

5. There shall be no chemical leach-out or crystallization from the flame-retardant process allowed. Flame retarding shall be done at the mill. No flame retarding shall be acceptable after drapery fabrication without prior approval.
6. Flame retarded fabrics shall be certified as tested to NFPA 701

2.4 REMOVAL OF EQUIPMENT

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain property of Owner, demolished materials shall become the Contractor's property and shall be removed, recycled, or disposed from project site in an appropriate and legal manner.

1. Review with the Owner to review any salvageable items to determine if Owner wants to retain ownership and discuss Contractor’s waste management and recycling plan.

B. Conduct demolition operations to prevent injury to people and damage to facilities.

1. Note the existing safety curtain is known to be asbestos, contract with a licensed abatement company for removal.

C. Provide stage floor protection in area where equipment is being removed and provide a path to move debris to disposal location.

D. Remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

2.5 RELOCATION OF LOUDSPEAKER CLUSTER

A. The existing center loudspeaker cluster and associated frames are to be removed prior to the start of demolition, protected, and stored during construction. Coordinate with General Contractor and Owner for storage location.

B. The center loudspeaker cluster shall be re-installed downstage of the new proscenium soffit. Provide supplemental support structure bolted to the building structure to support the speaker cluster.

C. Loudspeaker cluster frame shall be hung from support lines of:

1. Oil-free, zinc coated, 1/4", 7x19 aircraft cable. 7,000 lbs minimum breaking strength.

D. Frame connection by:

a. Forged rated eye bolt
b. Rated hot dip galvanized jaw/jaw (cotter pin type) turnbuckle with 6" of take-up, lock nuts, lock washers and safety wire mouse (after adjustment).
c. Wire rope thimble
d. Compression sleeve installed as per manufacturer's recommendation.
e. Dress cable ends by clear heat shrink tubing

E. Connection at ceiling by:

a. Attachment to supplemental support structure
b. Rated galvanized shackle, cotter pin type
c. Wire rope thimble

d. Compression sleeve installed as per manufacturer's recommendation
e. Dress cable ends by clear heat shrink tubing.

2. Adjust to trim loudspeaker cluster parallel to stage floor at height as indicated on the Drawings.

F. Engage with a representative of the loudspeaker manufacturer or an AV integrator to re-tune and re-aim the loudspeakers after re-hanging.

2.6 COUNTERWEIGHT RIGGING SYSTEM

A. Provided counterweight equipment as indicated on the drawings.

1. Acceptable Products (no known equal):

a. ETC Rigging Prodigy Balance

2. Systems that require loading of counterweight at an upper loading gallery are not acceptable for this installation. The existing loading gallery does not have loading capacity to support storage of counterweights.

B. Arbor Guide Tracks

1. Provide arbor guide tracks installed on the rigging wall from the stage floor to the underside of the headblock beam, as indicated on the Drawings. The center-to-center dimension (in plan) between each guide varies, refer to the Drawings. The arbor guide tracks must form a true vertical plane and be so certified by the Contractor. All splice joints shall be free of burrs and irregularities and in exact alignment.
2. Provide tee bars of extruded aluminum bolted to a 10 gauge tube steel frame. Provide wall knees of various lengths for attachment to rigging wall face and structural pilasters. See Structural Drawings and coordinate for exact locations of wall attachment.
3. Provide top and bottom stop batten of 2" x 2" x ¼" steel angle. Bumper strips of 2" x 2" hardwood with neoprene pads bolted to the stop battens. Neoprene bumpers shall be flat head screwed with ferrules to hardwood at 4” o.c. Stop battens bolted to each tee with one 3/8” diameter bolt.
4. Finish flat black

C. Arbors

1. Size and weight capacity per schedule on Drawings.
2. Arbor top and bottom to be steel plate formed channel with forged eyes for each lift line and for hand lines.
3. Provide tee bar guide shoes mounted top and bottom of tie bar. Each to be 2 pieces of 1/8" UHMW separated by UHMW spacer. Full width 3/16" steel reinforcing plate on front and back.
4. Provide two high tensile strength threaded connecting rods between top and bottom spaced to fit counterweight slots with ½” x ¼” deep notches every 1-3/8” to receive the weight pins. Fastened with 1 ¾” diameter collar and ½” diameter x 2-1/4” long clevis pin.
5. Each arbor shall have a permanent weight stack of 6-1/4” x 16” steel counterweights with cutouts for the hand line and arbor rods.

a. Machined to allow stacking with a nominal weight of 30 lbs.

b. Each weight includes a dedicated pin to be captured by rods and machined weight
c. Each pin shall be labeled with the cumulative weight from top to bottom.
d. Labels for dedicated pipe weight shall be a different color.

D. Lift Lines

1. Oil-free, zinc coated, 1/4", 7x19 aircraft cable. 7,000 lbs. minimum breaking strength for general linesets.
2. Pipe batten connection by:

a. Pipe clamp
b. Rated hot dip galvanized jaw/jaw (cotter pin type) turnbuckle with 6" of take-up, locking hardware and safety wire mouse (after adjustment).
c. Wire rope thimble
d. Copper compression sleeves installed as per manufacturer's recommendation.
e. Dress cable ends using black heat shrink tubing.

3. Arbor connections by:

a. Thimble
b. Rated galvanized shackle, cotter pin type with cotters on inward side.
c. Copper compression sleeves installed as per manufacturer's recommendation.
d. Dress cable ends using black heat shrink tubing.

4. Adjust lengths of lift lines to trim batten parallel to stage floor at low trim height as indicated on the Drawings.

E. Truss Battens

1. Provide segmented truss battens complete with couplings, connectors and fittings as indicated on the Drawings. Pipe to be of 1½" nominal Schedule 40 black steel pipe as per standard industry practice.
2. Batten segments and couplings to be secured with 5/16" bolts, lock washers and nuts.
3. Upper and lower pipe joined by rectangular steel tubes, coped and welded to pipes. Space tube steel to coordinate with lift lines.
4. Batten ends to be covered with yellow vinyl caps to protect individuals from contact with cut pipe ends.
5. Battens to be painted with flat black enamel.
6. Battens to be marked with a 1" wide white stripe on centerline only, full circumference around pipe.

F. Operating (Hand) Lines

1. Unspliced 3/4" first grade line of filament and staple/spun polyester wrapped fibrillated polyolefin. Three-Strand Composite Multiline II, color standard white as manufactured by New England Rope or equal. Clean of slivers and foreign materials.
2. Dead tie with bowline at top, use 2 tight fitting half hitches after passing through eye at bottom of arbor, tape ends, or dress top with 2 removable nylon tie wraps.

G. Rope Locks

1. Steel, quick-acting eccentric levers. Heat treated cams.
2. Slip ring to hold lever in locked position.

3. Operating handle and slip ring to have an over-molded coating.
4. Include over speed mechanism to detects a runaway condition, it triggers a device to control the load.

H. Lower Sheave Assembly

1. Provide 8" diameter steel sheave, turned and grooved for 3/4" hand line, press-fitted with sealed ball bearings.
2. Include encoder sensor to provide position information for each batten continually throughout normal operation.

I. Locking Rails

1. Provide integral steel locking rail at each lineset. Anchor to rigging gallery structure.
2. Include with built-in rail and index lighting.
3. Provide one (1) power supply for each 12 linesets

J. Head Blocks

1. Heavy-duty machined cast ductile iron, #30 gray iron, or high strength filled nylon sheave turned and grooved for steel cable lift lines and for 3/4" operating line. Pitch diameter to be matched for steel cable and rope. Grooves to have 1/64" tolerance.
2. See schedule on Drawings for the number of grooves in each head block.
3. Sheaves to have 4" machine faced hubs bored for 2 press-fitted Timkin 7204-B cup and 07100 preloaded cone roller, (no known equal). Alternates require specific approval.
4. Shafts of 1" diameter steel, locked to side plate, with adjustment nut factory tightened to manufacturer's torque specifications and locked to shaft by cotter pin or self-locking nut.
5. Sides not less than 3/16" CRS plate, welded and riveted to 1½" x 2" x ¼" steel base angles with 1½" legs horizontal, turned in and cut to clear vertical lines on 6-line+ sets. Base angle legs shall be turned out for 4-line sets. Side plates to span past edges of head block beam flanges by at least 1½". Side plates to span base angle cut and head block beam flanges by at least 1½".
6. Sides joined into rigid assembly by at least five 3/8" bolts with spacer pipes located where appropriate to retain cables in sheave grooves.
7. Head block sheave to be 12" in diameter, typical, unless otherwise noted on the Drawings.
8. Head blocks attached to the head block beam by double steel clips with forged offset or space plate for thickness of beam flange. Clips bolted to block base angle by minimum (2) ½" dia. grade 5 bolts with nuts and lockwashers.

K. Loft Blocks

1. Machined, cast ductile iron, #30 gray iron, or high strength filled nylon sheaves, turned and grooved for one ¼" steel cable. 1/64" groove tolerance.
2. Sheaves bored and press-fitted with double sealed precision ball bearing assemblies. SKF 60 Series 2 RS or equal.
3. Shafts of 5/8" diameter steel locked to side plate, with adjustment nut factory set for proper shaft and bearing adjustment and locked in place.
4. Side plates not less than 10 gauge CRS plate.
5. Base angles shall be 1½" x 1½" x ¼", with legs turned out.
6. Sides joined into rigid assembly by at least five 3/8" bolts with spacer pipes located where appropriate to retain cables in sheave grooves and fully enclose sheave.
7. Loft block sheave to be 8" in diameter, typical, unless otherwise noted on the Drawings

8. Loft blocks attached to the beam by double steel clips with forged offset or space plate for thickness of beam flange. Clips bolted to block by minimum (2) 3/8" dia. grade 5 bolts with nuts and lockwashers

L. Counterweight System Labeling

1. The linesets shall be labeled with the designations indicated on the Drawings in the following locations:

a. The onstage face of the locking rail.
b. The onstage face of the arbor.
c. Pipe ends

2. Labels shall be painted with enamel paint on structure using stencils or by a professional sign painter.

M. System Signage

1. Provide signage indicating system load data for each of the following locations:

a. Stage Level
b. Loading Gallery

2. System data shall include:

a. Working Load Limit and total load capacity of general purpose sets
b. Working Load Limit and total load capacity of fixed electric sets
c. Weight per each size of counterweight

3. Signage shall be made of 1/8" aluminum, painted finish.

a. Block lettering of 1/4" high minimum letters.

2.7 MOTORIZED HOIST BATTENS

A. Provided motorized hoists as indicated on the drawings.

1. Acceptable Products:

a. ETC Rigging EXO Prodigy Hoist

B. Following is the minimum operating criteria indicated in the drawings and specified in this section:

1. Hoisting capacity – Safe Working Load (SWL)

a. as indicated on the drawings.

2. Speed:

a. Fixed Speed: 30 feet per minute

3. Lift Lines: as indicated on the drawings
4. Batten Length: as indicated on the drawings

5. Travel Distance: as indicated on the drawings
6. Limits for all hoists:

    a. Ultimate up hard struck Limit
    b. Initial up hard struck limit
    c. Initial down hard struck limit
    d. Ultimate down hard struck limit

7. Telemetry shall be by encoder and ensure accuracy ± 3/8”
8. Brakes

    a. Electrically released Primary Brake (motor side of gear box)
    b. Electrically or mechanical released Secondary Brake (load side of gear box)

9. Load detection of the actual load ± 3% (load profiling)
10. Slack line detection

C. Hoist Architecture

1. Provide a system of compact vertically mounted “hybrid drum” fixed speed hoists to be located and mounted as shown on the drawings.
2. Hybrid Drum is defined as a combination of a pile-on and multilayer type drum with cone shaped support flange.
3. Fleet angles exceeding 1.5 degrees will not be accepted.
4. Hoist system shall utilize decentralized motor control elements with distributed motor starters local to each individual hoist. Hoists cables shall be connectorized for connection to the hoist power/data plug boxes.
5. The hoists shall be mounted on a chassis bolted to structure as shown on the drawings.

    a. All mounting hardware and structure is under this contract.

6. Hoisting Capacity

    a. The safe working load (SWL) of the hoist shall be as listed above; this capacity shall not be reduced due to the weight of the batten, or wire rope.
    b. During the commissioning and acceptance testing phase, this hoist shall be capable of lifting 25% more than the SWL without substitution of any components. See “System Start up, Owners Instruction and Commissioning”.

7. Lift Lines:

    a. This information defines the number of wire ropes that will be attached to the hoist drum, the drum must be sized to accommodate the full travel, plus three dead (safety) wraps and space for two unused wraps for each of lift line. The termination of each wire rope shall be by compression sleeve that hold the wire rope firmly to the drum.
    b. Note: the total length of each lift line is a function of the travel distance and the distance from the hoist to the attachment point for the batten.

8. Travel Distance:

    a. The travel distance shall be as detailed in the drawings.

9. Limits:

a. The hoist shall be capable of being stopped at any point between its initial up and initial down limits.
b. The hoist shall have the following hard struck limit switches

1) "Ultimate up" hard struck Limit
2) "Initial up" hard struck limit
3) "Initial down" hard struck limit
4) "Ultimate down" hard struck limit

c. The initial hard limits, both up and down, stop the hoist from traveling but allow the operator to drive off the initial limit. The ultimate hard limits, both up and down, initiate an E-stop in which power is removed from the motor drive after a fast deceleration.
d. In all cases proper over travel must be provided in the hoist design to accommodate a failure of the control system. The hoist must come to a complete stop after striking an "initial up" or "initial down" limit without striking an "ultimate" limit. If the "initial limits" fail to function, the hoist must come to a complete stop before striking an immoveable object as the result of striking an "ultimate" limit.

10. Brake:

a. Each hoist shall have a primary motor brake and a secondary brake. Each brake shall be cable of stopping and holding 200% of the hoisting capacity. Each brake shall be spring or torque applied, fail safe, electromagnetically or torque released.
b. Secondary brake shall be on load side of hoist drive-train. Secondary brake shall be mechanically coupled to wire rope drum with as few connections as possible. Secondary brake located at the motor's high RPM/low torque output shaft shall not be accepted.

D. Telemetry

1. The telemetry, i.e. position, of the moving element connected to the hoist shall be determined by the feed-back of, at minimum, a single encoder. This encoder shall be capable of accurately positioning the moving element. Belt driven encoders are not acceptable.

E. Load Detection

1. The hoist shall be provided with a "load cell" device which is capable of determining the load which has been added or removed from the system. This device shall be integrated into the control system and each hoist shall be able to "learn" its load, as a safeguard against unintentionally overloading or under-loading the hoist.
2. The control system must stop the motor drive if the system load changes by more than ±3%.
3. In no case shall the system allow movement if the SWL is exceeded.

F. Slack Line Detection

1. The hoist shall be provided with a ground bar or limit switches, one per each lift line, which initiate an E-stop if any of the lift lines becomes slack.

G. Power and Control Distribution

1. Each hoist shall be connected to electrical power via an 8'-0" long cable extending from the rear of the hoist to the source outlet in the Power and Control Distribution box. (coordinate with Electrical Contractor).
2. The control circuit shall be attached to the hoist via a separate control wire that is also 8'-0" long and shall be connected at the hoist and at the Power and Control Distribution box.
3. The receptacles shall be installed in a sheet metal junction box and shall include a power and control outlet.
4. The distribution box shall include an 3 phase motor rated breaker sized for the operating horsepower of the motor.
5. The wiring and connectors shall be barriered between high and low voltage.
6. The Power and Control Distribution box shall be UL listed.
7. Control wiring terminations shall be made via an IDC style connector.
8. Hoists shall connect to the control panel via a single CAT-5e style cable.
9. The Control Panel shall operate on low voltage power supplied via the control cable that connects the control circuit to the power and control distribution box.
10. A centralized contactor cabinet with individual multiple wire connecting to each hoist shall not be acceptable for this installation.

H. Lift Lines:

1. Oil-free, zinc coated, 1/4", 7x19 aircraft cable. 7,000 lbs. minimum breaking strength.
2. Pipe batten connection by:

    a. Pipe clamp
    b. Rated hot dip galvanized jaw/jaw (cotter pin type) turnbuckle with 6" of take-up, lock nuts, lock washers and safety wire mouse (after adjustment).
    c. Wire rope thimble
    d. Compression sleeve installed as per manufacturer's recommendation.
    e. Dress cable ends by clear heat shrink tubing.

3. Adjust lengths of lift lines to trim batten parallel to stage floor at low trim height as indicated on the Drawings

I. Truss Battens

1. Provide segmented truss battens complete with couplings, connectors and fittings as indicated on the Drawings. Pipe to be of 1½" nominal Schedule 40 black steel pipe as per standard industry practice.
2. Batten segments and couplings to be secured with 5/16" bolts, lock washers and nuts.
3. Upper and lower pipe joined by rectangular steel tubes, coped and welded to pipes. Space tube steel to coordinate with lift lines.
4. Batten ends to be covered with yellow vinyl caps to protect individuals from contact with cut pipe ends.
5. Battens to be painted with flat black enamel.
6. Battens to be marked with a 1" wide white stripe on centerline only, full circumference around pipe.

J. Head Blocks

1. Heavy-duty machined cast ductile iron, #30 gray iron, or high strength filled nylon sheave turned and grooved for steel cable lift lines. Pitch diameter to be matched for steel cable. Grooves to have 1/64" tolerance.
2. See schedule on Drawings for the number of grooves in each head block.

3. Sheaves to have 4" machine faced hubs bored for 2 press-fitted Timkin 7204-B cup and 07100 preloaded cone roller, (no known equal). Alternates require specific approval.
4. Shafts of 1" diameter steel, locked to side plate, with adjustment nut factory tightened to manufacturer's torque specifications and locked to shaft by cotter pin or self-locking nut.
5. Sides not less than 3/16" CRS plate, welded and riveted to 1½" x 2" x ¼" steel base angles with 1½" legs horizontal, turned in and cut to clear vertical lines on 6-line+ sets. Base angle legs shall be turned out for 4-line sets. Side plates to span past edges of head block beam flanges by at least 1½". Side plates to span base angle cut and head block beam flanges by at least 1½".
6. Sides joined into rigid assembly by at least five 3/8" bolts with spacer pipes located where appropriate to retain cables in sheave grooves.
7. Head block sheave to be 12" in diameter, typical, unless otherwise noted on the Drawings.
8. Head blocks attached to the head block beam by double steel clips with forged offset or space plate for thickness of beam flange. Clips bolted to block base angle by minimum (2) ½" dia. grade 5 bolts with nuts and lockwashers.

K. Loft Blocks

1. Machined, cast ductile iron, #30 gray iron, or high strength filled nylon sheaves, turned and grooved for one ¼" steel cable. 1/64" groove tolerance.
2. Sheaves bored and press-fitted with double sealed precision ball bearing assemblies. SKF 60 Series 2 RS or equal.
3. Shafts of 5/8" diameter steel locked to side plate, with adjustment nut factory set for proper shaft and bearing adjustment and locked in place.
4. Side plates not less than 10 gauge CRS plate.
5. Base angles shall be 1½" x 1½" x ¼", with legs turned out.
6. Sides joined into rigid assembly by at least five 3/8" bolts with spacer pipes located where appropriate to retain cables in sheave grooves and fully enclose sheave.
7. Loft block sheave to be 8" in diameter, typical, unless otherwise noted on the Drawings
8. Loft blocks attached to the beam by double steel clips with forged offset or space plate for thickness of beam flange. Clips bolted to block by minimum (2) 3/8" dia. grade 5 bolts with nuts and lockwashers

L. Pantograph Cable and Management System

1. Provide pantograph cable and management system to contain and manage cables running to the stage electric linesets.
2. The pantograph body shall contain and protect the electrical cables and be constructed of an extruded shape with sturdy hinges capable of resisting the stresses and loads of regular operation of the battens through their full travel.
3. All pantographs shall have additional empty space to allow for the installation of future cables by the Owner.
4. The pantograph shall be powder coated flat black and shall match the truss battens.
5. Cable Requirements:

    a. Cables to have basket weave strain relief as indicated and/or required.
    b. Cables to have neoprene bushing to terminal boxes as indicated and/or required.

6. Lighting power and data cables:

    a. Lighting Power cable

        1) Shall be multi-conductor flat SO cable

2) #12 AWG, 14 conductors
3) No common neutrals.
4) Coordinate required quantities with Section 116163 contractor.

b. Lighting Ethernet data cable

1) (2) Heavy duty Ethernet cable with Neutrik Ethercon connector on one end and RJ-45 connector at other end.
2) Acceptable Products:

a) TMB ProPlex, Lex Products PowerFlex, or equal.

c. Each end of each cable shall have additional length and bare ends for termination by Division 26 into ceiling terminal box and batten mounted plugging box provided under Section 116163.

1) At batten end provide 10'-0" of additional length
2) At ceiling end provide 20'-0" of additional length

7. Provide track and trolley at high end of the cable pantograph for free floating adjustment through the travel of the batten.

a. Provide rubber bumper track stops for limit the travel of the trolley which can be adjusted in the field.
b. Pantograph shall not cause more than 4 inches of sway stage right or stage left of the battens from low trim to high trim elevations.
c. Track shall be captured.
d. Pantograph track to be:

1) H&H Specialties series 400 track with H&H 451a or 450a carrier for loads of 200 lbs or less
2) Triple E Unibeam track with UBM28A carrier for loads exceeding 200 lbs.

2.8 MOTORIZED SELF-CLIMBING HOIST

A. Provide motorized self-climbing battens as indicated on the drawings.

1. Acceptable Products:

a. ETC Rigging - FlyPipe

B. Following is the minimum operating criteria indicated in the drawings and specified in this section:

1. Hoisting capacity – Safe Working Load (SWL)

a. 500 lbs.

2. Fixed Speed:

a. 20 feet per minute

3. Lift Lines: as indicated on the drawings
4. Batten Length: as indicated on the drawings

5. Travel Distance: as indicated on the drawings
6. Limits for all hoists:

    a. Ultimate up hard struck Limit
    b. Initial up hard struck limit
    c. Initial down hard struck limit
    d. Ultimate down hard struck limit

7. Telemetry shall be by encoder and ensure accuracy ± 3/8”
8. Brakes

    a. Electrically released Primary Brake (motor side of gear box)
    b. Over speed Secondary Brake (load side of gear box)

9. Load detection of the actual load ± 3% (load profiling)
10. Slack line detection

C. Hoist Architecture

1. Provide a fixed speed self-climbing hoist to be located and mounted as shown on the drawings.
2. All hoist components shall be contained within an integral unit.
3. Hoist system shall utilize decentralized motor control elements with distributed motor starters local to each individual hoist. Hoist cables shall be connectorized for connection to the power and control distribution box.
4. The hoist shall be suspended from the structure as shown on the drawings.
5. All mounting hardware and structure is under this contract.
6. Hoisting Capacity

    a. The safe working load (SWL) of the hoist shall be as listed above; this capacity shall not be reduced due to the weight of the hoist, batten, or wire rope.
    b. During the commissioning and acceptance testing phase, this hoist shall be capable of lifting 25% more than the SWL without substitution of any components. See “Commissioning and Training”.

D. Lift Lines:

1. This information defines the number of wire ropes that will be attached to the hoist drum, the drum must be sized to accommodate the full travel, plus three dead (safety) wraps and space for two unused wraps for each of lift line. The termination of each wire rope shall be by compression sleeve that hold the wire rope firmly to the drum.
2. Note: the total length of each lift line is a function of the travel distance and the distance from the hoist to the attachment point for the batten.

E. Travel Distance:

1. The travel distance shall be as detailed in the drawings.

F. Limits:

1. The hoist shall be capable of being stopped at any point between its initial up and initial down limits.
2. The hoist shall have the following hard struck limit switches

a. “Ultimate up” hard struck Limit
b. “Initial up” hard struck limit
c. “Initial down” hard struck limit
d. “Ultimate down” hard struck limit

3. The initial hard limits, both up and down, stop the hoist from traveling but allow the operator to drive off the initial limit. The ultimate hard limits, both up and down, initiate an E-stop in which power is removed from the motor drive after a fast deceleration.
4. In all cases proper over travel must be provided in the hoist design to accommodate a failure of the control system. The hoist must come to a complete stop after striking an “initial up” or “initial down” limit without striking an “ultimate” limit. If the “initial limits” fail to function, the hoist must come to a complete stop before striking an immoveable object as the result of striking an “ultimate” limit.

G. Brake:

1. The primary brake shall be cable of stopping and holding 200% of the hoisting capacity. Each brake shall be spring or torque applied, fail safe, electromagnetically or torque released.
2. The secondary over speed brake shall be on load side of hoist drive-train. Secondary brake shall be mechanically coupled to wire rope drum with as few connections as possible.

H. Telemetry

1. The telemetry, i.e. position, of the moving element connected to the hoist shall be determined by the feed-back of, at minimum, a single encoder. This encoder shall be capable of accurately positioning the moving element. Belt driven encoders are not acceptable.

I. Load Detection

1. The hoist shall be provided with a “load cell” device that is capable of determining the load which has been added or removed from the system. This device shall be integrated into the control system and each hoist shall be able to “learn” its load, as a safeguard against unintentionally overloading or under-loading the hoist.
2. The control system must stop the motor drive if the system load changes by more than ±3%.
3. In no case shall the system allow movement if the SWL is exceeded.

J. Slack Line Detection

1. The hoist shall be provided with a ground bar or limit switches, one per each lift line, which initiate an E-stop if any of the lift lines becomes slack.

K. Power and Control Distribution

1. Each hoist shall be connected to electrical power via an cable extending from the rear of the hoist to the source outlet in the power and control distribution box. (coordinate with Electrical Contractor).
2. The control circuit shall be attached to the hoist via a separate control wire and shall be connected at the hoist and at the power and control distribution box.
3. The receptacles shall be installed in a sheet metal junction box and shall include a power and control outlet.
4. The distribution box shall include a 3-phase motor rated breaker sized for the operating horsepower of the motor.
5. The wiring and connectors shall be barriered between high and low voltage.

6. The Power and Control Distribution box shall be UL listed.
7. Control wiring terminations shall be made via an IDC style connector.
8. Hoists shall connect to the control panel via a single CAT-5e style cable.
9. The Control Panel shall operate on low voltage power supplied via the control cable that connects the control circuit to the power and control distribution box.
10. A centralized contactor cabinet with individual multiple wire connecting to each hoist shall not be acceptable for this installation.

L. Lift Lines:

1. Oil-free, zinc coated, 1/8", 7x19 aircraft cable. 2,000 lbs. minimum breaking strength, two per lift line.
2. Connection at structure by:

    a. Attachment bracket with 6” of take-up.
    b. Wire rope thimble
    c. Compression sleeve installed as per manufacturer's recommendation.
    d. Dress cable ends by clear heat shrink tubing.

3. Adjust lengths of lift lines to trim batten parallel to stage floor at low trim height as indicated on the Drawings.

M. Single Pipe Battens

1. Provide single battens complete with couplings, connectors and fittings as indicated on the Drawings. Pipe to be of extruded aluminum with a 1 7/8” outside diameter with a vertical internal stiffener web.
2. Batten sections shall be secured with internal sleeves.
3. Batten ends to be covered with yellow vinyl caps to protect individuals from contact with cut ends.
4. Battens to be anodized black.

N. Cable and Management System

1. The cable management system shall contain and protect the hoist power and control cables and Lighting system power and data cables.
2. The two pairs of cables shall be supported within a helix style cable management system. The helix system shall be a series of steel ribs connected to each other with nylon straps and supported from the building structure.
3. Cable Requirements:

    a. Cables to have basket weave strain relief as indicated and/or required.
    b. Cables to have neoprene bushing to terminal boxes as indicated and/or required.
    c. Cable to be black in color.

4. Hoist power and data cables:

    a. Hoist power and data cables shall be supplied with factory-installed connectors at each end to mate with the power and control distribution box and hoist.

5. Lighting power and data cables:

    a. Lighting Power cable

1) Shall be multi-conductor SO cable
2) #12 AWG, 14 conductors
3) No common neutrals.
4) Coordinate required quantities with Section 116163 contractor.

b. Lighting Ethernet data cable

1) (1) Heavy duty Ethernet cable with Neutrik Ethercon connector on one end and RJ-45 connector at other end.
2) Acceptable Products:

a) TMB ProPlex, Lex Products PowerFlex, or equal.

6. Each end of each cable shall have additional length and bare ends for termination by Division 26 into ceiling terminal box and batten mounted plugging box provided under Section 116163

a. At batten end provide 5'-0" of additional length
b. At ceiling end provide 10'-0" of additional length

2.9 RIGGING CONTROL SYSTEM

A. The Rigging Control System shall be an advanced automated controller of motorized scenic elements. These elements shall include, but not be limited to the various types of hoists specified herein.

B. The Rigging Control System shall enable the coordinated controlled movement of individual elements as specific prerecorded cue sequences, coordinating groups of elements moving simultaneously or in predetermined sequences as well as the direct control of elements for performance set-up and service.

C. System shall detect load imbalance over or under predefined load and shall cause the system to go into Category 1 E-Stop condition. The system must trigger a Category 1 E-Stop on load imbalance detection of not more than 5% of the predefined load.

D. Provide all necessary contactors, relays, protective devices, motor starters, motor drives etc. in NEMA enclosures for installation by Division 26.

E. Microprocessor controls and drives shall utilize a non-volatile memory. System configurations, operating parameters, presets, etc. shall be retained during power failure.

F. The Rigging Control System shall utilize the latest technology; however it must be a proven system with existing installations that have performed without incident per these specifications for a minimum of 5 years. Prototype systems will not be considered.

G. Functions

1. Provide fixed speed control of individual motors.
2. Provide monitoring for counterweight sets
3. Provide digital two-way communication between the control console and motor control elements. This communication must include feedback loop information, E-Stop information, position information, error information as well as all other vital system statistics.
4. Control via plug-in handheld console as described herein or local control at hoists. All features must be available on the handheld console.

5. System must continually monitor and control all safety functions including but not limit to, E-stop, cross groove detector, over current, over temp, over load, and over speed and other critical safety functions.

H. Console

1. Self-contained wall mounted console that shall contain all requisite control processors with redundant elements necessary for complete operation.
2. All necessary switches, back light pushbuttons, display screens, etc to perform all functions called for herein from this single console.
3. Console shall include the following:

    a. Enclosure of formed steel and machined aluminum, finish black, scratch-resistant, power-coat paint.
    b. Independent Emergency Stop (as part of separate E-Stop system).
    c. Hold-to-Run switch on console.
    d. Security access via PIN.
    e. Menu selection keys.
    f. Touchscreen panel display.
    g. Emergency control in event of graphic failure.
    h. Alarm signal of vital functions.
    i. Auto selection and monitoring of line input power.
    j. Auto fault detection of power supply inputs.
    k. Playback modules for independent and/or group function control

4. Console shall be:

    a. ETC Rigging – QuickTouch Preset
    b. Remote Enable Pendant with 50 ft long cable

5. System Computer

    a. The computer architecture and all central processing for the control system shall be contained in the handheld console and shall be a specifically designed for controlling stage movement machinery. The computer shall utilize multi-processing architecture and interact with the remote control elements described herein.
    b. Computer shall be configured to allow performance upgrades and "fixes" via software, without replacement of non-defective hardware.
    c. The computer shall issue control commands to the hoist electronic motor drive modules via an industry standard control protocol i.e. Ethernet – Cat 5 UTP, SIMOLINK or ProfiNET by way of a cable plant established for this sole purpose.

6. Network Communications

    a. Data distribution networks shall link the handheld console, remote plug-in receptacles, dedicated wall panels and the motor control racks if specified herein.
    b. Ethernet (IEEE 802.3i) 100Base-TX, category 6 latest version of communication protocol.
    c. Integrated motor control shall be via a SIMOLINK or ProfiNET.

7. E-stop Enable Network

a. In addition to the data networks listed above, there shall be a low voltage VDC logic signal network called "e-stop-enable". This system shall run independently of the rigging control system. Failure of the rigging control system shall not disable this E-Stop network.
b. The e-stop enable network is continually active. In the event of an E-stop activation this network shall discontinue the operation of ALL moving elements.
c. Failure in this network shall cause the electronic motor control modules to cease operation. No motor element shall function unless the E-stop enable network is active.
d. An individual E-stop device shall have dual /redundant contacts and have a high mean time before failure rate.

8. E-Stop device

a. The panel shall have on the front an "E-Stop" mushroom push button which shall activate the E-Stop system.

2.10 PROSCENIUM SAFETY CURTAIN

A. General

1. Proscenium Safety Curtain shall comply with the following:

a. International Building Code Section 410.3.5 "Proscenium Curtain"
b. ANSI E1.22, "Entertainment Technology - Fire Safety Curtain Systems"
c. NFPA 80, Chapter 20, "Fabric Fire Safety Curtains"
d. Additional requirements of this specification where those requirements exceed the Code.

2. The safety curtain shall be a single non-asbestos fabric panel, motor operated, with fusible link and break-glass release emergency operation.
3. The curtain shall be made of noncombustible materials constructed and mounted so as to intercept hot gases, flames and smoke and to prevent glow from a severe fire on the stage showing on the auditorium side within a period of 20 minutes.
4. The curtain shall be so constructed as to withstand horizontal movement or bowing of no more than 2' when subjected to lateral load of 2 lbs. per square foot over the entire area of the curtain.
5. The closing of the curtain shall have an average closing speed of not less then 6" / sec and not more then 24" / sec. The last 8'-0" of travel shall require not less than 5 second.

B. Safety Curtain

1. The safety curtain shall be fabricated from a non-asbestos coated curtain fabric made of 100% glass yarns. The weight of the material shall be approximately 40 oz. per square yard and approximately .08" thick. The material shall withstand continuous high temperatures to 1500 degrees Fahrenheit. The strength of the finished cloth in tension shall not be less than 260 lbs per inch warp width and 290 lbs per inch of filling width. The material shall not be affected by bleaches or mildew. The material shall be "Zetex Plus A-1210" as manufactured by Newtex Industries or equal.
2. All strips of fabric to be run vertically for the full height of the curtain; horizontal seams not permitted. Lap seams not less than 1" and sewn with 2 lines of stitching. The fire characteristics of the thread must not compromise the assembly.

3. Fabric at the sides to be turned back and sewn with a 6" flat hem reinforced with 16 gauge painted steel sheet metal on each side of hem.
4. Steel strap curtain guides, with ball bearing trolleys bolted in 3 places each to the side of the curtain, 1'-6" on center.
5. The top and bottom of the curtain shall have a 6-inch flat single-thickness pocket to hold the pipe batten.
6. Yield pad as shown on Drawings. Yield pad of noncombustible material not less than 3" thick to form a seal against the floor.
7. Finished curtain to overlap proscenium rated opening per code at top and sides. Curtain must extend into smoke pockets per code.

C. Pipe Battens

1. Provide pipe battens complete with sleeves, connectors and fittings as indicated on the Drawings. Pipe to be of 2" nominal Schedule 40 black iron pipe as per standard industry practice.
2. Batten joints to be secured with 18" close fitted internal sleeve by (2) 3/8" dia. bolts with lock nuts perpendicular to floor on each side of joint.
3. Battens to be painted with flat black enamel.

D. Smoke Stop and Smoke Pockets

1. The top of the curtain shall have a smoke stop fitted to make it as smoke tight as practicable.
2. The smoke pockets at the sides of the curtain shall be of structural steel shapes and plates not less than ¼" thick. Construction to be bolted, no welding permitted.
3. The smoke pockets shall be not less than 11" deep and 6" wide. The smoke pockets shall be set back from the face of the proscenium arch by at least 6". The smoke pockets shall extend from the stage floor level to a point 3'-0" above the top of the raised curtain and shall be securely bolted to the proscenium wall. Coordinate attachment backing.
4. Details of construction and anchorage to be approved by local building and fire authorities and the Architect prior to fabrication.

E. Curtain Guide Track

1. Provide curtain guide channel track as shown on the Drawings.
2. Track to be not less than 14 gauge steel track with adjustable mountings for attachment to the smoke pocket assemblies.

F. Lift Lines

1. Oil-free, zinc coated, 1/4", 7x19 aircraft cable. 7,000 lbs. minimum breaking strength.
2. Pipe batten connection by:

    a. Pipe clamp
    b. Rated hot dip galvanized jaw/jaw (cotter pin type) turnbuckle with 6" of take-up, lock nuts, lock washers and safety wire mouse (after adjustment).
    c. Wire rope thimble
    d. Compression sleeve installed as per manufacturer's recommendation.

G. Hoist Components

1. Hoist motor shall be properly sized to carry the weight of the safety curtain. The motor shall have a minimum NEMA service factor of 1.25 for continuous operation. The motor shall be totally enclosed and fan cooled. Motor shall be C flange type mount. It shall operate on 3 phase, 208 VAC (confirm voltage with electrical contractor). Brakes shall be an integral part of the motor. Brakes shall be normally closed, direct acting, spring loaded, electrically released, and equipped with a manual release as well. Brakes must stop and hold 200% of the full load torque.
2. Release of the safety curtain by any of the emergency release devices shall cause a hydraulic governor to control the decent of the safety curtain as outlined in 2.5.A.5 above. The hydraulic governor can be used as the primary brake but at no time shall the brake require electricity to hold the curtain in the up position or shall electricity be required to allow the safety curtain to be released and complete its travel. The hydraulic governor shall be an integrated unit - no hoses shall be required.
3. Hoist gearboxes shall have combination helical-worm reducers, directly mounted by a flange to the motor. Gear reducers shall be selected to safely transmit the required power, torque and impact. All gear reducers shall have a minimum service factor of 1.50 and an AGMA load classification of 1. The gear reducer case shall be high-tensile nickel cast iron. The helical gear shall be centrifugally cast bronze, mounted on a cast iron hub. The input and output shafts shall each be supported by two tapered roller bearings. The gears shall run in an oil bath. The shaft bearings shall be provided with double-lip oil seals to prevent leakage. There shall be a drip pan provided under the gearbox.

H. Limit Switches

1. The primary limit control shall be a rotary limit switch connected to output shaft of gearbox. The limit switch shall be driven from the drive train by means of a roller chain or toothed belt transmission. All shaft connections shall be pinned or keyed. Connections using set screws shall not be acceptable.

I. Electronic Controls

1. The electronic controls, mounted in the Production Control Panel as shown in the drawings, shall allow the curtain to go up, down or stop anywhere in its travel. This movement is independent of an “emergency release” situation. At no time shall the electronic controls inhibit the movement of the safety curtain during an “emergency release” situation.
2. It shall be possible to reposition the safety curtain at any location in its travel using the constant contact (hold-to-run) UP and DOWN buttons located on the panel.
3. The EMERGENCY STOP button, mounted on the same panel as the UP and DOWN, buttons, shall be the large “mushroom” type and shall be a true power interrupting disconnect.
4. When using the electronic controls to operate the safety curtain, the time to fully open the curtain shall not exceed 60 seconds.

J. Motor Control Cabinet

1. Provide wall mounted NEMA enclosure mounted at the gridiron level as shown on the drawings.
2. Panel shall utilize forward/reversing motor starter technology.

    a. Starters shall be specifically manufactured as a reversing starter with overload protection and mechanically interlocked to prevent simultaneous forward and reverse activation.
    b. Provide panels with current and thermal overload protection.

3. Provide Emergency Stop “mushroom” button mounted on the face of the enclosure.
4. Provide momentary key switches for local UP and DOWN control of the hoist on the face of the enclosure.
5. The enclosure must fit into the space provided. Field verify all site conditions.

K. Cable Drums

1. Cable drums shall be designed to properly support the required loads without crushing or deformation. Drums shall have integral hubs, which will accept properly sized drum shafts for the transmission of loads and torque from the drive mechanism to the cable drums. Outboard ends of shafts shall be supported by self-aligning pillow block bearings. Drum shafts shall be continuous passing through both hubs and both bearing mounts. The drum hub shall be keyed to the drum shaft with keys, which are properly sized for the shaft diameter, and set-screwed through the hub. The length of the hubs and keys shall be sized for the torsional load on the drum.
2. Drums shall be grooved for the wire rope to be spiral wound. The pitch diameter of the drum groove shall be in accordance with recommendations of the wire rope manufacturer. The groove shall be machined to accept a minimum of 3/8 the rope depth, with 15 degree sloping sides, and spaced for a minimum clearance of 1/32" between cables.
3. There shall be a minimum of three dead wraps. Drums shall carry only a single layer of cable. An angled hole shall be drilled from the root of the cable groove through the drum wall for each cable. The axis of the hole shall be a 45-degree angle to a radial line through the center of the hole. The hole shall be chamfered, free of burrs and of correct size to retain a Nicopress cable retainer as manufactured by the National Telephone Supply Company or other approved connection.
4. All drums shall be machined to at least 63 RMS finish with concentricity to a rotational angle + 1/16".
5. All stepped-down shaft corners and shoulders shall have proper fleet radius.

L. Cross Groove Detection

1. Each cable drum shall be provided with a ground bar or limit switch which initiate an E-stop if any of the lift lines leave their established rope drum groove either due to slack line or cross groove condition.

M. Emergency Release Line (safety line)

1. Provide wire rope safety line with 165°F fusible links. Fusible links to conform to local and state codes.
2. Provide diverter sheaves where safety line changes directions as indicated on the drawings.
3. Provide diverter sheaves with bolted steel side plates and safety line keepers. Keepers must prevent a slack release line from coming out of the sheave groove.
4. Provide secondary mounting steel and hardware for attaching sheaves to structure.

    a. Safety line shall extend across the top of the stage within 12” of the roof support structure.

N. Electro-Mechanical Release Station

1. Provide an electro-mechanical safety line release activated by rate of rise heat detectors and by release of tension in the safety line.

2. Provide switch mounted in the release mechanism enclosure for testing system operation. Activation of release mechanism shall release tension in the safety line and close the safety curtain.
3. The release unit shall incorporate three pulleys to permit its attachment to the safety line at any point and to help prevent accidental release.
4. The release shall contain an integral battery and charger to provide emergency power during power interruptions. The release shall operate from a 120 VAC power source.
5. The electrical safety line release shall be UL Listed.

O. Emergency Release Station

1. Sheet metal enclosure, finished with red enamel paint. Stencil legend "IN CASE OF FIRE BREAK GLASS PULL RED PIN TO LOWER SAFETY CURTAIN" with white paint as indicated on the Drawings.
2. Mounting hardware as is appropriate for secure attachment of release station to proscenium wall. Metal enclosure shall be removable from the proscenium wall without releasing the safety curtain release line.
3. Emergency release line securely attached to steel release plate. Form line over thimble and secure line appropriately.
4. Provide 1/8" thick tempered glass window to cover steel release pull pin. Provide a steel mallet chained to the side of the pull pin box to break glass. Glass to be held in place with screws and clips for ease of replacement. Provide 2 spare panes of glass for replacement.

P. Safety Chains

1. Provide 3/8" welded proof coil chain rated not less than 3,700 lbs proof test or 1,800 pounds safe working load.
2. Anchor to gridiron channels with 3/8" forged eye bolt and shackle.
3. Attach to safety curtain top batten with ring batten clamp and shackle.
4. Adjust length to hold curtain upright at low trim.

Q. Safety Curtain Signage

1. On each side of proscenium, adjacent to the safety line, mount a sign panel not less than 9" high by 12" wide reading "IN CASE OF FIRE BREAK GLASS PULL RED PIN TO RELEASE SAFETY CURTAIN".

R. Approvals Required

1. Provide the Architect with detailed plans and shop drawings for submission to local and State Fire Marshall. Shop drawings will not be released for fabrication until so approved.
2. Completed installation must be operated twice, and adjusted as necessary, for approval of the Architect, Theatre Consultant and local authorities.

2.11 TRAVELER TRACK ASSEMBLIES

A. Provide tracks for the traveler curtains and side masking draperies as indicated on Drawings and schedules. Complete with all necessary accessories (CWANA).

B. Track:

1. Track to be heavy-duty channel type, approximately 3" x 3", 14 gauge steel or extruded aluminum formed to provide parallel double tracks for carrier wheels and totally enclosed except for bottom carrier slot.
2. Traveler tracks for bi-part drapes to be in two sections, with 2'-0" combined center overlap, fitted for manual line operation.
3. Each traveler track section to be a single piece, free of burrs, dents or irregularities. Sections for bi-part track assemblies clamped together by at least 3 lap clamps.
4. Hanger fittings and clamps for attachment spaced at 4'-0" on center maximum.
5. Finish Black.

C. Carriers:

1. Provide one master carrier for each single-section line-operated traveler track.
2. Provide two master carriers for each double-section traveler track.
3. Master carriers to each have 4 paired neoprene wheels with ball bearings.
4. Master carriers to have 2 clamps for attachment of operating line and 2 plated swivels with 6" of usable trim chains for curtain attachment.
5. Single carriers to have 2 neoprene wheels with ball bearing with "hollow center" design to bypass the operating line.
6. Each single carrier to have single plated swivels with 6" of usable trim chain.
7. One single carrier for each 1'-0" of track length.
8. Masking leg track master carrier:

    a. Two paired nylon wheels with ball bearing,
    b. Spring loaded brake with release line. Release line of ¼" braided cotton cord with 3" diameter metal ring at end. Release line to extend from brake to +4'-0" above finished floor.

9. Two plated swivels with 6" of usable trim chain
10. Provide end stacking (rear fold, back pack) devices to stack drapery only at offstage track ends. Provide rubber washers to packing tabs.

D. Traveler Track Pulley Blocks:

1. End pulley blocks heavy-duty type with 8" sheaves turned and grooved for 1/2" operating line. Double vertical sheaves on the live end of the tracks; a single horizontal sheave on the dead end. Housings firmly bolted to the track.

    a. Flying Traveler Tracks: Provide a single 45 degree slanted sheave on the dead end.

2. Floor pulley blocks to have 8" sheaves with sealed ball bearings. Sheaves mounted to slide vertically and clamp in a steel frame with full side plates of sufficient height to permit 9" tension and adjustment of operating line. Base weighted with attached sandbag.
3. All blocks to provide for positive retention of operating cords in grooves of sheaves.

E. Traveler Operating Hand Lines:

1. Each hand line to be a single length, first quality, 1/2" diameter, fiberglass center, braided cotton cord.
2. Rig for curtain operation from the live end of the track.
3. Length of hand line to be adjusted for tension with traveler curtains mounted and trimmed.

F. Products:

1. ADC 280 series
2. H&H 400 series
3. Or equal

2.12 DRAPERIES

A. Main Drape and Border

1. The face material of the Main Drape and Border Draperies shall meet or exceed the following criteria:

    a. 100% Inherently Flame Retardant (IFR) polyester velour
    b. Acceptable products:

        1) Rose Brand 25 oz. “Prestige”
        2) Dazian 25 oz. “Angelo”
        3) JB Martin 25oz. “Dante”
        4) or approved equal

    c. The color shall be custom dyed to match Sherwin Williams - SW 7585 Sundried Tomato.

2. Line with black IFR lining fabric. Tack lining to face material by sewing cording between each face material seam and the lining material at 4’-0” on center vertically. Tack lining to face material hems every 4’-0” on center horizontally in a similar fashion.

    a. Acceptable Products

        1) Rose Brand “Avora Lining”
        2) Rose Brand “Poly Chintz”
        3) Or equal IFR lining fabric

3. Main Drape Construction:

    a. Two panels for bi-part action as indicated on drawings. Each panel finished with 100% fullness, box pleated and sewn down.
    b. Sew with nylon thread. Color to match face material. Thread shall have no apparent sheen with relationship to the velour.
    c. All finish webbing to be black heavyweight polypropylene, unless otherwise indicated.
    d. The center edges of each panel faced back with a full width of fabric plus 1'-0” (minimum) and hand-tacked entire height with continuous catch stitching spaced 4” apart, seizing lining and facing material.
    e. Offstage edges faced back 1'-0”.
    f. Provide pocket for storage of floor block at the offstage edge of the live end of the Main Drape.
    g. Provide a paging handle for the upstage panel of each bi-parting curtain set. The paging handle shall be located on the back face of the onstage side of the panel with the point of attachment located 48” above the bottom of the curtain.

        1) Each handle to be fabricated of a 12” loop of velour face material which is sewn around a core of heavy-duty 2” black polypropylene webbing.

2) Each handle to be stitched to the back of the center edge of the panel and seized in the stitching where the face material is turned back. Sewing for the attachment of the handle shall not be visible on the face of the curtain panel.

h. Box pleats at top of panels 1'-0" O.C. reinforced with heavyweight 3½" polypropylene webbing. Vertical seams to be located so as to be hidden behind pleats.

i. At center of each pleat on main drape, provide 1" cadmium plated rigid eye snap hook attached by nylon webbing strap sewn and riveted through curtain and polypropylene webbing with two rivets. This assembly shall be centered on the webbing. Provide double layer of polypropylene webbing (3½" square) at snap hook locations.

j. 6" double-turned bottom hems with 0.75 lb per foot weighted tape in a separate pocket inside hem. Continuous chain of equal weight, sewn in, acceptable. Weight pocket to be 1" short of finished hem for main drape, equal to finished hem for valance. Ends of weight pockets to be secured with 1½" wide black hook-and-loop fastener for the full height of the pocket opening.

1) Weights shall be shipped separately from draperies and installed in weight pockets in the field.
2) A pull-line or tape shall be placed within each weight pocket prior to shipping. The pull line shall be provided to facilitate installation of weights in the field.

k. Size and quantity as indicated in the Drapery Schedules.

4. Main Border Construction:

a. Entire drapery shall be continuous, finished with 100% fullness, box pleated and sewn down.

b. Sew with nylon thread. Color to match face material. Thread shall have no apparent sheen with relationship to the velour.

c. All finish webbing to be black heavyweight polypropylene, unless otherwise indicated.

d. Offstage edges faced back 1'-0".

e. Box pleats at top of panels 1'-0" O.C. reinforced with heavy weight 3½" polypropylene webbing. Vertical seams to be located so as to be hidden behind pleats.

f. At center of each pleat on valance, provide #2 black oxide finish brass grommets, double grommets at both ends. Center grommets on webbing. Provide double layer of webbing (3½" square) at each grommet.

g. Mark with centerline designation on heavy-duty muslin with permanent markings, sewn securely to webbing. 2" high letters minimum.

h. Provide one 2'-0" black #4 cotton braided tie line at each grommet. Center tie line to be white. Finish ends of tie lines to prevent unraveling.

i. 6" double-turned bottom hems with 0.75 lb per foot weighted tape in a separate pocket inside hem. Continuous chain of equal weight, sewn in, acceptable. Weight pocket to be equal to finished hem for valance. Ends of weight pockets to be secured with 1½" wide black hook-and-loop fastener for the full height of the pocket opening.

1) Weights shall be shipped separately from draperies and installed in weight pockets in the field.
2) A pull-line or tape shall be placed within each weight pocket prior to shipping. The pull line shall be provided to facilitate installation of weights in the field.

j. Size and quantity as indicated in the Drapery Schedules.

B. Stage Masking Draperies

1. The face material of the stage masking draperies shall meet or exceed the following criteria:

    a. 100% Inherently Flame Retardant (IFR) polyester velour
    b. Acceptable products:

        1) Rose Brand 22 oz. “Encore”
        2) Dazian 21 oz. “Da Vinci Velvet Plus”
        3) JB Martin 22oz “ Dante”
        4) or approved equal

    c. The color of all stage masking draperies shall be black.

2. Each panel finished without fullness. Space grommets 1’-0” on center unless otherwise indicated in Drapery Schedules.
3. Black-out drapery to be constructed in two panels for use as traveler. Continuous borders of lengths as indicated on drawings. All legs to be provided in pairs. Single panel masking curtains as indicated in the schedules.
4. Sew with nylon thread or cotton thread. Color to match face material. Thread shall have no apparent sheen with relationship to the velour.
5. All finish webbing to be black heavyweight polypropylene, unless otherwise indicated.
6. Edges of masking legs and the offstage edge of traveler panels are to be faced back with at least 1'-0” of fabric. Edges of borders and tabs with 2” hems. Hand-tack entire height with continuous catch stitching spaced 4” apart.
7. The onstage edge of traveler panels are to be faced back one full width of fabric plus 1'-0” (minimum).
8. Tops reinforced with 3½” polypropylene webbing with #2 black oxide finish brass grommets, 6” O.C.; double grommets at both ends. Center grommets on webbing. Provide double layer of webbing (3½” square) at each grommet at travelers and legs (not required for borders).
9. Masking borders to be marked with centerline designation on heavy-duty muslin with permanent markings, sewn securely to webbing. 2” high letters minimum.
10. Provide one 2'-0” black #4 cotton braided tie line at each grommet. Center tie line to be white on masking borders and tabs. Finish ends of tie lines to prevent unraveling.
11. Bottoms of all floor-length maskings to have 6” double-turned hems with #8 zinc coated chain in separate pocket inside hem. Weight pocket to be 1” short of finished hem for full height maskings and equal to finished hem for borders. Ends of weight pockets to be secured with 1½” wide black hook-and-loop fastener for the full height of the pocket opening.

    a. Weights shall be shipped separately from draperies and installed in weight pockets in the field.
    b. A pull-line or tape shall be placed within each weight pocket prior to shipping. The pull line shall be provided to facilitate installation of weights in the field.
    c. Sizes and quantities as indicated in the Drapery Schedules.

C. Cyclorama

1. Material: White leno cyclorama cloth, fabricated without seams.
2. Finish webbing to be white heavyweight polypropylene.
3. Where the specified height of the cyclorama precludes the use of a single piece of leno, one horizontal seam near the top of the cyclorama will be acceptable.
4. Edges to have 3” double-stitched seams.
5. Top reinforced with 3½” polypropylene webbing. #2 brass grommets and white braided cotton tie lines 1'-0” O.C., double grommets at ends. One yellow tie line at centerline. Mark center of drape on webbing.

6. Bottom to have 4” triple hem. White ribbon ties at 1'-0” O.C. for 1” O.D. pipe batten triple stitched to top of hem. 1'-0” polypropylene webbing sewn into ends of hems with two grommets 4” apart at corners. Provide slots in the back of the hem for installing pipe weight.
7. Provide grommets at sides, 1'-0” O.C.
8. Provide 1” O.D. painted pipe for bottom of cyclorama.

2.13 FABRICATION

A. Fabricate all work in this section in accordance with the Architect’s direction, specifications, approved shop drawings, pertinent project drawings, established trade practices and applicable code requirements.

B. Machine-finish all operating parts to standard trade tolerance, fits and finishes.

C. Carry out shop welding in full accordance with the appropriate sections of the “Specification for the Design, Fabrication and Erection of Structural Steel for Buildings” of the American Institute of Steel Construction (AISC).

PART 3 - EXECUTION

3.1 INSTALLERS / INTEGRATORS

A. To establish comparative standards of quality, the provision of the equipment and services of this section shall be by one of the following contractors:

Blue Sky Integration
6026 Kalamazoo Ave SE Suite 225
Grand Rapids, MI 49508
Tel: (616) 451-9245

Fantasee Integration
6235 Concord Avenue
Detroit, MI 48211
Tel: (734) 699-7200

Tobins Lake Sales
8322 Whittaker Rd
Ypsilanti, MI 48197
Tel: (734) 624-0264

Vincent Lighting Systems
36500 Ford Road
Westland, MI 48185
Tel: (800) 922-5356

B. Substitution Limitations

1. Any contractor who wishes to be listed and has not been pre-approved must submit qualification information to the Architect. Proposal shall include all of the information listed below:

    a. Statements of financial responsibility for the past five fiscal years showing assets and liabilities.
    b. List of principal officers and design and service engineers in an organizational structure flow chart.
    c. List of not less than 5 projects of similar size and scope completed within the five years on which contractor has provided full services: product engineering, shop drawings, manufacture, installation and commissioning. In each instance, indicate specifics of scope of fabrication and installation. Include a contact list: name, address and phone numbers of person(s) directly responsible for operation and maintenance of equipment in each facility.
    d. List of current projects and approximate contract value and completion dates. Include list of names, phone numbers and addresses of owner, owner's representatives and architect.
    e. For each above described project, list of names of persons who supervised preparation of shop drawings, manufacture of components, and installation of equipment.
    f. List of names of persons who would do project management, product engineering, supervision of shop drawing, and supervision of installation should this contract be awarded.
    g. Contract Bond Company information indicating that contractor has bonding capacity for full duration of project. Include list of other bonded projects coinciding with this project.
    h. Evidence of ability to undertake custom product engineering to meet specific requirements of project specifications. Provide sample project engineering drawings for custom products and contact information for facility operators where those products have been installed.

2. Standards of Acceptance:

    a. Refer to Paragraph 1.8B - Quality Assurance/Qualifications.

3.2 EXAMINATION

A. Verification of Conditions: Contractor must examine areas and conditions under which the equipment is to be installed and must notify the General Contractor in writing of conditions detrimental to proper and timely completion of work. Work will not proceed until unsatisfactory conditions have been corrected in a manner acceptable to the Contractor.

3.3 INSTALLATION

A. Provide direct site supervision during the installation of electrical work associated with the Theatrical Rigging system elements.

B. Install all work in this section in accordance with the Architect’s direction, specifications, approved shop drawings, pertinent project drawings, established trade practices and applicable code requirements.

C. Install all work securely, complete with all bolts, nuts, washers, clips, fittings, supports, and other items required for proper installation and operation.

D. Position all items accurately as indicated on drawings and true to plumb, line and level. Maintain maximum headroom and clearances at all points.

E. Coordinate work with all other trades to avoid causing delays in construction schedule.

F. All field welding requires prior approval of the Architect and Contractor's Structural Engineer.

G. Carry out approved field welding in full accordance with the appropriate sections of "Specification for the Design, Fabrication and Erection of Structural Steel Buildings" of the American Institute of Steel Construction (AISC).

H. Do all cutting, drilling, tapping and approved welding required to properly install work. Obtain Architect's prior approval for cutting and drilling of existing structural work.

I. Clean structural steel and fabricated steelwork of rust, scale and foreign matter by grinding; prime with 1 coat of primer; finish with 1 coat of first quality machinery enamel free of skips, runs and saps. Touch up all field connections, welds and abraded places with primer and enamel.

3.4 FIELD QUALITY CONTROL

A. The installation of the equipment indicated in this section shall be supervised by qualified personnel who are regularly employed by the Contractor for supervision of equipment installation similar to that indicated herein.

B. Installers must be appropriately skilled and experienced for the type and quality of work.

C. Arrange for all tests and inspections required by the General Requirements.

3.5 SYSTEM STARTUP AND COMMISSIONING

A. Commissioning

1. Upon completion of installation work required by the work of this Section, the Contractor shall perform all required tests and inspections, including but not limited to the Compliance Testing Procedures specified herein.
2. Contractor shall supply all equipment required for the commissioning process including access equipment (personnel lifts, ladders and appropriate protective equipment), test instruments and communications equipment.
3. Contractor shall provide staff to assist in the commissioning process.
4. Compliance Testing Procedures (CTP)

    a. Operate counterweight linesets
    b. Operate safety curtain
    c. Operate drapery tracks
    d. Verify all system motor drive elements. The following represents a sample of the types of testing that will be conducted:

        1) Validation of E-Stop and limit switches
        2) Validation of operational speeds

3) Validation of travel limits
4) Validation of target achievement & repeatability
5) Observe motion during E-Stop Activation
6) Observe motion during instantaneous loss of power (bang stop)

e. Contractor shall coordinate the site so as to ensure testing can be done in a well-lit, clean, safe environment, including barricades to ensure unauthorized persons are not able to interfere with the testing. No temporary wiring or transformers will be allowed during the CTP.

f. Contractor shall provide test weights delivered, manipulated for testing, and removed from site. Provide floor protection as required during CTP.

1) Provide sufficient quantities of weights to test each motor drive element to 125% of capacity.

g. All costs associated with the CTP are the responsibility of the Contractor; this includes items such as equipment necessary to access the hoists to ensure limits and brakes can be tested.

3.6 ADJUSTING

A. Adjust all equipment and components for operation in accordance with the specifications, approved shop drawings and pertinent Contract Drawings prior to the demonstration indicated herein.

3.7 CLEANING

A. Touch up minor abrasions and imperfections as required.

B. Remove from the premises all debris caused by this work. All unnecessary equipment and materials shall be removed from the area(s) of this work upon completion, removed from the job site and disposed of legally at no additional cost to the Owner.

3.8 CLOSEOUT ACTIVITIES

A. Demonstration

1. Upon completion of Commissioning, the Contractor will notify the Architect and Theatre Consultant that the system is complete, conforms to specification and is ready for Demonstration.
2. Installed equipment to be operated for approval and inspected for quality by the Theatre Consultant, the Architect and the Owner.
3. The Theatre Consultant will perform the tests listed in the Compliance Testing Procedures to verify compliance with specifications. For motorized systems, the Theatre Consultant will ask for the CTP to be repeated on randomly selected hoist units during the equipment Demonstration. Failure to reproduce the tests on two of the units will require complete retesting of all units in the presence of the Theatre Consultant.
4. Contractor shall supply all equipment required for the Demonstration, including access equipment (personnel lifts, ladders and appropriate protective equipment), test instruments and communications equipment.
5. Contractor shall provide staff to assist in the Demonstration, as necessary.

6. Adjustments or modifications shall be made as directed by the Architect and the Theatre Consultant.
7. Costs of re-inspection and additional testing by the Architect and Theatre Consultant, if required, due to lack of completion and/or errors and omissions shall be paid by the Contractor. This work will be conducted on a time and materials basis, including the Architect's and Theatre Consultant's standard hourly rates, and shall be scheduled and approved in writing prior to the re-inspection/testing session.

B. Training

1. Following the equipment demonstration, inspection and final adjustments, provide instruction to the Owner's staff or representatives on the safe operation, care and maintenance of the system.

    a. Instruction shall include, but not be limited to, proper general maintenance of the system, replacement procedures for user replaceable parts, and operating procedure to obtain maximum usage of system.
    b. Deliver all copies of approved Operations Manual to Owner prior to first instruction session and review it as part of that session.

2. Motorized Rigging Instruction:

    a. Provide instruction to Owner or Owner's designated staff on the detailed operation of motorized hoists, control elements and associated devices. This training shall take place in two separate sessions.

3. Timing for all sessions shall be scheduled by the Owner at their convenience.
4. Instruction must be by qualified expert operators who have actual experience with systems in performance conditions.
5. All training shall be videotaped, by the Contractor, for the training of future employees and students

3.9 PROTECTION

A. Provide full protection from damage, construction dirt and debris for all equipment from the point of installation to testing and commissioning.

B. Remove all equipment protection and clean components thoroughly prior to the demonstration session.

3.10 MAINTENANCE

A. Maintenance Services

1. One month prior to the end of the first year following the date of final systems acceptance, a factory engineer shall be provided to examine, adjust and repair the equipment included in this section which is found to require warranty work prior to the end of the warranty period. This service shall not cover adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the Manufacturer. All labor and materials which are required to perform this service shall meet or exceed these specifications and shall not compromise the performance of the equipment in any way.

2. Following this inspection and maintenance service, the Contractor shall provide the Owner and Theatre Consultant with a written report itemizing the results of the inspections and the warranty work that was conducted. The Contractor shall also include in this written report recommendations for any corrective actions which the Contractor feels should be taken with respect to the equipment included in this section but are outside the scope of the warranty agreement.

B. System Programming Updates

1. Contractor shall review system operation and control system programming with the Owner's representatives. Any required adjustments and changes to the control system programming requested by the Owner shall be performed and completed during the time of the corrective service site visit. All control system programming changes shall be documented by the Contractor.

C. Maintenance Contract

1. Provide to the Owner an executed yearly maintenance agreement for a total of 5 years. This agreement must include, but not be limited to:

    a. Visual inspection of each hoist and all associated loft blocks, idlers, mule blocks, wire rope, connections, etc.
    b. Upgrade, if available, to the latest release of the software compatible with the existing control system.
    c. Network data distribution inspection.
    d. Re-training of existing personnel and new training of new personnel. This training is to be at the same level or better than the original training.
    e. All material, components, accessories and services required to provide the work as specified herein.

END OF SECTION

SECTION 116163
THEATRICAL LIGHTING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. The work in this section includes Theatrical Lighting (TL) systems and equipment for power distribution and control in the Sexton Auditorium and associated support areas:

B. Section Includes

1. Major Systems and Equipment: furnish and supervise installation of the following major elements and associated accessories:

a. Power distribution system

1) Theatrical dimmers
2) Theatrical and architectural DMX controlled panelboards
3) Emergency transfer panels
4) Theatrical distribution wiring devices

b. Control system

1) Control racks
2) TL network control system
3) TL control consoles
4) Architectural lighting (AL) control systems

c. Theatrical lighting fixtures and accessories

1) LED Source Fixtures
2) Accessories
3) Portable Stage Cable
4) Unpacking, final assembly, addressing, hanging and focusing of fixtures.

d. All elements shown on “TL” Series drawings

2. Work Results:

a. Provide all hardware and software required for a complete and working theatrical lighting system as described herein.
b. Provide fully coordinated and engineered equipment, installation, supervision and commissioning for the following major systems and associated accessories.
c. Provide supervision of Theatrical Lighting Systems low voltage signal cable pulling, termination and testing by the Division 26 Electrical Contractor.
d. Provide coordination of conduit, backboxes and AC power wiring provided by the Division 26 Electrical Contractor.

e. Provide coordination of digital fixture addressing for factory-configured architectural lighting fixtures/drivers provided by the Division 26 Electrical Contractor.
f. Provide factory-trained technician on site to address all digital architectural lighting fixtures/drivers, configure system nodes and electronics, and assist the architectural lighting designer in programming architectural lighting presets.
g. Provide all material, components, accessories and services required to provide the work as specified herein, elsewhere in the project documents and/or as shown on related drawings.
h. Consult and coordinate with other affected work and contractors throughout the course of the work contained herein.

C. Products Supplied but Not Installed Under This Section

1. All equipment shall be installed and terminated under Division 26, except as noted below in paragraph D.1.

D. Products Installed but Not Supplied Under this Section

1. The work of this section includes supervision of the termination of all control wiring in panels and racks. All control cabling related to this section shall be installed under Division 26.

E. Related Requirements

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications apply to this Section.
2. Examine Contract Documents for requirements that directly affect or are affected by work of this Section. A list of those Documents and Sections includes, but is not limited to the following:

a. Division 01 – General Requirements
b. Division 03 – Concrete
c. Division 04 – Masonry
d. Division 05 – Metals
e. Division 09 – Finishes
f. Division 11 – Equipment

1) Section 116133 – Theatrical Rigging

g. Division 12 – Furnishings

1) Section 126100 – Fixed Audience Seating

h. Division 21 – Fire Suppression
i. Division 22 – Plumbing
j. Division 23 – Heating, Ventilating and Air Conditioning
k. Division 26 – Electrical

1) Section 265100 – Architectural Lighting Fixtures
2) Section 266100 – Theatrical Systems Electrical Requirements

a) General requirements for all Electrical work, including installation of system cable trays, terminal cabinets, empty conduit, junction/pull boxes and back boxes for system devices and panels (Division 26).

b) Electrical terminations (AC power and grounding only) to all equipment racks and AC power receptacles (Division 26).
c) Provision and installation of all conduit and back boxes (Division 26)
d) Electrical services and main circuit protection (Division 26)
e) Distribution system equipment (Division 26)
f) Conduit, wire, pull boxes, junction boxes and miscellaneous hardware and components as required for a complete electrical installation.
g) Terminations and testing of system continuity

l. Division 27 – Communications

1) Structured cabling systems
2) At common facility panels, coordinate receptacles for building standard communications systems.

1.2 PRICE AND PAYMENT PROCEDURES

A. Refer to Division 01 - General Requirements for information regarding price and payment procedures.

1.3 REFERENCES

A. Abbreviations:

1. The following abbreviations and acronyms are relevant to this Section and are in addition to those defined in Division 01 – General Requirements:

a. DMX or DMX512: ANSI E1.11 - 2008, USITT DMX512-A
b. NFPA: National Fire Protection Association
c. NEC: National Electric Code
d. UL: Underwriters Laboratories
e. IEEE: Institute of Electronic and Electrical Engineers
f. IESNA: Illuminating Engineering Society of North America
g. ANSI: American National Standards Institute
h. AISC: American Institute of Steel Construction
i. NEMA: National Electrical Manufacturers Association
j. TIA/EIA: Electronic Industries Alliance/Telecommunications Industry Association

B. Definitions

1. The following definitions are relevant to this Section and are in addition to those defined in Division 01 – General Requirements:

a. In all cases where a device or a part of equipment is referred to in a singular manner within the contract documents, it is intended that such a reference shall include all devices required to complete the installation in accordance with the project documents.

b. “Architect”: All references to the “Architect”, Kingscott will refer to the process by which the indicated action or decision regarding the work in this section will be administered. All such actions shall be initiated with or by the Architect, who will disseminate all pertinent information and documents to, as well as coordinate all efforts and site visits with, the Theater Consultant and all other project consultants who may have design responsibility relating to the work in this section.
c. “Theater Consultant”: Apeiro Design, Inc. The Theater Consultant will be party to all actions and decisions regarding the work in this section.
d. “Other Project Consultants”: Acoustical Consultant, Electrical Engineer, Structural Engineer, or Mechanical Engineer as is applicable to a particular issue.
e. “Contractor”: Manufacturer / Installer responsible for the fabrication and installation of the work contained in this section.

    1) Contractors involved with other work shall be indicated with a specific trade preceding the word “Contractor” (i.e. General, Electrical, etc.).

f. "Owner": Authorized personnel representing Lansing School District
g. “Furnish”: Purchase and/or fabricate and deliver to project site.
h. “Install”: Physically install the items in their proper location (s) on the project site.
i. “Provide”: Furnish and install.

C. Reference Standards:

1. Reference Division 01 for general project references and standards.
2. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies will refer to the latest edition of such publications adopted and published prior to submittal of the bid. All such codes and standards will be considered a part of this specification as if they were fully included herein.
3. If an applicable code or standard permits work of lesser quality or extent than this specification, then this specification and the related drawings will govern.
4. Comply with national, state and local codes.
5. Comply with national, state and local labor regulations and requirements.
6. The following standards apply to the work of this Section. It remains the Contractor’s responsibility to confirm and comply with all industry standards that are applicable to the work of this Section.

    a. Underwriters Laboratories

        1) UL 924
        2) UL 1008

    b. Institute of Electronic and Electrical Engineers

        1) IEEE 802.3i
        2) IEEE 802.3u
        3) IEEE 802.3z
        4) IEEE 802.3ab
        5) IEEE 802.3af
        6) IEEE 802.3at

    c. Illuminating Engineering Society of North America
    d. American National Standards Institute

1) ANSI E1.11 – 2008, USITT DMX512-A
2) ANSI E1.17 – 2010, Architecture for Control Networks
3) ANSI E1.20, Remote Device Management over DMX512 Networks

e. Electronic Industries Alliance/Telecommunications Industry Association

1) ANSI/TIA/EIA 568-A

a) Category 5e Standard

2) ANSI/TIA/EIA-568-B

a) Category 6 Standard

f. American Institute of Steel Construction

1) Specifications for the Design, Fabrication and Erection of Structural Steel Buildings

g. National Electrical Manufacturers Association

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. The Contractor is required through drawings, memos and meetings to properly coordinate the work with the other sections as necessary to complete the work of this section.

B. Pre-installation Meeting:

1. Refer to Division 01 - General Requirements for information regarding pre-installation meeting with the General Contractor.

C. Sequencing:

1. The installation of the equipment in this section shall be coordinated with other work which may be in conflict with or which must be completed before the work under this section may be installed, including:

a. Installation of associated electrical work (see Electrical Drawings)
b. Installation of HVAC work in ceilings (see Mechanical Drawings)
c. The installation of the electromechanical systems equipment, panels and devices shall not occur until all painting in the area has been completed.
d. Electromechanical and electronic equipment installation shall proceed after environmental site conditions are met. Refer to paragraph 1.10-B for class requirements.

1.5 ACTION SUBMITTALS

A. All submittals shall be submitted in accordance with Division 01.

B. All submittals shall be submitted in a timely manner, allowing sufficient time for adequate review and possible resubmittals without jeopardizing project schedule.

C. Submittals will be reviewed, accepted and field dimension verified prior to proceeding with the fabrication of the work in this section.

D. All submittals shall leave space available for review stamps and comments.

E. Provide insurance against loss or damage during shipment. Furnish certifications of such coverage to the General Contractor not less than 60 calendar days prior to the shipment of any equipment.

F. Review all pertinent project Contract Documents. Following this review, provide to the Architect and General Contractor any additional information required to make a fully functioning system. In addition, the Manufacturer shall indicate the maximum accepted wire size as it relates to termination points on their equipment.

G. Verify wire type, count and routing for all required data wiring between all components to allow for proper conduit sizing and routing by Division 26. Verify and coordinate all line voltage power input required by systems components that shall be provided under Division 26.

H. Product Data:

1. Where standard manufacturer parts are used, submit current product literature describing component, manufacturer's recommended applications, load ratings, safety factors and dimensions. The data shall include all information which indicates compliance with the specifications herein.
2. Clearly indicate specific component and applicable options.

I. Shop Drawings

1. Provide shop drawings in PDF format with sheets sized so that drawing elements are appropriately scaled and easily read.
2. Include a cover sheet with a drawing index including the sheet number and title for each sheet in the set.
3. Provide complete, fully dimensioned, large-scale detailed drawings of all major components.
4. Provide requisite schematics, plans and sections indicating assembly and installation of components.
5. Provide indications by arrow and boxed caption of all variations from contract drawings and specifications, except where variation is indicated as acceptable.
6. Provide detailed one-line riser diagrams and installation circuit diagrams indicating all control and/or data electrical requirements and point to point connections. These shall be provided within 30 days of Contract Award.
7. Provide sample architectural lighting touchscreen page layouts and functional narrative in initial submittal for review. Provide final layouts four weeks prior to system demonstration.
8. All custom elements shall be engineered. Provide approved drawings stamped by a Professional Engineer licensed in the project jurisdiction. The engineer shall verify that the equipment supplied under this section meets or exceeds the design criteria of this specification.
9. Provide a full Bill of Materials to be supplied, including quantities, manufacturers, manufacturer's part numbers, reference to applicable drawings, etc.

J. Samples

1. Submit sample items including, but not limited to:

    a. Panel engraving or silk screen
    b. Distribution device circuit label showing attachment method.

2. Additional samples must be submitted within 14 days of Architect's written request.

K. Source Quality Control Submittals

1. The Contractor shall supply as part of the submittal process the following Source Quality Control documents:

    a. Serial number of equipment tested
    b. Serial number of any component device(s)
    c. Batch number of major components
    d. Name of person conducting the test
    e. Date the test was conducted
    f. List of mechanical tests conducted
    g. List of electrical tests conducted

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents:

1. Submit documents in accordance with Division 01 – General Requirements.
2. At the time of acceptance testing, submit three (3) hard copies and PDF format electronic files of parts lists and maintenance instruction sheets.
3. Within 60 days of the acceptance testing, submit one (1) hard set and PDF format electronic files of "as built and approved" drawings showing all equipment as installed. These drawings shall include all adjustments made during the checkout process.
4. Submit operation and maintenance manuals with the "as built and approved" drawings. Each manual shall be bound in an individual binder with the project name on the front cover and system identification on the spine. Included with binder shall be a PDF format electronic version of the manual materials on a portable storage device. The manuals shall include:

    a. Complete parts list for all equipment and telephone numbers for the authorized parts and service distributors.
    b. Instructions as to the safe operation for all equipment.
    c. Recommended maintenance schedule for component parts that may need periodic replacement or maintenance.
    d. Recommendations for cleaning, maintaining and touch-up of all finished surfaces.
    e. Where specific elements do not require manuals, instruction sheets as to care and handling shall be provided.
    f. Warranties as required herein.

B. Maintenance Contract

1. Refer to 3.10 – Maintenance.
2. Submit maintenance contract proposal for Owner and Theatre Consultant review no later one month prior to substantial completion.

C. Submit verification that all punch list items have been rectified. Such written verification will be required for project closeout and initiation of the warranty period.

D. The record documents shall be reviewed by the Architect and all modifications to the documents stemming from this review shall be made as required.

E. Above submissions are required as a condition for final approval of the work.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts:

1. Furnish a package of spare parts for all user serviceable portions of the theatrical lighting system equipment:

    a. Furnish 10% of total quantity of each type of small component or part in system as spare parts (minimum of one). Package may include connectors, bulbs, fuses, knobs, switches, and other miscellaneous parts, in addition to any spare parts specifically listed in individual product specifications.
    b. Label all spare parts with Manufacturer's part number, designation and description, and location(s) where used.
    c. Furnish durable, clearly labeled storage containers for all spare parts, including special anti-static containers for electronically sensitive parts.
    d. Furnish five (5) 16GB USB flash drives or other appropriate data storage medium.

2. Provide unit price for recommended package of parts.

B. Extra Stock Materials:

1. Deliver stock of maintenance material to Owner. Furnish the following to match those installed and taken from the same production run, packaged with protective covering for storage and identified with appropriate labels:

    a. Furnish spare dimmer modules (minimum of two, or in quantities as listed in Appendix A) for each type of installed dimmer module in the system.
    b. Furnish one spare node or complete internal components of each type of installed node in the system. Spares of portable nodes are not required.
    c. Furnish 5% circuit breakers (minimum of one) of each size in the system, including automated circuit breakers.

1.8 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Refer to Division 01 – General Requirements.

B. Qualifications:

1. Manufacturers

a. The Manufacturer shall own and operate their own manufacturing facility for the fabrication of theatrical lighting distribution and control equipment and be regularly engaged in the fabrication of such equipment. Fabrication of such equipment shall comprise no less than 90% of the Manufacturer's business.

2. Installers / Integrators

a. The systems and equipment under this Section shall be provided through a single pre-approved Contractor who is a factory authorized dealer, integrator and servicer of all of the equipment specified herein and meets the following requirements.
b. The Contractor shall maintain a full-time Manufacturer-trained and certified field engineering staff of at least two people available within 4 hours travel of the project location on an emergency basis. Staff shall be employed by the local authorized dealer and trained in electronic lighting control systems and Ethernet systems services.
c. The Contractor shall have been continuously engaged in the integration and installation of theatrical lighting equipment for no less than five years and shall have provided complete engineering and installation services on a minimum of five projects of similar scope and complexity in the past five years.
d. Project Manager: The Contractor's Project Manager shall be qualified and have experience in projects of similar size and scope. The Project Manager shall have binding authority to represent and act for the Contractor and Manufacturer of this equipment. The Project Manager shall be the primary conduit for all information between the supplier of this equipment and the General Contractor. All information given to the Project Manager shall be considered as given to the Contractor.
e. The Contractor shall have, at the time of bid, a current contractor's license and shall know, understand, and have the required documentation to work in the State of Michigan. This license shall be maintained throughout the course of the work of this contract.

C. Contractor is responsible for proper installation, operation and safety of all component equipment.

D. Contractor is responsible for the complete integration and engineering of all systems described herein. Contractor shall confirm project details and, if necessary, suggest modifications to the criteria established herein in order to maintain the design intent.

E. Errors and omissions within the Contract Documents shall not relieve the Contractor and the General Contractor of the responsibility for providing a properly functioning installation of the system as described herein.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage and handling shall be coordinated with the General Contractor and shall meet all requirements described in Division 01.

B. Packing, Shipping, Handling and Unloading

1. All equipment shall be appropriately and substantially packed for shipment.
2. All equipment containers shall clearly indicate the equipment contained, "front", "top", "fragile", the project name, and theatre site allocation. Include packing and shipping lists for each container.

3. All shipping costs to the job site are the responsibility of the Contractor. The shipping method/company is at the total discretion of the Contractor in order to meet the published project schedules.

C. Acceptance at Site

1. Coordinate responsibility for acceptance of material and equipment at job site with the General Contractor.
2. The Contractor shall be responsible for acceptance of the Theatrical Lighting System components at the job site, confirming that all quantities and counts are correct and for keeping accurate logs and records of such information.

D. Storage and Protection

1. Upon delivery, the materials shall be stored under cover in a clean, dry and secured location, off the ground. Delivered materials which are damaged or otherwise not suitable for installation shall be removed from the job site and replaced with acceptable materials.
2. Replace, at no additional expense to the Owner, all equipment and materials which are damaged or lost during storage or handling.

1.10 SITE CONDITIONS

A. Existing Conditions

1. Verify all conditions at job site. Promptly report variations and obstructions to the Architect. All additions and/or corrections are to be requested prior to fabrication.

B. Environmental Requirements

1. Equipment is classified according to its susceptibility to construction conditions that may affect its operation. Classes shall be defined by the following paragraphs:

a. Class 1:

1) Cable and distribution apparatus, structural elements, electrical back boxes, faceplates, terminal boxes, and empty equipment rack frames may be stored in weather protected spaces under "normal" construction site conditions provided that no electronic components are contained within devices, storage boxes are sturdy and well-sealed, and equipment is protected with imperforate inner plastic sheeting.
2) Contractor may install this class of equipment in weather-protected spaces under "normal" construction site conditions provided that equipment is protected from dust and moisture by sturdy imperforate plastic sheeting and completely covered with corrugated cardboard held securely in place by duct tape. Cardboard covers shall not be removed until area is broom cleaned. Under no circumstances shall equipment remain uncovered overnight during installation or while work which causes high dust or moisture levels in area of placement is taking place.

b. Class 2:

1) Control panels, spare parts, test and other equipment (except as listed under Class 3) not subject to damage by concrete dust or dirt shall be stored and protected per Class 1 devices.

2) Contractor shall not install equipment in this class until area of installation is broom cleaned, "blown" clean with pressurized air, mopped, air conditioned and secure. Contractor may install control panels with electronic components under Class 1 conditions, but electronic components must be removed and not installed until area of installation meets Class 2 conditions.

c. Class 3:

1) Control consoles, filled equipment racks and other electronic equipment shall not be shipped to site until the rack and control rooms are finished, air conditioned, dust free, broom and mop cleaned, secure, and in all respects complete and ready for occupation.
2) This class of equipment shall not be unpacked until the system is complete in all other respects. Under no circumstances may any equipment in this class be removed from the rack and control rooms into or through spaces which are not cleaned, air conditioned, and complete.

C. Field Measurements

1. Field measurements must be taken prior to preparation of final shop drawings and prior to fabrication to ensure proper fitting of work. Allow for adjustments during installation whenever taking field measurements.
2. Should field measurement of site conditions alter the design or installation of system elements from the approved shop drawings, revised shop drawings shall be reissued for review.

1.11 WARRANTY

A. Comply with the warranty requirements of Division 01 and the following.

B. The Manufacturer shall warrant materials and workmanship of systems and equipment installed as free of defects. The Manufacturer shall guarantee in writing the repair or replacement within 14 days of any item found defective during a period of two (2) years following date of final acceptance. Ordinary wear and defects due to improper usage are excepted.

C. The Contractor shall warrant the workmanship of the installation services provided under this Section for a period of two (2) years following the date of final acceptance. Ordinary wear and damage due to improper usage are excepted.

D. During the warranty period, all emergency conditions where systems failures may be hazardous or may cause severe hardship or cancellation of performances shall be responded to within 24 hours. Immediate action shall be undertaken to ensure the safety of the audience and the performers.

E. During the warranty period, for each product that uses software, furnish manufacturer’s software updates to the Owner for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. To establish comparative standards of quality the systems and equipment described herein shall be furnished by the manufacturers listed herein and in Appendix A.

1. Manufacturers shall provide the Warranty and Maintenance services specified herein as applicable to their products.
2. Manufacturers shall engineer, design, produce shop drawings and fabricate all custom equipment required in this section.

2.2 SYSTEMS DESCRIPTION

A. The Auditorium shall contain the major system components as listed below and as shown on the TL-series drawings.

1. Power Distribution System

    a. Theatrical Dimmer Racks and Modules

        1) Installed dimmer racks with flexible configuration dimmers with bypass

    b. DMX controlled panelboards

        1) 120V 20A single pole circuit breakers feeding receptacles for 120V lighting fixtures, including LED source fixtures with on-board dimming.

    c. Emergency transfer panels
    d. Dimmed and switched power distribution devices

        1) Installed plugging boxes

2. Control System

    a. Control Racks
    b. Network data system

        1) Network components
        2) Network cabling
        3) Network connection devices
        4) Network computers
        5) Wireless network

    c. Theatrical lighting control consoles and peripherals
    d. Architectural lighting control system

        1) Architectural processors
        2) DMX bypass for LED source house lighting
        3) Architectural lighting control panels

3. The Theatrical lighting fixtures and accessories

    a. LED Source Fixtures

        1) Profile spotlight fixtures
        2) Wash fixtures
        3) Cyclorama fixtures
        4) Utility fixtures

b. Portable Stage Cable

1) Power extension cables, two-fers and adapters
2) DMX extension cables and terminators
3) Network extension cables

B. The systems shall be professional theatrical lighting systems complete with all necessary accessories to provide control, dimming and switching of incandescent and LED theatrical lighting fixtures via a network of power and both wired and wireless data distributed through each space included in the work of this section.

C. The control system shall be ACN, RDM and DMX compatible, operating over a TCP/IP network using Cat 5e cabling.

1. Data shall be provided via theatrical lighting console, architectural lighting processors and control panels, and wired and wireless remote devices. Data shall be input to the network via direct network connection or via DMX input nodes.

a. All input devices shall exist as network devices with distinct IP addresses capable of addressing any endpoint device on the network based on the properties defined by the master console.

2. Data shall be distributed over the Ethernet network to installed DMX nodes Data shall be converted to DMX at the nodes for use by endpoint devices.
3. The system shall provide PoE via endspan network switches compatible with the specified DMX nodes.

D. State of the Art Development

1. The Contractor shall furnish only the manufacturers' latest developed appropriate products. In cases where product development from a specified manufacturer surpasses the criteria of this specification, the Contractor shall inform the Architect and make the newer product available to the Owner for acceptance. In no case shall discontinued or obsolete equipment be acceptable. Should a newer product be suggested as a substitution for a discontinued product, or for a product that is in process of being phased out of production, that newer product shall be offered to the Owner at no additional cost.
2. Should product recall by the Manufacturer require temporary or permanent replacement of a product specified under this section, the Contractor shall notify the Owner at the earliest reasonable time and shall arrange to replace the product in question at the earliest possible time.
3. Equipment found defective or subject to recall prior to scheduled installation shall <u>not</u> be delivered to the job site.
4. Equipment defect or intended recall shall not relieve the Contractor from his contractual obligation with regard to delivery schedule of product. In this circumstance, notification shall be made to the Architect by express carrier. Arrangement for alternate product shall be made at this time.
5. Under no circumstances shall arrangement for alternate product necessarily require the Owner to accept superseded equipment except on a temporary basis.

E. Substitutions

1. All requests for variations from the specified materials and products will be reviewed by the Architect according to the procedures outlined in Division 01.

2. All requests for substitutions must be submitted in a timely manner, so as not to adversely impact the project schedule.
3. Substitutions will only be accepted if, in the opinion of the Architect, the product is an equal to the specified product. No substitutions may be made without written acceptance from the Architect. All substitutions made prior to this acceptance are at the sole risk of the Contractor.
4. A substitution must be a product of equal design, construction and performance. The Contractor must submit all pertinent information required to substantiate that the product is equal. The Contractor must submit all additional information, including test data, which may be requested in order for the Architect to fully evaluate the substitution. The burden of proof is solely on the Contractor.
5. All additional expenses of any kind with respect to substitution(s) shall be borne by the Contractor. This shall include, but not be limited to, all fees and expenses incurred by the Architect and other related Consultants for evaluation of the substitution and subsequent integration into the project should the substitution be taken and/or additional costs of other contractors related to the substitution(s).

2.3 MATERIALS

A. All equipment and components shall be new and complete. No used or reconditioned equipment shall be acceptable.

B. All mounting hardware shall be included.

1. All bolts and fasteners required to mount equipment to mounting hardware must be Grade 5 or better.

C. All equipment and components shall be factory tested prior to shipping.

D. All bolted attachments shall have lock washers or other approved self-locking hardware.

E. All internal wiring shall be factory completed and clearly marked. All field connections shall be by connector, terminal strip or other device specified herein. Any terminal strip connections shall be clearly labeled as to terminal designation.

F. All wire sizes and insulation shall comply with NEC, NFPA and UL standards and all other applicable national and local codes.

G. All control wire counts shall include 10% spares.

H. All microprocessor controls shall utilize a non-volatile memory. System configuration, operating parameter, preset, etc. shall be protected against system power failure for a minimum of 48 hours.

I. System components shall be modular in nature. Individual dimming modules shall slide in and be easily disconnected from power and removed from the rack without disturbing adjacent components and shall require no special tools for these tasks. Control circuitry shall be contained on plug-in printed circuit cards. Plug-in circuit cards shall be individually removable without disturbing adjacent components.

J. All fixed components including dimmer modules, non-dim modules, circuit breakers, and cabinets shall be labeled sequentially for ease of maintenance.

K. No manufacturer’s logo shall appear on control station faceplates or any other device located in public areas.

L. Any supplementary or auxiliary equipment necessary for the operation of the system shall be supplied with overload and short-circuit protection.

2.4 DIMMER RACKS AND MODULES

A. Dimmer Equipment Racks:

1. The entire dimmer rack assembly shall be UL listed. Rack finishes shall be manufacturer's standard baked enamel color.
2. Dimmer rack shall be floor mounted, dead front switch boards complete with all dimmers, control electronics, timers, circuit breakers, and wiring terminations. No external components shall be required.
3. Dimmer slots shall be sequentially numbered and labeled on both sides of the dimmer slots.
4. Each dimmer rack shall be labeled as indicated on the drawings or as listed in dimmer schedules. Engrave and fill or silk-screen labels.
5. Dimmer rack shall be completely wired internally by the Manufacturer. The Electrical Contractor shall provide input feed wiring, load wiring, low voltage wire pulls and individual cabinet disconnects. All terminals shall be clearly and permanently marked and numbered.
6. Dimmer racks shall be constructed of #14 or #16 US gauge cold rolled sheet steel.
7. Provide access panels or knockouts for bottom feed and top load/control wires.
8. All internal components shall be accessible from the front for testing and adjusting while system is operating. No rear access shall be needed for installation or future service.
9. Power distribution shall be by copper buss bars. Aluminum buss bars are not acceptable.
10. Theatrical dimmer racks shall be 120/208 volt, 3 phase, 4 wire, size for minimum 600-amp feeds, as indicated on Division 26 contract documents.
11. Theatrical dimmer rack load, neutral and ground terminals shall accept up to #2 AWG wire.
12. Individual rack disconnects shall be provided under Division 26. Coordinate fault current requirements with the Architect.
13. All internal wiring shall terminate in pressure wire or clamp type terminals for installation of Electrical Contractor's wiring. No wire nuts or crimps shall be acceptable.
14. All wiring provided by the Electrical Contractor under Division 26 shall be individually labeled at both ends of wire and at all splice locations.
15. Each branch load circuit must have an individual neutral to the dimmer cabinet terminals. Common neutrals shall not be acceptable for any load wire from the load to the dimmer cabinet terminals. Clearly note this requirement on all documentation.
16. Standard advertised product dimensions are to be considered maximum and are not to be increased. Reduced sizes are acceptable with prior approval of Architect.
17. Location of dimmer racks shall be as shown on drawings. Provide quantities of cabinets dictated by dimmer quantity indicated herein.
18. Provide requisite ancillary, current modifying, regulating, and monitoring devices required for operation of a complete fully functioning system.
19. Dimming panels may be cooled by free convection without the use of cooling fans or by fans or blowers with screened air inlet and outlet grilles. Regardless of cooling method, dimming panels shall operate within a maintained ambient room temperature range of no less than 32ºF and no more than 95ºF degrees.
20. Provide cabinet overheat sensor and pilot light for each cabinet mounted in face of cabinet. Automatic shut off of the dimming system components shall occur should maximum safe operating temperatures of the cabinet be exceeded. Over heat sensor shall be duplicated to provide remote-warning messages located on the theatrical lighting control console.
21. The interior construction of the entire electrical assembly shall be designed for a minimum standard fault current of 50,000 AIC with the capability for increased protection to 100,000 AIC, if required.

22. Noise generated shall not exceed 55dbc per cabinet, as measured with a Type 2 sound level meter at a distance of three feet from the cabinet in installed dimmer location.
23. The racks shall be mounted on vibration isolation mounts or pads consisting of a neoprene core with steel bearing plate, and a neoprene friction surface. Isolation mounts shall be Mason Industries Type "ND" or as specified by the project Acoustician; isolation pads shall be Mason Industries Type "WMSW" or as specified by the project Acoustician.
24. Dimmer bank shall accept USITT standard DMX512-A protocol digital control signal or Category 5e or greater Ethernet control signal in addition to any proprietary protocol control signal supported by the Manufacturer. Ethernet dimmer rack shall provide two (2) data inputs functioning on a Highest Takes Precedence basis.
25. Selection of signal protocol shall be automatic and shall not require use of mechanical transfer relays.
26. Control signal input of each individual dimmer rack shall be fully opto-isolated from control signal input of any other rack, and fully opto-isolated from any control signal output.

B. Dimmer Modules:

1. Dimmers shall meet all dimming performance criteria as listed in this section.
2. Dimmer electronics shall be completely solid state. Silicon controlled rectifiers shall be used to control AC power supplied to the loads.
3. Dimmers shall utilize two silicon-controlled rectifiers in back-to-back electrical configuration and all required gating circuitry on high voltage side of an integral opto-coupled control voltage isolator.
4. Rectifiers shall be mounted on ceramic substrate and encapsulated along with other components in epoxy-filled high-impact plastic case.
5. All dimmer modules shall be able to operate as "non-dims" with selection of this function through dimmer rack and control console software.

    a. When selected as a "non-dim", incoming control signal level is interpreted as either full on or full off signal.
    b. Level of control signal required to initiate turn-on and turn-off shall be user selectable from 0% to 100%.
    c. Non-dim function shall operate regardless of load type or wattage.

6. Dimmers shall operate properly on 60 Hz, 120 - 140 volts AC input. Dimmer output shall be AC, containing less than 1% DC component. At maximum input signal, the dimmer shall produce a full sine wave. With the input signal at zero, the dimmer output shall be zero voltage at any load with regulation set OFF. Output shall be symmetrical to the zero voltage axis at any control setting prior to any electronic enhancement.
7. Dimmer efficiency shall be at least 97% at any voltage and with any load to maximum capacity.
8. AC voltage control components shall be rated at a minimum of two times the rated capacity of the dimmer and shall sustain a total short circuit for a sufficient length of time to open primary circuit protection.
9. Incandescent dimmers (line and low voltage) shall be capable of hot patching cold tungsten loads up to full rated capacity without malfunction or change in operating characteristics regardless of control setting.
10. Speed of response of system processor modules to control signal changes shall be no more than 25 milliseconds.
11. Dimmer output shall repeat with respect to the control signal input unit value without hysteresis.

12. Dimmers set to equivalent control signals with equal types and amperage of loads shall not vary from one to another by more than one percent (1%) at any place in the control signal range from full-off to full-on. Dimmer response shall not be phase sensitive with respect to control signal. There shall be exact tracking from one dimmer to the next with no variation.
13. There shall be no visible dimming resolution stepping or flickering regardless of length of fade time or control fader settings.
14. Provide protection from overloads, short-circuiting, and transient voltage. Protection devices requiring reset or replacement must be accessible on the face of the dimming module or dimming cabinet.
15. Circuit Breakers:

    a. Provide input fully magnetic circuit breaker(s) mounted on the face of each dimmer module or cabinet faceplate. Provide one input breaker for each individual dimmer within a module (e.g. one for single module, two for dual modules, etc.).
    b. Input breakers must be rated for full load of the dimmer and must trip at 125% of rated capacity. Input breakers shall be rated for a minimum fault current of 10,000 AIC (120V) or 14,000 AIC (277V).
    c. Acceptable manufacturers: Airpax or approved equal

16. Provide dimmers with a ferrous core toroidal filter choke. This filter choke shall suppress lamp filament or transformer hum and vibration, prevent electromagnetic interference in professional quality audio, video, and computer equipment and limit objectionable harmonics. Laminated E.I. or C.I. type chokes are not acceptable.

    a. Rise Time Full Load (Theatrical Lighting Dimmers): Voltage rise time shall not be less than 500 microseconds measured and installed on site at 90 degree conduction angle from 10% to 90% of output wave form with dimmer operating at maximum load.

C. Dimmer Modules with Bypass

1. Dimmer modules with Bypass shall meet all of the criteria for dimmer modules listed above
2. Modules shall utilize the same chassis form as the dimmer modules
3. Modules shall contain two mechanically held relays
4. Each output in the module shall be configurable to operate as a dimmer or a relay
5. Local override switches shall permit full manual bypass of control signal at each output
6. Breakers shall be fully rated at 20 amps
7. Breakers shall be fully magnetic type

D. Dimmer Control Electronics:

1. Control electronics shall use digital electronic circuitry, be microprocessor based, and be designed specifically for the control of dimming systems. All user operated controls shall be low voltage, use Class II wiring and be electrically isolated from power wiring by means of a UL listed Class II transformer. Appropriate analog to digital conversion shall be acceptable provided circuitry is integral to the control system and not a stand-alone component.
2. System configuration, operating parameters, presets, levels and fade times shall be able to be field modified and shall not require components to be returned to the Manufacturer for such modifications.
3. System configuration, operating parameters, presets, levels and fade times shall be protected against system power failure for a minimum of 10 years. The state of the system status upon restoration of power shall be user selectable.
4. The dimmer control electronics may be capable of being addressed by the IEEE 802.3 Ethernet protocol.

a. The dimmer control electronics shall be capable of being addressed by an ACN-compliant transport system for the USITT DMX512-A protocol when any lighting control console utilizing the same protocol is plugged into a DMX In Node.

5. Dimmers shall regulate output voltage to maintain constant output RMS voltage as long as input remains over 120V per phase.
6. Dimmer output RMS voltage versus control input signal shall be consistent with a modified square law curve. The dimmer curve shall be stable and shall not require individual curve adjustment devices. The dimming curve shall be predetermined and shall not vary unless modified through control device software.

    a. Modified square law curve shall provide a more uniform output response to control level changes than a standard square law curve.
    b. Other optional curves shall be available for installation through rack and/or control console operations software.
    c. Field adjustment of dimming curve shall not be required.

E. Provide:

1. ETC Sensor3 AF Racks and ThruPower 500ms rise AF dimmers

2.5 DMX CONTROLLED PANELBOARDS

A. DMX Integrated Relay Panel

1. Panels shall provide remote on and off circuit control utilizing mechanically held relays in a single wall-mounted enclosure with integrated over-current circuit protection.
2. Panels shall support single, double, and triple pole relays, and include control electronics, electronics power supply, and isolated technical ground bar.
3. Panels shall support integral single, double, and triple pole branch circuit breakers, including GFCI breakers.
4. Panels shall support 300W phase-adaptive dimmer modules at any single pole circuit position.
5. All panels and components shall be ETL or UL Listed.
6. Breakers shall be sequentially numbered and labeled with their DMX address.
7. Each panel shall be labeled as indicated on the drawings or as listed in schedules. Engrave and fill or silk-screen labels.
8. Panels shall be no larger than 20” wide x 6” deep x 70” high.
9. Panels shall be constructed of 16-gauge steel with removable knockout panels to facilitate conduit entry. Front panel shall be easily removable for full access to all connections.
10. Panels shall be convection cooled.
11. Panels shall be fed by 3-Phase 4-wire (3-Phase conductors, 200% Neutral), Isolated Technical Ground and chassis ground 120/208 or 277/480 VAC 60 Hz supply.
12. Panels shall have Main Circuit Breaker protection on input feed.
13. All line, neutral and ground terminals shall accept up to 6 AWG wire.
14. The individual relays shall contain mechanically held contacts with ampacity ratings of 20 amps at up to 277AC, as required.
15. Each relay shall have an integral manual override switch with on/off status indication.
16. The relays shall have the following characteristics:

    a. Respond to control changes in less than 25 milliseconds
    b. Rated for a minimum of 100,000 mechanical operations at full resistive load

17. The panel control electronics shall operate on single phase, 120-277V AC 60Hz fed from an included 15-amp circuit breaker. Fault current protection shall be 25,000 AIC @ 120 VAC.
18. The panel shall receive DMX512 control protocol and sACN. Up to two additional control protocols, including 0-10V Dimming, Contact Closure, and DALI, shall be available, as required, via on-board interface or accessory card. Addressing shall be set through a user interface.
19. Panels shall support discrete addressing of each relay.
20. 2,500V of optical isolation shall be provided between the DMX512 inputs and the control electronics as well as between control and power components.
21. A voltage barrier shall be provided to separate line voltage and control voltage sections of the panel.
22. Provide:

    a. Electronic Theatre Controls Unison Echo Relay Panel Mains Feed in configurations and with accessories as listed in Appendix A.

2.6 EMERGENCY TRANSFER PANELS

A. Emergency Lighting Transfer System

1. Provide an emergency transfer system to provide automatic transfer of designated architectural house lighting branch circuits from theatrical system power controls to emergency power upon loss of normal power or activation of fire alarm.
2. The system shall consist of power transfer switches and control circuitry interconnected to provide complete, automatic protection.
3. Refer to Electrical drawings for designation and quantity of emergency branch circuits. Emergency power source to be provided by Division 26.
4. The system shall comply with ANSI/UL1008, ANSI/NFPA 110, and ANSI/NFPA 70 (NEC), including Article 700, 701 and 702 safety standards.
5. System shall provide multiple 20A circuits and be compatible with single or three phase systems.
6. System shall provide continuous monitoring of normal and emergency power in order to activate automatic power transfer.
7. The transfer switch shall be UL 1008 listed, electrically operated and mechanically held.
8. System shall include a normally closed dry contact closure for fire alarm input.
9. Provide:

    a. Electronic Theatre Controls ELTS2

2.7 THEATRICAL DISTRIBUTION WIRING DEVICES

A. General

1. Provide all theatrical distribution wiring devices as indicated on the drawings and as specified herein, for installation by Division 26.
2. Coordinate size of device, orientation of circuits and mounting detail to suit site condition.
3. Device back boxes and faceplates to be sheet metal construction, finished flat black unless otherwise noted. Provide requisite mounting holes, conduit knockouts, etc.

    a. Provide surface mount or custom flush mount back box as required for each location shown on drawings.

b. Standard flush mount back boxes to be provided by Division 26.
c. Provide properly sized faceplate as required for each location shown on drawings.
d. Faceplate shall match edges of back box in surface mount conditions.
e. Flush mounted faceplates shall have chamfered edges.
f. For faceplates located in public areas, the finish shall be per Architect.

4. Receptacles:

a. Stage Pin Connectors

1) All 20-amp stage pin receptacles shall be of the same manufacture
2) Flush mounted female receptacles shall have a screw-driven locking spring to ensure firm fit on face panel
3) Provide:

a) Union Connector 20-2P&G series
b) Rosco 2000 series
c) Bates Connectors

b. 20A Edison (NEMA 5-20R) duplex panel mounted receptacles

1) All receptacles shall be of the same manufacture
2) Hospital Grade to UL 498 Supplement SD
3) Retention force of grounding pin tested to NFPA 99. Retention force shall not be less than 4 oz.
4) Color: Black except where specifically noted otherwise
5) Provide:

a) Leviton 8300-E
b) Legrand/Pass & Seymour 8300-BK

c. 20A Edison (NEMA 5-20R) cord mounted receptacles

1) All receptacles shall be of the same manufacture
2) Hospital Grade to UL 498 Supplement SD
3) Retention force of grounding pin tested to NFPA 99. Retention force shall not be less than 4 oz.
4) Nylon and/or high impact polycarbonate body with screw-open cable gripping jaws
5) Straight body
6) Color: Black and white, black and clear, or clear and white
7) Provide:

a) Leviton 8319C
b) Legrand/Pass & Seymour PS5369XHG
c) Hubbell 8319C
d) Cooper (Arrow/Hart) 8369

5. Provide all wiring devices with either internal terminal strips or exterior terminal boxes for interconnection to the dimming and switched power system. All wiring devices may be internally wired at the factory prior to shipping.

a. Size all terminals as required based on wire sizes indicated on the Electrical Documents.
b. Terminal strips shall be grounded to the device enclosure.

6. Terminal Boxes:

a. Provide terminal boxes factory assembled with numbered terminal blocks for field connection by others, as indicated in the drawings and schedules.
b. All terminal boxes regardless of quantity of circuits shall be the same size.
c. Provide six spare terminals in each terminal box in addition to the spare circuits indicated in the schedules. Provide 4 ground lugs per box. Size all lugs and terminals as required based on wire sizes indicated on the Electrical Documents.
d. Sheet metal construction, finish flat black. Reinforce base of terminal boxes as required to take load from multi-cable.
e. Back box to be clearly labeled with circuit numbers.

7. Labeling:

a. Label each receptacle with appropriate DMX address as indicated on distribution schedule and drawings. Provide additional label for panel / breaker designation for each switched circuit receptacle.
b. All labels to be reverse-screened polycarbonate tags. Tags shall be applied to the device with an adhesive suitable for adherence to a textured, baked enamel finish under high heat conditions.
c. Label pigtails with (2) opposing cloth 1-1/4" high white numerals, vertically oriented and securely fixed under heavy duty clear shrink wrap, 6" above connector. Sole '6' and '9' numerals shall be underlined for orientation.

8. Mounting:

a. Devices shall be surface, flush or recess mounted at locations and mounting heights as called out on drawings.
b. Provide all requisite mounting hardware for installation of devices. Coordinate all device mounting requirements with Division 26.
c. All holes in mounting brackets to have 1" minimum slotted hole to enable adjustment for field conditions. Provide lock washers on bolts.

9. The Manufacturer is responsible for providing all devices to meet all requirements as stated by the National Electrical Code and local code in reference to separation, isolation, and clearances for all voltages specified, as well as terminal sizes for all cable sizes, cable entry sizes, and exit routes and standoff.

B. Plug Boxes with Flush Receptacles - Type 'PBR'

1. Provide plug boxes with flush mounted receptacles as shown on the drawings. See drawings for device locations and distribution schedule for device type, mounting type and circuit quantity.

C. Plugging Strip with Flush Receptacles – Type 'PSR'

1. Provide plugging strips of standard plug batten construction with flush mounted receptacles as shown on the drawings. See drawings for device locations and distribution schedule for device type, mounting type and circuit quantity.

D. Plugging Strip with Pigtails - Type ‘PSP’

1. Provide plugging strips of standard plug batten construction with pigtail mounted receptacles as shown on the drawings. See drawings for device locations and distribution schedule for device type, mounting type and circuit quantity.
2. Pigtail length shall be as indicated on drawings.
3. Provide pigtail of 12/3 ‘S’ or ‘SO’ neoprene jacketed cable with appropriate strain relief.
4. Provide with integral control device panels where indicated on drawings.
5. Provide brackets and hardware for mounting boxes. All holes in mounting bracket to have 1” minimum slotted hole to enable adjustment for field conditions. Provide lock washers on bolts.

E. Flexible Cable Terminal Box - Type ‘TB’

1. Provide junction boxes between conduit and flexible multi-cable feeding batten-mounted connector strips. See drawings for device locations and circuit quantities.
2. All wiring connections shall be internal to the device.
3. Provide feed through wiring terminals with individual circuit labels.
4. Provide with low voltage distribution system compatible with DMX and/or Ethernet protocols, as indicated on drawings.
5. Provide appropriate strain relief at all flexible cable entries.

2.8 CONTROL RACKS

A. Racks shall be 19” standard freestanding or wall-anchored equipment racks, as indicated in the drawings. Enclosure shall provide adequate space for all network components and auxiliary equipment as required.

B. Racks shall be provided with knockouts as required on top, bottom and sides to allow conduit connection as required.

C. In no case shall loose equipment be permanently mounted outside of a protective equipment rack or cabinet.

D. Provide finished, blank panels, complete with rack-mounting holes and hardware as necessary.

E. Label all controls that are contained within this contract as indicated on related drawings or as appropriate. All labels to be engraved and white filled.

F. Coordinate wall backing requirements for mounting wall-anchored equipment racks with General Contractor.

G. Control Rack shall contain network components and auxiliary equipment including but not limited to:

1. Rack Identification panel with rack designation and venue name
2. Task light panel
3. Network switches, patch panels, and cable management, as required
4. Network devices, including network nodes and taps, as required
5. DMX Combine Merger and Splitter Units, as required
6. Architectural processors, as required

7. Uninterruptible power supplies rated to power equipment contained in each rack for 30 minutes
8. Architectural Lighting Control panel
9. Additional Theatrical Lighting equipment as indicated on drawings
10. Control panels and equipment for other theatrical systems (e.g., Rigging) as indicated on drawings. Equipment to be supplied and installed in the rack under the work of the respective sections.
11. Network equipment drawers and storage drawers
12. Blank and vent panels as required

H. Confirm space requirements with other affected contractors in writing prior to fabrication.

2.9 NETWORK DATA SYSTEM

A. Network Components:

1. Network switches shall have the following characteristics and functions:

   a. Switches shall contain (24) auto-sensing ports, supporting 1000BASE-T, 100BASE-TX and 10BASE-T with PoE per IEEE 802.3af or 802.3at as appropriate.
   b. Switches shall be rack-mounted in standard 19" racks.
   c. Switches shall have front panel LEDs that shall report switch traffic, collisions and expansion status. Per port LEDs shall indicate link and partition status for individual connections.
   d. Switches shall have UTP ports on its front face for connecting to nodes and taps via standard 19" patch panel.
   e. Should Ethernet wire runs exceed 300 feet, provide switches with fiber ports equal to the number of fiber runs in the system.
   f. Acceptable manufacturers:

      1) Cisco
      2) Approved equal

2. UTP network patch panels

   a. Provide Category 5e Patch Bay (or bays as required) for termination of Category 5e wire runs.
   b. Provide Category 5e patch cords as required for connection between the patch bay (or bays), switches and Ethernet Power Supply.
   c. Patch bays shall be rack-mounted in standard 19" racks.
   d. Provide 1RU label panel above each patch panel. Label each patch jack with both the identifying receptacle designation and device location description. Legends shall correspond with receptacle panel legends where applicable.
   e. Provide lamacoid designation labels at left and right of the patch panel to indicate reference letter (A, B, C, etc.) of the individual patch panel. Labels mount on the steel rack ears.
   f. Provide rack mounted standard 19" cable management system for each patch panel.
   g. Patch bays and cable management panels shall be finished in a black anodized finish and shall contain black Category 5e connectors as required.
   h. Acceptable Manufacturers:

      1) Hubbell

B. Network Cabling:

1. UTP Cable

a. The copper cabling and connecting hardware must fully comply with the existing TIA/EIA 568B Standard and with the standard installation of Category 5e products.
b. The copper cabling should also comply with the TIA/EIA Category 5e standard.
c. Acceptable Manufacturers:

1) For non-plenum rated applications:

a) CommScope 55N4 Ultra II Enhanced Category 5 UTP cable
b) Belden 1583A

2) For plenum rated applications;

a) CommScope 5504M Ultra II Enhanced Category 5 UTP cable (for plenum rated applications).
b) Belden 1585A

C. Network Services Unit

1. The Network Services unit shall be a microprocessor-based device for automatic configuration, monitoring and management of an integrated lighting network system. The device shall:

a. Communicate with lighting network devices over Ethernet using standard Category 5e cabling and Ethernet switches.
b. Support multiple protocols, including ACN, DHCP, DNS, and FTP.
c. Support real-time logging and notification of system errors.
d. Provide storage of system device configurations.
e. Allow creation of user-defined reports.

2. Enclosure shall include a backlit graphic LCD display for identification and status reporting.
3. Provide with rack-mounting hardware and power supply.
4. Provide:

a. Electronic Theatre Controls Net3 Conductor.

D. Lighting Systems Laptop Computer

1. The lighting systems computer serves as both the Theatrical and Architectural lighting network programming interface.
2. The Computer shall meet or exceed the following specifications:

a. One (1) laptop PC with minimum 14” (1920x1080) display with UHD graphics, minimum Intel Core i5 processor, Microsoft Windows 10 Pro 64-Bit (or latest version of Windows OS) with a minimum of 8GB of DDR4 RAM and 512 GB solid state drive (SSD), USB 3.1 and USB Type C sockets, universal audio jack, HDMI video outlet, 802.11ac triband WiFi and Bluetooth, removable 40-60 WHr battery.

3. The Computer shall include the following:

a. Wired network interface (NIC) socket or USB NIC for direct use over the lighting Ethernet data network.
b. Fifteen-foot Ethernet cable for plug-in to the network receptacle.
c. Ruggedized protective case.
d. Kensington or equivalent lock and cable.

4. Acceptable Manufacturers:

a. Lenovo
b. Toshiba
c. Dell

5. System Software

a. Laptop shall include a Windows OS recovery image.
b. Provide networking software complete with manuals, technical support resources and backup software as required allowing online and offline Owner configuration and operation of all system parameters and configuration settings.
c. Provide Architectural lighting system software as specified herein.

E. Wireless Network

1. Provide wireless access points (WAP) to provide continuous and consistent access to the available lighting network using wireless remote lighting control units and laptop computers.
2. Wireless switches shall comply with the latest IEEE 802.11 standards.
3. Coordinate the Ethernet protocols (and frequencies) with other areas of work (AV, Automation, Administration, etc.) to ensure that the lighting system has its own dedicated secured channels and does not broadcast SSID information that would allow the system to be compromised. Setup MAC address filtering if nearby networks require it.
4. Each space shall have a distinct SSID and shall be secured using WPA-2 security.
5. Provide a wireless network map showing WAP locations, discrete address, and coordination with other wireless networks.
6. Provide external antenna connectors for auxiliary antennas.
7. Provide software to allow management and configuration of WAPs.
8. Wireless access points shall be provided with pipe mounting or other appropriate mounting hardware, power supply and 25’ Ethernet cable.
9. Provide network tap plugging device in quantities and locations as needed to provide full coverage.
10. Manufacturers:

a. Cisco Systems
b. Netgear
c. Or equal

2.10 NETWORK NODES

A. DMX In/Out Nodes – General:

1. DMX In/Out nodes will be located as noted on drawings. Nodes shall be connected via the Ethernet data network on Category 5e wire.

2. DMX In/Out nodes shall be capable of translating Ethernet based protocol into usable signal for output to plug-in peripheral devices employing USITT standard DMX512-A. These nodes shall comply with IEEE 802.3 standards.
3. DMX In/Out nodes shall support Remote Device Management (RDM) protocol.
4. XLR connectors at each node shall be able to be configured to output or allow input for any one frame of DMX512 with normal assignment being sequential. All nodes indicated in the system shall be able to operate simultaneously without data collision or corruption while maintaining recommended minimum and maximum DMX512/RS485 frame length, packet size and refresh rates.
5. DMX distribution over the data network shall be independent of all devices on the system. Regardless of dedicated theatrical lighting devices that may be connected to the various nodes, the DMX distribution system shall be configurable from a PC or other independent control device. The PC or other independent control device shall be provided under this section. Saving and loading of the system configuration to disk shall be supported.

B. Install DMX In/Out Nodes - Type 'EN':

1. Provide nodes with female five-pin XLR connectors within one node box, as shown on the drawings.

    a. Label each receptacle with appropriate designations. All labels to be engraved with white core fill. Provide white acrylic write on surface as shown.

2. Each node shall be powered via its Ethernet connection using Power Over Ethernet (IEEE 802.3af).
3. Devices shall be mounted at fixed locations and wired as indicated on the drawings.
4. Assembly shall have sheet metal back box and faceplate.

    a. Provide flush mount or surface back box and properly sized faceplate as required for each location shown on drawings
    b. Faceplate shall match edges of back box in surface mount conditions.

5. Provide quantities and configurations as indicated in drawings

    a. ETC Response Mk2 DMX Gateway

C. 4-Port DMX In/Out Nodes:

1. Devices shall have (4) five-pin XLR receptacles within one node box.

    a. Provide male XLR receptacles for DMX 'In' ports
    b. Provide female XLR receptacles for DMX 'Out' ports
    c. Label each receptacle with appropriate designations. All labels to be engraved with white core fill.

2. Each node shall be powered via its Ethernet connection using Power Over Ethernet (IEEE 802.3af).
3. Nodes shall be rack mounted in Network racks and wired as indicated on the drawings.
4. Provide quantities and configurations as indicated in drawings and as required for operation of the system as described herein:

    a. ETC Response Mk2 4-Port DMX Gateway

2.11 NETWORK CONNECTION DEVICES

A. General

1. Provide all network connection devices as indicated on the drawings and as specified herein, for installation by Division 26.
2. Coordinate size of device, orientation of circuits, and mounting detail to suit site condition.
3. Device back boxes and faceplates to be sheet metal construction, finished flat black unless otherwise noted.

    a. Provide surface mount or custom flush mount back box as required for each location shown on drawings.
    b. Standard flush mount back boxes to be provided by Division 26.
    c. Provide properly sized faceplate as required for each location shown on drawings.
    d. Faceplate shall match edges of back box in surface mount conditions.
    e. Flush mounted faceplates shall have chamfered edges.
    f. For faceplates located in public areas, the finish shall be per Architect.

4. All standard 19" rack panels to be flanged, black, anodized aluminum.
5. See drawings for device locations and control device schedules for device type, mounting type, and receptacle types and quantities.
6. Receptacles:

    a. RJ45 panel mounted receptacles

        1) RJ45 receptacles must comply with all Category 5e or greater standards.
        2) Ruggedized locking connector system
        3) Provide:

            a) Neutrik etherCON RJ45 receptacles

7. Labeling:

    a. Label each network receptacle with identifying port designation. All network receptacle labels to be engraved with white core fill, unless otherwise noted.
    b. Provide lamacoid tags for the following information:

        1) Maximum length of external Category 5e cable that can be connected without violating the Category 5e standard
        2) Circuit designation(s) of each power receptacle. Circuit designations to be verified by Division 26 prior to fabrication.

    c. Lamacoid tags to be engraved on black (with white core) with chamfered edges and shall be securely mechanically fastened to device.

8. Mounting:

    a. Devices shall be surface, flush or recess mounted at locations and mounting heights as called out on drawings and device schedules.
    b. Provide all requisite mounting hardware for installation of devices. Coordinate all device mounting requirements with Division 26.
    c. All holes in mounting brackets to have 1" minimum slotted hole to enable adjustment for field conditions. Provide lock washers on bolts.

B. Network Taps – Type 'ET':

1. RJ45 receptacles shall be connected via Category 5e cable to the Ethernet network and shall allow full function nodes or other peripheral portable nodes to be connected to the network.

2.12 THEATRICAL LIGHTING CONTROL CONSOLES

A. Lighting Control Console

1. The Theatrical Lighting control console shall be a microprocessor-based system designed specifically for theatrical lighting control application.
2. Console control surfaces shall be engineered for ease and clarity of operation and shall incorporate visual display to assist operator in modes of operation.
3. The console shall be capable of operation in blind (preview/non-live) and shall also be capable of operation in live (stage) mode.
4. The console shall allow cues to be modified while they are running. The console shall support color printouts to mimic color displayed on video screens.
5. Console shall be able to organize data for channels other than those associated with dimmer levels through the use of special grouping or numbering schemes. Simply flagging channels with a new color in the video display shall not be acceptable.
6. Console shall graphically organize information, particularly for LED and automated luminaires, to allow easy identification of the multiple parameters associated with such fixtures. Fixture parameters, including pan and tilt functions of automated luminaires, shall be assignable to an encoder, level wheel, track pad or mouse at the console and/or via an external control surface. In addition, the pan and tilt axis of multiple luminaires shall be able to be assigned to a single device, such as an encoder, level wheel, track ball or mouse, to allow multiple automated fixtures to track together to a single point on stage.
7. The console shall support the use of external control surfaces for the addition of dedicated playback faders, programming encoders, assignable buttons and other playback controls.
8. Console shall be capable of pan and tilt operation through external devices with virtual focus software (such as Wysiwyg) or automated tracking devices (such as BlackTrax).
9. Console shall support full bi-directional RDM communication with compatible devices.
10. Console shall support sACN and Art-Net control protocols.
11. Console shall have Ethernet, USB, DMX512/RDM, MIDI In/Out, and RS-232 ASCII port interfaces.
12. The console shall be capable of controlling the lighting network by being plugged directly into any network tap.
13. The console and any remote processors shall be connected through uninterruptible power supplies as needed to protect console and network operations for at least 30 minutes in the event of power failure.
14. The console shall be provided with all currently advertised features and components indicated in the most recently published product literature plus features described in System Description.
15. Provide:

    a. Electronic Theatre Controls – Ion Xe20 12K

B. Wireless Focus Remote Unit

1. Provide Wireless Remote Focus Unit system with all currently advertised features and components indicated in the most recently published product literature.

2. System shall consist of a handheld personal digital assistant equipped with a wireless access card for operation on an 802.11b wireless Ethernet network. Wireless access card must be compatible with wireless access points (WAP) provided with the theatrical lighting Ethernet network.
3. Remote shall support a wired network connection via RJ45 receptacle.
4. Remote shall operate with the main console.
5. Remote shall "call up" dimmers and channels from remote locations for lamp or focus checks without an operator at the main console.
6. Remote shall be capable of calling up and running through pre-recorded cues and triggering macros.
7. Remote shall be configured with mobile applications for:

    a. Lighting Control Console, as specified herein
    b. Architectural Lighting Control System, as specified herein

8. Remote shall not lose data if its battery becomes depleted.
9. Remote shall be provided with charger/charging cables.
10. Provide quantities as listed in Appendix A.

C. Video Monitors

1. Monitors shall be high resolution, 22" minimum, touchscreen, color, LCD monitors capable of displaying all console video display information. Monitors shall have connectors to mate directly with Lighting Control Console and/or Remote Video Interface and shall have front mounted controls for contrast, brightness, vertical hold, and horizontal hold.
2. Provide: quantity per Appendix A.

    a. Furnish 1 - 10' and 1 - 25' video extension cable for each monitor.
    b. Furnish 1 - 10' and 1 - 25' power extension cable for each monitor.
    c. Protective Cover:

        1) Provide one protective cover for each monitor.

2.13 THEATRICAL LIGHTING FIXTURES AND ACCESSORIES

A. LED Profile Spotlight, 4 Color Mixing

1. Fixture shall meet or exceed the following criteria:

    a. LED source spot fixture utilizing a 60 LED light engine with 4 colors
    b. Optics shall utilize interchangeable lens tubes as defined herein
    c. Fixture form factor similar in size and shape to incandescent profile spotlights
    d. LED "lamp life" of 50,000 hours
    e. Input voltage of 100 to 240VAC at 50/60Hz
    f. Fixture parameters controlled via DMX512/RDM
    g. Integral low noise fan controlled by on-board thermostat
    h. 15-bit dimming engine
    i. 6 control addresses
    j. Neutrik powerCON In and Through receptacles
    k. DMX512 5-pin XLR In and Through connectors, self-terminating
    l. Die cast aluminum fixture construction

m. All adjustments shall have reliable locking knobs that do not require the use of tools and do not transmit heat
n. 4 independent framing shutters with 25-degree minimum rotation of shutter assembly with the fixture
o. Slot for pattern holder or mechanical iris unit
p. C-Clamp for attachment of fixture to pipes of up to 3”
q. Five foot power cable terminated with plug, as listed in Appendix A. Plug shall be compatible with theatrical distribution receptacles.
r. Fixtures shall be calibrated prior to delivery to ensure consistent color and intensity across all fixtures
s. UL or ETL approved

2. Furnish:

a. Electronic Theatre Controls, ColorSource Spot or approved equal
b. in quantities with lens tube configuration and accessories as defined in Appendix B

B. LED Wash Fixture, 4 Color Mixing + White

1. Fixture shall meet or exceed the following criteria:

a. LED source wash fixture utilizing a 40 LED light engine with 4 colors plus white
b. Power consumption of 90W at full intensity
c. LED “lamp life” of 50,000 hours
d. Input voltage of 100 to 240VAC at 50/60Hz
e. Fixture parameters controlled via DMX512/RDM
f. Integral low noise fan controlled by on-board thermostat
g. 15-bit dimming engine
h. 6 control addresses
i. Beam angle of 15 degrees
j. Field angle of 26 degrees
k. Neutrik powerCON In and Through receptacles
l. DMX512 5-pin XLR In and Through connectors, self-terminating
m. Die cast aluminum fixture construction
n. All adjustments shall have reliable locking knobs that do not require the use of tools and do not transmit heat
o. C-Clamp for attachment of fixture to pipes of up to 3”
p. Five foot power cable terminated with plug, as listed in Appendix B. Plug shall be compatible with theatrical distribution receptacles.
q. Fixtures shall be calibrated prior to delivery to ensure consistent color and intensity across all fixtures
r. UL or ETL approved

2. Furnish:

a. Electronic Theatre Controls, ColorSource PAR or approved equal
b. in quantities with lenses and accessories as defined in Appendix B

C. LED Linear Strip Light

1. Fixture shall meet or exceed the following criteria:

a. LED source linear fixture utilizing RGB-L LED arrays

b. 6-foot fixture length
c. Power consumption of 440W at full intensity
d. Input voltage of 100 to 240VAC at 50/60Hz
e. Fixture parameters controlled via DMX512/RDM
f. Integral low noise fan controlled by on-board thermostat
g. Integral dimming engine
h. 5 control addresses
i. Homogenizing optics for even coverage of vertical surfaces
j. Strobe effect
k. Neutrik powerCON In and Through receptacles
l. DMX512 5-pin XLR In and Through connectors
m. Lightweight aluminum fixture construction in black finish
n. All adjustments shall have reliable locking knobs that do not require the use of tools and do not transmit heat
o. C-Clamp for attachment of fixture to pipes of up to 3”
p. Floor Trunnions for groundrow use
q. Five foot power cable terminated with plug, type as listed in Appendix B. Plug shall be compatible with theatrical distribution receptacles.
r. Fixtures shall be calibrated prior to delivery to ensure consistent color and intensity across all fixtures.
s. UL, ETL or CE approved

2. Furnish:

a. ETC ColorSource Linear 4 or approved equal
b. in quantities with accessories as defined in Appendix B

D. LED Flood Work Light

1. Fixture shall meet or exceed the following criteria:

a. Flood fixture providing a radially symmetrical pattern of light
b. LED source utilizing a 90W LED array
c. Output of 10000 lumens, minimum
d. 3000K color temperature, CRI of 90+
e. LED “lamp life” of 50,000 hours
f. Convection cooled for silent operation
g. Dimmable via mains voltage dimming or on-board dimmer
h. Homogenizing optics for even distribution
i. 18-gauge steel fixture construction with a black baked enamel finish
j. 36” power lead terminated with plug, type as listed in Appendix B. Plug shall be compatible with theatrical distribution receptacles.
k. C-Clamp for attachment of fixture to pipes of up to 3”
l. UL approved

2. Furnish:

a. Altman LED WorkLight II or approved equal
b. in quantities with accessories as defined in Appendix B

E. Ghost Light

1. Fixture shall meet or exceed the following criteria:

a. Fixture assembly designed for use when the auditorium is unoccupied
b. Medium screw base in protective cage
c. 18W medium base LED lamp
d. Lamp base and cage mounted on 72” tall stand
e. Castered base
f. Integral cable hook
g. 25’ power cable terminated with a parallel blade, U-ground Edison connector
h. UL or ETL approved

2. Furnish:

a. Altman Lighting Ghostlight

F. Accessories

1. Provide accessories as described in the attached Appendix B.
2. Each fixture to be supplied with:

a. Color frames of appropriate size, where applicable
b. Lamps, where applicable
c. Power input cable
d. Five-foot data cable for all LED fixtures
e. C-Clamp
f. Safety cable

G. Stage Cable

1. General

a. All stage extension cables shall be furnished with two 3” clear shrink wrap pieces, unshrunk, installed on cables for user labeling.
b. One shrink wrap piece shall be shrunk over a band of color at either end of the cable that shall identify the length of the cable. Alternate: shrink wrap shall be integral color as indicated.
c. Confirm color codes with Owner prior to fabrication.

2. Power Extension Cables

a. All shall be Extra Hard usage cable utilizing Stage Pin, NEMA or Neutrik PowerCON plugs as shown in Appendix A. Provide two affixed black sash cord ties.
b. Provide with 20A connectors and 12/3 SOOW-A cable.
c. Provide quantities as shown in Appendix B.

3. DMX Extension Cables

a. Provide DMX extension cables of ACT Tour-Plex Data-Sure or equal
b. 5-pin XLR connectors to mate with DMX nodes.
c. Provide quantities as shown in Appendix B.

4. DMX Terminators

a. Provide In-Line DMX Terminator with status LED for end of line termination
b. Provide quantities as shown in Appendix B.

5. Ethernet Extension Cables

    a. Provide Ethernet Extension Cables of ACT Tour-Plex Tour-Net Cat5e or equal
    b. RJ45 connectors to mate with Ethernet Taps.
    c. Provide quantities as shown in Appendix B.

2.14 ARCHITECTURAL LIGHTING CONTROL SYSTEM

A. General

1. The Architectural lighting control system shall be a microprocessor-based control system that works in conjunction with the theatrical lighting control console in rooms where consoles are provided and otherwise independently to set and control auditorium house lighting or studio lighting levels.
2. The system shall control architectural LED house lighting, work lighting and DMX-controlled switching and dimming for theatrical circuits as shown on the drawings.
3. The system shall operate through touchscreen control panels and pushbutton panel stations located as shown in the drawings. The system shall also be controlled remotely with a portable touchscreen station (specified herein) with plug-in locations as shown in the drawings.
4. The system shall be configured to allow multiple active presets to control architectural lighting, work lights, and theatrical fixtures simultaneously through the use of multiple room assignments.
5. Switching between panels shall not cause flicker or change in lighting levels when settings on panels or touchscreen controller are identical.
6. The system shall have the ability to “snapshot” DMX levels from the theatrical lighting console and record those levels into architectural system presets.
7. When in use, the theatrical console shall override preset levels on a highest takes precedence basis and shall directly control only those architectural and theatrical lighting circuits within the same performance space.
8. The architectural and theatrical lighting circuits in the performance spaces shall operate independently of the lighting circuits in the lobbies and public spaces. This system shall not control the lobbies and public spaces.
9. All control panels and presets shall be programmed by the Contractor as part of the work of this Section, in coordination with the Architect, Theatre Consultant, and Owner.
10. Provide:

    a. Electronic Theatre Controls Unison Paradigm System

B. Architectural Control Processor

1. The architectural control processor allows programming and recall of preset lighting states, time clock events and sequences, and control of fade times between presets.

    a. Provide support for a minimum of 99 lighting presets

2. Provide sufficient quantity of processors for each system to support simultaneous control during preset recall of:

    a. All architectural fixture control addresses
    b. All dimmed and switched architectural circuits
    c. All switched theatrical circuits
    d. One (1) DMX universe for theatrical dimmers and/or fixture control addresses

3. System operating program shall be stored in electrically erasable programmable read only memory (EEPROM).
4. Data storage facilities shall retain memory for an indefinite period of time. In case of power failure, the control module shall retain preset memory for minimum of 72 hours.
5. Provide control system configuration software operating on a PC platform to allow configuration and preset level setting.
6. Provide in a rack-mount enclosure for installation in standard 19" racks.

C. Architectural LED Lighting Dimming & Control Interfaces

1. Architectural lighting fixtures with LED sources compatible with low voltage dimming will be controlled via DMX data signals generated by the theatrical lighting control systems.
2. Architectural lighting fixtures with LED sources compatible with mains dimming will be controlled directly by dimmer modules in the theatrical lighting dimming system.
3. Low voltage drivers and theatrical system dimmer modules for all LED sourced architectural lighting fixture types shall be tested for full 0-100% dimming range compatibility at the dimming and control manufacturer's factory.
4. Control interface devices, including control signal nodes and repeaters, shall be rack-mounted or provided in DIN rail enclosures.
5. Fixture interface devices, including device drivers and external power supplies, required between control signals and the LED fixtures shall be provided under Division 26 work.
6. Provide:

    a. DMX output nodes, DMX repeaters, and/or DMX-controlled 0-10V output nodes as listed in Appendix A. Review Division 26 Architectural Lighting documents to confirm quantity of outputs required for control of system.

D. Architectural LED Lighting Emergency Bypass Detection

1. Provide a power loss detection device that will monitor normal power feed and generate a contact closure output to trigger emergency lighting bypass operation upon loss of normal power.
2. Each unit shall provide isolated outputs for connection of multiple devices.
3. Unit shall provide a normally-closed input for interface with fire alarm systems.
4. Unit shall provide accommodate an additional input from the House Light Panic System, where required.
5. Unit shall be compatible with single or three phase systems.
6. Unit shall provide automatic sensing of normal power loss.
7. Unit shall include an integrated circuit breaker for over-current protection and simulation of normal power loss.
8. The unit shall be UL924 listed.
9. Outputs shall be configurable as normally open or normally closed.
10. Provide:

    a. Electronic Theatre Controls Emergency Bypass Detection Kit, model EBDK

E. Architectural LED Lighting Emergency Bypass Controller

1. Provide low voltage bypass device that will allow LED sourced fixtures to operate as normal / emergency fittings by sending DMX512 directly to connected fittings. The unit shall override the control signals on associated emergency lighting fittings upon loss of normal power.

2. When in panic mode, the unit can provide a maintained normally open, normally closed, dry contact or +12VDC signal.
3. Each unit shall provide a full universe (512 channels) of DMX control.
4. The unit shall be UL924 listed.
5. Outputs shall be compatible with DMX512 protocol.
6. Provide:

    a. Electronic Theatre Controls DMX Emergency Bypass Controller, model DEBC

2.15 ARCHITECTURAL LIGHTING CONTROL PANELS

A. General:

1. Control electronics shall use digital electronic circuitry, be microprocessor based and be designed specifically for the control of architectural lighting systems. Location, overall dimensions, and quantity of control devices shall be as shown on drawings.
2. Controls shall be low voltage type and use N.E.C. Class II, low-voltage wiring.

    a. Only Belden control cables shall be acceptable.

3. Back boxes

    a. Back boxes shall be sheet metal construction, finished flat black unless otherwise noted.
    b. Provide surface mount back boxes sized to match faceplate as required for each location shown on drawings. Back boxes shall be standard deep masonry boxes by Square D or equal. Box depth not to exceed 4” without prior approval.
    c. Provide custom flush mount back boxes as required for each location shown on drawings. Box depth not to exceed 4” without prior approval. Coordinate box dimensions with site conditions and furnish for installation prior to wall and slab construction. Box depth shall be sized to ensure that faceplate is flush with final finishes.
    d. Standard flush mount back boxes to be provided by Division 26.
    e. Surface mount back boxes located in public areas to be finished as per Architect.

4. Faceplates

    a. Faceplate shall match edges of back box in surface mount conditions.
    b. Flush mounted faceplates shall have chamfered edges.
    c. For faceplates located in public areas, the finish shall be per Architect.
    d. Faceplates shall attach to the device with no visible mounting screws. No manufacturer's logo or other marking shall appear on faceplates unless otherwise noted.
    e. Faceplate finishes shall be manufacturer's standard finish unless otherwise noted by Architect or Architectural Lighting Consultant. Selection of finish, custom or standard color shall be by Architect.

5. All standard 19” rack panels to be flanged, black, anodized aluminum.

6. Control devices shall be provided with appropriate zone and/or scene descriptions. These descriptions shall be furnished to the Manufacturer prior to fabrication by the Architect or Architectural Lighting Consultant and shall be engraved and filled with color to be selected by Architect. Any silkscreened borders, logos, potentiometer graduations, etc. shall use a chemically bonded graphic process which resists removal by scratching, cleaning, or other light abrasive scouring.
7. All slider potentiometers shall have a minimum travel of one (1) inch and shall have a graduated scale marked adjacent to the slider.

B. Touchscreen Panel 'TP'

1. Provide a Color Touchscreen Controller capable of the following operations:

    a. Random playback of lighting presets as described herein.
    b. Control of relay-controlled work lighting circuits as described herein.

2. The Color Touchscreen Controller shall include the following:

    a. Back lit user customizable 7" color liquid crystal display with user interface touch screen faceplate.
    b. The Controller shall have multiple pages to enable:

        1) Preset selection and playback
        2) Preset, level and fade time recording
        3) Adjustment of individual House, Work and Blue light channel levels/status
        4) Recording of Theatrical Lighting console output into architectural system presets

3. Provide:

    a. Electronic Theatre Controls Unison Paradigm 7" Touchscreen

C. Portable Touchscreen Control Station – Type 'TPP'

1. Provide Touchscreen Panel with all features described above, in a rugged portable enclosure.
2. Case: Provide sturdy case with integral upstand and touchscreen cover.
3. Cables

    a. Provide 1 – 10' ethernet cable to mate with associated connection panels.

D. Architectural Entry Panels - Type 'EP'

1. Provide pushbutton entry stations in surface or flush mounted box in locations as shown on the drawings. See drawings for push button quantities per device type.
2. Station shall recall designated preset(s) and may be disabled by the main system control.
3. LED indicators in switches shall indicate the active preset on the panel.
4. Stations shall allow multiple presets to be concurrently active.

E. Architectural Preset Panel 'PP'

1. Provide preset stations with five push buttons in surface or flush mounted box in locations as shown on the drawings.
2. Station shall recall designated presets and may be disabled by the main system control.
3. LED indicators in switches shall indicate the active preset on the panel.

4. Station shall allow multiple presets to be concurrently active.

2.16 SOURCE QUALITY CONTROL

A. All equipment and components shall be factory tested prior to shipping.

B. Verification of Performance:

1. Provide Architect with all test results for verification of system performance.

C. For equipment that requires in house testing, do not ship any piece of equipment without either written verification of factory testing or written waiver of factory testing from Architect for that particular piece of equipment.

2.17 FABRICATION

A. Fabricate all work in this section in accordance with the Architect's direction, specifications, approved shop drawings, pertinent project drawings, established trade practices and applicable code requirements.

B. Machine-finish all operating parts to standard trade tolerance, fits and finishes.

C. Carry out shop welding in full accordance with the appropriate sections of "Specifications for the Design, Fabrication and Erection of Structural Steel Buildings" of the American Institute of Steel Construction (AISC).

D. Fabrication, assembly and wiring shall be neat and workmanlike throughout.

E. Control desks, racks and cabinets shall be welded assemblies of sheet steel or aluminum or of bar size angles, channels and tees or aluminum extrusions forming rigid enclosures to support internal components.

F. All face panels shall be fully supported on all edges, either internally or by rolling interior edges of panels.

G. All control device faceplate screws to be countersunk.

H. All distribution device faceplate screws to be Phillips pan head type.

I. Wood furniture/cabinet work for control desks acceptable with prior approval.

J. Operating elements shall be mechanically safe and electrically "dead".

K. All steel parts and panels shall be cleaned and primed with rust inhibiting primer. Exterior finishes shall be epoxy resin or baked enamel in matte black or in anodized black aluminum where approved.

L. Control element working face panels shall be heavy aluminum or bakelite. Legends and control and protective device designations shall be engraved in panels or in permanently attached plates and located for ready identification.

M. Operating instructions shall be similarly engraved and appropriately located on designated equipment.

N. All panel engraving shall be in Helvetica Regular, height as indicated in contract documents. In no case shall the engraving be less than 3/16" high without Architect's approval.

O. All internal wiring shall be factory completed and clearly marked.

P. Field connections shall be made by connector devices and cables as specified in preceding sections.

Q. Dimmer modules, dimmer controllers and other plug-in components may have spade lug and/or receptacle devices for connection.

R. Control relays wherever possible shall be the glass or polycarbonate enclosed plug-in type. Relays shall be acoustically damped.

S. Uniform components shall be used throughout the system. All dimmer, fader and preset controllers shall be physically similar; they may vary in voltage according to the Theatrical Lighting Manufacturer circuit requirements.

T. All wire sizes and insulation to comply with UL standards and local codes and meet or exceed electronics industry standards.

U. All wiring to be harnessed and bound. No loose or randomly routed wires permitted.

V. All printed circuit cards to be suitably racked with numbered and indexed guides. Legends to be provided on panel door.

W. Key all components in this section with locks or key switches alike. Provide six keys minimum.

X. Each receptacle within a wiring device must have a home run of its hot and neutral to the dimmer rack or DMX controlled panelboard. Circuits with more than one receptacle must be paralleled at the rack. The method of termination must not void UL listing. Circuits with more than one receptacle within a single wiring device may be paralleled within the device and require only one home run of the hot and neutral to the dimmer rack or DMX controlled panelboard.

Y. Minimize feeder inductance by twisting the hot and neutral conductors in long connector strips. Neutral conductor must be at least the same size or greater than the hot conductor.

PART 3 - EXECUTION

3.1 INSTALLERS / INTEGRATORS

A. To establish comparative standards of quality, the provision of equipment and services of this section shall be by one of the following authorized dealers:

Blue Sky Integration
6026 Kalamazoo Ave SE Suite 225
Grand Rapids, MI 49508
Tel: (616) 451-9245

Advanced Lighting & Sound
1026 Maplelawn Drive,
Troy, MI 48084
Tel: (248) 817-2092

Fantasee Integration
6235 Concord Avenue
Detroit, MI 48211
Tel: (734) 699-7200

TPC Technologies
185 Bell Road
Niles, MI 49120
Tel: (269) 687-9798

Tobins Lake Sales
8322 Whittaker Rd
Ypsilanti, MI 48197
Tel: (734) 624-0264

Vincent Lighting Systems
36500 Ford Road
Westland, MI 48185
Tel: (800) 922-5356

B. Substitution Limitations

1. Any contractor who wishes to be listed and has not been pre-approved must submit qualification information to the Architect. Proposal shall include all information listed below:

   a. Statements of financial responsibility for the past five fiscal years showing assets and liabilities.
   b. List of principal officers and design and service engineers in an organizational structure flow chart.
   c. List of not less than 5 projects of similar size and scope completed within the five years on which contractor has provided full services: product engineering, shop drawings, manufacture, installation and commissioning. In each instance, indicate specifics of scope of fabrication and installation. Include a contact list: name, address and phone numbers of person(s) directly responsible for operation and maintenance of equipment in each facility.
   d. List of current projects and approximate contract value and completion dates. Include list of names, phone numbers and addresses of owner, owner's representatives and architect.
   e. For each above described project, list of names of persons who supervised preparation of shop drawings, manufacture of components, and installation of equipment.
   f. List of names of persons who would do project management, product engineering, supervision of shop drawing, and supervision of installation should this contract be awarded.
   g. Contract Bond Company information indicating that contractor has bonding capacity for full duration of project. Include list of other bonded projects coinciding with this project.
   h. Evidence of ability to undertake custom product engineering to meet specific requirements of project specifications. Provide sample project engineering drawings for custom products and contact information for facility operators where those products have been installed.

2. Standards of Acceptance:

a. Refer to Paragraph 1.8B - Quality Assurance/Qualifications.

3.2 EXAMINATION

A. Verification of Conditions: Contractor must examine areas and conditions under which the equipment is to be installed and must notify the General Contractor in writing of conditions detrimental to proper and timely completion of work. Work will not proceed until unsatisfactory conditions have been corrected in a manner acceptable to the Contractor.

3.3 INSTALLATION

A. Provide direct site supervision during the installation of electrical work associated with the Theatrical and Architectural Lighting system elements.

B. Install all work in this section in accordance with the Architect's direction, specifications, approved shop drawings, pertinent project drawings, established trade practices and applicable code requirements.

C. Install all work securely, complete with all bolts, nuts, washers, clips, fittings, supports, and other items required for proper installation and operation.

D. Position all items accurately as indicated on drawings and true to plumb, line and level. Maintain maximum headroom and clearances at all points.

E. Coordinate work with all other trades to avoid causing delays in construction schedule.

F. All field welding requires prior approval of the Architect and Contractor's Structural Engineer.

G. Carry out approved field welding in full accordance with the appropriate sections of "Specifications for the Design, Fabrication and Erection of Structural Steel Buildings" of the American Institute of Steel Construction (AISC).

H. Do all cutting, drilling, tapping and approved welding required to properly install work. Obtain Architect's prior approval for cutting and drilling of existing structural work.

I. Clean structural steel and fabricated steelwork of rust, scale any foreign matter by grinding; prime with 1 coat of chromated primer; finish with 1 coat of first quality machinery enamel free of skips, runs and saps. Touch up all field connections, welds and abraded places with primer and enamel.

J. Address and configure all DMX-controlled fixtures for installation as required.

1. Fixture DMX addresses to be assigned by Contractor in coordination with permanently installed components of the Theatrical Lighting System.

K. Hang and circuit fixtures per lighting layout drawing coordinated with the Owner.

1. Power circuits from the Theatrical Lighting System to be assigned by Contractor.

3.4 FIELD QUALITY CONTROL

A. The installation of the equipment indicated in this section shall be supervised by qualified personnel who are regularly employed by the Contractor for supervision of equipment installation similar to that indicated herein.

B. Installers must be appropriately skilled and experienced for the type and quality of work.

C. Verify cable lengths for all Category 5e network wiring. Submit test results to Architect for review prior to network device installation.

D. Arrange for all tests and inspections required by the General Requirements.

3.5 SYSTEM STARTUP AND COMMISSIONING

A. Commissioning

1. Upon completion of installation work required by the work of this Section, the Contractor shall perform all required tests and inspections, including but not limited to the Compliance Testing Procedures specified herein.
2. Contractor shall supply all equipment required for the commissioning process including access equipment (personnel lifts, ladders and appropriate protective equipment), test instruments and communications equipment.
3. Contractor shall provide staff to assist in the commissioning process.
4. Compliance Testing Procedures (CTP)

    a. Test all dimmed/switched receptacle circuits:

        1) Polarity
        2) Circuit identification
        3) Assignment to designated device
        4) Voltage at end device?
        5) Dim function under load?

    b. Test all control receptacles for data integrity:

        1) DMX
        2) Ethernet

    c. Test all theatrical control devices for function:

        1) DMX Nodes
        2) Remotes
        3) Consoles
        4) Architectural Panels

    d. Test all cables provided as part of this section

B. Lighting Preset Programming

1. Coordinate with the Owner to determine the desired lighting presets including the layout and functionality of touchscreen pages as described herein, button station presets and keyswitch operations.

a. Preliminary programming of touchscreen control stations shall be completed prior to final system checkout.
b. Preliminary programming of pushbutton control stations shall be completed prior to final system checkout.

2. At the Demonstration, the touchscreen layouts, functionality, and preliminary lighting presets will be reviewed by the Owner and changes may be required at that time.

3.6 ADJUSTING

A. Adjust all equipment and components for operation in accordance with the specifications, approved shop drawings and pertinent Contract Drawings prior to the demonstration indicated herein.

3.7 CLEANING

A. Touch up minor abrasions and imperfections as required.

B. Remove from the premises all debris caused by this work. All unnecessary equipment and materials shall be removed from the area(s) of this work upon completion, removed from the job site and disposed of legally at no additional cost to the Owner.

3.8 CLOSEOUT ACTIVITIES

A. Demonstration

1. Upon completion of Commissioning, the Contractor will notify the Architect and Theatre Consultant that the system is complete, conforms to specification and is ready for Demonstration.
2. Installed equipment is to be operated for approval and inspected for quality by the Theatre Consultant, the Architect and the Owner.
3. The Theatre Consultant will perform the tests listed in the Compliance Testing Procedures to verify compliance with specifications.
4. Contractor shall supply all equipment required for the Demonstration, including access equipment (personnel lifts, ladders and appropriate protective equipment), test instruments and communications equipment.
5. Contractor shall provide staff to assist in the Demonstration, as necessary.
6. Adjustments or modifications shall be made as directed by the Architect and the Theatre Consultant.
7. Costs of re-inspection and additional testing by the Architect and Theatre Consultant, if required, due to lack of completion and/or errors and omissions shall be paid by the Contractor. This work will be conducted on a time and materials basis, including the Architect’s and Theatre Consultant’s standard hourly rates, and shall be scheduled and approved in writing prior to the re-inspection/testing session.

B. Training

1. Following the equipment demonstration, inspection and final adjustments, provide an instruction session to the Owner’s staff or representatives on the safe operation, care and maintenance of the system.

a. Provide instruction of not less than eight hours total, in 2 separate sessions.

b. Instruction shall include, but not be limited to, proper general maintenance of the system, replacement procedures for user replaceable parts, and operating procedure to obtain maximum usage of system.
c. Deliver all copies of approved Operations Manual to Owner prior to first instruction session and review it as part of that session.
d. The first session shall take place in the presence of the Architect or Theatre Consultant and shall occur directly after finish of Completion Checkout. If Owner, Architect judge that any work inspected fails to conform to the specification or is not substantially complete at time of Completion Checkout, postpone instruction session until Owner and Architect judge the entire Theatrical Lighting System to conform with specification.
e. The second session shall occur at a time arranged by the Owner no sooner than 1 day and no later than 1 month after first session.

2. Console Operator Instruction:

a. Provide instruction to Owner or Owner's selected key Lighting Control Console Operators on the detailed operation of Console. This training shall take place in two separate sessions. Each session shall be no less than four hours and shall take place on site.

3. Timing for all sessions shall be scheduled by the Owner at their convenience.
4. Instruction must be by qualified expert operators who have actual experience with systems in performance conditions.

3.9 PROTECTION

A. Provide full protection from damage, construction dirt and debris for all equipment from the point of installation to testing and commissioning.

B. Remove all equipment protection and clean components thoroughly prior to the demonstration session.

3.10 MAINTENANCE

A. Maintenance Service

1. One month prior to the end of the first year following the date of final systems acceptance, a factory engineer shall be provided to examine, adjust and repair the equipment included in this section which is found to require warranty work prior to the end of the warranty period. This service shall not cover adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the Manufacturer. All labor and materials which are required to perform this service shall meet or exceed these specifications and shall not compromise the performance of the equipment in any way.
2. Following this inspection and maintenance service, the Contractor shall provide the Owner and Theatre Consultant with a written report itemizing the results of the inspections and the warranty work that was conducted. The Contractor shall also include in this written report recommendations for any corrective actions which the Contractor feels should be taken with respect to the equipment included in this section but are outside the scope of the warranty agreement.

B. System Programming Updates

1. Contractor shall review system operation and control system programming with the Owner's representatives. Any required adjustments and changes to the control system programming requested by the Owner shall be performed and completed during the time of the corrective service site visit. All control system programming changes shall be documented by the Contractor.

3.11 ATTACHMENTS

A. Refer to Appendix A of this section for major systems component quantities and accessories.

END OF SECTION

SECTION 116163 - APPENDIX A

THEATRICAL LIGHTING SYSTEMS

ITEM #	ITEM DESCRIPTION	MANUFACTURER / PRODUCT		TOTAL
Power Controls				
1	48 Module Dimmer Rack	ETC - SR3-48, Sensor 3 48-Module Rack with AF Card		1
2	Dimmer Rack Control Electronics Module	ETC - CEM3, Control Module		1
3	20A Thru Power Dimmer Module, 500ms (installed)	ETC - TR20AF, Dual 20A 500ms Thru Power Dimmer Module		48
4	20A Thru Power Dimmer Module, 500ms (spare)	ETC - TR20AF, Dual 20A 500ms Thru Power Dimmer Module		2
5	DMX Integrated Relay Panel with 24 spaces	ETC - Unison Echo Relay Panel ERP-24R1-24B1		2
6	Emergency Lighting Transfer Switch, 12-circuit	ETC - ELTS2		1
Theatrical Control				
7	Control Console, 12000 Channels	ETC - Ion Xe20 12K		1
8	22" LCD Video Monitor	Per Console Manufacturer		2
9	Handheld Focus Remote	ETC - ETCpad		1
Theatrical Network				
10	19" Equipment Rack, 40U Swing-Frame	Middle Atlantic - SR-Series		1
11	Network Switch, 24-Port PoE	Cisco		2
12	Network patch panel and cable management	Hubbell		2
13	UPS/Power Conditioning, rack mount	APC		1
14	4-Port DMX Node with 4 outputs, rack mount	ETC - Response Mk2 4-Port Gateway with rack mount kit		1
15	0-10V Output Controller, 24-Port	ETC - Response 0-10V Gateway		A/R
16	DMX Repeater, 8-Port, rack mount	Pathway Connectivity - DMX/RDM Repeater		A/R
17	Emergency Bypass Detection Kit	ETC - EBDK		1
18	Emergency DMX Bypass Controller, 6-Output	ETC - DEBC-6		1
19	Lighting Network PC Laptop			1
20	Wireless Access Point	Cisco		1
Architectural Lighting Control				
21	Architectural Lighting Processor, rack mount	ETC - Paradigm Architectural Control Processor with ERn2 rack mount enclosure		1
22	Device Type TP, Touchscreen Control Panel	ETC - Paradigm 7" Touchscreen		1
23	Device Type TPP, Portable Touchscreen Control Panel	ETC - Paradigm 7" Touchscreen in custom enclosure		1
24	Device Type EP, Single-Button Entry Panel	ETC - Unison Heritage		3
25	Device Type PP, 5-Button Preset Panel	ETC - Unison Heritage		3

ITEM #	ITEM DESCRIPTION	MANUFACTURER / PRODUCT		TOTAL
Control Devices				
26	Device Type EN	ETC - Response Mk2 1-Port Gateway, 1 output		4
27	Device Type EN2	ETC - Response Mk2 2-Port Gateway, 2 output		9
28	Device Type ET2	Custom		3
Distribution Devices				
29	Device Type PBR 3 - 2/1/0	Custom		2
30	Device Type PBR 5 - 4/1/0	Custom		4
31	Device Type PBR 7 - 6/1/0	Custom		3
32	Device Type PSR - 5/1/0	Custom		2
33	Device Type PSP - 12/4/0	Custom		4
Control Cable				
34	Ethernet Patch Cable - 3'			A/R

Note:

This equipment list specifies major systems components and equipment and should not be interpreted as a "bill of materials". This list may not detail all equipment required for complete, working systems. It is the Lighting Systems Contractor's responsibility to provide complete, working systems regardless of the completeness of this list.

END OF SECTION 116163 - APPENDIX A

SECTION 116163 - APPENDIX B

THEATRICAL LIGHTING FIXTURES

ITEM #	DESCRIPTION	OPTIONS	ACCESSORIES	MANUFACTURER	PRODUCT	TOTAL
LED SOURCE						
1	Profile Spotlight, 4 Color Mixing	19° STD	c-clamp - safety cable - power & data cables - stage pin connector	ETC	ColorSource Spot	4
2	Profile Spotlight, 4 Color Mixing	26° STD	c-clamp - safety cable - power & data cables - stage pin connector	ETC	ColorSource Spot	8
3	Profile Spotlight, 4 Color Mixing	36° STD	c-clamp - safety cable - power & data cables - stage pin connector	ETC	ColorSource Spot	8
4	Wash Light, 4x+W Color Mixing	Secondary Lenses: (Oblong field + M)	c-clamp - safety cable - power & data cables - stage pin connector	ETC	ColorSource PAR	24
5	Cyclorama Linear Strip Light	Secondary Lenses: (Medium linear vertical) Floor Trunnion	c-clamp - safety cable - power & data cables - stage pin connector	ETC	ColorSource Linear 4	12
6	Flood Work Light	-	c-clamp - safety cable - edison connector	ALTMAN	LED WorkLight II	12
7	Ghost Light	-	edison connector	ALTMAN	Ghostlight	1

Note:

This equipment list specifies major systems components and equipment, and should not be interpreted as a "bill of materials". This list may not detail all equipment required for complete, working systems. It is the Lighting Fixtures Contractor's responsibility to provide complete, working systems regardless of the completeness of this list.

SECTION 116163 - APPENDIX B

THEATRICAL LIGHTING ACCESSORIES & CABLE

ITEM #	DESCRIPTION	MANUFACTURER	NOTES	TOTAL
ACCESSORIES				
STAGE CABLES - POWER				
1	Stage Pin Extension cable - 20 amp - 5'	LEX PRODUCTS / A.C.T.LIGHTING / C.B.I PROFESSIONAL WIRING SYS		10
2	Stage Pin Extension cable - 20 amp - 10'	LEX PRODUCTS / A.C.T.LIGHTING / C.B.I PROFESSIONAL WIRING SYS		10
3	Edison Extension cable - 20 amp - 5'	LEX PRODUCTS / A.C.T.LIGHTING / C.B.I PROFESSIONAL WIRING SYS		10
4	Edison Extension cable - 20 amp - 10'	LEX PRODUCTS / A.C.T.LIGHTING / C.B.I PROFESSIONAL WIRING SYS		10
5	PowerCON Extension cable - 20 amp - 5'	LEX PRODUCTS / A.C.T.LIGHTING / C.B.I PROFESSIONAL WIRING SYS		24
6	PowerCON Extension cable - 20 amp - 10'	LEX PRODUCTS / A.C.T.LIGHTING / C.B.I PROFESSIONAL WIRING SYS		10
STAGE CABLES - CONTROL				
7	5-pin XLR DMX extension cable - 5'	LEX PRODUCTS / A.C.T.LIGHTING / C.B.I PROFESSIONAL WIRING SYS		10
8	5-pin XLR DMX extension cable - 10'	LEX PRODUCTS / A.C.T.LIGHTING / C.B.I PROFESSIONAL WIRING SYS		10
9	5-Pin DMX Terminators	TMB		4
10	RJ45 Network extension cable - 5'	LEX PRODUCTS / A.C.T.LIGHTING / C.B.I PROFESSIONAL WIRING SYS		10
11	RJ45 Network extension cable - 10'	LEX PRODUCTS / A.C.T.LIGHTING / C.B.I PROFESSIONAL WIRING SYS		10

Note:

This equipment list specifies major systems components and equipment, and should not be interpreted as a "bill of materials". This list may not detail all equipment required for complete, working systems. It is the Lighting Fixtures Contractor's responsibility to provide complete, working systems regardless of the completeness of this list.

END OF SECTION 116163 - APPENDIX B

SECTION 126100
FIXED AUDITORIUM SEATING

PART 1 - GENERAL

1.1 SUMMARY

A. The work in this section includes the fixed auditorium seating system within the following spaces:

1. Sexton Auditorium

B. Section Includes

1. Furnish and install all elements of the fixed auditorium seating system and associated accessories.
2. Work Results:

a. Provide a complete, working and code compliant fixed auditorium seating system.
b. Provide fully coordinated and engineered equipment, installation, supervision and commissioning for the major systems and associated accessories as required for each space.
c. Provide all material, components, accessories and services required to provide the work as specified herein, elsewhere in the project documents and/or as shown on related drawings.
d. Consult and coordinate with other affected work and contractors throughout the course of the work contained herein.

C. Products Supplied but Not Installed Under This Section:

1. Extra materials as listed in Paragraph 1.7A, Extra Materials.

D. Related Requirements:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications apply to this Section.
2. Examine Contract Documents for requirements that directly affect or are affected by Work of this Section. A list of those Documents and Sections includes, but is not limited to the following:

a. Division 01 – General Requirements
b. Division 03 – Concrete

1) Fastener requirements

c. Division 04 – Masonry

1) Fastener requirements

d. Division 09 – Finishes

1) Adjacent walls and floors
2) Metal fabrication

1.2 PRICE AND PAYMENT PROCEDURES

A. Refer to Division 01 - General Requirements for information regarding price and payment procedures.

1.3 REFERENCES

A. Abbreviations:

1. The following abbreviations and acronyms are relevant to this Section and are in addition to those defined in Division 01 – General Requirements:

a. ANSI: American National Standards Institute
b. BIFMA: Business and Institutional Furniture Manufacturers Association
c. NFPA: National Fire Protection Association
d. UL: Underwriters Laboratories

B. Definitions

1. The following definitions are relevant to this Section and are in addition to those defined in Division 01 – General Requirements:

a. In all cases where a device or a part of equipment is referred to in a singular manner within the contract documents, it is intended that such a reference shall include all devices required to complete the installation in accordance with the project documents.
b. “Architect”: All references to the “Architect”, Kingscott, will refer to the process by which the indicated action or decision regarding the work in this section will be administered. All such actions shall be initiated with or by the Architect, who will disseminate all pertinent information and documents to, as well as coordinate all efforts and site visits with, the Theatre Consultant and all other project consultants who may have design responsibility relating to the work in this section.
c. “Theatre Consultant”: Apeiro Design, Inc. The Theatre Consultant will be party to all actions and decisions regarding the work in this section.
d. “Other Project Consultants”: Acoustical Consultant, Electrical Engineer, Structural Engineer, or Mechanical Engineer as is applicable to a particular issue.
e. “Contractor”: Manufacturer / Installer responsible for the fabrication and installation of the work contained in this section.

1) Contractors involved with other work shall be indicated with a specific trade preceding the word “Contractor” (i.e. General, Electrical, etc.).

f. "Owner": Authorized personnel representing Lansing School District
g. "Furnish": Purchase and/or fabricate and deliver to project site.
h. "Install": Physically install the items in their proper location(s) on the project site.
i. “Provide”: Furnish and install complete.

C. Reference Standards:

1. Reference Division 01 for general project references and standards.
2. References to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies will refer to the latest edition of such publications adopted and published prior to submittal of the bid. All such codes and standards will be considered a part of this specification as if they were fully included herein.
3. If an applicable code or standard permits work of lesser quality or extent than this specification, then this specification and the related drawings will govern.
4. Comply with national, state and local codes.
5. Comply with national, state and local labor regulations and requirements.
6. The following standards apply to the work of this Section. It remains the Contractor's responsibility to confirm and comply with all industry standards that are applicable to the work of this Section.

    a. International Building Code 2021
    b. Americans with Disabilities Standard for Accessible Design
    c. Local Authority Building Regulations
    d. Local Authority Licensing Regulations

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. The Contractor is required through drawings, memos and meetings to properly coordinate the work with the other sections as necessary to complete the work of this section.

B. Pre-Installation Meeting:

1. Refer to Division 01 - General Requirements for information regarding pre-installation meeting with the General Contractor.

C. Sequencing:

1. The delivery and installation of the equipment in this section shall be coordinated with other work which may be in conflict with or which must be completed before the work under this section may be installed, including:

    a. Floor slab work (see Architectural drawings)
    b. Installation of overhead HVAC work (see Mechanical drawings)
    c. Drywall, mudding, sanding or painting of ceilings and walls
    d. Sanding or application of finishes to floors

1.5 ACTION SUBMITTALS

A. All submittals shall be submitted in accordance with Division 01.

B. All submittals shall be submitted in a timely manner, allowing sufficient time for adequate review and possible resubmittals without jeopardizing the project schedule.

C. Submittals will be reviewed, accepted and field dimension verified prior to proceeding with the fabrication of the work in this section.

D. All submittals shall leave space available for review stamps and comments.

E. Provide full insurance against loss or damage during shipment. Furnish certifications of such coverage to the General Contractor not less than 60 calendar days prior to the shipment of any equipment.

F. Review all pertinent project Contract Documents. Following this review, provide to the Architect and General Contractor any additional information required to make a fully functioning system. In addition, the Manufacturer shall indicate maximum accepted wire size as it relates to termination points on their equipment.

G. Product Data:

1. Where standard manufacturer parts are used, submit current product literature describing component, manufacturer's recommended applications, load ratings, safety factors and dimensions. The data shall include all information which indicates compliance with the specifications herein.
2. Clearly indicate specific component and applicable options.

H. Shop Drawings:

1. Provide shop drawings in PDF format with sheets sized so that drawing elements are appropriately scaled and easily read.
2. Include a cover sheet with a drawing index including the sheet number and title for each sheet in the set.
3. Provide a minimum of one sheet for each seating level.
4. Provide ¼" scale layout plan(s) clearly indicating seat widths, dimensions for coordination for seat mounting, aisle widths and row-to-row clearances.
5. Provide ½" scale section details showing relationship of seat rows, indicating seat back to back spacing and clear aisle accessway.
6. Provide complete, fully dimensioned, large scale detailed fabrication drawings of all major components. Include plan or schedules with quantities of each seat size, removable seats, transfer arm seating, end panel lights, and all other accessories.
7. Provide plan of electrical junction box locations and details.
8. Provide plan of row letter and seat number layout.
9. Provide requisite schematics, plans and sections indicating assembly and installation of components.
10. Provide indications by arrow and boxed caption of all variations from contract drawings and specifications, except where variation is indicated as acceptable.
11. Provide power requirements, one-line riser diagrams and installation circuit diagrams for electrical equipment. Show all required wire sizes and counts between all components. These shall be provided within 30 days of Contract Award.
12. Provide detailed drawings of trolley for transport and storage of 'removable' seating.
13. Provide a full Bill of Materials to be supplied, including quantities, manufacturer, manufacturer's part number, reference to applicable drawings, etc.
14. Per the requirements of the approved schedule, provide a provisional set of shop drawings with all required information included. A revised set of drawings shall be provided after site verification measurements are taken. The second set shall show any modifications to the layout due to unexpected site conditions.
15. Shop drawings shall provide sufficient detail to show fabrication, installation, anchorage and interface of the work of this Section with the work of adjacent trades.
16. Responsibility to prevent or remedy conflicts with any floor element shall rest solely on the Contractor.
17. Responsibility for providing a seating layout that meets prevailing code requirements, as demonstrated in the Contract Documents, rests with the Contractor.

I. Samples:

1. Submit samples for approval as per the approved project schedule.
2. Submit samples of each of the following elements in each color, finish, pattern and texture specified per the terms of the Contract. If qualities of an element have not been specifically indicated herein, submit manufacturer's color charts or samples of actual materials indicating the full range of standard colors, finishes, patterns and textures available. The samples shall include, but are not limited to:

    a. Provide two 30” square "quality" samples of each seating fabric.
    b. Manufacturer’s color charts or actual samples of electrostatically applied powder finishes to be used on exposed parts.
    c. Manufacturer’s color charts or actual samples of plastics to be used on seat backs or bottoms.

3. Additional samples must be submitted within 14 days of Architect’s written request.

J. Certificates

1. Provide manufacturer's certificate stating materials meet fire performance characteristics specified herein.
2. Provide test certificates for specified performance testing.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents:

1. Submit documents in accordance with Division 01 - General Requirements.
2. At the time of acceptance testing, submit three (3) hard copies and PDF format electronic files of parts lists and maintenance instruction sheets.
3. Within 60 days of the acceptance testing, submit one (1) hard set and PDF format electronic files of “as built and approved” drawings showing all equipment as installed. These drawings shall include all adjustments made during the checkout process.
4. Submit operation and maintenance manuals with the “as built and approved” drawings. These manuals shall include all comments and adjustments made during the acceptance and review processes. Each manual shall be bound in an individual binder with the project name on the front cover and system identification on the spine. Included with binder shall be a PDF format electronic version of the manual materials on a portable storage device. The manuals shall include:

    a. Complete parts list for all equipment and telephone numbers for the authorized parts and service distributors.
    b. Instructions as to the safe operation for all equipment.
    c. Recommended maintenance schedule for all component parts
    d. Recommendations for cleaning, maintaining and touch-up of all finished surfaces
    e. Provide specific recommendations for cleaning upholstery, including precautions against materials and methods which could damage upholstery fabric.
    f. Where specific elements do not require manuals, instruction sheets as to care and handling shall be provided.
    g. Certificates of flame resistance as required herein.
    h. Warranties as required herein.

B. Submit verification that all punch list items have been rectified. Such written verification will be required for project closeout and initiation of the warranty period.

C. The record documents shall be reviewed by the Architect and Theatre Consultant, and all modifications to the documents stemming from this review shall be made as required.

D. Above submissions are required as a condition for final approval of the work.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Materials:

1. Deliver stock of maintenance material to Owner. Furnish the following to match those installed and taken from the same production run, packaged with protective covering for storage and identified with appropriate labels:

    a. Furnish complete seat and back assemblies equal to two percent (2%) of amount installed for each type and size of chair seat and back.
    b. Furnish seat and back fabric covers equal to five percent (5%) of amount installed for each type and size of cushion.
    c. Furnish armrests equal to five percent (5%) of amount installed for each type of armrest
    d. Furnish mounting hardware for all mounting conditions equal to five percent (5%) of chairs installed.

1.8 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Refer to Division 01 – General Requirements.

B. Qualifications:

1. All equipment and installation to be the responsibility of a single Contractor, who shall own and operate their own manufacturing facility for the fabrication of theatrical seating equipment and be regularly engaged in the fabrication of such equipment. Fabrication of such equipment shall comprise no less than 90% of the Contractor's business.
2. The Contractor shall have been continuously engaged in the fabrication and installation of equipment of the type indicated herein for no less than five years.
3. The Contractor shall have under their control all parts composing the complete chair including castings, steel, plywood, fabric, and accessories, as well as mounting and installation components. Contractor shall do all fabrication and coordinate installation, and shall maintain thorough test and inspection procedures to assure uniform high quality of all raw materials used as well as the finished product.
4. The Contractor shall have, at the time of bid, a current contractor's license and shall know, understand, and have the required documentation to work in the State of Michigan. This license shall be maintained throughout the course of the work of this contract.

C. Contractor is responsible for proper installation, operation and safety of all component equipment.

D. Contractor is responsible for the complete design and engineering of all systems described herein. Contractor shall confirm project details and, if necessary, suggest modifications to the criteria established herein in order to maintain the design intent.

E. Errors and omissions within the Contract Documents shall not relieve the Contractor and the General Contractor of the responsibility for providing a properly functioning installation of the system as described herein.

F. Mock-Ups:

1. Following approval of shop drawings and samples indicated above, and prior to fabrication, a mock-up shall be provided for quality review, verification and testing by the Architect, Theatre Consultant and Owner.
2. The mock-up for quality review shall meet the following criteria:

    a. Provide a minimum of two (2) chairs of each specified type including selected fabric, finishes, etc.
    b. One of the chairs of the mock-up will include an ADA transfer arm as specified herein; the other shall have a fixed decorative end standard.
    c. The mock-up should include the extreme widths of chairs to be provided.

3. Fabrication will not proceed until written approval of all mock-ups has been received from the Architect.
4. It shall be the Contractor's obligation to provide shipping of the mock-up to the Architect's office and, following installation, to the job site. Following approval of the finished installation, the mock-up shall be turned over to the Owner.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage and handling shall be coordinated with the General Contractor and shall meet all requirements described in Division 01.

B. Packing, Shipping, Handling and Unloading

1. All equipment shall be appropriately and substantially packed for shipment.

    a. Packaging should include humidity resistant wrapping with desiccant as appropriate to protect contents. Contractor shall ensure that seating and related materials are delivered to the job site in their original and undamaged cartons bearing the manufacturer's name, product name and stock numbers.

2. All equipment containers shall clearly indicate the equipment contained, "front", "top", "fragile", the project name, and theatre site allocation. Include packing and shipping lists for each container.
3. All shipping costs to the job site are the responsibility of the Contractor. The shipping method/company is at the total discretion of the Contractor in order to meet the published project schedules.

C. Acceptance at Site

1. Coordinate responsibility for acceptance of material and equipment at job site with the General Contractor.
2. The Contractor shall be responsible for acceptance of the fixed audience seating system components at the job site, confirming that all quantities and counts are correct and for keeping accurate logs and records of such information.

D. Storage and Protection

1. Upon delivery, the materials shall be stored in their original cartons under protective cover in a dry, clean and secure location, off the ground. Materials shall be stacked or positioned as directed by the Contractor. Delivered materials which are damaged or otherwise not suitable for installation shall be removed from the job site and replaced with acceptable materials.
2. Replace, at no additional expense to the Owner, all equipment and materials which are lost or damaged during storage or handling.

1.10 SITE CONDITIONS

A. Existing Conditions:

1. Verify all conditions at job site. Promptly report variations and obstructions to the Architect. All additions or corrections are to be requested through the General Contractor prior to fabrication.

B. Environmental Requirements:

1. Coordinate all environmental requirements for all materials provided and installed under this contract.
2. Seating shall not be installed before all overhead work and all painting in the audience chamber has been completed.
3. Fabric covered backs and seats shall not be installed until the audience chamber is climate controlled.

C. Field Measurements:

1. Field measurements must be taken prior to preparation of final shop drawings and prior to fabrication to ensure proper fitting of the work. Allow for adjustments during installation.

    a. Field measurements shall be taken by an experienced seating installation foreperson under the employ of the Contractor.

2. Should field measurement of site conditions alter the design or installation of system elements from the approved shop drawings, revised shop drawings shall be reissued for review.

1.11 WARRANTY

A. Comply with the warranty requirements of Division 01 and the following.

B. The Contractor shall warrant materials and workmanship of systems and equipment as free of defects. The Contractor shall guarantee in writing the repair or replacement within 30 days of any item found defective during a period of one (1) year following date of final acceptance. Ordinary wear and damage due to improper usage are excepted.

C. The Contractor shall warrant the workmanship of installation services provided under this section for a period of five (5) years following the date of final acceptance. Ordinary wear and damage to improper usage are excepted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. To establish comparative standards of quality, the equipment and services of this section shall be by one of the following manufacturers:

Irwin Seating Company
3251 Fruit Ridge NW
Grand Rapids, MI 49544
Tel: (616) 574-7400

KI
1330 Bellevue Street
Green Bay, WI 54302
Tel: (800) 424-2432

Series Seating
20900 NE 30th Ave Suite 901
Miami, FL 33180
Tel: (305) 932-4626

B. Substitution Limitations

1. Any contractor who wishes to be listed, and has not been pre-approved, must submit qualification information to the Architect. Proposal shall include all of the information listed below:

   a. Statements of financial responsibility for the past five fiscal years showing assets and liabilities.
   b. List of principal officers and design and service engineers in an organizational structure flow chart.
   c. List of not less than 5 projects of similar size and scope completed within the five years on which contractor has provided full services: product engineering, shop drawings, manufacture, installation and commissioning. In each instance, indicate specifics of scope of fabrication and installation. Include a contact list: name, address and phone numbers of person(s) directly responsible for operation and maintenance of equipment in each facility.
   d. List of current projects and approximate contract value and completion dates. Include list of names, phone numbers and addresses of owner, owner's representatives and architect.
   e. For each above described project, list of names of persons who supervised preparation of shop drawings, manufacture of components, and installation of equipment.
   f. List of names of persons who would do project management, product engineering, supervision of shop drawing, supervision of installation should this contract be awarded.
   g. Contract Bond Company information indicating that Contractor has bonding capacity for full duration of project. Include list of other bonded projects coinciding with this project.

h. Evidence of ability to undertake custom product engineering to meet specific requirements of project specifications. Provide sample project engineering drawings for custom products and contact information for facility operators where those products have been installed.

2. Standards of Acceptance:

a. Refer to Paragraph 1.8B - Quality Assurance/Qualifications.

2.2 SYSTEMS DESCRIPTION

A. Refer to 'TS' Series Contract Drawings for seating layout plans and to architectural and structural drawings for floor and riser plans.

B. The seating layout drawings indicate acceptable seat widths and quantities at each width. Proposed manufacturer's alterations from this layout shall be explained in the shop drawings.

C. Layout Requirements:

1. Seating layout shall conform to critical aisle dimensions as indicated on the Drawings. These dimensions are based on project code requirements.
2. Actual makeup of rows and requisite seat widths shall be the responsibility of the Contractor and shall be based on the Contractor's own field measurements and Theatre Consultant's review of final shop drawings.
3. The chairs must stagger from row to row on the centerline of the theatre to maximize vertical sightlines. End of rows shall align as indicated on the Drawings.
4. In rows which contain varying width chairs, the following criteria shall generally be followed:

a. Narrow seats are to be mounted adjacent to an aisle.
b. Wide seats are to be mounted adjacent to side walls or railings.
c. The remaining varying width seats shall be distributed throughout the row so that the narrow seats are not mounted adjacent to one another and the overall quantity of narrow seats is at the absolute minimum.

2.3 DESIGN CRITERIA

A. All auditorium seating must be designed, manufactured and installed to:

1. Perform satisfactorily in their intended situation and under their expected conditions in use.
2. Have sufficient strength to meet their intended conditions of use.
3. Be free from any dimensional inaccuracy or distortion likely to affect its installation or operation.
4. Ensure that they do not contain any material which by direct contact or otherwise can be detrimental to the health and safety of the user.

B. Overall front to back envelop with seat in upright position shall not exceed 21" without notifying Architect in writing.

C. The audience seating shall be fabricated using molded foam cushions for maximum comfort, using materials which are carefully selected to be free of defects, objectionable projections, or irregularities. Smoothly round corners, edges and exposed fasteners to present least possible snagging and pinching hazards.

D. Basis of design:

1. The basis of design for the fixed and removable auditorium seats shall be the following with special components as indicated herein or an approved equal:

a. Basis of design appearance:

1) Irwin Seating: 90.12.10.4 Citation Chair

E. Capacities:

1. Seats:

a. Seats shall be tested and professionally certified through an independent testing laboratory to support and withstand an evenly distributed minimum of 600 lbs. static load located 3” back from the front of the seat without deflection.
b. Seats shall be tested and professionally certified through an independent testing laboratory to withstand 300,000 operating cycles without added lubrication, spring fatigue or measurable bearing wear.
c. Seats shall be tested and professionally certified through an independent testing laboratory to withstand, without failure, not less than 100,000 impacts of a 40 lb. sandbag dropped equally from heights of 6”, 8”, 10” and 12”.
d. All up-stops and down-stops shall be completely concealed.

2. Backs:

a. Backs shall withstand an evenly distributed front or rear load of 450 lbs.
b. Backs shall be tested and professionally certified through an independent testing laboratory to withstand, without failure, not less than 40,000 alternating swinging impact cycles by each of 2 opposing 40 lb. sandbags. Sandbags shall be moved horizontally and equally through various distances of 6”, 8”, 10” and 12” at 35 cpm.

3. Arm rests:

a. Armrests shall be tested and professionally certified through an independent testing laboratory to accept a 250 lb. sandbag placed at the front of the armrest with no deflection.
b. The same test shall be performed on the rear of the armrest.

F. Fire Performance Characteristics

1. Flame Retardant performance: Upholstery components and the assembly thereof shall be in conformance with flammability standards as set forth in California Technical Bulletin 117.
2. Padding: Provide new (prime manufacture) polyurethane foam with an average burn length not exceeding 8" and average flame time after removal of flame source not exceeding 15 seconds, with drippings from test specimen not continuing to flame for more than 5 seconds after falling, when tested vertically in compliance with Federal Test Method Standard 191, Method 5903.2.

2.4 MATERIALS

A. General

1. All equipment and components shall be new and complete. No used or reconditioned equipment shall be acceptable unless otherwise noted.
2. All equipment to have pertinent testing labels.
3. All variations from the specified materials and product must be approved by the Architect.

B. Materials shall conform to the following minimum standard specifications:

1. Gray Iron Castings: American Society of Testing Materials A48, Class 25.
2. Steel Plates, Shapes, and Bars: American Society of Testing Materials A36.
3. Steel Sheets for Baked Enamel Finish: American Society of Testing Materials A591, commercial and drawing quality; Class C, galvanized-bonderized; 20 gauge minimum unless otherwise indicated.
4. Expansion Bolts: FS FF-B-588; Type, Class, and Style as recommended by the chair manufacturer.
5. Concealed Plywood: PS 1/ANSI A199.

C. Finishes

1. Finish for all exposed metal parts shall be Black and shall match.
2. Finish for all exposed plastic parts shall be Black and shall match.
3. Plastic Laminate color and pattern to be Formica Bleached Legno 8845-58.
4. Upholstery fabric shall be Maharam Textiles patter Merit, color Cabernet.
5. Cushions: Seat and back cushions made of open cell polyurethane foam.
6. Fasteners: All fasteners shall be concealed. No exposed fasteners permitted.

2.5 UPHOLSTERED SEATS

A. The seat shall have seat pans constructed of injection molded polypropylene and upholstered molded foam cushion.

B. The seat should be well shaped to provide maximum comfort.

C. Equip chairs with noiseless gravity uplift devices, so that unoccupied seats quietly rise to uniform full vertical fold.

D. Provide for seat rotation on bushings which do not require lubrication and have a positive internal return stop of rubber or neoprene.

E. The seats shall be free of exposed screws and bolts on the bottom, front and sides.

2.6 UPHOLSTERED SEAT BACKS

A. The seat back will be upholstered on the front with a one-piece injection molded polymer rear.

B. The seat back will be ergonomically designed back with lumbar support.

C. Inner structure will be a rigid triple curved, molded, compressed fire retardant chipboard.

D. Foam padding will be cold molded CMHR polyurethane foam.

E. The backs shall be free of screws and bolts on the bottom, front and sides.

F. The back of the rear panel shall not be upholstered nor covered with fabric of any kind.

2.7 AISLE AND INTERMEDIATE CHAIR STANDARDS

A. Standards shall be fabricated from tubular steel.

1. Tubular Steel Standards: Fabricate chair standards of heavy gauge rectangular steel tubing securely welded to steel mounting plate, with seat, back and armrest connections welded to tubing.

    a. All weldments shall be gas shielded, arc welded.

2. Fabricate seating units for attachment to floor conditions, both sloped and level, as indicated, using standards which have been manufactured to allow maximum cleaning space below point of attachment while maintaining seat height at proper elevation to floor.
3. Provide bolt caps at each floor standard foot which cover mounting stud and nut. Color to match selected metal finish for aisle standard.

2.8 AISLE END PANEL

A. Aisle end panels shall be injection molded glass-filled polypropylene and enclose the upper 2/3 of the support column. Panels are teardrop-shaped with a concave rear edge and well-rounded surfaces around a center area, which features a plastic laminate surfaced insert.

2.9 TRANSFER ARMS

A. Provide aisle standards equipped with swing-away end panel assemblies in locations shown on drawings and as required by building codes and the ADA.

B. The aisle end panel assembly shall swing away to allow the individual access to the seat. Aisle standards shall use positive latching hardware to secure swinging panel in place.

C. The accessible aisle end panels shall match others that are not accessible.

D. The accessible aisle end panels shall be designated with code complying graphics. All graphic elements shall be set flush in chair surfaces and shall be permanently affixed to the chair with dry adhesive.

2.10 ARMREST

A. Provide armrest at each aisle and between chairs, designed for concealed mounting to standards.

B. Armrests shall be low-profile comfort curved polypropylene.

C. Attachment shall be with 2 keyhole slots plus 1 security screw, or countersunk fasteners on underside.

2.11 NUMBER AND LETTER PLATES

A. Provide seat number plates for seat location identification system corresponding to approved shop drawings.

1. Number plates shall be 5/8" x 1-5/8" aluminum with a clear finish and black sans serif numerals

B. Provide row letter plates mounted to aisle end standards for seat location identification system corresponding to approved shop drawings.

1. Letter plates shall be 2” round with a clear finish and black sans serif numerals Text fill shall be deep in color and consistent. Characters shall be centered on the plate.

C. Fixing shall be by two-part epoxy adhesive.

2.12 MOVABLE CHAIR BASES

A. Designated chairs on the drawings shall be provided with low-profile steel platforms fitted with specially designed locking devices to provide for easy removal and re-attachment of the chair to accommodate conversion of the space for equipment access.

B. Release/transport tool shall be provided to the Owner with each chair/platform.

2.13 FABRICATION

A. Fabricate all work in this section in accordance with the Architect’s direction, specifications, approved shop drawings, pertinent project drawings, established trade practices, and applicable code requirements.

B. Machine finish all operating parts to standard trade tolerances, fits and finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Contractor must examine areas and conditions under which auditorium seating is to be installed, including condition of substrate to which seating standards are to be attached, and must notify the Architect in writing of conditions detrimental to proper and timely completion of work. Work will not proceed until unsatisfactory conditions have been corrected in a manner acceptable to the Contractor.

B. Surface Preparation: Prepare all surfaces as to manufacturer’s recommendations. Comply with all industry standards regarding surface materials.

3.2 INSTALLATION

A. Install all work in this section in accordance with the Architect's direction, specifications, approved shop drawings, pertinent project drawings, established trade practices and applicable code requirements.

B. Install all work securely, complete with all bolts, nuts, washers, clips, fittings, supports, and other items required for proper installation and operation.

C. Position all items accurately as indicated on drawings and true to plumb, line and level. Maintain maximum headroom and clearances at all points.

D. Install seats in locations indicated on approved shop drawings, with required clearances, elevations, and sightlines.

E. Install standards in locations necessitated by seating layout with each standard attached to the substrate by no less than two (2) anchoring devices of recommended size.

F. Install seats by mounting components to standards or brackets mounted on standards using industry approved hardware and fasteners.

G. Seats in back rows with a wall behind them or seats with a balustrade behind them should be set forward by 4". Maintain aisle width.

H. Contractor shall ensure that mounting bolts and assembly hardware are cut and capped and/or otherwise finished to achieve both a finished appearance to the installation and eliminate protrusions and sharp edges which could cut and tear.

3.3 FIELD QUALITY CONTROL

A. The installation of the equipment indicated in this section shall be supervised by qualified personnel who are regularly employed by the Contractor for supervision of equipment installation similar to that indicated herein.

B. Installers must be appropriately skilled and experienced for the type and quality of work.

C. Arrange for all tests and inspections required by the General Requirements.

3.4 ADJUSTING

A. Adjust all equipment and components for operation in accordance with the specifications, approved shop drawings and pertinent project drawings prior to the demonstration indicated herein.

B. Verify that moving components operate smoothly and quietly.

C. Adjust seat uplift mechanisms to ensure that seats in each row are aligned when in upright position.

D. Replace any upholstery damaged during installation.

3.5 CLEANING

A. Touch-up minor abrasions and imperfections as required.

B. Remove from the premises all debris caused by this work. All unnecessary equipment and materials shall be removed from the area(s) of this work upon completion, removed from the job site and disposed of legally at no additional cost to the Owner.

3.6 CLOSEOUT ACTIVITIES

A. Demonstration

1. Upon completion of the installation work required by the work of this Section, the Contractor will notify the Architect that the work is complete, conforms to specification and is ready for Demonstration.
2. Installed equipment shall be operated for approval and inspected for quality by the Theatre Consultant, the Architect and the Owner.
3. Installed seating shall be compared with the approved mock-up. They shall be identical in all respects.
4. Adjustments or modifications shall be made as directed by the Architect and the Theatre Consultant.
5. Cost of re-inspection and additional testing by the Architect and Theatre Consultant, if required, due to lack of completion and/or errors and omissions shall be paid by the Contractor respective to the area of work concerned. This work will be conducted on a time and materials basis, including the Architect's and Theatre Consultant's standard hourly rates, and shall be scheduled and approved in writing prior to the re-inspection/ testing session.

B. Training

1. Following the equipment demonstration, inspection and final adjustments, the Owner's designated staff or representatives shall be instructed in the use, care and maintenance of all items.
2. Schedule the instruction in conformance with project construction schedule and the availability of the Owner.

3.7 PROTECTION

A. Provide full protection from damage, construction dirt and debris for all equipment from the point of installation to testing and Owner acceptance.

B. Remove all equipment protection and clean all components thoroughly prior to the demonstration session.

END OF SECTION

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. Contractor shall be responsible for notifying Construction Manager in advance of submitting equipment of any deviations from basis of design. Contractor shall present cost differences in equipment selections to Construction Manager to assist in determining cost impacts to other trades.

1.6 MATERIALS

A. Mechanical 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 Mechanical Trades shall provide all control wiring, 120 volts and less, for the equipment and devices furnished under Division 22, and 23 of these specifications, including all wiring devices, conduit, etc.

C. Power wiring 120 volts and greater shall be by the Electrical Trades.

1.7 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.

1.8 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.

1.9 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.

1.10 UTILITY COMPANY REBATES

A. The contractor shall apply for all applicable utility company rebates in the name of the owner. In a timely manner after award of contract, the contractor shall complete pre-application notifications for the applicable rebates for each school or building. At the completion of the project, the contractor shall furnish and submit all additional information required and requested of the utility company for the final application and submit the final application. The contractor shall act as the technical contact for communication in securing the rebates. The rebates shall be forwarded directly from the utility company to the owner, in the owner's name. The contractor shall not claim any of the rebates for themselves.

1.11 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.

1.12 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.

1.13 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.

1.14 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 FILTERS

A. Provide and maintain filters in air handling systems throughout the construction period and prior to final acceptance of the building. Do not run air handling equipment without all prefilters and final filters as specified. Immediately prior to final building acceptance by the owner, contractor shall replace all disposable type air filters with new.

2.4 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.

SECTION 23 0505
SELECTIVE DEMOLITION FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Demolition and extension of existing mechanical 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, cutting and patching requirements, repairs.

1.3 SUMMARY

A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the system of minor electrical demolition as described in this specification.

B. The demolition documents plans and specification have been prepared from existing non-as built documents and cursory non-invasive field investigation.

C. It is the contractors obligation to become familiar with the extent of demolition and the existing condition before submitting their bid.

D. During demolition if the contractor discovers unforeseen significant non-code compliance conditions of the existing installation they shall notify the Architect and Engineer immediately in writing.

E. The contractor shall become familiar with the drawings and scope of work of other trades as the work scope of those trades relates to mechanical equipment and connection requirements.

F. During demolition the contractor shall record on site as-builts all hydronic system piping capped branches, capped supply air, return air and exhaust ducts for reuse in renovated project space.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping, ductwork, equipment, accessories, controls and control wiring/tubing to be demolished serve only equipment and facilities within the demolition areas.

B. Demolition drawings are based on casual field observation and existing record documents.

C. Report discrepancies between drawings and field conditions to Owner and Engineer before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Identify locations for capping piping, ductwork and controls before any demolition work commences.

B. Confirm isolation valve locations for hydronic piping. Repair leaking isolation valves or replace inoperable valves before commencing piping demolition.

C. Cap and seal air-tight supply, return and exhaust air ductwork at shaft walls before commencing sheet metal demolition.

D. Identify existing controls wiring and/or tubing that serves equipment before any demolition work commences.

3.3 DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK

A. Remove, relocate, and extend existing mechanical piping, sheet metal, and controls work to accommodate new construction.

B. Remove hydronic water piping back to isolation valve.

C. Remove all supply, return and exhaust air ductwork back to main connection.

D. Contractor shall ensure all modified systems are functional and in working order.

E. Pneumatic tubing for demolished equipment shall be removed back to mains and mains capped. Where existing pneumatic control systems are partially demolished or modified, the contractor shall take extra care to ensure that portions of the existing system intended to remain are left in proper working order.

3.4 CLEANING AND REPAIR

A. Refer to Division 01 - General Requirements for procedures.

B. Clean and repair existing materials, piping, sheet metal, diffuers, accessories and equipment that remain or that are to be reused.

SECTION 23 0517
SLEEVES AND SLEEVE SEALS FOR HVAC 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.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 PIPE SLEEVES

A. Manufacturers:

1. Flexicraft Industries; Pipe Wall Sleeve: www.flexicraft.com/#sle.

2. Substitutions: See Section 01 6000 - Product Requirements.

B. 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.

C. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

D. 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.

E. 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 in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

2.2 PIPE-SLEEVE SEALS

A. Manufacturers:

1. Advance Products & Systems, LLC; Innerlynx: www.apsonline.com/#sle.

2. American Polywater Corporation; PGKD Modular Seals: www.polywater-haufftechnik.com/#sle.

3. Flexicraft Industries; PipeSeal: www.flexicraft.com/#sle.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. 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.

C. Sealing Compounds:

1. Provide packing and sealing compound to fill pipe to sleeve thickness.

2. Combined packing and seal compound is to match partition fire-resistance hourly rating.

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. 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 in compliance 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 in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

E. 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.

F. 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 23 0519
METERS AND GAUGES FOR HVAC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pressure gauges and pressure gauge taps.

B. Thermometers and thermometer wells.

1.2 RELATED REQUIREMENTS

A. Section 23 2113 - Hydronic Piping.

1.3 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.

B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle, and Venturi; 2004 (Reaffirmed 2017).

C. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014 (Reapproved 2020).

D. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014 (Reapproved 2021).

E. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

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.

1.5 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.1 PRESSURE GAUGES

A. Manufacturers:

1. Dwyer Instruments, Inc: www.dwyer-inst.com/#sle.
2. Moeller Instrument Company, Inc: www.moellerinstrument.com/#sle.
3. Omega Engineering, Inc: www.omega.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

1. Case: Steel with brass bourdon tube.
2. Size: 4-1/2 inch diameter.
3. Mid-Scale Accuracy: One percent.
4. Scale: Psi and KPa.

2.2 PRESSURE GAUGE TAPPINGS

A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi.

B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.

2.3 STEM TYPE THERMOMETERS

A. Manufacturers:

1. Dwyer Instruments, Inc: www.dwyer-inst.com/#sle.
2. Omega Engineering, Inc: www.omega.com/#sle.
3. Weksler Glass Thermometer Corp: www.wekslerglass.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.

1. Size: 9 inch scale.
2. Window: Clear Lexan.

3. Stem: 3/4 inch NPT brass.

4. Accuracy: 2 percent, per ASTM E77.

5. Calibration: Degrees F.

2.4 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.

C. Install pressure gauges with pulsation dampers. Provide gauge cock to isolate each gauge. Extend nipples to allow clearance from insulation.

D. Provide instruments with scale ranges selected according to service with largest appropriate scale.

E. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

F. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

G. Locate test plugs where indicated; coordinate with Temperature Controls Contractor and Test and Balance Contractor for any additional locations needed to complete their work.

3.2 SCHEDULE

A. Pressure Gauges, Location:

1. Pumps.

2. Expansion tanks.

B. Pressure Gauge Tappings, Location:

1. Control valves 3/4 inch & larger - inlets and outlets.

2. Major coils - inlets and outlets.

3. Heat exchangers - inlets and outlets.

C. Stem Type Thermometers, Location:

1. Headers to central equipment.

2. Heat exchangers - inlets and outlets, 0 to 300 degrees F.

3. After major coils.

4. As noted on plans, diagrams and details.

SECTION 23 0523
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Globe valves.

B. Ball valves.

C. Butterfly valves.

D. Check valves.

E. Combination flow measuring and balancing valves.

F. Gate valves.

1.2 RELATED REQUIREMENTS

A. Section 23 0553 - Identification for HVAC Piping and Equipment.

B. Section 23 0719 - HVAC Piping Insulation.

C. Section 23 2113 - Hydronic 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. API STD 594 - Check Valves: Flanged, Lug, Wafer, and Butt-Welding; 2022.

B. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

D. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

E. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022.

F. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

G. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2020.

H. ASME B31.9 - Building Services Piping; 2020.

I. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2023).

J. ASTM A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service; 2021.

K. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

L. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).

M. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.

N. AWWA C606 - Grooved and Shouldered Joints; 2022.

O. MSS SP-45 - Drain and Bypass Connections; 2020.

P. MSS SP-67 - Butterfly Valves; 2022.

Q. MSS SP-68 - High Pressure Butterfly Valves with Offset Design; 2021.

R. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.

S. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a.

T. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

U. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

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:

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.

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. Throttling (Hydronic): Combination Flow Meauring and Balancing.

2. Throttling (Steam): Butterfly, Gate, and Ball.

3. Isolation (Shutoff): Butterfly and Ball.

4. Pump Outlet: Spring Loaded Check.

5. Dead-End: Butterfly, single-flange (lug) type.

6. Drain Valve: Ball with hose end connection and cap.

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. Required Valve End Connections for Non-Wafer Types: Use flanges, unions or grooved couplings to allow disconnection of components for servicing.

E. Hydronic Valves:

1. 2 NPS and Smaller, Bronze or Hot Forged Brass Valves.

2. 2-1/2 NPS and Larger, Cast Steel Valves or Butterfly Valves.

F. Heating Hot Water Valves:

1. Size 2 inch and Smaller, Bronze Valves:

a. Threaded ends.

2. Size 2-1/2 inch and Larger, Iron Valves:

a. 2-1/2 inch to 4 inch: Threaded ends.

G. Low Pressure Steam Valves for Pressures of 15 psi or Less:

1. Size 2 inch and Smaller, Bronze Valves:

2. Size 2-1/2 inch and Larger, Iron Valves:

H. Steam-Condensate Valves:

1. Size 2 inch and Smaller, Bronze Valves:

2. Size 2-1/2 inch and Larger, Iron Valves:

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. Gear Actuator: Quarter-turn valves 8 inch and larger.

2. Handwheel: Valves other than quarter-turn types.

3. Hand Lever: Quarter-turn valves 6 NPS and smaller.

D. Valves in Insulated Piping: Provide 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. Butterfly Valves: Extended neck.

3. Memory Stops: Fully adjustable after insulation is installed.

E. Memory Stops: Fully adjustable after insulation is installed.

F. 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: AWWA C606.

G. General ASME Compliance:

1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.

2. Building Services Piping Valves: ASME B31.9.

H. Bronze Valves:

1. Fabricate from dezincification resistant material.

2. Hot Forged Brass is an approved material from Bonomi only.

3. Copper alloys containing more than 15 percent zinc are not permitted.

I. Valve Bypass and Drain Connections: MSS SP-45.

J. Source Limitations: Obtain each valve type from a single manufacturer.

2.3 BRONZE, GLOBE VALVES

A. CWP Rating: Class 125: 200 psi:

1. Comply with MSS SP-80, Type 1.

2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.

3. Ends: Threaded or solder joint.

4. Stem and Disc: Bronze or PTFE.

5. Packing: Asbestos free.

a. Handwheel: Malleable iron.

2.4 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 brass Trim:

1. Comply with MSS SP-110.

2. WSP Rating: 150 psi.

3. WOG Rating: 400 psi.

4. Body: Forged bronze or dezincified-brass alloy.

5. Ends: Solder or threaded with union.

6. Seats: PTFE.

7. Stem: Bronze or brass.

8. Ball: Chrome plated brass.

9. Manufacturers:

   a. Apollo Valves: www.apollovalves.com/#sle.

   b. Jomar Valves, a division of Jomar Group: www.jomarvalve.com/#sle.

   c. Bonomi North America www.bonominorthamerica.com

   d. Tyco Flow Control: www.tycoflowcontrol.com

   e. Victaulic Company: www.victaulic.com

   f. Milwaukee Valve Company: www.milwaukeevalve.com

   g. Kitz Corporation of Ameria: www.kitz.com

   h. Nibco Valves: www.nibco.com/#sle

   i. ASC-Engineered Solutions www.asc-es.com

   j. Substitutions: See Section 01 6000 - Product Requirements.

2.5 CARBON STEEL, BALL VALVES

A. Class 300, Full Port, Stainless Steel Trim, Flanged:

1. Comply with MSS SP-72.

2. CWP Rating: 285 psig.

3. Body: Carbon steel, ASTM A216/A216M, Type WCB.

4. Seats: PTFE.

5. Stem: Stainless steel.

6. Ball: Stainless steel, vented.

7. Size: 1/2 to 12 inches.

8. Manufacturers:

   a. Apollo Valves: www.apollovalves.com/#sle.

   b. Jomar Valves, a division of Jomar Group: www.jomarvalve.com/#sle.

   c. Bonomi North America www.bonominorthamerica.com.

d. Tyco Flow Control: www.tycoflowcontrol.com

e. Victaulic Company: www.victaulic.com

f. Milwaukee Valve Company: www.milwaukeevalve.com

g. Kitz Corporation of Ameria: www.kitz.com

h. ASC-Engineered Solutions www.asc-es.com

i. Substitutions: See Section 01 6000 - Product Requirements.

2.6 IRON, SINGLE FLANGE BUTTERFLY VALVES

A. Lug Style; Bidirectional Dead-End Service without Use of Downstream Flange:

1. Comply with MSS SP-67, Type I.

2. Lug Style, CWP Ratings:

a. Sizes 2 to 12 inch: 150 psi.

3. Body Material: ASTM A126 cast iron or ASTM A536 ductile iron.

4. Stem: Stainless steel with stem offset from the centerline to provide full 360 degree circumferential setting.

5. Seat: replaceable EPDM.

6. Disc: Construct of aluminum bronze, chrome plated ductile iron, stainless steel, ductile iron with EPDM encapsulation, or Buna-N encapsulation.

7. Operator: 10 position lever handle.

8. Manufacturers:

a. Apollo Valves: www.apollovalves.com/#sle.

b. Jomar Valves, a division of Jomar Group: www.jomarvalve.com/#sle.

c. Kitz Corporation of America: www.kitzus-kca.com/#sle.

d. Nexus Valve, Inc: www.nexusvalve.com/#sle.

e. ASC-Engineered Solutions www.asc-es.com.

f. ABZ Valves and Controls.

g. Hammond Valve: www.hammondvalve.com

h. Pratt Industrial www.prattindl.com

i. Victaulic Company: www.victaulic.com

j. Substitutions: See Section 01 6000 - Product Requirements.

2.7 IRON, GROOVED-END BUTTERFLY VALVES

A. CWP Rating: 175 psi.

1. Comply with MSS SP-67, Type I.

2. Body: Coated ductile iron.

3. Stem: Two-piece stainless steel.

4. Disc: Coated ductile iron.

5. Disc Seal: EPDM.

6. Operator: 10 position lever handle.

7. Manufacturers:

a. Kitz Corporation of America: www.kitzus-kca.com/#sle.

b. Apollo Valves: www.apollovalves.com/#sle.

c. Bonomi North America www.bonominorthamerica.com

d. Tyco Flow Control: www.tycoflowcontrol.com.

e. ABZ Valves and Controls.

f. Hammond Valve: www.hammondvalve.com

g. Gruvlok by ASC Engineered Solutions www.asc-es.com

h. Victaulic Company: www.victaulic.com

i. Substitutions: See Section 01 6000 - Product Requirements.

2.8 HIGH-PERFORMANCE, SINGLE FLANGE BUTTERFLY VALVES

A. Lug type; Bidirectional dead end service without downstream flange:

1. Comply with MSS SP-68.

2. Class 150: CWP Rating: 285 psi at 100 degrees F.

3. Body: Provide carbon steel, cast iron, ductile Iron, or stainless steel.

4. Seat: Metal or reinforced PTFE.

5. Offset stem: Stainless steel.

6. Disc: Carbon steel.

7. Manufacturers:

   a. Apollo Valves: www.apollovalves.com/#sle.

   b. Substitutions: See Section 01 6000 - Product Requirements.

2.9 BRONZE, SWING CHECK VALVES

A. Class 125:

1. Pressure and Temperature Rating: MSS SP-80, Type 3.

2. Design: Y-pattern, horizontal or vertical flow.

3. WSP Rating: 200 psi.

4. Body: Bronze, ASTM B62.

5. End Connections: Threaded or soldered.

6. Disc: Bronze.

7. Manufacturers:

   a. Apollo Valves: www.apollovalves.com/#sle.

   b. ASC Engineered Solutions www.asc-es.com

   c. Kitz Corporation of America: www.kitzus-kca.com/#sle.

   d. Tyco Flow Control: www.tycoflowcontrol.com

   e. Victaulic Company: www.victaulic.com

   f. Substitutions: See Section 01 6000 - Product Requirements.

2.10 BRONZE SPRING LOADED CHECK VALVES

A. Class 125: CWP Rating 200 psig (1380 kPa).

1. Design: Vertical flow.

2. Body: Bronze, ASTM B61 or ASTM B62

3. Spring: Bronze

4. Ends: Threaded or soldered.

5. Disc: Nonmetallic

6. Manufacturers:

a. Milwaukee: www.milwaukeevalve.com

b. Apollo Valves[<>]: www.apollovalves.com/#sle.

c. ASC Engineered Solutions www.asc-es.com

d. Bonomi www.bonominorthamerica.com Hot Forged Brass Material approved

e. Substitutions: See Section01 6000-Product Requirements.

2.11 IRON, FLANGED END SWING CHECK VALVES

A. Class 125:

1. 150 psi with metal seats.

2. 200 psi with metal seats and nonmetallic-to-metal seats.

B. Design: Clear or full waterway with flanged ends.

C. Body: Gray iron with bolted bonnet in accordance with ASTM A126.

D. Trim: Bronze.

E. Disc: Stainless steel, bronze, or bronze faced rotating swing. Renewable disc and seat.

F. Gasket: Asbestos free.

G. Manufacturers:

1. Apollo Valves: www.apollovalves.com/#sle.

2. Bonomi North America www.bonominorthamerica.com

3. ASC Engineered Solutions www.asc-es.com.

4. Kitz Corporation of America.

5. Tyco Flow Control: www.tycoflowcontrol.com

6. Victaulic Company: www.victaulic.com

7. Titan Flow: www.titanfci.com

8. Substitutions: See Section 01 6000 - Product Requirements.

2.12 IRON, GROOVED-END SWING CHECK VALVES

A. Class 300:

1. Body Material: ASTM A536, Grade 65-45-12 ductile iron.
2. Seal: EPDM or Nitrile.
3. Disc: Stainless steel.
4. Coating: Black, non-lead paint.
5. Manufacturers:
    a. Gruvlok by ASC Engineered Solutions www.asc-es.com.
    b. Kitz Corporation of America.
    c. Tyco Flow Control: www.tycoflowcontrol.com
    d. Victaulic Company: www.victaulic.com
    e. Titan Flow: www.titanfci.com
    f. Substitutions: See Section 01 6000 - Product Requirements.

2.13 IRON, PLATE-TYPE, SPRING LOADED CHECK VALVES

A. Class 125 Dual-Plate:

1. Comply with API STD 594.
2. Sizes 2-1/2 to 12 inch: CWP Rating; 200 psi.
3. Body Design: Wafer or threaded lug ends, spring-loaded plates.
4. Body Material: ASTM A126, gray iron.
5. Trim: Bronze.
6. Resilient Seat: EPDM.
7. Spring: Stainless steel.
8. Manufacturers:
    a. Tyco Flow Control: www.tycoflowcontrol.com.
    b. Bonomi North America www.bonominorthamerica.com
    c. Crane Co.: www.cranevalve.com
    d. Kitz Corporation of America.

e. Victaulic Company: www.victaulic.com

f. Titan Flow: www.titanfci.com

g. Substitutions: See Section 01 6000 - Product Requirements.

2.14 CARBON STEEL, GATE VALVES

A. Class 150:

1. Body and Disc: ASTM A216/A216M.

2. CWP Rating: 150 psi.

3. Bolted Bonnet: OS&Y; Rising Stem.

4. End Connections: Flanged.

5. Packing and Gasket: Asbestos free.

6. Pressure and Temperature Rating: ASME B16.34.

2.15 COMBINATION FLOW MEASURING AND BALANCING VALVE

A. Manufacturers:

1. Griswold Controls

2. Nexus

3. Flow Design

B. Construction:

1. Manual Flow Control devices shall be fixed orifice venturi, modified venturi, or pitot balancing type accurate to at least +/- 3%.

2. Valves 2-1/2" and smaller shall be modified venturi style, forced brass body and with integrated ball valve, (2) pressure/temperature test ports, additional port for air vent or drain valve, a tag indicating the model and Cv, memory stop with graduated scale, blowout proof stem with dual O-ring seals, interchangeable union end with O-ring seal, hard chrome plated ball with Teflon seats, and rated at 600 PSI WOG, 325 degrees F.

3. Valves 2-1/2" and larger shall be venturi or pitot balancing type accurate to at least +/- 3%.

a. Venturi balancing type shall be a flanged carbon steel ST37 body (per ASME B16.5, Class 150 Flanges); butterfly valve with infinite position memory stop and 316 stainless steel disc. Valve shall have (2) 1/4" NPT ports and be rated for 230 PSI, 250 degrees F.

b. Pitot tube balancing type shall be flanged cast iron body (per ASTM A126, Class B Flanges) metering station with stainless steel pitot tube; a tag indicating the model and Cv; butterfly valve with infinite position memory stop and 316 stainless steel disc. Valve shall have a minimum, (2) 1/4" NPT ports, (1) 1/2" NPT port and (1) additional 3/4" NPT port. Valve shall be rated at 175 PSI, 275 degrees F.

PART 3 EXECUTION

3.1 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges, are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.2 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. Install valves with stems upright or horizontal, not inverted.

D. Install check valves where necessary to maintain direction of flow as follows:

1. Swing Check: Install horizontal maintaining hinge pin level.

2. Orient plate-type and center-guided into horizontal or vertical position, between flanges.

SECTION 23 0529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment components.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

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 A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

I. MFMA-4 - Metal Framing Standards Publication; 2004.

J. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.

2. Coordinate the work with other trades to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.

4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.

5. Notify Architect of any 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 Section 03 3000.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

1.6 QUALITY ASSURANCE

A. Comply with applicable building code.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.

2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.

3. 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 with a minimum safety factor of 1.25. Include consideration for vibration, equipment operation, and shock loads where applicable.

4. Steel Components: Use corrosion resistant materials suitable for the 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. Prefabricated Trapeze-Framed Metal Strut Systems:

1. Strut Channel or Bracket Material:

2. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

C. Hanger Rods:

1. Threaded zinc-plated steel unless otherwise indicated.

D. Pipe Supports:

1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2. Liquid Temperatures Up To 250 degrees F:

a. Overhead Support: MSS SP-58 Types 1, 3 through 12.

b. Support From Below: MSS SP-58 Types 35 through 38.

E. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

4. Hollow Masonry: Use toggle bolts.

5. Hollow Stud Walls: Use toggle bolts.

6. Steel: Use beam-ceiling clamps, beam clamps, machine bolts, or welded threaded studs.

7. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, plain, stainless steel, or zinc finish.

8. Sheet Metal: Use sheet metal screws.

9. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.

a. Comply with MFMA-4.

b. Channel Material: Use galvanized steel.

c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

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. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

I. Secure fasteners according to manufacturer's recommended torque settings.

J. Remove temporary supports.

SECTION 23 0548
VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vibration isolation requirements.

B. Vibration-isolated equipment support bases.

C. Vibration isolators.

D. Vibration-isolated and/or seismically engineered roof curbs.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

1.3 REFERENCE STANDARDS

A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.

2. Coordinate the work with other trades to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.

4. Notify Architect of any 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 Section 03 3000.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.

1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.

C. Shop Drawings - Vibration Isolation Systems:

1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.

2. Vibration-Isolated Equipment Support Bases: Include base weights, including concrete fill where applicable; indicate equipment mounting provisions.

1.6 QUALITY ASSURANCE

A. Comply with applicable building code.

PART 2 PRODUCTS

2.1 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:

1. Select vibration isolators to provide required static deflection.

2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

D. Equipment Isolation:

2.2 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Manufacturers:

1. Vibration-Isolated Equipment Support Bases:

a. Kinetics Noise Control, Inc; _____: www.kineticsnoise.com/#sle.

b. Mason Industries; _____: www.mason-ind.com/#sle.

c. Vibration Eliminator Company, Inc; _____: www.veco-nyc.com/#sle.

d. Vibro-Acoustics; ____: www.vibro-acoustics.com/#sle.

e. Substitutions: See Section 01 6000 - Product Requirements.

2. Source Limitations: Furnish vibration-isolated equipment support bases and associated components and accessories produced by the same manufacturer as the vibration isolators and obtained from a single supplier.

2.3 VIBRATION ISOLATORS

A. Manufacturers:

1. Vibration Isolators:

a. Kinetics Noise Control, Inc; _____: www.kineticsnoise.com/#sle.

b. Mason Industries; _____: www.mason-ind.com/#sle.

c. Vibration Eliminator Company, Inc; _____: www.veco-nyc.com/#sle.

d. Vibro-Acoustics; _____: www.vibro-acoustics.com/#sle.

e. Substitutions: See Section 01 6000 - Product Requirements.

2. Source Limitations: Furnish vibration-isolators and associated accessories produced by a single manufacturer and obtained from a single supplier.

B. General Requirements:

1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.

2. Spring Elements for Spring Isolators:

a. Color code or otherwise identify springs to indicate load capacity.

b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.

c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.

d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.

e. Selected to provide designed deflection of not less than 75 percent of specified deflection.

f. Selected to function without undue stress or overloading.

C. Vibration Isolators for Nonseismic Applications:

1. Spring Isolator Hangers, Nonseismic:

a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.

b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

2.4 ACOUSTICAL AND VIBRATION ISOLATORS

A. General Requirements:

1. Acoustical Isolation System: Through-stud isolators, pipe clamps, riser clamp pads, neoprene and felt lining material and associated support brackets.

2.5 VIBRATION-ISOLATED AND/OR SEISMICALLY ENGINEERED ROOF CURBS

A. Manufacturers:

1. Vibration-Isolated and/or Seismically Engineered Roof Curbs:

a. Kinetics Noise Control, Inc; _____: www.kineticsnoise.com/#sle.

b. Mason Industries; _____: www.mason-ind.com/#sle.

c. Vibration Eliminator Company, Inc; _____: www.veco-nyc.com/#sle.

d. Vibro-Acoustics; _____: www.vibro-acoustics.com/#sle.

e. Substitutions: See Section 01 6000 - Product Requirements.

2. Source Limitations: Furnish vibration-isolated roof curbs and associated accessories produced by the same manufacturer as the vibration isolators and obtained from a single supplier.

B. Vibration Isolation Curbs and Rails:

1. Adjustable Curb-mounted Spring Isolation Rails: Type ARTR – Full perimeter adjustable vibration isolation rail with integral restrained spring isolators for installation on top of a rigid roof curb. Rails shall be constructed using minimum 16 ga (1.6 mm) formed galvanized steel. Integral housed spring isolators shall have zinc plated high grade steel housings designed to limit motion due to wind or seismic forces, and shall include integral all-directional limit stops with reinforced elastomeric grommets preventing metal-to-metal contact and short circuiting, with nominal 1/4” (6 mm) clearance under normal operation. The integral isolators shall be adjustable to ensure that the supported equipment stays level after installation. Rails shall be provided with weather seal materials consisting of closed cell sponge tape for installation between the equipment and the upper rails, and waterproof, flexible, reinforced EPDM strips for joining the outside perimeter of upper and lower rails. Solid top covers, framing for acoustical barrier installation, galvanized steel duct supports, and flexible duct connections shall be provided as scheduled or required. The rail shall be manufactured, shipped and installed as a single piece where size and shipping conditions permit. Shipping splits and lifting points shall be coordinated with the installing contractor.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

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 anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:

1. Vibration-Isolated Equipment Support Bases:

a. Provide specified minimum clearance beneath base.

2. Spring Isolators:

a. Position equipment at operating height; provide temporary blocking as required.

b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.

c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.

3. Isolator Hangers:

a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.

b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.

4. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.

5. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.

6. Adjust isolators to be free of isolation short circuits during normal operation.

7. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Vibration Isolation Systems:

1. Verify isolator static deflections.

2. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

SECTION 23 0553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. 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 NAMEPLATES

A. Manufacturers:

1. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
2. Seton Identification Products, a Tricor Direct 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. Letter Color: White.

C. Letter Height: 1/4 inch.

D. Background Color: Black.

2.2 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.

2.3 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. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with nameplates. Small devices, such as inline pumps, may be identified with tags.

E. Identify control panels and major control components outside panels with nameplates.

F. Identify thermostats relating to terminal boxes or valves with nameplates.

G. Identify valves in main and branch piping with tags.

H. Identify air terminal units and radiator valves with numbered tags.

I. 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 0593
TESTING, ADJUSTING, AND BALANCING FOR HVAC & PLUMBING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic and refrigerating systems.

C. Measurement of final operating condition of HVAC systems.

D. Sound measurement of equipment operating conditions.

E. Commissioning activities.

1.2 RELATED REQUIREMENTS

A. Section 01 2100 - Allowances: Inspection and testing allowances.

B. Section 01 9113 - XXXXGeneral Commissioning Requirements: Commissioning requirements that apply to all types of work.

C. Section 23 0800 - Commissioning of HVAC.

D. Section 23 0005 - Basic HVAC Requirements.

1.3 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).

C. NEBB (TAB) - Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems; 2019, with Errata (2022).

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.

1. Submit to Engineer and Owner.

2. Submit six weeks prior to starting the testing, adjusting, and balancing work.

3. Include at least the following in the plan:

   a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.

   b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

   c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.

   d. Final test report forms to be used.

   e. Detailed step-by-step procedures for TAB work for each system and issue, including:

      1) Terminal flow calibration (for each terminal type).

      2) Diffuser proportioning.

      3) Branch/submain proportioning.

      4) Total flow calculations.

      5) Rechecking.

      6) Diversity issues.

   f. Details of how TOTAL flow will be determined; for example:

      1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.

      2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.

   g. Confirmation of understanding of the outside air ventilation criteria under all conditions.

   h. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).

   i. Method of checking building static and exhaust fan and/or relief damper capacity.

   j. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.

k. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Submit to the the Engineer within two weeks after completion of testing, adjusting, and balancing.

2. Revise TAB plan to reflect actual procedures and submit as part of final report.

3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Owner and Engineer and for inclusion in operating and maintenance manuals.

4. Provide report complete with index page, with cover identification at front. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

5. Include actual instrument list, with manufacturer name, serial number, date of use and date of calibration.

6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.

7. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

8. Include the following on the title page of each report:

a. Name of Testing, Adjusting, and Balancing Agency.

b. Address of Testing, Adjusting, and Balancing Agency.

c. Telephone number of Testing, Adjusting, and Balancing Agency.

d. Project name.

e. Project location.

f. Report date.

D. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 3 EXECUTION

2.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:

1. AABC (NSTSB), AABC National Standards for Total System Balance.

2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.

3. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

2. Certified by one of the following:

a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.

b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.

c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

F. Approved TAB Agencies:

1. Enviro-Aire. 586.779.6200; https://enviro-aire.com

2. Controls Solutions Inc. (CSI). 616.247.9422; https://controlyourbuilding.com

3. Environmental Testing Services. 248.859.6100; https://www.etsmi.com.

4. Integrity Test and Balance, Inc. 231.929.0940

5. International Test and Balance, Inc. 248.559.5864

6. Air Solutions, Inc. 810.358.8644

7. Substitutions must be approved by Engineer during Bid Phase.

2.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

B. Beginning of work means acceptance of existing conditions.

2.3 ADJUSTMENT TOLERANCES

A. Air Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

D. Plumbing Systems: Adjust to within plus or minus 5 percent of design.

2.4 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

2.5 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating. VAV damper position to be recorded with primary flow rate indicated. Cross check readings with pitot traverse and verify calibration of air flow monitoring stations.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

M. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

N. On fan powered VAV boxes, adjust air flow switches for proper operation.

O. For fans with variable pitch sheaves: Sheaves in equipment provided by manufacturer are for final belt and sheave sizing ONLY. TAB contractor shall be responsible for providing and installing final sheave and belt for fan.

P. Provide building static pressure readings when all systems have been balanced.

2.6 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

2.7 COMMISSIONING

A. See Sections 01 9113 - XXXXGeneral Commissioning Requirements and 23 0800 for additional requirements.

B. Perform prerequisites prior to starting commissioning activities.

C. Fill out Prefunctional Checklists for:

1. Air side systems.

2. Water side systems.

D. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

E. Re-check minimum outdoor air intake flows and maximum and intermediate total airflow rates for ___ percent of the air handlers plus a random sample equivalent to ____ percent of the final TAB report data as directed by Commissioning Authority.

1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.

2. Use the same test instruments as used in the original TAB work.

3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.

4. For purposes of re-check, failure is defined as follows:

a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.

b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.

c. Temperatures: Deviation of more than one degree F.

d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.

e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.

5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.

F. In the presence of the Commissioning Authority, verify that:

1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.

2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.

3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

2.8 SCOPE

A. Test, adjust, and balance the following:

1. Existing HVAC and Plumbing equipment and loads where modified and/or where downstream devices have been modified.

2. Steam Condensate Pumps.

3. HVAC Pumps.

4. Hydronic balancing valves.

5. Air Cooled Refrigerant Condensers.

6. Packaged Terminal Air Conditioning Units.

7. Air Coils.

8. Air Handling Units.

9. Fans.

10. Air Filters.

11. Air Terminal Units.

12. Air Inlets and Outlets.

13. Airflow measuring stations.

2.9 MINIMUM DATA TO BE REPORTED

A. Building:

1. Provide building static pressure readings when all systems have been balanced.

2. Final differntial pressure setpoint for hydronic systems and VAV air handling systems.

B. Balance Valves:

1. Model.
2. Size.
3. Cv.
4. Water flow, design and actual.
5. Water pressure drop, design and actual.
6. Memory stop position when locked.

C. Direct-drive Motors:

1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Service factor.
7. Starter size, rating, heater elements.
8. Sheave Make/Size/Bore.

D. Belt-driven Motors:

1. Identification/location.
2. Required driven RPM.
3. Driven sheave, diameter and RPM.
4. Belt, size and quantity.
5. Motor sheave manufacturer, bore size, diameter and RPM.
6. Center to center distance, maximum, minimum, and actual.

E. Pumps:

1. Identification/number.

2. Manufacturer.

3. Size/model.

4. Impeller.

5. Service.

6. Design flow rate, pressure drop, BHP.

7. Actual flow rate, pressure drop, BHP.

8. Discharge pressure.

9. Suction pressure.

10. Total operating head pressure.

11. Shut off, discharge and suction pressures.

12. Shut off, total head pressure.

F. Air Cooled Condensers:

1. Identification/number.

2. Location.

3. Manufacturer.

4. Model number.

5. Serial number.

6. Entering DB air temperature, design and actual.

7. Leaving DB air temperature, design and actual.

8. Number of compressors.

G. Heat Exchangers:

1. Identification/number.

2. Location.

3. Service.

4. Manufacturer.

5. Model number.

6. Serial number.

7. Steam pressure, design and actual.

8. Primary water entering temperature, design and actual.

9. Primary water leaving temperature, design and actual.

10. Primary water flow, design and actual.

11. Primary water pressure drop, design and actual.

12. Secondary water leaving temperature, design and actual.

13. Secondary water flow, design and actual.

14. Secondary water pressure drop, design and actual.

H. Cooling Coils:

1. Identification/number.

2. Location.

3. Service.

4. Manufacturer.

5. Air flow, design and actual.

6. Entering air DB temperature, design and actual.

7. Entering air WB temperature, design and actual.

8. Leaving air DB temperature, design and actual.

9. Leaving air WB temperature, design and actual.

10. Water flow, design and actual.

11. Water pressure drop, design and actual.

12. Entering water temperature, design and actual.

13. Leaving water temperature, design and actual.

14. Saturated suction temperature, design and actual.

15. Air pressure drop, design and actual.

I. Heating Coils:

1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Water flow, design and actual.
7. Water pressure drop, design and actual.
8. Entering water temperature, design and actual.
9. Leaving water temperature, design and actual.
10. Entering air temperature, design and actual.
11. Leaving air temperature, design and actual.
12. Air pressure drop, design and actual.

J. Air Moving Equipment:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.
7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.
9. Total static pressure, specified and actual.
10. External static pressure, specified and actual.
11. Inlet pressure.
12. Discharge pressure.
13. Sheave Make/Size/Bore.

14. Number of Belts/Make/Size.

15. Fan RPM.

K. Return Air/Outside Air:

1. Identification/location.

2. Design air flow.

3. Actual air flow.

4. Design return air flow.

5. Actual return air flow.

6. Design outside air flow.

7. Actual outside air flow.

8. Return air temperature.

9. Outside air temperature.

10. Required mixed air temperature.

11. Actual mixed air temperature.

12. Design outside/return air ratio.

13. Actual outside/return air ratio.

L. Fans:

1. Location.

2. Manufacturer.

3. Model number.

4. Serial number.

5. Air flow, specified and actual.

6. Total static pressure, specified and actual.

7. External static pressure, specified and actual.

8. Inlet pressure.

9. Discharge pressure.

10. Motor drive type.

11. Electrical data.

12. Service factor.

13. Frame size.

14. Sheave Make/Size/Bore.

15. Number of Belts/Make/Size.

16. Fan RPM.

M. Duct Traverses:

1. System zone/branch.

2. Duct size.

3. Area.

4. Design velocity.

5. Design air flow.

6. Test velocity.

7. Test air flow.

8. Duct static pressure.

9. Air temperature.

N. Duct Leak Tests:

1. Description of ductwork under test.

2. Duct design operating pressure.

3. Duct design test static pressure.

4. Duct capacity, air flow.

5. Maximum allowable leakage duct capacity times leak factor.

6. Test apparatus:

7. Test static pressure.

8. Test orifice differential pressure.

9. Leakage.

O. Air Monitoring Stations:

1. Identification/location.
2. System.
3. Size.
4. Area.
5. Design velocity.
6. Design air flow.
7. Test velocity.
8. Test air flow.

P. Filters:

1. Static pressure profile with measured and design static pressure drops

Q. Flow Measuring Stations:

1. Identification/number.
2. Location.
3. Size.
4. Manufacturer.
5. Model number.
6. Serial number.
7. Design Flow rate.
8. Design pressure drop.
9. Actual/final pressure drop.
10. Actual/final flow rate.
11. Station calibrated setting.

R. Terminal Unit Data:

1. Manufacturer.

2. Type, constant, variable, single, dual duct.

3. Identification/number.

4. Location.

5. Model number.

6. Size.

7. Minimum static pressure.

8. Minimum design air flow.

9. Minimum actual air flow.

10. Maximum design air flow.

11. Maximum actual air flow.

12. Inlet static pressure.

S. Inlets/Outlets Data:

1. Air terminal number.

2. Room number/location.

3. Terminal type.

4. Terminal face size.

5. Terminal neck size.

6. Area factor.

7. Design velocity.

8. Design air flow.

9. Test (final) velocity.

10. Test (final) air flow.

11. Percent of design air flow.

T. Sound Level Reports:

1. Location.

2. Octave bands - equipment off.

3. Octave bands - equipment on.

SECTION 23 0713
DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

C. Jacketing and accessories.

1.2 RELATED REQUIREMENTS

A. Section 23 0005 - Basic HVAC Requirements.

B. Section 23 3100 - HVAC Ducts and Casings: Glass fiber ducts.

1.3 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

E. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.

F. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.

G. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2019 (Reapproved 2022).

H. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers; 2015 (Reapproved 2022).

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

K. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

L. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

M. 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 data, description, thermal and/or acoustical characteristics, list of materials and thickness for each service, and locations for duct insulation and duct liners to be used on project.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified in this section and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

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, FLEXIBLE

A. Manufacturer:

1. CertainTeed Corporation: www.certainteed.com/#sle.

2. Johns Manville: 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 C553; flexible, noncombustible blanket.

1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.

2. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.

2. Secure with pressure-sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

E. Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter.

2.3 GLASS FIBER, RIGID

A. Manufacturer:

1. CertainTeed Corporation: www.certainteed.com/#sle.

2. Johns Manville: 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 C612; rigid, noncombustible blanket.

1. K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.

2. Maximum Service Temperature: 450 degrees F.

3. Maximum Water Vapor Absorption: 5.0 percent.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.

2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

3. Secure with two coats of vapor barrier mastic and glass tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

2.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:

1. Armacell LLC: www.armacell.us/#sle.

2. K-Flex USA LLC: www.kflexusa.com/#sle.

3. Substitutions: See Section 01 6000 - Product Requirements

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.

1. Minimum Service Temperature: Minus 40 degrees F.

2. Maximum Service Temperature: 180 degrees F.

3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

D. Weather Barrier Coating: Air dried, contact adhesive, compatible with insulation and ASTM E84 compliant.

1. Manufacturers:

a. Design Polymerics: www.designpoly.com/#sle.

b. Vimasco Corporation: www.vimasco.com/#sle.

c. Substitutions: See Section 01 6000 - Product Requirements

2.5 JACKETING AND ACCESSORIES

A. Flexible Weather-Proofing Outdoor Jacket: Self-healing, field-applied outdoor cladding.

1. Material: Aluminum foil/polymer laminate with rubberized asphalt layer and acrylic adhesive.

2. Thickness: 34 mils minimum.

3. Finish: Embossed.

4. Color: White.

5. Water Vapor Transmission: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.

6. Mold Resistance: Pass when tested in accordance with ASTM C1338.

7. Emissivity: 0.30 when tested in accordance with ASTM C1371.

8. Manufacturers:

   a. Polyguard Products: www.polyguardproducts.com.com/#sle.

   b. FlexClad Products.

   c. Substitutions: See Section 01 6000 - Product Requirements

2.6 DUCT LINER

A. Manufacturers:

1. CertainTeed Corporation: www.certainteed.com/#sle.

2. Johns Manville: www.jm.com/#sle.

3. Owens Corning Corporation: www.ocbuildingspec.com/#sle.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; rigid board and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer.

1. Fungal Resistance: No growth when tested according to ASTM G21.

2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.

3. Service Temperature: Up to 250 degrees F.

4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.

5. Minimum Noise Reduction Coefficients:

   a. 1 inch Thickness: 0.45.

C. Adhesive: Waterproof, fire-retardant type, ASTM C916.

D. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.1 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated Ducts Conveying Air Below Ambient Temperature:

1. Provide insulation with vapor barrier jackets.

2. Finish with tape and vapor barrier jacket.

3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

E. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with flexible weather proofing jacket.

F. Slope exterior ductwork to shed water.

G. External Duct Insulation Application:

1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.

2. Secure insulation without vapor barrier with staples, tape, or wires.

3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.

4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.

5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

H. Duct and Plenum Liner Application:

1. Adhere insulation with adhesive for 90 percent coverage.

2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.

3. Seal and smooth joints. Seal and coat transverse joints.

4. Seal liner surface penetrations with adhesive.

5. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

3.3 SCHEDULES

A. Exhaust and Relief Ducts Within 10 ft of Exterior Openings:

1. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.

B. Outside Air Intake Ducts:

1. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.

C. Plenums:

1. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.

2. Rigid Glass Fiber Duct Insulation: 1-1/2 inches thick.

D. Return Air Ducts:

1. Duct Liner: 1 inch thick. First 10 feet from equipment only.

E. Supply Ducts:

1. Duct Liner: 1 inch thick. First 10 feet from equipment only.

2. Located in plenum or unconditioned space:

a. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.

3. Located exposed in conditioned space:

a. No insulation required.

F. Exhaust Ducts for Units with Energy Recovery:

1. Duct Liner: 1 inch thick. First 10 feet from equipment only.

2. Located in plenum or unconditioned space:

a. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.

3. Located exposed in conditioned space:

    a. No insulation required.

G. Transfer Ducts:

1. Duct Liner: 1 inch thick.

H. Ducts Exposed to Outdoors:

1. Flexible Elastomeric Duct Insulation: 2 inches thick

2. Cover finished insulation with field applied jacket.

SECTION 23 0716
HVAC EQUIPMENT INSULATION

PART 1 GENERAL

7.1 SECTION INCLUDES

A. Equipment insulation.

B. Jacketing and accessories.

7.2 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Painting insulation covering.

B. Section 23 0553 - Identification for HVAC Piping and Equipment.

C. Section 23 2113 - Hydronic Piping: Placement of hangers and hanger inserts.

D. Section 23 2114 - Hydronic Specialties.

E. Section 23 2300 - Refrigerant Piping: Placement of inserts.

7.3 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 C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

7.4 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 equipment scheduled.

7.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

7.6 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

8.1 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.

8.2 GLASS FIBER, FLEXIBLE

A. Manufacturers:

1. CertainTeed Corporation: www.certainteed.com/#sle.

2. Johns Manville Corporation: www.jm.com/#sle.

3. Owens Corning Corporation: www.ocbuildingspec.com/#sle.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: ASTM C553; flexible, noncombustible.

1. K Value: 0.36 at 75 degrees F, when tested in accordance with ASTM C177 or ASTM C518.

2. Maximum Service Temperature: 1,000 degrees F.

3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.

1. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

2. Secure with self-sealing longitudinal laps and butt strips.

3. Secure with outward clinch expanding staples and vapor barrier mastic.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

8.3 JACKETING AND ACCESSORIES

A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire-retardant lagging adhesive.

PART 3 EXECUTION

9.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Factory Insulated Equipment: Do not insulate.

C. Exposed Equipment: Locate insulation and cover seams in least visible locations.

D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

E. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

F. Insulated equipment containing fluids below ambient temperature; insulate entire system.

G. Fiber glass insulated equipment containing fluids below ambient temperature; provide vapor barrier jackets, factory-applied or field-applied. Finish with glass cloth and vapor barrier adhesive.

H. For hot equipment containing fluids over 140 degrees F, insulate flanges and unions with removable sections and jackets.

I. Fiber glass insulated equipment containing fluids above ambient temperature; provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Finish with glass cloth and adhesive.

J. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas jacket sized for finish painting.

K. Cover glass fiber insulation with metal mesh and finish with heavy coat of insulating cement.

L. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

9.2 SCHEDULE

A. Heating Systems:

1. Heat Exchangers/Converters:

2. Air Separators: 2"

3. Expansion Tanks: 2" thick.

SECTION 23 0719
HVAC PIPING INSULATION

PART 1 GENERAL

2.1 SECTION INCLUDES

A. Piping insulation.

B. Jacketing and accessories.

2.2 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 23 2113 - Hydronic Piping

C. Section 23 2300 - Refrigerant Piping

2.3 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. 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).

C. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2019).

D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

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; 2024.

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.

2.4 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.

2.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

2.6 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

3.1 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.

3.2 GLASS FIBER, RIGID

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-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

G. Indoor Vapor Barrier Finish:

1. Vinyl emulsion type acrylic, compatible with insulation, black color.

3.3 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: 180 degrees F.

3. Connection: Waterproof vapor barrier adhesive.

C. Weather Barrier Coating: Air dried, contact adhesive, compatible with insulation and ASTM E84 compliant.

3.4 JACKETING AND ACCESSORIES

A. PVC Plastic.

1. 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: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.

d. Thickness: 10 mil, 0.010 inch.

e. Connections: Brush on welding adhesive.

2. Covering Adhesive Mastic: Compatible with insulation.

B. Painted Aluminum Jacket:

1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.

2. Thickness: 0.020 inch sheet.

3. Finish: Smooth. Painted White. Emittance value of at least 0.80.

4. Joining: Longitudinal slip joints and 2 inch laps.

5. Fittings: 0.024 thick fitting covers with moisture barrier.

6. Metal Jacket Bands: 1/2 inch wide; 0.020 inch thick stainless steel.

PART 3 EXECUTION

4.1 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

4.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated Pipes Conveying Fluids Below Ambient Temperature:

1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

E. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

F. 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.

3. Do not bury hangers in the insulation. Insulation vapor barrier shall not be broken.

G. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

H. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

I. 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.

J. 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.

K. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 8400.

L. Exterior Applications:

1. Jacketing shall be smooth (not stucco embossed) white painted aluminum with polyfilm moisture retarder and shall be applied over dry substrate (vapor retarder jacket) and insulation with a minimum 2" overlap on both circumferential and longitudinal joints.

2. Jacketing shall be installed in a manner to shed water and in accordance with the Midwest Insulation Contractor Association's (M.I.C.A.) National Commercial and Industrial Standards which has been endorsed by the National Insulation Association (N.I.A.).

3. Insulate fittings, joints, and valves with insulation and jacketing of like material and thickness as adjoining pipe.

4. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

5. Jacketing shall be installed according to all manufacturer recommendations.

4.3 SCHEDULE

A. Heating Systems:

1. Heating Water Supply and Return:

a. Pipe Size Range: 3/4 to 1-1/2 inch: 1-1/2 inches thick.

b. Pize Size Range: 2 to 6 inch: 2 inches thick.

2. Low Pressure Steam Piping:

a. Pipe Size Range: 3/4 inch: 3 inches thick.

b. Pize Size Range: 1 inch and greater: 4 inches thick.

3. Low Pressure Steam Condensate:

a. Pipe Size Range: 3/4 inch: 3 inches thick.

b. Pize Size Range: 1 inch and greater: 4 inches thick.

B. Cooling Systems:

1. Cold Condensate Drains: 1 inch thick.

2. Condensate Drains from Cooling Coils: 1 inch thick.

3. Refrigerant Suction: 1 inch thick.

4. Refrigerant Liquid: 1 inch thick.

SECTION 23 0800
COMMISSIONING OF HVAC

PART 1 GENERAL

1.1 SUMMARY

A. See Section 01 9113 - XXXXGeneral Commissioning Requirements for overall objectives; comply with the requirements of Section 01 9113.

B. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.

C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.

D. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:

1. Piping systems and equipment.

2. Ductwork and accessories.

3. Terminal units.

4. Sound control devices.

5. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.2 REFERENCE STANDARDS

A. ASHRAE Guideline 1.1 - HVAC&R Technical Requirements for the Commissioning Process; 2007, with Errata (2012).

1.3 SUBMITTALS

A. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.

B. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.

C. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:

1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.

2. Full as-built set of control drawings.

3. Full as-built sequence of operations for each piece of equipment.

4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:

    a. Floor.

    b. Room number.

    c. Room name.

    d. Air handler unit ID.

    e. Reference drawing number.

    f. Air terminal unit tag ID.

    g. Heating and/or cooling valve tag ID.

    h. Minimum air flow rate.

    i. Maximum air flow rate.

5. Full print out of all schedules and set points after testing and acceptance of the system.

6. Full as-built print out of software program.

7. Electronic copy on disk of the entire program for this facility.

8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.

9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.

10. Control equipment component submittals, parts lists, etc.

11. Warranty requirements.

12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).

13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:

    a. Sequences of operation.

    b. Control drawings.

    c. Points lists.

    d. Controller and/or module data.

    e. Thermostats and timers.

    f. Sensors and DP switches.

    g. Valves and valve actuators.

    h. Dampers and damper actuators.

    i. Program setups (software program printouts).

D. Project Record Documents: See Section 01 7800 for additional requirements.

1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.

2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.

E. Draft Training Plan: In addition to requirements specified in Section 01 7900, include:

1. Follow the recommendations of ASHRAE Guideline 1.1.

2. Control system manufacturer's recommended training.

3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.

F. Training Manuals: See Section 01 7900 for additional requirements.

1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 EXECUTION

3.1 PREPARATION

A. Cooperate with the Commissioning Authority in development of the Prefunctional Checklists and Functional Test Procedures.

B. Furnish additional information requested by the Commissioning Authority.

C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.

D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.

E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.

F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.

G. Provide temperature and pressure taps in accordance with Contract Documents.

3.2 INSPECTING AND TESTING - GENERAL

A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.

B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.

C. Provide two-way radios for use during the testing.

D. Valve/Damper Stroke Setup and Check:

1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.

2. Set pump/fan to normal operating mode.

3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.

4. Command valve/damper open; verify position is full open and adjust output signal as required.

5. Command valve/damper to a few intermediate positions.

6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

7. Closure for Heating Coil Valves - Normally Open:

    a. Set heating setpoint 20 degrees F above room temperature.

    b. Observe valve open.

    c. Remove control air or power from the valve and verify that the valve stem and actuator position do not change.

    d. Restore to normal.

    e. Set heating setpoint to 20 degrees F below room temperature.

    f. Observe the valve close.

    g. Restore to normal.

8. Closure for Cooling Coil Valves - Normally Closed:

    a. Set cooling setpoint 20 degrees F above room temperature.

    b. Observe the valve close.

    c. Remove control air or power from the valve and verify that the valve stem and actuator position do not change.

    d. Restore to normal.

    e. Set cooling setpoint to 20 degrees F below room temperature.

    f. Observe valve open.

    g. Restore to normal.

E. Isolation Valve or System Valve Leak Check: For valves not by coils.

1. With full pressure in the system, command valve closed.

2. Use an ultra-sonic flow meter to detect flow or leakage.

F. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

3.3 TAB COORDINATION

A. TAB: Testing, adjusting, and balancing of HVAC.

B. Coordinate commissioning schedule with TAB schedule.

C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.

D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.

E. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.

F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

3.4 CONTROL SYSTEM FUNCTIONAL TESTING

A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the requirements of Contract Documents and the detailed Sequences of Operation documentation submittal.

B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with Contract Documents.

C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.

D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.

1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner.

2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.

E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.

F. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.

1. Setpoint changing features and functions.

2. Sensor calibrations.

G. Demonstrate to the Commissioning Authority:

1. That all specified functions and features are set up, debugged and fully operable.

2. That scheduling features are fully functional and setup, including holidays.

3. That all graphic screens and value readouts are completed.

4. Correct date and time setting in central computer.

5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.

6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.

7. Power failure and battery backup and power-up restart functions.

8. Global commands features.

9. Security and access codes.

10. Occupant over-rides (manual, telephone, key, keypad, etc.).

11. O&M schedules and alarms.

12. Occupancy sensors and controls.

13. All control strategies and sequences not tested during controlled equipment testing.

H. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.5 OPERATION AND MAINTENANCE MANUALS

A. See Section 01 7800 for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

3.6 DEMONSTRATION AND TRAINING

A. See Section 01 7900 for additional requirements.

B. Demonstrate operation and maintenance of HVAC system to Owner' personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.

C. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the Commissioning Authority during Functional Testing.

D. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Provide the following minimum durations of training:

E. TAB Review: Instruct Owner's personnel for minimum ____ hours, after completion of TAB, on the following:

1. Review final TAB report, explaining the layout and meanings of each data type.

2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.

3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.

4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.

5. Other salient information that may be useful for facility operations, relative to TAB.

F. HVAC Control System Training: Perform training in at least three phases:

1. Phase 1 - Basic Control System: Provide minimum of ____ hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.

   a. This training may be held on-site or at the manufacturer's facility.

   b. If held off-site, the training may occur prior to final completion of the system installation.

   c. For off-site training, Contractor shall pay expenses of up to two attendees.

2. Phase 2 - Integrating with HVAC Systems: Provide minimum of ____ hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:

   a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.

   b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.

   c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.

   d. Every display screen, allowing time for questions.

   e. Point database entry and modifications.

3. Phase 3 - Post-Occupancy: Six months after occupancy conduct minimum of ____ hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.

G. Provide the services of manufacturer representatives to assist instructors where necessary.

H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

SECTION 23 0913
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Control panels.

B. Control Valves:

1. Ball valves with factory-mounted actuators.
2. Butterfly valves with factory-mounted actuators.
3. Electronic valve operators.

C. Dampers.

D. Damper Operators:

1. Electric operators.

E. Wall-, Surface-, and Duct-Mounted Sensors:

1. Temperature sensors.
2. Humidity sensors.
3. Building static pressure transmitters.
4. Static air pressure sensors.
5. Carbon monoxide sensors.
6. Carbon dioxide sensors.

F. Thermostats:

1. Freezestats.
2. Line voltage thermostats.
3. Room-mount thermostat accessories.
4. Outdoor-reset thermostats.
5. Airstream thermostats.
6. Electric high/low limit duct thermostats.

G. Fan and pump motor run-status monitoring.

H. Pipe-Mounted Sensors and Transmitters:

1. Temperature sensors.

2. Differential pressure transmitters.

1.2 RELATED REQUIREMENTS

A. Section 23 0519 - Meters and Gauges for HVAC Piping.

B. Section 23 2113 - Hydronic Piping.

C. Section 23 2114 - Hydronic Specialties.

D. Section 23 0923 - Direct-Digital Control System for HVAC.

E. Section 26 0583 - Wiring Connections.

F. Section 26 2726 - Wiring Devices.

1.3 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.

B. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2021.

C. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Errata (2023).

D. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).

E. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

D. Project Record Documents: Record actual location of control components, including panels, thermostats, and sensors.

1. Revise shop drawings to reflect actual installation and operating sequences.

E. 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 Thermostats and Other Exposed Sensors: One of each type.

1.5 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a five year period after Substantial Completion.

PART 2 PRODUCTS

2.1 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.2 CONTROL PANELS

A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.

B. NEMA EN 10250, general purpose utility enclosures with enameled finished face panel.

C. Provide common keying for all panels.

2.3 CONTROL VALVES

A. Performance Requirements:

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. ASME Compliance: Fabricate and label products to comply with ASME Boiler and Pressure Vessel Code where required by authorities having jurisdiction.

3. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements" to size products where indicated as delegated design.

4. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.

5. Backup Power Source: Systems and equipment served by a backup power source shall have associated control valve actuators served from a backup power source.

6. Environmental Conditions:

   a. Provide electric control valve actuators, with protective enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Electric control valve actuators not available with integral enclosures, complying with requirements indicated, shall be housed in protective secondary enclosures.

7. Determine control valve sizes and flow coefficients by ISA 75.01.01.

8. Control valve characteristics and rangeability shall comply with ISA 75.11.01.

9. Selection Criteria:

   a. Control valves shall be suitable for operation at following conditions:

      1) Heating Hot Water: 150 PSI.

   b. Control valve shutoff classifications shall be FCI 70-2, Class IV or better unless otherwise indicated.

   c. Valve pattern, three-way or straight through, shall be as indicated on Drawings.

   d. Controls Valves shall have 50% valve authority.

   e. Modulating straight-through pattern control valves shall have linear or equal percentage flow-throttling characteristics unless otherwise indicated.

   f. Modulating three-way pattern water valves shall have linear or equal percentag flow-throttling characteristics. The total flow through the valve shall remain constant regardless of the valve's position.

   g. Modulating butterfly valves shall have linear or equal percentage flow-throttling characteristics.

   h. Fail positions unless otherwise indicated:

      1) Chilled Water: Closed.

      2) Condenser Water: Open.

      3) Heating Hot Water: Open.

      4) Geothermal Heat Pump Loop Water: Open.

i. Globe-type control valves shall pass the design flow required with not more than 95 percent of stem lift unless otherwise indicated.

j. Rotary-type control valves, such as ball and butterfly valves, shall have Cv falling between 65 and 75 degrees of valve full open position and minimum valve Cv between 15 and 25 percent of open position.

k. Selection shall consider viscosity, flashing, and cavitation corrections.

l. Minimum Cv shall be calculated at 10 percent of design flow, with a coincident pressure differential equal to the system design pump head.

m. In water systems, select modulating control valves for a design Cv based on a pressure drop of twice the device it is controlling with a minimum of 2.3 ft and maximum of 10 ft, unless otherwise reviewed by Engineer.

n. Two-position control valves shall be line size unless otherwise indicated.

o. In water systems, use ball- or globe-style control valves for two-position control for valves NPS 2 and smaller and butterfly style for valves larger than NPS 2.

p. Close Off Pressure: 200 psi

B. Ball Valves with Factory-Mounted Actuators:

1. Manufacturers:

a. Belimo Aircontrols (USA), Inc: www.belimo.com/#sle.

b. Flow Tech.

c. Substitutions: See Section 01 6000 - Product Requirements.

2. Service: Use for brine (30 percent glycol), chilled water, or hot water.

3. Flow Characteristic: Equal percentage. Include 2-way and 3-way mixing operation configured to fail normally open (NO). Refer to Drawings.

4. Replacements in Kind: Provide pressure-independent type.

5. Rangeability: 500 to 1.

6. ANSI Rating: Class 300.

7. Leakage: Class IV (0.1 percent of rated capacity) per ANSI/FCI 70-2.

8. Body Size:

a. Under 2-1/2 inches:

1) Connection: NPT.

2) Materials:

(a) Body: Brass.

(b) Flanges: Ductile iron.

(c) Ball: Chrome-plated brass.

(d) Stem: Nickel-plated brass.

(e) Stem sleeve or other approved means to allow valve to be opened and closed without damaging field-applied insulation and insulation vapor barrier seal.

(f) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.

(g) Stem Seal: EPDM O-Rings.

(h) Flow Control Disk: Thermoplastic synthetic-resin.

b. Service Temperature:

1) Fluid Side: 0 to 284 degrees F liquid or 25 psig steam.

2) Ambient Side: From minus 4 to 122 degrees F.

9. Actuator Requirements:

a. Assembly: Factory-mounted.

b. Input: 0 to 5 VDC configured for proportional control.

c. Accessories: Provide with valve position indicator and manual override.

C. Butterfly Valves with Factory-Mount Actuators:

1. Manufacturers:

a. Belimo Aircontrols (USA), Inc: www.belimo.com/#sle.

b. Flow Tech.

c. Substitutions: See Section 01 6000 - Product Requirements.

2. Iron body, stainless steel disc, resilient replaceable seat for service to 180 degrees F wafer or lug ends, extended neck.

3. Hydronic Systems:

a. Rate for service pressure of 125 psig at 250 degrees F.

D. Electronic Valve Actuators:

1. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.

2. Select operator for full shut-off at maximum pump differential pressure.

3. Position indicator and graduated scale on each actuator.

4. Type: Motor operated, with or without gears, electric and electronic.

5. Voltage: Voltage selection delegated to professional designing control system.

6. Deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.

7. Function properly within a range of 85 to 120 percent of nameplate voltage.

8. Construction:

a. For Actuators Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.

b. For Actuators from 100 to 400 W: Gears ground steel, oil immersed, shaft hardened steel running in bronze, copper alloy or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel or cast-aluminum housing.

c. For Actuators Larger Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.

9. Field Adjustment:

a. Spring Return Actuators: Easily switchable from fail open to fail closed in the field without replacement.

b. Gear Type Actuators: External manual adjustment mechanism to allow manual positioning when the actuator is not powered.

10. Two-Position Actuators: Single direction, spring return or reversing type.

11. Modulating Actuators:

a. Operation: Capable of stopping at all points across full range, and starting in either direction from any point in range.

b. Control Input Signal:

1) Three Point, Tristate, or Floating Point: Clockwise and counter-clockwise inputs.

2) One input drives actuator to open position and other input drives actuator to close position. No signal of either input remains in last position.

3) Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation. Suitable for zero- to 10 and 4- to 20-mA signals.

4) Pulse Width Modulation (PWM): Actuator drives to a specified position according to pulse duration (length) of signal from a dry contact closure, triac sink, or source controller.

5) Programmable Multi-Function:

6) Control Input, Position Feedback, and Running Time: Factory or field programmable.

7) Diagnostic: Feedback of hunting or oscillation, mechanical overload, mechanical travel, and mechanical load limit.

8) Service Data: Include, at a minimum, number of hours powered and number of hours in motion.

12. Position Feedback:

a. Equip two-position actuators with limits switches or other positive means of a position indication signal for remote monitoring of open and close position.

b. Equip modulating actuators with a position feedback through voltage signal for remote monitoring.

c. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.

13. Fail-Safe:

a. Where indicated, provide actuator to fail to an end position.

b. Internal spring return mechanism to drive controlled device to an end position (open or close) on loss of power.

c. Batteries, capacitors, and other non-mechanical forms of fail-safe operation are acceptable only where uniquely indicated.

14. Integral Overload Protection:

a. Provide against overload throughout the entire operating range in both directions.

b. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.

15. Valve Attachment:

a. Unless otherwise required for valve interface, provide an actuator designed to be directly coupled to valve shaft without the need for connecting linkages.

b. Attach actuator to valve drive shaft in a way that ensures maximum transfer of power and torque without slippage.

c. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.

16. Temperature and Humidity:

a. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.

b. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.

17. Enclosure:

a. Suitable for ambient conditions encountered by application.

b. NEMA 250, Type 2 for indoor and protected applications.

c. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.

d. Provide actuator enclosure with heater and control where required by application.

18. Stroke Time:

a. Operate valve from fully closed to fully open within 60 seconds.

b. Operate valve from fully open to fully closed within 60 seconds.

c. Move valve to failed position within 15 seconds.

d. Select operating speed to be compatible with equipment and system operation.

19. Sound:

a. Spring Return: 62 dBA.

b. Non-Spring Return: 45 dBA.

2.4 CONTROL DAMPERS

A. See Section 23 3300 for dampers and this section for actuators and operators.

2.5 DAMPER OPERATORS

A. General:

1. Provide actuators with torque capacity sized for minimum of 20 percent greater than maximum design stream velocity and hold tight seal against maximum system pressures.

2. Provide spring return for two position control and for fail safe operation.

3. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.

4. Provide one operator for maximum 36 sq ft damper section.

B. Electric Operators:

1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

2.6 WALL-, SURFACE-, AND DUCT-MOUNT SENSORS

A. Temperature Sensors:

1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.

2. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F.

3. 100 ohm platinum RTD is acceptable if used with project DDC controllers.

4. Temperature Sensing Device: Compatible with project DDC controllers.

5. Performance Characteristics:

a. RTD:

1) Room Sensor Accuracy: Plus/minus 0.50 degrees F minimum.

2) Duct Averaging Accuracy: Plus/minus 0.50 degrees F minimum.

3) All Other Accuracy: Plus/minus 0.75 degrees F minimum.

4) Range: Minus 40 degrees F through 220 degrees F minimum.

b. Thermistor:

1) Accuracy (All): Plus/minus 0.36 degrees F minimum.

2) Range: Minus 25 degrees F through 122 degrees F minimum.

c. Temperature Transmitter:

1) Accuracy: 0.10 degree F minimum or plus/minus 0.20 percent of span.

d. Sensing Range:

1) Provide limited range sensors if required to sense the range expected for a respective point.

2) Use RTD type sensors for extended ranges beyond minus 30 to 230 degrees F.

3) Use temperature transmitters in conjunction with RTDs when RTDs are incompatible with DDC controller direct temperature input.

e. Wire Resistance:

1) Use appropriate wire size to limit temperature offset due to wire resistance to 1.0 degree F or use temperature transmitter when offset is greater than 1.0 degree F due to wire resistance.

2) Compensate for wire resistance in software input definition when feature is available in the DDC controller.

f. Outside Air Sensors: Watertight inlet fitting shielded from direct rays of the sun.

g. Immersion Temperature Sensors: A sensor encased in a corrosion-resistant probe with an indoor junction box service entry body.

h. Ceiling and Recessed Mount Temperature Sensors: Ceiling-mounted sensor in a low-profile housing.

i. Room Temperature Sensors:

1) Construct for surface or wall box mounting.

2) Provide the following:

(a) Setpoint reset slide switch with an adjustable temperature range.

(b) Individual heating/cooling setpoint slide switches.

(c) Momentary override request push button for activation of after-hours operation.

j. Room Temperature Sensors with Integral Digital Display:

1) Construct for surface or wall box.

2) Provide keypad with the following capabilities:

(a) Indication of space temperature.

(b) Setpoint adjustment to accommodate room setpoint.

(c) Manual occupancy override and indication of occupancy status.

B. Humidity Sensors, Duct-Mounted:

1. Digitally profiled thin-film capacitive sensor probe extended from die-cast metal, weather-proof plastic or metal housing designed for duct mounting.

2. Measuring Scale: 0 to 100 percent RH, noncondensing, temperature compensated.

3. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.

4. Accuracy: Plus/minus 1 percent between 20 to 40 percent RH linear range, NIST traceable with multi-point calibration.

5. Temperature Sensor, Combined: Platinum RTD.

a. Transmitter: Fitted within device-interface enclosure, calibrated.

b. Monitoring Range: 32 to 122 degrees F, adjustable.

c. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.

d. Accuracy: Plus/minus three percent. adjustable on the transmitter end.

6. Service Temperature: Minus 40 to 122 degrees F

7. Service Humidity: 0 to 100 percent RH, noncondensing.

C. Humidity Transmitters, Surface-Mounted:

1. High impact ABS plastic housing encased, wall-mounted, humidity and temperature indicating sensor.

2. Humidity Sensor Type: Thin-film capacitive.

3. Accuracy: 1 percent at rated measuring scale and capable of withstanding 95 percent relative humidity without loss of calibration.

4. Output: Two-wire, 4 to 20 mA, 0 to 5 VDC or 0 to 10 VDC, non-loop powered, selectable.

5. Temperature Sensor, Combined: Platinum RTD.

a. Transmitter: Fitted within device-interface enclosure, calibrated.

b. Monitoring Range: 32 to 122 degrees F, adjustable.

c. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.

d. Accuracy: Plus/minus three percent. adjustable on the transmitter end.

D. Building Static Pressure Transmitters:

1. Single port for direct or tubing connection into wall or ceiling static pressure tip, direct acting, double bell, scale range 0.01 to 6.0 in-wc positive or negative, and sensitivity of 0.0005 in-wc. Transmit electronic signal to receiver with matching scale range.

E. Static-Air Pressure Sensors:

1. Unidirectional with ranges not exceeding 150 percent of maximum expected input.

2. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F.

3. Accuracy: One percent of full scale with repeatability 0.3 percent.

4. Output: 0 to 5 vdc with power at 12 to 28 vdc.

F. Carbon Monoxide Sensors:

1. Gas sensing module that holds fixed or replaceable carbon monoxide gas-sensor cartridge.

2. Form Factor: IEC 60529, IP20 enclosure, single-gang electrical box mounted.

3. Electromechanical sensor with 0 to 500 ppm measurement range.

4. Accuracy: Plus/minus Five percent of range with 1 ppm resolution.

5. Hardwired Output: Three-wire, 4 to 20 mA, loop powered.

6. Alarm: Auxiliary dry contact relay driven by setpoint adjustable between 25 to 180 ppm.

G. Carbon Dioxide Sensors, Duct and Wall:

1. General: Provide nondispersive infrared (NDIR), diffusion sampling CO2 sensors with integral transducers and linear output.

2. Air Temperature: Range of 32 to 122 degrees F.

3. Relative Humidity: Range of 0 to 95 percent (noncondensing).

4. Power Input: Class 2; 12 to 30VDC or 24VAC 50/60 Hz; 100mA max.

5. Calibration Characteristics:

a. Automatically compensating algorithm for sensor drift due to sensor degradation.

b. Maximum Drift: 2 percent.

c. User calibratable with a minimum calibration interval of 5 years.

2.7 THERMOSTATS

A. Freezestats:

1. Configuration: Vapor-filled capillary.

2. Probe Sensing Length: 20 feet.

3. Setpoint Adjust Control: Screw with manual reset switch.

4. Switch Type: SPDT, snap-action, form C in dust-protected enclosure.

5. Sensing Range: 10 to 54 deg F.

6. Mounting: Locate on cooling coil intake side.

7. Field Interface: Connect load line-voltage to starter.

B. Line Voltage Thermostats:

1. Integral manual On/Off/Auto selector switch, single or two pole as required.

2. Dead Band: Maximum 2 degrees F.

3. Cover: Locking with set point adjustment, with thermometer.

4. Rating: Motor load.

C. Room-Mounted Thermostat Accessories:

1. Insulating Bases: For thermostats located on exterior walls.

2. Thermostat Guards: Locking transparent plastic mounted on separate base.

3. Aspirating Boxes: Where indicated for thermostats requiring flush installation.

D. Outdoor Reset Thermostats:

1. Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range, adjustable setpoint.

2. Scale range: Minus 10 to 70 degrees F.

E. Airstream Thermostats:

1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.

2. Averaging service remote bulb element: 7.5 feet.

F. Electric High/Low Limit Duct Thermostats:

1. Snap acting, single pole, single throw, manual reset switch that trips if temperature sensed across any 12 inches of bulb length is above, equal to, or below setpoint,

2. Bulb length: Minimum 20 feet.

3. Provide one thermostat for every 20 sq ft of coil surface.

2.8 FAN AND PUMP MOTOR RUN-STATUS MONITORING

A. Current Switches:

1. Micro-Split Core: 2-state, On/Off digital output of motor status with adjustable trip point to detect belt loss or mechanical failure.

2. Mini Split-Core: 2-state, On/Off digital output of inverter-duty motor status with adjustable trip point to detect belt loss or mechanical failure.

3. Maximum AC Current Monitoring Value: 175 percent of rated motor current.

B. Differential Pressure Switches:

1. Fan Status: Select for adjustable range between 0 to 5 in-wc across fan discharge and external or fan inlet. Include static pressure tips.

2. Pump Status: Select for adjustable range between 8 to 60 psi across pump discharge and suction sides. Include static pressure tips and 3-way valve manifold.

2.9 PIPE-MOUNTED SENSORS AND TRANSMITTERS

A. Temperature Sensors:

1. Pipe-mounted temperature probe tied to weather-resistant enclosure for direct insertion into compatible liquids or gases or inserted into intermediary thermal grease-filled pipe-well compatible with interfaced fluid.

2. Sensor Type: 1,000 ohm Platinum RTD.

3. Transmitter: Fitted within probe-interface enclosure, calibrated.

a. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.

b. Accuracy: Plus/minus three percent. adjustable on the transmitter end.

4. Accessories: Provide downstream PT test plug and brass pipe-well.

B. Differential Pressure Transmitters:

1. Manufacturers:

a. Veris Industries: www.veris.com/#sle.

b. Substitutions: See Section 01 6000 - Product Requirements.

2. General: Provide wet media differential pressure transducers with 10 ft (3.5 m) shieldedcable, to allow remote pressure sensing capability.

a. Input Power: Class 2; 15 to 30 VDC, 24VAC nominal, 50/60 Hz.

b. Output: 3-wire transmitter; 4 to 20 mA, 0 to 5V, or 0 to 10V, selectable,

c. Sensor:

1) Media Compatibility: 17 to 4 PH stainless steel.

2) Status Indication: Dual color LED.

3) Proof Pressure: 2x max. F.S. range.

4) Burst Pressure: 5x max. F.S. range.

d. Pressure Ranges:

1) 0 psi to 50 psi (Gauge): 5 psid/10 psid/25 psid/50 psid (pressure differential).

e. Operating Conditions:

1) Temperature Compensated Range:

(a) TC Zero less than 1.5 percent of product F.S. (full scale) per sensor.

f. Enclosure: NEMA EN 10250, Type 4.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

F. Ensure installation of components is complementary to installation of similar components.

G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.2 INSTALLATION

A. Furnish and install products required to satisfy most stringent requirements indicated.

B. Install products level, plumb, parallel, and perpendicular with building construction.

C. Install in accordance with manufacturer's instructions.

D. Check and verify location of thermostats with plans and room details before installation. Locate 48 inches above floor. Align with lighting switches and humidistats.

E. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

F. Provide guards on thermostats in public areas and where indicated.

G. Provide valves with position indicators and with pilot positioners where sequenced with other controls.

H. Provide isolation (two-position) dampers of parallel blade construction.

I. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.

J. Mount control panels adjacent to associated equipment on vibration free walls or free-standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

K. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.

L. Provide conduit and electrical wiring in accordance with Division 26. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

SECTION 23 0915
VARIABLE FREQUENCY DRIVES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Variable frequency drives. This specification is to cover a complete variable frequency motor drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor. The drive shall be designed specifically for variable torque applications.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements.

B. Division 03 - Concrete: Concrete equipment pads.

C. Section 23 0005 - Basic HVAC Requirements.

D. Division 26 - Electrical

1.3 REFERENCE STANDARDS

A. NEMA ICS 7.1

B. NEMA ICS 7

C. IEEE 519

D. UL 508A

E. UL 508

1.4 SUBMITTALS

A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 - General Requirements for submittal procedures.

B. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

C. Shop Drawings: Indicate front and side views of enclosures with overall dimensions and weights shown; conduit entrance locations and requirements; and nameplate legends.

D. Manufacturer's Field Reports: Indicate start-up inspection findings.

E. Qualifications: VFDs and options shall be UL listed as a complete assembly. The base VFD shall be UL listed for 100 KAIC without the need for input fuses. It is required that the drive manufacturer has an existing sales representative exclusively for HVAC products with expertise in HVAC systems and controls, and an independent service organization.

1.5 WARRANTY

A. Warranty shall be twenty-four (24) months from the date of certified startup, not to exceed thirty (30) months from the date of manufacture. The warranty shall include all parts, labor, travel time and expenses.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ABB U.S.; Model ACH 550: www.abb.us/drives.com.

B. Danfoss

C. Square D www.squared.com.

2.2 DESCRIPTION

A. Variable Frequency Drives: The VFD shall be solid state, with a pulse width modulated (PWM) output. The VFD package, as specified herein, shall be enclosed in a NEMA 1 enclosure, completely assembled and tested by the manufacturer. The VFD shall employ a full wave rectifier, integral line reactors, capacitors and insulated gate bipolar transistors as the output switching device. The drive efficiency shall be 97 percent or better at full speed and full load. Fundamental power factor shall be 0.98 at all speeds and loads.

2.3 OPERATING REQUIREMENTS

A. Rated Input Voltage: Input 460/480 VAC +/- 10 percent, 3-phase, 48-63 Hz or input 208/220/230/240 VAC +/- 10 percent 3-phase, 48-63 Hz Undervoltage trip at rated input -35 percent. Overvoltage trip at rated input +30 percent.

B. Interrupt Rating: 65 kAIC, suitable for use on a circuit capable of delivering not more than 65,000 RMS symmetrical amps, 480V maximum.

C. Output Frequency: 0 to 250 Hz. Operation above 60 Hz shall require programming changes to prevent inadvertent high-speed operation.

D. Operating Conditions: 0 to 40C, less that 95 percent humidity, noncondensing.

E. VFD Enclosure: The VFD package, as specified herein, shall be enclosed in a UL listed Type 1 enclosure, completely assemble and tested by the manufacturer.

F. Input Signal: 4 to 20 mA DC.

2.4 COMPONENTS

A. Display: All VFDs shall have the same customer interface, including digital display and keypad, regardless of horsepower rating. The keypad is to be used for local control, for setting all parameters and for stepping through the displays and menus. The keypad shall be removable, be capable of remote mounting, and have its own nonvolatile memory. The keypad shall include hand-off-auto membrane selections. When in "Hand" the VFD will be started and the speed will be controlled from the up/down arrows. When in "Off" the VFD will be stopped. When in "Auto" the VFD will start via and external speed reference. The drive shall incorporate "bumpless transfer" of speed reference when switching between "Auto" and "Hand" modes. There shall be fault reset and "Help" buttons on the keypad. The "Help" button shall include "on-line" assistance for programming and troubleshooting.

1. The VFDs shall utilize preprogrammed application macros specifically designed to facilitate startup. The application macros shall provide on command to reprogram all parameters and customer interfaces for a particular application to reduce programming time. The VFD shall have two user macros to allow end-user to create and save custom settings.

2. There shall be a built in time clock in the VFD keypad. The clock shall have a battery backup with a ten (10) year minimum lifespan. The clock shall be used to date and time stamp faults and record operation parameters at the time of fault. If the battery fails, the VFD shall automatically revert to hours of operation since initial power-up. The clock shall also be programmable to control start/stop functions, constant speeds, PID parameter sets and output relays. The VFD shall have a digital input that allows an override to the time clock, when in the off mode, for a programmable timeframe. There shall be four (4) separate, independent timer functions that have both weekday and weekend settings.

B. Status Indicators: The following operating information displays shall be standard on the VFD digital display, All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of two operating values from the list below shall be capable of being displayed at all times. The display shall be in complete English words, alpha-numeric codes are not acceptable.

1. Output Frequency.

2. Motor Speed (RPM, percent or engineering units).

3. Motor Current.

4. Calculated Motor Torque.

5. Calculated Motor Power (kW).

6. DC Bus Voltage.

7. Output Voltage.

8. Analog Input Values.

9. Analog Output Values.

10. Keypad Reference Values.

11. Elapsed Time Meter (resettable).

12. kWh meter (resettable).

13. Digital Input Status.

14. Digital Output Status.

15. Ammeter.

C. The VFD shall have the ability to automatically restart after an overcurrent, overvoltage, undervoltage or loss of input signal protective trip. The number of restart attempts, trial time and time between reset attempts shall be programmable.

1. The VFD shall be capable of starting into a rotating load and accelerate or decelerate to setpoint without safety tripping or component damage. The VFD shall also be capable of DC injection braking at start to stop a reverse spinning motor prior to ramp.

2. The VFD shall be equipped with an automatic extended control power ride-through circuit, which will utilize the inertia of the load to keep the drive powered. Typical control power ride-through for a fan load shall be two (2) seconds minimum.

3. If the input reference (4-20mA or 2-10V) is lost, the VFD shall give the use the option of either: stopping and displaying fault, running at a programmable preset speed, hold the VFD speed based on the last good reference received, or cause a warning to be issued, as selected by the user. The drive shall be programmable to signal this condition via a keypad warning, relay output and or over the serial communication bus.

4. The customer terminal strip shall be isolated from the line and ground.

5. The drive shall be employ current limit circuits to provide trip free operation: The slow current regulation limit circuit shall be variable to 150 percent (minimum) of the VFD's normal duty current rating. This adjustment shall be made via the keypad and shall be displayed in actual amps, not as a percent of full load. The current switch-off limit shall be fixed at 350 percent (minimum, instantaneous) of the VFD's normal duty current rating.

6. The overload rating of the drive shall be 110 percent of its normal duty current rating for one minute in every ten minutes, 130 percent overload for two seconds. The minimum FLA rating shall meet or exceed the values in the NEC/UL Table 430-150 for 4-pole motors.

7. The VFD shall have an integral 5 percent impedance line reactors to reduce the harmonics to the power line and to add protection from AC line transients. The VFD shall include a coordinated AC transient protection system consisting of 4-120 joule-rated MOV's (phase to phase and phase to ground), a capacitor clamp and 5 percent impedance reactors.

8. The VFD shall be capable of sensing a loss of load (broken belt, no water in pump, etc.) and signal the loss of load condition. The drive shall be programmable to signal this condition via a keypad warning, relay output and or over the serial communications bus.

D. VFD Adjustments: Three programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed. Two PID setpoint controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VFD, using the microprocessor in the VFD for the closed loop control. There shall be a independent, second PID loop that can utilize the second analog input and modulate one of the analog outputs to maintain setpoint of an independent process. All setpoints, process variables, etc, to be accessible from the serial communication network. Two programmable analog inputs shall accept a current or voltage signal for speed reference or for reference and actual signals for PID controller. Two programmable analog outputs (0-20 ma or 4-20 ma). The outputs may be programmed to output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power, and other data. Six programmable digital inputs. Three programmable digital Form C relay outputs. Seven programmable preset speeds. Two independently adjustable accel and decal ramps.

E. Serial Communications: The VFD shall have an RS-485 port as standard. The standard protocols shall be Modbus and Johnson Controls NS bus, with optional protocols for LonWorks, BACnet and Ethernet available. Serial communications capabilities shall include, but not be limited to: run-stop control, speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, accel/decal time adjustments, and lock/unlock the keypad. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed/frequency, current, precent torque, kilowatt hours, operating hours and drive temperature. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible. The VFD shall allow the DDC to control the drive's digital and analog outputs via the serial interface.

F. Microprocessor based Bypass Controller: A complete factory wired and tested bypass system consisting of an input contactor, output contactor and bypass contactor. Overload protection shall be provided in both drive and bypass modes. Controller shall be manual or automatic (selectable) transfer to line power via contactors. A keypad to control the bypass controller shall be mounted on the enclosure door. The bypass keypad shall include a one-one diagram and status LED's to indicate the mode of operation, drive and bypass status, and ready and enable conditions. When in "Drive" mode, the bypass contactor is open and the drive output contactor is closed. In the "Bypass" position, the drive output contactor is open and the bypass controller is closed.

G. Door Interlocks: Furnish mechanical means to prevent opening of equipment with power connected, or to disconnect power if door is opened; include means for defeating interlock by qualified persons.

H. Safety Interlocks: Furnish terminals for remote contact to inhibit starting under both manual and automatic mode.

I. Control Interlocks: Furnish terminals for remote contact to allow starting in automatic mode.

J. Disconnecting Means: Include integral fused disconnect switch on the line side of each controller.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with NEMA ICS 7.1 and manufacturer's instructions.

B. Tighten accessible connections and mechanical fasteners after placing controller.

C. Provide fuses in fusible switches; refer to Section 16491 for product requirements.

D. Installation shall be the responsibility of the mechanical contractor. The contractor shall install the drive in accordance with the recommendations of the VFD manufacturer as outlined in the installation manual.

E. Power wiring shall be completed by the electrical contractor.

F. Make final adjustments to installed controller to assure proper operation of load system. Obtain performance requirements from installer of driven loads.

3.2 MANUFACTURER'S FIELD SERVICES

A. Provide the service of the manufacturer's field representative to prepare and start controllers. Certified factory startup shall be provided for each drive by a factory-authorized service center. A certified start-up form shall be filled out for each drive with a copy provided to the owner and a copy kept on file at the manufacturer.

3.3 DEMONSTRATION

A. Demonstrate operation of controllers in automatic and manual modes.

SECTION 23 0925
DIRECT-DIGITAL CONTROL (DDC) SYSTEMS FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Control Equipment

B. Software

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements.

B. Division 02 - Existing Conditions.

C. Section 23 0005 - Basic HVAC Requirements.

D. Section 23 0553 - Identification for HVAC Piping and Equipment.

E. Section 23 0800 - Commissioning of HVAC.

F. Section 23 0913 - Instrumentation and Control Devices for HVAC.

G. Section 23 0915 - Variable Frequency Drives.

H. Section 23 2123 - Hydronic Pumps.

I. Section 23 3300 - Air Duct Accessories.

J. Section 23 3423 - HVAC Power Ventilators.

K. Section 23 5233.13 - Finned Water-Tube Boilers.

L. Section 23 7223 - Packaged Air-to-Air Energy Recovery Units.

M. Section 23 7413 - Packaged Outdoor Central-Station Air-Handling Units.

N. Section 23 8148 - Water Source Heat Pumps.

O. Division 26 - Electrical.

1.3 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 PRODUCT INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 23 0913 - Instrumentation and Control Devices for HVAC:

1. Duct static pressure sensors

2. H2O Pressure Differential/Flow Switches

B. Section 28 4600 - Fire Detection and Alarm:

1. Smoke Detectors/Fire Stats

1.5 PRODUCTS NOT FURNISHED OR INSTALLED BUT INTEGRATED WITH THE WORK OF THIS SECTION

A. General:

1. Coordination Meeting: The Installer furnishing the DDC network shall meet with the Installer(s) furnishing each of the following products to coordinate details of the interface between these products and the DDC network. The Owner or his designated representative shall be present at this meeting. Each Installer shall provide the Owner and all other Installers with details of the proposed interface, hardware and software identifiers for the interface points, network identifiers, wiring requirements, communication speeds, and required network accessories. The purpose of this meeting shall be to insure there are no unresolved issues regarding the integration of these products into the DDC network. Submittals for these products shall not be approved prior to the completion of this meeting.

B. Section 23 8000 - Decentralized HVAC Equipment:

1. Unit ventilators, unit heaters, fan coils, etc.: Unit ventilators, unit heaters, fan coils, cabinet heaters, convective or fin tube heaters, zone reheat, and similar terminal units: These units shall be furnished configured to accept control inputs from an external building automation system controller. Factory mounted safeties and other controls shall not interfere with this controller.

C. Communications with Third Party Equipment:

1. Any additional integral control systems included with the products integrated with the work of this section shall be furnished with a open protocol network interface for integration into the Direct Digital Control System described in this section.

1.6 DESCRIPTION

A. General: The control system shall consist of a high-speed, peer-to-peer network of DDC controllers and a web-based operator interface. Depict each mechanical system and building floor plan by a point-and-click graphic. A web server with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.

B. The system shall directly control HVAC equipment as detailed on the drawings. Each zone controller shall provide occupied and unoccupied modes of operation by individual zone. Furnish energy conservation features such as optimal start and stop, night setback, request-based logic, and demand level adjustment of setpoints as specified in the sequence.

C. System shall use open protocol communications to the operator workstation or web server and for communication between control modules.

1.7 APPROVED CONTROL SYSTEMS INSTALLERS

A. Michigan Environmental Controls.

B. Metro Environmental.

C. Johnson Controls.

D. Trane.

E. Siemens.

F. Honeywell.

G. Inclusion on this list does not guarantee acceptance of products or installation. Control systems shall comply with the terms of this specification.

1. The Contractor shall use only operator workstation software, controller software, custom application programming language, and controllers from the corresponding manufacturer and product line unless the Owner approves use of multiple manufacturers.

1.8 QUALITY ASSURANCE

A. Installer and Manufacturer Qualifications

1. Installer shall have an established working relationship with the Control System Manufacturer.

2. Installer shall have successfully completed Control System Manufacturer's control system training. Upon request, Installer shall present record of completed training including course outlines.

B. Perform work in accordance with NFPA 70.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and indicated.

1.9 CODES AND STANDARDS

A. Work, materials, and equipment shall comply with the most restrictive of local, state, and federal authorities' codes and ordinances or these plans and specifications. As a minimum, the installation shall comply with current editions in effect 30 days prior to receipt of bids of the following codes:

1. National Electric Code (NEC)

2. International Building Code (IBC)

   a. Section 719 Ducts and Air Transfer Openings

   b. Section 907 Fire Alarm and Detection Systems

   c. Section 909 Smoke Control Systems

   d. Chapter 28 Mechanical

3. International Mechanical Code (IMC)

4. ANSI/ASHRAE 135-2004: Data Communication Protocol for Building Automation and Control Systems (BACNET)

1.10 SYSTEM PERFORMANCE

A. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation (server and browser for web-based systems).

1. Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 sec.

2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec. and shall automatically refresh every 15 sec.

3. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.

4. Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.

5. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 15 sec.

6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 sec. Select execution times consistent with the mechanical process under control.

7. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.

8. Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 sec of other workstations.

9. Reporting Accuracy. System shall report values with minimum end-to-end accuracy as listed below:

    a. Space Temperature: +/- 1 degrees F

    b. Ducted Air: +/- 1 degrees F

    c. Outside Air: +/- 2 degrees F

    d. Dew Point: +/- 3 degrees F

    e. Water Temperature: +/- 1 degrees F

    f. Delta-T: +/- 0.25 degrees F

    g. Relative Humidity: +/- 5% RH

    h. Water Flow: +/- 1% of reading

    i. Airflow (terminal): +/- 10% of full scale

        1) Accuracy applies to 10% - 100% of scale

    j. Airflow (measuring stations): +/- 3% of reading

    k. Air Pressure (ducts): +/- 0.1 in. w.g.

    l. Air Pressure (space): +/- 0.01 in. w.g.

    m. Water Pressure: +/- 2% of full scale

        1) For both absolute and differential pressure

    n. Electrical (A, V, W, Power Factor): +/- 1% of reading

        1) Not including utility supplied meters

    o. Carbon Monoxide (CO): +/- 5% of reading

    p. Carbon Dioxide (CO2): +/- 50 ppm

10. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances as listed below:

a. Air Pressure (0 to 6 in. w.g.): +/- 0.2 in. w.g.

b. Air Pressure (-0.1 to 0.1 in. w.g.): +/- 0.01 in. w.g.

c. Airflow: +/-10% of full scale

d. Space Temperature: +/- 2.0 degrees F

e. Duct Temperature: +/- 3 degrees F

f. Humidity: +/- 5% RH

g. Fluid Pressure (1 to 150 psi): +/- 1.5 psi

h. Fluid Pressure (0 to 50 in. w.g. differential): +/- 1.0 in. w.g.

1.11 SUBMITTALS

A. Direct Digital Control System Hardware

1. Complete bill of materials indicating quantity, manufacturer, model number, and relevant technical data of equipment to be used.

2. Manufacturer's description and technical data such as performance curves, product specifications, and installation and maintenance instructions for items listed below and for relevant items not listed below:

a. Direct digital controllers (controller panels)

b. Transducers and transmitters

c. Sensors (include accuracy data)

d. Actuators

e. Valves

f. Relays and switches

g. Control panels

h. Power supplies

i. Batteries

j. Operator interface equipment

k. Wiring

3. Wiring diagrams and layouts for each control panel. Show termination numbers.

4. Floor plan schematic diagrams indicating field sensor and controller locations.

5. Riser diagrams showing control network layout, communication protocol, and wire types.

B. Central System Hardware and Software

1. Complete bill of material indicating quantity, manufacturer, model number, and relevant technical data of equipment used.

2. Manufacturer's description and technical data such as product specifications and installation and maintenance instructions for items listed below and for relevant items furnished under this contract not listed below:

a. Central Processing Unit (CPU) or web server

b. Monitors

c. Keyboards

d. Power supplies

e. Battery backups

f. Interface equipment between CPU or server and control panels

g. Operating System software

h. Operator interface software

i. Color graphic software

j. Third-party software

3. Schematic diagrams of control, communication, and power wiring for central system installation. Show interface wiring to control system.

4. Network riser diagrams of wiring between central control unit and control panels.

C. Controlled Systems

1. Riser diagrams showing control network layout, communication protocol, and wire types.

2. Schematic diagram of each controlled system. Label control points with point names. Graphically show locations of control elements.

3. Schematic wiring diagram of each controlled system. Label control elements and terminals. Where a control element is also shown on control system schematic, use the same name.

4. Instrumentation list (Bill of Materials) for each controlled system. List each control system element in a table. Show element name, type of device, manufacturer, model number, and product data sheet number.

5. Complete description of control system operation including sequences of operation. Include and reference schematic diagram of controlled system. List I/O points and software points. Indicate alarmed and trended points.

6. Sequence of Operations shall include both equipment with packaged controls and equipment with TCC provided controls - regardless of who is purchasing the equipment (i.e. Owner Furnished Equipment or Kitchen FSE Consultant furnished equipment). Tcc shall reac out to the Equipment Supplier for packaged controls and provide a detailed list of items by Equipment Supplier and by TCC. Sequence of Operations of packaged equipment shall match sequence as outlined on drawings. TCC maintains all responsibility for the control sequence of all Equipment, regardless of who furnishes.

D. Training Materials: Provide course outline and materials for each class at least six weeks before first class. Training shall be furnished via instructor-led sessions, computer-based training, or web-based training. Engineer will modify course outlines and materials if necessary to meet Owner's needs. Engineer will review and approve course outlines and materials at least three weeks before first class.

1.12 WARRANTY

A. Warrant work as follows:

1. Warrant labor and materials for specified control system free from defects for a period of 12 months after final acceptance. Control system failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request.

2. Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.

3. Provide updates to operator workstation or web server software, project-specific software, graphic software, database software, and firmware that resolve Contractor-identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with above-mentioned items. Do not install updates or upgrades without Owner's written authorization.

4. Exception: Contractor shall not be required to warrant reused devices except those that have been rebuilt or repaired. Installation labor and materials shall be warranted. Demonstrate operable condition of reused devices at time of Engineer's acceptance.

1.13 OWNERSHIP OF PROPRIETARY MATERIAL

A. Project-specific software and documentation shall become Owner's property. This includes, but is not limited to:

1. Graphics

2. Record drawings

3. Database

4. Application programming code

5. Documentation

PART 2 PRODUCTS

2.1 MATERIALS

A. Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least five years after completion of this contract.

2.2 COMMUNICATIONS

A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise an open protocol internetwork.

B. Install new wiring and network devices as required to provide a complete and workable control network.

C. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.

D. Internetwork operator interface and value passing shall be transparent to internetwork architecture.

1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.

2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.

E. Controllers with real-time clocks shall synchronize with the building management system. System shall automatically synchronize system clocks daily from an operator-designated controller via the internetwork. If applicable, system shall automatically adjust for daylight saving and standard time.

F. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.

G. System shall support Web services data exchange with any other system that complies with XML (extensible markup language) and SOAP (simple object access protocol) standards specified by the Web Services Interoperability Organization (WS-I) Basic Profile 1.0 or higher. Web services support shall as a minimum be provided at the workstation or web server level and shall enable data to be read from or written to the system.

1. System shall support Web services read data requests by retrieving requested trend data or point values (I/O hardware points, analog value software points, or binary value software points) from any system controller or from the trend history database.

2. System shall support Web services write data request to each analog and binary object that can be edited through the system operator interface by downloading a numeric value to the specified object.

3. For read or write requests, the system shall require user name and password authentication and shall support SSL (Secure Socket Layer) or equivalent data encryption.

4. System shall support discovery through a Web services connection or shall provide a tool available through the Operator Interface that will reveal the path/identifier needed to allow a third party Web services device to read data from or write data to any object in the system which supports this service.

2.3 OPERATOR INTERFACE

A. Operator Interface. Web server shall reside on high-speed network with building controllers. Each standard browser connected to server shall be able to access all system information. In addition to the primary operator interface, the system shall include a secondary interface compatible with a locally available commercial wireless network and viewable on a commercially available wireless device such as a Wireless Access Protocol (WAP) enabled cellular telephone or personal digital assistant (PDA). This secondary interface may be text-based and shall provide a summary of the most important data. As a minimum, the following capabilities shall be provided through this interface:

1. An operator authentication system that requires an operator to log in before viewing or editing any data, and which can be configured to limit the privileges of an individual operator.

2. The ability to view and acknowledge any alarm in the system. Alarms or links to alarms shall be provided on a contiguous list so the operator can quickly view all alarms.

3. A summary page or pages for each piece of equipment in the system. This page shall include the current values of all critical I/O points and shall allow the operator to lock binary points on or off and to lock analog points to any value within their range.

4. Navigation links that allow the operator to quickly navigate from the home screen to any piece of equipment in the system, and then return to the home screen. These links may be arranged in a hierarchical fashion, such as navigating from the home screen to a particular building, then to a specific floor in the building, and then to a specific room or piece of equipment.

B. Communication. Web server or workstation and controllers shall communicate using an open protocol communications language. Web server or workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol.

C. Hardware. Each workstation or web server shall consist of the following:

1. Hardware Base. Industry-standard hardware shall meet or exceed DDC system manufacturer's recommended specifications and shall meet response times as specified. Hard disk shall have sufficient memory to store system software, one year of data for trended points, and a system database at least twice the size of the existing database at system acceptance.

D. Operator Functions. Operator interface shall allow each authorized operator to execute the following functions as a minimum:

1. Log In and Log Out. System shall require user name and password to log in to operator interface.

2. Point-and-click Navigation. Operator interface shall be graphically based and shall allow operators to access graphics for equipment and geographic areas using point-and-click navigation.

3. View and Adjust Equipment Properties. Operators shall be able to view controlled equipment status and to adjust operating parameters such as setpoints, PID gains, on and off controls, and sensor calibration.

4. View and Adjust Operating Schedules. Operators shall be able to view scheduled operating hours of each schedulable piece of equipment on a weekly or monthly calendar-based graphical schedule display, to select and adjust each schedule and time period, and to simultaneously schedule related equipment. System shall clearly show exception schedules and holidays on the schedule display.

5. View and Respond to Alarms. Operators shall be able to view a list of currently active system alarms, to acknowledge each alarm, and to clear (delete) unneeded alarms.

6. View and Configure Trends. Operators shall be able to view a trend graph of each trended point and to edit graph configuration to display a specific time period or data range. Operator shall be able to create custom trend graphs to display on the same page data from multiple trended points.

7. View and Configure Reports. Operators shall be able to run preconfigured reports, to view report results, and to customize report configuration to show data of interest.

8. Manage Control System Hardware. Operators shall be able to view controller status, to restart (reboot) each controller, and to download new control software to each controller.

9. Manage Operator Access. Typically, only a few operators are authorized to manage operator access. Authorized operators shall be able to view a list of operators with system access and of functions they can perform while logged in. Operators shall be able to add operators, to delete operators, and to edit operator function authorization. Operator shall be able to authorize each operator function separately.

E. System Software.

1. Operating System. Web server shall have an industry-standard professional-grade operating system. Acceptable systems include Microsoft Windows XP Pro, Red Hat Linux, or Sun Solaris. Coordinate operating system type with the Owner.

2. System Graphics. Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.

   a. Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.

   b. Animation. Graphics shall be able to animate by displaying different image files for changed object status.

   c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.

   d. Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Macromedia Flash).

F. System Tools. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If furnished as a stand-alone program, software shall be installable on standard IBM-compatible PCs with no limit on the number of copies that can be installed under the system license.

1. Automatic System Database Configuration. Each workstation or web server shall store on its hard disk a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.

2. Controller Memory Download. Operators shall be able to download memory from the system database to each controller.

3. System Configuration. Operators shall be able to configure the system.

4. Online Help. Context-sensitive online help for each tool shall assist operators in operating and editing the system.

5. Security. System shall require a user name and password to view, edit, add, or delete data.

   a. Operator Access. Each user name and password combination shall define accessible viewing, editing, adding, and deleting functions in each system application, editor, and object. Authorized operators shall be able to vary and deny each operator's accessible functions based on equipment or geographic location.

   b. Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. Operators shall be able to adjust automatic log out delay.

   c. Encrypted Security Data. Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.

6. System Diagnostics. System shall automatically monitor controller and I/O point operation. System shall annunciate controller failure and I/O point locking (manual overriding to a fixed value).

7. Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Configure and enable alarm points as detailed on the drawings.

8. Alarm Messages. Alarm messages shall use an English language descriptor without acronyms or mnemonics to describe alarm source, location, and nature.

9. Alarm Reactions. Operator shall be able to configure (by object) actions workstation or web server shall initiate on receipt of each alarm. As a minimum, workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send page, and audibly annunciate.

10. Alarm Maintenance. Operators shall be able to view system alarms and changes of state chronologically, to acknowledge and delete alarms, and to archive closed alarms to the workstation or web server hard disk from each workstation or web browser interface.

11. Trend Configuration. Operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk.

12. Object and Property Status and Control. Operator shall be able to view, and to edit if applicable, the status of each system object and property by menu, on graphics, or through custom programs.

13. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.

14. Standard Reports. Furnish the following standard system reports:

    a. Objects. System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.

    b. Alarm Summary. Current alarms and closed alarms. System shall retain closed alarms for an adjustable period.

    c. Logs. System shall log the following to a database or text file and shall retain data for an adjustable period:

        1) Alarm History.

        2) Trend Data. Operator shall be able to select trends to be logged.

        3) Operator Activity. At a minimum, system shall log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System shall date and time stamp logged activity.

15. Custom Reports. Operator shall be able to create custom reports that retrieve data, including archived trend data, from the system, that analyze data using common algebraic calculations, and that present results in tabular or graphical format. Reports shall be launched from the operator interface.

16. Graphics Generation. Graphically based tools and documentation shall allow Operator to edit system graphics, to create graphics, and to integrate graphics into the system. Operator shall be able to add analog and binary values, dynamic text, static text, and animation files to a background graphic using a mouse.

17. Graphics Library. Complete library of standard HVAC equipment graphics shall include equipment such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. Library shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. Library graphic file format shall be compatible with graphics generation tools.

18. Custom Application Programming. Operator shall be able to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language shall have the following features:

    a. Language. Language shall be graphically based and shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks.

    b. Programming Environment. Tool shall provide a full-screen, cursor-and-mouse-driven programming environment that incorporates word processing features such as cut and paste. Operators shall be able to insert, add, modify, and delete custom programming code, and to copy blocks of code to a file library for reuse in other control programs.

    c. Independent Program Modules. Operator shall be able to develop independently executing program modules that can disable, enable and exchange data with other program modules.

    d. Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.

    e. Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.

    f. Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.

g. Variables: Operator shall be able to use variable values in program conditional statements and mathematical functions.

1) Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.

2) System Variables. Operator shall be able to use predefined variables to represent status and results of Controller Software and shall be able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.

G. Portable Operator's Terminal. Provide all necessary software to configure an IBM-compatible laptop computer for use as a Portable Operator's Terminal. Operator shall be able to connect configured Terminal to the system network or directly to each controller for programming, setting up, and troubleshooting.

2.4 CONTROLLER SOFTWARE

A. Building and energy management application software shall reside and operate in system controllers. Applications shall be editable through operator workstation, web browser interface, or engineering workstation.

B. Scheduling. System shall provide the following schedule options as a minimum:

1. Weekly. Provide separate schedules for each day of the week. Each schedule shall be able to include up to 5 occupied periods (5 start-stop pairs or 10 events).

2. Exception. Operator shall be able to designate an exception schedule for each of the next 365 days. After an exception schedule has executed, system shall discard and replace exception schedule with standard schedule for that day of the week.

3. Holiday. Operator shall be able to define 24 special or holiday schedules of varying length on a scheduling calendar that repeats each year.

C. System Coordination. Operator shall be able to group related equipment based on function and location and to use these groups for scheduling and other applications.

D. Binary and Analog Alarms. See Paragraph 2.3.F.7 (Alarm Processing).

E. Alarm Reporting. See Paragraph 2.3.F.9 (Alarm Reactions).

F. Remote Communication. System shall automatically contact operator workstation or server on receipt of critical alarms. If no network connection is available, system shall use a modem connection.

G. Maintenance Management. System shall generate maintenance alarms when equipment exceeds adjustable runtime, equipment starts, or performance limits.

H. Sequencing. Application software shall sequence chillers, boilers, and pumps as detailed on the drawings.

I. PID Control. System shall provide direct- and reverse-acting PID (proportional-integral-derivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm shall calculate a time-varying analog value that can be used to position an output or to stage a series of outputs.

J. Staggered Start. System shall stagger controlled equipment restart after power outage. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.

K. Energy Calculations.

1. System shall accumulate and convert instantaneous power (kW) or flow rates (L/s [gpm]) to energy usage data.

2. System shall calculate a sliding-window average (rolling average). Operator shall be able to adjust window interval to 15 minutes, 30 minutes, or 60 minutes.

L. Anti-Short Cycling. Binary output objects shall be protected from short cycling by means of adjustable minimum on-time and off-time settings.

M. On and Off Control with Differential. System shall provide direct- and reverse-acting on and off algorithms with adjustable differential to cycle a binary output based on a controlled variable and setpoint.

N. Runtime Totalization. System shall provide an algorithm that can totalize runtime for each binary input and output. Operator shall be able to enable runtime alarm based on exceeded adjustable runtime limit.

2.5 CONTROLLERS

A. General. Provide Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified.

B. Communication.

1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.

2. Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.

3. Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.

4. Stand-Alone Operation. Each piece of equipment specified shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.

C. Environment. Controller hardware shall be suitable for anticipated ambient conditions.

1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).

2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

D. Keypad. Provide a local keypad and display for each BC and AAC. Operator shall be able to use keypad to view and edit data. Keypad and display shall require password to prevent unauthorized use. If the manufacturer does not normally provide a keypad and display for each BC and AAC, provide the software and any interface cabling needed to use a laptop computer as a Portable Operator's Terminal for the system.

E. Real-Time Clock. Controllers that perform scheduling shall have a real-time clock.

F. Serviceability.

1. Controllers shall have diagnostic LEDs for power, communication, and processor.

2. Wires shall be connected to a field-removable modular terminal strip or to a termination card connected by a ribbon cable.

3. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.

G. Memory.

1. Controller memory shall support operating system, database, and programming requirements.

2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.

3. Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.

H. Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

I. Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

2.6 INPUT AND OUTPUT INTERFACE

A. General. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.

B. Protection. Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with up to 24 V for any duration shall cause no controller damage.

C. Binary Inputs. Binary inputs shall monitor the on and off signal from a remote device. Binary inputs shall provide a wetting current of at least 12 mA and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.

D. Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall accumulate up to 10 pulses per second.

E. Analog Inputs. Analog inputs shall monitor low-voltage (0-10 Vdc), current (4-20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.

F. Binary Outputs. Binary outputs shall send an on-or-off signal for on and off control. Building Controller binary outputs shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.

G. Analog Outputs. Analog outputs shall send a modulating 0-10 Vdc or 4-20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.

H. Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.

I. Universal Inputs and Outputs. Inputs and outputs that can be designated as either binary or analog in software shall conform to the provisions of this section that are appropriate for their designated use.

2.7 POWER SUPPLIES AND LINE FILTERING

A. Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.

1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.

a. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.

b. Line voltage units shall be UL recognized and CSA listed.

B. Power Line Filtering.

1. Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:

2. Dielectric strength of 1000 V minimum

3. Response time of 10 nanoseconds or less

4. Transverse mode noise attenuation of 65 dB or greater

5. Common mode noise attenuation of 150 dB or greater at 40-100 Hz

2.8 AUXILIARY CONTROL DEVICES

A. Local Control Panels.

1. Indoor control panels shall be fully enclosed NEMA 1 construction with hinged door key-lock latch and removable sub-panels. A common key shall open each control panel and sub-panel.

2. Prewire internal and face-mounted device connections with color-coded stranded conductors tie-wrapped or neatly installed in plastic troughs. Field connection terminals shall be UL listed for 600 V service, individually identified per control and interlock drawings, with adequate clearance for field wiring.

3. Each local panel shall have a control power source power switch (on-off) with overcurrent protection.

2.9 WIRING AND RACEWAYS

A. General. Provide copper wiring, plenum cable, and raceways as specified in applicable sections of Division 26.

B. Insulated wire shall use copper conductors and shall be UL listed for 90°C (200°F) minimum service.

2.10 FIBER OPTIC CABLE SYSTEM

A. Optical Cable. Optical cables shall be duplex 900 mm tight-buffer construction designed for intra-building environments. Sheath shall be UL listed OFNP in accordance with NEC Article 770. Optical fiber shall meet the requirements of FDDI, ANSI X3T9.5 PMD for 62.5/125mm.

B. Connectors. Field terminate optical fibers with ST type connectors. Connectors shall have ceramic ferrules and metal bayonet latching bodies.

PART 3 EXECUTION

3.1 EXAMINATION

A. Thoroughly examine project plans for control device and equipment locations. Report discrepancies, conflicts, or omissions to Architect or Engineer for resolution before starting rough-in work.

B. Inspect site to verify that equipment can be installed as shown. Report discrepancies, conflicts, or omissions to Engineer for resolution before starting rough-in work.

C. Examine drawings and specifications for work of others. Report inadequate headroom or space conditions or other discrepancies to Engineer and obtain written instructions for changes necessary to accommodate Section 23 0923 work with work of others. Controls Contractor shall perform at his expense necessary changes in specified work caused by failure or neglect to report discrepancies.

3.2 PROTECTION

A. Controls Contractor shall protect against and be liable for damage to work and to material caused by Contractor's work or employees.

B. Controls Contractor shall be responsible for work and equipment until inspected, tested, and accepted. Protect material not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3 COORDINATION

A. Site.

1. Assist in coordinating space conditions to accommodate the work of each trade where work will be installed near or will interfere with work of other trades. If installation without coordination causes interference with work of other trades, Contractor shall correct conditions without extra charge.

2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.

B. Test and Balance.

1. Provide Test and Balance Contractor a single set of necessary tools to interface to control system for testing and balancing.

2. Train Test and Balance Contractor to use control system interface tools.

3. Provide a qualified technician to assist with testing and balancing the first 20 terminal units.

4. Test and Balance Contractor shall return tools undamaged and in working condition at completion of testing and balancing.

C. Life Safety.

1. Duct smoke detectors required for air handler shutdown are provided under Division 28. Interlock smoke detectors to air handlers for shutdown as indicated on drawings.

2. Smoke dampers and actuators required for duct smoke isolation are provided under Division 23. Interlock smoke dampers to air handlers as indicated on drawings.

3. Fire and smoke dampers and actuators required for fire-rated walls are provided under Division 23. Fire and smoke damper control is provided under Division 28.

D. Coordination with Other Controls. Integrate with and coordinate controls and control devices furnished or installed by others as follows.

1. Communication media and equipment shall be provided as specified.

2. Each supplier of a controls product shall configure, program, start up, and test that product to meet the sequences of operation detailed on the drawings.

3. Coordinate and resolve incompatibility issues that arise between control products provided under this section and those provided under other sections or divisions of this specification.

4. Controls Contractor shall be responsible for integration of control products provided by multiple suppliers regardless of where integration is described within the contract documents.

3.4 GENERAL WORKMANSHIP

A. Install equipment, piping, and wiring or raceway horizontally, vertically, and parallel to walls wherever possible.

B. Provide sufficient slack and flexible connections to allow for piping and equipment vibration isolation.

C. Install equipment in readily accessible locations as defined by National Electrical Code (NEC) Chapter 1 Article 100 Part A.

D. Verify wiring integrity to ensure continuity and freedom from shorts and ground faults.

E. Equipment, installation, and wiring shall comply with industry specifications and standards and local codes for performance, reliability, and compatibility.

3.5 FILED QUALITY CONTROL

A. Work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes and ordinances.

B. Continually monitor field installation for code compliance and workmanship quality.

C. Contractor shall arrange for work inspection by local or state authorities having jurisdiction over the work.

3.6 WIRING

A. The control contractor shall be responsible to provide additional 120V power as required for temperature controls and building automation. Some circuits may be indicated on the electrical drawings (if applicable) or provided from existing controllers being removed. If additional circuits are required, coordinate with the electrical contractor and/or owner’s representative for locations of available circuits and provide circuit breakers, wiring and conduit as necessary.

B. The control contractor shall be responsible to provide low-voltage power supplies, wiring, conduit, etc. as necessary to power control, metering and monitoring devices.

C. Control and interlock wiring and installation shall comply with national and local electrical codes, Division 26, and manufacturer's recommendations. Where the requirements of Section 23 09 23 differ from Division 26, Section 23 09 23 shall take precedence.

D. NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway as specified by NEC and Division 26.

E. Low-voltage wiring shall meet NEC Class 2 requirements. Subfuse low-voltage power circuits as required to meet Class 2 current limit.

F. NEC Class 2 (current-limited) wires not in raceway but in concealed and accessible locations such as return air plenums shall be UL listed for the intended application.

G. Install wiring in raceway where subject to mechanical damage and at levels below 3 m (10ft) in mechanical, electrical, or service rooms.

H. Install Class 1 and Class 2 wiring in separate raceways. Boxes and panels containing high-voltage wiring and equipment shall not be used for low-voltage wiring except for the purpose of interfacing the two through relays and transformers.

I. Do not install wiring in raceway containing tubing.

J. Run exposed Class 2 wiring parallel to a surface or perpendicular to it and tie neatly at 3 m (10 ft) intervals.

K. Use structural members to support or anchor plenum cables without raceway. Do not use ductwork, electrical raceways, piping, or ceiling suspension systems to support or anchor cables.

L. Secure raceways with raceway clamps fastened to structure and spaced according to code requirements. Raceways and pull boxes shall not be hung on or attached to ductwork, electrical raceways, piping, or ceiling suspension systems.

M. Size raceway and select wire size and type in accordance with manufacturer's recommendations and NEC requirements.

N. Include one pull string in each raceway 2.5 cm (1 in.) or larger.

O. Use color-coded conductors throughout.

P. Locate control and status relays in designated enclosures only. Do not install control and status relays in packaged equipment control panel enclosures containing Class 1 starters.

Q. Conceal raceways except within mechanical, electrical, or service rooms. Maintain minimum clearance of 15 cm (6 in.) between raceway and high-temperature equipment such as steam pipes or flues.

R. Adhere to requirements in Division 26 where raceway crosses building expansion joints.

S. Install insulated bushings on raceway ends and enclosure openings. Seal top ends of vertical raceways.

T. Terminate control and interlock wiring related to the work of this section. Maintain at the job site updated (as-built) wiring diagrams that identify terminations.

U. Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 1 m (3 ft) in length and shall be supported at each end. Do not use flexible metal raceway less than ½ in. electrical trade size. Use liquid-tight flexible metal raceways in areas exposed to moisture including chiller and boiler rooms.

V. Install raceway rigidly, support adequately, ream at both ends, and leave clean and free of obstructions. Join raceway sections with couplings and according to code. Make terminations in boxes with fittings. Make terminations not in boxes with bushings.

W. Install signal and communication cable according to DDC system recommendations.

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.

2. Install exposed cable in raceway. Wiring and cable in mechanical rooms shall be installed in conduit.

3. Install concealed cable in raceway.

4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.

5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.

6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.

7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

8. Low voltage cabling shall be run separate from 120 volt control wiring.

9. Input and output wiring shall be run in separate conduit systems.

10. Analog inputs shall be run separate from digital inputs.

11. Network cabling shall be run in separate conduit system.

12. No control wiring splices are allowed.

3.7 COMMUNICATION WIRING

A. Communication wiring shall be low-voltage Class 2 wiring.

B. Install communication wiring in separate raceways and enclosures from other Class 2 wiring.

C. During installation do not exceed maximum cable pulling, tension, or bend radius specified by the cable manufacturer.

D. Verify entire network's integrity following cable installation using appropriate tests for each cable.

E. Install lightning arrestor according to manufacturer's recommendations between cable and ground where a cable enters or exits a building.

F. Each run of communication wiring shall be a continuous length without splices when that length is commercially available. Runs longer than commercially available lengths shall have as few splices as possible using commercially available lengths.

G. Label communication wiring to indicate origination and destination.

H. Ground coaxial cable according to NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

3.8 FIBER OPTIC CABLE

A. During installation do not exceed maximum pulling tensions specified by cable manufacturer. Post-installation residual cable tension shall be within cable manufacturer's specifications.

B. Install cabling and associated components according to manufacturers' instructions. Do not exceed minimum cable and unjacketed fiber bend radii specified by cable manufacturer.

3.9 INSTALLATION OF SENSORS

A. Install sensors according to manufacturer's recommendations.

B. Mount sensors rigidly and adequately for operating environment.

C. Install room temperature sensors on concealed junction boxes properly supported by wall framing.

D. Air seal wires attached to sensors in their raceways or in the wall to prevent sensor readings from being affected by air transmitted from other areas.

E. Use averaging sensors in mixing plenums and hot and cold decks. Install averaging sensors in a serpentine manner vertically across duct. Support each bend with a capillary clip.

F. Install mixing plenum low-limit sensors in a serpentine manner horizontally across duct. Support each bend with a capillary clip. Provide 3 m (1 ft) of sensing element for each 1 m2 (1 ft2) of coil area.

G. Install pipe-mounted temperature sensors in wells. Install liquid temperature sensors with heat-conducting fluid in thermal wells.

H. Install outdoor air temperature sensors on north wall at designated location with sun shield.

I. Differential Air Static Pressure.

1. Supply Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube. Make pressure tap connections according to manufacturer's recommendations.

2. Return Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube. Make pressure tap connections according to manufacturer's recommendations.

3. Building Static Pressure. Pipe pressure sensor's low-pressure port to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe high-pressure port to a location behind a thermostat cover.

4. Piping to pressure transducer pressure ports shall contain a capped test port adjacent to transducer.

5. Pressure transducers, except those controlling VAV boxes, shall be located in control panels, not on monitored equipment or on ductwork. Mount transducers in a vibration-free location accessible for service without use of ladders or special equipment.

6. Mount gauge tees adjacent to air and water differential pressure taps. Install shut-off valves before tee for water gauges.

J. Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status.

3.10 WARNING LABELS

A. Affix permanent warning labels to equipment that can be automatically started by the control system.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows.

a. C A U T I O N: This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing

B. Affix permanent warning labels to motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows.

a. C A U T I O N: This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

3.11 IDENTIFICATION OF HARDWARE AND WIRING

A. Label wiring and cabling, including that within factory-fabricated panels, with control system address or termination number at each end within 5 cm (2 in.) of termination.

B. Permanently label or code each point of field terminal strips to show instrument or item served.

C. Label control panels with minimum 1 cm (½ in.) letters on laminated plastic nameplates.

D. Label each control component with a permanent label. Label plug-in components such that label remains stationary during component replacement.

E. Label room sensors related to terminal boxes or valves with nameplates.

F. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.

G. Label identifiers shall match record documents.

3.12 PROGRAMMING

A. Software Programming. Programming shall provide actions for each possible situation. Graphic- or parameter-based programs shall be documented. Text-based programs shall be modular, structured, and commented to clearly describe each section of the program.

1. Application Programming. Provide application programming that adheres to the sequences of operation. Program documentation or comment statements shall reflect language used in sequences of operation.

2. System Programming. Provide system programming necessary for system operation.

B. Operator Interface.

1. Standard Graphics. Provide graphics as specified in Section 23 09 23 Article 2.3 Paragraph E.2 (System Graphics). Show on each equipment graphic input and output points and relevant calculated points. Point information on graphics shall dynamically update.

2. Install, initialize, start up, and troubleshoot operator interface software and functions (including operating system software, operator interface database, and third-party software installation and integration required for successful operator interface operation).

3.13 CONTROL SYSTEM CHECKOUT AND TESTING

A. Startup Testing. Complete startup testing to verify operational control system before notifying Owner of system demonstration. Provide Owner with schedule for startup testing. Owner may have representative present during any or all startup testing.

1. Calibrate and prepare for service each instrument, control, and accessory equipment furnished under Section 23 09 23.

2. Verify that control wiring is properly connected and free of shorts and ground faults. Verify that terminations are tight.

3. Enable control systems and verify each input device's calibration. Calibrate each device according to manufacturer's recommendations.

4. Verify that binary output devices such as relays, solenoid valves, two-position actuators and control valves, and magnetic starters, operate properly and that normal positions are correct.

5. Verify that analog output devices such as I/Ps and actuators are functional, that start and span are correct, and that direction and normal positions are correct. Check control valves and automatic dampers to ensure proper action and closure. Make necessary adjustments to valve stem and damper blade travel.

6. Prepare a log documenting startup testing of each input and output device, with technician's initials certifying each device has been tested and calibrated.

7. Verify that system operates according to sequences of operation. Simulate and observe each operational mode by overriding and varying inputs and schedules. Tune PID loops and each control routine that requires tuning.

8. Alarms and Interlocks.

    a. Check each alarm with an appropriate signal at a value that will trip the alarm.

    b. Trip interlocks using field contacts to check logic and to ensure that actuators fail in the proper direction.

    c. Test interlock actions by simulating alarm conditions to check initiating value of variable and interlock action.

3.14 CLEANING

A. On completion of work, check equipment furnished under this section for paint damage. Repair damaged factory-finished paint to match adjacent areas. Replace deformed cabinets and enclosures with new material and repaint to match adjacent areas.

3.15 TRAINING

A. Provide training for a designated staff of Owner's representatives. Training shall be provided via self-paced training, web-based or computer-based training, classroom training, or a combination of training methods.

B. Training shall enable students to accomplish the following objectives.

1. Proficiently operate system

2. Understand control system architecture and configuration

3. Understand DDC system components

4. Understand system operation, including DDC system control and optimizing routines (algorithms)
5. Operate workstation and peripherals
6. Log on and off system
7. Access graphics, point reports, and logs
8. Adjust and change system setpoints, time schedules, and holiday schedules
9. Recognize common HVAC system malfunctions by observing system graphics, trend graphs, and other system tools
10. Understand system drawings and Operation and Maintenance manual
11. Understand job layout and location of control components
12. Access data from DDC controllers
13. Operate portable operator's terminals
14. Create and change system graphics
15. Create, delete, and modify alarms, including configuring alarm reactions
16. Create, delete, and modify point trend logs (graphs) and multi-point trend graphs
17. Configure and run reports
18. Add, remove, and modify system's physical points
19. Create, modify, and delete application programming
20. Add operator interface stations
21. Add a new controller to system
22. Download firmware and advanced applications programming to a controller
23. Configure and calibrate I/O points
24. Maintain software and prepare backups
25. Interface with job-specific, third-party operator software
26. Add new users and understand password security procedures

C. Divide presentation of objectives into three sessions (1-13, 14-23, and 24-26). Participants will attend one or more of sessions, depending on knowledge level required.

1. Day-to-day Operators (objectives 1-13)

2. Advanced Operators (objectives 1-13 and 14-23)

3. System Managers and Administrators (objectives 1-13 and 24-26)

D. Provide course outline and materials according to Section 23 09 23 Article 1.10 (Submittals). Provide one copy of training material per student.

E. Instructors shall be factory-trained and experienced in presenting this material.

F. Perform classroom training using a network of working controllers representative of installed hardware.

SECTION 23 2113
HYDRONIC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hydronic system requirements.

B. Heating water piping, above grade.

C. Condenser water piping, above grade.

D. Equipment drains and overflows.

E. Pipe hangers and supports.

F. Unions, flanges, mechanical couplings, and dielectric connections.

1.2 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting.

B. Section 23 0516 - Expansion Fittings and Loops for HVAC Piping.

C. Section 23 0523 - General-Duty Valves for HVAC Piping.

D. Section 23 0553 - Identification for HVAC Piping and Equipment.

E. Section 23 0719 - HVAC Piping Insulation.

F. Section 23 2114 - Hydronic Specialties.

G. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.3 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. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

E. ASME B31.9 - Building Services Piping; 2020.

F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

G. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

H. ASTM B32 - Standard Specification for Solder Metal; 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 F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 2024.

L. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2019).

M. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

N. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

O. AWWA C606 - Grooved and Shouldered Joints; 2022.

P. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:

1. Include data on pipe materials, pipe fittings,and accessories.

2. Show grooved joint couplings, fittings, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.

1.5 QUALITY ASSURANCE

A. Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.

B. Coupling Manufacturer:

1. Perform on-site training by factory-trained representative to the Contractor's field personnel in the proper use of grooving tools and installation of grooved joint products.

2. Periodic job site visits by factory-trained representative to ensure best practices in grooved joint installation.

C. Welder Qualifications: Certify in accordance with ASME BPVC-IX.

1.6 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

1.7 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing hydronic piping systems with the following minimum working-pressure ratings:

1. Hot-Water Piping: 150 psig at 200 deg. F

2. Condenser Water Piping: 150 psig at 75 deg. F

PART 2 PRODUCTS

2.1 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:

1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.

2. Use non-conducting dielectric connections whenever jointing dissimilar metals.

3. Grooved mechanical joints may be used in accessible locations only.

a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.

b. Use rigid joints unless otherwise indicated.

4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D. Valves: Provide valves where indicated:

1. Provide drain valves where indicated, and if not indicated, provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.

2.2 HEATING WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:

1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.

2. Threaded Joints: ASME B16.3, malleable iron fittings.

3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

B. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn, using one of the following joint types:

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.

a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.

2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

2.3 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn; using one of the following joint types:

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

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.

B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge-shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.5 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe of 2 Inches and Less:

1. Ferrous Piping: 150 psi brass or malleable iron, threaded.

2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe 2 Inches and Greater:

1. Ferrous Piping: 150 psig forged steel, slip-on.

2. Copper Piping: Bronze.

3. Gaskets: 1/16 inch thick, preformed neoprene.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.

1. Dimensions and Testing: In accordance with AWWA C606.

2. Mechanical Couplings: Comply with ASTM F1476.

3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.

4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

5. Manufacturers:

a. Anvil International: www.anvilintl.com/#sle.

b. Gruvlok by ASC Engineered Solutions www.asc-es.com

c. Victaulic Company: www.victaulic.com/#sle.

d. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare piping connections to equipment using jointing system specified.

E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

F. After completion, fill, clean, and treat systems. See Section 23 2500 for additional requirements.

3.2 PIPING APPLICATIONS

A. Heating water piping, above grade:

1. Pipe sizes 3/4" - 2": Copper, soldered/brazed joints.

2. Pipe sizes 2 1/2" and larger: Schedule 40 black steel, welded joints or grooved joints where allowed

3.3 INSTALLATION

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

B. Install in accordance with manufacturer's instructions.

C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

D. Install piping to conserve building space and to avoid interference with use of space.

E. Group piping whenever practical at common elevations.

F. Sleeve pipe passing through partitions, walls, and floors.

G. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified.

H. Slope piping and arrange to drain at low points.

I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

J. Grooved Joints:

1. Install in accordance with the manufacturer's latest published installation instructions.

2. Gaskets to be suitable for the intended service, molded, and produced by the coupling manufacturer.

K. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.

2. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.

3. Place hangers within 12 inches of each horizontal elbow.

4. Use hangers with 1-1/2 inches minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

7. Provide copper plated hangers and supports for copper piping.

8. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

L. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. See Section 23 0719.

M. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 3100 .

N. Use eccentric reducers to maintain top of pipe level.

O. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welds.

P. Install valves with stems upright or horizontal, not inverted.

3.4 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.

2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.

3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.

4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.

5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.

2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.

3. Isolate expansion tanks and determine that hydronic system is full of water.

4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."

5. After hydrostatic test pressure has been applied for at least 4 hours, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.

6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.

2. Inspect pumps for proper rotation. Set makeup pressure-reducing valves for required system pressure.

3. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).

4. Set temperature controls so all coils are calling for full flow.

5. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.

6. Verify lubrication of motors and bearings.

SECTION 23 2114
HYDRONIC SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Expansion tanks.

B. Buffer tanks.

C. Air vents.

D. Air separators.

E. Strainers.

F. Suction diffusers.

G. Pump connectors.

H. Combination pump discharge valves.

I. Balancing valves.

J. Relief valves.

1.2 RELATED REQUIREMENTS

A. Section 23 2113 - Hydronic Piping.

B. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.3 REFERENCE STANDARDS

A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2023.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.1 EXPANSION TANKS

A. Manufacturers:

1. Amtrol Inc: www.amtrol.com/#sle.

2. ITT Bell & Gossett: www.bellgossett.com/#sle.

3. Taco, Inc: www.taco-hvac.com/#sle.

4. Wessels: www.westank.com

5. Grundfos: www.grundfos.com

6. Substitutions: See Section 01 6000 - Product Requirements.

B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, adjustable flexible EPDM diaphragm or bladder seal factory precharged to 12 psi, and steel support stand.

C. Accessories: Provide air-charging fitting, bulls eye sight glass, pressure gauge, and tank drain ball valve.

2.2 AIR VENTS

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.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 Air Vent: Short vertical sections of 2-inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

C. Float Air Vent:

1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

2. Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.

D. Hygroscopic Air Vent:

1. Brass with hygroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring-loaded ball check valve.

E. Maximum Fluid Pressure: 150 psi.

F. Maximum Fluid Temperature: 250 degrees F.

2.3 AIR SEPARATORS

A. In-line Air Separators:

1. Manufacturers:

a. Armstrong International, Inc: www.armstronginternational.com/#sle.

b. ITT Bell & Gossett: www.bellgossett.com/#sle.

c. Nexus Valve, Inc: www.nexusvalve.com/#sle.

d. Taco, Inc: www.taco-hvac.com/#sle.

e. Substitutions: See Section 01 6000 - Product Requirements.

2. Cast iron for sizes 1-1/2 inch and smaller, or steel for sizes 2 inch and larger; tested and stamped in accordance with ASME BPVC-VIII-1; for 125 psi operating pressure.

3. Maximum Allowable Service Temperature: 450 degrees F.

4. Accessories: Provide epoxy coating finish, drain ball valve, and removable strainer.

B. Coalescing Air/Dirt Separators:

1. Manufacturers:

a. Armstrong International, Inc: www.armstronginternational.com/#sle.

b. ITT Bell & Gossett: www.bellgossett.com/#sle.

c. Spirotherm, Inc: www.spirotherm.com/#sle.

d. Caleffi: www.caleffi.com.

e. Taco: www.tacocomfort.com.

f. Wessels: www.westank.com

g. Grundfos: www.grundfos.com

h. Substitutions: See Section 01 6000 - Product Requirements.

2. Tank: Fabricated steel tank; tested and stamped in accordance with ASME BPVC-VIII-1 for maximum fluid service subject to application requirements and manufacturer's standard maximum operating conditions.

3. Air Vent: Integral float actuated air vent at top fitting of tank rated at 150 psi, threaded to top of separator.

4. End Connections: Class 150 flanged for 2-1/2 inch and larger otherwise threaded.

5. Blowdown Connection: Threaded.

6. Size: Match system flow capacity.

7. Maximum Fluid Service Pressure: 150 psi.

8. Maximum Fluid Service Temperature: 250 degrees F.

9. Accessories:

   a. Provide with magnetic insert.

   b. Comprised of neodymium 45H magnets with a strength of 13,550 Gauss, the magnetic rod helps remove metallic sediment that can pose a serious threat to modern system components. The insert can be easily moved from its position inside the separator to facilitate blow down and sediment removal.

2.4 STRAINERS

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.com/#sle.

2. Grinnell Products: www.grinnell.com/#sle.

3. The Metraflex Company: www.metraflex.com/#sle.

4. Titan Flow Control: www.titanfci.com.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Size 2 inch and Under:

1. Provide threaded, grooved, or sweat brass or iron body for up to 175 psi working pressure, Y-pattern strainer with 1/32 inch stainless steel perforated screen.

C. Size 2-1/2 inch to 4 inch:

1. Provide flanged iron body for 175 psi working pressure, Y pattern with stainless steel perforated screen.

D. Size 5 inch and Larger:

E. Accessories: Provide blowdown vent/drain and outlet ball valve.

2.5 SUCTION DIFFUSERS

A. Manufacturers:

1. Anvil International: www.anvilintl.com/#sle.

2. Bell & Gossett, a brand of Xylem, Inc: www.bellgossett.com/#sle.

3. Victaulic Company of America: www.victaulic.com/#sle.

4. Taco: www.tacohvac.com.

5. Grundfos: www.grundfos.com

6. Substitutions: See Section 01 6000 - Product Requirements.

B. Fitting: Angle pattern, cast-iron or ductile-iron body, threaded for 2 inch and smaller, flanged or grooved for 2-1/2 inch and larger, rated for 175 psi working pressure, with full-length, 4-plane removable straightening vanes made of carbon steel or 304 stainless steel, orifice cylinder shall be made of either carbon steel or 304 stainless steel, full-length cylinder strainer with 3/16 inch diameter openings, and 16 mesh full-length removable startup screen.

C. Accessories: Adjustable foot support, blowdown tapping in bottom, gauge tapping in side.

2.6 PUMP CONNECTORS

A. Manufacturers:

1. Anvil International: www.anvilintl.com/#sle.

2. The Metraflex Company: www.metraflex.com/#sle.

3. Victaulic: www.victaulic.com.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.

1. Maximum Allowable Working Pressure: 175 psig at 200 degrees F.

2. End Connections: Same as specified for pipe jointing.

3. Provide pump connector with integral vanes to reduce turbulent flow.

4. Provide necessary accessories including, but not limited to, swivel joints and limit stops.

2.7 COMBINATION PUMP DISCHARGE VALVES

A. Manufacturers:

1. Anvil International: www.anvilintl.com/#sle.
2. Crane Co.: www.craneco.com/#sle.
3. Taco, Inc: www.taco-hvac.com/#sle.
4. Victaulic Company of America: www.victaulic.com/#sle.
5. ITT Bell & Gossett: www.bellgossett.com/#sle..
6. Grundfos: www.grundfos.com
7. Substitutions: See Section 01 6000 - Product Requirements.

B. The valve shall have a calibrated nameplate with multi-turn stem.

C. The valve shall include a rubber memory button to allow the valve to be re-balanced to its original position after shut-off or maintenance.

D. The valve shall have a fully backseating disc to allow the valve packing to be replaced while under pressure.

E. The valve shall have a maximum temperature rating of 250°F (121°C).

F. Accessories:

1. Pressure/Temperature port.

2.8 RELIEF VALVES

A. Manufacturers:

1. Apollo Valves: www.apollovalves.com/#sle.
2. Armstrong International, Inc: www.armstronginternational.com/#sle.
3. ITT Bell & Gossett: www.bellgossett.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions.

B. Where large air quantities can accumulate, provide enlarged air collection standpipes.

C. Provide manual air vents at system high points and as indicated.

D. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

E. Provide air separator on suction side of system circulation pump and connect to expansion tank.

F. Provide valved drain and hose connection on strainer blowdown connection.

G. Provide pump suction fitting on suction side of base-mounted centrifugal pumps. Remove temporary strainers after cleaning systems.

H. Provide combination pump discharge valve on discharge side of pumps where indicated.

I. Support pump fittings with floor-mounted pipe and flange supports.

J. Provide relief valves on pressure tanks, low-pressure side of reducing valves, heat exchangers, and expansion tanks.

K. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

L. Pipe relief valve outlet to nearest floor drain.

M. Where one line vents several relief valves, make cross-sectional area equal to sum of individual vent areas.

N. Install floor mounted equipment on 4" housekeeping pad, unless otherwise noted.

O. Clean and flush glycol system before adding glycol solution, see Section 23 2500.

P. Feed glycol solution to system through make-up line with pressure regulator, venting system high points.

SECTION 23 2123
HYDRONIC PUMPS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. System-lubricated circulators.

B. In-line pumps.

C. In-line pump systems.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 23 0719 - HVAC Piping Insulation.

C. Section 23 0934 - Variable-Frequency Motor Controllers for HVAC.

D. Section 23 2113 - Hydronic Piping.

E. Section 23 2114 - Hydronic Specialties.

F. Section 26 0583 - Wiring Connections.

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 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

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 Pump Seals: One set for each type and size of pump.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Armstrong Fluid Technology, Inc: www.armstrongfluidtechnology.com/#sle.

B. Bell & Gossett, a Xylem Inc. brand: www.bellgossett.com/#sle.

C. Grundfos Pumps Corporation: www.grundfos.com/#sle.

D. Taco: www.tacohvac.com.

E. Substitutions: See Section 01 6000 - Product Requirements.

2.2 GENERAL

A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B. Electrical Requirements:

1. Listed and classified by UL or testing agency acceptable to authority having jurisdiction as suitable for the purpose specified and indicated.

2. Variable Frequency Drives (VFDs): Provide in accordance with Section 23 0934, except for integral-VFDs.

3. Enclosures: Provide unspecified product(s) required to fit motor:

2.3 SYSTEM-LUBRICATED CIRCULATORS

A. Horizontal shaft, single stage, direct connected with multiple speed wet rotor motor for in-line mounting, for 140 psi maximum working pressure, 230 degrees F maximum water temperature.

B. Casing: Cast iron with flanged pump connections.

C. Impeller, Shaft, Rotor: Stainless Steel.

D. Bearings: Metal Impregnated carbon (graphite) and ceramic.

E. Motor: Impedance protected, multiple speed, with external speed selector.

2.4 CIRCULATORS

A. Horizontal shaft, single-stage pump with direct connected, resilient-mount, oil lubricated motor for discharge pressures of up to 125 psi.

B. Casing: Cast iron, with flanged pump connections.

C. Impeller: Non-ferrous keyed to shaft.

D. Bearings: Oil-lubricated bronze sleeve.

E. Shaft: Alloy steel with bronze sleeve, integral thrust collar.

F. Seal: Mechanical seal, 225 degrees F maximum continuous duty temperature.

G. Drive: Flexible coupling.

2.5 IN-LINE PUMP SYSTEMS

A. In-line Pump System: Two single-stage, close-coupled, vertical pump manifold with radially-split casing and integral controls rated for discharge pressures up to 220 psi.

B. Casing: Cast iron, with suction and discharge gauge port, casing wear ring, seal flush connection, drain plug, flanged suction, and discharge.

C. Impeller: Bronze, fully enclosed, keyed directly to motor shaft or extension.

D. Shaft: Carbon steel with stainless steel impeller cap screw or nut and bronze sleeve.

E. Seal: Mechanical seal, 225 degrees F maximum continuous duty temperature.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close-coupled or base-mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches and over.

D. Provide line sized shut-off valve and strainer or pump suction fitting on pump suction, and line sized combination pump discharge valve or soft seat check valve and balancing valve on pump discharge.

E. Provide air cock and drain connection on horizontal pump casings.

F. Provide drains for bases and seals, piped to and discharging into floor drains.

G. Check, align, and certify alignment of base-mounted pumps prior to start-up.

H. Install close-coupled and base-mounted pumps on concrete housekeeping base, with anchor bolts, set and level, and grout in place.

I. Lubricate pumps before start-up.

SECTION 23 2213
STEAM AND CONDENSATE HEATING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and pipe fittings.

B. Steam piping system.

C. Steam condensate piping system.

1.2 RELATED REQUIREMENTS

A. Section 23 0523 - General-Duty Valves for HVAC Piping.

B. Section 23 0553 - Identification for HVAC Piping and Equipment.

C. Section 23 0719 - HVAC Piping Insulation.

D. Section 23 2214 - Steam and Condensate Heating Specialties.

E. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.3 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

B. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

D. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

F. AWWA C606 - Grooved and Shouldered Joints; 2022.

1.4 SYSTEM DESCRIPTION

A. When more than one piping system material is selected, ensure systems components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

B. Use unions and flanges downstream of valves and at equipment or apparatus connections. Use dielectric unions where joining dissimilar materials. Do not use direct welded or threaded connections.

C. Use gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Use gate valves for throttling, bypass, or manual flow control services.

1.5 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 catalogue information. Indicate valve data and ratings.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.1 LOW PRESSURE STEAM PIPING (15 PSIG MAXIMUM)

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black.

1. Fittings: ASME B16.3 malleable iron Class 150, or ASTM A234/A234M wrought steel.

2. Joints: Threaded, or AWS D1.1/D1.1M welded.

B. Steel Pipe Sizes 12 Inch and Over: ASTM A53/A53M, 3/8 inch wall, black.

1. Fittings: ASTM A234/A234M wrought steel.

2. Joints: Welded in accordance with AWS D1.1/D1.1M.

2.2 LOW PRESSURE STEAM CONDENSATE PIPING

A. Steel Pipe: ASTM A53/A53M, Schedule 80, black.

1. Fittings: ASME B16.3 malleable iron Class 150, or ASTM A234/A234M wrought steel.

2. Joints: Threaded, or AWS D1.1/D1.1M welded.

2.3 UNIONS, FLANGES, AND COUPLINGS

A. Unions for Pipe 2 Inches and Under:

1. Ferrous Piping: 150 psig galvanized malleable iron, threaded.

2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe Over 2 Inches:

1. Ferrous Piping: 150 psig forged steel, slip-on.

2. Copper Piping: Bronze.

3. Gaskets: 1/16 inch thick preformed non-asbestos graphite fiber.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.

1. Dimensions and Testing: In accordance with AWWA C606.

2. Housing Material: Provide ASTM A47/A47M malleable iron, ductile iron, or _____, galvanized.

3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.

4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

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 or unions.

D. Keep open ends of pipe free from scale and dirt. Whenever work is suspended during construction protect open ends with temporary plugs or caps.

E. After completion, fill, clean, and treat systems. See Section 23 2500.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Sleeve pipe passing through partitions, walls, and floors.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance for installation of insulation and access to valves and fittings.

G. Slope steam piping one inch in 40 feet in direction of flow. Use eccentric reducers to maintain bottom of pipe level.

H. Slope steam condensate piping one inch in 40 feet. Provide drip trap assembly at low points and before control valves. Run condensate lines from trap to nearest condensate receiver. Provide loop vents over trapped sections.

SECTION 23 2214
STEAM AND CONDENSATE HEATING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steam traps.

B. Steam air vents.

C. Low pressure condensate return units.

D. Condensate pumps.

E. Direct operated pressure reducing valves.

F. Safety relief valves.

G. Steam control valves.

H. Self-operated temperature regulators.

I. Steam condensate meters.

1.2 RELATED REQUIREMENTS

A. Section 23 0513 - Common Motor Requirements for HVAC Equipment: Pump motors.

B. Section 23 0716 - HVAC Equipment Insulation.

C. Section 23 0719 - HVAC Piping Insulation.

1.3 REFERENCE STANDARDS

A. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

B. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2023.

C. ASME B31.9 - Building Services Piping; 2020.

D. ASTM A105/A105M - Standard Specification for Carbon Steel Forgings for Piping Applications; 2024.

E. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2023).

F. ASTM A182/A182M - Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service; 2023.

G. ASTM A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service; 2021.

H. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2025.

I. ASTM A351/A351M - Standard Specification for Castings, Austenitic, for Pressure-Containing Parts; 2018, with Editorial Revision (2019).

J. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

K. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).

L. ASTM A743/A743M - Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application; 2021.

M. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:

1. Provide for manufactured products and assemblies required for this project.

2. Include product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.

3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each specialty.

4. Include electrical characteristics and connection requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.1 STEAM TRAPS

A. Manufacturers:

1. Armstrong International, Inc; _____: www.armstronginternational.com/#sle.

2. Marshall Engineered Products Company; _____: www.mepcollc.com/#sle.

3. Spirax-Sarco; _____: www.spiraxsarco.com/us/#sle.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Steam Trap Applications:

1. Use Float and Thermostatic Traps for:

a. Heating coils.

b. Heat exchangers.

c. Branch lines.

C. Steam Trap Performance:

1. Select to handle minimum of two times maximum condensate load of apparatus served.

2. Pressure Differentials:

a. Low Pressure Systems (15 psi maximum): 2 psi.

D. Float and Thermostatic Steam Traps:

1. Manufacturers:

a. Armstrong International, Inc; _____: www.armstronginternational.com/#sle.

b. Spirax-Sarco; _____: www.spiraxsarco.com/us/#sle.

c. Watson McDaniel Company; _____: www.watsonmcdaniel.com/#sle.

d. Substitutions: See Section 01 6000 - Product Requirements.

2. Metal body with bolted cover, stainless steel or bronze bellows type thermostatic air vent, stainless steel or copper float, stainless steel lever valve assembly, bottom drain plug, and accessible to internal parts without disturbing piping.

2.2 STEAM AIR VENTS

A. Manufacturers:

1. Armstrong International, Inc; _____: www.armstronginternational.com/#sle.

2. Bell and Gossett, a xylem brand; _____: www.bellgossett.com/#sle.

3. Spirax-Sarco; _____: www.spiraxsarco.com/us/#sle.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. 125 psi WSP: Balanced pressure type; cast brass body and cover; access to internal parts without disturbing piping; stainless steel bellows, stainless steel valve and seat.

2.3 LOW PRESSURE CONDENSATE RETURN UNITS

A. Condensate Return Units: Consist of receiver, inlet strainer, pumps, float switches, control panel and accessories.

B. Condensate Receiver: Cast iron, equipped with externally adjustable float switches, water level gauge, dial thermometer, pressure gauges on pump discharge, bronze isolation valves between pumps and receiver, and lifting eye bolts.

C. Inlet Strainer: Cast iron with vertical self-cleaning bronze screen and large dirt pocket, mounted on receiver. Screen shall be easily removable for cleaning.

D. Electrical Pumps: One stage, vertical design, bronze fitted with stainless steel shaft, bronze impeller, renewable bronze case ring, mechanical shaft seal, close coupled to 1750 rpm motor.

E. Control Cabinet:

1. NEMA EN 10250 enclosure, UL listed, with piano hinged door, grounding lug, terminal strip, and fusible control circuit transformer.

2. Combination magnetic starters with overload relays, circuit breakers and cover interlock.

3. Electric alternator.

a. Operate pumps on high level, alternating after each cycle.

b. Operate second pump upon failure of first pump and alarm.

4. 'Auto-Off' switch.

5. Test button, high level alarm light, acknowledge button, alarm horn.

2.4 DIRECT OPERATED PRESSURE REDUCING VALVES

A. Manufacturers:

1. Armstrong International, Inc; GP 2000 PRV: www.armstronginternational.com/#sle.

2. Cash Acme, a brand of Reliance Worldwide Corporation; _____: www.cashacme.com/#sle.

3. McDonnell & Miller, a xylem brand; _____: www.mcdonnellmiller.com/#sle.

4. Spirax-Sarco; _____: www.spiraxsarco.com/us/#sle.

5. Watson McDaniel Company; _____: www.watsonmcdaniel.com/#sle.

6. Substitutions: See Section 01 6000 - Product Requirements.

B. Cast iron or bronze body, phosphor bronze diaphragm, pressure adjustment screw with lock nut, single spring operator, and stainless or chrome steel fabricated valve stem, trim and spring.

C. End Connections: Female thread for sizes 2 inch and smaller, otherwise flanged.

D. Operating Pressure Range: 15 to 250 psi with 15 psi differential.

E. Maximum Service Temperature: 450 degrees F.

2.5 SAFETY RELIEF VALVES

A. Manufacturers:

1. Armstrong International, Inc; _____: www.armstronginternational.com/#sle.

2. Cash Acme, a brand of Reliance Worldwide Corporation; _____: www.cashacme.com/#sle.

3. ITT McDonnell & Miller, a xylem brand; _____: www.mcdonnellmiller.com/#sle.

4. Spirax-Sarco; _____: www.spiraxsarco.com/us/#sle.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Valve: Bronze body, stainless steel valve spring, stem, and trim, direct pressure actuated, capacities ASME certified and labelled.

C. Accessories: Drip pan elbow.

2.6 STEAM CONTROL VALVES

A. Manufacturers:

1. Armstrong International Inc; Python Control Valve: www.armstronginternational.com/#sle.

2. Watson McDaniel Company; _____: www.watsonmcdaniel.com/#sle.

3. Substitutions: See Section 01 6000 - Product Requirements.

B. Valve Configuration:

1. Electrically actuated, fail open, 2-way body with threaded end connections.

2. Electrical Actuator: 2-position, 4 to 20 mA with 6 to 8 second travel.

C. Materials:

1. Valve Body: Carbon steel A216 Grade WCB.

2. Bonnet: Carbon steel A216 Grade WCB.

3. Valve/Valve Seat: 17-4 PH h900.

4. Valve Spindle: Stainless steel, comply with ASTM A276/A276M, Type 431.

5. Gland Packing:

   a. Carbon filled V-Teflon, 450 degrees F.

   b. Grafoil, 800 degrees F.

6. Yoke: Ductile iron.

7. Actuator Spring: Silicon chromium spring steel.

8. Actuator Diaphragm: Nitrite reinforced with nylon fiber.

9. Cage Material: Stainless steel CB30, comply with ASTM A743/A743M.

10. Sealing Ring Material: Carbon filled V-Teflon.

2.7 SELF-OPERATED TEMPERATURE REGULATORS

A. Manufacturers:

1. Jordan Valve; _____: www.jordanvalve.com/us/#sle.

2. Spirax-Sarco; _____: www.spiraxsarco.com/us/#sle.

3. Watson McDaniel Company; _____: www.watsonmcdaniel.com/#sle.

B. Cast iron, bronze, or stainless steel body, stainless steel seat, temperature adjustment screw, brazed stainless steel fabricated trim, high-pressure brass bellows with corrosion resistant tin plated finish, indicating dial thermometer, and 8 feet long copper capillary bulb with union hub and union nut.

C. Heating: Class IV shut-off, single-seated, direct-acting, normally open, 2-way valve for steam and hot water sourced applications.

D. End Connections: Female thread for sizes 2 inch and smaller, otherwise flanged.

E. Operating Temperature Range: 75 to 165 degrees F with 2 to 5 degrees F differential.

F. Maximum Operating Pressure Range: 250 psi.

G. Thermowell: Capillary fitting brass bulb, 13 inch long with thermal grease.

2.8 STEAM CONDENSATE METERS

A. Manufacturers:

1. Lincoln Meter Company; _____: www.lincolnmeter.com/#sle.

2. Spirax-Sarco; _____: www.spiraxsarco.com/us/#sle.

3. Substitutions: See Section 01 6000 - Product Requirements.

B. Cast iron body, stainless steel rotor and gears, tungsten carbide bearings, bronze trim, vortex type meter with vaned rotor.

C. Standard meter registers in gallons, calibrated for water at 200 degrees F, with temperature correction chart, maximum totalization 1 MG.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install steam and steam condensate piping and specialties in accordance with ASME B31.9.

B. Install specialties in accordance with manufacturer's instructions.

C. Steam Traps:

1. Provide minimum 3/4 inch size on steam mains and branches.

2. Install with union or flanged connections at both ends.

3. Provide gate valve and strainer at inlet, and gate valve and check valve at discharge.

4. Provide minimum 10 inch long, line size dirt pocket between apparatus and trap.

D. Remove thermostatic elements from steam traps during temporary and trial usage, and until system has been operated and dirt pockets cleaned of sediment and scale.

E. Terminate relief valves to outdoors 2 feet minimum above roof. Provide drip pan elbow with drain connection to nearest floor drain.

SECTION 23 2300
REFRIGERANT PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Valves.

E. Strainers.

F. Check valves.

G. Filter-driers.

H. Solenoid valves.

I. Expansion valves.

J. Flexible connections.

K. Engineered wall seals and insulation protection.

L. Exterior penetration accessories.

1.2 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 23 0716 - HVAC Equipment Insulation.

C. Section 23 0719 - HVAC Piping Insulation.

D. Section 23 0993 - Sequence of Operations for HVAC Controls.

E. Section 23 6100 - Refrigerant Compressors.

F. Section 23 6213 - Packaged Air-Cooled Refrigerant Compressor and Condenser Units.

G. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. AHRI 495 - Performance Rating of Refrigerant Liquid Receivers; 2005.

B. AHRI 730 (I-P) - Flow Capacity Rating of Suction Line Filters and Suction Line Filter Driers; 2013 (Reapproved 2014).

C. AHRI 760 (I-P) - Performance Rating of Solenoid Valves for Use with Volatile Refrigerants; 2014.

D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Errata (2023).

E. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2022, with Errata (2023).

F. 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.

G. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

H. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.

I. ASME B31.9 - Building Services Piping; 2020.

J. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

K. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.

L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

M. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

N. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

O. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

P. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

Q. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

R. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013 (Reapproved 2021).

S. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

T. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide general assembly of specialties, including manufacturer's catalogue information. Provide manufacturer's catalog data including load capacity.

C. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

D. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.

E. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 20 years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Filter-Driers:

1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

B. Solenoid Valves:

1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.

2. Use in liquid line of single or multiple evaporator systems.

3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

2.2 REGULATORY REQUIREMENTS

A. Comply with ASME B31.9 for installation of piping system.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

C. Welders Certification: In accordance with ASME BPVC-IX.

2.3 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.

1. Fittings: ASME B16.22 wrought copper.

2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

B. Pipe Supports and Anchors:

1. Provide hangers and supports that comply with MSS SP-58.

a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. 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, UV tolerant, polypropylene or reinforced PVC.

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.

2.4 REFRIGERANT

A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

B. Refrigerant: As indicated on drawings and as defined in ASHRAE Std 34.

2.5 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or soldered ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.6 VALVES

A. Manufacturers:

1. Hansen Technologies Corporation; _____: www.hantech.com/#sle.

2. Henry Technologies; _____: www.henrytech.com/#sle.

3. Flomatic Valves; _____: www.flomatic.com/#sle.

4. Parker Hannifin - Sporlan Division; _____: www.parker.com/#sle.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Diaphragm Packless Valves:

1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, soldered or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

C. Packed Angle Valves:

1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, soldered or flared ends; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

D. Ball Valves:

1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.

E. Service Valves:

1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or soldered ends, for maximum pressure of 500 psi.

2.7 STRAINERS

A. Manufacturers:

1. Hansen Technologies Corporation; _____: www.hantech.com/#sle.

2. Parker Hannifin - Sporlan Division; _____: www.parker.com/#sle.

B. Straight Line or Angle Line Type:

1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

2.8 CHECK VALVES

A. Manufacturers:

1. Hansen Technologies Corporation; _____: www.hantech.com/#sle.

2. Parker Hannifin; _____: www.parker.com/#sle.

3. Substitutions: See Section 01 6000 - Product Requirements.

B. Straight Through Type:

1. Brass body and disc, phosphor-bronze or stainless steel spring, neoprene seat; for maximum working pressure of 500 psi and maximum temperature of 200 degrees F.

2.9 FILTER-DRIERS

A. Manufacturers:

1. Flow Controls Division of Emerson Electric; _____: www.emersonflowcontrols.com/#sle.

2. Parker Hannifin - Sporlan Division; Catch-All; _____: www.parker.com/#sle.

3. Substitutions: See Section 01 6000 - Product Requirements.

B. Performance:

1. Flow Capacity - Liquid Line: Tonnage as indicated in schedule, minimum, rated in accordance with AHRI 710.

2. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.

3. Design Working Pressure: 350 psi, minimum.

C. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

D. Construction: UL listed.

1. Connections: As specified for applicable pipe type.

2.10 SOLENOID VALVES

A. Manufacturers:

1. Flow Controls Division of Emerson Electric; _____: www.emersonflowcontrols.com/#sle.

2. Parker Hannifin - Sporlan Division; _____: www.parker.com/#sle.

3. Substitutions: See Section 01 6000 - Product Requirements.

B. Valve: AHRI 760 (I-P), pilot operated, copper, brass or steel body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil failure), integral strainer, with flared, soldered, or threaded ends; for maximum working pressure of 500 psi.

2.11 EXPANSION VALVES

A. Manufacturers:

1. Flow Controls Division of Emerson Electric; _____: www.emersonflowcontrols.com/#sle.

2. Parker Hannifin - Sporlan Division; _____: www.parker.com/#sle.

3. Substitutions: See Section 01 6000 - Product Requirements.

B. Angle or Straight Through Type: AHRI 760 (I-P); design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, adjustable superheat setting, replaceable inlet strainer, with nonreplaceable capillary tube and remote sensing bulb and remote bulb well.

C. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F superheat. Select to avoid being undersized at full load and excessively oversized at part load.

2.12 FLEXIBLE CONNECTORS

A. Manufacturers:

1. Circuit Hydraulics, Ltd; _____: www.circuit-hydraulics.co.uk/#sle.

2. Flexicraft Industries; _____: www.flexicraft.com/#sle.

3. Penflex; _____: www.penflex.com/#sle.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure of 500 psi.

2.13 ENGINEERED WALL SEALS AND INSULATION PROTECTION

A. Manufacturers:

1. Airex Manufacturing, Inc; ____: www.airexmfg.com/#sle.

2. Substitutions: See Section 01 6000 - Product Requirements.

B. Basis of Design: Airex Manufacturing, Inc; www.airexmfg.com/#sle.

1. Pipe Penetration Wall Seal: Airex Titan Outlet.

2. Refrigeration Pipe Insulation Protection System: Airex E-Flex Guard.

3. Pipe Penetration Wall Seal and Insulation Protection System: Airex Pro-System Kit.

C. Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.

1. Outlet Cover Color: Gray.

2. Water Penetration: Comply with ASTM E331.

3. Air Leakage: Comply with ASTM E283/E283M.

4. Air Permeance: Comply with ASTM E2178.

D. Insulation Protection System: Mechanical line insulation and PVC cover.

1. PVC Insulation Cover Color: Black with full-length velcro fastener.

2. Weatherization and Ultraviolet Exposure Protection: Comply with ASTM G153.

3. Water/Vapor Permeability: Comply with ASTM E96/E96M.

4. Anti-Fungal and Anti-Microbial Resistance: Comply with ASTM G21.

5. Flame Spread and Smoke Development Rating of 25/450: Comply with ASTM E84.

6. Adhesive free.

2.14 EXTERIOR PENETRATION ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

1. Products:

a. Quickflash Weatherproofing Products, Inc; _____: www.quickflashproducts.com/#sle.

b. Substitutions: See Section 01 6000 - Product Requirements.

B. 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.

1. Products:

a. Alta Products, LLC; Sigrist Pipe Chase Housing, Curbs, and Exit Seals: www.altaproductsllc.com/#sle.

b. Menzies Metal Products; _____: www.menzies-metal.com/#sle.

c. Substitutions: See Section 01 6000 - Product Requirements.

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 or unions.

3.2 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.5.

2. Support horizontal piping as indicated.

3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

4. Place hangers within 12 inches of each horizontal elbow.

5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

7. Provide copper plated hangers and supports for copper piping.

G. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

H. Provide clearance for installation of insulation and access to valves and fittings.

I. Provide access to concealed valves and fittings. Coordinate size and location of access doors with Section 08 3100.

J. Flood piping system with nitrogen when brazing.

K. Insulate piping; refer to Section and Section 23 0716.

L. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

M. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.

N. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

O. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

P. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

Q. Fully charge completed system with refrigerant after testing.

R. Provide electrical connection to solenoid valves. See Section 26 0583.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Test refrigeration system in accordance with ASME B31.5.

C. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using halide torch. Test and repair piping until no leakage.

SECTION 23 2500
HVAC WATER TREATMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water testing.

B. Materials.

1. System cleaner.

2. Closed system treatment (water).

C. By-pass (pot) feeder.

1.2 RELATED REQUIREMENTS

A. Section 01 6000 - Product Requirements: Owner furnished treatment equipment.

B. Section 23 0913 - Instrumentation and Control Devices for HVAC.

C. Section 23 2113 - Hydronic Piping.

D. Section 23 2114 - Hydronic Specialties.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

C. Shop Drawings: Indicate system schematic, equipment locations, and controls schematics, electrical characteristics and connection requirements.

D. Manufacturer's Field Reports: Indicate start-up of treatment systems when completed and operating properly. Indicate analysis of system water after cleaning and after treatment.

E. Project Record Documents: Record actual locations of equipment and piping, including sampling points and location of chemical injectors.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.

2. Sufficient chemicals for treatment and testing during required maintenance period.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience. Company shall have local representatives with water analysis laboratories and full time service personnel.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. AmSolv-Amrep, Inc: www.amsolv.com/#sle.

B. GE Water & Process Technologies: www.gewater.com/#sle.

C. Nalco, an Ecolab Company: www.nalco.com/#sle.

D. H-O-H Water Technologies, Inc.

E. Substitutions: See Section 01 6000 - Product Requirements.

2.2 REGULATORY REQUIREMENTS

A. Comply with applicable codes for addition of non-potable chemicals to building mechanical systems and to public sewage systems.

2.3 MATERIALS

A. System Cleaner:

1. Manufacturers:

a. As recommended by chemical treatment manufacturer..

2. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodiumtripoly phosphate and sodium molybdate.

B. Closed System Treatment (Water):

1. Manufacturers:

a. AmSolv-Amrep, Inc: www.amsolv.com/#sle.

b. GE Water & Process Technologies: www.gewater.com/#sle.

c. Nalco, an Ecolab Company: www.nalco.com/#sle.

d. Substitutions: See Section 01 6000 - Product Requirements.

2. Sequestering agent to reduce deposits and adjust pH.

3. Corrosion inhibitors; boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.

4. Conductivity enhancers; phosphates or phosphonates.

2.4 BY-PASS (POT) FEEDER

A. Manufacturers:

1. Griswold Controls: www.griswoldcontrols.com/#sle.

2. J. L. Wingert Company: www.jlwingert.com/#sle.

3. Neptune, a brand of the Dover Company: www.neptune1.com/#sle.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. 2 quart quick opening cap for working pressure of 175 psi.

PART 3 EXECUTION

3.1 PREPARATION

A. Systems shall be operational, filled, started, and vented prior to cleaning. The mechanical contractor shall meter the initial water fill for the purpose of hydrostatic pressure testing and/or system flushing. After completion of this requirement the water shall be metered out. This will provide the contractor with a precise measure of coolant required to fill the system as well as the amount of water trapped in the system. This process will allow for any adjustments required prior to delivery of the premixed glycol solution and ensure that the solution strength is in compliance with the specification.

B. Place terminal control valves in open position during cleaning.

C. Verify that electric power is available and of the correct characteristics.

3.2 CLEANING SEQUENCE

A. Concentration:

1. As recommended by manufacturer.

B. Hot Water Heating Systems:

1. Apply heat while circulating, slowly raising temperature to 160 degrees F and maintain for 12 hours minimum.

2. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water.

3. Circulate for 6 hours at design temperatures, then drain.

4. Refill with clean water and repeat until system cleaner is removed.

C. Remove, clean, and replace strainer screens.

D. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.4 CLOSED SYSTEM TREATMENT

A. Provide one bypass feeder on each system. Install isolating and drain valves and necessary piping. Install around balancing valve downstream of circulating pumps unless indicated otherwise.

B. Introduce closed system treatment through bypass feeder when required or indicated by test.

3.5 CLOSEOUT ACTIVITIES

A. Training: Train Owner's personnel on operation and maintenance of chemical treatment system.

1. Provide minimum of two hours of instruction for two people.

2. Have operation and maintenance data prepared and available for review during training.

3. Conduct training using actual equipment after treated system has been put into full operation.

3.6 MAINTENANCE

A. Perform maintenance work using competent and qualified personnel under the supervision and in the direct employ of the equipment manufacturer or original installer.

B. Provide service and maintenance of treatment systems for one year from Date of Substantial Completion.

C. Provide monthly technical service visits to perform field inspections and make water analysis on-site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report after each visit.

D. Provide laboratory and technical assistance services during this maintenance period.

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal ducts.

B. Flexible ducts.

C. Single-wall rectangular ducts and fittings.

D. Single-wall round ducts and fittings.

E. Sheet metal materials.

F. Sealants and gaskets.

G. Hangers and supports.

1.2 RELATED REQUIREMENTS

A. Division 03 - Concrete

B. Division 07 - Thermal Moisture Protection: Firestopping

C. Section 07 8400 - Firestopping.

D. Section 09 9113 - Exterior Painting: Weld priming, weather resistant, paint or coating.

E. Section 09 9123 - Interior Painting: Weld priming, paint or coating.

F. Section 23 0005 - Basic HVAC Requirements

G. Section 23 0593 - Testing, Adjusting and balancing for HVAC

H. Section 23 0548 - Vibration and Seismic Controls for HVAC.

I. Section 23 0713 - Duct Insulation: External insulation and duct liner.

J. Section 23 3300 - Air Duct Accessories.

K. Section 23 3319 - Duct Silencers.

L. Section 23 3600 - Air Terminal Units.

M. Section 23 3700 - Air Outlets and Inlets: Fabric air distribution devices.

1.3 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASHRAE Std 126 - Method of Testing HVAC Air Ducts; 2020.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

D. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2025.

E. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2025b.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

H. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

J. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

K. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.

L. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

M. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

N. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.

O. UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies; Current Edition, Including All Revisions.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.5 SUBMITTALS

A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 - General Requirements for submittal procedures.

B. Product Data: Provide data for duct materials, duct connections, and factory fabricated fittings.

C. Shop Drawings: Submit 1/4 scale, double line shop drawings that indicate duct fittings, duct size, bottom of duct elevations, necessary offsets to accommodate building structure, particulars such as gages, sizes, welds, elevations, all fittings, and configuration prior to start of work for all systems.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.

1.7 REGULATORY REQUIREMENTS

A. Construct ductwork to SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; Current Edition including all Addenda.

1.8 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCT AND FITTING ASSEMBLIES

A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.

B. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCT AND FITTING ASSEMBLIES

A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.

B. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

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

a. McGill AirFlow LLC.

b. Spiral Manufacturing Co., Inc.

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.

E. Tees and Laterals: Select types ansd fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SEALANTS AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.

2. Tape Width: 3 inches.

3. Sealant: Modified styrene acrylic.

4. Water resistant.

5. Mold and mildew resistant

6. Maximum Static-Pressure Class: 10-ing wg, positive and negative

7. Service: Indoor and outdoor

8. Service Temperature: Minus 40 to plus 200 deg F.

9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.

10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

11. Sealant 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."

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.

2. Solids Content: Minimum 65 percent.

3. Shore A Hardness: Minimum 20.

4. Water resistant.

5. Mold and mildew resistant.

6. VOC: Maximum 75 g/L (less water).

7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.

8. Service: Indoor or outdoor.

9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.

2. Type: S.

3. Grade: NS.

4. Class: 25.

5. Use: O.

6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

7. Sealant 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."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg pressure class, positive or negative.

2.4 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, "Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.5 METAL DUCTS

A. Material Requirements:

1. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.

3. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

a. Galvanized Coating Designation: G90.

b. Finishes for Surfaces Exposed to View: Mill phosphatized.

4. Galvanealed Sheet Steel (FOR EXPOSED, PAINTED DUCTWORK): Comply with ASTM A653-09; hot dipped zinc iron coated steel, annealed, coating designation "A" (A60, A40)

5. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed

6. ducts.

7. Aluminum: ASTM B209/B209M, aluminum sheet, alloy 3003-H14.

8. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.

9. Stainless Steel: ASTM A480/A480M, Type 304 or 316.

10. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

    a. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

11. Tie Rods: Galvanized steel, 1/4-inchminimum diameter for lengths 36 inches or less; 3/8-inchminimum diameter for lengths longer than 36 inches.

B. Manufactured Ductwork and Fittings:

1. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

C. Fabrication:

1. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

2. Provide turning vanes in all mitered elbows.

3. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

4. T's, bends, and elbows: construct according to SMACNA (DCS).

5. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

6. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

7. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

8. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

D. Rectangular Metal Duct:

1. Rectangular Double Wall Insulated: Rectangular spiral lock seam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with the solid inner wall.

    a. Insulation:

        1) Thickness: 1 inch.

        2) Material: Air.

E. Round Metal Ducts:

1. Round Single Wall Duct: Round lock seam duct with galvanized steel outer wall.

2. Round Double Wall Insulated Duct: Round spiral lock seam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with the solid inner wall.

    a. Insulation:

        1) Thickness: 1 inch.

        2) Material: Air.

3. Round Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).

F. Connectors, Fittings, Sealants, and Miscellaneous:

1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.

2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).

3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

    a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.

    b. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

    c. For Use with Flexible Ducts: UL labeled.

4. Gasket Tape:

    a. Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle ring connections.

5. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

6. Hanger Fasteners: Attach hangers to structure using appropriate fasteners as follows:

2.6 FLEXIBLE DUCTS

A. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form spiral helix.

1. Insulation: R6 insulation with polyethylene vapor barrier film.

2. Pressure Rating: 10 in-wc positive and 5 in-wc negative.

3. Maximum Velocity: 5500 fpm.

4. Temperature Range: Minus 20 degrees F to 250 degrees F.

B. Acoustic Flexible Ducts: UL 181, Class 1, spunbond nylon, mechanically fastened and rolled using galvanized steel to form spiral helix.

1. Insulation: Fiberglass insulation with metallic vapor barrier.

2. Inner Core: Spunbonded, nonwoven inner core.

3. Pressure Rating: 6 in-wc positive and 5 in-wc negative.

4. Maximum Velocity: 4000 fpm.

5. Temperature Range: Minus 20 degrees F to 250 degrees F.

C. Flexible Air Ducts:

1. UL 181, Class 1, Black polymer film supported by helically wound spring steel wire.

2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.

3. Pressure Rating: From 10 in-wc positive to 1 in-wc negative.

4. Maximum Velocity: 4,000 fpm.

5. Temperature Range: Minus 20 to 210 degrees F.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install products following the manufacturer's instructions.

C. Comply with safety standards NFPA 90A and NFPA 90B.

D. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

E. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

F. Install round ducts in maximum practical lengths.

G. Install ducts with fewest possible joints.

H. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

I. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

J. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

K. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

L. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

M. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

N. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

O. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

P. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

Q. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

R. Flexible Ducts: Connect to metal ducts with adhesive.

S. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.

T. Provide openings in ductwork as indicated to accommodate thermometers and controllers. Provide pilot tube openings as indicated for testing of systems, complete with metal can with spring device or screw to insure against air leakage. For openings, insulate ductwork and install insulation material inside a metal ring.

U. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with a crimp in the direction of airflow.

V. Use double nuts and lock washers on threaded rod supports.

W. Connect terminal units to supply ducts directly or with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

X. Connect diffusers or light troffer boots to low-pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

Y. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

Z. Louver Fit-out:

1. Provide blank-out panels sealing available area of wall-mounted exterior-faced louver when connected ductwork is smaller than actual louver free area, and duct outlet is smaller than the louver frame.

2. Use the same duct material painted black on the exterior side, then seal louver frame and duct.

AA. Fire Partitions: Provide firestopping sealing. See Section 07 8400.

BB. Duct Accessories, Terminal Units, Inlets, and Outlets: Interconnect as indicated in Sections 23 3300, 23 3600, and 23 3700.

CC. Duct Insulation: Provide duct insulation. See Section 23 0713.

DD. Painting: Provide surface finish as indicated on drawings. See Sections 09 9113 and 09 9123.

3.2 HANGERS AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.

2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.

4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.4 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.
13. All locations, Laboratory Exhaust Ducts: Seal Class A.

CLEANING

3.1 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.

B. Clean new duct system(s) before testing, adjusting, and balancing.

C. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

D. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.

2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

E. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).

2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.

3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.

4. Coils and related components.

5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.

6. Supply-air ducts, dampers, actuators, and turning vanes.

7. Dedicated exhaust and ventilation components and makeup air systems.

F. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.

2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.

3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.

4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.

5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

6. Provide drainage and cleanup for wash-down procedures.

7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.2 FIELD QUALITY CONTROLS

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.

2. Test the following systems:

a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections, selected by Architect from sections installed, totaling no less than 25 percent of total installed duct area for each designated pressure class.

b. Ducts with a Pressure Class 3-Inch wg and less do not need to be tested unless noted otherwise by Engineer in Contract Documents.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.

4. Keep open ends of ductwork covered during construction.

5. Test for leaks before applying external insulation.

6. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.

7. Give seven days' advance notice for testing.

8. Duct System Cleanliness Tests:

a. Visually inspect duct system to ensure that no visible contaminants are present.

b. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCAACR, "Assessment, Cleaning and Restoration of HVAC Systems."

1) Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

9. Duct system will be considered defective if it does not pass tests and inspections.

10. Prepare test and inspection reports.

3.3 SCHEDULES

A. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive 1-inch wg.

b. Minimum SMACNA Seal Class: C.

c. SMACNA Leakage Class for Rectangular: 12

d. SMACNA Leakage Class for Round and Flat Oval: 6.

2. Ducts Connected to Constant-Volume Air-Handling Units:

a. Pressure Class: Positive 4-inch wg.

b. Minimum SMACNA Seal Class: A.

c. SMACNA Leakage Class for Rectuangular: 6.

d. SMACNA Leakage Class for Round and Flat Oval: 3.

3. Ducts Connected to Variable-Air-Volume Air-Handling Units:

a. Pressure Class: Positive 4-inch wg.

b. Minimum SMACNA Seal Class: A.

c. SMACNA Leakage Class for Rectangular: 6.

d. SMACNA Leakage Class for Round and Flat Oval: 3.

B. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 1-inch wg.

b. Minimum SMACNA Seal Class: B.

c. SMACNA Leakage Class for Rectangular: 12.

d. SMACNA Leakage Class for Round and Flat Oval: 6.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 4-inch wg.

b. Minimum SMACNA Seal Class: A.

c. SMACNA Leakage Class for Rectangular: 6.

d. SMACNA Leakage Class for Round and Flat Oval: 3.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 2-inch wg.

b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.

c. SMACNA Leakage Class for Rectangular: 24.

d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Fans Exhausting Laboratory and Process (ASHRAE 62.1, Class 3 and 4) Air:

a. Type 316, stainless-steel sheet.

1) Exposed to View: No. 4 finish.

2) Concealed: No. 2D finish.

b. Pressure Class: Positive or negative 6-inch wg.

c. Minimum SMACNA Seal Class: A.

d. SMACNA Leakage Class: 3.

D. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 2-inch wg.

b. Minimum SMACNA Seal Class: B.

c. SMACNA Leakage Class for Rectangular: 12.

d. SMACNA Leakage Class for Round and Flat Oval: 6.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.

b. Minimum SMACNA Seal Class: B.

c. SMACNA Leakage Class for Rectangular: 12.

d. SMACNA Leakage Class for Round and Flat Oval: 6.

E. Intermediate Reinforcement:

1. Stainless-Steel Ducts:

a. Exposed to Airstream: Match duct material.

b. Not Exposed to Airstream: Match duct material.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.

2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.

2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.

3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.

2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.

b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90 degree elbow.

2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90 degree elbow.

3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90 degree elbow.

4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.

c. Round Elbows, 14 Inches and Larger in Diameter: Welded.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.

b. Rectangular Main to Round Branch: Spin in.

1) Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

c. Velocity 1000 fpm or Lower: 90-degree tap.

d. Velocity 1000 to 1500 fpm: Conical tap.

e. Velocity 1500 fpm or Higher: 45-degree lateral.

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers - metal.

C. Combination fire and smoke dampers.

D. Duct access doors.

E. Duct test holes.

F. Fire dampers.

G. Flexible duct connectors.

H. Smoke dampers.

I. Volume control dampers.

J. Control dampers.

K. Miscellaneous Products:

1. Damper operators.

2. Damper position switch.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project procedural and administrative requirements.

B. Division 07 - Thermal and Moisture Protection: Firestopping

C. Section 23 0005 - Basic HVAC Requirements

D. Section 23 0548 - Vibration and Seismic Controls for HVAC.

E. Section 23 3100 - HVAC Ducts and Casings.

F. Section 23 3600 - Air Terminal Units: Pressure regulating damper assemblies.

G. Section 25 3513 - Integrated Automation Actuators and Operators: Damper operators.

H. Section 25 3523 - Integrated Automation Control Dampers: Product furnishing.

1.3 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

B. NFPA 92 - Standard for Smoke Control Systems; 2021, with Amendment.

C. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.

D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

E. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.

F. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

G. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 - General Requirements for submittal procedures.

B. Product Data: Provide for shop-fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers:

1. Carlisle HVAC Products: www.carlislehvac.com.

2. Elgen Manufacturing, Inc: www.elgenmfg.com.

3. Krueger-HVAC, Division of Air System Components: www.krueger-hvac.com.

4. Titus HVAC, a brand of Johnson Controls: www.titus-hvac.com.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.2 BACKDRAFT DAMPERS - METAL

A. Manufacturers:

1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com.

2. Nailor Industries, Inc: www.nailor.com.

3. Pottorff: www.pottorff.com/#sle.

4. Ruskin Company: www.ruskin.com.

5. United Enertech: www.unitedenertech.com.

6. Substitutions: See Section 01 6000 - Product Requirements.

B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.3 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers:

1. Nailor Industries, Inc: www.nailor.com.

2. NCA, a brand of Metal Industries Inc: www.ncamfg.com.

3. Ruskin Company: www.ruskin.com.

4. United Enertech: www.unitedenertech.com.

5. Greenheck: www.greenheck.com.

6. Substitutions: See Section 01 6000 - Product Requirements.

B. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

C. Provide factory sleeve and collar for each damper.

D. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft.

E. Operators: UL listed and labelled spring return electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on exterior of duct and link to damper operating shaft.

F. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.4 DUCT ACCESS DOORS

A. Manufacturers:

1. Acudor Products Inc, a Division of Nelson Industrial Inc: www.acudor.com.

2. Ductmate Industries, Inc, a DMI Company: www.ductmate.com.

3. Elgen Manufacturing, Inc: www.elgenmfg.com.

4. Lloyd Industries, Inc: www.firedamper.com.

5. Nailor Industries, Inc: www.nailor.com.

6. Ruskin Company: www.ruskin.com.

7. SEMCO LLC: www.semcohvac.com.

8. The Williams Brothers Corporation of America: www.wbdoors.com/#sle.

9. Substitutions: See Section 01 6000 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Access doors with sheet metal screw fasteners are not acceptable.

2.5 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

1. Manufacturers:

a. Carlisle HVAC Products: www.carlislehvac.com.

b. Substitutions: See Section 01 6000 - Product Requirements.

2.6 FIRE DAMPERS

A. Manufacturers:

1. Nailor Industries, Inc: www.nailor.com.
2. NCA, a brand of Metal Industries Inc: www.ncamfg.com.
3. Ruskin Company: www.ruskin.com.
4. United Enertech: www.unitedenertech.com.
5. Greenheck: www.greenheck.com.
6. Substitutions: See Section 01 6000 - Product Requirements.

B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

C. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1-inch pressure-class ducts up to 12 inches in height.

D. Fusible Links: UL 33, separate at 165 degrees F with adjustable link straps for combination fire/balancing dampers.

2.7 FLEXIBLE DUCT CONNECTORS

A. Manufacturers:

1. Carlisle HVAC Products: www.carlislehvac.com.
2. Ductmate Industries, Inc, a DMI Company: www.ductmate.com.
3. Elgen Manufacturing, Inc: www.elgenmfg.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Flexible Duct Connections: Fabric crimped into metal edging strip.

D. Maximum Installed Length: 14 inch.

2.8 SMOKE DAMPERS

A. Manufacturers:

1. Nailor Industries, Inc: www.nailor.com.
2. Ruskin Company: www.ruskin.com.
3. United Enertech: www.unitedenertech.com.
4. Greenheck: www.greenheck.com.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.

C. Dampers: UL Class 1 airfoil blade type smoke damper, normally open automatically operated by electric actuator.

2.9 VOLUME CONTROL DAMPERS

A. Products for Automatic Controls: See Section 25 3523.

B. Manufacturers:

1. AireTechnologies, Inc, a DMI Company: www.airetechnologies.com.

2. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com.

3. Elgen Manufacturing Company, Inc: www.elgenmfg.com/#sle.

4. MKT Metal Manufacturing: www.mktduct.com.

5. Nailor Industries, Inc: www.nailor.com.

6. NCA, a brand of Metal Industries Inc: www.ncamfg.com.

7. Pottorff: www.pottorff.com/#sle.

8. Ruskin Company: www.ruskin.com.

9. United Enertech: www.unitedenertech.com.

10. Substitutions: See Section 01 6000 - Product Requirements.

C. Fabricate in accordance with SMACNA (DCS) and as indicated.

D. Single Blade Dampers:

1. Blade: 24 gauge, 0.0239 inch, minimum.

E. Multi-Blade Damper: Fabricate consisting of opposed blades with maximum blade sizes 8 by 72 inches. Assemble center- and edge-crimped blades in prime-coated or galvanized-channel frame with suitable hardware.

1. Blade: 18 gauge, 0.0478 inch, minimum.

F. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

G. Quadrants:

1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.

2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

3. Where rod lengths exceed 30 inches provide regulator at both ends.

2.10 CONTROL DAMPERS

A. Manufacturers:

1. Ruskin Company: www.ruskin.com.

2. United Enertech: www.unitedenertech.com.

3. Greenheck Fan Corporation: www.greenheck.com/#sle.

4. Tamco Dampers: www.tamcodampers.com

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Performance:

1. Test in accordance with AMCA 500-D.

2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. Delegated Design: Engage a qualified professional, as defined in Section 014000 "Quality Requirements," to size products where indicated as delegated design.

4. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.

5. Backup Power Source: Systems and equipment served by a backup power source shall have associated control damper actuators served from a backup power source.

6. Environmental Conditions:

a. Provide electric control-damper actuators, with protective enclosures satisfying the following minimum requirements unless more stringent requirements are indicated.

b. Electric control-damper actuators not available with integral enclosures, complying with requirements indicated, shall be housed in protective secondary enclosures.

7. Hazardous Locations: Explosion-proof rating for condition.

8. Selection Criteria:

a. Fail positions unless otherwise indicated:

1) Supply Air: Last position.

2) Return Air: Last position.

3) Outdoor Air: Last position.

4) Mixed Air: Last position.

5) Exhaust Air: Last position.

b. Dampers shall have stable operation throughout full range of operation, from design to minimum airflow over varying pressures and temperatures encountered.

c. Select modulating dampers for a pressure drop of 2 percent of fan total static pressure unless otherwise indicated.

d. Two-position dampers shall be full size of duct or equipment connection unless otherwise indicated.

9. Factory assemble multiple damper sections to provide a single damper assembly of size required by the application.

10. Damper actuator shall be factory installed by damper manufacturer as integral part of damper assembly. Coordinate actuator location and mounting requirements with damper manufacturer.

C. Standard Frame:

1. Material: 12-gauge aluminum.

2. Frame seals shall be extruded silicone, secured in an integral slot within the aluminum frame extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Metallic compression type jamb seals will not be approved.

3. Damper frame shall have duct mounting flanges on both sides of frame.

D. Standard Blade:

1. Type: Multi-blade such as V or 3V for low to medium pressure.

2. Operation: Unless otherwise indicated, use parallel blade configuration for two-position control, equipment isolation service, and when mixing two airstreams. For other applications, use opposed blade configuration.

3. Material: Extruded aluminum (6063-T5) air-foil profiles with a minimum wall thickness of 0.06” (1.52mm). All blades shall be symmetrically pivoted.

4. Blade seals shall be extruded EPDM or silicone, secured in an integral slot within the aluminum blade extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Adhesive or clip-on type blade seals will not be approved.

5. Dampers shall be custom made to required size, with blade stops not exceeding 1¼" (31.7 mm) in height. The blade stop shall be a continuous and integral part of the head/sill. Welded and caulked blade stops shall not be acceptable.

E. Bearings are to be maintenance-free, requiring no lubrication.

F. Jamb Seals: Spring stainless steel.

G. Linkage hardware shall be aluminum and corrosion-resistant zinc-plated steel, installed in the frame side, out of the airstream, and accessible after installation. Linkage hardware shall be complete with cup-point trunnion screws to prevent linkage slippage and a Celcon bearing between moving parts to reduce wear and increase longevity. Linkage that consists of metal rubbing metal will not be approved.

H. Dampers shall be designed for operation in temperatures ranging from -40°F (-40°C) to 212°F (100°C).

I. Dampers shall be AMCA rated for Leakage Class 1A at 1 in. w.g. (0.25 kPa) static pressure differential. Standard air leakage data to be certified under the AMCA Certified Ratings Program.

J. Pressure Drop: 0.05-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.

K. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.

L. Field-supplied intermediate structural support is required to resist applied pressure loads for dampers that consist of two or more sections in both height and width.

M. Operators: Refer to 23 0913 Instrumentation and Control Devices for HVAC.

2.11 MISCELLANEOUS PRODUCTS

A. Damper Operators: Provide electric operators; see Section 23 0913.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 3100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 by 8 inch size access door for hand and shoulder access, or as indicated on drawings. Provide minimum 4 by 4 inch size access door for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire-rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.

G. Demonstrate re-setting of fire dampers to Owner's representative.

H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

J. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off.

K. Provide control dampers where shown on drawings and/or control diagrams. Coordinate with Temperature Controls Contractor.

L. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

SECTION 23 3319
DUCT SILENCERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Duct silencers.

B. Air transfer silencers.

1.2 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

B. Section 23 3100 - HVAC Ducts and Casings: Connections to silencers.

C. Section 23 3300 - Air Duct Accessories: Flexible duct connections.

1.3 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

B. ASTM E477 - Standard Test Method for Laboratory Measurements of Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers; 2020.

C. ASTM E596 - Standard Test Method for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures; 2022.

D. NEBB (STDS) - Procedural Standard for Measurement of Sound and Vibration; 2015, with Errata (2022).

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog information indicating, materials, dimensional data, pressure losses, and acoustical performance.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.1 DUCT SILENCERS

A. Manufacturers:

1. Price Industries, Inc: www.priceindustries.com/#sle.

2. SEMCO LLC, Flakt Woods Group: www.semcohvac.com/#sle.

3. Spiral Pipe of Texas, Inc: www.spotusa.com/#sle.

4. Vibro-Acoustics; _____: www.vibro-acoustics.com/#sle.

5. Substitutions: See Section 01 6000 - Product Requirements.

2.2 AIR TRANSFER SILENCERS

A. Manufacturers:

1. Price Industries, Inc: www.priceindustries.com/#sle.

2. Spiral Pipe of Texas, Inc: www.spotusa.com/#sle.

3. VibroAcoustics: www.vibro-acoustics.com

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: Duct sections with sheet metal outer casing, sound absorbing fill material, and inner casing of perforated sheet metal; incorporating interior baffles of similar construction. Fabricate in accordance with SMACNA (DCS) HVAC Duct Construction Standards.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Support duct silencers independent of ducts with flexible duct connections, lagged with leaded vinyl sheet on inlet and outlet. Refer to Section 23 3100 and Section 23 3300.

SECTION 23 3423
HVAC POWER VENTILATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof exhausters.

1.2 RELATED REQUIREMENTS

A. Section 23 0513 - Common Motor Requirements for HVAC Equipment.

B. Section 23 0548 - Vibration and Seismic Controls for HVAC.

C. Section 23 3300 - Air Duct Accessories.

D. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate fan roof curbs and service utilities installation according to fan size.

1.5 SUBMITTALS

A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 - General Requirements for submittal procedures.

B. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

1.6 FIELD CONDITIONS

A. Request Owner permission to use permanent ventilator(s) for ventilation during construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Greenheck Fan Corporation: www.greenheck.com.

B. Loren Cook Company: www.lorencook.com.

C. PennBarry, Division of Air System Components: www.pennbarry.com.

D. Twin City Fan & Blower: www.tcf.com.

E. Substitutions: See Section 01 6000 - Product Requirements.

2.2 ROOF EXHAUSTERS

A. Manufacturers:

1. Greenheck Fan Corporation: www.greenheck.com.

2. PennBarry, Division of Air System Components: www.pennbarry.com.

3. Twin City Fan & Blower: www.tcf.com.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

C. Roof Curb: 24 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips.

D. Disconnect Switch: Factory wired, nonfusible, in housing for thermal overload protected motor.

E. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.

F. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm gets attained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

G. Performance Ratings: As indicated on drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

D. Hung Cabinet Fans:

1. Install flexible connections between fan and ductwork; see Section 23 3300. Ensure metal bands of connectors are parallel with minimum 1 inch flex between ductwork and fan while running.

E. Provide sheaves required for final air balance.

F. Install backdraft dampers on inlet to roof and wall exhausters.

SECTION 23 3700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Diffusers:

1. Perforated ceiling diffusers.
2. Rectangular ceiling diffusers.
3. Round ceiling diffusers.

B. Registers/grilles:

1. Ceiling-mounted, egg crate exhaust and return register/grilles.
2. Wall-mounted, supply register/grilles.
3. Wall-mounted, exhaust and return register/grilles.

C. Duct-mounted supply and return registers/louvers.

D. Intake and Relief Louvers.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project provedural and administrative requirements.

B. Division 09 - Finishes: Painting of ducts and visible behind outlets and inlets.

C. Section 09 9123 - Interior Painting: Painting of ducts visible behind outlets and inlets.

1.3 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.

B. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.

1.4 SUBMITTALS

A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 - General Requirements for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.5 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

PART 2 PRODUCTS

2.1 DIFFUSERS, REGISTERS, GRILLES MANUFACTURERS

A. Krueger-HVAC: www.krueger-hvac.com.

B. Price Industries: www.price-hvac.com.

C. Titus, a brand of Air Distribution Technologies: www.titus-hvac.com.

D. Tuttle and Bailey: www.tuttleandbailey.com.

E. Shoemaker Manufacturing: www.shoemakermfg.com

F. Duravent (Hart & Cooley): www.hartandcooley.com

G. Substitutions: See Section 01 6000 - Product Requirements.

2.2 RECTANGULAR CEILING DIFFUSERS

A. Type: Provide square, plaque face diffuser to discharge air in 360 degree pattern with sectorizing baffles where indicated.

B. Connections: Round.

C. Frame: Provide surface mount, snap-in, inverted T-bar, and spline type. In plaster ceilings, provide plaster frame and ceiling frame.

D. Fabrication: Steel with baked enamel finish.

E. Color: As indicated.

F. Accessories: Provide radial opposed blade, butterfly, and combination splitter volume control damper; removable core, sectorizing baffle, safety chain, wire guard, equalizing grid, operating rod extension, anti-smudging device, and gaskets for surface mounted diffusers with damper adjustable from diffuser face.

2.3 PERFORATED FACE CEILING DIFFUSERS

A. Type: Perforated face with fully adjustable pattern and removable face.

B. Frame: Surface mount type. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabrication: Steel with steel frame and baked enamel finish.

D. Color: As indicated.

E. Accessories: Radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.4 DUCT-MOUNTED SUPPLY AND RETURN REGISTERS/LOUVERS

A. Type: Duct-mounted, rectangular register for round-spiral duct with adjustable pivot-ended blades, end caps, built-in volume damper, and dual cover flanges to lay flush on duct surface regardless of diameter. Performance to match manufacturer's catalog data.

B. Material: 22 gauge, 0.0299 inch.

C. Color: As indicated on drawings.

2.5 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch grid core.

B. Fabrication: Grid core consists of aluminum with mill aluminum finish.

C. Color: To be selected by Architect from manufacturer's standard range.

D. Frame: 1-1/4 inch margin with countersunk screw mounting.

E. Accessories: Provide integral gang and face operated opposed blade damper, 2 inch filter frame, plaster frame, square mesh insect screen, square mesh debris screen, prescored molded fiberglass back, and 45 degree angled eggcrate or other similar provisions for visual blocking such as angled louver or 90 degree duct elbow.

2.6 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, single deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Steel with 20 gauge, 0.0359 inch minimum frames and 22 gauge, 0.0299 inch minimum blades, steel and aluminum with 20 gauge, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: As indicated.

E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.7 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, vertical face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Steel frames and blades, with factory baked enamel finish.

D. Color: As indicated on the drawings.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.8 INTAKE AND RELIEF LOUVERS

A. Louver Manufacturers:

1. Greenheck .

2. Ruskin.

B. Quality Assurance:

1. Louvers licensed to bear AMCA Certified Ratings Seal. Ratings based on tests and procedures performed in accordance with AMCA 511 and comply with AMCA Certified Ratings Program. AMCA Certified Ratings Seal applies to air performace and water penetration ratings.

C. Fabrication:

1. Frame:

a. Material: Extruded aluminum, Alloy 6063-T5.

b. Wall Thickness: 0.081 inch (2.1mm), nominal.

c. Depth: 6 inches.

d. Downspouts and caulking surfaces.

2. Blades:

a. Style: Drainable.

b. Material: Extruded aluminum, Alloy 6063-T5.

c. Wall Thickness: 0.081 inch (2.1mm), nominal.

d. Angle: 37 degrees.

e. Centers: 6 inches.

3. Bird Screen:

a. Material: Aluminum, 3/4 inch x 0.51 inch expaned, flattened.

b. Frame: Removeable, rewireable.

4. Gutters: Drain gutters in head frame at each blade.

5. Downspouts: Downspouts in jambs to drain water from louver for minimum water cascade from blade to blade.

6. Vertical Supports: Hidden vertical supports to allow continuous line appearance up to 120 inches.

7. Sill: Steeply angles integral sill eliminating areas of standing or trapped moisture where mold or mildew may thrive and effect indoor air quality.

8. Assembly: Factory assemble louver components.

D. Perforamce Data:

1. Design Load: Incorporate structural supports required to withstand wind load of 25 pounds per square foot (100 mph wind equivalent).

E. Accessories:

1. Blank-Off Panels: 0.063 inch extruded aluminum, 2 inch insulated core finish to match louver.

2. Insect Screen: Aluminum mech construction.

F. Factory Finish:

1. Baked Enamel Finish:

a. Color shall be as selected by architect.

b. Finish to be applied after a thourough cleaning and preparation of the metal surface.

c. Total dry film thickness: 1.2 mils.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black, see Section 09 9123.

SECTION 23 5700
HEAT EXCHANGERS FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shell and tube type heat exchangers.

1.2 RELATED REQUIREMENTS

A. Section 23 0913 - Instrumentation and Control Devices for HVAC.

B. Section 23 2113 - Hydronic Piping.

C. Section 23 2114 - Hydronic Specialties.

D. Section 23 2213 - Steam and Condensate Heating Piping.

E. Section 23 2214 - Steam and Condensate Heating Specialties.

F. Section 25 3519 - Integrated Automation Control Valves.

1.3 REFERENCE STANDARDS

A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2023.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data with dimensions, locations, and size of tappings and performance data.

PART 2 PRODUCTS

2.1 SHELL AND TUBE TYPE HEAT EXCHANGER

A. Manufacturers:

1. Armstrong Pumps Inc: www.armstrongpumps.com/#sle.

2. Baltimore Aircoil Company: www.baltimoreaircoil.com/#sle.

3. Bell & Gossett, a xylem brand: www.bellgossett.com/#sle.

4. Thrush Co. Inc.: www.thrushco.com

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Heat Transfer Configuration: Heating fluid in shell and heated fluid within tubes.

C. Type: Steam to liquid, two-pass, 4 inch flanged straight tube path assembly.

D. Comply with ASME BPVC-VIII-1 for manufacture of tubular heat exchangers and heat exchanger shells.

E. Maximum Service Temperature: 375 degree F on shell and tube sides.

F. Tubes: U-tube type with 3/4 inch OD minimum seamless copper tubes suitable for 125 psi working pressure.

G. Shell: Steel pipe with threaded or flanged piping connections and necessary tappings, steel saddle and attaching U-bolts, prime coated.

H. Heads: Cast iron or fabricated steel with steel or bronze tube sheets, threaded or flanged for piping connections.

I. Accessories:

1. Provide electronic control valve; see Section 25 3519.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Support heat exchangers from structure.

C. Pitch shell to completely drain condensate.

D. Pipe relief valves to nearest floor drain.

E. Pipe drain valves to nearest floor drain.

3.2 STEAM TO WATER HEAT EXCHANGER TRIM

A. Shell: Pressure gauge tapping with pigtail siphon, vacuum breaker; see Section 23 2214.

B. Water Inlet: Thermometer well, pressure gauge tapping, valved drain; see Section 23 2114.

C. Water Outlet: Thermometer well for temperature regulator sensor, ASME rated pressure and temperature relief valve, thermometer well, pressure gauge tapping; see Section 23 2114.

SECTION 23 6213
PACKAGED AIR-COOLED REFRIGERANT COMPRESSOR AND CONDENSER UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Condensing unit package.

B. Charge of refrigerant and oil.

C. Controls and control connections.

D. Refrigerant piping connections.

E. Motor starters.

F. Electrical power connections.

1.2 RELATED REQUIREMENTS

A. Section 23 0513 - Common Motor Requirements for HVAC Equipment.

B. Section 23 0548 - Vibration and Seismic Controls for HVAC: Placement of vibration isolators.

C. Section 23 2300 - Refrigerant Piping.

D. Section 28 4400 - Refrigerant Detection and Alarm.

1.3 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.

B. AHRI 365 (I-P) - Performance Rating of Commercial and Industrial Unitary Air-Conditioning Condensing Units; 2009.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Errata (2023).

D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.

E. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide rated capacities, weights specialties and accessories, electrical nameplate data, and wiring diagrams. To ensure capacities are complementary, include equipment served by condensing units in submittal or submit at the same time.

C. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Include schematic layouts showing condensing units, cooling coils, refrigerant piping, and accessories required for complete system.

1.5 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. AAON; www.aaon.com

B. Daikin; www.daikinapplied.com

C. York International Corporation/Johnson Controls, Inc; _____: www.york.com/#sle.

D. Adaptivair, Inc: www.adaptivair.com/#sle.

E. Substitutions: See Section 01 6000 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

2.3 MANUFACTURED UNITS

A. Units: Self-contained, packaged, factory-assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressors, condensing coil and fans, integral subcooling coil, controls, liquid receiver, wind deflector, and screens.

B. Construction and Ratings: In accordance with AHRI 210/240. Test in accordance with ASHRAE Std 23.

C. Performance Ratings: Energy Efficiency Rating (EER) and Coefficient of Performance (COP) not less than prescribed by ASHRAE Std 90.1.

D. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) no greater than that allowed by federal code.

2.4 CASING

A. House components in welded steel frame with galvanized steel panels with weather resistant, baked enamel finish.

B. Mount starters, disconnects, and controls in weatherproof panel provided with full opening access doors. Provide mechanical interlock to disconnect power when door is opened.

C. Provide removable access doors or panels with quick fasteners and piano hinges.

2.5 CONDENSER COILS

A. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Provide subcooling circuits. Air test under water to 425 psig, and vacuum dehydrate. Seal with holding charge of nitrogen.

2.6 FAN REQUIREMENTS

A. Vertical discharge, direct-driven propeller-type condenser fans with fan guard on discharge. Equip with roller or ball bearings with grease fittings extended to outside of casing.

B. Motors as indicated, in compliance with Section 23 0513.

2.7 COMPRESSORS

A. Compressor: Semi-hermetic reciprocating type.

B. Mounting: Statically and dynamically balance rotating parts and mount on spring vibration isolators.

C. Lubrication System: Reversible, positive displacement oil pump with oil charging valve, oil level sight glass, and magnetic plug or strainer.

D. Motor: Constant speed 1800 rpm suction gas cooled with electronic sensor and winding over temperature protection, designed for across-the-line starting.

1. Furnish with starter, see Section 23 0513.

E. Capacity Reduction Equipment: Suction valve unloaders, with lifting mechanism operated by electrically actuated solenoid valve, with unloaded compressor start; controlled from suction pressure.

F. Sump Oil Heater: Evaporates refrigerant returning to sump during shut down. Energizes heater continuously when compressor is not operating.

2.8 REFRIGERANT CIRCUIT

A. Provide each unit with two independent refrigerant circuits, factory-supplied and piped. See Section 23 2300.

B. For each refrigerant circuit, provide:

1. Filter dryer replaceable core type.

2. Thermal expansion valve for maximum operating pressure.

3. Insulated suction line.

4. Liquid line solenoid valve.

5. Charging valve.

6. Discharge line check valve.

C. For heat pump units, provide reversing valve, suction line accumulator, discharge muffler, flow control check valve, and solid-state defrost control utilizing thermistors.

2.9 CONTROLS

A. On unit, mount weatherproof steel control panel, NEMA EN 10250, containing power and control wiring, molded case disconnect switch, factory wired with single point power connection.

B. For each compressor, provide across-the-line starter, nonrecycling compressor overload, starter relay, and control power transformer or terminal for controls power. Provide manual reset current overload protection. For each condenser fan, provide across-the-line starter with starter relay.

C. Provide safety controls arranged so any one will shut down machine:

1. High discharge pressure switch (manual reset) for each compressor.

2. Low suction pressure switch (automatic reset) for each compressor.

3. Oil Pressure switch (manual reset).

D. Provide the following operating controls:

E. Provide controls to permit operation down to 0 degrees F ambient temperature.

F. Gauges: Prepiped for suction and discharge refrigerant pressures and oil pressure for each compressor.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's installation instructions.

B. Complete structural, mechanical, and electrical connections in accordance with manufacturer's installation instructions.

C. Install units on vibration isolation. See Section 23 0548.

D. Provide refrigerant detection systems for units and piping installed indoors; see Section 28 4400.

3.2 SYSTEM STARTUP

A. Supply initial charge of refrigerant and oil for each refrigeration system. Replace losses of oil or refrigerant prior to end of correction period.

B. Charge system with refrigerant and test entire system for leaks after completion of installation. Repair leaks, put system into operation, and test equipment performance.

C. Shut-down system if initial start-up and testing takes place in winter and machines are to remain inoperative. Repeat start-up and testing operation at beginning of first cooling season.

SECTION 23 7313
MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Indoor air handling units and components as scheduled and shown on drawings.

B. Motor disconnects, motor starters, and variable frequency drives.

1.2 RELATED REQUIREMENTS

A. Section 23 0548 - Vibration and Seismic Controls for HVAC.

B. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC & Plumbing.

C. Section 23 0719 - HVAC Piping Insulation.

D. Section 23 3300 - Air Duct Accessories: Flexible duct connections.

E. The requirements of the General Conditions, Supplementary Conditions, Division 1, equipment schedules, and drawings apply.

F. Section 25 1500 - Integrated Automation Software.

G. Section 26 2923 - Variable-Frequency Motor Controllers.

1.3 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015 (Reaffirmed 2020).

B. AHRI 260 (I-P) - Sound Rating of Ducted Air Moving and Conditioning Equipment; 2017.

C. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils; 2001, with Addenda (2011).

D. AHRI 430 (I-P) - Performance Rating of Central Station Air-handling Unit Supply Fans; 2020.

E. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

F. AMCA 99 - Standards Handbook; 2016.

G. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016, with Errata (2018).

H. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

I. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

J. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

N. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

O. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

P. UL 508 - Industrial Control Equipment; Current Edition, Including All Revisions.

Q. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.4 COORDINATION

A. In the event air handlers are supplied by a manufacturer other than the basis of design, coordinate with the General Contractor and affected subcontractors to ensure the specified performance is met. This coordination shall include (but is not limited to) the following:

1. Structural supports for units.

2. Ductwork sizes and connection locations

3. Piping size and locations

4. Interference with existing or planned ductwork, piping and wiring

5. Electrical power requirements and wire/conduit and over current protection sizes

6. Size and location of concrete bases/housekeeping pads.

7. Location of unit supports and wall/roof penetrations.

B. The Mechanical Contractor shall be responsible for costs incurred by the General Contractor, Subcontractors, and Consulting Engineers to accommodate units furnished by a manufacturer other than manufacturer named as basis of design.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:

1. Published Literature: Indicate dimensions, weights, capacities, ratings, gauges and finishes of materials, and electrical characteristics and connection requirements.

2. Fans: Performance and fan curves with specified operating point clearly plotted, power, RPM.

C. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. The design indicated on the schedules and shown on the drawings is based upon the products of the named manufacturer. Alternate equipment manufacturers are acceptable if equipment meets scheduled performance requirements and dimensional requirements.

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: AdaptivAir.

B. Aternately, provide product, subject to compliace with requirements, by one of the following:

1. Approved Equal (Prior Written Approval by Engineer of Record is Required).

C. Substitutions: See Section 01 6000 - Product Requirements.

2.2 GENERAL DESCRIPTION

A. Air Handling Unit(s) (AHU) shall consists of a structural base, insulated casing, access doors, fans, motors, motor controls, coils, filters, dampers, controls, components, and accessories; as shown on drawings, schedules, and specifications.

B. Provide AHU to meet the specified levels of performance for scheduled items including airflow, static pressure, cooling capacity, heating capacity, electrical characteristics, sound, casing leakage, panel deflection and casing thermal performance.

C. AHU shall maintain structural integrity when wall panels are removed.

D. Provide internal components and accessories as specified and scheduled. Components and accessories shall be installed by the AHU manufacturer in an ISO-9002 certified facility.

E. Manufacturer shall provide detailed, step-by-step instructions for disassembly and reassembly.

2.3 CASING CONSTRUCTION

A. All unit casings shall be double wall galvanized steel construction with 2” thick injected foam panels with thermal break.

B. Minimum metal gauge for casing panels is to be 20 Ga.

C. Provide internal components and accessories as specified and scheduled

D. Casing panels shall be 2” double-wall construction with thermal break. Thermal break shall be between interior and exterior liner of the panel assembly, and between the panel and casing framework

E. Provide casing with minimum thermal resistance (R-value) of 13 hr-ft^2-°F/BTU. Exposed insulation is not acceptable

F. Casing panel insulation shall either be constructed with injected polyurethane foam or 4” Fiberglass. Foam insulation shall be manufactured by Eco Mate®. Rigid foam board panels shall not be used

G. All exterior and interior casing panels (roof, wall, access door) shall be made of galvanized steel. Door metal gauge shall be the same as the side wall panels

H. Unit casing shall leak no more than 0.5% of design airflow at 1.25 times design static pressure up to a maximum of +10 inches w.g. in positive pressure sections and -10 inches w.g. in negative pressure sections down to a minimum of 60 CFM measurable leakage or 6,000 design CFM

I. Provide wall panels and access doors that deflect no more than L/240 when subjected to 1.5 times design static pressure up to a maximum of +10 inches w.g. in positive pressure sections and -10 inches w.g. in negative pressure sections

J. Full Perimeter Base Rail:

1. Construct of galvanized steel.

2. Provide base rail of sufficient height to raise unit for external trapping of condensate drain pans.

K. Access Doors:

1. Door construction to be the same as the casing panels

2. Provide QTY (2) Allegis door handles

3. Provide QTY (2) latches with roller cam mechanisms

4. Doors to not have a single handle linked to multiple latching points. A separate handle is required for each latching point

5. Provide access doors with a locking hasp to accommodate a lockout device

2.4 FAN SECTION

A. Type: Forward curved, single width, single inlet, centrifugal plug fan, in accordance with AMCA 99. See Section 23 3413

B. Performance Ratings: Determined in accordance with AMCA 210 and labeled with AMCA Certified Rating Seal.

C. Sound Ratings: AMCA 301; tested to AMCA 300 and label with AMCA Certified Sound Rating Seal.

D. Bearings: Self-aligning, grease lubricated, with lubrication fittings extended to exterior of casing with plastic tube and grease fitting rigidly attached to casing.

E. Unit[s] shall be provided with fan quantities as shown on equipment schedule and drawings.

F. The fan section shall be provided with an access door.

G. Fans shall be direct-drive single-inlet air movers with backward-curved high-performance centrifugal impellers, mounted on a permanent magnet EC external rotor motor with integrated control electronics or AC motor with separate control device.

H. Impeller shall be made of aluminum, with backward-curved, continuously welded blades.

I. Complete motorized impeller assembly shall have been statically and dynamically balanced by the manufacturer to grade G6.3 per ISO 1940-1 or equivalent AMCA 204 fan application category BV-3. An IRD or PMC analyzer shall have been used to measure velocity, the final balanced reading shall not exceed 0.1 inches/second.

J. Motor and drive and impeller shall be factory tested together as an assembly across entire speed range.

K. Provide vibration isolation, as scheduled.

L. Drives:

1. Comply with AMCA 99.

2. Bearings: Heavy duty pillow block type, ball bearings, with ABMA STD 9 L-10 life at 50,000 hours.

3. Shafts: Solid, hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.

4. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts, and keyed. Variable and adjustable pitch sheaves for motors 15 hp and under selected so required rpm is obtained with sheaves set at mid-position; fixed sheave for 20 hp and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.

5. Belt Guard: Fabricate to SMACNA (DCS); 0.106 inch thick, 3/4 inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

M. Fan Motor Variable Frequency Drives (VFDs)

1. Manufacturer shall provide UL or ETL listed VFDs and associated components, as scheduled and shown on drawings. VFDs shall comply with applicable provisions of the National Electric Code.

2. VFDs shall be mounted in a dedicated NEMA 1 compartment located on the primary access side of its associated fan section and wire VFD to motor, unless otherwise indicated on drawings.

3. After unit installation, VFD shall be started and programmed by a factory trained and employed service technician. Refer to Section 3.05.

4. Unit(s) shall be provided with following VFD disconnect:

   a. Non-Fused, Fused main disconnect

   b. 2 contactor VFD bypass with VFD service input switch and Non-Fused, Fused main disconnect

5. Unit(s) shall be provided with a user interface consisting of following features:

   a. 30 Character multi-lingual alphanumeric display

   b. Parameter set-up and operating data

   c. Display data shall include:

      1) output frequency (Hz)

   d. speed (RPM)

   e. motor current

   f. calculated % motor torque

g. calculated motor power (kW)

h. DC bus voltage

i. output voltage

j. heat sink temperature

k. elapsed time meter (re-settable)

l. kWh (re-settable)

m. input / output terminal monitor

n. PID actual value (feedback) & error

o. fault text

p. warning text

q. scalable process variable display

6. VFD shall be provided with the following protection circuits:

   a. over current

   b. ground fault

   c. over voltage

   d. under voltage

   e. over temperature

   f. input power loss of phase

   g. loss of reference/feedback

   h. adjustable current limit regulator

7. VFD shall be UL 508C approved for electronic motor overload (12t).

8. VFD shall be provided with features for high input transient protection and surge suppression, such as

   a. 4 MOVs ahead of diode bridge

   b. 120 Joule rated 1600V diode module

   c. Compliant with UL 1449 / ANSI 61.4

9. VFD shall be provided with the following communication features:
    a. Two programmable analog inputs
10. Six programmable digital inputs
    a. Two programmable analog output
    b. Three programmable digital relay outputs
    c. Modbus RTU Communications protocol
    d. Adjustable filters on analog inputs and outputs
    e. Input speed signals, including 4-20 mA and 0-10 VDC
    f. Accel/Decel contacts [floating point control]
    g. Auto restart [customer selectable and adjustable]
    h. Integrated control interface for Siemens FLN, Johnson N2, Modbus RTU, BACnet MS/TP or LONWorks over RS-485.
11. VFD shall consist of the following functions:
    a. Pre-magnetization on start
    b. DC braking/hold at stop
    c. Ramp or coast to stop
    d. Seven preset speeds
    e. Three critical frequency lockout bands
    f. Start function shall include ramp, flying start, automatic torque boost, and automatic torque boost with flying start

2.5 COIL SECTION

A. Coils shall meet or exceed performance scheduled on drawings

B. Water coils shall be provided with performance certified in accordance with AHRI Standard 410 for coil capacity and pressure drop, wherever applicable. Coils circuits shall be designed such that the fluid velocity is within the range of certified rating conditions at design flow

C. Coils shall be providede with a maximum face velocity as scheduled. Face velocity calculations shall be based on the finned area of the coil.

D. Coils shall be built in their own full perimeter frame. Tube sheets on each end shall have fully drawn collars to support and protect tubes. Horizontal coil casing and support members shall allow moisture to drain. Casing and support members shall not block finned area

E. Intermediate drain pan shall be provided on stacked cooling coils

F. Water, glycol and DX coils shall be provided with a tube OD of 1/2” or 5/8”

G. Individual coils shall be removable from the side of the AHU.

H. Unit shall be provided with a drain pans under each cooling coil with a length to contain coil condensate. Drain pan shall extend a minimum of 6” downstream of the face of the coil.

I. Drain pan shall be double wall with 2” of foam injected insulation R-value of 13

J. Drain pan shall allow visual inspection and physical cleaning on 100% of the pan surface without removal of the coil.

K. Provide drain pan that allows the design rate of condensate drainage regardless of fan status.

L. Provide drain pan sloped in at least two planes by at least 1/8” per foot toward a single drain. Locate drain connection at the lowest point of the pan. Pan shall have no horizontal surfaces.

M. Air Coils:

1. Certify capacities, pressure drops, and selection procedures in accordance with AHRI 410.

2.6 FILTER AND AIR CLEANER SECTION

A. Unit[s] shall be provided with filter segments consisting of filters and frames as scheduled.

B. General: Provide filter sections with filter racks, minimum of one access door for filter removal, and filter block-offs to prevent air bypass.

C. Differential Pressure Gauge:

1. Provide factory installed dial type differential pressure gauge, flush mounted with casing outer wall, and fully piped to both sides of each filter to indicate status.

2. Maintain plus/minus 5 percent accuracy within operating limits of 20 degrees F to 120 degrees F.

2.7 DAMPER SECTION

A. Dampers provided shall be tested in accordance with AMCA 500.

B. Factory-installed dampers shall be provided, as shown on drawings.

C. Dampers shall have airfoil blades, extruded vinyl edge seals, and flexible metal compressible jamb seals.

D. Dampers shall have a maximum leakage rate of 4 CFM/square foot at 1" w.g., and shall comply with ASHRAE 90.1.

E. Damper blades shall be galvanized steel or aluminum, as scheduled.

F. Mixing Section: Provide a functional section to support the damper assembly for modulating the volume of outdoor, return, and exhaust air.

2.8 ENERGY RECOVERY

A. Unit[s] shall be provided with a rotary wheel heat exchanger in a cassette frame complete with removable energy transfer media, seals, drive motor and belt.

B. Energy recovery wheel performance shall be AHRI 1060 certified and bear the AHRI certified label. Components that are independently tested or “rated in accordance with” shall not be acceptable. Manufacturer membership in AHRI is not an acceptable substitute. Certified components must be listed as active in the AHRI Directory. (www.ahridirectory.org)

C. The energy recovery cassette shall be an Underwriters Laboratory UR recognized component for fire and electrical safety and bear the UR symbol. Recognized components shall be listed in the UL directory. (http://database.ul.com)

D. The energy recovery cassette shall comply with NFPA 90A by virtue of UL standard 1812 and UL900 fire test for determination of flammability and smoke density.

E. The energy recovery cassette shall carry a 5-Year standard warranty on the entire cassette assembly (excluding the motor) from the date of shipment. Motors shall carry the manufacturers standard 18 month warranty from the date of manufacture.

F. Cassette frame and structural components shall be constructed of G90 galvanized steel for corrosion resistance.

G. Wheel structure shall consist of a welded hub, spoke and continuous rolled rim assembly of stainless steel, and shall be self-supporting without energy transfer segments present.

H. Wheel structure shall be connected to the shaft by means of taper lock bushings.

I. Wheel bearings shall be permanently sealed and selected for a minimum 30 year L-10 life of 400,000 hours.

J. Bearings requiring external grease fittings or periodic maintenance are not acceptable.

K. Standard cassette may be affixed within the cabinet in any orientation without the need for factorymodification.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions, industry standards, and applicable codes.

B. AHUs shall not be used for temporary heating, cooling or ventilation prior to complete inspection and startup performed per this specification.

C. Install AHUs on a concrete pador structural steel base, as shown on drawings.

D. Install AHUs with manufacturer’s recommended clearances for access, coil pull, and fan removal.

E. One complete set of filters shall be provided for testing, balancing, and commissioning. Provide second complete set of filters at time of transfer to owner.

F. Install AHU plumb and level. Connect piping and ductwork according to manufacturer’s instructions.

G. Insulate plumbing associated with drain pan drains and connections.

H. Install insulation on all staggered coil piping connections, both internal and external to the unit.

I. Contractor to provide detail installation plan and drawings. Including but not limited to: sequencing of installation, opening requirements in existing wall, and detialed and/or 3D shop drawings coordinated with all trades and displines.

J. Bolt sections together with gaskets.

K. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface; see Section 25 1500.

3.2 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

SECTION 23 8126.13
SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air cooled condensing units.

B. Indoor air handling (fan and coil) units for ductless systems.

C. Controls.

1.2 RELATED REQUIREMENTS

A. Section 23 0913 - Instrumentation and Control Devices for HVAC: Thermostats, humidistats, time clocks.

1.3 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Errata (2023).

D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.

E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

G. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

D. Design Data: Indicate refrigerant pipe sizing.

E. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Trane Technologies, PLC: www.trane.com/#sle.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.2 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.

1. Heating: None.

2. Cooling: Outdoor electric condensing unit with evaporator coils in multiple ductless indoor units ("mini-split").

3. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Drawings for additional requirements.

2.3 INDOOR AIR HANDLING UNITS FOR DUCTLESS SYSTEMS

A. Manufacturers:

1. Trane Technologies, PLC: www.trane.com/#sle.

2. Substitutions: See Section 01 6000 - Product Requirements.

B. Basis of Design: Trane Technologies, PLC: www.trane.com/#sle.

C. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.

D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.

1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.

2. Manufacturer: System manufacturer.

2.4 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.

1. Comply with AHRI 210/240.

2. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

3. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.

B. Compressor: Hermetic, two speed 1800 and 3600 rpm, AHRI 520 resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high-pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

C. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

1. Condenser Fans: Direct-drive propeller type.

D. Accessories: Filter drier, high-pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).

1. Provide thermostatic expansion valves.

E. Operating Controls:

1. Control by room thermostat to maintain room temperature setting.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Install refrigeration systems in accordance with ASHRAE Std 15.

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. Revisions to equipment being provided by other trades shall be coordinated with the contractor(s) responsible. Any and all revisions to documents which are necessary to facilitate installation of such equipment shall be captured in Record Documents as stated in item A above.

C. 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 0505
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical demolition and extension of existing 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.

C. Section 26 0005 - Basic Electrical Requirements.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that abandoned wiring and equipment serve only abandoned facilities.

B. Demolition drawings are based on casual field observation and existing record documents.

C. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.

2. Make temporary connections to maintain service in areas adjacent to work area.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.

1. Notify Owner before partially or completely disabling system.

2. Notify local fire service.

3. Make notifications at least 24 hours in advance.

4. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:

1. PCB-containing electrical equipment, including transformers, capacitors, and switches.

2. PCB- and DEHP-containing lighting ballasts.

3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

F. Disconnect and remove abandoned panelboards and distribution equipment.

G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

H. Repair adjacent construction and finishes damaged during demolition and extension work.

I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

3.4 CLEANING AND REPAIR

A. See Division 01 - General Requirements.

B. Clean and repair existing materials and equipment that remain or that are to be reused.

C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

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. Mineral-Insultated cable.

D. Wiring connectors.

E. Electrical tape.

F. Heat shrink tubing.

G. Oxide inhibiting compound.

H. Wire pulling lubricant.

I. Cable ties.

J. 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 0505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.

F. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

G. Section 26 0536 - Cable Trays for Electrical Systems: Additional installation requirements for cables installed in cable tray systems.

H. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

I. Section 28 4600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

J. Division 31 - Earthwork: Excavating, bedding, and backfilling.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.

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. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

F. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.

G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

K. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

L. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

M. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

N. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

O. 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. Mineral-Insulated cable is permitted only as follows:

1. Where not otherwise restricted, may be used:

a. For feeders from Generator to Fire Pump.

J. 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. 480Y/277 V, 3 Phase, 4 Wire System:

1) Phase A: Brown.

2) Phase B: Orange.

3) Phase C: Yellow.

4) Neutral/Grounded: Gray.

b. 208Y/120 V, 3 Phase, 4 Wire System:

1) Phase A: Black.

2) Phase B: Red.

3) Phase C: Blue.

4) Neutral/Grounded: White.

c. Equipment Ground, All Systems: Green.

d. 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.

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 0536 - Cable Trays for Electrical Systems: Additional grounding and bonding requirements for cable tray systems.

F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 5600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

H. 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; 2023.

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; 2025.

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 Engineer. 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 Ring:

a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.

b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.

c. Provide ground enhancement material around conductor.

d. Provide connection from ground ring conductor to:

1) Perimeter columns of metal building frame.

2) Ground rod electrodes located as indicated.

5. 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.

6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

7. 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.

H. Cable Tray Systems: Also comply with Section 26 0536.

I. Pole-Mounted Luminaires: Also comply with Section 26 5600.

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 0536 - Cable Trays for Electrical Systems: Additional support and attachment requirements for cable tray.

G. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

H. Section 26 2513 - Low-Voltage Busways: Additional support and attachment requirements for busway.

I. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

J. Section 26 5600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

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; 2023.

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. Cable Tray Support and Attachment: See Section 26 0536 for additional requirements.

J. Box Support and Attachment: See Section 26 0533.16 for additional requirements.

K. Busway Support and Attachment: See Section 26 2513 for additional requirements.

L. Interior Luminaire Support and Attachment: See Section 26 5100 for additional requirements.

M. Exterior Luminaire Support and Attachment: See Section 26 5600 for additional requirements.

N. Secure fasteners in accordance with manufacturer's recommended torque settings.

O. Remove temporary supports.

P. 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 0533.23 - Surface Raceways for Electrical Systems.

K. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

L. Section 28 4600 - Fire Detection and Alarm: Fire alarm wiring in conduit.

M. 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; 2023.

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. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.

C. Provide conduit, fittings, supports, and accessories required for complete raceway system.

D. Provide products listed, classified, and labeled as suitable for purpose intended.

E. Minimum Conduit Size, Unless Otherwise Indicated:

1. Branch Circuits: 3/4 inch (21 mm) trade size.

2. Flexible Connections to Luminaires: 3/8-inch trade size.

3. Underground, Interior: 1 inch (27 mm) trade size.

4. Underground, Exterior: 1-inch trade size.

F. 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. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.

D. Aluminum Rigid Metal Conduit (RMC): Install in accordance with NECA 102.

E. Rigid Polyvinyl Chloride (PVC) Conduit: Install 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.

L. Section 26 2813 - Fuses: Spare fuse cabinets.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

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 EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.

2. NEMA EN 10250 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 0533.23
SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface raceway systems.

B. Wireways.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements.

B. Divison 02 - Existing Conditions: Demolition, cleaning and disposal requirements.

C. Section 26 0005 - Basic Electrical Requirements.

D. Section 26 0526 - Grounding and Bonding for Electrical Systems.

E. Section 26 0529 - Hangers and Supports for Electrical Systems.

F. Section 26 0533.13 - Conduit for Electrical Systems.

G. Section 26 0533.16 - Boxes for Electrical Systems.

H. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

I. Section 26 2726 - Wiring Devices: Receptacles.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA BI 50061 - Installation Guidelines for Surface and Nonmetallic Raceway; 2021 (Reapproved 2025).

E. UL 870 - Wireways, Auxiliary Gutters, and Associated Fittings; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of raceways with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate rough-in locations of outlet boxes provided under Section 26 0533.16 and conduit provided under Section 26 0533.13 as required for installation of raceways provided under this section.

3. Verify minimum sizes of raceways with the actual conductors and components to be installed.

4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install raceways until final surface finishes and painting are complete.

2. Do not begin installation of conductors and cables until installation of raceways is complete between outlet, junction and splicing points.

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 including dimensions, knockout sizes and locations, materials, fabrication details, finishes, service condition requirements, and accessories.

1. Surface Raceway Systems: Include information on fill capacities for conductors and cables.

PART 2 PRODUCTS

2.1 RACEWAY REQUIREMENTS

A. Provide all components, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

2.2 SURFACE RACEWAY SYSTEMS

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com

2. Legrand North America, Inc: www.legrand.us/#sle.

3. MonoSystems, Inc: www.monosystems.com

4. Wiremold, a brand of Legrand North America, Inc: www.legrand.us

2.3 WIREWAYS

A. Manufacturers:

1. Cooper B-Line, a division of Cooper Industries: www.cooperindustries.com

2. Enduro Composites: www.endurocomposites.com

3. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com

4. Schneider Electric; Square D Products: www.schneider-electric.us

B. Description: Lay-in wireways and wiring troughs with removable covers; listed and labeled as complying with UL 870.

C. Wireway Type, Unless Otherwise Indicated:

1. Indoor Clean, Dry Locations: NEMA EN 10250, Type 1, painted steel with screw-cover.

2. Outdoor Locations: NEMA EN 10250, Type 3R, painted steel with screw-cover; include provision for padlocking.

D. Finish for Painted Steel Wireways: Manufacturer's standard grey unless otherwise indicated.

E. Where wireway size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes and conduit terminations are installed in proper locations and are properly sized in accordance with NFPA 70 to accommodate raceways.

C. Verify that mounting surfaces are ready to receive raceways and that final surface finishes are complete, including painting.

D. 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. Surface Nonmetallic Raceways: Install in accordance with NEMA BI 50061.

D. Install raceways plumb and level.

E. Arrange wireways and associated raceway connections to comply with NFPA 70, including but not limited to requirements for deflected conductors and wireways used as pullboxes. Increase size of wireway where necessary.

F. Secure and support raceways in accordance with Section 26 0529 at intervals complying with NFPA 70 and manufacturer's requirements.

G. Close unused raceway openings.

H. Provide grounding and bonding in accordance with Section 26 0526.

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 0536 - Cable Trays for Electrical Systems: Additional identification requirements for cable tray systems.

F. Section 26 0573 - Power System Studies: Arc flash hazard warning labels.

G. 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. Transformers:

1) Identify kVA rating.

2) Identify voltage and phase for primary and secondary.

3) Identify power source and circuit number. Include location when not within sight of equipment.

c. 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.

d. Transfer Switches:

1) Identify voltage and phase.

2) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.

2. Service Equipment:

a. Use identification nameplate to identify each service disconnecting means.

3. Emergency System Equipment:

a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.

b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.

4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.

5. 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.

6. 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.

7. 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.

b. Industrial control panels.

c. Motor control centers.

d. Elevator control panels.

e. Industrial machinery.

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 Cable Tray: Comply with Section 26 0536.

F. 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.

G. 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.

H. Identification for Luminaires:

1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

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:

a. Emergency Power System: Text "EMERGENCY".

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.

E. Section 26 2813 - Fuses.

F. Section 26 2816.16 - Enclosed Switches.

1.3 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.

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 00001 - Motors and Generators; 2024.

H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

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 both new and directly affected existing portions of 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. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.

c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 00001 code letter designation.

d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.

e. 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).

f. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.

g. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

2. Existing Installations:

a. Collect data on existing electrical distribution system necessary for completion of studies, including field verification of available existing data (e.g. construction documents, previous studies). Include actual settings for field-adjustable devices.

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 0800
ELECTRICAL COMMISSIONING AND TESTING REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. This specification includes the commissioning process requirements for Electrical equipment, systems and assemblies.

B. Refer to Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.2 SCOPE OF COMMISSIONING

A. The following Electrical systems are to be commissioned:

1. Lighting Controls
2. Generator
3. Automatic Transfer Switches
4. Pull the Plug Test
5. Integrated Power Loss Test
6. Normal Power Panels
7. Main Distribution Panels
8. Emergency Power Panels
9. Transformers
10. Unitnterruptable Power Supplies (UPS)

B. Refer to Division 01 Section "General Commissioning Requirements" for general commissioning scope.

1.3 DEFINITIONS

A. Refer to Division 01 Section "General Commissioning Requirements" for definitions.

1.4 DOCUMENTATION

A. Refer to Division 01 Section "General Commissioning Requirements" for documentation to be provided by the CxA.

B. Refer to Division 01 Section "General Commissioning Requirements" for documentation to be provided by the construction manager and contractor. In addition, provide the following:

1. Equipment Start Up Reports. See equipment specific specifications for Start Up requirements.

1.5 COORDINATION

A. Refer to Division 01 Section “General Commissioning Requirements” for requirements pertaining to coordination during the commissioning process.

1.6 RESPONSIBILITIES

A. Refer to Division 01 Section “General Commissioning Requirements” for requirements pertaining to responsibilities during the commissioning process.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the Contractor for the equipment being tested.

B. Special equipment, tools and instruments (specific to a piece of equipment and only available from the vendor) required for testing shall be included in the base bid price to the Owner and left on site, except for stand-alone data logging equipment that may be used by the CxA.

C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.

D. Temporary data logging equipment and software required to test equipment will be provided by the CxA, but shall not become the property of the Owner.

E. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications.

PART 3 EXECUTION

3.1 STARTUP PLANS AND REPORTS

A. For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 2 weeks prior to startup.

B. For each item of equipment and system for which the manufacturer provides a startup report, document compliance by submitting the completed startup checklist and final startup report, signed and dated by the responsible entity.

3.2 PREFUNCTIONAL CHECKLISTS

A. A Prefunctional Checklist is required to be filled out for each item of equipment or system to be commissioned.

1. These checklists do not replace manufacturer’s recommended startup checklists regardless of apparent redundancy.

2. The following types of information will be gathered via the completed Prefunctional Checklist forms:

a. Certification by installing contractor that the unit is properly installed, started up, operating, and ready for Functional Testing.

b. Manufacturer, model number, and relevant capacity information. List information "as installed."

c. Serial number of installed unit.

B. Contractor is responsible for filling out Prefunctional Checklists after completion of installation and before operational startup. Witness of operational startup by the Commissioning Authority is not required unless otherwise specified.

1. Each line item is to be initialed and dated by the Contractor. Checklists are not complete until all line items are initialed and dated without deficiencies.

2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing. Re-submission of the Checklist is required upon completion of remaining items.

3. Individual Checklists may contain line items that are the responsibility of more than one installer. Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.

4. If any Checklist line item is not relevant, record reasons on the form.

5. Contractor may independently perform startup inspections and/or tests at Contractor's option.

6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.

7. Submit completed Checklists to Commissioning Authority within two days of completion.

C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.

1. Provide all additional information requested by Commissioning Authority to aid in preparation of Checklists, such as shop drawing submittals, manufacturer's startup checklists, and operation & maintenance data.

2. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.

D. Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.3 FUNCTIONAL TESTING FOR LIGHTING CONTROL SYSTEMS

A. Electrical Contractor and Lighting Control agency shall perform Functional Performance testing for all luminaires and control systems.

B. Equipment functional performance testing shall demonstrate the installation and operation of components, systems and system-to-system interfacing relationships in accordance with approved plans and specifications such that operation, function and maintenance serviceability for each of the commissioned systems are confirmed. Testing shall include all modes and sequence of operation, including under full-load, part-load and the following emergency conditions:

1. All modes as described in the Lighting Controls Narrative and Lighting Controls Matrix.

2. Redundant or automatic back-up mode.

3. Performance of alarms.

4. Mode of operation upon a loss of power and restoration of power.

C. Occupant Sensor Controls

1. Where occupant sensor controls are provided, the following procedures shall be performed:

a. Certify that the occupant sensor has been located and aimed in accordance with manufacturer recommendations.

b. For projects with seven of fewer sensors, each sensor shall be tested.

c. For projects with more than seven occupant sensors, testing shall be done for each unique combination of sensor type and space geometry. Where multiples of each unique combination of sensor type and space geometry are provided, not less than 10 percent, but in no case less than one, of each combination shall be tested unless the code official or design professional requires a higher percentage to be tested. Where 30 percent or more of the tested controls fail, all remaining identical combinations shall be tested.

d. For occupant sensor controls to be tested, verify the following:

1) Where occupant sensor controls include status indicators, verify correct operation.

2) The controlled lights turn off or down to the permitted level within the required time.

3) For auto-on occupant sensor controls, the lights turn on to the permitted level when an occupant enters the space.

4) For manual-on occupant sensor controls, the lights turn on only when manually activated.

5) The lights are not incorrectly turned on by movement in adjacent areas or by HVAC operation.

3.4 FUNCTIONAL TESTS

A. A Functional Test is required for EACH item of equipment, system, or other assembly specified to be commissioned unless SAMPLING of multiple identical units is allowed by the final test procedures.

B. Contractor is responsible for execution of required Functional Tests after completion of Prefunctional Checklists and before closeout.

C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation of forms for that purpose.

D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner. If a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and record the Contractor's stated intentions for correction.

1. Deficiencies are any condition in the installation or function of a component, piece of equipment, or system that is not in compliance with Contract Documents or does not perform properly.

2. When the deficiency has been corrected, the Commissioning Authority will reschedule the test and the Contractor shall re-test.

3. If 10 percent of identical items fail to perform due to materials or manufacturing defect, all items will be considered defective. Contractor shall provide a proposal for correction within 2 weeks after notification of defect.

4. Contractor shall bear the cost of Owner and Commissioning Authority personnel time to witness re-testing.

E. Functional Test Procedures:

1. Examples of Functional Testing:

a. Test the dynamic function of equipment and systems using direct observation and/or monitoring methods under full operation.

b. Systems are tested under various conditions such as high heating/cooling loads, low heating/cooling loads, component failures, unoccupied mode, fire alarm, power failure, etc.

c. Systems are subjected to all controls and building automation system sequences of operation. Components are verified to respond accordingly.

F. Deferred Functional Tests: Some tests may need to be performed after substantial completion due to partial occupancy, seasonal requirements, or other site conditions. Performance of these tests remains the Contractor's responsibility regardless of timing.

3.5 TEST PROCEDURES – GENERAL

A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

B. Provide all necessary materials and system modifications required to produce flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test conditions.

C. Identical Units

1. Identical units are defined as those with the same application and sequence of operation except for minor size or capacity differences.

2. 2. Where sample Functional Testing of identical units is permitted, test 30% of the project total. If half of these units fail Functional Testing, all units (i.e. 100% of the project total) shall be inspected and issues remediated by the Contractor. Thereafter, all units (i.e. 100% of the project total) shall undergo Functional Testing.

3. Sampling is not allowed for:

a. Major equipment.

b. Life-safety-critical equipment.

D. For Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance.

E. For Simulated Conditions: Artificially create the necessary condition for the purpose of testing the response of a system.

F. For Over-Writing Values: Change the sensor value known to the control system to see the response of the system.

G. For Indirect Indicators: Observe a response or condition indirectly from a control system screen or other device.

H. For Monitoring: Record parameters of equipment operation using trending capabilities of the control system. Where monitoring of specific points is called for in Functional Testing, complete the following:

1. Provide hard copies of monitored data in columnar format.

2. Alternately, provide graphical output if producible by the system.

3.6 OPERATION AND MAINTENANCE MANUALS

A. Contractor provide final operation & maintenance manuals of commissioned equipment to the Commissioning Authority for review. Contractor make changes recommended by the Commissioning Authority.

3.7 DEMONSTRATION AND TRAINING

A. Contractor submit training plan for Owner personnel to the Commissioning Authority for review and approval.

B. Contractor coordinate scheduling of specified training sessions with invitations to the Commissioning Authority.

C. Contractor provide sign-in sheet and agenda for each training session along with copies of training aids and documentation to the Commissioning Authority for review.

SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Occupancy sensors.

B. Outdoor motion sensors.

C. Time switches.

D. In-wall time switches.

E. Outdoor photo controls.

F. Digital load controllers.

G. Accessories.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements.

B. Section 26 0005 - Basic Electrical Requirements.

C. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.

D. Section 26 0526 - Grounding and Bonding for Electrical Systems.

E. Section 26 0529 - Hangers and Supports for Electrical Systems

F. Section 26 0533.16 - Boxes for Electrical Systems.

G. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

H. Section 26 0800 - Electrical Commissioning and Testing Requirements.

I. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

1. Includes finish requirements for wall controls specified in this section.

2. Includes accessory receptacles, switches, dimmers and wall plates, to match lighting controls specified in this section.

J. Section 26 2813 - Fuses.

K. Section 26 5100 - Interior Lighting.

L. Section 26 5600 - Exterior Lighting.

M. Section 28 4600 - Fire Detection and Alarm. Interface with fire alarm system for emergency lighting.

1.3 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2023.

C. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols; 2020.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

E. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

G. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.

H. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 773 - Plug-in, Locking Type Photocontrols for Use with Area Lighting; Current Edition, Including All Revisions.

K. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.

L. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of lighting control devices with millwork, furniture, equipment and other potential conflicts.

2. Coordinate placement of wall switch occupancy sensors with installed door swings.

3. Coordinate placement of occupancy sensors with millwork, furniture, equipment and other potential obstructions to motion detection coverage.

4. Coordinate placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement.

5. Coordinate lighting control device product selections with luminaire characteristics; see Section 26 5100 and lighting fixture schedule.

6. Notify Architect of conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install lighting control 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 - General Requirements for submittal procedures.

B. Product Data: Include ratings, operating modes or sequence of functions, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:

1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

2. Digital Load Controllers: Provide dimensioned plan views indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing factory and field connections. Include manufacturer product characteristics and application instructions for wired and wireless applications, including start-up and commissioning.

3. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.

D. Field quality control reports.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.7 WARRANTY

A. Provide five year manufacturer warranty for occupancy sensors.

B. Provide five year manufacturer warranty for utility grade locking receptacle-mounted outdoor photo controls.

1.8 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to commencing work of this section. Meeting shall be attended by Contractor(s), System Installer, Factory authorized manufacturer's representative, and representative of all trades related to the system installation.

B. Review installation procedures and coordination required with related work and the following:

1. Confirm the location and mounting of all devices, with special attention to placement of switches, dimmers and any sensors.

2. Review the specifications for low voltage control wiring and termination.

3. Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.

4. Discuss requirements for integration with other trades.

C. Inspect and make notes of job conditions prior to installation:

1. Record minutes of the conference and provide copies to all parties present.

2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.

3. Installation shall not begin until all outstanding issues are resolved to the satisfaction of the Architect.

PART 2 PRODUCTS

2.1 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for purpose intended.

B. Unless specifically indicated as excluded, provide components necessary for complete operating system including, but not limited to, conduit, wiring, connectors, hardware, and accessories.

2.2 OCCUPANCY SENSORS

A. Manufacturers:

1. Acuity Brands, Inc: www.acuitybrands.com.
2. Hubbell Incorporated: www.hubbell.com.
3. Legrand North America, Inc: www.legrand.us.
4. Lutron Electronics Company, Inc: www.lutron.com.
5. SensorWorx: www.sensorworx.com
6. Cooper Wavelinx: www.cooperlighting.com/global/brands/wavelinx
7. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B. General Requirements:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
   a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
   b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
   c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and ultrasonic technologies.
   d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and audible sound sensing technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.

7. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

C. Wall Switch Occupancy Sensors:

1. General Requirements:

a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.

b. Unless otherwise indicated or required to control load indicated on drawings, provide line voltage units with self-contained relay.

c. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

d. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.

e. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.

2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet.

3. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet.

D. Ceiling Mounted Occupancy Sensors:

1. General Requirements:

a. Description: Low profile occupancy sensors designed for ceiling installation.

b. Unless otherwise indicated or required to control load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.

c. Provide field selectable setting for disabling LED motion detector visual indicator.

d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.

e. Finish: Refer to section 26 2726 for finishes.

2. Ultrasonic Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within area of 500 square feet at mounting height of 9 feet, with field of view of 360 degrees.

b. Medium Range Sensors: Capable of detecting motion within area of 1,000 square feet at mounting height of 9 feet, with field of view of 360 degrees.

c. Extended Range Sensors: Capable of detecting motion within area of 2,000 square feet at mounting height of 9 feet.

3. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet at mounting height of 9 feet, with field of view of 360 degrees.

b. Extended Range Sensors: Capable of detecting motion within area of 1,200 square feet at mounting height of 9 feet, with field of view of 360 degrees.

E. Power Packs for Low-Voltage Occupancy Sensors:

1. Description: Plenum rated, self-contained low-voltage class 2 transformer and relay compatible with specified low-voltage occupancy sensors for switching of line-voltage loads.

2. Provide dedicated power packs for automatically controlled wiring devices.

3. Provide quantity and configuration of power and slave packs with associated wiring and accessories as required to control load indicated on drawings.

4. Input Supply Voltage: Dual rated for 120/277 V ac.

5. Load Rating: As required to control load indicated on drawings.

2.3 OUTDOOR MOTION SENSORS

A. Manufacturers:

1. Acuity Brands, Inc: www.acuitybrands.com/

2. Hubbell Lighting, Inc: www.hubbelllighting.com/

3. Legrand North America, Inc: www.legrand.us/

4. RAB Lighting, Inc: www.rablighting.com/

B. Description: Factory-assembled wet location listed device suitable for wall or ceiling/eave mounting, with integral swivel for field adjustment of coverage, capable of detecting motion for automatic control of load indicated.

C. Sensor Technology: Passive Infrared (PIR) designed to detect occupancy by sensing movement of thermal energy between zones.

D. Operation: Unless otherwise indicated, motion sensor to turn load on when motion is detected and to turn load off when no motion is detected during adjustable turn-off delay time interval.

E. Turn-Off Delay: Field adjustable, with time delay settings available up to 15 minutes.

F. Integral Photocell: For dusk to dawn operation.

G. Manual Override: Activated by switching power off to unit and then back on.

H. Load Rating: 1,000 W incandescent and fluorescent load at 120 V ac.

I. Coverage: Capable of detecting motion within distance of 50 feet at mounting height of 8 feet, with field of view of 270 degrees.

2.4 OUTDOOR PHOTO CONTROLS

A. Manufacturers:

1. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

2.5 DIGITAL LOAD CONTROLLERS

A. Manufacturers:

1. Acuity
2. Eaton
3. Hubbell Control Solutions: www.hubbell.com/hubbellcontrolsolutions/en/#sle.
4. Lutron Electronics Company, Inc: www.lutron.com/#sle.
5. Sensor Switch Inc: www.sensorswitch.com/#sle.
6. WattStopper: www.wattstopper.com/#sle.

B. System Description:

1. Stand-alone system, including interconnected modules and accessories, for lighting and plug load low-voltage control as indicated on drawings, schedules, written sequences of operation, and reviewed shop drawings.
2. Product standard system configurations preconfigured out of box, plug-and-play, automatically self-addressing devices for communications, and without need to field configure or program features, or requiring device setting adjustments. LEDs on unit indicate operation and troubleshooting without software intervention.

3. Provide quantity and configuration of power and slave packs, communication modules, and load expansion modules, including associated wiring, wired and wireless components, and accessories to control loads indicated.

C. General Requirements:

1. Listed for powering and controlling line-voltage loads, power packs, contactors, relays, and other lighting control devices.

2. Input Supply Voltage: Dual rated for 120/277 VAC.

3. Cabling Terminations:

a. Include line and load wiring leads.

4. Compatibility:

a. Compatible with luminaires specified with integral sensors; include auxiliary contact closure accessory components for controls indicated.

b. Compatible with wired and wireless sensors and communication protocols for controlling line-voltage loads.

1) Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.

c. Configurable for single room control as indicated from single digital load controller.

5. Provide UL 2043 plenum rated control unit with self-contained relay(s) and low-voltage class 2 transformer, compatible with specified wired and wireless sensors, components, and ballasts/drivers.

a. Comply with NFPA 70 for use in plenum spaces.

b. Provide UL 2043 plenum rating for associated system control components for control indicated.

6. Surface Mounting: Standard junction box attachments.

7. Provide one auxiliary contact closure output where indicated.

8. Minimum Load Rating: As required to control load indicated on drawings.

9. Control Inputs:

a. Digital: Two.

b. Analog: One.

10. Output Control Capability:

    a. Single Zone Switching Modules: One programmable channel.

    b. Multi-Zone Switching Modules: Up to three separately programmable channels.

11. Emergency Branch Circuit Loads:

    a. Comply with NFPA 70 for controlling or bypassing emergency branch circuits as indicated.

    b. Provide control devices listed for interfacing with fire alarm system for override operations.

        1) See Section 28 4600.

    c. Provide UL 1008 listed components.

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 openings for outlet boxes are neatly cut and will be completely covered by devices or 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 lighting control devices.

F. Verify that service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.

G. 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. Install lighting control devices 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 as required for installation of lighting control devices; see Section 26 0533.16.

C. Maintain separation of remote-control, signaling, and power-limited circuits.

1. See manufacturer instructions and Section 26 0519 for control wiring conductors, wiring methods, and identification requirements.

D. Install lighting control devices in accordance with manufacturer's instructions.

E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

F. Install lighting control devices plumb and level, and held securely in place.

G. Where required and not furnished with lighting control device, provide wall plate; see Section 26 2726.

H. Provide required supports; see Section 26 0529.

I. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface 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.

J. Occupancy Sensor Locations:

1. Location Adjustments: Within design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.

2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

K. Outdoor Photo Control Locations:

1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.

2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by photo control itself.

L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into photo control.

M. Daylighting Control Photo Sensor Locations:

1. Location Adjustments: Within design intent, reasonably minor adjustments to locations may be made in order to optimize control and avoid conflicts or problems affecting proper detection of light levels.

2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure light level controlled at designated task location, while minimizing measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.

3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into space, while minimizing measured amount of lighting from artificial sources.

N. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

O. Where indicated or required, provide cabinet or enclosure for mounting of lighting control device system components; see Section 26 0533.16.

3.4 FIELD QUALITY CONTROL

A. Inspect each lighting control device for damage and defects.

B. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

C. Test outdoor photo controls to verify proper operation, including time delays where applicable.

D. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable.

E. Correct wiring deficiencies and replace damaged or defective conductors, cables, and lighting control devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours of training.

3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of installed lighting control devices.

4. Location: At project site.

SECTION 26 2200
LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General purpose transformers.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements.

B. Division 03 - Concrete: Concrete equipment pads.

C. Section 26 0005 - Basic Electrical Requirements

D. Section 26 0526 - Grounding and Bonding for Electrical Systems.

E. Section 26 0529 - Hangers and Supports for Electrical Systems.

F. Section 26 0533.13 - Conduit for Electrical Systems: Flexible conduit connections.

G. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

H. Section 26 0800 - Electrical Commissioning and Testing Requirements.

I. Section 26 2416 - Panelboards.

1.3 REFERENCE STANDARDS

A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.

B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.

C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.

F. NEMA ST 20 - Dry Type Transformers for General Applications; 2021.

G. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.

K. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; 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 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 the work with placement of supports, anchors, etc. required for mounting.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Strategic Energy Solutions, Inc. 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.

1.7 FIELD CONDITIONS

A. Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.

1. Greater than 10 kVA: 104 degrees F maximum.

2. Less than 10 kVA: 77 degrees F maximum.

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: Provide transformers produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.2 TRANSFORMERS - GENERAL REQUIREMENTS

A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.

B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:

1. Altitude: Less than 3,300 feet.

2. Ambient Temperature:

a. Greater than 10 kVA: Not exceeding 104 degrees F.

b. Less than 10 kVA: Not exceeding 77 degrees F.

C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.

E. Basic Impulse Level: 10 kV.

F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

G. Isolate core and coil from enclosure using vibration-absorbing mounts.

H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.3 GENERAL PURPOSE TRANSFORMERS

A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.

B. Insulation System and Allowable Average Winding Temperature Rise:

1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.

2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.

C. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.

D. Winding Taps:

1. Less than 3 kVA: None.

2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.

3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.

4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.

E. Energy Efficiency: Comply with 10 CFR 431, Subpart K.

F. Sound Levels: Standard sound levels complying with NEMA ST 20

G. Mounting Provisions:

1. Less than 15 kVA: Suitable for wall mounting.

2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.

3. Larger than 75 kVA: Suitable for floor mounting.

H. Transformer Enclosure: Comply with NEMA ST 20.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

2. Construction: Steel.

a. Less than 15 kVA: Totally enclosed, non-ventilated.

b. 15 kVA and Larger: Ventilated.

3. Finish: Manufacturer's standard grey, suitable for outdoor installations.

4. Provide lifting eyes or brackets.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.

C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.

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 transformers in accordance with NECA 409 and IEEE C57.94.

D. Use flexible conduit, under the provisions of Section 26 0533.13, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.

F. Install transformers plumb and level.

G. Transformer Support:

1. Provide required support and attachment in accordance with Section 26 0529, where not furnished by transformer manufacturer.

2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.

3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch high concrete pad constructed in accordance with Section 03 3000.

4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

H. Provide grounding and bonding in accordance with Section 26 0526.

I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.

J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

K. Identify transformers in accordance with Section 26 0553.

3.3 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

SECTION 26 2416
PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. 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 0800 - Electrical Commissioning and Testing Requirements.

J. Section 26 2200 - Low-Voltage Transformers: Small power centers with integral primary breaker, transformer, and panelboard.

K. Section 26 2813 - Fuses: Fuses for fusible switches and spare fuse cabinets.

L. 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; 2023.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.

G. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

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. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. 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: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for 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 EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: 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 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit 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 Bus Connections: Arranged for sequential phasing of overcurrent protective devices.

2. Phase and Neutral Bus Material: Aluminum.

3. Ground Bus Material: Aluminum.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.

2. Provide clear plastic circuit directory holder mounted on inside of door.

2.5 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. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

6. 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.

7. Do not use tandem circuit breakers.

8. Do not use handle ties in lieu of multi-pole circuit breakers.

9. 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. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. 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.

I. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

J. Provide grounding and bonding in accordance with Section 26 0526.

K. Install all field-installed branch devices, components, and accessories.

L. Provide filler plates to cover unused spaces in panelboards.

M. 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.

2. Intrusion detection and access control system circuits.

3. Video surveillance system 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. Wall switches.

B. Receptacles.

C. 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.

J. Section 26 0923 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.

1.3 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

L. UL 1310 - Class 2 Power Units; 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 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.

c. Business offices, corridors, waiting rooms and the like in clinics, medical and dental offices and outpatient facilities.

d. Child care facilities, pre-schools and educational facilities.

e. Assembly occupancies

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.

2.2 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".

2.3 WALL SWITCHES

A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

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. Automatically Controlled Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; controlled receptacle marking on device face per NFPA 70; single, duplex or quadraplex as indicated on the drawings.

a. Devices indicated in Electrical Legend as Automatically Controlled shall meet the requirements of this section.

b. Split receptacles within a common device such that half of the receptacles are automatically controlled and the other half are uncontrolled (hot).

c. Provide for all wiring devices as indicated in plans.

d. Outlets shall be installed such that top receptacle is connected to the automatic controls.

3. 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.

4. 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.

E. USB Charging Devices:

1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.

a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.

2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

3. Provide with automatic control markings in accordance with Convienence Receptacles section.

F. USB Charging/GFCI Combination Devices:

1. Meets specifications indicated in this section for USB Charging Devices, GFCI Receptacles and Tamper-Resistant devices.

G. Cable Reel Recptacles:

1. Reel shall have a heavy-duty spring motor, with self-contained rewind and non-sparking rachet assembly, a 4-way roller and adjustable cable stop, and a safety chain. Reel shall lock when desired cable has been payed out, and unlock and retract when cable is pulled to release lock.

2. Reel shall be provided with minimum 25 foot cable rated for 20 amperes with required phase conductors, neutral and equipment grounding conductor. Provide device with NEMA configuration as indicated in drawings.

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. Wall Switches: 48 inches above finished floor.

b. 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 2813
FUSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fuses.

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: Identification products and requirements.

D. Section 26 0573 - Power System Studies: Additional criteria for the selection of protective devices specified in this section.

E. Section 26 2816.16 - Enclosed Switches: Fusible switches.

1.3 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

C. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses; Current Edition, Including All Revisions.

D. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com

B. Littelfuse, Inc: www.littelfuse.com

C. Mersen: ep-us.mersen.com

2.2 APPLICATIONS

A. Service Entrance:

1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.

2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

B. Feeders:

1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.

2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

2.3 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

1. Class RK1, Time-Delay Fuses.

2. Class RK5, Fast-Acting, Non-Time-Delay Fuses:

H. Class L Fuses: Comply with UL 248-10.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

SECTION 26 2816.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed safety switches.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements.

B. Section 26 0005 - Basic Electrical Requirements.

C. Section 26 0526 - Grounding and Bonding for Electrical Systems.

D. Section 26 0529 - Hangers and Supports for Electrical Systems.

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 0573 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.

G. Section 26 2813 - Fuses.

H. Section 26 3600 - Transfer Switches: Automatic and non-automatic switches listed for use as transfer switch equipment.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within 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.

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

2.2 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:

1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

H. Provide with switch blade contact position that is visible when the cover is open.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

K. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

M. Heavy Duty Switches:

1. Comply with NEMA BS 31047.

2. Conductor Terminations:

a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

a. Provide means for locking handle in the ON position where indicated.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 0526.

H. Identify enclosed switches in accordance with Section 26 0553.

3.2 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

SECTION 26 3323
CENTRAL BATTERY EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Standard-transfer interruptible power supply (IPS) centralized emergency lighting inverters.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements.

B. Division 03 - Concrete: Concrete equipment pads for floor mounted units.

C. Section 26 0005 - Basic Electrical Requirements

D. Section .

E. Section .

F. Section : Identification products and requirements.

G. Section : Additional criteria for the selection of equipment and associated protective devices specified in this section.

H. Section 26 0800 - Electrical Commissioning and Testing Requirements.

I. Section :

1. Luminaires for interface with centralized emergency lighting inverters.

2. Emergency lighting unit equipment.

J. Section : Luminaires for interface with centralized emergency lighting inverters.

K. Section 28 4600 - Fire Detection and Alarm: Interface with Fire Alarm control system in accordance with NFPA 101.

1.3 REFERENCE STANDARDS

A. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA 416 - Recommended Practice for Installing Energy Storage Systems (ESS); 2016.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 111 - Standard on Stored Electrical Energy Emergency and Standby Power Systems; 2025.

I. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

J. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate compatibility of centralized emergency lighting inverters to be installed with work provided under other sections or by others.

2. 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 required by NFPA 70.

3. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Coordinate the work with placement of supports, anchors, etc. required for mounting.

5. 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. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70 (National Electrical Code).

2. NFPA 101 (Life Safety Code).

3. NFPA 111.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to inverter system components, enclosure, and finish.

D. Do not exceed maximum ambient temperature requirements for batteries at any time, which reduces battery service life. Replace batteries exposed to temperatures in excess of manufacturer's requirements.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section , for additional warranty requirements.

B. Inverter Assemblies: Provide minimum two year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

C. Batteries: Provide pro-rata warranty for the duration of rated design life.

PART 2 PRODUCTS

2.1 CENTRALIZED EMERGENCY LIGHTING INVERTERS - GENERAL REQUIREMENTS

A. Provide complete centralized emergency lighting inverter system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Inverter Assemblies: Manufactured units consisting of inverters, batteries, enclosures, and associated components specifically designed for emergency lighting applications; microprocessor-based utilizing pulse width modulation (PWM) with insulated gate bipolar transistors (IGBT's); listed and labeled as complying with UL 924.

1. Battery Run Times of 120 Minutes: Listed as complying with UL 924 for "emergency lighting and power equipment".

2. Battery Run Times Other than 90 Minutes: Listed as complying with UL 924 for "auxiliary lighting and power equipment".

D. Provide inverters and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

E. Increase indicated power ratings as required to accommodate any applicable inverter load restrictions.

F. Inverters Installed in Spaces Used for Environmental Air: Plenum rated; listed and labeled as complying with UL 2043, suitable for use in air-handling spaces.

G. Battery System:

1. Provide battery capacity as required for achieving battery run time indicated.

2. Battery Charger: Microprocessor-controlled, temperature compensated; capable of returning supplied battery(s) from fully discharged to fully charged condition within unless otherwise indicated.

3. Provide automatic low voltage battery disconnect to prevent battery "deep discharge" damage.

H. Enclosures:

1. Environment Type per NEMA EN 10250:

a. Indoor Clean, Dry Locations:

b. Outdoor Locations:

2. Hinged Doors: Lockable, with all locks keyed alike.

3. Finish:

I. Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category B.

J. Automatic Sequence of Operations:

1. Upon failure or degradation of primary/normal input power, transfer load to battery power.

2. When primary/normal input power has been restored, retransfer load to primary/normal power and recharge battery.

K. Input Tolerance:

1. Voltage Range:

2. Frequency Range:

3. Total Harmonic Distortion (THD): maximum at full load.

L. Output Requirements:

1. Voltage Regulation:

2. Frequency Range:

3. Total Harmonic Distortion (THD): maximum for linear load.

4. Load Power Factor Capability:

M. Micro Inverter Features (Units equal to or less than 55VA):

1. Control Functions:

a. Automatic mode.

b. Manual Test Mode: Simulates failure of primary/normal source.

c. Self-testing/self-diagnostics.

d. Battery charging.

2. Status Indications:

a. Remote test switch.

b. Charge indicator.

c. Alarm function.

3. Other features:

a. Five-year Warranty on electronics and battery.

b. Suiteable for use in plenum (non-air supply/air return applications).

c. Remote mounting up to 250 feet away from light fixture.

N. Mini Inverter Features Units between 55VA and 1100VA:

1. Control Functions:

a. Automatic mode.

b. Manual Test Mode: Simulates failure of primary/normal source.

c. Self-testing/self-diagnostics.

2. Status Indications:

a. Connected to primary/normal source.

b. Connected to battery power.

c. Primary/normal source available.

d. Battery charging.

3. Alarm Indications (Units with Self-Testing/Self-Diagnostics):

a. General trouble/alarm.

4. Other Features:

a. Five-year Warranty on electronics and battery.

O. Floor Mounted Inverter Features (Units 1500 VA and Larger):

1. Control Functions:

a. Automatic mode.

b. Manual Test Mode: Simulates failure of primary/normal source.

c. Automatic Shutdown Mode (IPS Inverters Only): Upon applicable inverter circuit trouble/fault unit shuts down.

d. Self-testing/self-diagnostics.

2. Status Indications:

a. Connected to primary/normal source.

b. Connected to battery power.

c. Primary/normal source available.

d. Battery charging.

3. Alarm Indications:

   a. Output overload/overcurrent.

   b. High temperature.

   c. Low battery.

4. Other Features:

   a. Warranties:

      1) 20-year warranted battery.

      2) 5-year extended warranty on electronics.

   b. Input circuit breaker.

   c. Event log.

   d. Communications Capability: Compatible with system indicated. Provide all accessories necessary for proper interface.

   e. Remote monitoring capability.

   f. Dry contacts for connection to Fire Alarm system.

      1) Emergency lighting inverter shall overcome switch position and activate all indicated fixtures connected to full lumen output.

2.2 STANDARD-TRANSFER INTERRUPTIBLE POWER SUPPLY (IPS) CENTRALIZED EMERGENCY LIGHTING INVERTERS

A. Manufacturers:

1. Iota Engineering; www.iotaengineering.com

2. Myers Emergency Power Systems; www.meyerseps.com

3. Evenlite, Inc: www.evenlite.com/#sle.

4. Current Lighting - Dual-Lite: www.currentlighting.com/dual-lite

5. AstraLite: www.astralitelighting.com.

6. Source Limitations: Furnish inverter assemblies and accessories produced by a single manufacturer and obtained from a single supplier.

B. Description: Offline/standby type inverters with maximum transfer time to battery power source upon loss of normal power source; suitable for operation of incandescent, LED, and fluorescent light sources (not suitable for HID light sources).

C. Standard-Transfer Interruptible Power Supply (IPS) Centralized Emergency Lighting Inverter:

1. Nominal Input/Output Voltage: As indicated on drawings.

2. Nominal Power Rating: As indicated on drawings.

3. Battery Type: Valve-regulated lead acid (VRLA)/sealed lead calcium.

4. Battery Run Time at Full Output: 90 minutes.

5. Output Circuit Breaker(s): As indicated on drawings.

6. Features:

a. manual bypass switch.

b. Normally off output bus.

c. Outputs:

1) Contact for power on status.

2) Contacts for power source status (primary/normal or battery).

3) Contact for alarm condition.

4) Contact for maintenance bypass switch status.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of inverter assemblies are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive inverter assemblies.

E. 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 inverter assemblies in accordance with applicable requirements of NECA 416.

C. Install products in accordance with manufacturer's instructions.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Provide required support and attachment in accordance with Section .

F. Install inverter assemblies plumb and level.

G. Unless otherwise indicated, mount floor-mounted inverter assemblies on properly sized 3 inch high concrete pad constructed in accordance with Division 03 - Concrete.

H. Provide grounding and bonding in accordance with Section .

I. Identify inverter assemblies and associated system wiring in accordance with Section .

3.3 FIELD QUALITY CONTROL

A. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

B. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank.

C. Prepare and start system in accordance with manufacturer's instructions.

D. Perform acceptance test in accordance with NFPA 111.

E. Inspect and test in accordance with NETA ATS, except Section 4.

F. Perform inspections and tests listed in NETA ATS, Section 7.22.2.

G. Batteries and Charger: Perform inspections and tests listed in NETA ATS, Section 7.18.

H. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.4 MAINTENANCE

A. Provide trouble call-back service upon notification by Owner:

1. Provide on-site response within 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.

B. Maintain an on-site log 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.

SECTION 26 3600
TRANSFER SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:

1. Automatic transfer switches.
2. Manual transfer switches.
3. Remote annunciators.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements.

B. Division 03 - Concrete: Concrete equipment pads for floor mounted units.

C. Division 14 - Conveying Equipment: For interface with transfer switch.

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 of equipment specified in this section.

I. Section 26 0800 - Electrical Commissioning and Testing Requirements.

J. Section 26 2816.16 - Enclosed Switches: Safety switches not listed for use as transfer switch equipment.

K. Section 26 3213 - Engine Generators: For interface with transfer switches.

1. Includes code requirements applicable to work of this section.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NEMA IA 10042-1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment; 2025.

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 110 - Standard for Emergency and Standby Power Systems; 2025.

G. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.

a. Engine Generators: See Section 26 3213.

2. 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 required by NFPA 70.

3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Coordinate the work with placement of supports, anchors, etc. required for mounting.

5. 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 each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.

1. Where applicable, include characteristic trip curves for overcurrent protective devices upon request.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

D. Maintenance contracts.

E. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70 (National Electrical Code).

2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for system Level specified in Section 26 3213.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Transfer Switches:

1. ASCO Power Technologies: www.ascopower.com

2. Same as manufacturer of engine generator(s) used for this project.

3. Source Limitations: Provide transfer switches and accessories produced by single manufacturer and obtained from single supplier.

2.2 TRANSFER SWITCHES

A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Applications:

1. Utilize open transition transfer unless otherwise indicated or required.

D. Construction Type: Either "contactor type" (open contact) or "breaker type" (enclosed contact) transfer switches complying with specified requirements are acceptable.

E. Automatic Transfer Switch:

1. Transfer Switch Type: As indicated on the drawings.

2. Transition Configuration: As indicated on the drawings.

3. Voltage: As indicated on the drawings.

4. Ampere Rating: As indicated on the drawings.

5. Neutral Configuration: Solid neutral (unswitched), except as indicated.

6. Features:

a. Provide signal connection to elevator programming hub.

F. Comply with NEMA IA 10042-1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).

G. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.

H. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.

I. Switching Methods:

1. Open Transition:

a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.

2. Obtain control power for transfer operation from line side of source to which the load is to be transferred.

J. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.

K. Enclosures:

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

2. Finish: Manufacturer's standard unless otherwise indicated.

L. Short Circuit Current Rating:

1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating not less than the available fault current at the installed location as indicated on the drawings.

M. Automatic Transfer Switches:

1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.

2. Control Functions:

a. Automatic mode.

b. Test Mode: Simulates failure of primary/normal source.

c. Voltage and Frequency Sensing:

1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.

2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.

3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.

d. Outputs:

1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).

2) Auxiliary contacts; two set(s) for each switch position.

(a) Provide contact connection between stand-by transfer switch and the elevator control system to limit operation of only one elevator at a time while the system is operating on generator power.

e. Adjustable Time Delays:

1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.

2) Transfer to alternate/emergency source time delay.

3) Retransfer to primary/normal source time delay.

4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.

f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.

g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.

3. Status Indications:

a. Connected to alternate/emergency source.

b. Connected to primary/normal source.

c. Alternate/emergency source available.

4. Automatic Sequence of Operations:

a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.

b. When alternate/emergency source is available, life safety system transfer switch shall transfer load to alternate/emergency source after programmable time delay (maximum time to transfer shall be 10 seconds to comply with life safety requirements).

c. After programmable time delay (30 seconds), the stand-by transfer switch shall transfer load to alternate/emergency source.

d. After programmable time delay (60 seconds), the optional transfer switch shall transfer load to alternate/emergency source.

e. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.

f. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

g. The prioritization of power systems shall be in the following order:

1) Life safety and fire pump

2) Stand-by

3) Optional

h. Any overload or event that limits the capacity of the generator system, shall open the transfer switches of the systems starting with the lowest priority system.

N. Remote Annunciators:

1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.

2. Transfer Switch Status Indications:

a. Connected to alternate/emergency source.

b. Connected to primary/normal source.

c. Alternate/emergency source available.

O. Interface with Other Work:

1. Interface with engine generators as specified in Section 26 3213.

2. Interface with elevators as specified in Division 14.

a. Provide wiring and connection between transfer switch and elevator controllers.

3. Interface with building automation system.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive transfer switches.

E. 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 and required maintenance access.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install transfer switches plumb and level.

F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 3 inch high concrete pad constructed in accordance with Section 03 3000.

G. Provide grounding and bonding in accordance with Section 26 0526.

H. Identify transfer switches and associated system wiring in accordance with Section 26 0553.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Prepare and start system in accordance with manufacturer's instructions.

C. Automatic Transfer Switches:

1. Inspect and test in accordance with NETA ATS, except Section 4.

2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.

D. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.4 MAINTENANCE

A. Provide to Owner at no extra cost, a separate maintenance contract for the service and maintenance of transfer switches for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

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.

C. Surge protective devices for branch panelboard 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 2300 - Low-Voltage Switchgear.

D. Section 26 2413 - Switchboards.

E. Section 26 2416 - Panelboards.

1.3 ABBREVIATIONS AND ACRONYMS

A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.

B. SPD: Surge Protective Device.

1.4 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 1283 - Standard for Electromagnetic Interference Filters; Current Edition, Including All Revisions.

E. 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. Field-installed, Externally Mounted Surge Protective Devices:

1. ABB/GE: www.geindustrial.com

2. Current Technology; a brand of Thomas & Betts Power Solutions: www.tnbpowersolutions.com

3. Schneider Electric: www.se.com/#sle.

4. Raycap; www.raycap.com

B. 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.

2. 480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 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 EN 10250: 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. Switchgear: See Section 26 2300.

2. Switchboards: See Section 26 2413.

3. 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.

2.5 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS

A. Surge Protective Device:

1. Protection Circuits: Field-replaceable modular or non-modular.

2. Surge Current Rating: Not less than 50 kA per mode/100 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. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs (UL 1283 listing not available for Type 1 SPDs).

6. 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 26 5100
INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Ballasts and drivers.

D. LED emergency power supply units.

E. Emergency Lighting Control Units (Transfer Switches)

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 0533.13 - Conduit for Electrical Systems.

E. Section 26 0529 - Hangers and Supports for Electrical Systems.

F. Section 26 0533.16 - Boxes for Electrical Systems.

G. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

H. Section 26 0923 - Lighting Control Devices.

1. Includes automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.

I. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.

J. Section 26 5600 - Exterior Lighting.

1.3 REFERENCE STANDARDS

A. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).

B. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

C. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.

D. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.

E. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

G. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.

H. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

I. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.

J. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2023.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

N. UL 1598 - Luminaires; Current Edition, Including All Revisions.

O. UL 1598C - Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits; Current Edition, Including All Revisions.

P. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.

4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to 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 including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

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.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70 and NFPA 101.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70 and NFPA 101.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s), light engines, drivers and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.

2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.

3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

4. Air-Handling Recessed Fluorescent Luminaires: Suitable for air supply/return, heat removal, or combination as indicated.

H. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.

2. Tested in accordance with IES LM-79 and IES LM-80.

3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.3 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:

1. Sealed maintenance-free lead calcium unless otherwise indicated.

2. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101; provide indicator light(s) to report test and diagnostic status.

2.4 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).

2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

B. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to 10 percent relative light output unless dimming capability to lower level is indicated, without flicker.

2. Control Compatibility: Fully compatible with the dimming controls to be installed.

C. Dimmable LED Drivers: Comply with Section 26 0923 - Lighting Control Devices .

2.5 LED EMERGENCY POWER SUPPLY UNITS

A. Manufacturers:

1. Iota Engineering, LLC: www.iotaengineering.com

2. Lithonia Lighting: www.lithonia.com

3. Philips Emergency Lighting/Bodine: www.bodine.com

4. Manufacturer Limitations: Where possible, for each type of luminaire provide emergency power supply units produced by a single manufacturer.

5. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. Description: Self-contained emergency power supply units suitable for use with indicated luminaires, complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

C. Operation: Upon interruption of normal power source, solid-state control automatically switches connected lamp(s) to the emergency power supply for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

D. Battery: Sealed maintenance-free high-temperature nickel cadmium unless otherwise indicated.

E. Diagnostics: Provide accessible and visible multi-chromatic combination test switch/indicator light to display charge, test, and diagnostic status and to manually activate emergency operation.

F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status and field selectable audible alert.

2.6 EMERGENCY LIGHTING CONTROL DEVICES (TRANSFER DEVICES)

A. Manufacturers:

1. Philips Emergency Lighting Bodine: www.philips.com/bodine

2. Iota Engineering: www.iotaengineering.com

3. Engineer pre-approved equal

B. General Requirements:

1. The emergency lighting control device shall work in conjunction with an auxiliary generator or a central inverter system to power light fixtures for egress lighting regardless of fixture wall switch position.

2. All units shall be UL924 listed and approved.

C. Operation:

1. Device shall sense loss of normal power and switch the AC driver input power connected to an unswitched generator (or central inverter) supplied lighting circuit.

2. The device shall be capable of bypassing the wall switch when the auxiliary generator (or central inverter) powers.

3. Unit shall be capable of 120/277 volt operation.

D. Equipment:

1. Emergency Lighting Control Device - 3 Amp

a. For use within a single luminaire. Device shall be suitable for indoor and damp locations and capable of being used with fluorescent or LED lighting loads. Device shall be UL listed for installation inside, on top of or remote from the fixture. Shall include power loss sensing, UL924 listed and approved.

2. Emergency Lighting Control Device - 20 Amp

a. For use adjacent to local switching means. Device shall be suitable for indoor and damp locations and capable of being used with incadescent, fluorescent and LED lighting loads. Shall include power loss sensing, UL 924 listed and approved.

3. Branch Circuit Emergency Lighting Transfer Switch

a. Mounted onto junction box type, verify with field conditions. Device shall be suitable for indoor, damp and plenum (UL 2043) locations and capable of being used with incadescent, fluorescent and LED lighting loads. Shall include power loss sensing, UL 924 listed and approved.

2.7 MICRO AND MINI INVERTERS

A. Manufacturers:

1. Philips Emergency Lighting Bodine: www.philips.com/bodine

2. Iota Engineering: www.iotaengineering.com

3. Engineer pre-approved equal.

B. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

C. Operation: Upon interruption of normal power source, solid-state control automatically switches connected lamp(s) to the emergency power supply for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

D. Battery:

1. High temperature rechargable, replaceable nickel-cadmium.

2. Battery shall be sized to supply all connected lamps where indicated.

E. Diagnostics: Unit shall include test switch and charge indicator light.

F. Unit shall be sine wave output capable with dual voltage input and output capabilities.

G. Provide with low-voltage battery disconnect.

H. Installation locations shall be coordinated with selected manufacturer's requirements and said manufacturer's distance limitations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

B. Verify that suitable support frames are installed where required.

C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:

1. Do not use ceiling tiles to bear weight of luminaires.

2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.

3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.

4. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.

5. See appropriate Division 09 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:

1. Install trims tight to mounting surface with no visible light leakage.

2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.

3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

H. Suspended Luminaires:

1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

2. Install canopies tight to mounting surface.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to bottom of luminaire.

J. Install accessories furnished with each luminaire.

K. Bond products and metal accessories to branch circuit equipment grounding conductor.

L. Emergency Lighting Units:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

M. Exit Signs:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

N. LED Emergency Power Supply Units:

1. For field-installed units, install inside luminaire unless otherwise indicated. Where installation inside luminaire is not possible, install on top of luminaire.

O. Identify luminaires connected to emergency power system in accordance with Section 26 0553.

P. Install lamps in each luminaire.

3.3 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Test self-powered exit signs, emergency lighting units, and emergency power supply units to verify proper operation upon loss of normal power supply.

3.4 CLOSEOUT ACTIVITIES

A. The building operations and maintenance documents shall be provided to the owner and shall consist of manufacturers' information, specifications and recommendations; programming procedures and data points; narratives; and other means of illustrating to the owner how the building, equipment and systems are intended to be installed, maintained and operated. Required regular maintenance actions for equipment and systems shall be clearly stated on a readily visible label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.

SECTION 266100
THEATRICAL SYSTEMS ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. Provide all electrical services, materials, labor and installation suitable to accommodate the installation and complete function of the Division 11 theatrical systems equipment specified in other Sections, including:

    a. Section 116133 – Theatrical Rigging
    b. Section 116163 – Theatrical Lighting Systems

2. Coordinate Theatrical Systems-related electrical materials installation with the Theatrical Systems drawings.
3. Provide Theatrical Systems-related electrical materials and methods in accordance with all requirements and related sections of Division 26 and as detailed herein. In event of conflict, the stricter requirement will prevail.
4. Provide all Theatrical Systems junction boxes, pull boxes, terminal cabinets, cable trays, cable hooks, conduit, enclosures, standard outlet and device back boxes, floor boxes, and other electrical materials and hardware for a complete Theatrical Systems electrical infrastructure as specified herein and in quantities and locations as shown on the Theatrical Systems and Electrical drawings.
5. Provide all disconnects, panelboards and company switches for Theatrical Systems Equipment as specified herein and in quantities as shown on Electrical drawings.
6. Provide test reports and verification that wiring installations comply with applicable standards and the requirements set forth in the Division 11 Theatrical Systems documents and by the equipment manufacturers.
7. Under work of this Section, related to Section 116133 – Theatrical Rigging (TR-series drawings)

    a. Coordinate with the work of Section 116133 - Theatrical Rigging
    b. Provide all conduit, wire, wire pulling and termination for theatrical rigging equipment.
    c. Provide terminations for theatrical rigging systems motion control racks and devices; low voltage termination will be terminated under the direct supervision of the Theatrical Rigging Contractor.
    d. Provide all local motor disconnects as required to complete system in a code compliant manner.
    e. Provide and terminate all wiring and receptacles required for theatrical rigging system power as indicated on drawings.
    f. Provide terminations for all system electrical safety devices.

8. Under work of this Section, related to Section 116163 - Theatrical Lighting Systems (TL-series drawings)

a. Coordinate with the work of Section 116163 - Theatrical Lighting Systems.
b. Provide all conduit, wire, wire pulling and termination for theatrical lighting systems.
c. Provide and terminate all wiring and receptacles required for the theatrical lighting system "LS" power system as indicated on drawings.
d. Provide terminations for theatrical lighting system racks and devices; low voltage termination will be terminated under the direct supervision of the Theatrical Lighting Contractor.
e. Provide interface(s) as necessary to dim architectural LED lighting fixtures controlled by the Theatrical Lighting System with input control signal (DMX control protocol) provided under Section 116163.

1) For each dimmed fixture type controlled by the Theatrical Lighting System, verify full-range dimming compatibility with power and dimming controls manufacturer; if necessary, submit sample fixtures and drivers for factory testing.

f. Provide emergency power feed(s) to emergency transfer panel(s) provided under Section 116163 to transfer designated architectural house lighting branch circuits, as determined by the Electrical Engineer, from normal to emergency power.
g. Provide emergency power branch circuits to designated architectural LED lighting control signal interface(s) provided under Section 116163.

9. Delegated Design:

a. Refer to Section 260529 – Hanger and Support for Electrical Systems
b. Refer to Section 260548 – Electrical Vibration and Noise Control
c. Provide design of the means of fastening, suspension and support of the work of this Section.

B. Products Installed but Not Supplied Under This Section

1. Related to Section 116133 - Theatrical Rigging

a. Install all Theatrical Rigging line voltage and low voltage control equipment as furnished under Section 116133.
b. Terminate all Theatrical Rigging power disconnects and devices within equipment racks (including receptacles, etc.), as furnished under Section 116133.
c. Install all Theatrical Rigging specialty panel and device back boxes furnished by Division 11 where noted. Provide all required conduit, electrical hardware, and mounting brackets to complete installation.

2. Related to Section 116163 - Theatrical Lighting Systems

a. Receive, store and install theatrical lighting power distribution equipment, emergency power transfer equipment, and associated control equipment furnished under Section 116163.
b. Receive, store and install all power and control distribution and connection devices furnished under Section 116163.
c. Install all head-end control equipment furnished under Section 116163 under the direct supervision of the equipment manufacturer.
d. Coordinate and install control signal interfaces provided under Section 116163 to transfer control signal for designated architectural LED lighting fixtures and drive all loads to full in the case of a loss of normal power.

e. Install terminal boxes and terminate flexible multi-cable drops to fixed electric battens.

1.2 REFERENCES

A. Abbreviations and Acronyms

1. The following abbreviations and acronyms are relevant to this Section and are in addition to those defined in Division 01 – General Requirements.

a. AV – Audio-Visual
b. AWG – American Wire Gauge
c. FAT – Factory Acceptance Test
d. MEP – Mechanical Electrical Plumbing
e. RF – Radio Frequency

B. Definitions

1. The following definitions are relevant to this Section and are in addition to those defined in Division 01 – General Requirements.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination

1. Under work of this Section, coordinate the installation of all Electrical provisions for the Theatrical Systems.
2. Comply with "hold clear" requirements indicated in the Contract Documents for the Theatrical Systems.

B. Pre-installation Meeting

1. Refer to Division 01 – General Requirements for information regarding pre-installation meeting with General Contractor.

C. Sequencing

1. Install the theatrical systems wiring devices following completion of all painting and wet trade work in the area, and the area is continuously free of excessive water, dirt, dust and debris that may be harmful to installed equipment.
2. Sequence the work to comply with the equipment delivery, storage and handling requirements specified elsewhere in this Section.
3. Computer grade network components, rack processors and modules, and any other equipment sensitive to construction debris and dust shall not be installed until all debris and dust has been removed. Typical finished "office" cleanliness shall be required and must be continuously maintained in rooms in which computer grade equipment is to be installed.
4. Computer grade network components, rack processors and modules, and any other valuable equipment shall not be installed until equipment rooms are continuously secure.
5. The unpacking and installation of computer control consoles and peripheral devices shall not occur until the control room is continuously secure, free of dust and debris, and climate controlled.
6. Scheduling:

a. Comply with the project schedule.
b. Install, startup, test and commission the work of this Section in a timely manner to allow the work of the various theatrical systems sections to proceed in conformance with their portion of the project schedule, including a reasonable allowance for the startup, testing, commissioning, and compliance testing procedures specified in those Sections.

1.4 SUBMITTALS

A. Submit information on materials being proposed in accordance with the requirements of Division 01 – General Requirements.

B. Product Data

1. Submit for each product specified in this Section.

C. Shop Drawings

1. Provide coordinated mounting detail drawings for all theatrical devices.
2. Provide coordinated plan detail drawings showing all theatrical-related MEP equipment regardless of its location.
3. Provide coordinated section and elevation detail drawings showing all theatrical-related MEP equipment in all theatrical systems equipment rooms, including but not limited to dimmer rooms, control rooms, projection rooms, theatrical audio video equipment rack rooms, etc.

D. Delegated Design Submittals

1. Provide drawings and calculations meeting the review requirements of the authorities having jurisdiction, stamped and wet signed by a Professional Engineer licensed in the project jurisdiction for work of the specific type performed.

E. Site Quality Control Submittals

1. Submit test reports for wire and cable installed under work of this Section.

F. Manufacturer Reports

1. Submit reports of Factory Acceptance Testing.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage and handling of theatrical systems equipment to be installed under this section shall be coordinated with each of the theatrical systems equipment contractors and shall meet all requirements described in Division 01.

B. Acceptance at Site

1. Coordinate responsibility for acceptance of Division 11 furnished theatrical equipment components at job site with the theatrical system contractors and General Contractor.
2. The Contractor shall be responsible for acceptance of the theatrical systems components at the job site, confirming that all quantities and counts are correct and for keeping accurate logs and records of such information.

C. Storage and Protection

1. Upon delivery, the materials shall be stored under cover in a clean, dry and secured location, off the ground. Delivered materials which are damaged or otherwise not suitable for installation shall be removed from the job site and replaced with acceptable materials.
2. Replace, at no additional expense to the Owner, all equipment and materials which are damaged or lost during storage or handling.

1.6 SITE CONDITIONS

A. Existing Conditions

1. Verify all conditions at job site. Promptly report variations and obstructions to the Architect. All additions and/or corrections are to be requested prior to fabrication.

B. Environmental Requirements

1. Equipment is classified according to its susceptibility to construction conditions that may affect its operation. Classes shall be defined by the following paragraphs.

a. Class 1:

1) Cable and distribution apparatus, structural elements, electrical back boxes, face plates, terminal boxes, empty dimmer racks, and empty equipment rack frames may be stored in weather-protected spaces under “normal” construction site conditions provided that no electronic components are contained within devices. Storage boxes shall be sturdy and well-sealed, and equipment shall be protected with imperforate inner plastic sheeting.
2) Contractor may install this class of equipment in weather-protected spaces under “normal” construction site conditions provided that equipment is protected from dust and moisture by sturdy imperforate plastic sheeting and completely covered with corrugated cardboard held securely in place by tape with an acrylic adhesive that provides UV resistance, such as “blue painter’s tape”. Cardboard covers shall not be removed until area is broom cleaned. Under no circumstances shall equipment remain uncovered overnight during installation or while work which causes high dust or moisture levels in area of placement is taking place.

b. Class 2:

1) Control panels, dimmer modules, spare parts, test and other equipment (except as listed under Class 3) not subject to damage by concrete dust or dirt shall be stored and protected as specified herein for Class 1 devices.
2) Contractor shall not install equipment in this class until area of installation is broom cleaned, "blown" clean with pressurized air, mopped, air conditioned and secure. Contractor may install control panels with electronic components under Class 2 conditions, but electronic components must be removed and not installed until area of installation meets Class 3 conditions.

c. Class 3:

1) Mixing and control consoles, computers, dimmer control electronics, filled equipment racks and other electronic equipment shall not be shipped to site until the rack and control rooms are finished, air conditioned, dust free, broom and mop cleaned, secure, and in all respects complete and ready for occupation.
2) This class of equipment shall not be unpacked until the system is complete in all other respects. Under no circumstances may any equipment in this class be removed from the rack and control rooms into or through spaces that are not cleaned, air conditioned, and complete.

C. Field Measurements

1. Field measurements must be taken prior to preparation of final shop drawings and prior to fabrication to ensure proper fitting of work. Allow for adjustments during installation whenever taking field measurements.
2. Should field measurement of site conditions alter the design or installation of system elements from the approved shop drawings, revised shop drawings shall be reissued for review.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND COMPONENTS

A. Raceways

1. Refer to Section 260533 – Raceways and Boxes for Electrical Systems, in addition to the following.

a. Conduit and Fittings

1) Provide electrical metallic tubing (EMT) conduit for all Theatrical Systems wiring with the following exceptions:

b. Cable Trays

1) General

a) Provide cable trays, tray supports, and splicing hardware to accommodate cable runs as shown on theatre equipment drawings. Refer to sections 116163.
b) Trays to be adequately mounted so that there is no visible deflection between supported sections.

B. Boxes

1. Refer to Section 260533 - Raceways and Boxes for Electrical Systems, in addition to the following.

a. Pull and Junction Boxes

1) Pull and junction boxes shall be as specified under 260533, Electrical Boxes, Pull and Junction Boxes.

b. Theatrical Lighting Systems Device Outlet Boxes

1) Recessed outlet boxes

a) Theatrical lighting control station back boxes shall be an extra deep masonry box with a minimum depth of 2-1/2" to accommodate electronics and connectors.
b) Provide recessed outlet boxes so that the receptacle-outlet cover plate can be securely attached to the back box as intended by the receptacle-outlet cover plate manufacturer.
c) Provide recessed outlet boxes so that the receptacle-outlet cover plate is flush with the final finished surface of the surrounding wall finish. Verify surface treatments with Architect prior to installation.

C. Theatrical Systems Line Voltage Cable

1. Provide only cable types specified in Electrical Documents. No substitutions allowed without written approval of the Architect, Theatre Consultant and specialized Theatrical Systems Manufacturer/Contractor.
2. Size cables and wires to compensate for voltage drop in all line voltage cable runs so that voltage measured at each remote device is no less than 115V under a loaded condition with a 10 amp load.
3. Cable splicing may only be used where cable lengths exceed available stock purchasable lengths or in relocating existing devices. Any cable splices must be fully insulated. Conductor counts of 8 or more conductors shall utilize a terminal strip with bussing straps.

a. Crimped butt type splices are acceptable for conductor counts of less than 8 conductors.
b. Wire nuts are not acceptable.

4. The Architect, Theatre Consultant and specialized Theatrical Systems Manufacturer/Contractor shall be notified in advance of all splice locations for approval.

D. Theatrical Systems Control Cable

1. General

a. Provide only wire types specified in Electrical Documents and verified by Theatrical Systems Manufacturer/Contractor's shop drawings. No substitutions allowed without written approval of the Architect, Theatre Consultant and specialized Theatrical Systems Manufacturer/Contractor.
b. Wire types provided in Electrical documents represent the information available at the time of bid and are provided for development of conduit size requirement and bidding purposes. Determination of the final wire type is dependent on the proprietary systems of the successful Division 11 manufacturer. Do not purchase or install any Theatrical Systems control cable until shop drawings for these systems are approved.
c. All wire to be installed in conduit unless otherwise noted or by specific written agreement by Electrical Engineer. Should an exception be made allowing cable to be run outside of conduit, Contractor shall provide appropriate plenum rated cable for approval by Electrical Engineer and Theatrical Systems Manufacturers.
d. Network cable runs shall be continuous. Cable splicing will not be acceptable.
e. All network cable runs must be confirmed. Lengths exceeding 250 feet (75M) shall be identified and brought to the attention of the theatrical equipment contractor.

1) Resolution of overlength condition shall be per individual theatrical contractor's approved method, which may include substitution to fiber or added midspan device.

2. Network Cabling

a. Theatrical Lighting Control Network Cabling

1) The Theatrical Lighting Control systems network cable runs consist of copper twisted pair wiring or optical fiber for the transport of Ethernet protocol as indicated in the Theatrical Lighting System drawings and specifications.
2) Cabling shall include a 3-foot service loop at the field device and minimum 12-foot service loop at terminal panels/equipment racks.
3) Category 5e network cabling lengths exceeding 250 feet shall be identified by Contractor at the time of shop drawing submittal.
4) All Category 5e network runs exceeding 250 feet must be run via satellite network locations added to resolve over-length conditions. Fiber optic cabling may not be substituted unless specified otherwise.
5) All network cable runs shall be continuous. Cable splices, wire nuts, terminal strips, etc., are not acceptable.

E. Wiring Devices

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Contractor must examine areas and conditions under which the equipment is to be installed and must notify the General Contractor in writing of conditions detrimental to proper and timely completion of work. Work will not proceed until unsatisfactory conditions have been corrected in a manner acceptable to the Contractor.

3.2 THEATRICAL SYSTEMS INSTALLATION

A. General

1. Comply with the requirements of Section 260500 – Part 3 – Execution for Electrical Systems, and the following more restrictive requirements for Electrical systems work related to Theatre and Stage Equipment systems infrastructure.
2. At theatrical function catwalks, lighting catwalks and similar theatrical purpose functional positions, coordinate locations of all Electrical installation with the "hold clear" zones for Theatre and Stage Equipment.
3. Install all equipment racks, panels, terminal boxes, cable trays, conduit, enclosures and wiring devices in conformance with the static load and seismic restraint requirements of all local and national building Codes applicable to the project.
4. Install all work securely, complete with all bolts, nuts, washers, clips, fittings, supports, and other items required for proper installation and operation.
5. No conduit or conduit supports are permitted on horizontal railings, on vertical hangers below 48 inches, overhead rigging grids, or across theatrical lighting positions.

6. Position all devices accurately as indicated on drawings and true to plumb, line and level. Maintain maximum headroom and clearances at all points. Where the Contractor may desire deviations from mounting methods shown on the drawings due to field conditions, submit a Request for Information (RFI) in conformance with Project procedures and obtain response before proceeding with the work.
7. Coordinate work with all other trades to avoid causing delays in construction schedule.

B. Raceway, Conduit and Fittings

1. Unless otherwise indicated, for Theatre and Stage Equipment systems infrastructure, provide a conduit system of steel material.
2. Provide rigid steel conduit where exposed to physical damage.
3. Below slab-on-grade, at other underground locations, and embedded in concrete masonry units (CMU) provide:

    a. Rigid steel conduit (RSC) with bitumastic coating, or,
    b. PVC Coated Rigid Steel Conduit (CRSC), or,
    c. At other locations, provide electrical metallic tubing (EMT).

4. Install raceway free of dents, nicks, and burrs. Ream all cut raceway and raceway ends.
5. Provide conduit trade size as indicated, but not less than:

    a. For metallic conduit, ¾ inch trade size.
    b. For rigid non-metallic conduit, 1 inch trade size.

C. Wireways, Auxiliary Gutters and Associated Fittings

1. Install plumb and square.
2. Protect cables from damage from cover fastening screws.

D. Cable Trays

1. Install cable trays in conformance with NFPA 70 Articles 250 and 392, NEMA VE 2.
2. Install with sufficient space maintained about the cable trays to permit adequate access for installing and maintaining the cables. Install with a minimum clear distance of 3 feet on one side, and one foot above the top member of the cable tray to any obstruction above.
3. Provide cable trays, tray supports, and splicing hardware to accommodate cable runs as shown on theatrical drawings. Coordinate cable tray size and loading depth with the wiring requirements of the related theatrical drawings and Division 11 Section.
4. Provide drop-out fittings above equipment racks, and at other locations as required to maintain cable bend radius limits.

E. Outlet, Device, Pull and Junction Boxes, Terminal Cabinets

1. Comply with NFPA 70 Article 314 and the following.
2. Provide a pull box for any conduit run which is greater than 150 feet or where the run includes the equivalent of three 90-degree bends, including those bends located immediately at an outlet or fitting.
3. Label pull boxes with the system name and box circuit identification.
4. Indicate locations of pull boxes and terminal cabinets on Record Documents.
5. Recessed outlet boxes shall be installed as follows:

a. Install recessed outlet boxes so that the receptacle-outlet cover plate can be securely attached to the back box as intended by the receptacle-outlet cover plate manufacturer.
b. Install recessed outlet boxes so that the receptacle-outlet cover plate is flush with the final finished surface of the surrounding wall finish. Verify surface treatments with Architect prior to installation.
c. Install recessed boxes plumb, true, and slightly back of the final finished surface so the device cover can be installed tight to the finish surface.

6. Surface mount outlet boxes shall be installed as follows:

a. Install surface mounted outlet boxes so that the back of the box is flush with the final finished surface of the surrounding wall finish.
b. Install surface boxes plumb and true. Coordinate box size with device size. Any surface mount back box which allows the receptacle-outlet cover plate to overhang the edge of the box presents a safety hazard and shall not be acceptable.

7. Verify surface treatments with Architect prior to installation
8. Mark the inside of all back boxes with the device designation as indicated in the theatrical systems drawings using a permanent marker or paint pen.

F. Wiring Device Installation

1. All theatrical systems devices are to be mounted as shown on the drawings. Deviations from mounting methods shown on the drawings due to field conditions should be approved by the Architect prior to installation.
2. Mark the inside of all back boxes with the device designation as indicated in the theatrical systems drawings using a permanent marker or paint pen.
3. All network device cover plates must be labeled with the allowable remaining portable cable length such that the entire run does not exceed 300 feet or individual system specification, whichever is less.
4. Clean all boxes of any dust, dirt or debris prior to cover plate installation.
5. All devices, plates & equipment must be covered after installation and protected from construction dust and debris.

G. Theatrical Systems Control Cables

1. Theatrical Systems Ethernet network shall be Category 5e UTP /100Base-TX cabling installed in accordance with all applicable standards including but not limited to IEEE 802.3u standard.

a. Cable runs between hubs shall not exceed 250 feet (75 M). Contractor shall verify run lengths prior to installation.
b. No splices. No exceptions.
c. Contractor shall provide field installation reports verifying that cable installations comply with specifications.

2. Theatrical Systems Fiber Optic (fiber back bone) /100Base-FX cabling shall be installed in accordance with all applicable standards including but not limited to IEEE 802.3u standard (if required).
3. Termination of all control cabling shall be undertaken only under the direct supervision of the applicable Theatrical System Manufacturer's authorized field service personnel.

3.3 FIELD QUALITY CONTROL

A. Field Tests and Inspection:

1. Electrical Contractor shall replace any Theatrical Systems cable that was damaged during cable pull within empty conduit infrastructure.
2. Prior to energizing of the Theatrical Systems, perform complete system check-out to verify that all items are correctly installed and shall safely operate as specified herein.
3. Perform required tests and adjustments upon completion of installation of Theatrical Systems, including but not limited to those specified herein.
4. Contractor shall provide sufficient field service personnel (minimum of 2) to perform all tests specified below. Contractor shall furnish sufficient workmen to operate all equipment and to assist in all tests specified below. Contractor shall provide ladders and other devices, to allow communication between parties and access to all devices to be tested.
5. Contractor shall carry out the following inspections of the Theatrical Systems cabling and submit to the Theatre Consultant the written results at each inspection for inclusion on the permanent records of the theatrical systems. Follow EIA standards RS-160 and RS-219 in performing test. Make corrections necessary to bring system(s) into compliance with the specifications.

    a. Category Cable:

        1) Test cabling using at least one (1) of the following test measurement devices or equal:

            a) Category 5e/6 Cable Pair Tester, Level III or later tester for full compliance with TIA/EIA 568-B.1 and B.2, (to include all current addendums) - Microtest Omniscanner, HP, Scope, Fluke, Siemon, or equal.
            b) Outside Plant Voice Cabling Plant tester - capable of detecting shorts, opens, reversals, mis-wiring and crosstwists. (example: Siemon STM-8).

        2) Performance Requirements

            a) To EIA/TIA standards referenced herein for Category 5e/6 cabling. Performance requirement is for circuit end-to-end.

        3) Test Procedures:

            a) Use the specified Category cable test set, and test using the Permanent Link procedure.
            b) Verify that all Category cable runs meet TIA/EIA-568B compliance, using an appropriate Level III testing instrument. The instrument must verify the integrity of all conductors, as well as correctness of termination sequence. Tests shall be performed between modular jacks at Theatrical Systems panels and modular jacks at patch panel.
            c) Test station wire only after all pairs of station wire in an area have been terminated at both ends, and no work of this Section or other Sections may cause physical disturbance to the wiring.
            d) Test and submit a test report for each individual cable segment.
            e) Provide 250MHz sweep test, polarity checks, near-end cross talk, signal attenuation, noise, DC loop back resistance, pair-by-pair continuity and length.

f) Submit a test report indicating that the link meets Category 5e/6 minimum requirements for at least the following parameters:

i. Wire map, pin to pin match
ii. Length
iii. Report by frequency:

- Insertion loss
- NEXT, worst pair to pair
- Power sum NEXT
- ELFEXT, worst pair to pair
- Power sum ELFEXT
- Return loss

iv. Report pass or fail

g) Correct any and all transpositions found
h) Retest
i) If any conductor in a station wire tests either open or short, then the entire station wire is to be removed, replaced, and re-tested.

b. Fiber Optic Cable:

1) Test cabling using at least one (1) of the following test measurement devices or equal:

a) Optical power meter (HP, Siecor, 3M, Fotec).
b) Optical Time Domain Reflectometer (Tektronix TTP2 Fiber Master Optical Time Domain Reflectometer or equal).

2) Performance Requirements

a) Optical Budget, any end to end link - not to exceed the sum of the following:

i. The specified cable performance, pro-rated for total link distance.
ii. Multimode:

- 0.03 dB for each fusion splice
- 0.3 dB for each mechanical splice
- 0.4 dB for each LC connector

3) Test Procedures:

a) Measure and record all fiber optic line End-to-End attenuations in accordance with TIA/EIA-526-14A using factory terminated test jumpers. Overall line attenuation, including all patch panel connections and mechanical or fusion splices shall be in accordance with TIA/EIA-568B. All fiber connectors shall be tested to assure insertion losses < 0.3 dB (typical) and 0.75 dB (maximum).
b) Test each fiber link for overall attenuation from end to end in both directions.

c) Perform the attenuation acceptance test for multi-mode cable at both the 850nm and 1300nm wavelengths.

3.4 SYSTEM STARTUP AND COMMISSIONING

A. Test, “ring out” and provide industry standard compliance documentation for all cable types provided for the theatrical systems and equipment, including but not limited to:

1. 120V power receptacles
2. Category cable & network devices
3. Fiber optic devices

B. Provide personnel at the time of commissioning to supervise the inspection / testing of theatre systems related electrical equipment. This includes distribution boards, circuit breaker panels, relay panels, emergency lighting transfer and all mains voltage devices installed under this section.

C. Provide the appropriate test equipment for the commissioning of theatre systems-related electrical equipment.

D. Provide access (ladders, lifts, scaffolding, etc.) to all theatre systems-related electrical equipment for inspection at the time of commissioning

3.5 ADJUSTING

A. Adjust all equipment and components for operation in accordance with the specifications, approved shop drawings and pertinent Contract Drawings prior to the theatrical systems demonstrations.

3.6 CLEANING

A. Touch up minor abrasions and imperfections as required.

B. Remove from the premises all debris caused by this work. All unnecessary equipment and materials shall be removed from the area(s) of this work upon completion, removed from the job site and disposed of legally at no additional cost to the Owner.

3.7 PROTECTION

A. Provide full protection from damage, paint, construction dirt and debris for all equipment from the point of installation to testing and commissioning.

B. Remove all equipment protection and clean components thoroughly prior to any demonstration sessions.

END OF SECTION

SECTION 28 4600
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire alarm system and associated components, including control units, related equipment, initiating devices, and notification appliances.

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: For interface with fire alarm system.

G. Section 21 3000 - Fire Pumps: For interface with fire alarm system.

H. Section 23 3300 - Air Duct Accessories: Smoke dampers and Smoke detectors monitored and controlled by fire alarm system.

I. Section 26 0005 - Basic Electrical Requirements.

J. Section 26 0505 - Selective Demolition for Electrical

K. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: For non-power-limited cables.

L. Section 26 0526 - Grounding and Bonding for Electrical Systems.

M. Section 26 0533.16 - Boxes for Electrical Systems.

N. Section 26 0536 - Cable Trays for Electrical Systems.

O. Section 26 0533.13 - Conduit for Electrical Systems.

P. Section 26 0533.16 - Boxes for Electrical Systems.

Q. Section 26 0800 - Electrical Commissioning and Testing Requirements.

R. Section 26 3213 - Engine Generators: For interface with fire alarm system.

S. Section 26 3323 - Central Battery Equipment: For interface with fire alarm system.

T. Section 26 3600 - Transfer Switches: For interface with fire alarm system.

U. Section 27 5319.11 - Distributed Antenna System

1.3 ABBREVIATIONS AND ACRONYMS

A. AHJ: Authorities having jurisdiction.

B. BAS: Building automation system.

C. DMNS: Distributed mass notification system.

D. ECS: Emergency communications system.

E. EoL: End-of-line.

F. EVACS: Emergency voice/audio communication systems.

G. FACU: Fire alarm control unit.

H. HVAC: Heating, ventilation, and air conditioning.

I. IDC: Initiating device circuit.

J. LAN: Local area network.

K. MNS: Mass notification system.

L. NAC: Notification appliance circuit.

M. NPLFA: Non-power-limited fire alarm.

N. PLFA: Power-limited fire alarm.

O. SLC: Signaling line circuit.

P. SOO: Sequence of operation.

1.4 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. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices; 2022.

D. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

F. NECA 90 - Standard for Commissioning Building Electrical Systems; 2015.

G. NECA 305 - Standard for Fire Alarm System Job Practices; 2018.

H. NFPA 3 - Standard for Commissioning of Fire Protection and Life Safety Systems; 2024.

I. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

L. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

M. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

N. NFPA 1225 - Standard for Emergency Services Communications; 2022.

O. UL 38 - Standard for Manual Signaling Boxes for Fire Alarm Systems; Current Edition, Including All Revisions.

P. UL 217 - Standard for Smoke Alarms; Current Edition, Including All Revisions.

Q. UL 268 - Standard for Smoke Detectors for Fire Alarm Systems; Current Edition, Including All Revisions.

R. UL 268A - Standard for Smoke Detectors for Duct Application; Current Edition, Including All Revisions.

S. UL 464 - Standard for Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories; Current Edition, Including All Revisions.

T. UL 864 - Control Units and Accessories for Fire Alarm Systems; Current Edition, Including All Revisions.

U. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

V. UL 1480 - Standard for Speakers for Fire Alarm and Signaling Systems, Including Accessories; Current Edition, Including All Revisions.

W. UL 1711 - Amplifiers for Fire Protective Signaling Systems; Current Edition, Including All Revisions.

X. UL 1971 - Standard for Signaling Devices for the Hearing Impaired; Current Edition, Including All Revisions.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate arrangement of equipment with dimensions and clearance requirements of actual equipment.

2. Coordinate placement of devices and notification appliances with potential conflicts or view obstructions.

3. Coordinate work to provide power for equipment at required locations (e.g., smoke dampers, type of actuators, line or local control transformer, zoning, grouping and circuit activations).

4. Coordinate fire suppression system device requirements, monitoring, control, and associated interconnections.

5. Coordinate requirements for branch circuit protection, identification, and shunt trip if applicable.

6. Coordinate kitchen equipment requirements for fire alarm system interconnections based on selected equipment.

7. Coordinate reflected ceiling plans to avoid conflicting placements; maintain minimum diffuser and detector clearances as indicated.

8. Coordinate submittals to confirm equipment and associated components are capable of indicated settings, and manufacturer documentation identifies required compatible product listings.

9. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

10. Door Hardware: See Division 08 and coordinate, including access control panel locations.

11. Elevators or Escalators: See Division 14.

12. Lighting Controls: See Division 26.

13. Non-Power-Limited Cables: See Section 26 0519.

14. Engine Generators: See Section 26 3213.

15. Automatic Transfer Switches: See Section 26 3600.

16. Central Battery Equipment: See Section 26 3323.

17. See Section 26 0800 - Electrical Commissioning and Testing Requirements and coordinate for supporting requirements, including support of services not limited to installation checklists, acceptance testing reports, functional testing and integrated system testing.

B. Preinstallation Meetings:

1. Conduct meeting with facility representative to review devices, notification appliances, and equipment locations.

2. Conduct meeting with facility representative and other related equipment manufacturers to discuss fire alarm system interface requirements.

3. Conduct meeting to review anticipated installation of code-required smoke control requirements, product solutions, and SOO.

4. Convene one week before starting work for review of documented SOO for system applications.

C. Sequencing:

1. Verify exact termination locations required for boxes, enclosures, and equipment.

2. Do not install devices or notification appliances until final surface finishes, painting, and cleaning are complete, unless otherwise required by AHJ.

3. Do not begin installation of conductors and cables until installation of conduit and pathways between termination points is complete.

4. Sequence work to protect cabling (e.g., overspray painting, physical stress, and insulation damage or covering markings).

5. Verify naming convention for equipment identification, including room names and numbers, prior to creation of final drawings, reports, and labels.

D. Scheduling:

1. Arrange access to facility for data collection with facility representative.

2. Where work involves interruption of existing electrical or fire alarm system service, arrange interruption with Owner.

a. Arrange test start and end with responsible reporting service. Confirm system normal operating mode and record as-found and as-left settings.

b. Arrange work to disable individual devices or circuits for minimal disruption if possible.

c. Arrange in accordance with NFPA 72 fire alarm system impairment requirements.

d. Where required by AHJ, arrange systems or partial system out of service interruption in accordance with requirements of building, life safety, and fire codes (e.g., approved fire watch plus required notifications, tags at each fire department connection and control valve, and AHJ notification when excess hours).

1.6 SUBMITTALS

A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.

B. Evidence of designer qualifications.

C. Comply with NFPA 72 chapter "Documentation," including noting names of installers, owners, and system classification information.

D. Design Documents: Submit all information required for plan review and permitting by AHJ, including floor plans, riser diagrams, and description of operation.

1. Copy (if any) of list of data required by AHJ.

2. NFPA 72 "Record of Completion", filled out to extent known at time.

3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A, and complete listing of software required.

4. Manufacturer's detailed product data sheet for each component, including wiring diagrams, and circuit length limitations. Catalog pages and product descriptions include ratings, dimensions, finishes, service conditions, and included features.

5. Certification by manufacturer of FACU that system design complies with Contract Documents.

6. Certification by Contractor that system design complies with Contract Documents.

E. Shop Drawings: Submit installation documentation required for plan review and permitting by AHJ, including floor plans showing locations of fire alarm system components, enlarged drawn to identified scale plan view, and riser diagrams.

1. System zone boundaries and interfaces to fire safety systems.

2. Show locations of components, circuits, and raceways; mark components with identifiers used in control unit programming.

3. Include elevations and details of proposed equipment arrangements.

4. Include system interconnection schematic riser diagram showing proposed and approved cable size and type; coordinated with floor plans and describing circuit class, survivability, and application specific information required by NFPA 72.

5. Include typical wiring diagrams for devices, notification appliances, remote indicators, annunciators, remote test stations, and EoL and power supervisory devices.

6. Include requirements and control diagrams for interfacing with other systems.

7. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; standby and spare capacity calculations; notification appliance circuit loop resistance and voltage drop calculations, including spare capacity.

8. List of devices and notification appliances on each SLC, with spare capacity indicated.

9. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.

10. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.

11. Detailed drawing of graphic annunciators, displays, and interfaces.

12. Certification by either FACU manufacturer or manufacturer of related equipment.

13. Certification by FACU manufacturer that system design complies with Contract Documents.

14. Certification by Contractor that system design complies with Contract Documents.

F. 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.

G. Evidence of installer qualifications.

H. Evidence of maintenance contractor qualifications, if different from installer.

I. 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," filled out.

J. 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 AHJ.

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 require recording of system trouble events by qualified personnel, such as when routine testing is being conducted for fire drills and when entering into contracts for building renovations.

K. 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, and updated input/output chart.

a. ECS: Voice messages by event.

L. Closeout Documents:

1. Certification by manufacturer that 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 AHJ.

M. Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.

1. Refer to Division 01 for additional provisions.

2. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.

3. In addition to items in quantities indicated in PART 2, furnish the following:

   a. Tools, software, and documentation necessary to modify fire alarm system using Owner's personnel; minimum modification capability to include addition and deletion of devices, notification appliances, circuits, and zones, and changes to system description, and operation.

      1) ECS: Include same capability for evacuation and instructional messages.

   b. One copy of software not resident in read-only-memory.

1.7 QUALITY ASSURANCE

A. Copies of Design Criteria Documents: For duration of project, maintain at project site copy of each referenced document that prescribes execution requirements; bound together. Also, NFPA 72, relevant portions of other applicable codes, and instructions and guidelines of AHJ. Include in submittals upon completion.

B. Designer Qualifications: NICET Level III (three) or Level IV (four) certified fire alarm technician or registered fire protection engineer, employed by FACU manufacturer, Contractor, or installer, with experience designing fire alarm systems in jurisdictional area of AHJ.

C. Installer Qualifications: Firm with minimum three years documented experience installing fire alarm systems of specified type and providing contract maintenance service as regular part of their business.

   1. Authorized representative of FACU manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.

   2. Installer Personnel: At least two years of experience installing fire alarm systems.

   3. Supervisor: Level III (three) or Level IV (four) certified fire alarm technician; furnish name and address.

D. Manufacturer Qualifications: Company specialized in manufacturing products specified in this section with at least three years of documented experience.

E. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Refer to Division 01 for packaging and waste requirements.

B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 305.

C. Handle carefully to avoid damage to internal components, enclosure, and finish.

D. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.9 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

B. Do not exceed maximum ambient temperature requirements for batteries at any time, which reduces battery service life. Replace batteries exposed to temperatures in excess of manufacturer's requirements.

C. 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.

D. Existing Conditions:

1. Existing Fire Alarm System: Remove existing components indicated and incorporate remaining components into new system. Comply with NFPA 70.

a. All new devices and system components shall be compatible with existing system.

2. Maintain existing under warranty as if new; do not take existing portions of system out of service until new portions are fully operational, tested, and connected.

3. On-Premises Supervising Station: Include modifications necessary to existing supervising station to accommodate new fire alarm work.

4. Modifications to Existing System:

a. Remove inactive or abandoned cables and components from existing fire alarm system.

b. Remove unused existing components and materials from site and dispose according to local and federal requirements.

c. Remove accessible portion of abandoned cables unless tagged with identification product suitable to withstand based on installed environment.

1.10 WARRANTY

A. Refer to Division 01 for additional warranty requirements.

B. Fire Alarm Control Units and Accessory Equipment: Provide minimum 3-year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

C. Fire Alarm Manual Pull Stations: Provide minimum 1-year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

D. Fire Alarm System Detectors: Provide minimum 1-year year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

E. Fire Alarm System Notification Appliances: Provide minimum 1-year year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 FIRE ALARM SYSTEM

A. General Requirements:

1. Provide new fire alarm system complying with NFPA 70, NFPA 72, NFPA 90A, and consisting of required equipment, conduit, cabinets, outlet boxes, wiring, connectors, hardware, supports, accessories, components, software, and system programming as necessary for complete operating system that provides functional intent indicated.

2. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:

   a. 36 CFR 1191 and ADA Standards.

   b. Requirements of State Fire Marshal.

   c. Requirements of AHJ.

   d. Applicable local codes.

   e. Contract Documents.

   f. NFPA 72; "should" is mandatory; where conflicts between requirements require deviation, identify deviations clearly on design documents.

3. Fire Alarm System Products:

   a. Listed, classified, and labeled as suitable for purpose intended.

   b. Installation Environments: Provide products suitable for their respective indoor and outdoor applications.

4. Fire Alarm System Design Information:

a. Building Code: Comply with applicable building code.

1) Principle Occupancy: As indicated on Architect code summary drawings.

2) Principle Use: As indicated on Architect code summary drawings.

3) Elevators: As indicated on Architect code summary drawings.

(a) Emergency Operation: As indicated on Architect code summary drawings.

b. NFPA 72 Fire Alarm System Classification: Protected premises.

c. Smoke and Heat Detector Coverage: Partial or selective coverage in accordance with NFPA 72.

d. Notification Appliance Zones:

1) See fire alarm system floor plans on drawings.

5. Provide fire alarm circuits in accordance with NFPA 70.

a. Comply with methods of interconnecting FACUs in accordance with NFPA 72 and NFPA 70.

b. Power Sources:

1) Comply with requirements for power supplies of emergency systems in accordance with NFPA 70.

2) Primary: Dedicated branch circuits from facility power distribution system.

3) Secondary: Storage batteries with capacity to operate system for period specified by NFPA 72.

c. Wiring and Wiring Methods:

1) General Requirements:

(a) Comply with requirements for wiring and wiring methods in accordance with NFPA 70.

(b) Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum-rated, listed and labeled as suitable for use in return air plenums.

(c) Special Occupancies: Comply with NFPA 70.

(d) Comply with NFPA 70 for wire and cable plenum, riser, general-purpose, limited-use, undercarpet, and underground applications.

2) Fire Alarm Circuits:

(a) Comply with NFPA 70 for conditions and types required for multiconductor cable systems.

(b) Non-Power-Limited Fire Alarm (NPLFA) Circuits:

(1) Provide dedicated NPLFA non-GFCI branch circuits for fire alarm equipment and marked by red identification in accordance with NFPA 70.

(c) Power-Limited Fire Alarm (PLFA) Circuits:

(1) Provide identification for PLFA circuits in accordance with NFPA 70.

6. Provide pathway class designations and pathway survivability, as defined in NFPA 72.

a. Provide monitoring of conductors and other signaling channels for integrity and circuit performance.

b. Pathway Class Designations:

1) Unless otherwise indicated or required, pathways to meet the following requirements:

(a) SLCs: Class B (star, tee-tap, multi-tap, with no return).

(b) IDCs: Class B (daisy-chain with EoL resistor device installed at end of circuit).

(c) NACs: Class B (daisy-chain with EoL resistor device installed at end of circuit).

B. Fire Alarm System Interfaces and Control Functions:

1. UL 864 listed unless otherwise indicated.

2. Descriptions below are intended to provide means for interface. See project SOOs, narrative, and input/output matrix for execution requirements.

3. Provide initiating devices, interfaces, and control functions for emergency control function interfaces in accordance with NFPA 72.

4. Provide monitoring of interconnected systems. Coordinate notification appliance alternate markings as indicated on drawings.

5. Fire Suppression Systems:

a. Provide minimum of four monitoring point inputs per system unless otherwise indicated.

b. Kitchen Hood Suppression Systems: Provide minimum of one monitoring point input per system.

c. Fire Sprinkler Systems:

1) Waterflow Switches: Provide minimum of one monitoring point input per switch.

2) Control Valve Supervisory (Tamper) Switches: Provide minimum of one monitoring point input per switch.

3) Pressure Supervisory (High/Low Pressure) Switches: Provide minimum of two monitoring point inputs per switch (separate points for high/low pressure signals).

4) Fire Pumps: Provide minimum of seven monitoring point inputs.

5) Preaction Control Panels: Provide minimum of four monitoring point inputs per system.

6) Heat Trace (Freeze Protection) Monitoring Systems: Provide minimum of two monitoring point inputs per system.

6. Elevators:

a. Comply with ASME A17.1.

b. Elevator Shutoff:

1) Elevator Machine Room Heat Detector:

(a) Shut down elevator power prior to hoistway sprinkler activation.

(b) Locate within 24 inches of each sprinkler in accordance with NFPA 72.

2) Sprinkler Pressure or Waterflow: Shut down elevator power prior to hoistway sprinkler activation.

3) For each elevator, provide output signal to stop elevator via addressable relay module and power isolation relay.

c. Elevator Emergency Recall Operation:

1) Elevator Lobby, Hoistway, and Machine Room Smoke Detectors: Elevator recall for fire fighters' service.

2) In each elevator machine room, provide interface for each elevator car or group of elevator cars as determined by AHJ via separate addressable relay modules for each output signal below, where applicable.

(a) Recall elevator to designated (primary) level.

(b) Recall elevator to alternate level.

(c) Smoke detection in elevator machine room (fire fighter's hat light).

7. Fire and Smoke Doors/Shutters/Curtains:

a. Electromagnetic Door Holder Release:

1) Provide output signal for release of electromagnetic door holders via addressable relay module and power isolation relay.

2) Door holders powered via 24 VDC unless otherwise indicated.

3) Door release activated as determined by AHJ.

(a) 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. See Section .

(b) See Division 08.

b. Automatic Fire and Smoke Door/Shutter/Curtain Release:

1) Provide output signal for release of fire and smoke doors/shutters/curtains via addressable relay module and power isolation relay.

2) Unless otherwise indicated, door/shutter/curtain release activated as determined by AHJ.

(a) 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.

(b) See Division 08.

8. Lighting/Dimming Control Systems:

a. System Override:

1) Provide output signal to override lighting/dimming controls via addressable relay module and power isolation relay.

2) Provide connection to UL 864 listed control system interface or interface with system control power where interruption of control power overrides system.

3) Upon activation of fire alarm system, lighting/dimming control system shall provide full illumination to all emergency light fixtures along path of egress for a minimum of 90 minutes, or until the alarm is reset.

9. Sound and Audio/Visual Media Control Systems:

a. System Override:

1) Provide output signal to override sound and audio/visual media controls via addressable relay module and power isolation relays.

2) Provide connection to UL 864 listed system interface or interface with system control power where interruption of control power overrides system.

10. Generator Systems:

a. Provide minimum of three monitoring point inputs per system.

11. Central Battery Equipment:

a. Provide minimum of three monitoring point inputs per system.

12. Dwelling Units:

a. Connect all dwelling unit initiating devices back to Fire Alarm Control Panel. Provide supervisory signal to Supervising Station.

13. Other Interconnected Systems: For systems listed below, provide minimum of two monitoring point inputs each.

a. Gas Detection Systems: Including providing notification appliances as indicated on plans for NOX - Nitrous Oxide, CO2 - Carbon Dioxide, CO - Carbon Monoxide, and HC - Hydrocarbon.

14. HVAC Systems:

a. Air Handling Units (AHUs) and Roof Top Units (RTUs):

1) Provide duct smoke detector on supply side of air stream for units over 2,000 cfm.

2) Provide duct smoke detector on return side of air stream for units over 15,000 cfm.

3) Provide remote test station for each duct smoke detector unless explicitly indicated as not required.

4) Provide output signal to shut down units with at least one duct smoke detector via addressable relay module.

5) Where fire/smoke dampers are located downstream of unit, provide monitoring point input to determine that unit is not operational and subsequently provide output signal to close such dampers via addressable relay module and power isolation relay.

b. Energy Recovery Units (ERUs):

1) Provide duct smoke detector on supply side of air stream.

2) Provide duct smoke detector on return side of air stream.

3) Provide remote test station for each duct smoke detector unless explicitly indicated as not required.

4) Provide output signal to shut down units with at least one duct smoke detector via addressable relay module.

5) Where fire/smoke dampers are located downstream of unit, provide monitoring point input to determine that unit is not operational and subsequently provide output signal to close such dampers via addressable relay module and power isolation relay.

15. High Volume Low Speed (HVLS) Fans:

a. Provide interlocked shut down of all HVLS fans upon activation of waterflow switch, in accordance with NFPA 13 and NFPA 72.

b. HVLS Fan Shutoff:

1) Provide output signal to stop fans via addressable relay module and power isolation relay.

2) Fan shutoff activated as determined by AHJ.

16. Fire/Smoke Dampers:

a. Provide output signal to close fire/smoke damper via addressable relay module and power isolation relay.

b. Fire/smoke damper activated as indicated on drawings.

2.2 FIRE ALARM CONTROL UNITS AND RELATED EQUIPMENT

A. Manufacturers:

1. Honeywell International, Inc; Honeywell Notifier: www.honeywell.com

2. Siemens Industry: www.siemens.com

3. National Time and Signal Company, Inc.: www.nastco.net

4. Johnson Controls International; Simplex: www.simplexfire.com

5. Edwards Fire Safety, a brand of Carrier: www.edwardsfiresafety.com

6. Source Limitations: Furnish FACUs and related equipment produced by single manufacturer and obtained from single supplier.

7. Match existing FACU manufacturer for new equipment.

B. Fire Alarm Control Units and Related Equipment: Listed and labeled as complying with UL 864.

C. Provide cabinets and enclosures as indicated or as required to house system components.

D. Fire Alarm Control Unit (FACU): Addressable.

1. SLCs and IDCs: Configurable for Class B or Class A with additional modules.

2. NACs: Integral and programmable with synchronization modules or cards as required.

3. Power Supply: 120 VAC, 60 Hz, supplying necessary power for FACU.

4. User-Interface: Touchscreen display for system interfacing and service mode settings, include password and user credentials; configurable for custom actions and incorporates historical event log.

5. Support self-testing detector capability.

6. Remote Annunciator Support: Up to 10.

7. Provide NAC expansion as required.

8. Networking: Not required.

9. ECS: FACU listed for purpose.

10. Enclosure Finish Color: Black.

E. Notification Appliance Circuit Expansion:

1. Where notification appliance circuit requirements exceed capacity of FACU, provide accessories and cabinets as required for expansion.

F. Emergency Communications System (ECS):

1. Comply with NFPA 1225.

2. Amplifiers listed and labeled as complying with UL 1711.

3. FACU Listed for ECS:

a. Provide digital ECS integrated with FACU and capable of automatic and manual paging, messaging, evacuation, and alerting on selective and all-call basis.

b. Provide all-call and total evacuation necessary switch points of command, manual controls of evacuation and paging, per zone, prerecorded messaging for nonemergency voice notifications, door unlock provisions, and commands for speaker bypass, unless otherwise approved by Engineer and AHJ.

c. Provide minimum of six switch points of command for speaker bypass, visual bypass, elevator recall bypass, door control bypass, HVAC bypass, and auxiliary bypass.

d. Local and Remote Transponders:

1) Audio hardware, including multiple primary and backup amplifiers, speaker circuit interfaces, power supplies, supervision hardware, cabinets, and battery backup systems may be configured to support multiple notification zones and packaged as audio transponders.

2) Transponders considered system control equipment and located, installed, and interfaced accordingly.

3) Provide firefighter's telephone or other ECS in accordance with NFPA 72.

G. Remote Annunciators:

1. LED Remote Annunciators:

a. Provide LEDs each with customizable label for displaying alarm, supervisory, and trouble conditions.

b. Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.

2.3 FIRE ALARM SYSTEM INITIATING DEVICES

A. Manufacturers:

1. Source Limitations: Furnish initiating devices produced by same manufacturer as FACUs where possible.

B. General Requirements:

1. Addressable Systems:

a. Addressable Devices: Individually identifiable by addressable FACU; suitable for connection to FACU SLCs.

b. Conventional/Nonaddressable Devices: Provide addressable interface modules as indicated or as required for connection to addressable FACU. Unless devices are explicitly permitted to be connected together as one zone, provide separate addressable monitoring point for each device in order to be individually identifiable by addressable FACU.

2. Provide devices and associated accessories suitable for intended application and location to be installed. Unless otherwise indicated, use addressable devices and addressable interface modules only in clean, dry, indoor, nonhazardous locations.

3. Surface-Mounted Devices: Provide manufacturer's accessory surface mount backboxes or suitable outlet/device box.

4. Devices for Outdoor and Damp/Wet Locations: Weatherproof, suitable for outdoor use; provide manufacturer's accessory backboxes or enclosures in accordance with product listing.

5. Devices for Hazardous/Classified Locations: Listed and labeled as suitable for classification of installed location.

6. Protective Covers for Fire Alarm Devices: Provide in areas either indicated in Construction Documents, or if those locations are not indicated, provide in areas similar to Gymnasiums, Pools, or other areas of the like.

a. Refer to Accessories in this section for more information.

C. Manual Fire Alarm Boxes/Pull Stations:

1. Description: Noncoded manual signaling boxes listed and labeled as complying with UL 38.

2. Alarm Initiation: Configured for general alarm initiation unless otherwise indicated; presignal stations (where indicated) require use of key to initiate general alarm.

3. Operation: Dual-action unless otherwise indicated or required.

a. Dual-Action Operation: First requires pushing, pulling, or lifting, then pulling of lever.

4. Color: Red, in accordance with NFPA 72.

5. Station Reset: Requires use of key or tool.

D. Duct Smoke Detectors:

1. Listed and labeled as complying with UL 268A.

2. Ratings: Compatible with air velocity, temperature, and humidity requirements for installed duct.

3. Housing: Select as required for application.

4. Sampling Tubes: Select as required for installation in duct to be monitored.

E. Accessories:

1. Remote Test Stations: Allows for detector key switch test and reset; provides visual and audible indication of alarm condition.

2. Remote Indicators: Provides visual and audible indication of alarm condition.

3. Provide Detector Bases As Indicated:

a. Color: White, unless otherwise indicated.

2.4 FIRE ALARM SYSTEM NOTIFICATION APPLIANCES

A. Manufacturers:

1. Source Limitations: Furnish notification appliances produced by same manufacturer as FACUs where possible.

B. General Requirements:

1. Provide signaling notification appliances listed for fire-protective service and intended operating mode, public or private; suitable for connection to FACU notification appliance circuits.

2. Provide notification appliances and associated accessories suitable for intended application and location to be installed. Use notification appliances only according to listed mounting (e.g. ceiling, wall).

3. Surface-Mounted Notification Appliances: Provide manufacturer's accessory surface mount backboxes or suitable outlet/device box.

4. Exterior Notification:

a. In addition to required occupant notification, provide notification appliances on exterior of building.

b. Outdoor and Damp/Wet Locations: Weatherproof, suitable for outdoor use; provide manufacturer's accessory backboxes or enclosures in accordance with product listing.

5. Notification Appliance Derating: Include device derating adjustments in accordance with listing where applicable, including the following.

a. Where accessory protective guards or enclosures are utilized.

b. Where required by field conditions (e.g., ambient temperature and sound).

6. Notification Appliance Color:

a. Wall-Mounted: Red.

b. Ceiling-Mounted: White.

c. See drawings for mounting configuration indicated by symbols on floor plans, system interconnection diagrams, and details.

C. Visible Notification Appliances:

1. Public Mode Operation: Listed and labeled as complying with UL 1971.

2. Strobes: Clear or nominal white lens with flash rate of 1 Hz unless otherwise indicated or required; xenon or LED light source with maximum pulse duration of 0.02 seconds; candela rating as indicated.

D. Audible Notification Appliances:

1. Listed and labeled as complying with UL 464.

2. Rated Sound Pressure Level: As required to achieve design sound pressure levels, but not less than 75 dBA at 10 feet for public mode operation or 45 dBA at 10 feet for private mode operation in accordance with UL 464.

3. Horns: Selectable tone, including at minimum NFPA 72 temporal 3 pattern and continuous; minimum of two selectable volume levels.

4. Low-Frequency Sounders: Listed for producing 520 Hz low frequency alarm signal for sleeping areas in accordance with NFPA 72; selectable tone, including at minimum NFPA 72 temporal 3 pattern and continuous.

E. Combination Notification Appliances: Comply with respective requirements for each signaling method.

F. Accessories:

1. Notification Appliance Bases: White, unless otherwise indicated.

2. Provide guards to protect notification appliances where subject to mechanical damage; listed for use with notification appliance.

2.5 WIRE AND CABLE

A. General Requirements:

1. Provide cables as indicated or as required for connections between system components.

2.6 ACCESSORIES

A. Provide components as indicated or as required for connection of fire alarm system to devices and other systems indicated.

B. Provide EoL resistors as required for wiring supervision.

C. Protective Covers for Fire Alarm Devices:

1. Listed to same standard as device being protected.

2. Outdoor Covers: Weather resistant, suitable for outdoor use; use only with outdoor-rated devices.

3. Provide guards to protect devices where subject to mechanical damage; listed for use with detector.

a. Protective Covers for Manual Pull Stations:

1) Provide protective covers with hinged access for manual pull stations where indicated.

2) Listed and labeled as complying with UL 38.

3) Outdoor Covers: Weather resistant, suitable for outdoor use; use only with outdoor rated devices.

D. Surge Protection:

1. Line Voltage Surge Protection:

a. Provide for each line voltage circuit serving fire alarm system control units and related equipment (e.g., FACU, field booster panels, nodes, and transponders).

b. Listed and labeled as complying with UL 1449.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that system capacities listed in manufacturer instructions align with designed system.

B. Verify that mounting surfaces are ready to accept components and equipment, with suitable support frames and anchors installed where required.

C. Verify ratings, configurations, and characteristics of system components.

D. Verify rough-ins for field connections.

E. Verify that work likely to damage fire alarm system has been completed.

F. Verify that interior of building has been protected from weather.

G. Perform preinstallation tests and inspections per manufacturer's instructions and in accordance with NECA 305.

H. Verify that system bonding is in accordance with Section 26 0526.

I. Do not energize system until deficiencies have been corrected.

J. Verify that branch circuit wiring installation is completed, tested, and ready for connection to fire alarm system. Overcurrent protection ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

3.2 PREPARATION

A. Prior to installation, confirm environment of installation area is clean, and with ambient temperature, humidity, and ventilation requirements are per manufacturer’s written instructions.

1. Clean and vacuum in accordance with manufacturer's written instructions. Confirm equipment ventilation holes are absent of obstructions and free for air flow.

2. Clean pathways thoroughly to remove foreign materials before installing conductors and cables.

3. Clean dirt, debris, plaster, and other foreign materials from equipment enclosures, cabinets, and outlet boxes.

4. Clean surfaces to receive adhesive products according to manufacturer's instructions.

B. Follow tool requirements for installation, including torquing adjustments, as listed in manufacturer documentation.

C. Remove detector dust covers prior to system energization.

3.3 INSTALLATION

A. Install field-devices, components, FACU and related equipment, and accessories in accordance with the following:

B. Field Locations:

1. Obtain Owner's approval of locations of devices and notification appliances before installation.

2. Arrange equipment to provide minimum operational clearances and required maintenance access in accordance with manufacturer's instructions and NFPA 70.

3. Conceal wiring, conduit, outlet boxes, and supports where installed in finished areas; maintain code-required access.

C. Raceways and Supports:

1. Coordinate locations of outlet boxes as required for installation. Only install boxes and equipment at locations based on application standards indicated in NFPA 72.

2. Secure and support raceways at intervals complying with NFPA 70. Provide supports where vertical rise exceeds permissible limits.

3. Install firestopping to preserve fire resistance rating of partitions and other elements.

D. Wiring and Connections:

1. Maintain separation of Class 1, Class 2, Class 3 remote-control, signaling, fire alarm circuits, and power-limited circuits in accordance with cable insulation class and NFPA 70.

2. Maintain circuit pathway and class designations in accordance with NFPA 72 for configuration, separation, and survivability.

3. Comply with permitted and not permitted installations for wires, cables, cable routing assemblies, communications circuits, and fire alarm circuits in accordance with NFPA 70.

4. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by AHJ. Provide independent support from building structure and suspended ceiling systems. Do not provide support from raceways, piping, ductwork, or other systems.

5. Provide grounding and bonding in accordance with Section 26 0526.

6. Comply with manufacturer's minimum cable sizes or ratings.

7. Do not exceed manufacturer's recommended maximum power, signal, or network cable lengths between components.

8. Provide network wiring in accordance with NFPA 70.

9. Neatly train and bundle conductors inside boxes, wireways, and cabinets.

10. See manufacturer's instructions for batteries.

E. Fire Alarm System Components:

1. Install field-installed devices, components, relays, notification appliances, accessories, and when applicable EoL resistors.

a. Install wiring to supervisory devices and associated EoL resistors as required for supervision of hardwired connections

2. Install Wall-Mounted Equipment: Assemble component hardware within (e.g., card bays, sub-bays, expansion bays, signal cards, other card frames, networking, signal transmission, application modules, tamper monitoring devices, interconnecting modules, and auxiliary power supplies), including space for required spare capacity, and configure settings.

3. Install Interconnect Wiring: Connect system cabinets, install processor and cards, cabling, connectors, terminations, and bonding.

F. Branch Power:

1. After installation confirmations, follow manufacturer instructions to connect branch circuit power cables to premises fire alarm system components; comply with NFPA 70.

2. Where accessories require auxiliary power, provide control power source and monitoring as indicated or as required to complete installation.

3. Install auxiliary power supplies, including indicated monitoring, and connections necessary for remote equipment.

G. System Identification:

1. Identify devices, notification appliances, components, cables, and equipment in accordance with approved submittals. See Section 26 0553.

2. Confirm fire alarm system programming meets requirements of SOO and sub-system SOOs.

3. Mark location of disconnecting means for NPFLA circuits.

4. Coordinate to provide red branch power circuit protective devices or identify them accordingly as required by NFPA 72 and NFPA 70.

5. Mark date of batteries installed on inside cover of panels and formal maintenance logs.

H. Troubleshooting and Installer Checks:

1. Field test connectivity periodically during installation process to avoid unexpected troubleshooting.

2. Check system operation for notification, FACU functions, circuit supervision, alarm initiating devices, supervisory initiating devices, dress panels/doors/covers, and programming before performing field tests.

I. Fire Alarm System Tests:

1. Perform required tests of NFPA 72. Record measured values during operational checks.

2. Confirm functional testing of fire alarm system is as indicated in Contract Documents.

3.4 FIELD QUALITY CONTROL

A. See Division for additional requirements.

B. Provide services of manufacturer's authorized representation to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's detailed testing procedures and field reports and with submittals.

C. Provide equipment, two-way radios for testing personnel use, tools, and supplies required to accomplish inspection and testing.

D. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

E. Inspect and test in accordance with manufacturer's instructions.

F. Inspect wiring and components for damage and defects.

G. Batteries and Power Supplies: Perform inspections and tests listed in manufacturer installation instructions.

H. Perform additional requirements related to testing and inspection during system startup.

I. Test for interface with other systems.

J. Test shunt trips to verify operation.

K. Correct defective work, adjust for operation, and retest until entire system complies with Contract Documents.

L. Submit detailed reports indicated inspection and testing results, corrective actions taken, and as-found and final adjusted settings.

3.5 SYSTEM STARTUP

A. Obtain Owner approval prior to performing system startup.

B. Manufacturer Services: Provide services of manufacturer's authorized representation to systems startup. Include manufacturer's detailed startup procedures with submittals.

C. Prepare and start equipment and systems in accordance with manufacturer's instructions and recommendations.

3.6 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust initiating device and notification appliance settings to achieve desired operation as indicated in submittals.

C. Measure power supply primary and secondary voltages, log values for records, and make appropriate adjustments.

D. Adjust alignment of equipment covers and doors. Provide keys and spare keys to Owner.

E. Reprint and reinstall damaged or misinstalled labels; maintain neat and square to installed location good workmanship - see NECA 1; maintain consistent placements for identification on products of similar type.

F. Adjust devices or notification appliances and associated bases to be flush and level.

G. Program system parameters according to requirements of Owner.

3.7 CLEANING

A. Refer to Division 01 and Section 26 0500 for additional requirements.

B. See Section 01 7419 - Construction Waste Management and Disposal for field-generated construction waste requirements.

C. Check tightness of electrical connections. Replace damaged components and provide closure plates for vacant positions. Provide circuit directory updates for related power branch circuits.

D. Clean and repair existing materials and equipment that remain or are indicated for reuse.

E. Clean dirt, debris, plaster, and other foreign materials from outlet boxes and fire alarm system equipment and components.

F. Clean fire alarm system equipment and components according to manufacturer's instructions and NECA 305.

G. Clean surfaces and interiors of boxes and device cover plates in accordance with manufacturer's instructions to remove dirt, fingerprints, debris, plaster, and other foreign materials.

H. Repair scratched or marred exposed surfaces to match original factory finish.

I. Comply with federal (EPA), state, and local regulations for battery handling and disposal. Do not spill battery fluids down plumbing drains. Only use containers safe for transportation marked 'nonspillable.'

3.8 COMMISSIONING

A. See Section 26 0800 - Electrical Commissioning and Testing Requirements for additional requirements.

B. Comply with NFPA 3 for commissioning of fire protection and life safety systems.

C. Comply with NECA 90 for commissioning building electrical systems.

D. Support Commissioning Agent in assembling test data and generating reports.

E. Participate in four hours of seasonal testing, as scheduled by Commissioning Agent, six months from Date of Substantial Completion.

3.9 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify AHJ and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide services of installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that work is complete and correct; perform preliminary tests as required.

E. Provide tools, software, and supplies required to accomplish inspection, testing, and document results.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of AHJ; document each inspection and test.

G. Correct defective work, adjust for operation, and retest until entire system complies with Contract Documents.

3.10 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 nontechnical administrative staff; classroom:

1. Initial Training: One session precloseout.

C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:

1. Initial Training: One session precloseout.

D. Use operation and maintenance documentation as primary instruction material; have paper copies available for attendees and supplement training material aids.

3.11 CLOSEOUT ACTIVITIES

A. See Division 01 for additional submittals and requirements.

B. Closeout Demonstration: Demonstrate operation of all functions to Owner.

1. Be prepared to conduct any of required tests.

2. Have minimum 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 FACU manufacturer present during demonstration.

4. Demonstration may be combined with inspection and testing required by AHJ; notify AHJ with enough time to schedule demonstration.

5. Repeat demonstration until successful.

3.12 PROTECTION

A. Protect installed fire alarm system from subsequent construction operations.

3.13 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 control of maintenance contractor.

3. Record keeping required by NFPA 72 and AHJ.

C. Provide trouble call-back service upon notification by Owner:

1. Provide on-site response within two 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 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 complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with detailed schedule.

E. Maintain on-site log listing date and time of each inspection and call-back visit, condition of system, nature of 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.

J.W. Sexton HS Auditorium Remodel
LANSING SCHOOL DISTRICT

CONSTRUCTION DOCUMENTS
11/07/2025

DIRECTORY

CLIENT:
LANSING SCHOOL DISTRICT
519 WEST KALAMAZOO STREET
LANSING, MI 48933
P. (517) 755-1000

ARCHITECT:
KINGSCOTT ASSOCIATES INC.
450 TRADE CENTRE WAY, SUITE 130
PORTAGE, MI 49002
P. (800) 632-1815

CONSTRUCTION
THE CHRISTMAN COMPANY
208 N CAPITOL AVENUE
LANSING, MI 48933
P. (517) 482-1488

STRUCTURAL ENGINEER:
ROBERT DARVAS ASSOCIATES
440 SOUTH MAIN ST
ANN ARBOR, MI 48104
P. (734) 761-8713

MEP ENGINEER:
SES ENGINEERING
4000 WEST 11 MILE ROAD
BERKLEY, MI 48072
P. (248) 399-1900

THEATER CONSULTANT:
APIERO DESIGN
1045 SANSOME ST, SUITE 300
SAN FRANCISCO, CA 94111
P. (415) 392-7528

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J.W. Sexton HS Auditorium Remodel
LANSING SCHOOL DISTRICT
102 McPherson Ave, Lansing, MI 48915

ISSUANCES	DATE
BID & CONSTRUCTION	11/07/2025

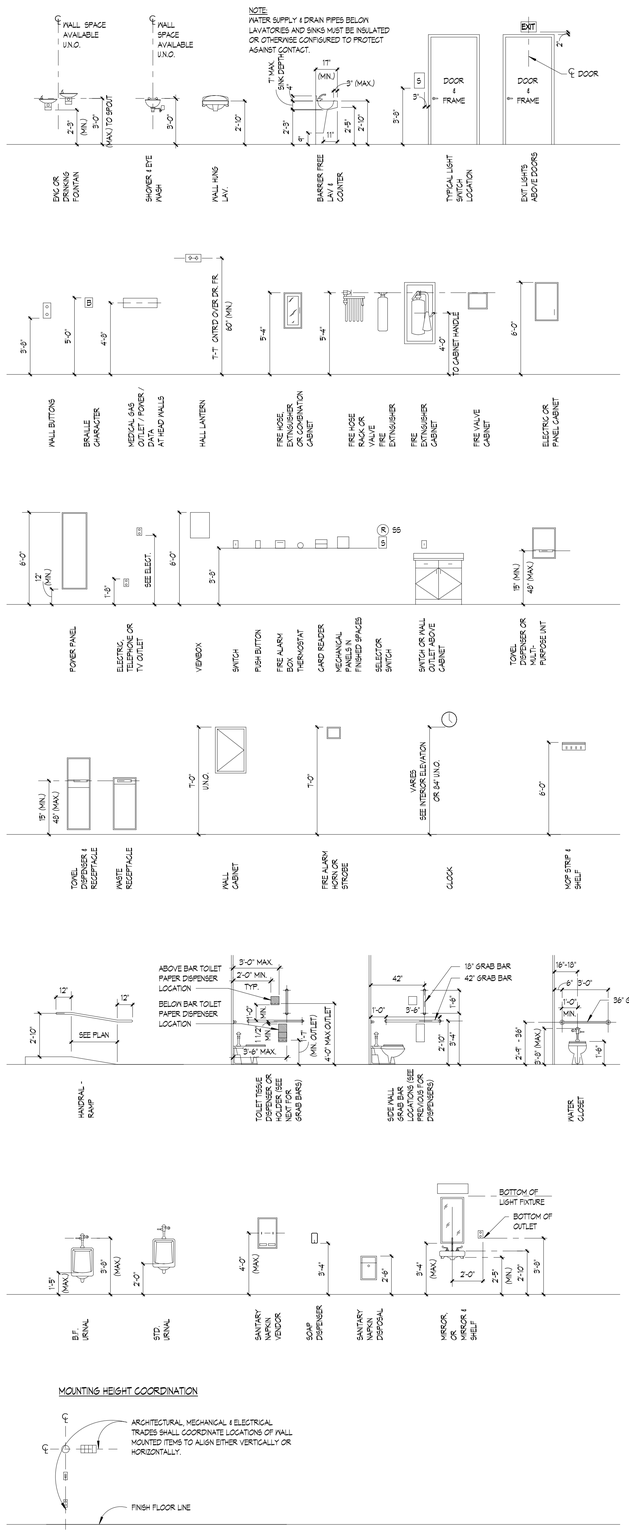
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JOB NO. 2616.11

SHEET TITLE
TITLE SHEET

SHEET NO.
G0.1

MOUNTING HEIGHTS (U.N.O.)



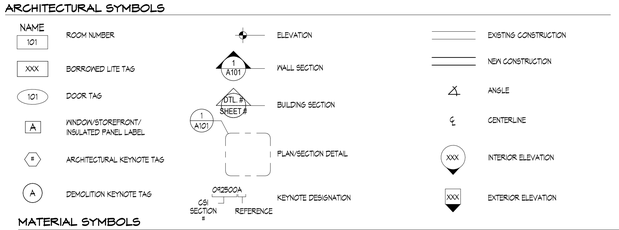
MOUNTING HEIGHT COORDINATION

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ABBREVIATIONS

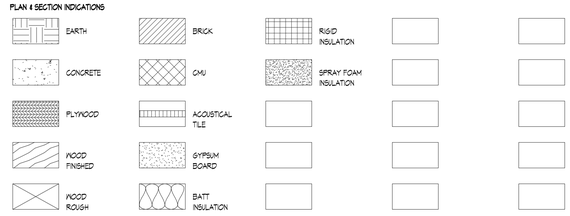
ADJ	ADJACENT
AFF	ABOVE FINISHED FLOOR
AL / ALUM	ALUMINUM
ALT	ALTERNATE
APC	ACOUSTICAL PANEL CEILING
APPROX	APPROXIMATE
ARCH	ARCHITECT / ARCHITECTURAL
AVG	AVERAGE
AWP	ACOUSTICAL WALL PANEL
BD	BOARD
BF	BARRIER FREE
BFF	BELOW FINISHED FLOOR
BFST	BARRIER FREE STONE THRESHOLD
BL	BORROWED LIGHT
BLDG	BUILDING
BLK	BLOCK
BM	BEAM
BN	BULLNOSE
B.O.	BY OWNER
BOD	BOTTOM OF DECK
BOX	BOTTOM OF STEEL
BOT	BOTTOM
BP	BEARING PLATE
BRG	BEARING
BSMT	BASEMENT
CAB	CABINET
CAP	CAPACITY
CB	CHALKBOARD
CJ	CONTROL JOINT
CL	CENTER LINE
CLG	CEILING
CLO	CLOSET
CLR	CLEAR
CMU	CONCRETE MASONRY UNIT
CNTR	COUNTER
COL	COLUMN
CONC	CONCRETE
CONST	CONSTRUCT OR CONSTRUCTION
CONT	CONTINUOUS
CONTR	CONTRACTOR
COR	CORRUGATED
CORR	CORRIDOR
CP	CENTER POINT
CPT	CARPET
CR / CLRM	CLASSROOM
CS	COUNTER SINK
CTF	CERAMIC TILE FLOOR
CTR	CENTER
CTW	CERAMIC TILE WALL
CUST	CUSTODIAN
CU YD	CUBIC YARDS
CYL	CYLINDER
DBL	DOUBLE
DEPT	DEPARTMENT
DET	DETAIL
DIA	DIAMETER
DIAG	DIAGONAL
DIM	DIMENSION
DIR	DIRECTORY
DN	DOWN
DR	DOOR
DS	DOWNSPOUT
DWG	DRAWING
E	EAST
EA	EACH
EJ	EXPANSION JOINT
EL	ELEVATION
ELEV	ELEVATOR
EMER	EMERGENCY
ENCL	ENCLOSURE
ENT	ENTRANCE
EQ	EQUAL
EQUIP	EQUIPMENT
EST	ESTIMATE
EW	EACH WAY
EX / EXIST	EXISTING
EXP	EXPOSED
EXPN	EXPANSION
EXT	EXTERIOR
F	FAHRENHEIT
FB	FACEBRICK
FDN	FOUNDATION
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FH	FULL HEIGHT
FHC	FIRE HOSE CABINET
FIG	FIGURE
FIN	FINISH
FIX	FIXTURE
FL / FLR	FLOOR
FLEX	FLEXIBLE
FR	FRAME
FRPF	FIREPROOF
F.S.	FULL SIZE
FT	FEET
FTG	FOOTING
FURN	FURNITURE
FRP	FIBERGLASS REINFORCED PANEL
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GB	GRAB BAR
GC	GENERAL CONTRACTOR
GEN	GENERAL
GL	GLASS
GOVT	GOVERNMENT
GYP	GYPSUM
HD	HAND
HDWR	HARDWARE
HDWD	HARDWOOD
HM	HOLLOW METAL
HORZ	HORIZONTAL
HP	HIGH POINT
HPC	HIGH PERFORMANCE COATING SYSTEM
HR	HOUR
HT	HEIGHT
ID	INSIDE DIAMETER
IN	INCH
INCL	INCLUDE
INFO	INFORMATION
INSUL	INSULATION
INT	INTERIORS
JAN	JANITOR
JC	JANITOR CLOSET
JCT	JUNCTION
JT	JOINT
KIT	KITCHEN
KP	KICK PLATE
KS	KNEEE SPACE
L	LENGTH
LAB	LABORATORY
LB	POUND
LIN	LINEAR
LKR	LOCKER
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LONG	LONGITUDINAL
LP	LOW POINT
LVT	LUXURY VINYL TILE
MAT / MATL	MATERIAL
MAX	MAXIMUM
MB	MARKERBOARD
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MO	MASONRY OPENING
MS	METAL SHELVING
MTD	MOUNTED
MTL	METAL
MT	METAL TRANSITION
MWL	METAL WARDROBE LOCKER
N	NORTH
NIC	NOT IN CONTRACT
NO	NUMBER
NTS	NOT TO SCALE
OD	OUTSIDE DIAMETER
OFD	OVERFLOW DRAIN
OFF	OFFICE
OH	OVERHAED
OP	OPERABLE PARTITION
OPNG	OPENING
OPP	OPPOSITE
P / PT	PAINT
PART	PARTITION
PC	POLISHED CONCRETE
PERF	PERFORATED
PL	PLATE
PLAM	PLASTIC LAMINATE
PLAT	PLATFORM
PLYD	PLYWOOD
POL	POLISH
P.P.M.	PARTS PER MILLION
PR	PAIR
PREFAB	PREFABRICATED
PREFIN	PREFINISHED
PROJ	PROJECT
PSE	PROJECTION SCREEN - ELECTRIC
PSM	PROJECTION SCREEN - MANUAL
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	POINT
PVC	POLYVINYL-CHLORIDE
1/4 RD	QUARTER ROUND
R / RAD	RADIUS
RAF	RESILIENT ATHLETIC FLOOR
RB	RESILIENT BASE / RUBBER BASE
RD	ROOF DRAIN
REC	RECESSED
RECT	RECTANGLE / RECTANGULAR
REF	REFERENCE
REINF	REINFORCED / REINFORCEMENT
REM	REMOVEABLE
RESIL	RESILIENT
REQD	REQUIRED
REV	REVISION
RFG	ROOFING
RFS	RUBBER FLOOR SHEET
RFT	RUBBER FLOOR TILE
RGH	ROUGH
RM	ROOM
RO	ROUGH OPENING
RSTA	RESILIENT STAIR TREAD ACCESSORY
RT	RESILIENT TRANSITION
S	SOUTH
SAF	SAFETY
SC	SEALED CONCRETE
SCH	SCHEDULE
SECT	SECTION
SECY	SECRETARY
SEQ	SEQUENCE
SHT	SHEET
SIM	SIMILAR
SPEC	SPECIFICATIONS
SPF	SOUNDPROOF
SPM	SINGLE PLY MEMBRANE
SQ	SQUARE
SS	STAINLESS STEEL
STA	STATION
STD	STANDARD
STL	STEEL
STOR	STORAGE
STR	STRUCTURAL
SUB	SUB FLOOR
SUSP	SUSPENDED
SYM	SYMMETRICAL
ST / STOR	STORAGE
SV	SHEET VINYL FLOORING
T	TOILET
T&G	TONGUE & GROOVE
TA	TOILET ACCESSORY
TB	TACK BOARD
TC	TOP CHORD
TCX	TOP CHORD EXTENSION
TEL	TELEPHONE
TEMP	TEMPERATURE
THK	THICK
TOB	TOP OF BEAM
TOF	TOP OF FOOTING
TOJ	TOP OF JOIST
TOL	TOP OF LEDGE
TOM	TOP OF MASONRY
TOS	TOP OF STEEL
TOW	TOP OF WALL
TS	TUBE STEEL
TV	TELEVISION
TYP	TYPICAL
TZ	TERRAZZO
TZT	TERRAZZO TILE
UNFIN	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
VBS	VOLLEYBALL STANDARD
VCT	VINYL COMPOSITION TILE
VDB	VISUAL DISPLAY BOARD
VERT	VERTICAL
VEST	VESTIBULE
VIF	VERIFY IN FIELD
VIN	VINYL
VOL	VOLUME
VRB	VENTER RUBBER BASE
W	WEST
W/	WITH
WAF	WID ATHLETIC FLOOR
WB	WOOD BASE
WC	WALL COVERING
WD	WOOD
W/O	WITHOUT
W.P.	WORKING POINT
WPF	WATERPROOF
WT	WEIGHT
YD	YARD

ARCHITECTURAL SYMBOLS



MATERIAL SYMBOLS

PLAN & SECTION INDICATIONS



KINGSCOTT
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J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

ISSUANCES	DATE
BID & CONSTRUCTION	11/07/2025

KEY PLAN

N

JOB NO. 2616.11

SHEET TITLE
DATA SHEET

SHEET NO.
G0.2

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COMPOSITE PLAN GENERAL NOTES

UNAFFECTED EXISTING AREA

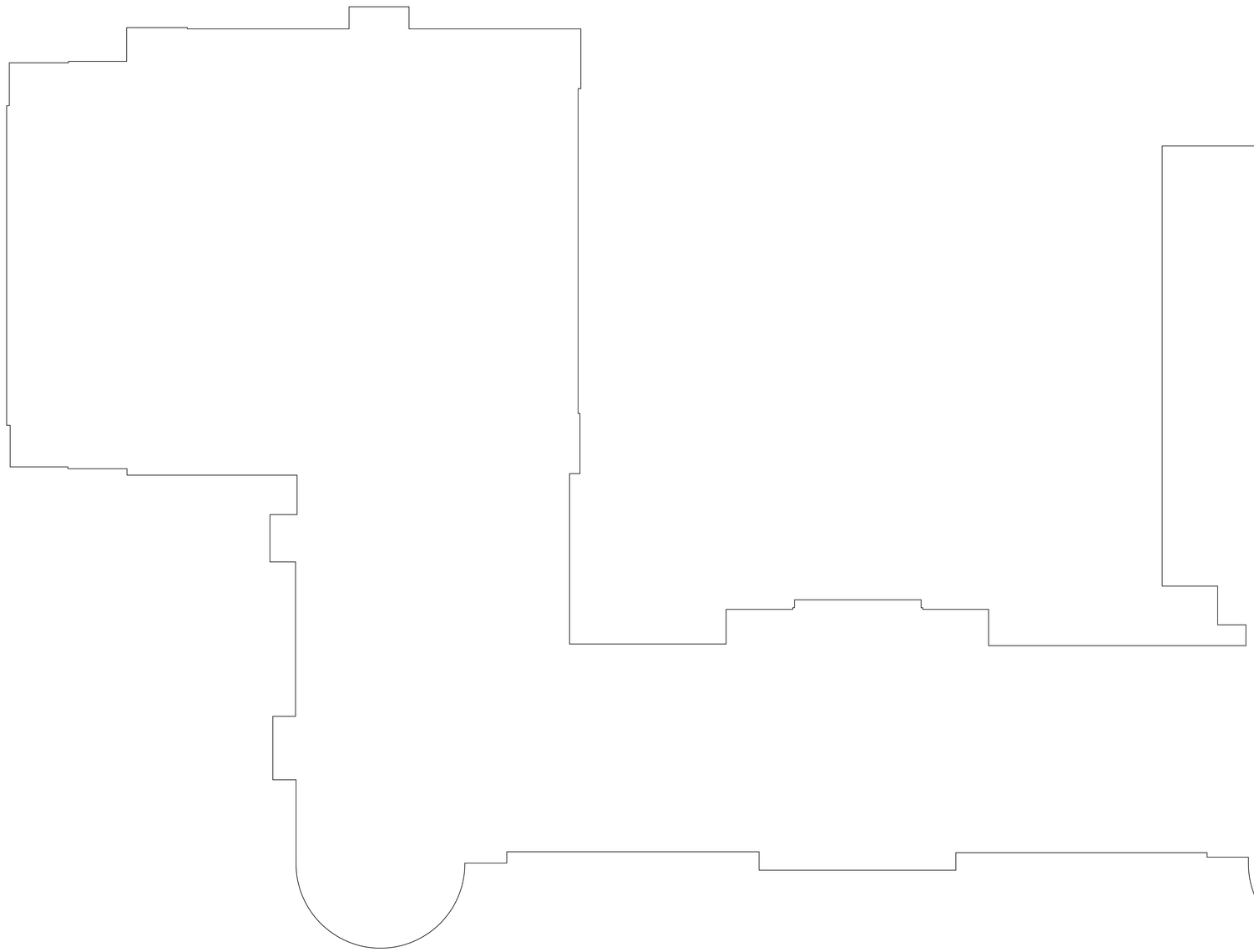
MAJOR REMODELED AREA

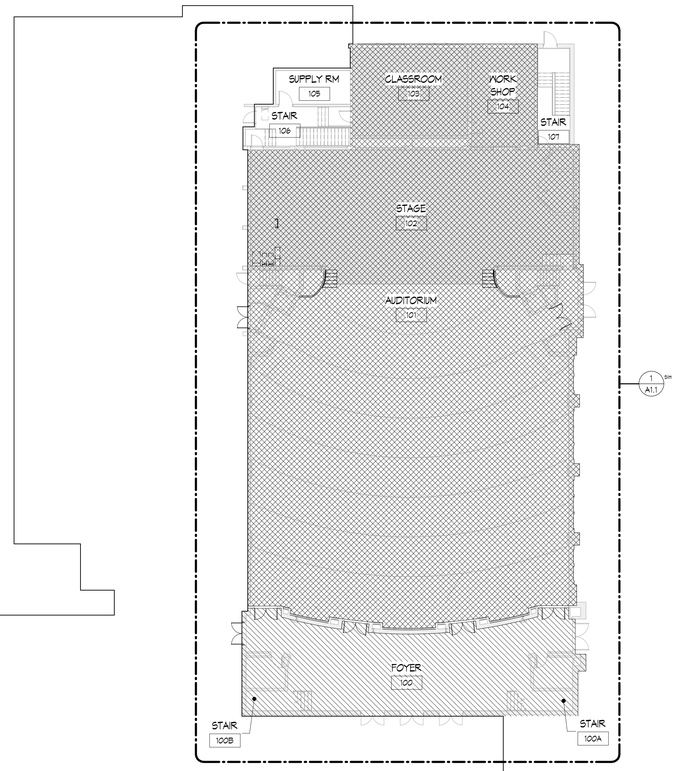
MINOR REMODELED AREA

* SHOWN FOR GENERAL ORIENTATION / REFERENCE ONLY

NAME
101 INDICATES CONSTRUCTION DOCUMENT ROOM NUMBERS.

REFER TO CODE COMPLIANCE SHEETS FOR BUILDING CODE REQUIREMENTS.





1 FIRST FLOOR COMPOSITE FLOOR PLAN
1/16" = 1'-0"

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J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

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N

JOB NO. 2616.11

SHEET TITLE
FIRST FLOOR COMPOSITE PLAN

SHEET NO.
A0.1

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BUILDING CODE INFORMATION

BUILDING CODES:	MICHIGAN BUILDING CODE 2021 2018 NFPA 101 LIFE SAFETY CODE.
BARRIER FREE DESIGN:	MICHIGAN BUILDING CODE 2021 CHAPTER 11
PLUMBING CODE:	MICHIGAN PLUMBING CODE 2021
MECHANICAL CODE:	MICHIGAN MECHANICAL CODE 2021
ELECTRICAL CODE:	MICHIGAN ELECTRICAL CODE 2023
OCCUPANCY:	E (EDUCATIONAL) A-1 (ASSEMBLY)
CONSTRUCTION TYPE:	II B (EXISTING)
EXISTING BUILDING:	PARTIALLY SPRINKLERED (STAGE AREA)

FIRST LEVEL SEATING CAPACITY: 823 SEATS
FIRST LEVEL WHEELCHAIR SEATING REQUIRED: 9 SEATS

BALCONY SEATING CAPACITY: 656 SEATS (EXISTING TO REMAIN)
BALCONY TO BE ADDRESSED IN LATER PHASE

SEPARATED OCCUPANCIES: A, E: NO SEPARATION REQUIREMENT
CORRIDOR: 1 HOUR
EGRESS STAIR: 1 HOUR
STAGE: 2 HOUR (SPRINKLERED)

MEANS OF EGRESS REQUIREMENTS:	ALLOWED
COMMON PATH: (NFPA 13.2.5.2.) & (M.B.C. 1006.2.1)	75' - 0"
EXIT TRAVEL DISTANCE: (N.F.P.A. 13.2.6.2.) & (MBC 1017.2)	250'-0" (W/ FIRE SUPPRESSION) 200'-0" (W/O FIRE SUPPRESSION)

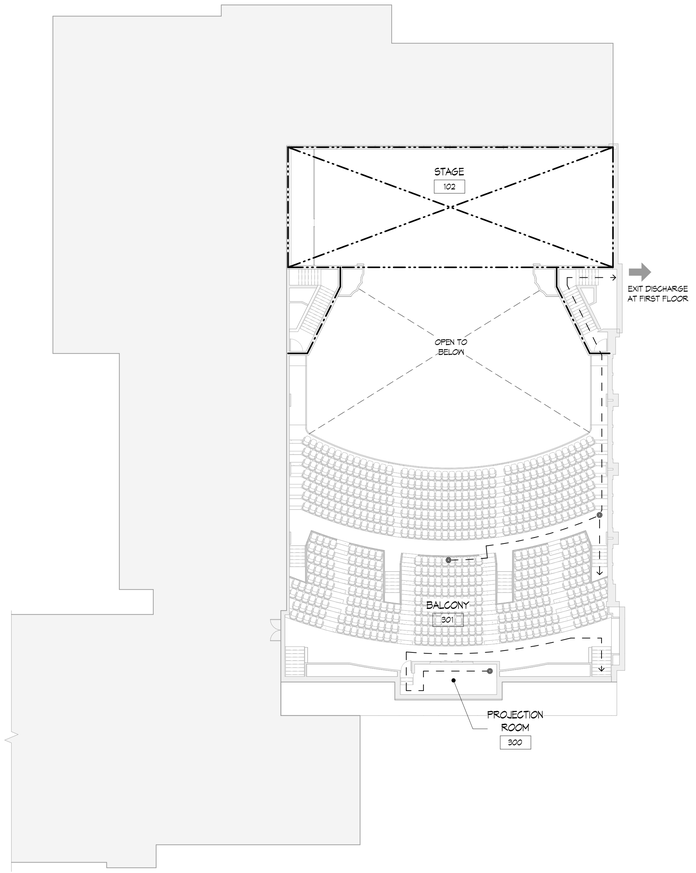
TOTAL EXISTING BUILDING AREA: 224,500 S.F.
TOTAL RENOVATION AREA: 29,420 S.F.

CODE COMPLIANCE LEGEND

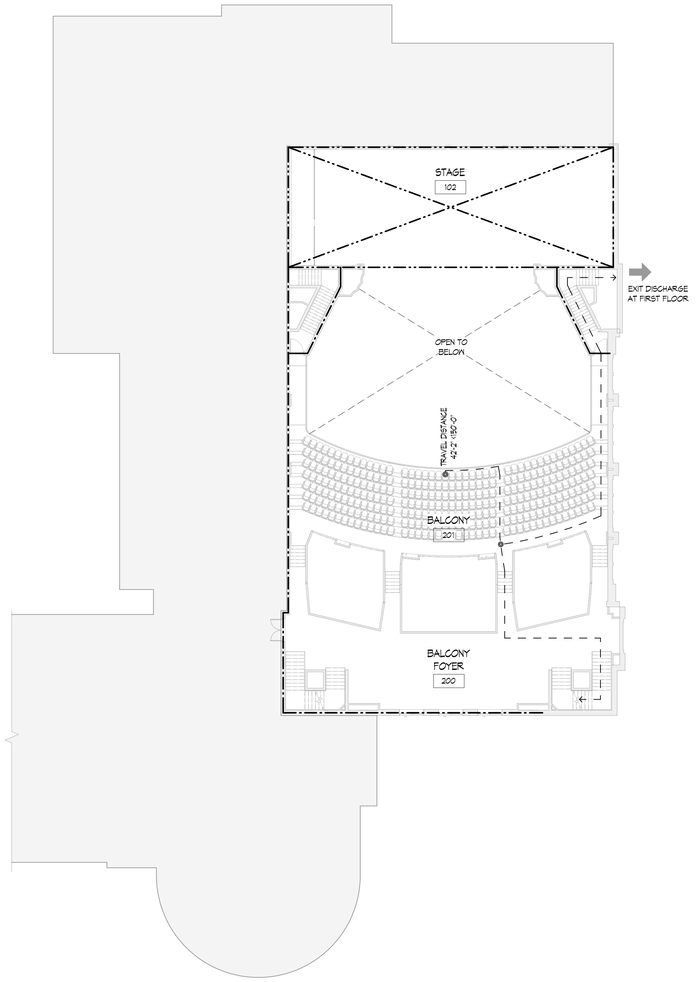
- PRESUMED 1 HOUR FIRE RATED BARRIER.
- PRESUMED 2 HOUR FIRE SEPARATION AREA.
- NEW FIRE CURTAIN
- FIRE EXTINGUISHER / FIRE EXTINGUISHER CABINET. SEE SHEETS 1/A1_ THRU A1_ FOR LOCATIONS.
- EXIT
- NAME / XXX — ROOM NAME & ROOM NUMBER

GENERAL NOTES

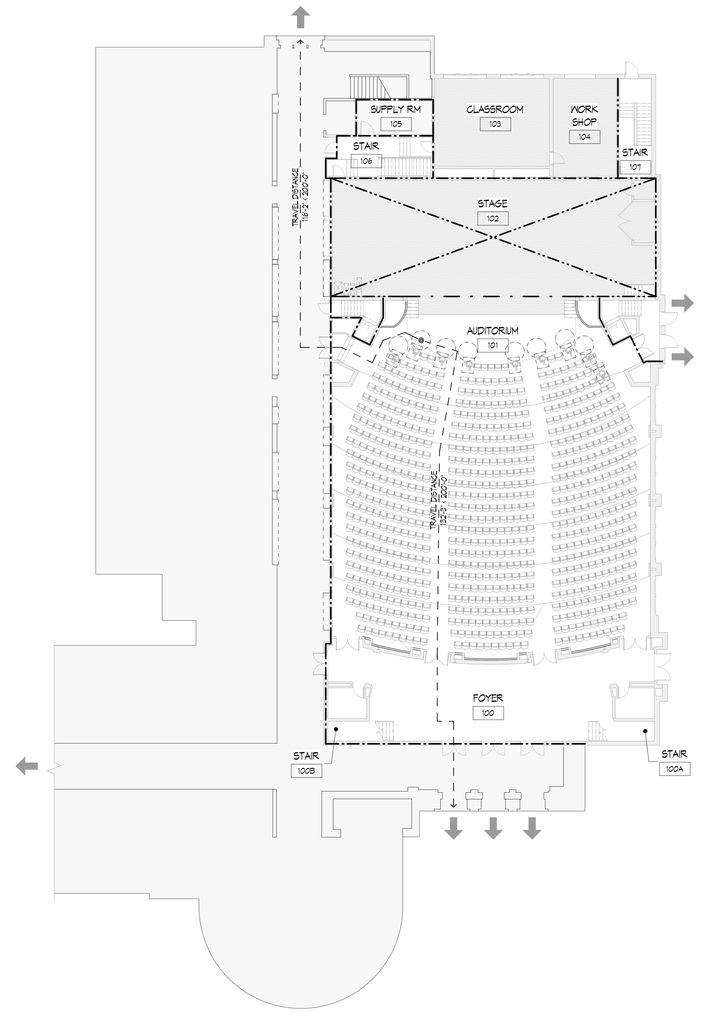
1. SEAL ALL PENETRATIONS AND OPENINGS IN FIRE RATED WALL CONSTRUCTION WITH FIRE RESISTANT RATED SEALANT AND / OR FIRE STOPPING TO MATCH WALL RATING AS INDICATED.



3 THIRD FLOOR CODE COMPLIANCE PLAN
1/16" = 1'-0"



2 SECOND FOOR CODE COMPLIANCE PLAN
1/16" = 1'-0"



1 FIRST FLOOR CODE COMPLIANCE PLAN
1/16" = 1'-0"

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LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

ISSUANCES	DATE
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N

JOB NO. 2616.11

SHEET TITLE
CODE COMPLIANCE PLANS

SHEET NO.
A0.3

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ROOF PLAN GENERAL NOTES

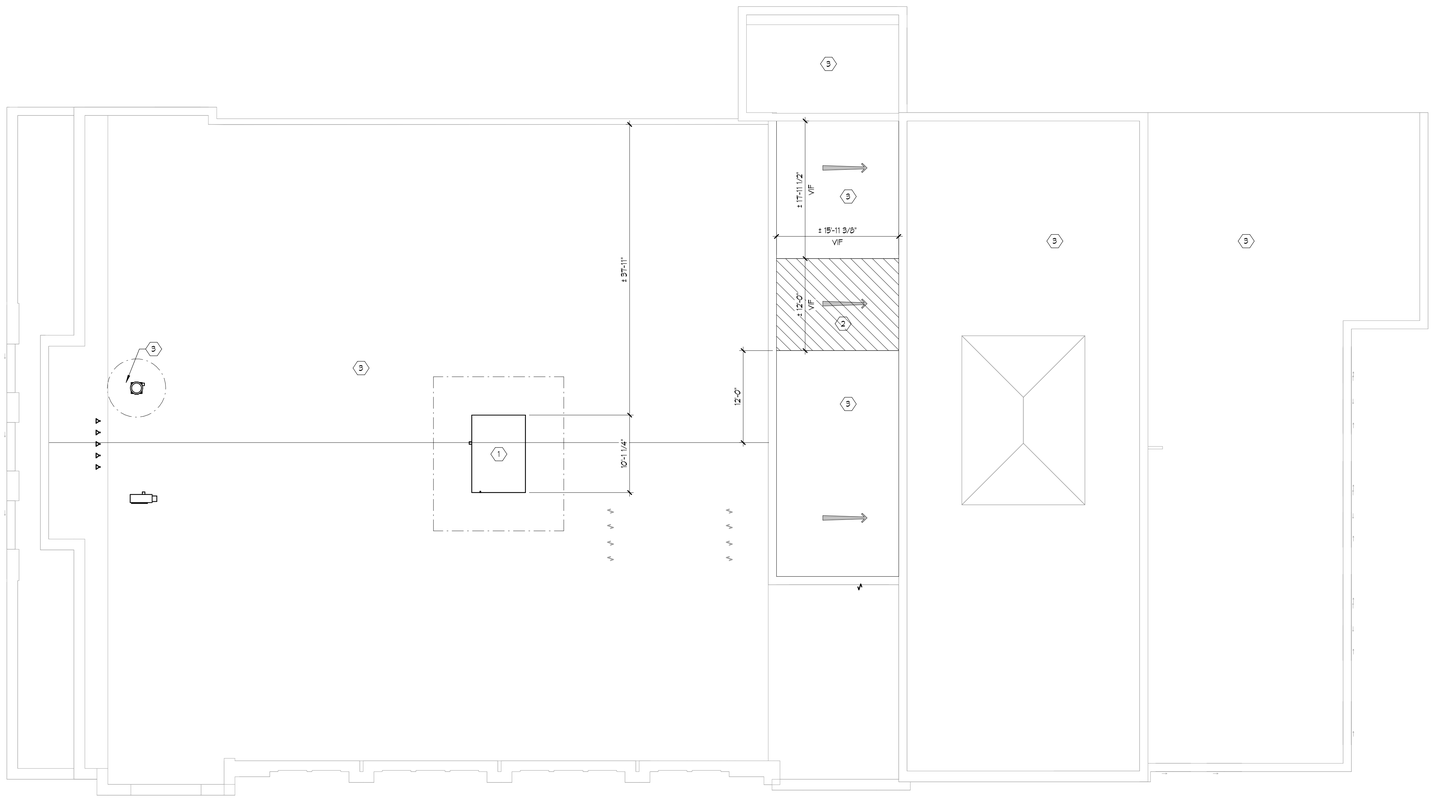
1. FOR MECHANICAL EQUIPMENT INSTALLED ON ROOF, CONTRACTOR SHALL INSTALL EQUIPMENT SUPPORTS, ROOF CURBS OR PADS AS REQUIRED TO POSITION EQUIPMENT THE REQUIRED DISTANCE ABOVE FINISHED ROOF SURFACE. SEE MECHANICAL PLANS FOR ROOF-MOUNTED EQUIPMENT. INSTALL NEW ROOF TOP EQUIPMENT PER EXISTING ROOF MANUFACTURERS INSTRUCTIONS TO MAINTAIN EXISTING WARRANTIES.
2. PROVIDE TREATED WOOD CURB RAILS ON WALK PADS FOR SMALL CONDENSER UNIT ASSOCIATED W/ FAN COIL UNITS. SEE MECHANICAL FOR LOCATIONS. SEE STRUCTURAL STANDARD DETAILING FOR PLACEMENT AND JOIST REINFORCEMENT.
3. ROOF SLOPES TO BE A MINIMUM OF 1/4" PER FOOT. TAPERED INSULATION ROOF SADDLES TO SLOPE TO ROOF DRAINS AS REQUIRED TO MAKE A COMPLETE SYSTEM OF 1/4" PER FOOT SLOPE.
4. TAPERED INSULATION INDICATED IS FOR DESIGN INTENT ONLY. ROOFING CONTRACTOR IS RESPONSIBLE FOR ALL SITE VERIFICATION AND FINAL INSULATION LAYOUTS TO ENSURE POSITIVE DRAINAGE. SUBMIT SHOP DRAWINGS OF TAPER AND INSULATION PLAN AT ALL NEW ROOF AREAS.
5. PROVIDE SINGLE MEMBRANE ROOFING COMPLETE WITH FLASHING AT CORNERS, COPING AND JUNCTIONS, U.N.O.

ROOF PLAN LEGEND

- ROOF STRUCTURE SLOPE DIRECTION
- TAPERED INSULATION SLOPE DIRECTION
- BUILT-UP TAPERED INSULATION

ROOF PLAN KEYNOTES

1. MECHANICAL EQUIPMENT ON NEW ROOF CURB - REFER TO MECHANICAL DRAWINGS.
2. DEMO & REPLACE ROOF AREA AS REQ. FOR THE INSERTION OF MECHANICAL EQUIPMENT. REFER TO MECHANICAL DRAWINGS.
3. EXISTING ROOF - NO WORK.
4. EXHAUST FAN - REFER TO MECHANICAL DRAWINGS.



1 ROOF PLAN
1/8" = 1'-0"

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J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

ISSUANCES	DATE
BID & CONSTRUCTION	11/07/2025

KEY PLAN

N

JOB NO. 2616.11

SHEET TITLE
ROOF PLAN

SHEET NO.
A0.5

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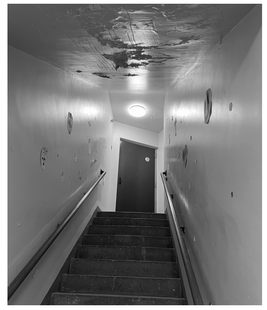
STAGE LEFT BALCONY CEILING



STAGE LEFT STAIRWELL LOBBY



STAGE RIGHT STAIRWELL TO CORRIDOR FROM BALCONY



STAGE RIGHT STAIRWELL TO BALCONY FROM CORRIDOR



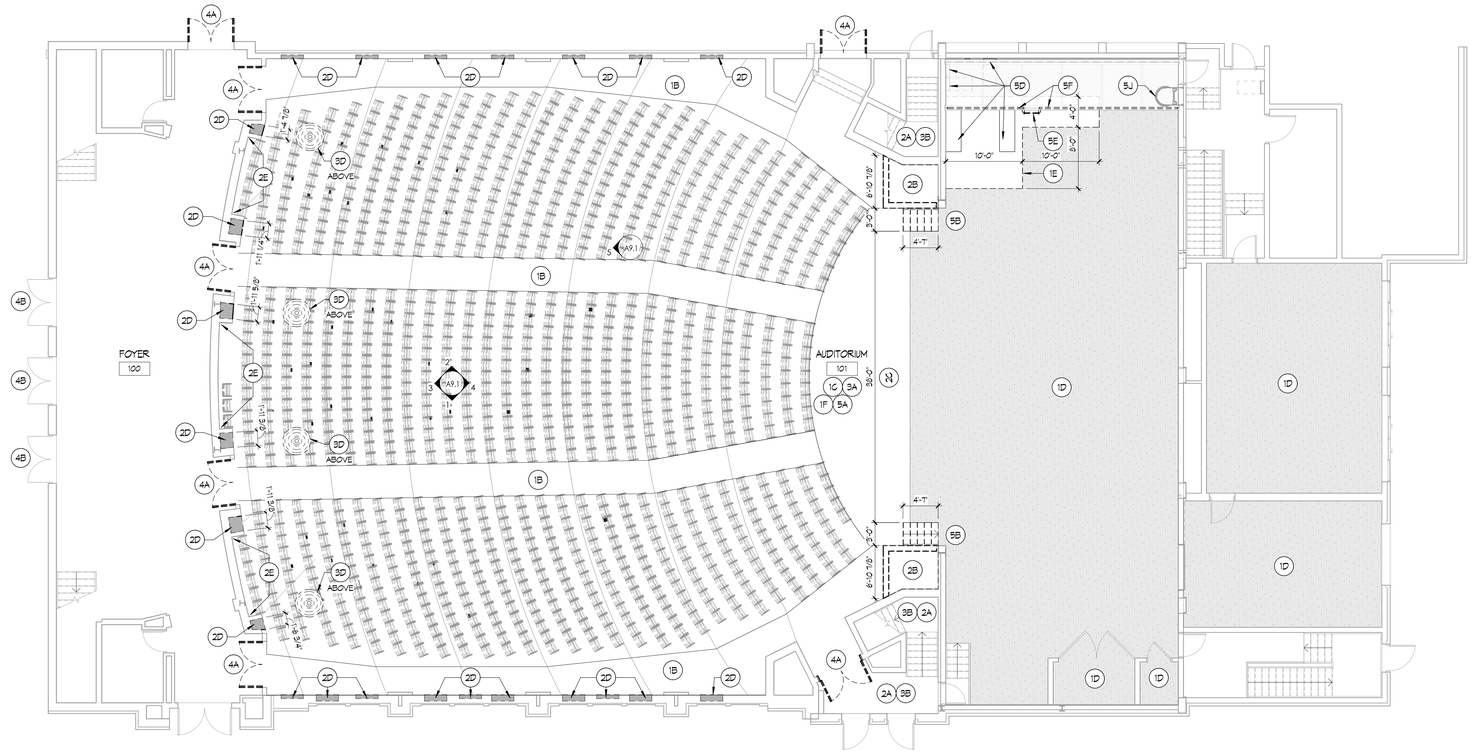
STAGE RIGHT STAIRWELL TO CORRIDOR FROM BALCONY



STAGE RIGHT STAIRWELL TO CORRIDOR FROM BALCONY



STAGE LEFT STAIRWELL TO BALCONY



1 FIRST FLOOR AUDITORIUM DEMOLITION PLAN

1/8" = 1'-0"

DEMOLITION PLAN GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH ALL OTHER DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL AREAS THAT WILL REQUIRE DEMOLITION NOT INDICATED ON THESE SHEETS.
2. THE DEMOLITION PLANS GENERALLY INDICATE AREAS OF EXTENSIVE REMOVALS AND DO NOT INDICATE ALL OF THE WORK. CONTRACTOR SHALL PERFORM ALL DEMOLITION WHICH IS NECESSARY FOR THE PROPER EXECUTION OF THE PROJECT WHETHER OR NOT SAID DEMOLITION IS SPECIFICALLY INDICATED WITHIN THE DOCUMENTS.
3. CONTRACTOR IS RESPONSIBLE TO INFILL, PATCH AND/ OR REPAIR, EXISTING WALL, FLOORS AND CEILINGS TO MATCH EXISTING WHERE DEMOLITION OCCURS OTHER THAN AS DESCRIBED IN THESE DOCUMENTS.
4. IT IS THE INTENTION OF THESE DOCUMENTS THAT THE DEMOLITION OF PORTIONS OF MASONRY WALLS (BOTH INTERIOR AND EXTERIOR) ARE GENERALLY TO BE DONE ALONG JOINT AND COURSING LINES.
5. PATCH AND REPAIR REMAINING ADJACENT SURFACES AT AREAS OF REMOVAL AND/ OR ALTERATION TO MATCH EXISTING. PROVIDE A SOUND AND PROPER SUBSTRATE FOR NEW FINISH. COORDINATE WITH COLOR PLANS. WHERE A NEW FINISH IS NOT INDICATED, MATCH EXISTING ADJACENT FINISHES.
6. ALL DEMOLITION IS TO BE DONE WITH REASONABLE CARE AS TO MINIMIZE DAMAGE TO EXISTING REMAINING SURFACES. CONTRACTOR IS RESPONSIBLE TO PROPERLY DISPOSE OF ALL DEMOLISHED ITEMS NOT INDICATED TO BE RELOCATED OR TURNED OVER TO OWNER.
7. REMOVE AND TURN OVER TO OWNER ALL FIRE EXTINGUISHERS AND CABINETS AT AREAS TO BE DEMOLISHED, IF NOT OTHERWISE INDICATED TO BE RELOCATED.
8. CLEAN AND PREPARE ALL EXISTING SURFACES WHICH ARE TO BE PAINTED/ PATCHED. PREPARATION TO INCLUDE MINOR PATCHING.
9. PROVIDE TEMPORARY SHORING, BRACING, AND/ OR SUPPORTS AS REQUIRED FOR WALL AND/ OR ROOF AT AREAS OF REMOVAL AND ALTERATION.
10. COORDINATE WITH MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS FOR FURTHER DEMOLITION NOTES.

DEMOLITION PLAN KEYNOTES

1 **FLOORS**

A. SAWCUT OPENING FOR MECHANICAL. COORDINATE LOCATIONS WITH CONTRACTORS.

B. REMOVE AND DISPOSE OF AISLE CARPETING AND PERIMETER WOODEN BASE AT FIRST FLOOR. PREP REMAINING SURFACES TO RECEIVE NEW FINISH.

C. REMOVE AND DISPOSE OF LINOLEUM FLOORING.

D. SAND DOWN STAGE FLOORING IN PREPARATION FOR RE-FINISHING.

E. REMOVE AND DISPOSE OF WOOD PLATFORM AND WOOD/ METAL SUPPORT ON STAGE FLOOR AS INDICATED IN PLAN.

F. REMOVE AND DISPOSE OF ALL EXISTING FLOOR GRILLES IN AUDITORIUM SEATING AREA, TYPICAL OF 45 INSTANCES. COORDINATE WITH MECHANICAL. CONCRETE PATCH AT ALL LOCATIONS OF REMOVAL.

G. REMOVE AND DISPOSE OF FLOOR MOUNTED LOUVER.

H. EXISTING CONCRETE CURBS AND MISC. WOOD CURB TO BE DEMOLISHED.

2 **WALLS**

A. AREAS OF WALL SURFACES PREPPED FOR PATCH & REPAIR AS A RESULT OF PRE-EXISTING DAMAGE, LIGHTING COORDINATION, AND REMOVAL OF ACOUSTICAL PANELS.

B. REMOVE EXISTING STAGE CHEEK WALLS & WOOD PANELING AS INDICATED UP TO 9'-0", UPPER PORTION OF CHEEK WALL TO REMAIN.

C. REMOVE AND DISPOSE OF EXISTING VERTICAL WOOD PANELING & METAL RAILING HOLDERS MOUNTED AT FRONT OF STAGE. SALVAGE EXISTING DECORATIVE GRATES AT STAGE FRONT AND SIDE AREAS. COORDINATE REMOVAL OF SURFACE MOUNTED CONDUIT AND POWER BOXES WITH ELECTRICAL DRAWINGS.

D. PARTIAL WALL REMOVAL REQUIRED AT AREAS OF MECHANICAL DEMOLITION AND ACCESS FOR NEW MECHANICAL SCOPE.

E. REMOVE AND DISPOSE OF ACOUSTICAL WALL SURFACE. PREP FOR NEW WORK.

F. PARTIAL WALL REMOVAL AT EXISTING OPENINGS FOR THE INSTALLATION OF NEW MECHANICAL LOUVER. COORDINATE WITH MECHANICAL DRAWINGS.

3 CEILINGS

A. PARTIAL REMOVAL OF EXISTING CEILING AS REQUIRED FOR THE INSTALLATION OF MECHANICAL EQUIPMENT. COORDINATE WITH MECHANICAL DRAWINGS. PATCH AND REPAIR AS NEEDED TO MATCH EXISTING ADJACENT SURFACES.

B. AREAS OF PLASTER CEILING SURFACES PREPPED FOR PATCH & REPAIR AS A RESULT OF PRE-EXISTING DAMAGE. REFER TO PHOTOS ON SHEET D1.1 AND CONTRACTOR TO VERIFY EXTENTS NEEDED IN FIELD.

C. DEMOLISH STAGE AREA BULKHEAD AND SOFFIT. SEE REFLECTED CEILING PLAN FOR EXTENTS.

D. REMOVE EXISTING DIFFUSERS AT FIRST FLOOR (BELOW BALCONY) CEILING.

4 DOORS

A. REMOVE AND DISPOSE OF INTERIOR DOOR, INCLUDING FRAME. ALL RELATED ANCHORS AND SUPPORTS. SAWCUT ALL FRAME ANCHORS - PRYING ANCHORS FROM SUBSTRATES IS UNACCEPTABLE. SALVAGE HARDWARE & RETURN TO OWNER.

B. DOOR, FRAME, GLAZING & TRANSOMS TO REMAIN. STRIP PAINT AT DOOR AND FRAMES. LIGHTLY SAND REMAINING SURFACES. PREP SURFACES TO RECEIVE NEW STAIN FINISH.

5 MISCELLANEOUS

A. REMOVE AND SALVAGE OF ALL FIRST FLOOR AUDITORIUM FIXED SEATING. GRIND EXISTING MOUNTING BRACKET LOCATIONS AND PATCH TO SMOOTH. COORDINATE RETURN OF SEATING WITH OWNER.

B. REMOVE AND DISPOSE OF STAGE STAIRS. PREP FOR INSTALLATION OF NEW STAIR.

C. REMOVE AND DISPOSE OF EXISTING MECHANICAL LOUVER.

D. ELECTRICAL EQUIPMENT TO BE REMOVED - REFER TO ELECTRICAL DRAWINGS.

E. REMOVE AND DISPOSE OF LADDER UP TO FIRST RIGGING PLATFORM.

F. REMOVE AND DISPOSE OF LOADING GALLERY GUARDRAILS.

G. REMOVE AND RETURN TO OWNER ROUND FIXTURE ON SIDE OF BALCONY FACE. PATCH AND REPAIR AS NEEDED. PREP FOR PAINT.

H. MECHANICAL EQUIPMENT TO BE DEMOLISHED. REFER TO MECHANICAL DRAWINGS.

I. NOT USED.

J. EXISTING CAGED LADDER TO REMAIN.

K. REMOVE AND DISPOSE OF BACK RON OF BALCONY SEATING.

L. REMOVE AND RETAIN/ PROTECT EXISTING EQUIPMENT. COORDINATE WITH OWNER.

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KEY PLAN

N

JOB NO. 2616.11

SHEET TITLE

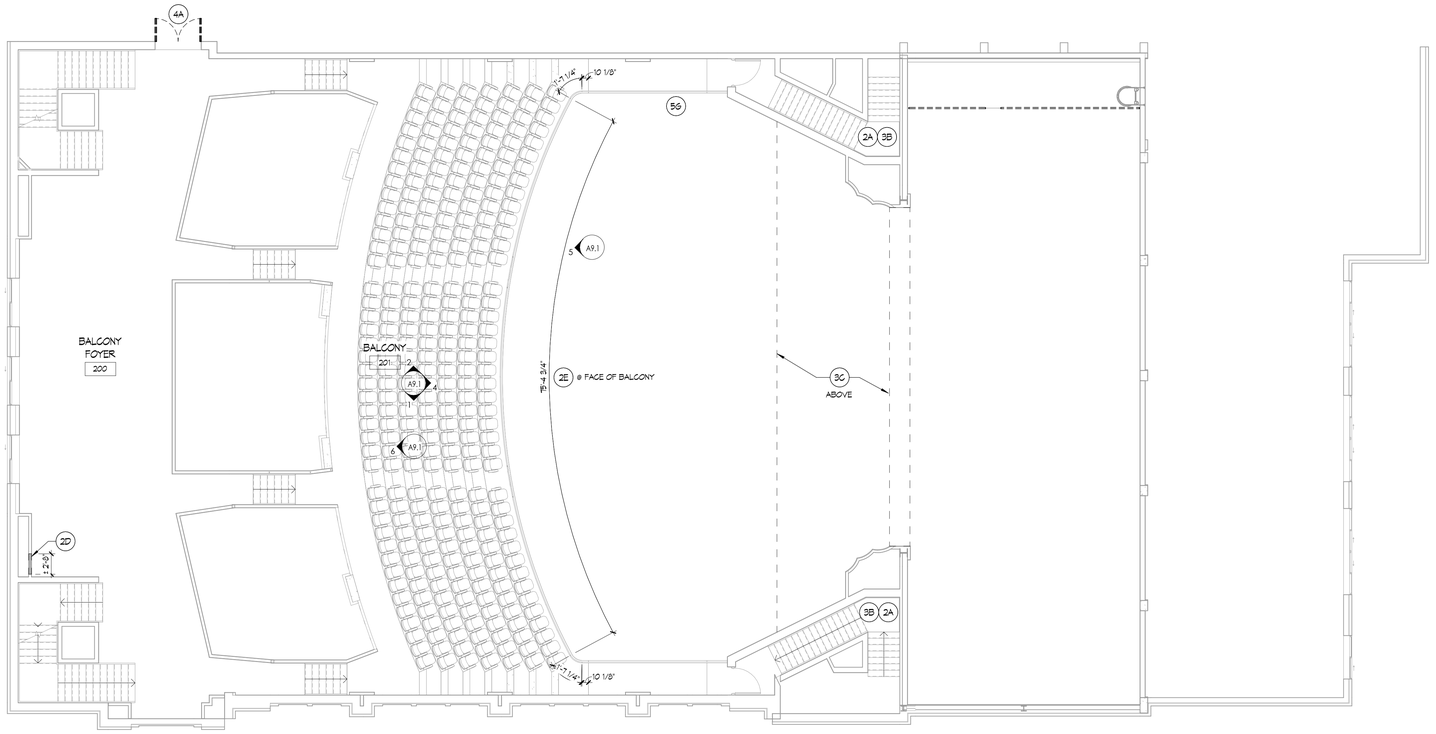
FIRST FLOOR AUDITORIUM DEMOLITION PLAN

SHEET NO.

D1.1

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1 SECOND FLOOR AUDITORIUM DEMOLITION PLAN
1/8" = 1'-0"

DEMOLITION PLAN GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH ALL OTHER DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL AREAS THAT WILL REQUIRE DEMOLITION NOT INDICATED ON THESE SHEETS.
2. THE DEMOLITION PLANS GENERALLY INDICATE AREAS OF EXTENSIVE REMOVALS AND DO NOT INDICATE ALL OF THE WORK. CONTRACTOR SHALL PERFORM ALL DEMOLITION WHICH IS NECESSARY FOR THE PROPER EXECUTION OF THE PROJECT WHETHER OR NOT SAID DEMOLITION IS SPECIFICALLY INDICATED WITHIN THE DOCUMENTS.
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4. IT IS THE INTENTION OF THESE DOCUMENTS THAT THE DEMOLITION OF PORTIONS OF MASONRY WALLS (BOTH INTERIOR AND EXTERIOR) ARE GENERALLY TO BE DONE ALONG JOINT AND COURSING LINES.
5. PATCH AND REPAIR REMAINING ADJACENT SURFACES AT AREAS OF REMOVAL AND/ OR ALTERATION TO MATCH EXISTING. PROVIDE A SOUND AND PROPER SUBSTRATE FOR NEW FINISH. COORDINATE WITH COLOR PLANS. WHERE A NEW FINISH IS NOT INDICATED, MATCH EXISTING ADJACENT FINISHES.
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7. REMOVE AND TURN OVER TO OWNER ALL FIRE EXTINGUISHERS AND CABINETS AT AREAS TO BE DEMOLISHED, IF NOT OTHERWISE INDICATED TO BE RELOCATED.
8. CLEAN AND PREPARE ALL EXISTING SURFACES WHICH ARE TO BE PAINTED/ PATCHED. PREPARATION TO INCLUDE MINOR PATCHING.
9. PROVIDE TEMPORARY SHORING, BRACING, AND/ OR SUPPORTS AS REQUIRED FOR WALL AND/ OR ROOF AT AREAS OF REMOVAL AND ALTERATION.
10. COORDINATE WITH MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS FOR FURTHER DEMOLITION NOTES.

DEMOLITION PLAN KEYNOTES

(1) FLOORS

A. SAWCUT OPENING FOR MECHANICAL. COORDINATE LOCATIONS WITH CONTRACTORS.

B. REMOVE AND DISPOSE OF AISLE CARPETING AND PERIMETER WOODEN BASE AT FIRST FLOOR. PREP REMAINING SURFACES TO RECEIVE NEW FINISH.

C. REMOVE AND DISPOSE OF LINOLEUM FLOORING.

D. SAND DOWN STAGE FLOORING IN PREPARATION FOR RE-FINISHING.

E. REMOVE AND DISPOSE OF WOOD PLATFORM AND WOOD/ METAL SUPPORT ON STAGE FLOOR AS INDICATED IN PLAN.

F. REMOVE AND DISPOSE OF ALL EXISTING FLOOR GRILLES IN AUDITORIUM SEATING AREA, TYPICAL OF 48 INSTANCES. COORDINATE WITH MECHANICAL. CONCRETE PATCH AT ALL LOCATIONS OF REMOVAL.

G. REMOVE AND DISPOSE OF FLOOR MOUNTED LOUVER.

H. EXISTING CONCRETE CURBS AND MISC. WOOD CURB TO BE DEMOLISHED.

(2) WALLS

A. AREAS OF WALL SURFACES PREPPED FOR PATCH & REPAIR AS A RESULT OF PRE-EXISTING DAMAGE, LIGHTING COORDINATION, AND REMOVAL OF ACOUSTICAL PANELS.

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C. REMOVE AND DISPOSE OF EXISTING VERTICAL WOOD PANELING & METAL RAILING HOLDERS MOUNTED AT FRONT OF STAGE. SALVAGE EXISTING DECORATIVE GRATES AT STAGE FRONT AND SIDE AREAS. COORDINATE REMOVAL OF SURFACE MOUNTED CONDUIT AND POWER BOXES WITH ELECTRICAL DRAWINGS.

D. PARTIAL WALL REMOVAL REQUIRED AT AREAS OF MECHANICAL DEMOLITION AND ACCESS FOR NEW MECHANICAL SCOPE.

E. REMOVE AND DISPOSE OF ACOUSTICAL WALL SURFACE. PREP FOR NEW WORK.

F. PARTIAL WALL REMOVAL AT EXISTING OPENINGS FOR THE INSTALLATION OF NEW MECHANICAL LOUVER. COORDINATE WITH MECHANICAL DRAWINGS.

(3) CEILINGS

A. PARTIAL REMOVAL OF EXISTING CEILING AS REQUIRED FOR THE INSTALLATION OF MECHANICAL EQUIPMENT. COORDINATE WITH MECHANICAL DRAWINGS. PATCH AND REPAIR AS NEEDED TO MATCH EXISTING ADJACENT SURFACES.

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C. DEMOLISH STAGE AREA BULKHEAD AND SOFFIT. SEE REFLECTED CEILING PLAN FOR EXTENTS.

D. REMOVE EXISTING DIFFUSERS AT FIRST FLOOR (BELOW BALCONY) CEILING.

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B. DOOR, FRAME, GLAZING & TRANSOMS TO REMAIN. STRIP PAINT AT DOOR AND FRAMES, LIGHTLY SAND REMAINING SURFACES. PREP SURFACES TO RECEIVE NEW STAIN FINISH.

(5) MISCELLANEOUS

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B. REMOVE AND DISPOSE OF STAGE STAIRS. PREP FOR INSTALLATION OF NEW STAIR.

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D. ELECTRICAL EQUIPMENT TO BE REMOVED - REFER TO ELECTRICAL DRAWINGS.

E. REMOVE AND DISPOSE OF LADDER UP TO FIRST RIGGING PLATFORM.

F. REMOVE AND DISPOSE OF LOADING GALLERY GUARDRAILS.

G. REMOVE AND RETURN TO OWNER ROUND FIXTURE ON SIDE OF BALCONY FACE. PATCH AND REPAIR AS NEEDED, PREP FOR PAINT.

H. MECHANICAL EQUIPMENT TO BE DEMOLISHED. REFER TO MECHANICAL DRAWINGS.

I. NOT USED.

J. EXISTING CAGED LADDER TO REMAIN.

K. REMOVE AND DISPOSE OF BACK ROW OF BALCONY SEATING.

L. REMOVE AND RETAIN/ PROTECT EXISTING EQUIPMENT. COORDINATE WITH OWNER.

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Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

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ISSUANCES	DATE
BID & CONSTRUCTION	11/07/2025

KEY PLAN

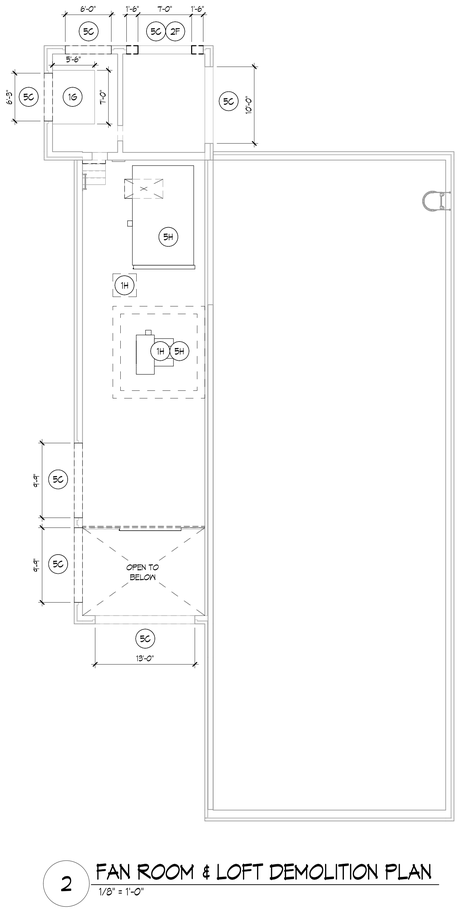
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SHEET TITLE
SECOND FLOOR AUDITORIUM DEMOLITION PLAN

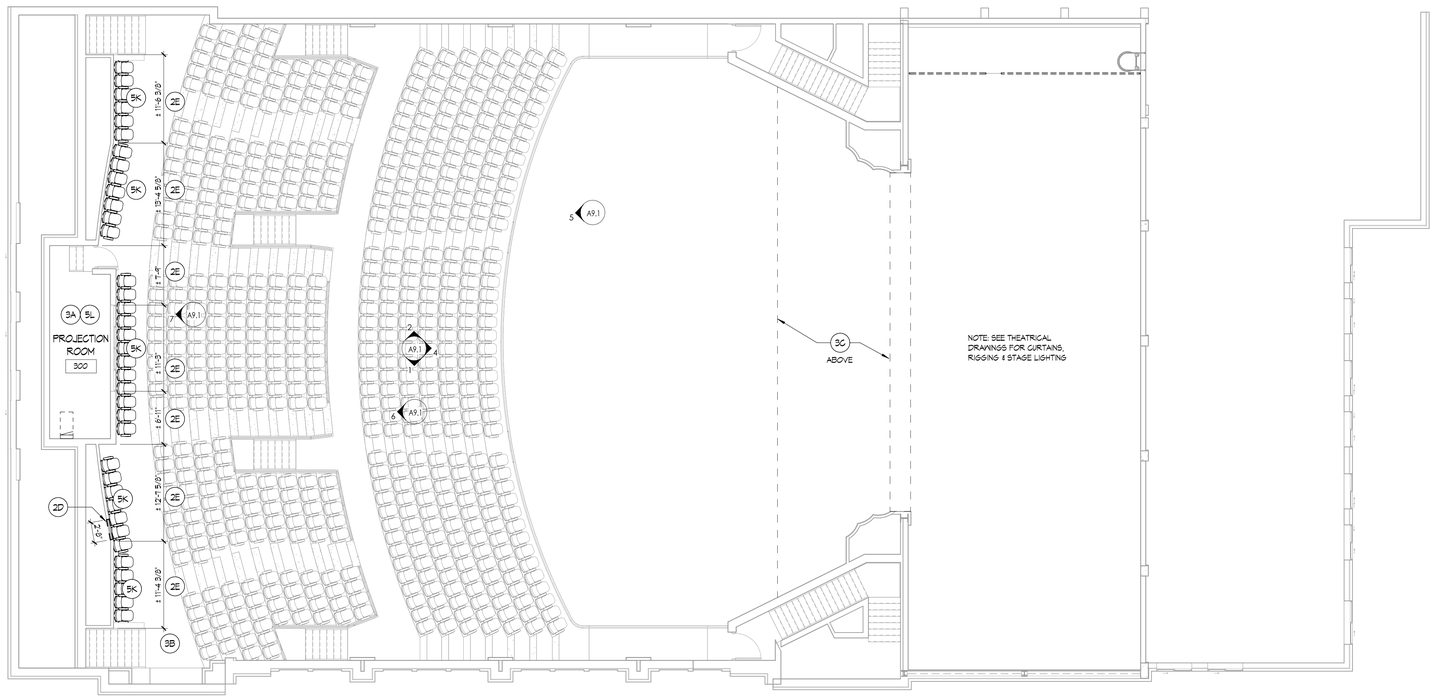
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2 FAN ROOM & LOFT DEMOLITION PLAN

1/8" = 1'-0"



1 THIRD FLOOR AUDITORIUM DEMOLITION PLAN

1/8" = 1'-0"

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DEMOLITION PLAN KEYNOTES

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C. REMOVE AND DISPOSE OF LINOLEUM FLOORING.

D. SAND DOWN STAGE FLOORING IN PREPARATION FOR RE-FINISHING.

E. REMOVE AND DISPOSE OF WOOD PLATFORM AND WOOD/ METAL SUPPORT ON STAGE FLOOR AS INDICATED IN PLAN.

F. REMOVE AND DISPOSE OF ALL EXISTING FLOOR GRILLES IN AUDITORIUM SEATING AREA, TYPICAL OF 45 INSTANCES. COORDINATE WITH MECHANICAL. CONCRETE PATCH AT ALL LOCATIONS OF REMOVAL.

G. REMOVE AND DISPOSE OF FLOOR MOUNTED LOUVER.

H. EXISTING CONCRETE CURBS AND MISC. WOOD CURB TO BE DEMOLISHED.

2 WALLS

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C. DEMOLISH STAGE AREA BULKHEAD AND SOFFIT. SEE REFLECTED CEILING PLAN FOR EXTENTS.

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5 MISCELLANEOUS

A. REMOVE AND SALVAGE OF ALL FIRST FLOOR AUDITORIUM FIXED SEATING. GRIND EXISTING MOUNTING BRACKET LOCATIONS AND PATCH TO SMOOTH. COORDINATE RETURN OF SEATING WITH OWNER.

B. REMOVE AND DISPOSE OF STAGE STAIRS. PREP FOR INSTALLATION OF NEW STAIR.

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D. ELECTRICAL EQUIPMENT TO BE REMOVED - REFER TO ELECTRICAL DRAWINGS.

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F. REMOVE AND DISPOSE OF LOADING GALLERY GUARDRAILS.

G. REMOVE AND RETURN TO OWNER ROUND FIXTURE ON SIDE OF BALCONY FACE. PATCH AND REPAIR AS NEEDED. PREP FOR PAINT.

H. MECHANICAL EQUIPMENT TO BE DEMOLISHED. REFER TO MECHANICAL DRAWINGS.

I. NOT USED.

J. EXISTING CAGED LADDER TO REMAIN.

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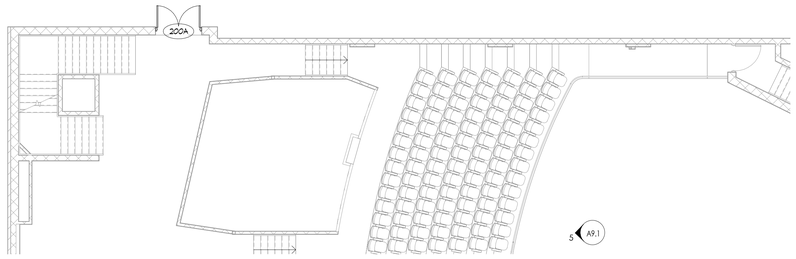
THIRD FLOOR & FAN ROOM AUDITORIUM DEMOLITION PLAN

SHEET NO.

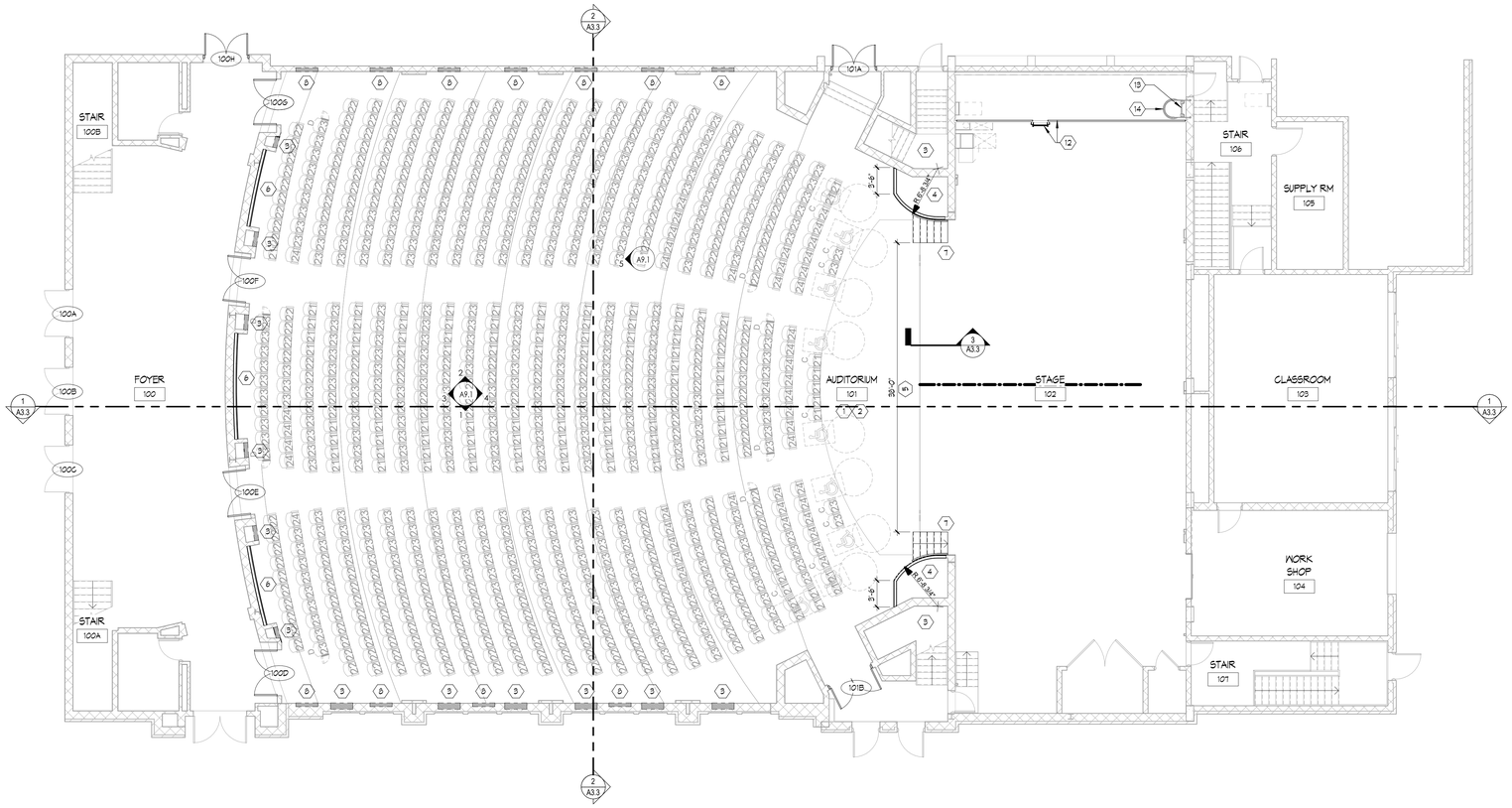
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2 PARTIAL SECOND FLOOR AUDITORIUM FLOOR PLAN
1/8" = 1'-0"



1 FIRST FLOOR AUDITORIUM FLOOR PLAN
1/8" = 1'-0"

ARCHITECTURAL GENERAL NOTES

1. XX INDICATES CONSTRUCTION DOCUMENT ROOM NUMBERS.
2. REFER TO THEATRICAL PLANS FOR SEATING, EQUIPMENT, CURTAINS, AND RIGGING SYSTEMS.
3. REFER TO COLOR LAYOUT PLANS FOR FLOOR FINISH PATTERNS AND COLORS.
4. REFER TO ENLARGED PLANS FOR ADDITIONAL NOTES AND DIMENSIONS.
5. MASONRY CONTRACTOR TO INSTALL LOOSE LINTELS FOR MISCELLANEOUS OPENINGS NOT INDICATED ON DRAWINGS BUT REQUIRED FOR MECHANICAL, ELECTRICAL, THEATRICAL EQUIPMENT OR OTHER ITEMS THAT PASS THROUGH A WALL. STEEL LINTELS SHALL BE SUPPLIED BY THE STEEL CONTRACTOR.
6. REFER TO TITLE SHEET FOR FLOOR PLAN SYMBOLS LEGEND.

ARCHITECTURAL PLAN KEYNOTES

1. NEW FIRST FLOOR SEATING. REFER TO THEATRICAL PLANS
2. PATCH & REPAIR FLOOR AT AREAS OF REMOVED FLOOR GRILLES. NEW FLOOR INFILL WITH METAL JOIST, ACOUSTICAL INSULATION, AND DENSE DECK - REFER TO STRUCTURAL AND MECHANICAL
3. PATCH & REPAIR EXISTING WALL & CEILING FINISH AS REQUIRED.
4. NEW 2X4 STUD CONSTRUCTION STAGE CHEEK WALLS. RADIUS TO MATCH EXISTING WOOD TRIM ABOVE, CONTRACTOR TO V.I.F. REFER TO COLOR PLAN.
5. REPLACE FRONT STAGE, REFER TO SHEET A3.3.
6. 3-5/8" MTL STUD WALL UP TO CEILING W/ ACOUSTICAL BATT INSULATION. 1-1/2" HAT CHANNELS AND ONE LAYER GYPSUM BD UP TO 3'-6"UP TO REFER TO INTERIORS PLAN FOR ACOUSTICAL WALL TREATMENT.
7. NEW WOOD FRAMED STAIR AND HANDRAIL. STAIR TREADS TO MATCH ADJACENT STAGE AREA FLOORING.
8. NEW WALL LOUVER. PATCH & REPAIR EXISTING WALL AFFECTED BY MECHANICAL DEMOLITION.
9. INFILL EXISTING OPENINGS TO MATCH EXISTING ADJACENT SURFACES. NEW 4" FACE BRICK ON 8" CMU WALL INFILL. TOOTH IN MASONRY UNITS.
10. NEW MECHANICAL EQUIPMENT. COORDINATE WITH MECHANICAL DRAWINGS.
11. NEW FLOOR INFILL WITH METAL JOIST, ACOUSTICAL INSULATION, AND DENSE DECK - REFER TO STRUCTURAL.
12. NEW METAL LADDER TO LOADING GALLERY W/ OSHA GUARDRAIL 36"H.
13. NEW STAINLESS STEEL LADDER CABLE FALL ARREST FOR FIXED LADDERS, DIRECT ATTACH TO LADDER. INCLUDE CONSTRUCTION STYLE POSITIONING HARNESS, BACK & SIDE D-RINGS. PROVIDE (2) FULL BODY HARNESSES (SIZE BY OWNER).
14. PROVIDE LOCK & RESTRICTION SIGNAGE AT EXISTING CAGED LADDER.

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J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

ISSUANCES	DATE
BID & CONSTRUCTION	11/07/2025

KEY PLAN

N

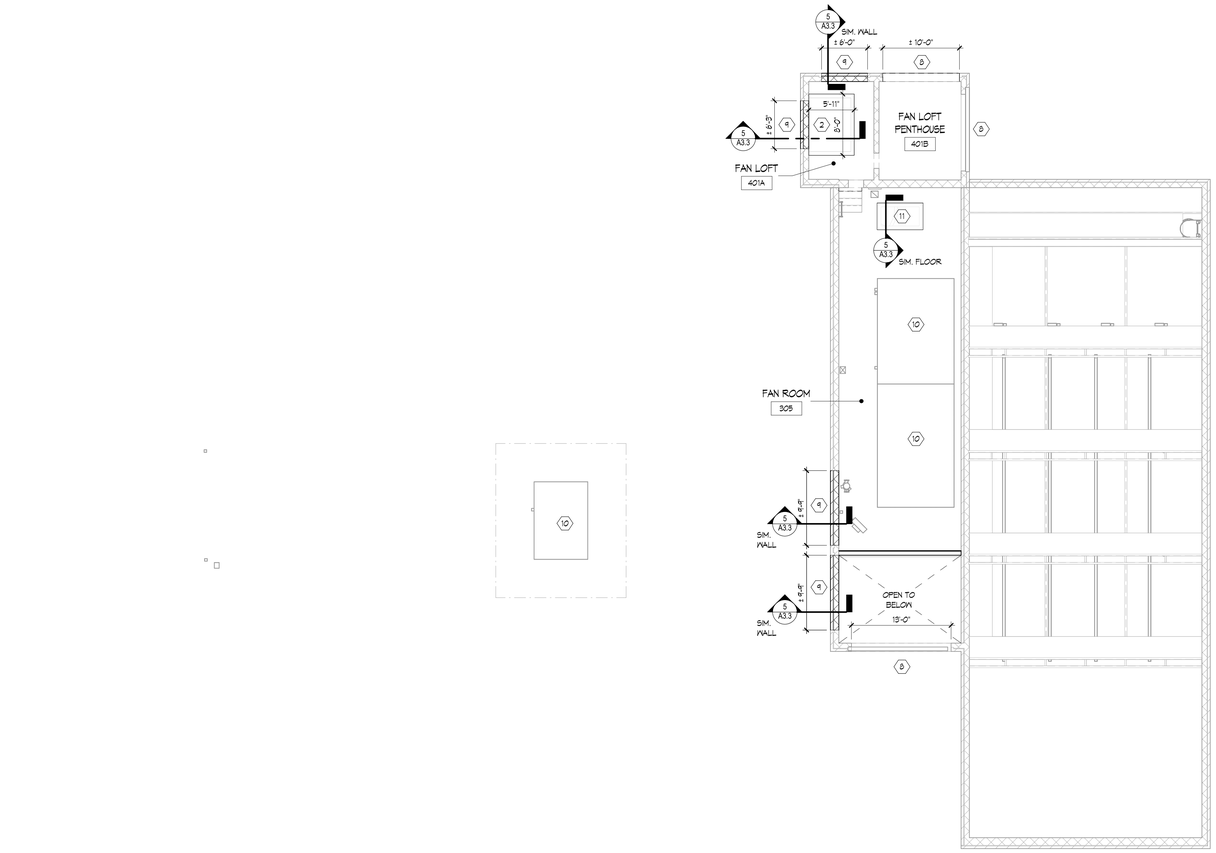
JOB NO. 2616.11

SHEET TITLE
FIRST FLOOR & PARTIAL SECOND FLOOR AUDITORIUM PLAN

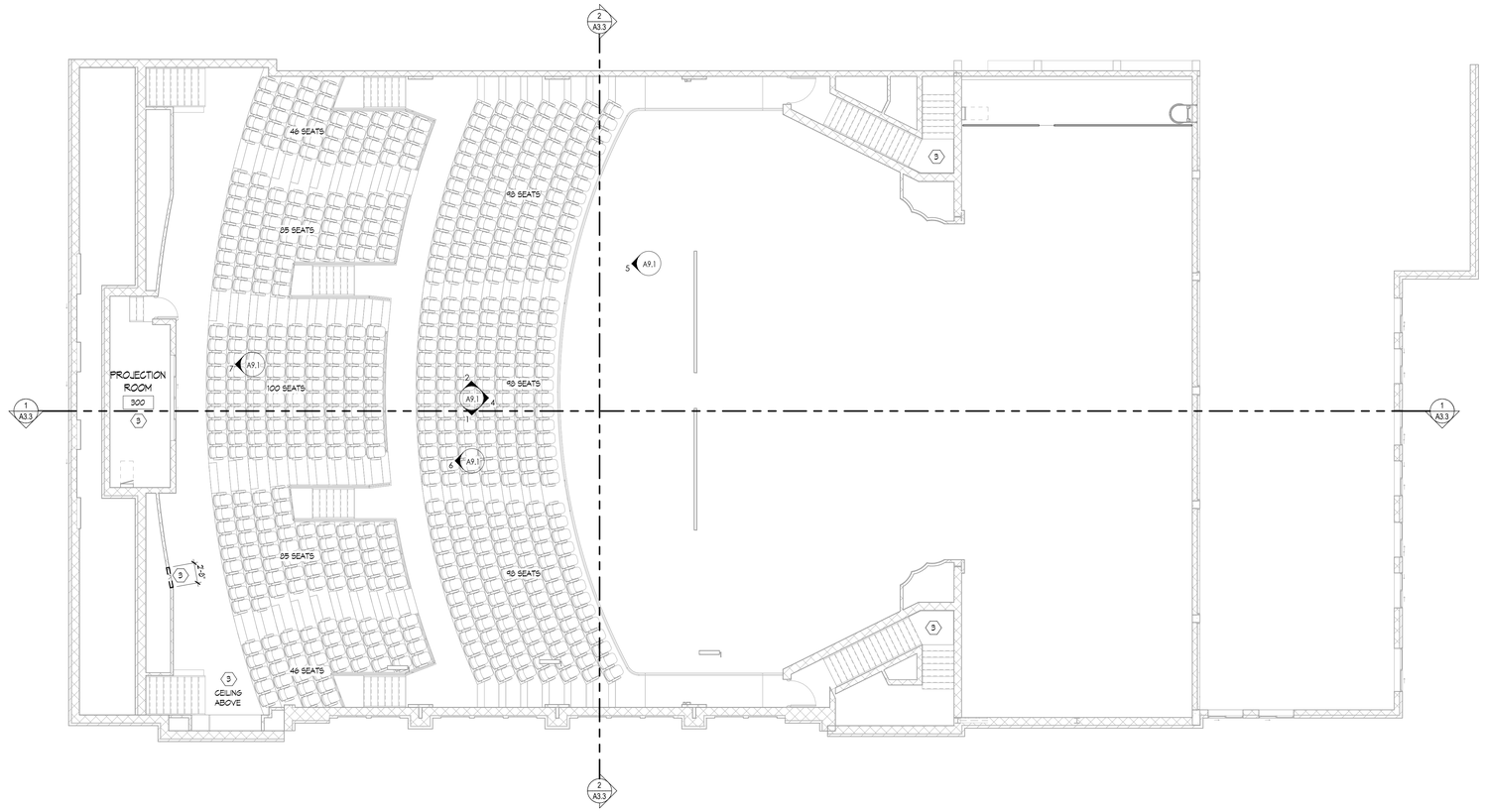
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2 FAN ROOM & LOFT FLOOR PLAN
1/8" = 1'-0"



1 THIRD FLOOR
1/8" = 1'-0"

ARCHITECTURAL GENERAL NOTES

1. XX INDICATES CONSTRUCTION DOCUMENT ROOM NUMBERS.
2. REFER TO THEATRICAL PLANS FOR SEATING, EQUIPMENT, CURTAINS, AND RIGGING SYSTEMS.
3. REFER TO COLOR LAYOUT PLANS FOR FLOOR FINISH PATTERNS AND COLORS.
4. REFER TO ENLARGED PLANS FOR ADDITIONAL NOTES AND DIMENSIONS.
5. MASONRY CONTRACTOR TO INSTALL LOOSE LINTELS FOR MISCELLANEOUS OPENINGS NOT INDICATED ON DRAWINGS BUT REQUIRED FOR MECHANICAL, ELECTRICAL, THEATRICAL EQUIPMENT OR OTHER ITEMS THAT PASS THROUGH A WALL. STEEL LINTELS SHALL BE SUPPLIED BY THE STEEL CONTRACTOR.
6. REFER TO TITLE SHEET FOR FLOOR PLAN SYMBOLS LEGEND.

ARCHITECTURAL PLAN KEYNOTES

1. NEW FIRST FLOOR SEATING, REFER TO THEATRICAL PLANS
2. PATCH & REPAIR FLOOR AT AREAS OF REMOVED FLOOR GRILLES. NEW FLOOR INFILL WITH METAL JOIST, ACOUSTICAL INSULATION, AND DENSE DECK - REFER TO STRUCTURAL AND MECHANICAL.
3. PATCH & REPAIR EXISTING WALL & CEILING FINISH AS REQUIRED.
4. NEW 2X4 STUD CONSTRUCTION STAGE CHEEK WALLS. RADIUS TO MATCH EXISTING WOOD TRIM ABOVE, CONTRACTOR TO V.I.F. REFER TO COLOR PLAN.
5. REPLACE FRONT STAGE, REFER TO SHEET A3.3.
6. 3-5/8" MTL. STUD WALL UP TO CEILING W/ ACOUSTICAL BATT INSULATION. 1-1/2" HAT CHANNELS AND ONE LAYER GYPSUM BD UP TO 3'-8" UP TO REFER TO INTERIORS PLAN FOR ACOUSTICAL WALL TREATMENT.
7. NEW WOOD FRAMED STAIR AND HANDRAIL. STAIR TREADS TO MATCH ADJACENT STAGE AREA FLOORING.
8. NEW WALL LOUVER. PATCH & REPAIR EXISTING WALL AFFECTED BY MECHANICAL DEMOLITION.
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14. PROVIDE LOCK & RESTRICTION SIGNAGE AT EXISTING CAGED LADDER.

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Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

J.W.

ISSUANCES	DATE
BID & CONSTRUCTION	11/07/2025

KEY PLAN

N

JOB NO. 2616.11

SHEET TITLE

THIRD FLOOR & FAN ROOM AUDITORIUM PLAN

SHEET NO.

A1.3

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EQUIPMENT PLAN KEYNOTES

1. PLASTIC LAMINATE AT FRONT OF STAGE AND SIDE WALLS. SEE INT. ELEVATIONS FOR LOCATION
2. SLIP COVERS FOR BACK OF THE EXISTING BALCONY SEATING. (DO NOT PROVIDE A COVER FOR THE SEAT). PROVIDE ADDITIONAL QTY FOR ATTIC STOCK. NO EXPOSED SEAMS ON COVERS. V.I.F. QUANTITY AND SIZE OF SEATS. MATERIAL TO BE BLACK NYLON SPANDEX.

ACOUSTICAL WALL PANEL (AWP) SCHEDULE

NOTE: FIELD VERIFY ALL ACOUSTICAL WALL PANELS. FIELD CUT AROUND ANY WALL OBSTRUCTIONS AS NEED

TAG	LENGTH	HEIGHT	THICKNESS	COLOR	NOTES
AWP-1	48"	48"	4 1/8"	GRAPHITE	BASE BID
AWP-2	48"	48"	4 1/8"	GRAPHITE	BASE BID
AWP-3	40"	12"	2 1/8"	GRAPHITE	BASE BID
AWP-4	97"	12"	2 1/8"	GRAPHITE	BASE BID
AWP-5	80"	12"	2 1/8"	GRAPHITE	BASE BID
AWP-6	36"	18"	2 1/8"	RED	BASE BID
AWP-7	24"	18"	2 1/8"	RED	BASE BID
AWP-8	36"	20"	2 1/8"	RED	BASE BID
AWP-9	18"	20"	2 1/8"	RED	BASE BID
AWP-10	24"	20"	2 1/8"	RED	BASE BID
AWP-11	48"	18"	1 1/8"	GRAPHITE	BASE BID
AWP-12B	48"	48"	1/2"	GRAPHITE	BASE BID
AWP-13B	48"	48"	1/2"	GRAPHITE	BASE BID
AWP-14	36"	36"	2 1/8"	GRAPHITE	BASE BID
AWP-12A	48"	48"	1/2"	GRAPHITE	ADD ALT
AWP-13A	48"	48"	1/2"	GRAPHITE	ADD ALT

ACOUSTICAL PANEL MATERIALS

AWP 1412
MANUFACTURER: KINETICS
STYLE: HIGH IMPACT HARDSIDE
UPHOLSTERY: GUILFORD OF MAINE - ANCHORAGE (OPEN HOUSE)
COLOR: SEE AWP SCHEDULE
EDGE: SQUARE
NOTES: INSTALLED WITH Z-CLIPS. SEE INT ELEV FOR DIMS.

AWP 3-1414
MANUFACTURER: KINETICS
STYLE: HIGH IMPACT HARDSIDE
UPHOLSTERY: GUILFORD OF MAINE - ANCHORAGE (OPEN HOUSE)
COLOR: SEE AWP SCHEDULE
EDGE: SQUARE
NOTES: INSTALLED WITH Z-CLIPS. SEE INT ELEV FOR DIMS.

AWP 12B13B
FABRIC WRAPPED PLYWOOD PANELS (BASE BID)
UPHOLSTERY: GUILFORD OF MAINE - ANCHORAGE (OPEN HOUSE)
COLOR: SEE AWP SCHEDULE
NOTES: INSTALLED WITH Z-CLIPS. SEE INT ELEV FOR DIMS.

AWP 12A13A
FABRIC WRAPPED PLYWOOD PANELS (ADD ALT.)
UPHOLSTERY: GUILFORD OF MAINE - ANCHORAGE (OPEN HOUSE)
COLOR: SEE AWP SCHEDULE
NOTES: INSTALLED WITH Z-CLIPS. SEE INT ELEV FOR DIMS.

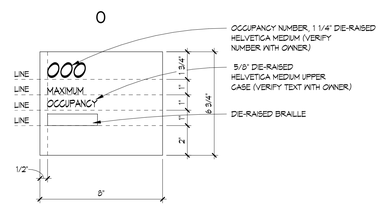
SIGNAGE GENERAL NOTES

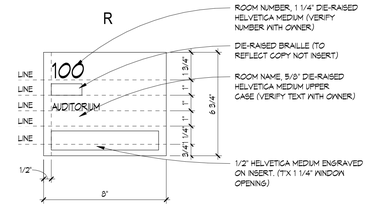
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2. SEE SPEC SECTION 101423 FOR ADDITIONAL INFORMATION.
3. SIGNAGE AND INSTALLATION TO MEET ADA REQUIREMENTS.
4. MOUNTING HEIGHT PER ADA REQUIREMENTS.
5. PROVIDE BLANK PANEL FOR MASKING AT ALL SIGNS MOUNTED ON GLASS.

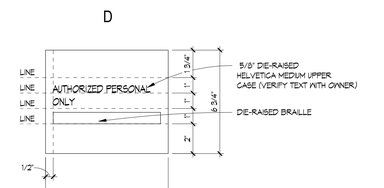
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ROOM IDENTIFICATION PANEL SIGNAGE, SPECIFICATION SECTION 101423.16

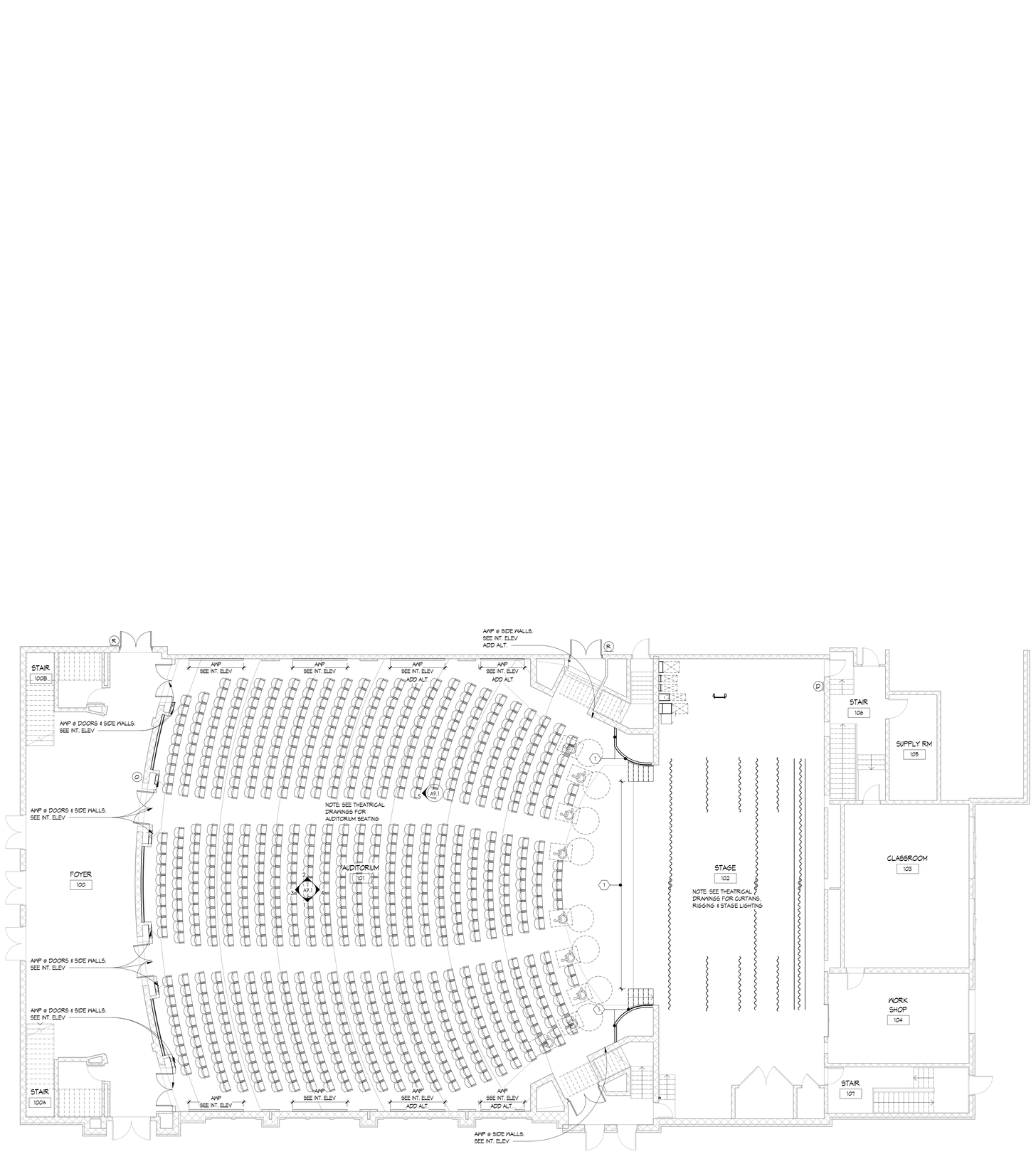
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"O" = OCCUPANCY
"D" = AUTHORIZED PERSONAL ONLY







INT_SIGNAGE TYPES Copy 1



1 FIRST FLOOR EQUIPMENT PLAN - UNIT 1100
1/8" = 1'-0"

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J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

ISSUANCES	DATE
BID & CONSTRUCTION	11/07/2025

KEY PLAN

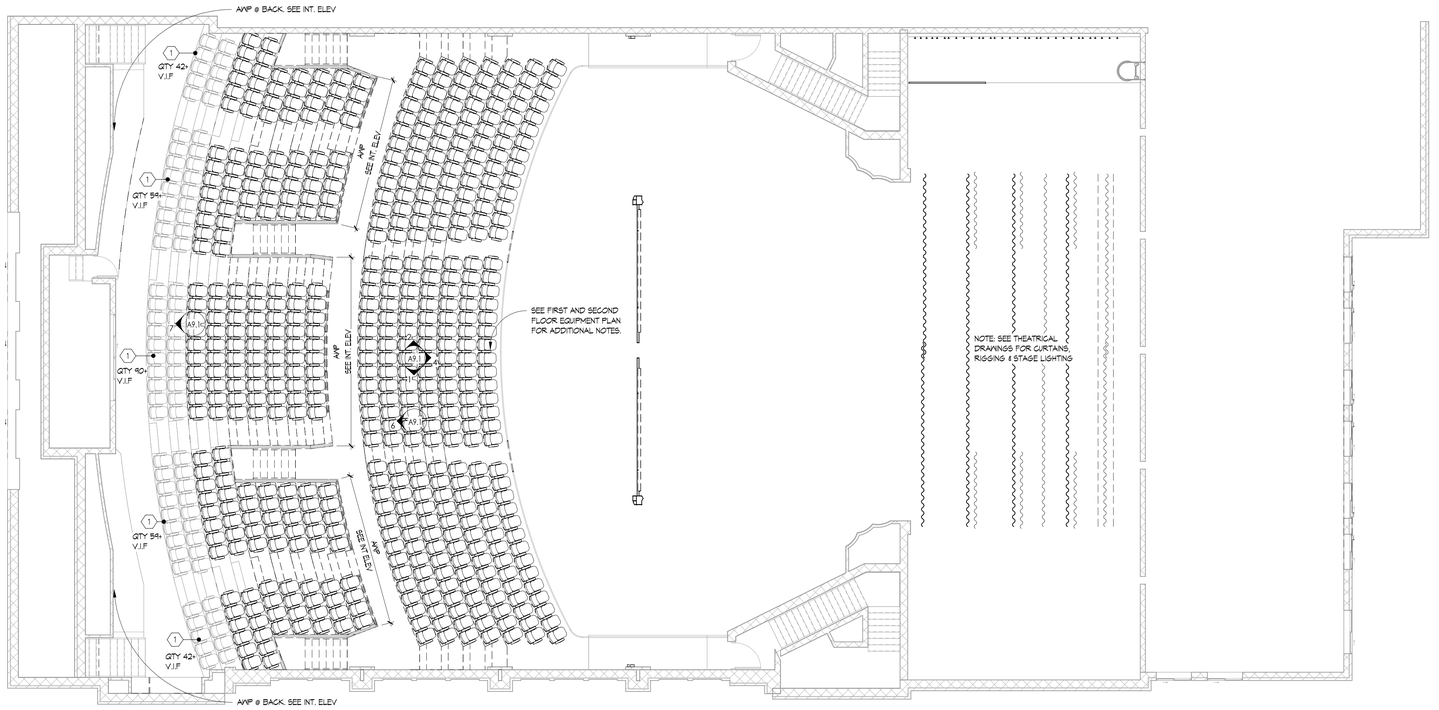
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JOB NO. 2616.11

SHEET TITLE
FIRST FLOOR EQUIPMENT PLAN

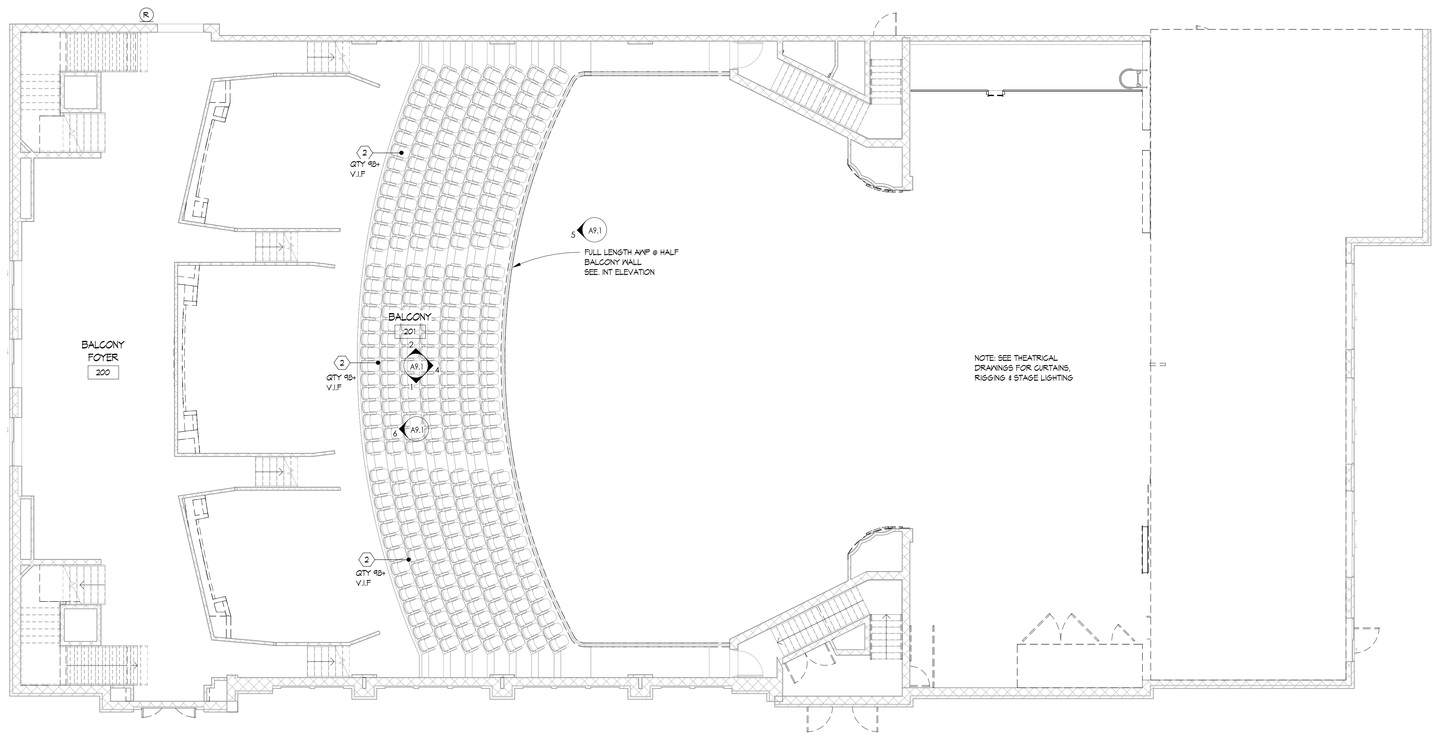
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2 THIRD FLOOR EQUIPMENT PLAN - UNIT 3100

1/8" = 1'-0"



1 SECOND FLOOR EQUIPMENT PLAN - UNIT 2100

1/8" = 1'-0"

EQUIPMENT PLAN KEYNOTES

1. PLASTIC LAMINATE AT FRONT OF STAGE AND SIDE WALLS. SEE INT. ELEVATIONS FOR LOCATION
2. SLIP COVERS FOR BACK OF THE EXISTING BALCONY SEATING. (DO NOT PROVIDE A COVER FOR THE SEAT). PROVIDE ADDITIONAL QTY FOR ATTIC STOCK. NO EXPOSED SEAMS ON COVERS. V.I.F QUANTITY AND SIZE OF SEATS. MATERIAL TO BE BLACK NYLON SPANDEX.

ACOUSTICAL WALL PANEL (AWP) SCHEDULE

NOTE: FIELD VERIFY ALL ACOUSTICAL WALL PANELS. FIELD CUT AROUND ANY WALL OBSTRUCTIONS AS NEED

TAG	LENGTH	HEIGHT	THICKNESS	COLOR	NOTES
AWP-1	48"	48"	4 1/8"	GRAPHITE	BASE BID
AWP-2	48"	48"	4 1/8"	GRAPHITE	BASE BID
AWP-3	40"	72"	2 1/8"	GRAPHITE	BASE BID
AWP-4	57"	72"	2 1/8"	GRAPHITE	BASE BID
AWP-5	60"	72"	2 1/8"	GRAPHITE	BASE BID
AWP-6	36"	78"	2 1/8"	RED	BASE BID
AWP-7	24"	78"	2 1/8"	RED	BASE BID
AWP-8	36"	20"	2 1/8"	RED	BASE BID
AWP-9	78"	20"	2 1/8"	RED	BASE BID
AWP-10	24"	20"	2 1/8"	RED	BASE BID
AWP-11	48"	18"	1 1/8"	GRAPHITE	BASE BID
AWP-12B	48"	48"	1/2"	GRAPHITE	BASE BID
AWP-13B	48"	48"	1/2"	GRAPHITE	BASE BID
AWP-14	36"	36"	2 1/8"	GRAPHITE	BASE BID
AWP-12A	48"	48"	1/2"	GRAPHITE	ADD ALT
AWP-13A	48"	48"	1/2"	GRAPHITE	ADD ALT

ACOUSTICAL PANEL MATERIALS

AWP 1-12
MANUFACTURER: KINETICS
STYLE: HIGH IMPACT HARDSIDE
UPHOLSTERY: GUILFORD OF MAINE - ANCHORAGE (OPEN HOUSE)
COLOR: SEE AWP SCHEDULE
EDGE: SQUARE
NOTES: INSTALLED WITH Z-CLIPS. SEE INT ELEV FOR DIMS.

AWP 3-R14
MANUFACTURER: KINETICS
STYLE: HIGH IMPACT HARDSIDE
UPHOLSTERY: GUILFORD OF MAINE - ANCHORAGE (OPEN HOUSE)
COLOR: SEE AWP SCHEDULE
EDGE: SQUARE
NOTES: INSTALLED WITH Z-CLIPS. SEE INT ELEV FOR DIMS.

AWP 12B-13B
FABRIC WRAPPED PLYWOOD PANELS (BASE BID)
UPHOLSTERY: GUILFORD OF MAINE - ANCHORAGE (OPEN HOUSE)
COLOR: SEE AWP SCHEDULE
NOTES: INSTALLED WITH Z-CLIPS. SEE INT ELEV FOR DIMS.

AWP 12A-13A
FABRIC WRAPPED PLYWOOD PANELS (ADD ALT)
UPHOLSTERY: GUILFORD OF MAINE - ANCHORAGE (OPEN HOUSE)
COLOR: SEE AWP SCHEDULE
NOTES: INSTALLED WITH Z-CLIPS. SEE INT ELEV FOR DIMS.

SIGNAGE GENERAL NOTES

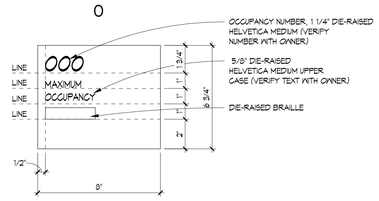
1. FINAL TEXT & NUMBERS AS PROVIDED BY OWNER OR ARCHITECT.
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3. SIGNAGE AND INSTALLATION TO MEET ADA REQUIREMENTS.
4. MOUNTING HEIGHT PER ADA REQUIREMENTS.
5. PROVIDE BLANK PANEL FOR MASKING AT ALL SIGNS MOUNTED ON GLASS.

INT_SIGNAGE GENERAL NOTES

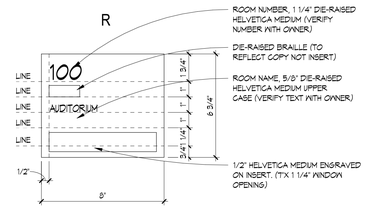
ROOM IDENTIFICATION PANEL SIGNAGE, SPECIFICATION SECTION 101423.16

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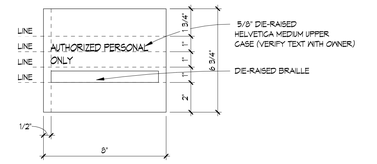
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R



D



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Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

J.W.

ISSUANCES	DATE
BID & CONSTRUCTION	11/07/2025

KEY PLAN

N

JOB NO. 2616.11

SHEET TITLE

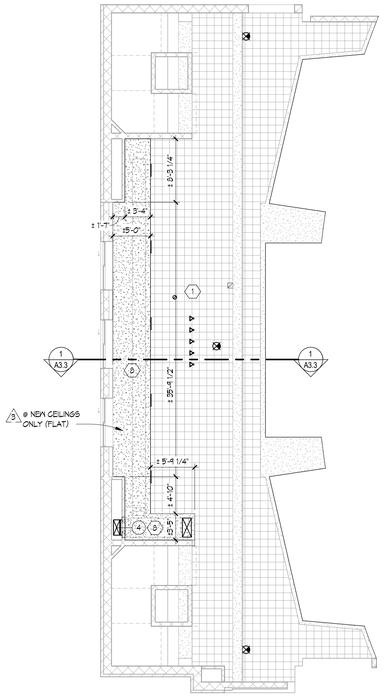
SECOND & THIRD FLOOR EQUIPMENT PLAN

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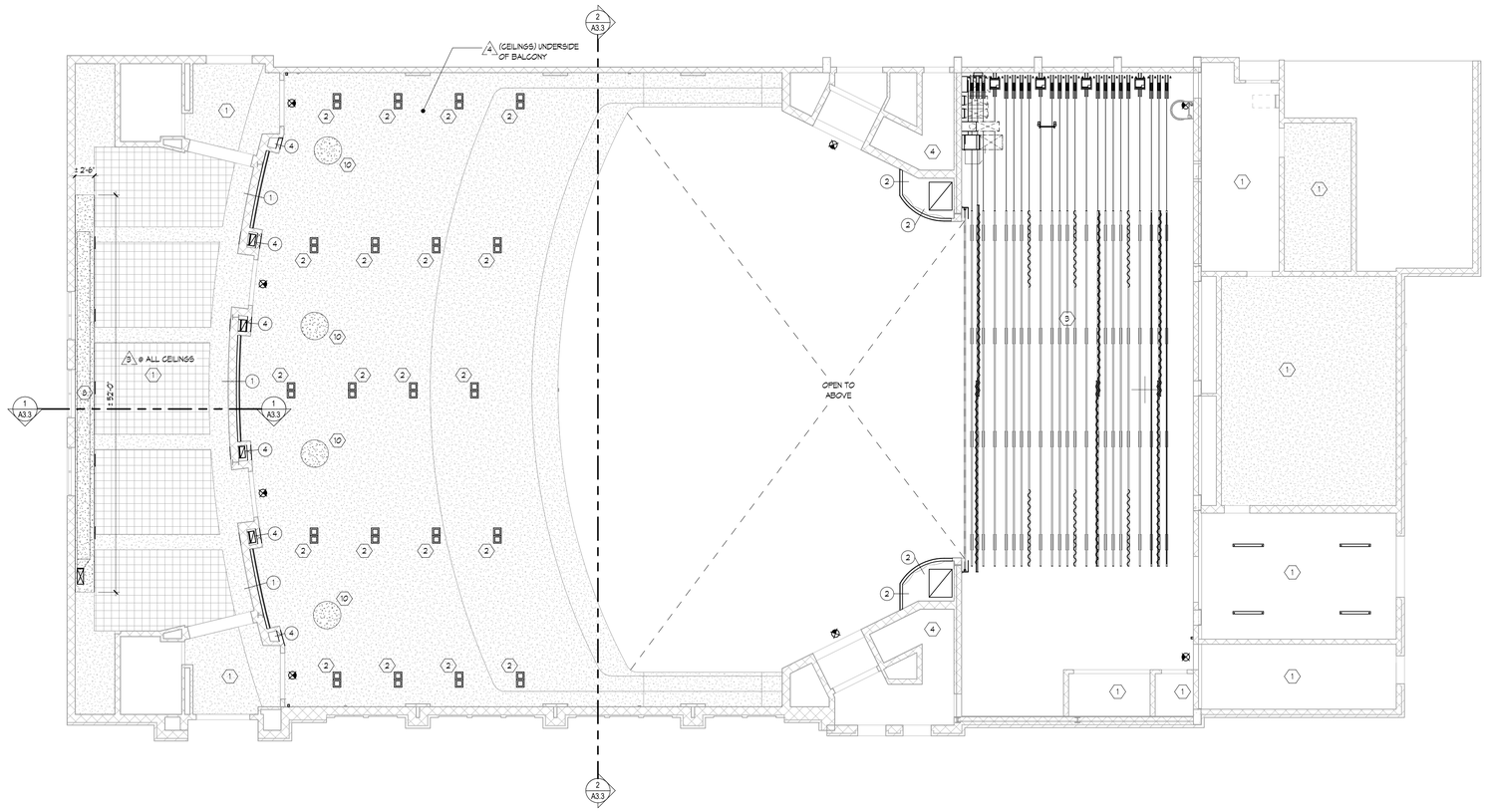
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2 SECOND FLOOR FOYER REFLECTED CEILING PLAN

1/8" = 1'-0"



1 FIRST FLOOR AUDITORIUM REFLECTED CEILING PLAN

1/8" = 1'-0"

REFLECTED CEILING PLAN GENERAL NOTES

1. FOR PARTITION TYPES AND BULKHEAD DETAILS REFER TO SHEET XA2.30 REFERENCE
2. PROVIDE 'BULLNOSE' GWB UP TO FINISH CEILINGS, TYPICAL AT ALL OUTSIDE CORNERS OF WALLS.
3. REFER TO CODE COMPLIANCE PLANS FOR VERTICAL FIRE RESISTANT RATINGS AT WALLS AND HORIZONTAL FIRE RESISTANT RATINGS AT CEILINGS.
4. PROVIDE RATED SEALANT AND/ OR STOPPING AT ALL PENETRATIONS AND OPENING THROUGH ALL EXISTING AND NEW CORRIDOR WALLS AND FIRE RATED PARTITIONS.
5. COORDINATE EXACT LOCATION REQUIRED FOR GYP. CEILING 24" x 24" ACCESS PANELS INDICATED WITH OTHER TRADES. REFER TO SPECIFICATIONS FOR MORE INFORMATION.
6. PROVIDE ACOUSTICAL SEALANT AND/ OR STOPPING AT ALL PENETRATIONS THROUGH NON-FIRE RATED WALLS.
7. △ REFER TO PAINT SPECIFICATIONS FOR COLOR INFORMATION.
8. REFER TO ACOUSTICAL PANEL CEILING SPECIFICATIONS FOR TILE INFORMATION.
9. FACTORY FINISH ALL EXPOSED GRID ON ALL SURFACE. REFER TO APG SPECIFICATIONS.
10. IF CONTROL JOINTS ARE NOT INDICATED IN GYPSUM BOARD CEILINGS, PROVIDE AS RECOMMENDED.
11. ACOUSTICAL PANEL CEILINGS SHALL BE APG-1, U.N.O.
12. SEE COLOR LAYOUT PLANS FOR CEILING PAINT COLORS. GYP CEILINGS PAINTED P-1, U.N.O.

REFLECTED CEILING LEGEND

- (8) PARTITION TYPE
- 2X4 SURFACE MOUNTED LIGHT FIXTURE
- 1X4 SURFACE MOUNTED LIGHT FIXTURE
- 2X2 SURFACED / PENDANT MOUNTED LIGHT FIXTURE
- 12"X12" SURFACE / PENDANT MOUNTED LIGHT FIXTURE
- SURFACE / PENDANT MOUNTED LIGHT FIXTURE
- 2X4 RECESSED LIGHT FIXTURE
- 1X4 RECESSED LIGHT FIXTURE
- 2X2 RECESSED LIGHT FIXTURE
- 12"X12" RECESSED LIGHT FIXTURE
- RECESSED LIGHT FIXTURE
- CEILING MOUNTED EXIT SIGN
- INDUSTRIAL FLUORESCENT
- COVE LIGHT FIXTURE
- SD SMOKE DETECTOR
- S PUBLIC ADDRESS SPEAKER
- S SOUND SYSTEM SPEAKER
- DROP CORD RECEPTACLE
- CEILING FAN
- SPRINKLER HEAD
- SUPPLY DIFFUSER
- M SUPPLY DIFFUSER
- RETURN / EXHAUST GRILLE
- SLOT DIFFUSER
- △ △ TRACK LIGHT

REFLECTED CEILING PLAN KEYNOTES

1. NO WORK.
2. NEW RECESSED LIGHTING.
3. CURTAIN RIGGING SYSTEM.
4. EXISTING PLASTER CEILING. REPAIR AND REPLACE DAMAGED PLASTER CONSTRUCTION. PAINT TO MATCH EXISTING SURFACE.
5. EXPOSED HVAC DUCTWORK. PAINT TO MATCH EXISTING CEILING.
6. NEW CFMF SOFFIT CONSTRUCTION W/ 3 LAYERS OF 5/8" GYP BD. PAINT TO MATCH EXISTING CEILING.
7. HVAC PLENUM THROUGH SOFFIT/ CEILING. PROVIDE 'J' TRIM & ACOUSTICAL SEALANT ALL AROUND.
8. 3-5/8" CFMF AND GYP BD SOFFIT.
9. EXISTING CEILING DIFFUSERS TO REMAIN. PAINT TO MATCH ADJACENT SURFACES.
10. NEW PLASTER CEILING PATCH & REPAIR AT AREA OF REMOVED CEILING DIFFUSERS.
11. UNDERSIDE OF ROOF DECK.
12. GYPSUM BOARD CONTROL JOINT.

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J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

ISSUANCES	DATE
BID & CONSTRUCTION	11/07/2025

KEY PLAN

N

JOB NO. 2616.11

SHEET TITLE

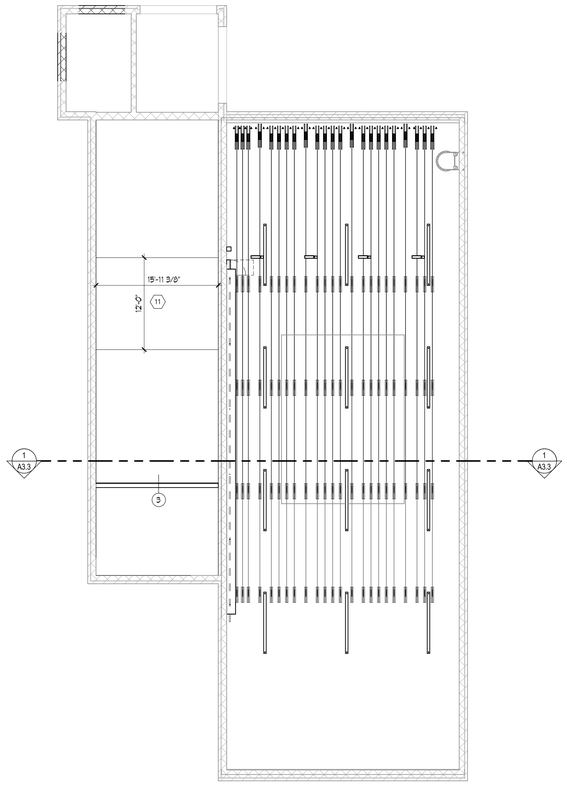
FIRST & SECOND FLOOR AUDITORIUM REFLECTED CEILING PLAN

SHEET NO.

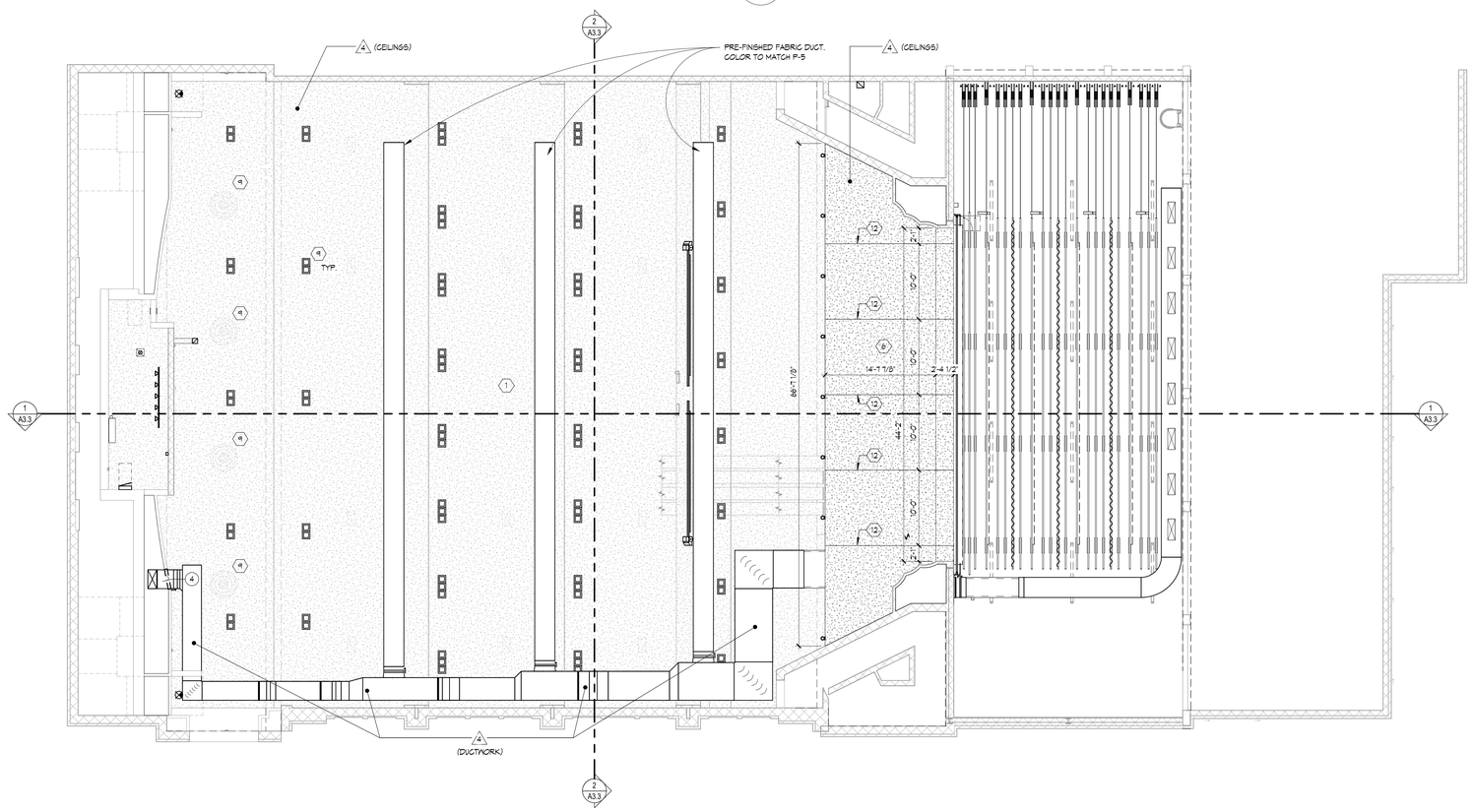
A2.1

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2 FAN ROOM & LOFT REFLECTED CEILING PLAN
1/8" = 1'-0"



1 THIRD FLOOR REFLECTED CEILING PLAN
1/8" = 1'-0"

REFLECTED CEILING PLAN GENERAL NOTES

1. FOR PARTITION TYPES AND BULKHEAD DETAILS REFER TO SHEET XA2.30 REFERENCE
2. PROVIDE 'BULLNOSE' CMU UP TO FINISH CEILINGS, TYPICAL AT ALL OUTSIDE CORNERS OF WALLS.
3. REFER TO CODE COMPLIANCE PLANS FOR VERTICAL FIRE RESISTANT RATINGS AT WALLS AND HORIZONTAL FIRE RESISTANT RATINGS AT CEILINGS.
4. PROVIDE RATED SEALANT AND/ OR STOPPING AT ALL PENETRATIONS AND OPENING THROUGH ALL EXISTING AND NEW CORRIDOR WALLS AND FIRE RATED PARTITIONS.
5. COORDINATE EXACT LOCATION REQUIRED FOR SYP. CEILING 24" x 24" ACCESS PANELS INDICATED WITH OTHER TRADES. REFER TO SPECIFICATIONS FOR MORE INFORMATION.
6. PROVIDE ACOUSTICAL SEALANT AND/ OR STOPPING AT ALL PENETRATIONS THROUGH NON-FIRE RATED WALLS.
7. △ REFER TO PAINT SPECIFICATIONS FOR COLOR INFORMATION.
8. REFER TO ACOUSTICAL PANEL CEILING SPECIFICATIONS FOR TILE INFORMATION.
9. FACTORY FINISH ALL EXPOSED GRID ON ALL SURFACE. REFER TO APC SPECIFICATIONS.
10. IF CONTROL JOINTS ARE NOT INDICATED IN GYPSUM BOARD CEILINGS, PROVIDE AS RECOMMENDED.
11. ACOUSTICAL PANEL CEILINGS SHALL BE APC-1, U.N.O.
12. SEE COLOR LAYOUT PLANS FOR CEILING PAINT COLORS. GYP CEILINGS PAINTED P-1, U.N.O.

REFLECTED CEILING LEGEND

- (a) PARTITION TYPE
- 2X4' SURFACE MOUNTED LIGHT FIXTURE
- 1X4' SURFACE MOUNTED LIGHT FIXTURE
- 2X2' SURFACED / PENDANT MOUNTED LIGHT FIXTURE
- 12"X12" SURFACE / PENDANT MOUNTED LIGHT FIXTURE
- SURFACE / PENDANT MOUNTED LIGHT FIXTURE
- 2X4' RECESSED LIGHT FIXTURE
- 1X4' RECESSED LIGHT FIXTURE
- 2X2' RECESSED LIGHT FIXTURE
- 12"X12" RECESSED LIGHT FIXTURE
- RECESSED LIGHT FIXTURE
- CEILING MOUNTED EXIT SIGN
- INDUSTRIAL FLUORESCENT
- COVE LIGHT FIXTURE
- SD SMOKE DETECTOR
- S PUBLIC ADDRESS SPEAKER
- S SOUND SYSTEM SPEAKER
- DROP CORD RECEPTACLE
- CEILING FAN
- SPRINKLER HEAD
- SUPPLY DIFFUSER
- M SUPPLY DIFFUSER
- RETURN / EXHAUST GRILLE
- SLOT DIFFUSER
- TRACK LIGHT

REFLECTED CEILING PLAN KEYNOTES

1. NO WORK.
2. NEW RECESSED LIGHTING.
3. CURTAIN RIGGING SYSTEM.
4. EXISTING PLASTER CEILING. REPAIR AND REPLACE DAMAGED PLASTER CONSTRUCTION. PAINT TO MATCH EXISTING SURFACE.
5. EXPOSED HVAC DUCTWORK. PAINT TO MATCH EXISTING CEILING.
6. NEW GFMF SOFFIT CONSTRUCTION W/ 3 LAYERS OF 5/8" GYP BD. PAINT TO MATCH EXISTING CEILING.
7. HVAC PLENUM THROUGH SOFFIT/ CEILING. PROVIDE 'J' TRIM & ACOUSTICAL SEALANT ALL AROUND.
8. 2-5/8" CFMF AND GYP BD SOFFIT.
9. EXISTING CEILING DIFFUSERS TO REMAIN. PAINT TO MATCH ADJACENT SURFACES.
10. NEW PLASTER CEILING PATCH & REPAIR AT AREA OF REMOVED CEILING DIFFUSERS.
11. UNDERSIDE OF ROOF DECK.
12. GYPSUM BOARD CONTROL JOINT.

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J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

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KEY PLAN

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JOB NO. 2616.11

SHEET TITLE
THIRD FLOOR AUDITORIUM REFLECTED CEILING PLAN

SHEET NO.
A2.3

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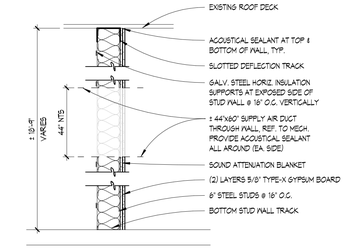
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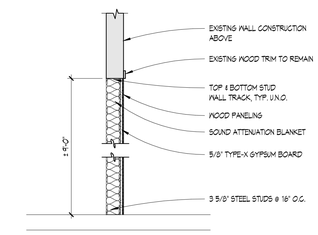
PARTITION NOTES:

PARTITION TAGS ON PLANS AND PARTITION TYPE DETAILS HAVE BEEN PROVIDED TO SHOW GENERAL INTENT OF THE CONSTRUCTION. CONTRACTORS MUST VERIFY EACH CONDITION FOR FIRE RATING, BEARING, STRUCTURAL REQUIREMENTS AND WALL FINISHES. PROVIDE APPROPRIATE CONSTRUCTION AS REQUIRED. SPECIFICALLY INDICATED IN REFERENCED DETAIL OR NOT. REFER TO THE FOLLOWING NOTES FOR ADDITIONAL REQUIREMENTS AND DIRECTIONS FOR APPLICATION OF SEALANT, MATERIALS AND GYPSUM BOARD TYPES.

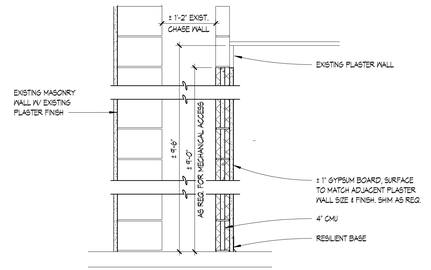
1. REFER TO CODE COMPLIANCE PLANS FOR REQUIRED RATINGS ON WALLS. PROVIDE FIRE RATED SEALANT, FIRESTOPPING AND TYPE 'X' GYPSUM BOARD AS REQUIRED. ALL RECESSES IN FIRE WALLS SHALL HAVE SOLID MASONRY OR MULTIPLE LAYERS OF GYPSUM BOARD AS REQUIRED TO MAINTAIN APPLICABLE FIRE RATING. PROVIDE ACOUSTICAL SEALANT AT ALL NON-RATED WALLS. PROVIDE FIRE RATED SEALANT AT ALL RATED WALLS.
2. PROVIDE FIRE RATED SEALANT AND/OR FIRESTOPPING AT ALL PENETRATIONS (CONDUIT, PIPING, DUCTWORK, ETC.) THROUGH FIRE RATED WALLS. REFER TO DETAILS ON THIS PAGE AND COORDINATE WITH MEP TRADES.
3. PROVIDE ACOUSTICAL SEALANT AT ALL PENETRATIONS (CONDUIT, PIPING, DUCTWORK, ETC.) THROUGH NON-FIRE RATED WALLS.
4. PROVIDE ABUSE RESISTANT GYPSUM BOARD FROM FLOOR 8'-0" A.F.F. FOR ALL WALLS NOT COVERED BY TILE OR WALL PROTECTION. PROVIDE TYPE 'X' GYPSUM BOARD FOR THE REMAINDER OF THE WALL AND/OR BULKHEAD. STANDARD TYPE 'X' GYPSUM BOARD MAY BE USED BELOW 4'-0" A.F.F. WHEN BEHIND FIXED ITEMS SUCH AS CASEWORK, SHELVES, LOCKERS, WALL PROTECTION, ETC.
5. PROVIDE COMBINATION WATER AND ABUSE RESISTANT GYPSUM BOARD FROM FLOOR TO 48" A.F.F. FOR ALL WALLS IN JANITOR CLOSETS AND NON-TILED TOILET ROOMS. PROVIDE TYPE 'X' GYPSUM BOARD FOR THE REMAINDER OF THE WALL AND/OR BULKHEAD.
6. REFER TO REFLECTED CEILING PLANS FOR CEILING HEIGHTS, LOCATIONS AND MATERIALS.
7. REFER TO STRUCTURAL DRAWINGS AND WALL SECTIONS FOR FLOOR AND METAL DECK ELEVATIONS AND LOCATIONS.
8. REFER TO COLOR LAYOUT PLANS FOR WALL FINISH.
9. REFER TO BUILDING DETAILS, EQUIPMENT PLANS AND SPECIFICATIONS. PROVIDE BLOCKING IN ALL STEEL STUD PARTITIONS AS REQUIRED FOR CASEWORK SUPPORT, FLATSCREEN TV'S, PROJECTORS AND OTHER EQUIPMENT. PROVIDE SOLID WOOD BLOCKING FOR ALL DOOR STOP LOCATIONS.
10. REFER TO STRUCTURAL DRAWINGS FOR TOP OF WALL DEFLECTION DETAILS AT MASONRY AND STUD WALLS. PROVIDE SLIP TYPE DEFLECTION TRACK AND DETAILING AT HEAD OF NON-FIRE RATED, NON-BEARING STUD WALLS AS REQUIRED FOR FIRE RATINGS. CONSULT STUD AND GYPSUM BOARD MANUFACTURER STANDARD DETAILING FOR THESE CONDITIONS.
11. PROVIDE MINIMUM 20 GA. STUDS AT 16" O.C. FOR ALL WALLS, U.N.O. STUD SIZE AND GUAGE WILL VERY DEPENDING ON STUD WALL HEIGHT AND AS REQUIRED FOR MINIMUM GUAGE AND SIZE NOTES.
12. PARTITION TYPES ARE A REPRESENTATION OF PARTITION REQUIREMENTS, REFER TO WALL SECTIONS AND BUILDING DETAILS FOR SPECIFIC BLOCK COURSING PATTERN.
13. PROVIDE CONTROL JOINTS IN GYPSUM CEILINGS @ MINIMUM OF 20'-0" O.C. VERTICALLY & HORIZONTALLY.
14. (E) —— INDICATES EXISTING WALL.



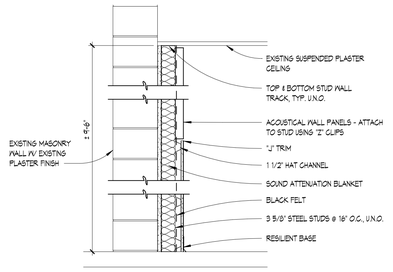
3 METAL STUD PARTITION WALL
3/4" = 1'-0"



2 METAL STUD PARTITION WALL
3/4" = 1'-0"



4 CMU/ PLASTER WALL
3/4" = 1'-0"



1 FIRST FLOOR ACOUSTIC WALL
3/4" = 1'-0"

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LANSING SCHOOL DISTRICT

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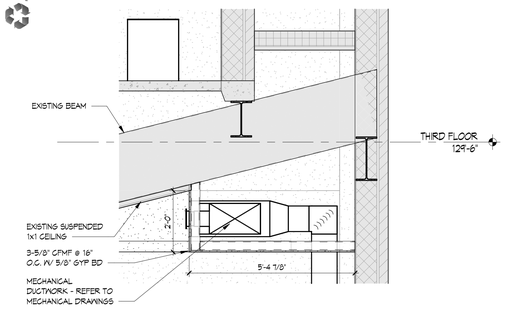
KEY PLAN

N

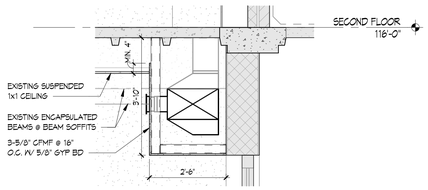
JOB NO. 2616.11

SHEET TITLE
INTERIOR PARTITION TYPES

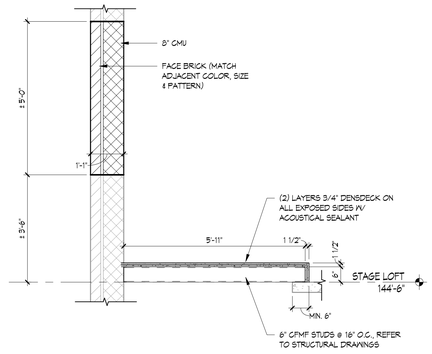
SHEET NO.
A2.30



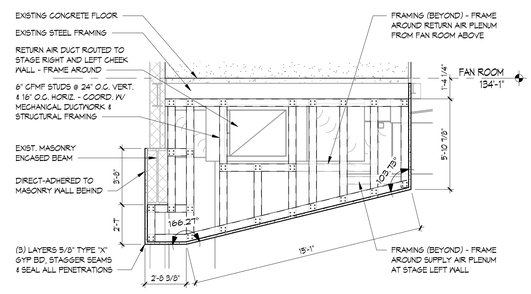
7 SOFFIT AT SECOND FLOOR FOYER
1/2" = 1'-0"



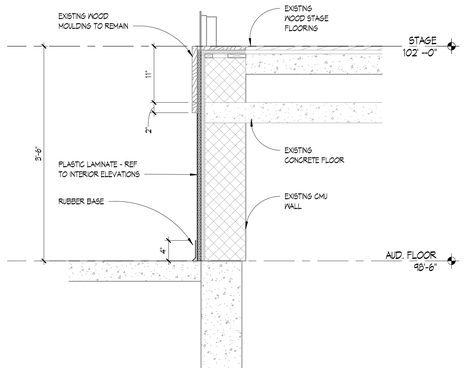
6 SOFFIT AT FIRST FLOOR FOYER
1/2" = 1'-0"



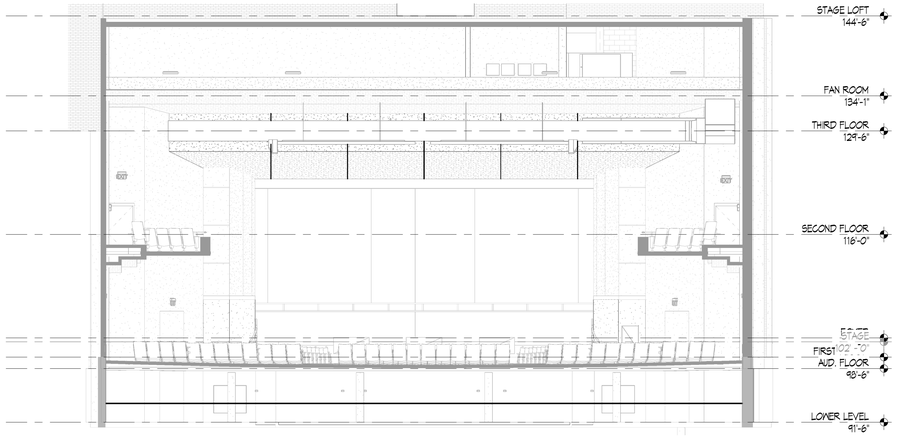
5 SECTION THROUGH FAN LOFT
1/2" = 1'-0"



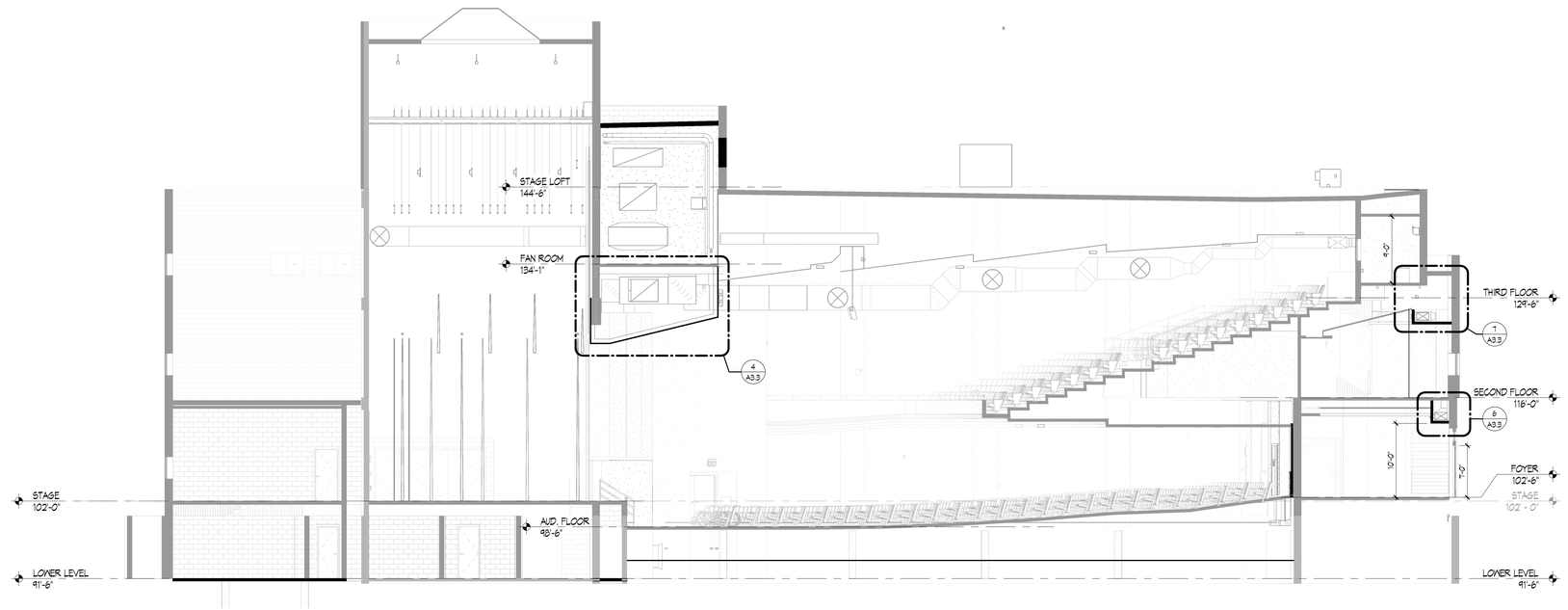
4 STAGE AREA SOFFIT
1/4" = 1'-0"



3 SECTION THROUGH STAGE
1" = 1'-0"



2 TRANSVERSE SECTION
1/8" = 1'-0"



1 LONGITUDINAL SECTION
1/8" = 1'-0"

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SHEET TITLE
BUILDING SECTIONS & DETAILS

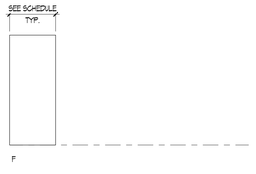
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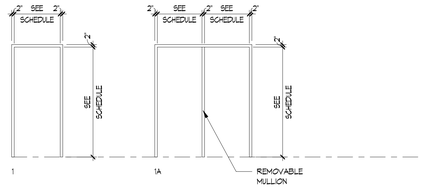
DOOR SCHEDULE

DOOR NUMBER	DOOR WIDTH	DOOR HEIGHT	DOOR TYPE	DOOR MATERIAL	DOOR GLASS	FRAME TYPE	FRAME MATERIAL	FRAME GLASS	FRAME DETAILS HEAD	FRAME DETAILS JAMB	FRAME DETAILS JAMB	FRAME DETAILS SILL	FIRE RATING	REMARKS
100A	6'-0"	7'-0"	EXIST.	WD	EXIST.	EXIST.	WD	EXIST.	--	--	--		-	EXWD, EXHF
100B	6'-0"	7'-0"	EXIST.	WD	EXIST.	EXIST.	WD	EXIST.	--	--	--		-	EXWD, EXHF
100C	6'-0"	7'-0"	EXIST.	WD	EXIST.	EXIST.	WD	EXIST.	--	--	--		-	EXWD, EXHF
100D	6'-0"	7'-0"	F	HM	--	1A	HM	--	8/A6.1	7/A6.1	7/A6.1		-	EXWD, EXHF
100E	6'-0"	7'-0"	F	HM	--	1A	HM	--	8/A6.1	7/A6.1	7/A6.1		-	EXWD, EXHF
100F	6'-0"	7'-0"	F	HM	--	1A	HM	--	8/A6.1	7/A6.1	7/A6.1		-	EXWD, EXHF
100G	6'-0"	7'-0"	F	HM	--	1A	HM	--	8/A6.1	7/A6.1	7/A6.1		-	EXWD, EXHF
100H	5'-8"	6'-10"	F	WD	--	1A	HM	--	1/A6.1	3/A6.1	3/A6.1		20 MIN	EXWD, EXHF
101A	5'-8"	6'-10"	F	WD	--	1A	HM	--	2/A6.1	3/A6.1	3/A6.1		20 MIN	EXHMD, EXHMF
101B	6'-0"	7'-0"	F	HM	--	1A	HM	--	4/A6.1	5/A6.1	5/A6.1		90 MIN	EXHMD, EXHMF
200A	5'-8"	6'-10"	F	WD	--	1A	HM	--	1/A6.1	3/A6.1	3/A6.1		20 MIN	EXWD, EXHF



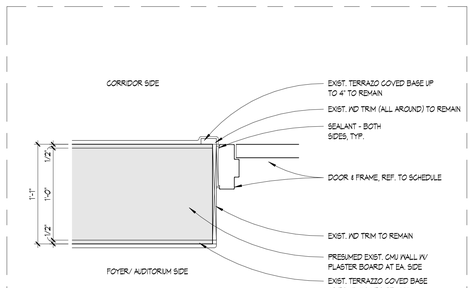
DOOR TYPES

FIELD VERIFY OPENING SIZE PRIOR TO MANUFACTURING



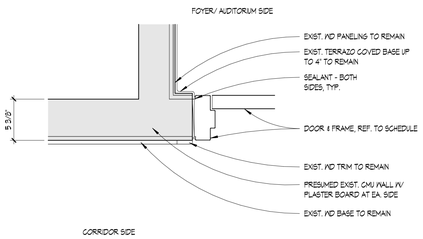
FRAME TYPES

FIELD VERIFY OPENING SIZE PRIOR TO MANUFACTURING



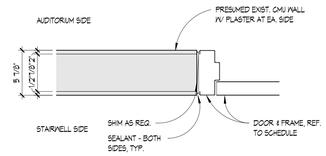
3 JAMB - HM FRAME

1 1/2" = 1'-0"



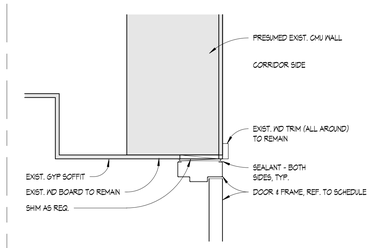
7 JAMB - HM FRAME

1 1/2" = 1'-0"



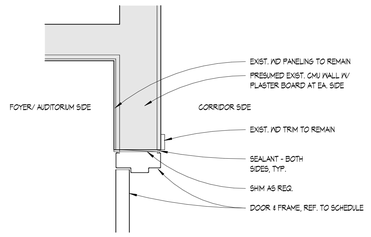
5 HEAD - HM FRAME

1 1/2" = 1'-0"



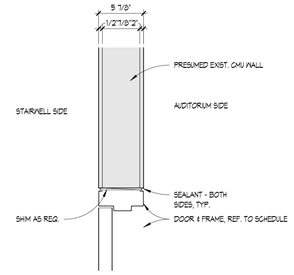
2 HEAD - HM FRAME

1 1/2" = 1'-0"



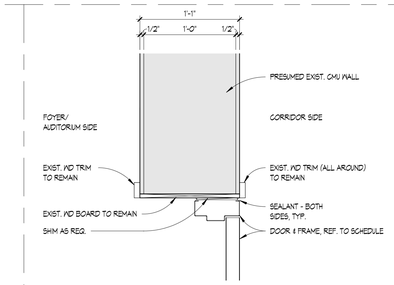
6 JAMB - HM FRAME

1 1/2" = 1'-0"



4 HEAD - HM FRAME

1 1/2" = 1'-0"



1 HEAD - HM FRAME

1 1/2" = 1'-0"

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KEY PLAN

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JOB NO. 2616.11

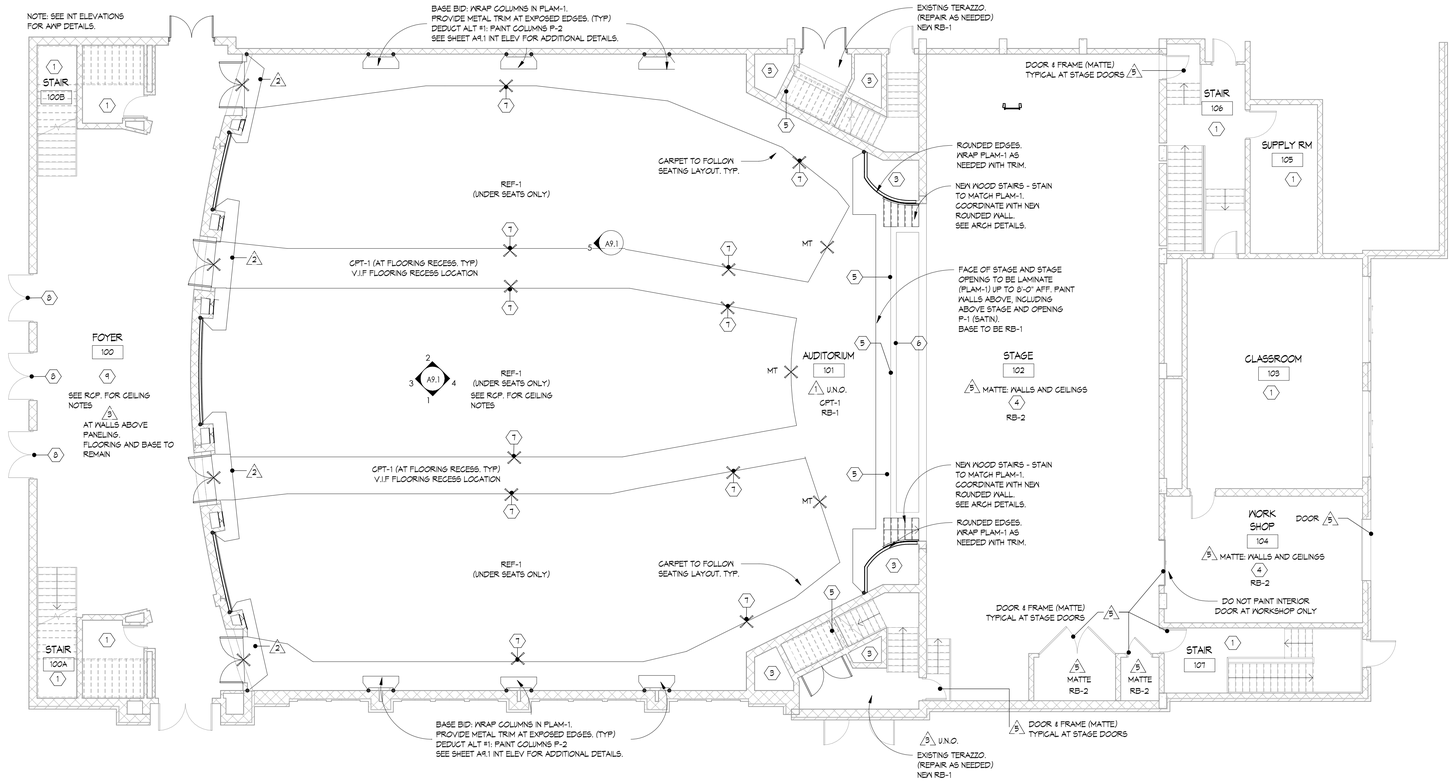
SHEET TITLE

DOOR SCHEDULE & OPENING ELEVATIONS

SHEET NO.

A6.1

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1 FIRST FLOOR COLOR - UNIT 1100
1/8" = 1'-0"

COLOR LAYOUT PLAN GENERAL NOTES

1. PAINT ALL NEW DOOR FRAMES AND HOLLOW METAL DOORS, SEMI-GLOSS P-1. DO NOT PAINT ALUMINUM DOOR FRAMES.
2. SEE REFLECTED CEILING PLANS FOR ACOUSTICAL CEILING TYPES.
3. UNLESS NOTED OTHERWISE, PAINT BULKHEADS, GYP CEILINGS, AND EXPOSED CEILINGS P-5 (SHERWIN WILLIAMS - TRIGORN BLACK IN MATTE)
4. DO NOT PAINT EXISTING UNPAINTED GLAY MASONRY WALLS. U.N.O.
5. FLOORING TRANSITIONS TO OCCUR IN LINE WITH THE CENTERLINE OF THE DOOR LEAF.
6. AT EXPOSED CEILING, PAINT MECHANICAL & STRUCTRUAL ELEMENTS TO MATCH COLOR INDICATED.
7. PROVIDE CAULK WHERE HARD SURFACE FLOORING EDGES MEET DOOR FRAMES.

COLOR LAYOUT PLAN LEGEND

- 1 — PAINT, SEE SPECIFICATION SECTIONS 099123 & 099600
- CPS-# — CARPET SHEET, SEE SPECIFICATION SECTION 096816
- RB-# — RUBBER BASE, SEE SPECIFICATION SECTION 096513
- REF-# — RESINOUS EPOXY FLOORING, SEE SPECIFICATION SECTION 096723
- RT — RESILIENT TRANSITION, SEE SPECIFICATION SECTION 096513
- S.C. — SEALED CONCRETE FLOOR
- TZ-# — TERRAZZO TILE FLOORING, SEE SPECIFICATION SECTION 096816
- AWP-# — ACOUSTICAL WALL PANEL.
- PRODUCT EXTENTS WITH MATERIAL INDICATED
- WORK POINT
- FLOORING TRANSITION
- MATERIAL INSTALL DIRECTION
- CHANGE OF MATERIAL

COLOR LAYOUT PLAN KEYNOTES

1. EXISTING FINISHES TO REMAIN.
2. PROVIDE SLIM LINE RESILIENT TRANSITION AT CARPET EDGE TO EPOXY FLOORING. TRANSITION TO BE AT SEATING END PANELS
3. CHASE SPACE. NO FINISHES
4. REPAIR AND REPLACE EXISTING STAGE FLOOR AS NEEDED. REFINISH & STAIN STAGE BLACK.
5. PREP AND REFINISH EXISTING DECORATE GRATES. ADD A CLEAR PROTECTIVE COATING AND REINSTALL.
6. REFINISHED WOOD TRIM EDGE AT STAGE EDGE. STAINED TO MATCH LAMINATE PLAM-1.
7. LIGHTED TRANSITIONS AT CARPET TO EPOXY CHANGE. SEE LIGHTING PLANS
8. REFINISH SOLID WOOD DOORS THAT ARE CURRENTLY PAINTED. SAND PREP AND STAIN THE DOORS. STAIN TO MATCH WOOD WITHIN FOYER 100.
9. WOOD PANELING TO REMAIN. PROTECT SURFACE AS REQUIRED. DO NOT PAINT.

COLOR LAYOUT MATERIAL INDEX

CARPET

CPT-# MANUFACTURER: JJ FLOORING
STYLE: 7198 CHROMATOS
COLOR: 3319 SCARLET
NOTES: ASHLAR INSTALLATION

PAINT

P-1 MANUFACTURER: SHERWIN WILLIAMS
COLOR: IRON ORE
COLOR NO: SW 7069
NOTES: SATIN

P-2 MANUFACTURER: SHERWIN WILLIAMS
COLOR: SUNDERED TOMATO
COLOR NO: SW 7593
NOTES: SATIN

P-3 MANUFACTURER: SHERWIN WILLIAMS
COLOR: SNOWBOND
COLOR NO: SW 7004
NOTES: SATIN

P-4 MANUFACTURER: SHERWIN WILLIAMS
COLOR: IRON ORE
COLOR NO: SW 7069
NOTES: FLAT (CEILINGS)

P-5 MANUFACTURER: SHERWIN WILLIAMS
COLOR: TRIGORN BLACK
COLOR NO: SW 6258
NOTES: MATTE (BACK OF HOUSE WALLS)
SEMIGLOSS (DOORS AND FRAMES)

P-E TOUCH UP PAINT ONLY. COLOR MATCH EXISTING.

RUBBER BASE

RB-1 MANUFACTURER: TARKETT/ JOHNSONITE
STYLE: MVI 20 K AMBASSADOR 4"
COLOR: 20 CHARCOAL
SIZE: 4"H
NOTES: AUDITORIUM

RB-2 MANUFACTURER: TARKETT/ JOHNSONITE
STYLE: TRADITIONAL VINYL
COLOR: 40 BLACK
SIZE: 6"H
NOTES: STAGE & BACK OF HOUSE

PLASTIC LAMINATE

PLAM-1 MANUFACTURER: FORMICA
STYLE: BLEACHED LEGNO
COLOR: 8845-58
NOTES: PROVIDE ALUMINUM METAL TRIM AT EXPOSED EDGES

RESINOUS EPOXY FLOOR

REF-# MANUFACTURER: STONHARD
STYLE: STONSHIELD
COLOR: ASH (CONFIRM WITH OWNER)
NOTES: SATIN FINISH

TRANSITIONS

MT MANUFACTURER: SCHLUTER
STYLE: VINPRO-U
COLOR: ALUMINUM
NOTES: ONLY WHERE NOTED
SEE SPEC SECTION 096813 FOR ADDITIONAL INFORMATION

NOTE TO CONTRACTOR:

SEE SPECIFICATION MANUAL FOR ADDITIONAL MATERIAL INFORMATION. CONTRACTORS ARE RESPONSIBLE FOR READING & UNDERSTANDING BOTH THE DRAWINGS & SPECIFICATIONS, AND ADDRESSING ANY DISPARITIES WITH THE ARCHITECT PRIOR TO INSTALLATION.

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KEY PLAN

N

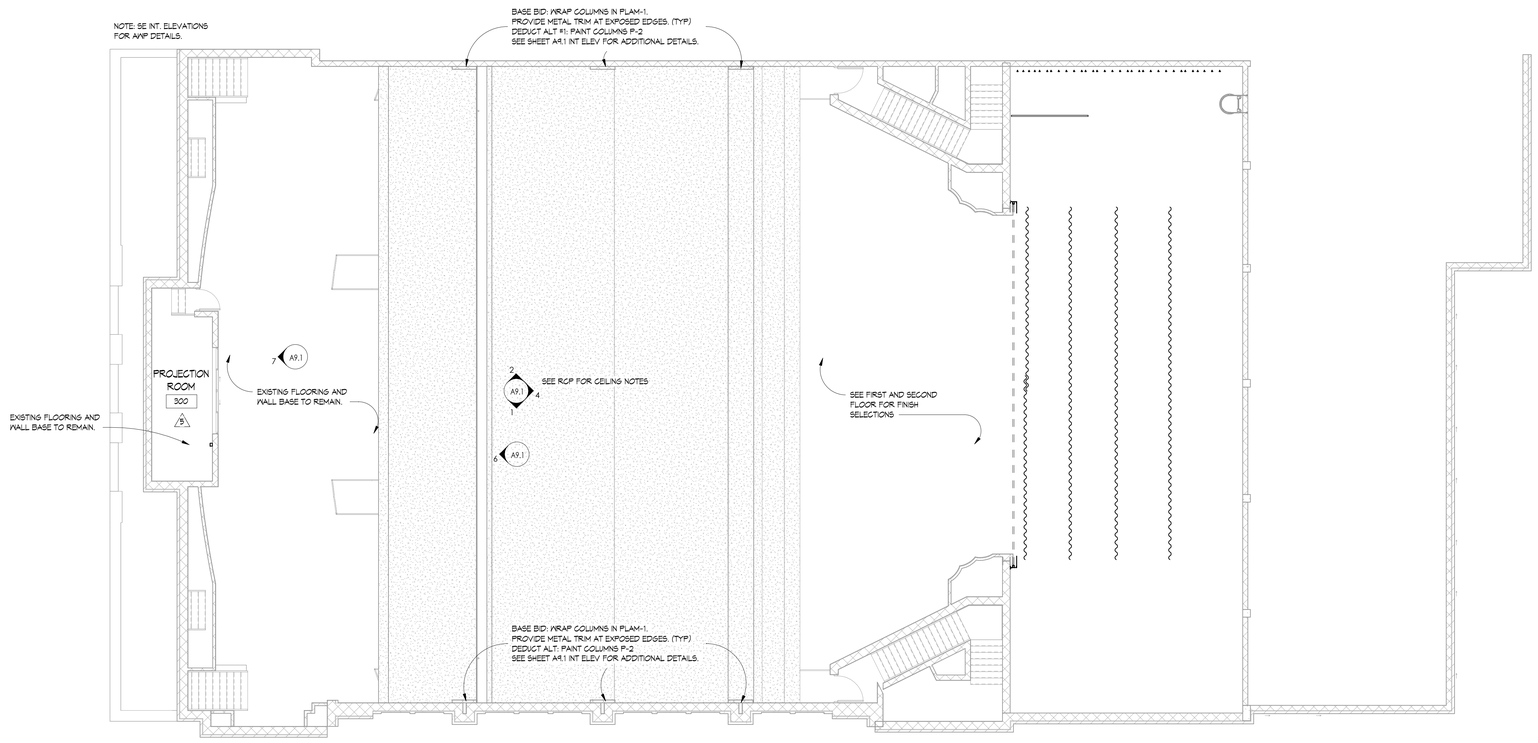
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SHEET TITLE
FIRST FLOOR COLOR LAYOUT PLAN

SHEET NO.
A8.1

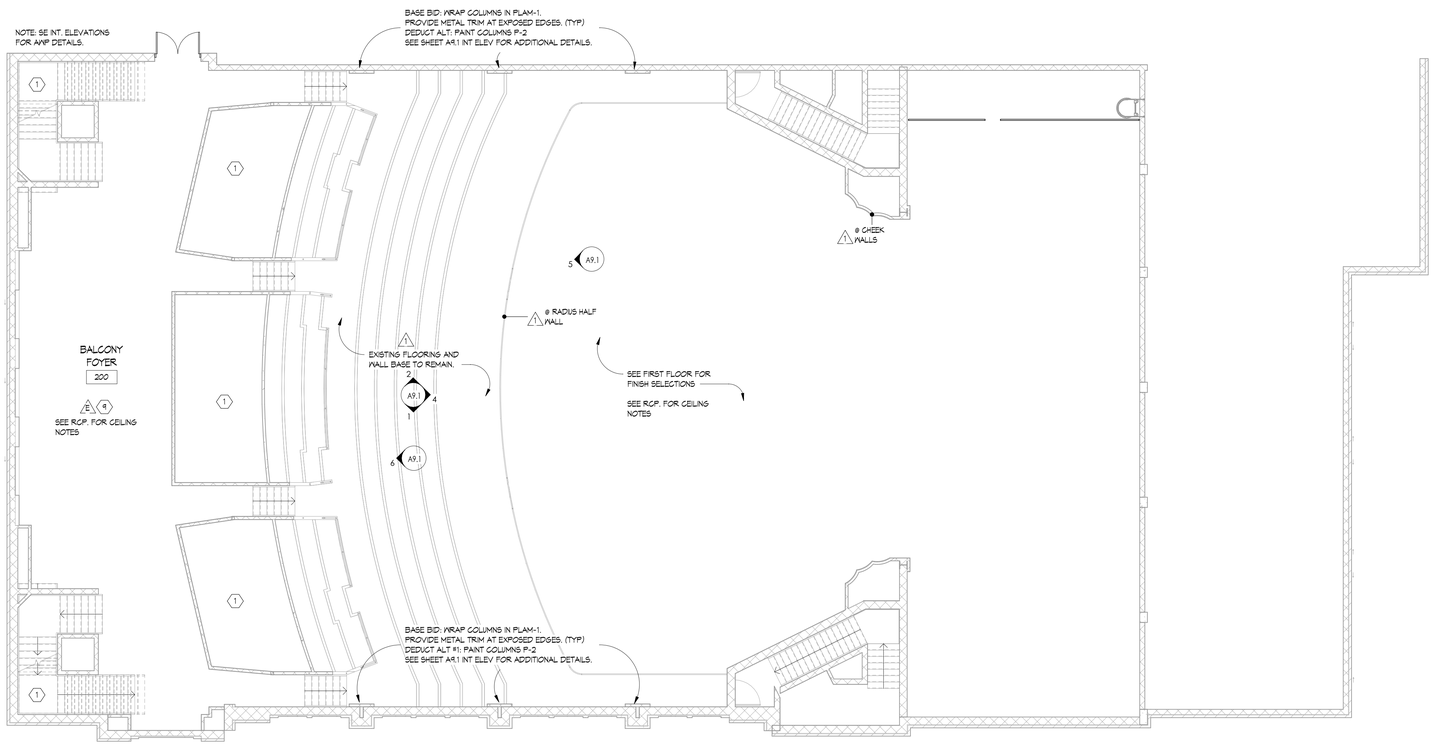
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2 THIRD FLOOR COLOR - 3100

1/8" = 1'-0"



1 SECOND FLOOR COLOR - UNIT 2100

1/8" = 1'-0"

COLOR LAYOUT PLAN GENERAL NOTES

1. PAINT ALL NEW DOOR FRAMES AND HOLLOW METAL DOORS, SEMI-GLOSS P-1. DO NOT PAINT ALUMINUM DOOR FRAMES.
2. SEE REFLECTED CEILING PLANS FOR ACOUSTICAL CEILING TYPES.
3. UNLESS NOTED OTHERWISE, PAINT BULKHEADS, GYP CEILINGS, AND EXPOSED CEILINGS P-5 (SHERWIN WILLIAMS - TRICORN BLACK IN MATTE)
4. DO NOT PAINT EXISTING UNPAINTED GLAY MASONRY WALLS. U.N.O.
5. FLOORING TRANSITIONS TO OCCUR IN LINE WITH THE CENTERLINE OF THE DOOR LEAF.
6. AT EXPOSED CEILING, PAINT MECHANICAL & STRUCTRUAL ELEMENTS TO MATCH COLOR INDICATED.
7. PROVIDE CAULK WHERE HARD SURFACE FLOORING EDGES MEET DOOR FRAMES.

COLOR LAYOUT PLAN LEGEND

- A — PAINT, SEE SPECIFICATION SECTIONS 099123 & 099600
- CPS-# — CARPET SHEET, SEE SPECIFICATION SECTION 096816
- RB-# — RUBBER BASE, SEE SPECIFICATION SECTION 096513
- REF-# — RESINOUS EPOXY FLOORING, SEE SPECIFICATION SECTION 096723
- RT — RESILIENT TRANSITION, SEE SPECIFICATION SECTION 096513
- S.C. — SEALED CONCRETE FLOOR
- TZ-# — TERRAZZO TILE FLOORING, SEE SPECIFICATION SECTION 096616
- AWP-# — ACOUSTICAL WALL PANEL
- PRODUCT EXTENTS WITH MATERIAL INDICATED
- WP — WORK POINT
- FLOORING TRANSITION
- MATERIAL INSTALL DIRECTION
- A / B — CHANGE OF MATERIAL

COLOR LAYOUT PLAN KEYNOTES

1. EXISTING FINISHES TO REMAIN.
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9. WOOD PANELING TO REMAIN. PROTECT SURFACE AS REQUIRED. DO NOT PAINT.

COLOR LAYOUT MATERIAL INDEX

CARPET

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STYLE: "198 CHROMATICS
COLOR: 3319 SCARLET
NOTES: ASHLAR INSTALLATION

PAINT

P-1 MANUFACTURER: SHERWIN WILLIAMS
COLOR: IRON ORE
COLOR NO: SW 7069
NOTES: SATIN

P-2 MANUFACTURER: SHERWIN WILLIAMS
COLOR: SUNDRIED TOMATO
COLOR NO: SW 7595
NOTES: SATIN

P-3 MANUFACTURER: SHERWIN WILLIAMS
COLOR: SNOWBOND
COLOR NO: SW 7004
NOTES: SATIN

P-4 MANUFACTURER: SHERWIN WILLIAMS
COLOR: IRON ORE
COLOR NO: SW 7069
NOTES: FLAT (CEILINGS)

P-5 MANUFACTURER: SHERWIN WILLIAMS
COLOR: TRICORN BLACK
COLOR NO: SW 6258
NOTES: MATTE (BACK OF HOUSE WALLS)
SEMIGLOSS (DOORS AND FRAMES)

P-E TOUCH UP PAINT ONLY. COLOR MATCH EXISTING.

RUBBER BASE

RB-1 MANUFACTURER: TARKETT/ JOHNSONSITE
STYLE: MN 20 K AMBASSADOR 4"
COLOR: 20 CHARCOAL
SIZE: 4"H
NOTES: AUDITORIUM

RB-2 MANUFACTURER: TARKETT/ JOHNSONSITE
STYLE: TRADITIONAL VINYL
COLOR: 40 BLACK
SIZE: 6"H
NOTES: STAGE & BACK OF HOUSE

PLASTIC LAMINATE

PLAM-1 MANUFACTURER: FORMICA
STYLE: BLEACHED LEGNO
COLOR: 5845-58
NOTES: PROVIDE ALUMINUM METAL TRIM AT EXPOSED EDGES

RESINOUS EPOXY FLOOR

REF-# MANUFACTURER: STONHARD
STYLE: STONSHIELD
COLOR: ASH (CONFIRM WITH OWNER)
NOTES: SATIN FINISH

TRANSITIONS

MT MANUFACTURER: SCHLUTER
STYLE: VINPRO-U
COLOR: ALUMINUM
NOTES: ONLY WHERE NOTED
SEE SPEC SECTION 096813 FOR ADDITIONAL INFORMATION

NOTE TO CONTRACTOR:

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BID & CONSTRUCTION	11/07/2025

KEY PLAN

N

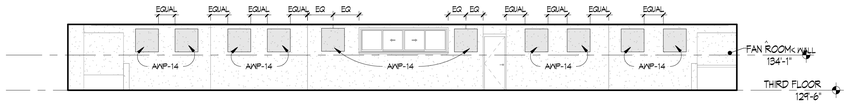
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SHEET TITLE
SECOND & THIRD FLOOR COLOR LAYOUT PLAN

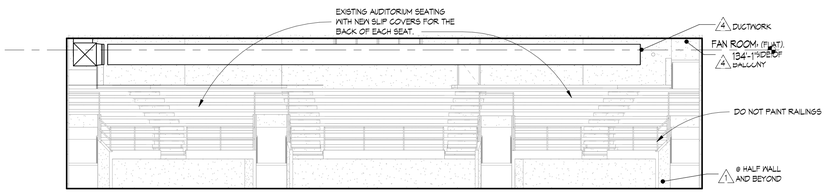
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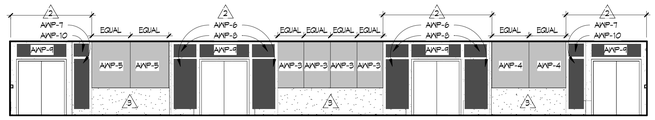
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7 AUDITORIUM - THIRD FLOOR BACK WALL ELEVATION
1/8" = 1'-0"

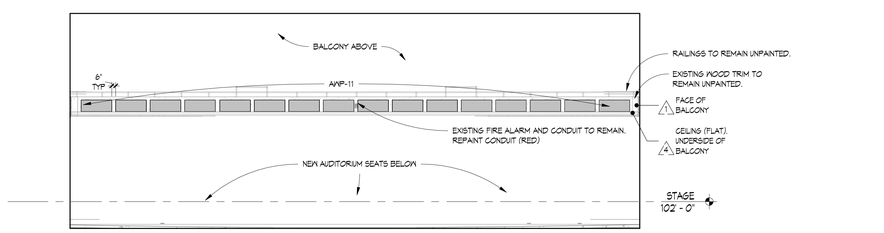


6 AUDITORIUM - THIRD FLOOR BALCONY ELEVATION
1/8" = 1'-0"

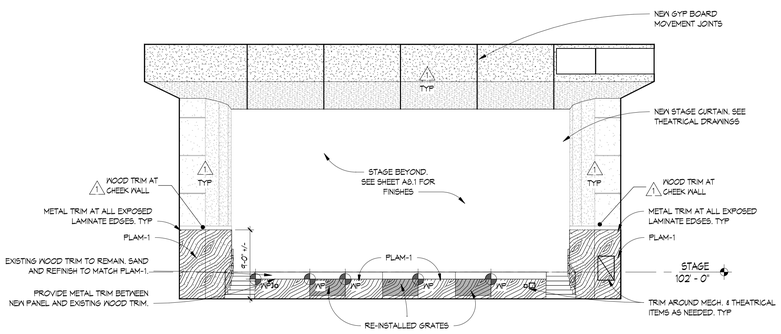


SEE SHEET A9.1 FOR ADDITIONAL PAINT INFORMATION

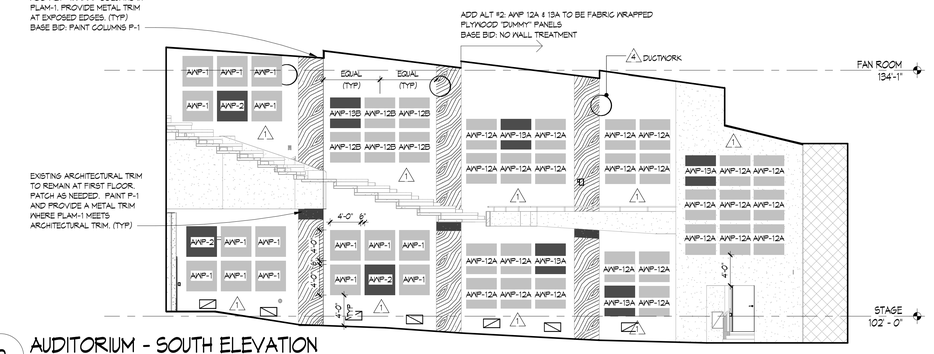
3 AUDITORIUM - EAST ELEVATION
1/8" = 1'-0"



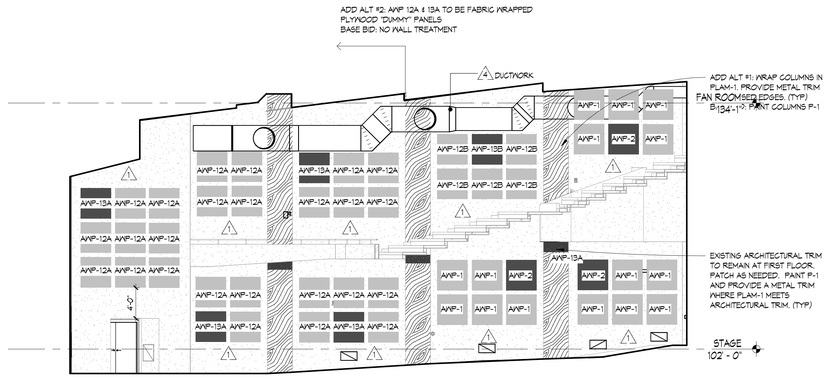
5 AUDITORIUM - SECOND FLOOR BALCONY ELEVATION
1/8" = 1'-0"



4 AUDITORIUM - WEST ELEVATION
1/8" = 1'-0"



2 AUDITORIUM - SOUTH ELEVATION
1/8" = 1'-0"



1 AUDITORIUM - NORTH ELEVATION
1/8" = 1'-0"

ACOUSTICAL WALL PANEL (AWP) SCHEDULE

NOTE: FIELD VERIFY ALL ACOUSTICAL WALL PANELS. FIELD CUT AROUND ANY WALL OBSTRUCTIONS AS NEED

TAG	LENGTH	HEIGHT	THICKNESS	COLOR	NOTES
AWP-1	48"	48"	4 1/8"	GRAPHITE	BASE BID
AWP-2	48"	48"	4 1/8"	GRAPHITE	BASE BID
AWP-3	40"	72"	2 1/8"	GRAPHITE	BASE BID
AWP-4	51"	72"	2 1/8"	GRAPHITE	BASE BID
AWP-5	60"	72"	2 1/8"	GRAPHITE	BASE BID
AWP-6	36"	78"	2 1/8"	RED	BASE BID
AWP-7	24"	78"	2 1/8"	RED	BASE BID
AWP-8	36"	20"	2 1/8"	RED	BASE BID
AWP-9	78"	20"	2 1/8"	RED	BASE BID
AWP-10	24"	20"	2 1/8"	RED	BASE BID
AWP-11	48"	18"	1 1/8"	GRAPHITE	BASE BID
AWP-12B	48"	48"	1/2"	GRAPHITE	BASE BID
AWP-13B	48"	48"	1/2"	GRAPHITE	BASE BID
AWP-14	36"	36"	2 1/8"	GRAPHITE	BASE BID
AWP-12A	48"	48"	1/2"	GRAPHITE	ADD ALT
AWP-13A	48"	48"	1/2"	GRAPHITE	ADD ALT

ACOUSTICAL PANEL MATERIALS

AWP 112 — MANUFACTURER: KINETICS
STYLE: HIGH IMPACT HARDSIDE
UPHOLSTERY: GUILFORD OF MAINE - ANCHORASE (OPEN HOUSE)
COLOR: SEE AWP SCHEDULE
EDGE: SQUARE
NOTES: INSTALLED WITH Z-CLIPS. SEE INT ELEV FOR DIMS.

AWP 9-4114 — MANUFACTURER: KINETICS
STYLE: HIGH IMPACT HARDSIDE
UPHOLSTERY: GUILFORD OF MAINE - ANCHORASE (OPEN HOUSE)
COLOR: SEE AWP SCHEDULE
EDGE: SQUARE
NOTES: INSTALLED WITH Z-CLIPS. SEE INT ELEV FOR DIMS.

AWP 12B413B — FABRIC WRAPPED PLYWOOD PANELS (BASE BID)
UPHOLSTERY: GUILFORD OF MAINE - ANCHORASE (OPEN HOUSE)
COLOR: SEE AWP SCHEDULE
NOTES: INSTALLED WITH Z-CLIPS. SEE INT ELEV FOR DIMS.

AWP 12A413A — FABRIC WRAPPED PLYWOOD PANELS (ADD ALT)
UPHOLSTERY: GUILFORD OF MAINE - ANCHORASE (OPEN HOUSE)
COLOR: SEE AWP SCHEDULE
NOTES: INSTALLED WITH Z-CLIPS. SEE INT ELEV FOR DIMS.

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LANSING SCHOOL DISTRICT

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BID & CONSTRUCTION	11/07/2025

KEY PLAN

N

JOB NO. 2616.11

SHEET TITLE
INTERIOR ELEVATIONS

SHEET NO.
A9.1

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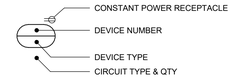
THEATRICAL LIGHTING GENERAL NOTES

1. TL-SERIES DRAWINGS TO BE REFERENCED IN CONJUNCTION WITH SPECIFICATION SECTION 11 61 63.
2. THE LIGHTING SYSTEM SHOWN ON THESE SHEETS IS BASED ON DMX-CONTROLLED POWER DISTRIBUTION. EACH CONTROLLED BREAKER HAS A UNIQUE DMX ADDRESS, AND EACH BRANCH CIRCUIT RECEPTACLE IS WIRED TO THE BREAKER WITH THE SAME NUMBER DESIGNATION. 20A 120V BRANCH CIRCUITS MAY BE WIRED TO A MAXIMUM OF SIX RECEPTACLES.
3. NO COMMON NEUTRALS PERMITTED IN WIRING DEVICES. EACH CIRCUIT MUST HAVE INDIVIDUAL HOT AND NEUTRAL CONDUCTORS WHICH HOMERUN TO THE CONTROLLED PANELBOARD.
4. VERIFY ALL DIMENSIONS AND AS-BUILT CONDITIONS IN THE FIELD PRIOR TO FABRICATION OF INSTALLED ELEMENTS.
5. VERIFY ALL NETWORK CABLE ROUTING AND DISTANCES IN THE FIELD. PROVIDE FIBER OR MIDSPAN DEVICE IF ANY CONDITIONS ARE ANTICIPATED TO EXCEED 275 FEET.
6. VERIFY EXACT SIZES OF BACK BOXES AND FINAL WIRE TYPES AND QUANTITIES.
7. CONFIRM COLOR FOR ALL LIGHTING DEVICES LOCATED IN PUBLIC SPACES WITH ARCHITECT.
8. ALL EXPOSED ELEMENTS IN TECHNICAL AREAS TO BE FINISHED FLAT BLACK UNLESS OTHERWISE NOTED.
9. COORDINATE INSTALLATION REQUIREMENTS FOR THE WORK OF THIS SECTION WITH DIVISION 26 CONTRACTOR.
10. COORDINATE DMX ADDRESSING REQUIREMENTS FOR ARCHITECTURAL FIXTURES CONTROLLED BY THE THEATRICAL LIGHTING SYSTEM WITH DIVISION 26.
11. ALL CONDUIT, WIRE, MOUNTING, POWER FEEDS AND POWER TERMINATIONS BY DIVISION 26 UNLESS OTHERWISE NOTED.
12. REFER TO DIVISION 26 SPECIFICATIONS AND DRAWINGS FOR ALL PANELBOARD DESIGNATIONS.
13. ALL CONTROL WIRE TERMINATIONS BY DIVISION 26 CONTRACTOR UNLESS OTHERWISE NOTED. PROVIDE COORDINATION AND DIRECT SUPERVISION FOR THE TERMINATION OF ALL PROPRIETARY CONTROL WIRING.
14. NO SPLICES PERMITTED FOR CONTROL WIRING RUNS.
15. NO CONDUIT OR CONDUIT SUPPORTS PERMITTED ON LIGHTING PIPES OR LIGHTING POSITIONS.
16. COORDINATE CABLE MANAGEMENT REQUIREMENTS AND FEED CABLE LENGTHS AND TYPES FOR ALL BATTEN MOUNTED DEVICES WITH THEATRICAL RIGGING CONTRACTOR.
17. SEE SCHEDULES ON TL-SERIES SHEETS FOR LOAD CIRCUIT AND CONTROL ASSIGNMENTS AND DEVICE MOUNTING INFORMATION.

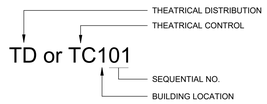
GENERAL ABBREVIATIONS

A	AMPERAGE
AC	ALTERNATING CURRENT
ADA	AMERICANS WITH DISABILITIES ACT
AFF	ABOVE FINISHED FLOOR
ARCH	ARCHITECTURAL
AUX	AUXILIARY
AV	AUDIO VIDEO
AWG	AMERICAN WIRE GAUGE
BOH	BACK OF HOUSE
CL	CENTERLINE
CMS	CABLE MANAGEMENT SYSTEM
CR	CONTROL RACK
DC	DIRECT CURRENT
DIV	DIVISION
DR	DIMMER RACK
DSL	DOWNSTAGE LEFT
DSR	DOWNSTAGE RIGHT
EE	ELECTRICAL ENGINEER
ELEC	ELECTRICAL
EM	EMERGENCY
ETR	EXISTING TO REMAIN
ETS	EMERGENCY TRANSFER SYSTEM
FOH	FRONT OF HOUSE
GND	GROUND
HL	HOUSE LEFT
HR	HOUSE RIGHT
ID	INSIDE DIAMETER
JB	JUNCTION BOX
LS	LIGHTING SYSTEM
LTG	LIGHTING
MISC	MISCELLANEOUS
NOM	NOMINAL
OC	ON CENTER
OD	OUTSIDE DIAMETER
OPP	OPPOSITE
ORCH	ORCHESTRA
PCP	PRODUCTION CONTROL POSITION
PoE	POWER OVER ETHERNET
PRH	PROJECT RECEPTACLE HEIGHT
PSH	PROJECT SWITCH HEIGHT
QTY	QUANTITY
REF	REFERENCE
REQD	REQUIRED
RFU	REMOTE FOCUS UNIT
RU/U	RACK UNIT
SIM	SIMILAR
SL	STAGE LEFT
SLL	SOUND AND LIGHT LOCK
SPEC	SPECIFICATION
SR	STAGE RIGHT
TAV	THEATRICAL AUDIO VIDEO
TBD	TO BE DETERMINED
TL	THEATRICAL LIGHTING
TLC	THEATRICAL LIGHTING CONTRACTOR
TRC	THEATRICAL RIGGING CONTRACTOR
TRP	THEATRICAL LIGHTING RELAY PANEL
TSE	THEATRE AND STAGE EQUIPMENT
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
USL	UPSTAGE LEFT
USR	UPSTAGE RIGHT
V	VOLTAGE
VIF	VERIFY IN FIELD
WAP	WIRELESS ACCESS POINT
WBO	WORK BY OTHERS

DEVICE SYMBOL KEY



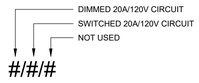
DEVICE NUMBERING KEY



BUILDING LOCATION

0	BASEMENT / TRAP LEVEL
1	STAGE / MAIN AUDITORIUM LEVEL
2	BALCONY LEVEL / BOX BOOM LEVEL
3	CONTROL BOOTH LEVEL
4	STAGE LOFT LEVEL

CIRCUIT TYPE KEY



DEVICE ABBREVIATIONS

THEATRICAL CONTROL DISTRIBUTION

CC#	CONSOLE CONNECTION PANEL
EN#	DMX ETHERNET NODE
ET#	ETHERNET TAP
ET-TB	ETHERNET TERMINAL BOX

= TOTAL NUMBER OF ETHERNET OR DMX CONTROL PORTS PER DEVICE

ARCHITECTURAL CONTROL

EP	ENTRY PUSHBUTTON PANEL
PP	PRESET PUSHBUTTON PANEL
TP	TOUCHSCREEN PANEL

POWER DISTRIBUTION

PBP #	PLUGGING BOX WITH PIGTAILS
PBR #	PLUGGING BOX WITH RECEPTACLES
PSP #	PLUGGING STRIP WITH PIGTAILS
PSR #	PLUGGING STRIP WITH RECEPTACLES
TB #	TERMINAL BOX

= TOTAL NUMBER OF LOAD CIRCUITS PER DEVICE

COORDINATION SYMBOLS (WORK BY OTHERS)

THESE SYMBOLS APPEAR IN DRAWINGS FOR COORDINATION PURPOSES ONLY AND ARE NOT PROVIDED AS A PART OF THE WORK OF THIS SECTION.

WORK BY DIVISION 26

LS	20A 120V DUPLEX LIGHTING SYSTEM RECEPTACLE
LS	20A 120V QUAD LIGHTING SYSTEM RECEPTACLE
LS L5-20	20A 120V L5-20 TWIST-LOCK LIGHTING SYSTEM RECEPTACLE (FOLLOWSPOT)

WORK BY DIVISION 27

	BUILDING NETWORK RECEPTACLE

LIGHTING SYSTEM DIVISION OF RESPONSIBILITIES

SCOPE OF WORK	FURNISHED	INSTALLED
CONDUIT	DIV. 26	DIV. 26
STANDARD BACK BOXES	DIV. 26	DIV. 26
CUSTOM BACK BOXES	DIV. 11 - TLC	DIV. 26
AC POWER WIRING	DIV. 26	DIV. 26
AC POWER RECEPTACLES (LS)	DIV. 26	DIV. 26
AC POWER DEVICES IN RACKS	DIV. 11 - TLC	DIV. 26
CONTROL / LOW VOLTAGE WIRING	DIV. 26	DIV. 26
FLEXIBLE CABLE IN CMS	DIV. 11 - TRC	DIV. 26
AC POWER TERMINATIONS	---	DIV. 26
CONTROL TERMINATIONS	---	DIV. 26
TL FACEPLATES	DIV. 11 - TLC	DIV. 26
TL CONTROLLED PANELBOARDS	DIV. 11 - TLC	DIV. 26
TL EQUIPMENT	DIV. 11 - TLC	DIV. 11 - TLC

LIGHTING SYSTEM DEMOLITION NOTES

1. DEMOLISH EXISTING THEATRICAL LIGHTING BRANCH CIRCUIT BACKBOXES, WIRING AND CONDUIT.
2. DEMOLISH THEATRICAL LIGHTING PATCH PANEL AND ASSOCIATED CONTROL DEVICES.
3. DEMOLISH ARCHITECTURAL LIGHTING BRANCH CIRCUITS, WIRING, CONDUIT TO BE REUSED.
4. DEMOLISH WIRING, CONDUIT AND CONTACT INTERFACES FOR EMERGENCY LIGHTING TRANSFER SYSTEM.
5. EXISTING WIRING, CONDUIT, FOR LOBBY LIGHTING TO REMAIN.
6. DEMOLISH CONTROL DISTRIBUTION FACEPLATES WHERE NOTED AND REPLACE WITH BLANK COVER PLATES; BACKBOXES AND CONDUIT TO BE ABANDONED IN PLACE. DISCONNECT AND ABANDON IN PLACE ANY UNUSED EXISTING CONTROL DISTRIBUTION WIRING, UNLESS OTHERWISE NOTED.
7. A COMPLETE BUILDING SURVEY WAS NOT AVAILABLE AT THE TIME OF ISSUE OF THESE DRAWINGS. CONTRACTOR SHALL BE REQUIRED TO FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS RELATED TO THE WORK OF THIS SECTION PRIOR TO COMPLETING SHOP DRAWINGS AND INSTALLING EQUIPMENT. OBSTRUCTIONS WHICH IMPEDE THE INSTALLATION OF THE EQUIPMENT AS SHOWN SHALL BE MODIFIED BY THE CONTRACTOR TO ALLOW PROPER INSTALLATION.

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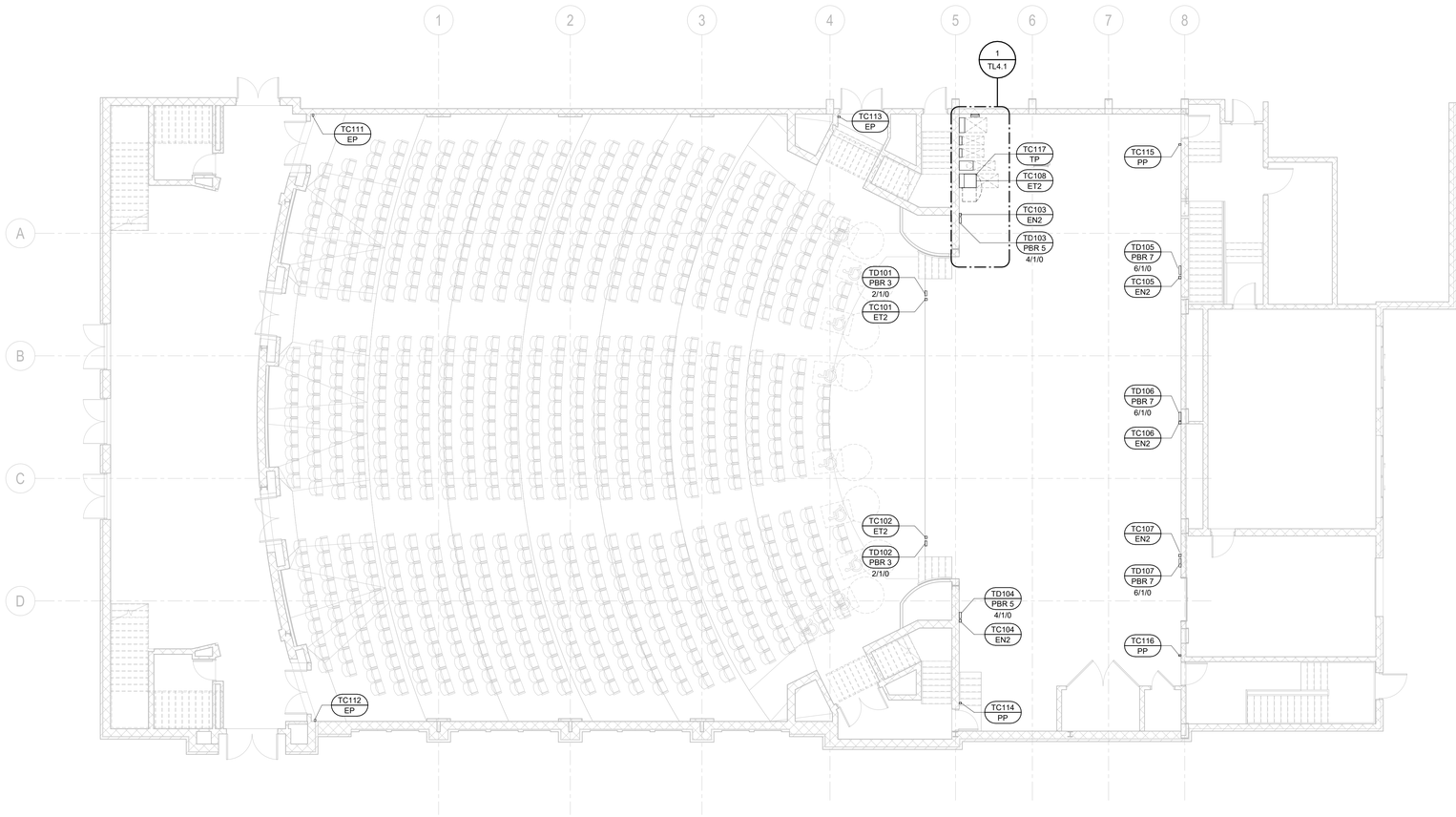
JOB NO. 2616.11

SHEET TITLE
THEATRICAL LIGHTING SYMBOL KEY & NOTES

SHEET NO.
TL0.0

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1 THEATRICAL LIGHTING PLAN - FIRST FLOOR
1/8" = 1'-0"

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KEY PLAN

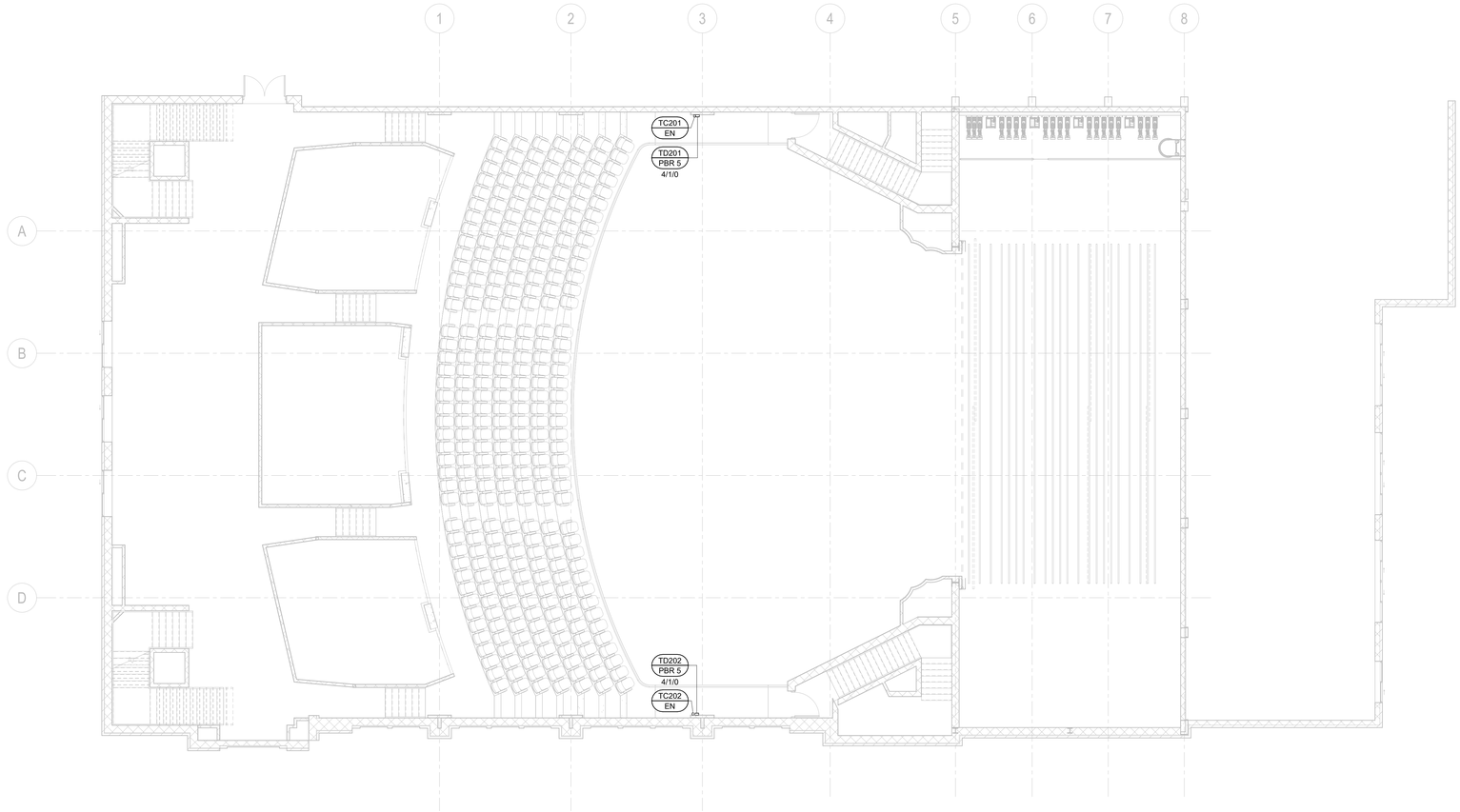
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SHEET TITLE
THEATRICAL LIGHTING FIRST FLOOR PLAN

SHEET NO.
TL1.1

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1 THEATRICAL LIGHTING PLAN - SECOND FLOOR
1/8" = 1'-0"

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KEY PLAN

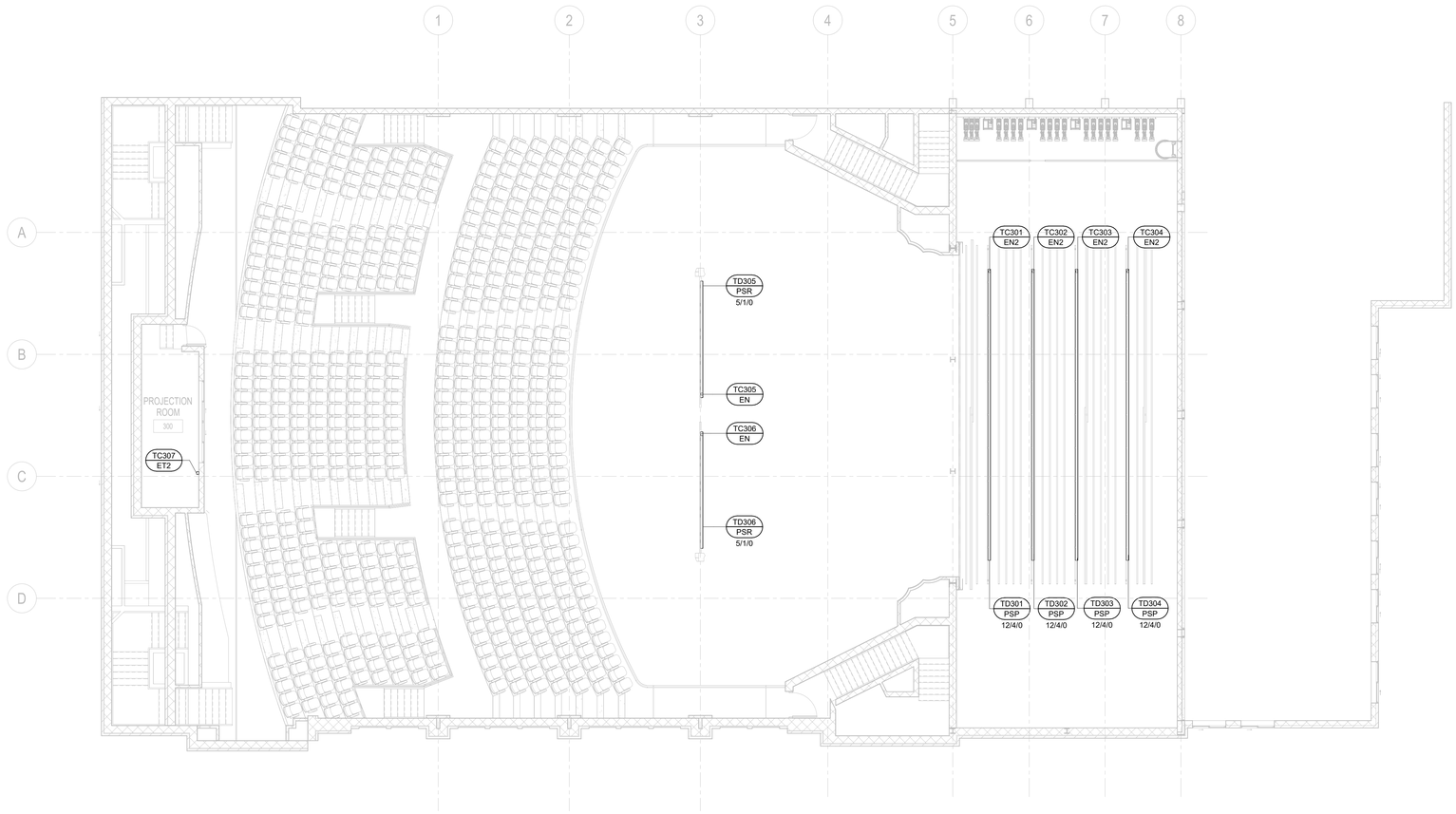
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JOB NO. 2616.11

SHEET TITLE
THEATRICAL LIGHTING SECOND FLOOR PLAN

SHEET NO.
TL1.2

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1 THEATRICAL LIGHTING PLAN - THIRD FLOOR
1/8" = 1'-0"

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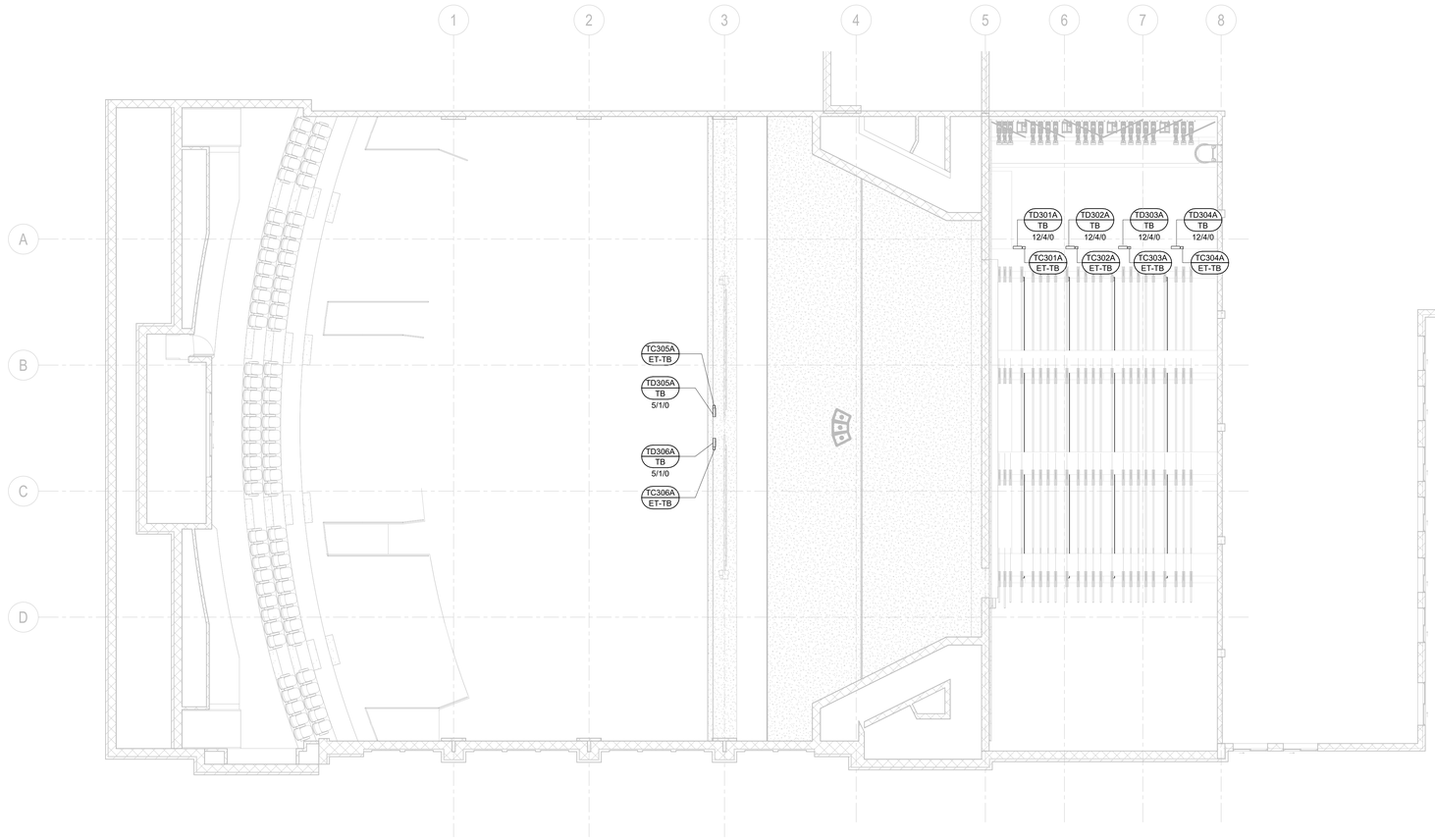
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SHEET TITLE
THEATRICAL LIGHTING
THIRD FLOOR PLAN

SHEET NO.
TL1.3

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1 THEATRICAL LIGHTING PLAN - STAGE LOFT
1/8" = 1'-0"

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KEY PLAN
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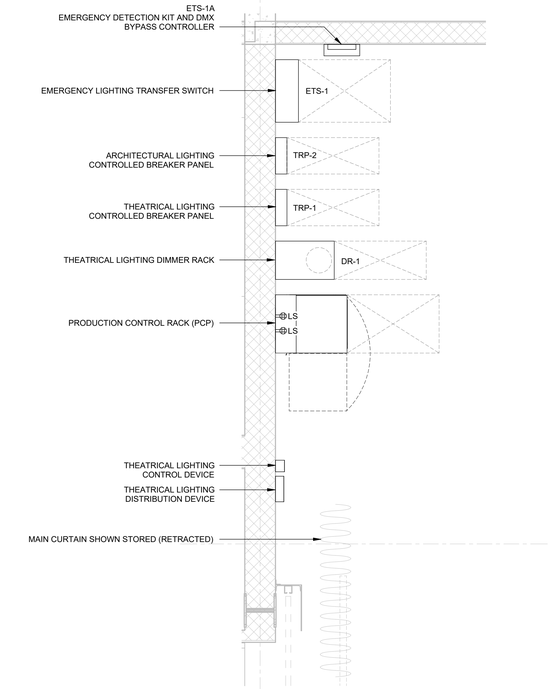
JOB NO. 2616.11

SHEET TITLE
THEATRICAL LIGHTING STAGE LOFT PLAN

SHEET NO.
TL1.4

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1 ENLARGED PLAN - DIMMER AREA
1/2" = 1'-0"

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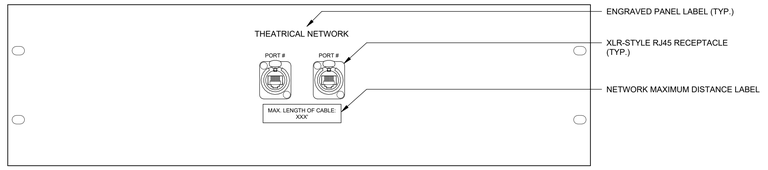
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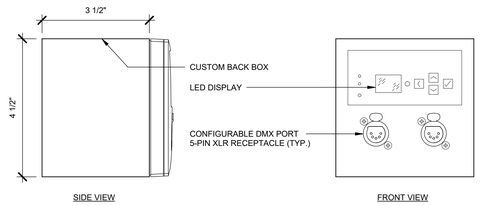
SHEET TITLE
THEATRICAL LIGHTING ENLARGED PLAN

SHEET NO.
TL4.1

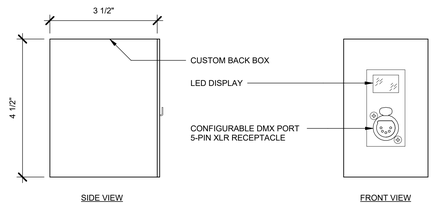
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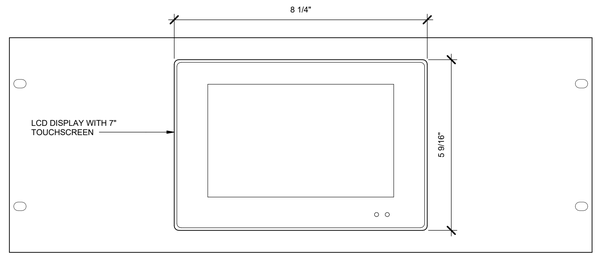
8 DEVICE DETAIL - 'ET2' - RACK
6" = 1'-0"



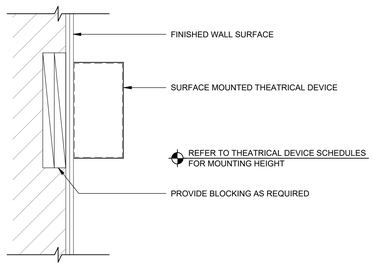
7 DEVICE DETAIL - 'EN2' - SURFACE
6" = 1'-0"



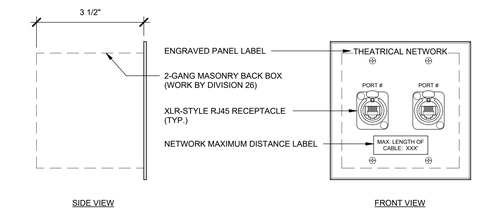
6 DEVICE DETAIL - 'EN' - SURFACE
6" = 1'-0"



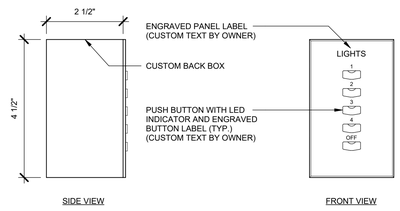
3 DEVICE DETAIL - 'TP' - RACK
6" = 1'-0"



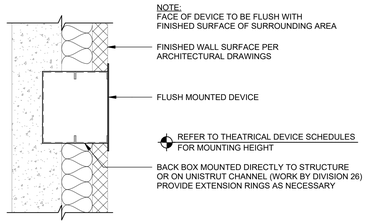
10 MOUNTING DETAIL - LIGHTING DEVICE - SURFACE
3" = 1'-0"



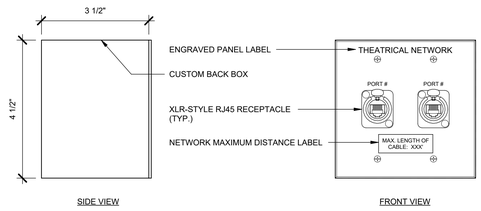
5 DEVICE DETAIL - 'ET2' - FLUSH
6" = 1'-0"



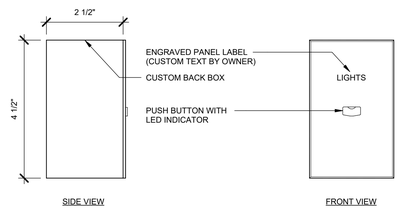
2 DEVICE DETAIL - 'PP' - SURFACE
6" = 1'-0"



9 MOUNTING DETAIL - LIGHTING DEVICE - FLUSH
3" = 1'-0"



4 DEVICE DETAIL - 'ET2' - SURFACE
6" = 1'-0"



1 DEVICE DETAIL - 'EP' - SURFACE
6" = 1'-0"

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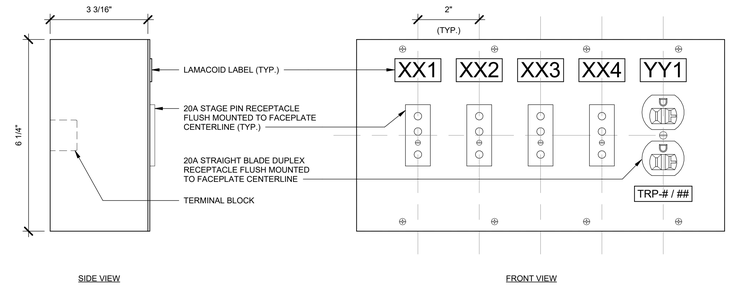
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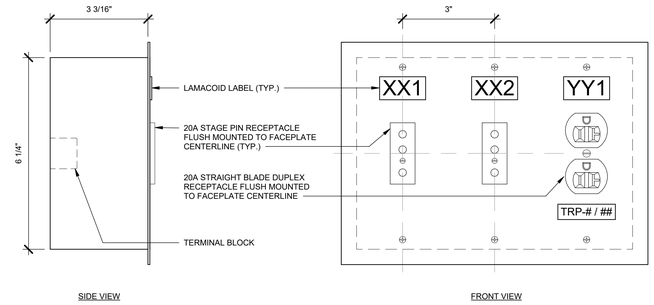
SHEET TITLE
THEATRICAL LIGHTING DETAILS

SHEET NO. TL5.1

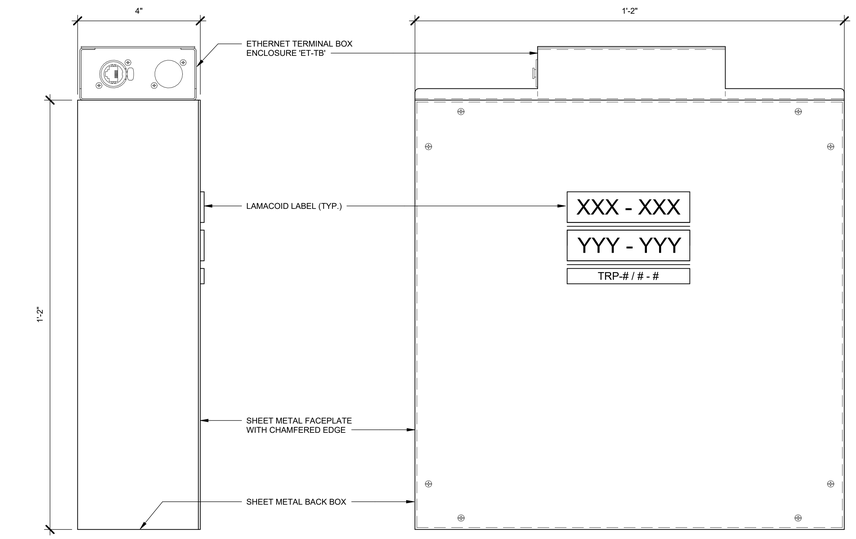
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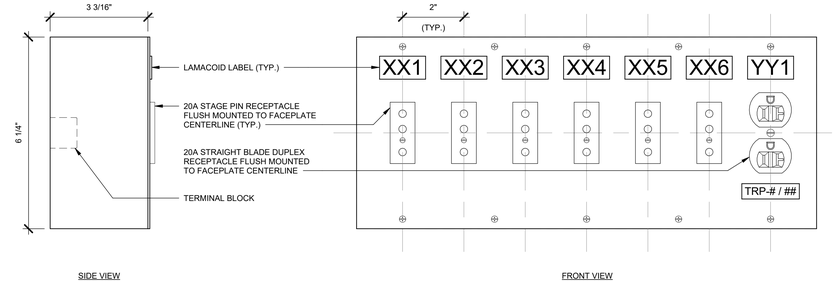
3 DEVICE DETAIL - PBR 5 - 4/1/0 - SURFACE
6" = 1'-0"



2 DEVICE DETAIL - PBR 3 - 2/1/0 - FLUSH
6" = 1'-0"



4 DEVICE DETAIL - 'TB' WITH 'ET-TB'
6" = 1'-0"



1 DEVICE DETAIL - PBR 7 - 6/1/0 - SURFACE
6" = 1'-0"

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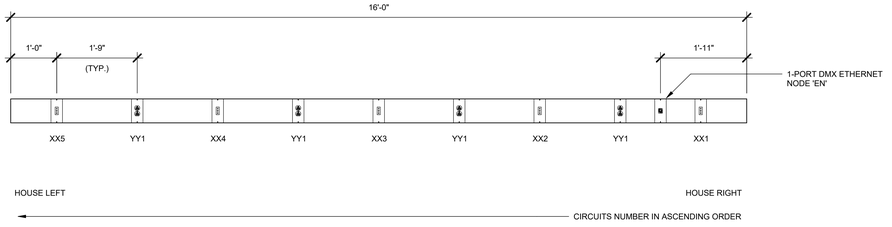
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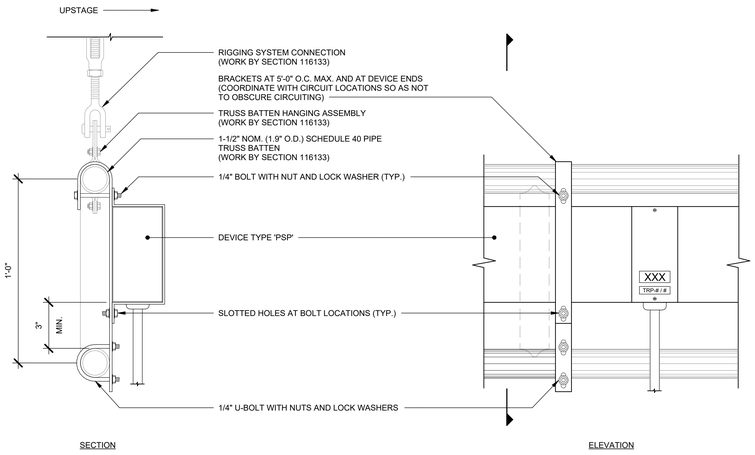
SHEET TITLE
THEATRICAL LIGHTING DETAILS

SHEET NO.
TL5.2

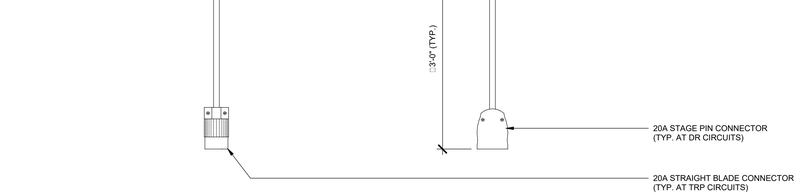
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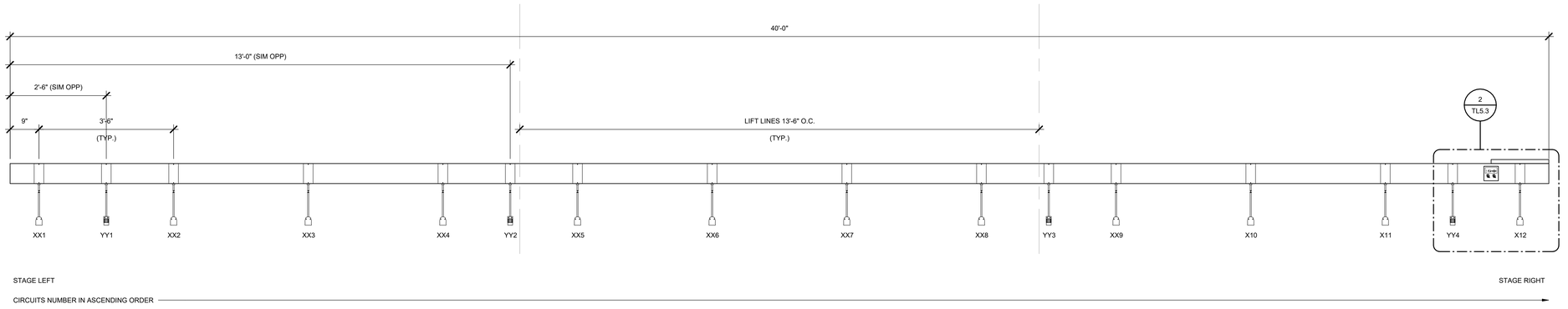
3 DEVICE DETAIL - PSR - 5/1/0 WITH 'EN'
3/4" = 1'-0"



4 MOUNTING DETAIL - PLUGGING STRIP 'PSP' - TRUSS BATTEN
3" = 1'-0"



2 PLUGGING STRIP PIGTAIL DETAIL
3" = 1'-0"



1 DEVICE DETAIL - PSP - 12/4/0 WITH 'EN2'
3/4" = 1'-0"

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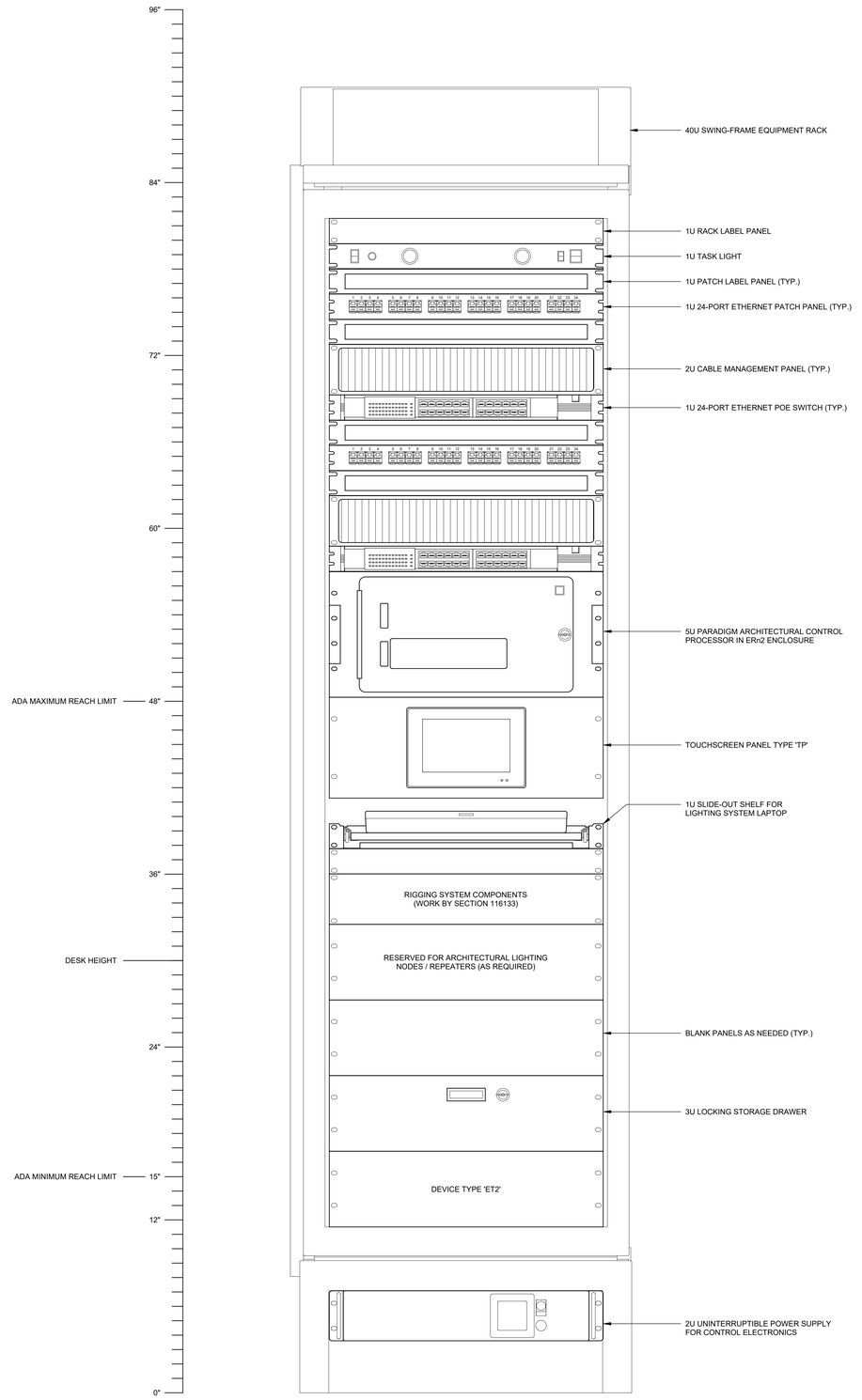
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SHEET TITLE
THEATRICAL LIGHTING DETAILS

SHEET NO. TL5.3

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1 PCP - PRODUCTION CONTROL PANEL RACK ELEVATION
3" = 1'-0"

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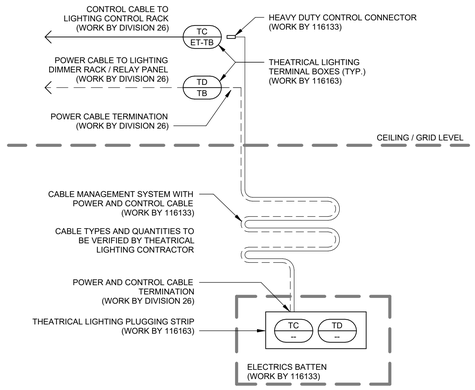
ISSUANCES	DATE
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JOB NO. 2616.11

SHEET TITLE
THEATRICAL LIGHTING RACK ELEVATIONS

SHEET NO.
TL5.4

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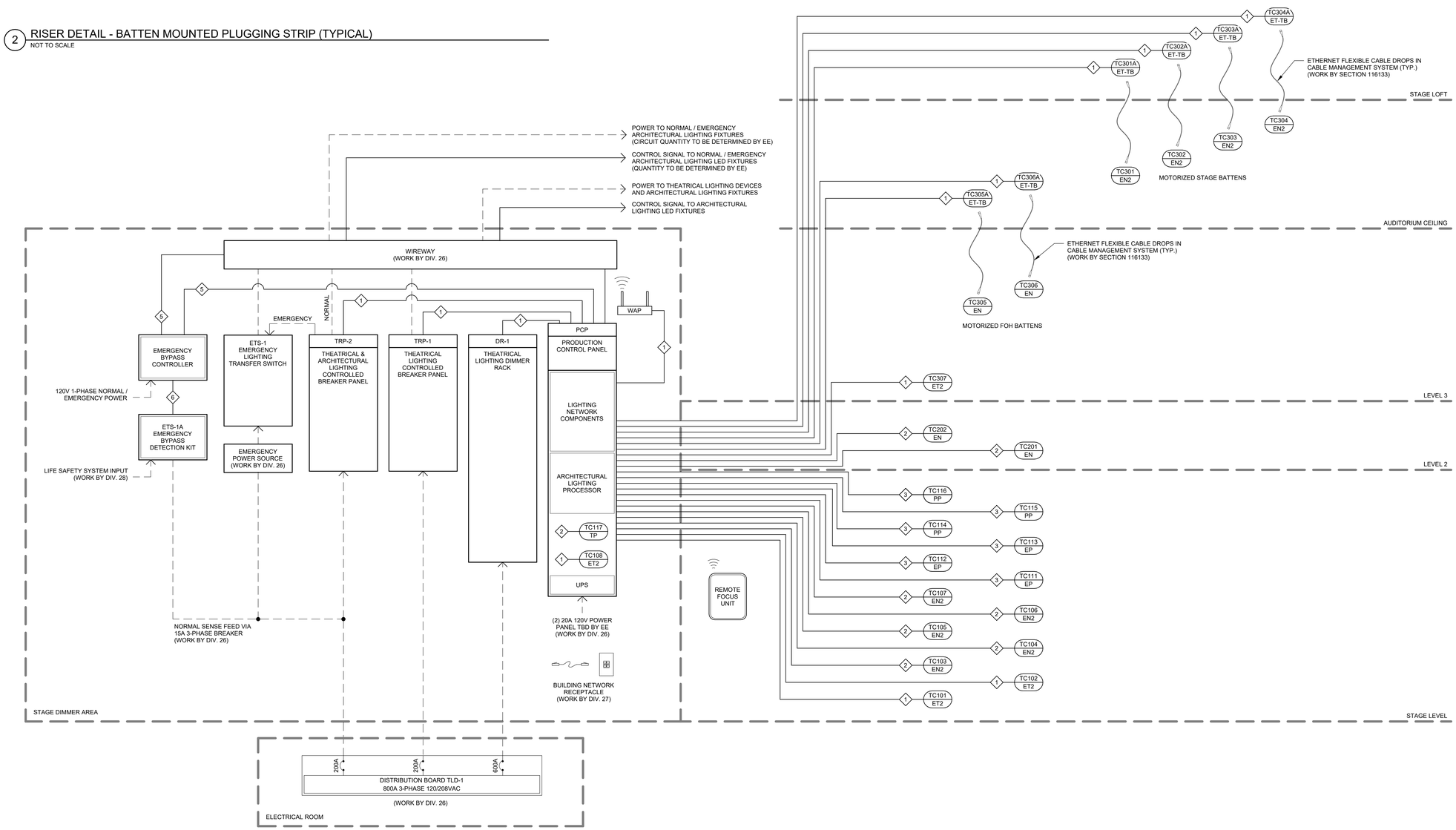
2 RISER DETAIL - BATTEN MOUNTED PLUGGING STRIP (TYPICAL)
NOT TO SCALE

WIRE TYPE AND COUNT KEY	
1	(#) BELDEN 1583A
2	(1) BELDEN 1583A (1) #14AWG STRANDED WIRE
3	(1) BELDEN 8471 (1) #14AWG STRANDED WIRE
4	[NOT USED]
5	(1) BELDEN 9729
6	(2) #16AWG

(#) QUANTITY AS NEEDED - REFER TO CONTROL SCHEDULE

NOTES:

CONTRACTOR TO VERIFY THAT ETHERNET CABLE RUNS DO NOT EXCEED 275'.



1 THEATRICAL LIGHTING RISER DIAGRAM
NOT TO SCALE

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SHEET TITLE
THEATRICAL LIGHTING RISER DIAGRAM

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THEATRICAL LIGHTING SYSTEM DISTRIBUTION SCHEDULE

NOTES:
1. ALL CIRCUITS ARE HOME RUN TO DIMMER RACKS OR CONTROLLED BREAKER PANELS. NO COMMON NEUTRALS.
2. ALL MOUNTING HEIGHT DIMENSIONS ARE TO BOTTOM OF DEVICE.
3. DMX ADDRESSES REFER TO CIRCUIT NUMBERS.
4. ROUTING INDICATES DEVICE FED FROM TERMINAL BOX VIA FLEXIBLE CABLE MANAGEMENT SYSTEM. REFER TO TERMINAL BOX SCHEDULE FOR DETAILS.

DEVICE #	DEVICE TYPE	LOCATION	SHEET REF.	2.4kW DIMMERS					120V SWITCHED					ROUTING	DEVICE DETAIL	BACKBOX	HEIGHT	MOUNTING DETAIL	FACEPLATE FINISH
				AMPS	QTY	DMX Start	DMX End	RACK	AMPS	QTY	DMX Start	DMX End	PANEL						
TD 101	PBR 3	STAGE APRON	TL1.1	20A	2	67	68	DR-1	20A	1	121	121	TRP-1		2/TL5.2	Flush	18" AFF	9/TL5.1	TBD BY ARCHITECT
TD 102	PBR 3	STAGE APRON	TL1.1	20A	2	69	70	DR-1	20A	1	122	122	TRP-1		2/TL5.2	Flush	18" AFF	9/TL5.1	TBD BY ARCHITECT
TD 103	PBR 5	DOWNSTAGE RIGHT	TL1.1	20A	4	71	74	DR-1	20A	1	123	123	TRP-1		3/TL5.2	Surface	18" AFF	10/TL5.1	BLACK
TD 104	PBR 5	DOWNSTAGE LEFT	TL1.1	20A	4	75	78	DR-1	20A	1	124	124	TRP-1		3/TL5.2	Surface	18" AFF	10/TL5.1	BLACK
TD 105	PBR 7	UPSTAGE RIGHT	TL1.1	20A	6	79	84	DR-1	20A	1	125	125	TRP-2		1/TL5.2	Surface	18" AFF	10/TL5.1	BLACK
TD 106	PBR 7	UPSTAGE CENTER	TL1.1	20A	6	85	90	DR-1	20A	1	126	126	TRP-2		1/TL5.2	Surface	18" AFF	10/TL5.1	BLACK
TD 107	PBR 7	UPSTAGE LEFT	TL1.1	20A	6	91	96	DR-1	20A	1	127	127	TRP-2		1/TL5.2	Surface	18" AFF	10/TL5.1	BLACK
TD 201	PBR 5	BOX BOOM - HOUSE LEFT	TL1.2	20A	4	59	62	DR-1	20A	1	119	119	TRP-1		3/TL5.2	Surface	96" AFF	10/TL5.1	BLACK
TD 202	PBR 5	BOX BOOM - HOUSE RIGHT	TL1.2	20A	4	63	66	DR-1	20A	1	120	120	TRP-1		3/TL5.2	Surface	96" AFF	10/TL5.1	BLACK
TD 301	PSP	1ST ELECTRIC	TL1.3	20A	12	1	12	DR-1	20A	4	101	104	TRP-1	TD301A	1/TL5.3	Surface	BATTEN	4/TL5.3	BLACK
TD 302	PSP	2ND ELECTRIC	TL1.3	20A	12	13	24	DR-1	20A	4	105	108	TRP-1	TD302A	1/TL5.3	Surface	BATTEN	4/TL5.3	BLACK
TD 303	PSP	3RD ELECTRIC	TL1.3	20A	12	25	36	DR-1	20A	4	109	112	TRP-1	TD303A	1/TL5.3	Surface	BATTEN	4/TL5.3	BLACK
TD 304	PSP	4TH ELECTRIC	TL1.3	20A	12	37	48	DR-1	20A	4	113	116	TRP-1	TD304A	1/TL5.3	Surface	BATTEN	4/TL5.3	BLACK
TD 305	PSR	FOH ELECTRIC - HOUSE LEFT	TL1.3	20A	5	49	53	DR-1	20A	1	117	117	TRP-1	TD305A	3/TL5.3	Surface	BATTEN		BLACK
TD 306	PSR	FOH ELECTRIC - HOUSE RIGHT	TL1.4	20A	5	54	58	DR-1	20A	1	118	118	TRP-1	TD306A	3/TL5.3	Surface	BATTEN		BLACK
TD		Architectural Lighting Allowance			0	0	0		20A	21	201	221	TRP-2						
Totals:					96					48									

THEATRICAL LIGHTING SYSTEM CONTROL SCHEDULE

NOTES:
1. ALL MOUNTING HEIGHT DIMENSIONS ARE TO BOTTOM OF DEVICE.
2. BACKBOX TYPE 'DEVICE' INDICATES SHARED BACKBOX WITH THEATRICAL LIGHTING DISTRIBUTION 'TD' DEVICE. REFER TO DISTRIBUTION SCHEDULE FOR DETAILS.
3. ROUTING INDICATES DEVICE FED FROM TERMINAL BOX VIA FLEXIBLE CABLE MANAGEMENT SYSTEM. REFER TO TERMINAL BOX SCHEDULE FOR DETAILS.

DEVICE #	TYPE	LOCATION	SHEET REF.	NETWORK QTY.	ROUTING	DEVICE DETAIL	BACKBOX	HEIGHT	MOUNTING DETAIL	FACEPLATE FINISH
TC 101	ET2	STAGE APRON	TL1.1	2		5/TL5.1	Flush	18" AFF	9/TL5.1	TBD BY ARCHITECT
TC 102	ET2	STAGE APRON	TL1.1	2		5/TL5.1	Flush	18" AFF	9/TL5.1	TBD BY ARCHITECT
TC 103	EN2	DOWNSTAGE RIGHT	TL1.1	1		7/TL5.1	Surface	18" AFF	10/TL5.1	BLACK
TC 104	EN2	DOWNSTAGE LEFT	TL1.1	1		7/TL5.1	Surface	18" AFF	10/TL5.1	BLACK
TC 105	EN2	UPSTAGE RIGHT	TL1.1	1		7/TL5.1	Surface	18" AFF	10/TL5.1	BLACK
TC 106	EN2	UPSTAGE CENTER	TL1.1	1		7/TL5.1	Surface	18" AFF	10/TL5.1	BLACK
TC 107	EN2	UPSTAGE LEFT	TL1.1	1		7/TL5.1	Surface	18" AFF	10/TL5.1	BLACK
TC 108	ET2	DOWNSTAGE RIGHT	TL1.1	2		8/TL5.1	Rack	18" AFF		BLACK
TC 111	EP	REAR HOUSE LEFT ENTRY	TL1.1	0		1/TL5.1	Surface	42" AFF	10/TL5.1	TBD BY ARCHITECT
TC 112	EP	REAR HOUSE RIGHT ENTRY	TL1.1	0		1/TL5.1	Surface	42" AFF	10/TL5.1	TBD BY ARCHITECT
TC 113	EP	HOUSE LEFT ENTRY	TL1.1	0		1/TL5.1	Surface	42" AFF	10/TL5.1	TBD BY ARCHITECT
TC 114	PP	DOWNSTAGE LEFT	TL1.1	0		2/TL5.1	Surface	42" AFF	10/TL5.1	BLACK
TC 115	PP	UPSTAGE RIGHT	TL1.1	0		2/TL5.1	Surface	42" AFF	10/TL5.1	BLACK
TC 116	PP	UPSTAGE LEFT	TL1.1	0		2/TL5.1	Surface	42" AFF	10/TL5.1	BLACK
TC 117	TP	DOWNSTAGE RIGHT	TL1.1	1		3/TL5.1	Rack	PSH		BLACK
TC 201	EN	BOX BOOM - HOUSE LEFT	TL1.2	1		6/TL5.1	Surface	96" AFF	10/TL5.1	BLACK
TC 202	EN	BOX BOOM - HOUSE RIGHT	TL1.2	1		6/TL5.1	Surface	96" AFF	10/TL5.1	BLACK
TC 301	EN2	1ST ELECTRIC	TL1.3	1		1/TL5.3	Device	BATTEN		BLACK
TC 302	EN2	2ND ELECTRIC	TL1.3	1		1/TL5.3	Device	BATTEN		BLACK
TC 303	EN2	3RD ELECTRIC	TL1.3	1		1/TL5.3	Device	BATTEN		BLACK
TC 304	EN2	4TH ELECTRIC	TL1.3	1		1/TL5.3	Device	BATTEN		BLACK
TC 305	EN	FOH ELECTRIC - HOUSE LEFT	TL1.3	1		3/TL5.3	Device	BATTEN		BLACK
TC 306	EN	FOH ELECTRIC - HOUSE RIGHT	TL1.3	1		3/TL5.3	Device	BATTEN		BLACK
TC 307	ET2	PROJECTION ROOM	TL1.3	2		4/TL5.1	Surface	18" AFF	10/TL5.1	BLACK
Totals:				22						

THEATRICAL LIGHTING TERMINAL BOX SCHEDULE

NOTES:
1. REFER TO THEATRICAL LIGHTING SYSTEM CONTROL AND DISTRIBUTION SCHEDULES FOR ASSOCIATED DEVICES.

DEVICE #	TYPE	LOCATION	SHEET REF.	DEVICE DETAIL	BACKBOX	HEIGHT	MOUNTING DETAIL	FACEPLATE FINISH
TC 301A	ET-TB	STAGE CATWALK - STAGE RIGHT	TL1.4	4/TL5.2	Surface	CATWALK		BLACK
TC 302A	ET-TB	STAGE CATWALK - STAGE RIGHT	TL1.4	4/TL5.2	Surface	CATWALK		BLACK
TC 303A	ET-TB	STAGE CATWALK - STAGE RIGHT	TL1.4	4/TL5.2	Surface	CATWALK		BLACK
TC 304A	ET-TB	STAGE CATWALK - STAGE RIGHT	TL1.4	4/TL5.2	Surface	CATWALK		BLACK
TC 305A	ET-TB	FOH CEILING	TL1.4	4/TL5.2	Surface	CEILING		BLACK
TC 306A	ET-TB	FOH CEILING	TL1.4	4/TL5.2	Surface	CEILING		BLACK
TD 301A	TB	STAGE CATWALK - STAGE RIGHT	TL1.4	4/TL5.2	Surface	CATWALK		BLACK
TD 302A	TB	STAGE CATWALK - STAGE RIGHT	TL1.4	4/TL5.2	Surface	CATWALK		BLACK
TD 303A	TB	STAGE CATWALK - STAGE RIGHT	TL1.4	4/TL5.2	Surface	CATWALK		BLACK
TD 304A	TB	STAGE CATWALK - STAGE RIGHT	TL1.4	4/TL5.2	Surface	CATWALK		BLACK
TD 305A	TB	FOH CEILING	TL1.4	4/TL5.2	Surface	CEILING		BLACK
TD 306A	TB	FOH CEILING	TL1.4	4/TL5.2	Surface	CEILING		BLACK

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LSD Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

ISSUANCES	DATE
CONSTRUCTION DOCUMENTS	11/06/2025

JOB NO. 2616.11

SHEET TITLE
THEATRICAL LIGHTING SCHEDULES

SHEET NO.
TL6.2

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THEATRICAL RIGGING GENERAL NOTES

1. TR-SERIES DRAWINGS TO BE REFERENCED IN CONJUNCTION WITH SPECIFICATION SECTION 11 61 33.
2. VERIFY ALL DIMENSIONS AND AS-BUILT CONDITIONS IN THE FIELD PRIOR TO FABRICATION OF INSTALLED ELEMENTS.
3. ALL FASTENERS TO HAVE LOCKWASHERS OR OTHER APPROVED SELF-LOCKING HARDWARE.
4. ALL EXPOSED ELEMENTS IN TECHNICAL AREAS TO BE FINISHED FLAT BLACK UNLESS OTHERWISE NOTED.
5. FLEET ANGLES SHALL NOT EXCEED 1.5°.
6. THEATRICAL RIGGING SYSTEM SHOP DRAWINGS MUST BE STAMPED BY A STRUCTURAL ENGINEER LICENSED IN THE PROJECT JURISDICTION.
7. COORDINATE INSTALLATION REQUIREMENTS FOR THE WORK OF THIS SECTION WITH DIVISION 26 CONTRACTOR.
8. ALL CONDUIT, WIRE, POWER FEEDS, JUNCTION / PULL BOXES, NON-FUSED DISCONNECTS AND POWER TERMINATIONS BY DIVISION 26 UNLESS OTHERWISE NOTED.
9. REFER TO DIVISION 26 SPECIFICATIONS AND DRAWINGS FOR ALL PANELBOARD DESIGNATIONS.
10. ALL CONTROL WIRE TERMINATIONS BY DIVISION 26 CONTRACTOR UNLESS OTHERWISE NOTED. PROVIDE COORDINATION AND DIRECT SUPERVISION FOR THE TERMINATION OF ALL PROPRIETARY CONTROL WIRING.
11. NO SPLICES PERMITTED FOR CONTROL WIRING RUNS.
12. NO CONDUIT OR CONDUIT SUPPORTS PERMITTED ON HORIZONTAL PIPES OR CATWALK RAILINGS. ALL CATWALK AND GALLERY RAILINGS TO BE COMPLETELY CLEAR OF ALL OBSTRUCTIONS FROM TOP OF KICK PLATE TO TOP OF UPPER HORIZONTAL RAILING.
13. DIMENSIONS ARE PROVIDED FOR REFERENCE ONLY. REFER TO APPLICABLE ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR CRITICAL DIMENSIONS.
14. THESE DRAWINGS ARE INTENDED TO PROVIDE INFORMATION REGARDING THEATRICAL EQUIPMENT ONLY. REFER TO APPLICABLE ARCHITECTURAL OR ENGINEERING DRAWINGS FOR ARCHITECTURAL AND ENGINEERING INFORMATION RELATED TO THE BUILDING.
15. COORDINATE FIXED ELECTRIC CABLING WITH THEATRICAL LIGHTING SECTION 116163.
16. COORDINATE ORCHESTRA ENCLOSURE CABLING WITH ORCHESTRA ENCLOSURE SECTION 116113.

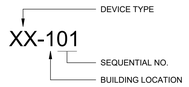
GENERAL ABBREVIATIONS

A	AMPERAGE
AC	ALTERNATING CURRENT
ADA	AMERICANS WITH DISABILITIES ACT
AFF	ABOVE FINISHED FLOOR
ARCH	ARCHITECTURAL
AV	AUDIO VIDEO
AWG	AMERICAN WIRE GAUGE
BOH	BACK OF HOUSE
CL	CENTERLINE
CMS	CABLE MANAGEMENT SYSTEM
DIA	DIAMETER
DIST	DISTANCE
DIV.	DIVISION
DSL	DOWNSTAGE LEFT
DSR	DOWNSTAGE RIGHT
EE	ELECTRICAL ENGINEER
ELEC	ELECTRICAL
EQUIP	EQUIPMENT
ESTOP	EMERGENCY STOP
ETR	EXISTING TO REMAIN
FOH	FRONT OF HOUSE
GND	GROUND
HL	HOUSE LEFT
HR	HOUSE RIGHT
ID	INSIDE DIAMETER
IFR	INHERENTLY FLAME RETARDANT
JB	JUNCTION BOX
MAX	MAXIMUM
MISC	MISCELLANEOUS
NO	NUMBER
NOM	NOMINAL
OC	ON CENTER
OD	OUTSIDE DIAMETER
OPP	OPPOSITE
ORCH	ORCHESTRA
PCP	PRODUCTION CONTROL POSITION
PoE	POWER OVER ETHERNET
PRH	PROJECT RECEPTACLE HEIGHT
PSH	PROJECT SWITCH HEIGHT
QTY	QUANTITY
REF	REFERENCE
REQD	REQUIRED
RU/U	RACK UNIT
SIM	SIMILAR
SL	STAGE LEFT
SPEC	SPECIFICATION
SR	STAGE RIGHT
STRUCT	STRUCTURAL
TAV	THEATRICAL AUDIO VIDEO
TBD	TO BE DETERMINED
TL	THEATRICAL LIGHTING
TLC	THEATRICAL LIGHTING CONTRACTOR
TR	THEATRICAL RIGGING
TRC	THEATRICAL RIGGING CONTRACTOR
TSE	THEATRE AND STAGE EQUIPMENT
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
USC	UPSTAGE CENTER
USL	UPSTAGE LEFT
USR	UPSTAGE RIGHT
V	VOLTAGE
VIF	VERIFY IN FIELD
WBO	WORK BY OTHERS
WLL	WORKING LOAD LIMIT

DEVICE SYMBOL KEY



DEVICE NUMBERING KEY



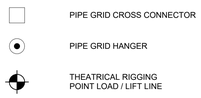
BUILDING LOCATION

0 BASEMENT / ORCHESTRA PIT / TRAP LEVEL
1 STAGE / MAIN AUDITORIUM LEVEL
2 BALCONY LEVEL / BOX BOOM LEVEL
3 CATWALK / TECHNICAL GALLERY LEVEL
4 GRIDIRON LEVEL

DEVICE ABBREVIATIONS

CP	CONTROL POINT WITH EMERGENCY STOP
ES	EMERGENCY STOP
MCC	MOTOR CONTROL CABINET
MCR	MOTION CONTROL RACK

SYMBOL KEY



COORDINATION SYMBOLS (WORK BY OTHERS)

THESE SYMBOLS APPEAR IN DRAWINGS FOR COORDINATION PURPOSES ONLY AND ARE NOT PROVIDED AS A PART OF THE WORK OF THIS SECTION.

WORK BY ARCHITECTURAL

CEILING OPENING FOR RIGGING LIFT LINE

RIGGING SYSTEM DIVISION OF RESPONSIBILITIES

SCOPE OF WORK	FURNISHED	INSTALLED
CONDUIT	DIV. 26	DIV. 26
STANDARD BACK BOXES	DIV. 26	DIV. 26
CUSTOM BACK BOXES	DIV. 11 - TRC	DIV. 26
AC POWER WIRING	DIV. 26	DIV. 26
AC POWER RECEPTACLES (RS)	DIV. 26	DIV. 26
AC POWER DEVICES IN RACKS	DIV. 11 - TRC	DIV. 26
CONTROL / LOW VOLTAGE WIRING	DIV. 26	DIV. 26
AC POWER TERMINATIONS	---	DIV. 26
CONTROL TERMINATIONS	---	DIV. 26
FLEXIBLE CABLE IN CMS	DIV. 11 - TRC	DIV. 11 - TRC
PRIMARY RIGGING STEEL	DIV. 05	DIV. 05
SECONDARY RIGGING STEEL	DIV. 11 - TRC	DIV. 11 - TRC
MCR AND MCC EQUIPMENT	DIV. 11 - TRC	DIV. 11 - TRC
HOISTS AND RIGGING EQUIPMENT	DIV. 11 - TRC	DIV. 11 - TRC

RIGGING SYSTEM DEMOLITION NOTES

1. DEMOLISH EXISTING THEATRICAL RIGGING COUNTERWEIGHT SYSTEM, INCLUDING LOCKING RAIL, ARBORS, HAND LINES, GUIDE SYSTEM, HEAD BLOCKS, LOFT BLOCKS, BATTENS AND LIFT LINES.
2. DEMOLISH EXISTING PROSCENIUM SAFETY FIRE CURTAIN SYSTEM INCLUDING, ARBOR, BLOCKS, DASHPOT, BATTENS, LIFT LINES, AND RELEASE LINES.
3. EXISTING SAFETY CURTAIN IS KNOWN TO BE ASBESTOS. CONTRACT WITH ABATEMENT COMPANY FOR REMOVAL.
4. REMOVE EXISTING CENTER LOUDSPEAKERS AND PROTECT DURING CONSTRUCTION. RE-HANG IN NEW POSITION DOWNSTAGE OF NEW PROSCENIUM SOFFIT.
5. A COMPLETE BUILDING SURVEY WAS NOT AVAILABLE AT THE TIME OF ISSUE OF THESE DRAWINGS. CONTRACTOR SHALL BE REQUIRED TO FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS RELATED TO THE WORK OF THIS SECTION PRIOR TO COMPLETING SHOP DRAWINGS AND INSTALLING EQUIPMENT. OBSTRUCTIONS WHICH IMPEDE THE INSTALLATION OF THE EQUIPMENT AS SHOWN SHALL BE MODIFIED BY THE CONTRACTOR TO ALLOW PROPER INSTALLATION.

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THEATRICAL RIGGING SYMBOL KEY & NOTES

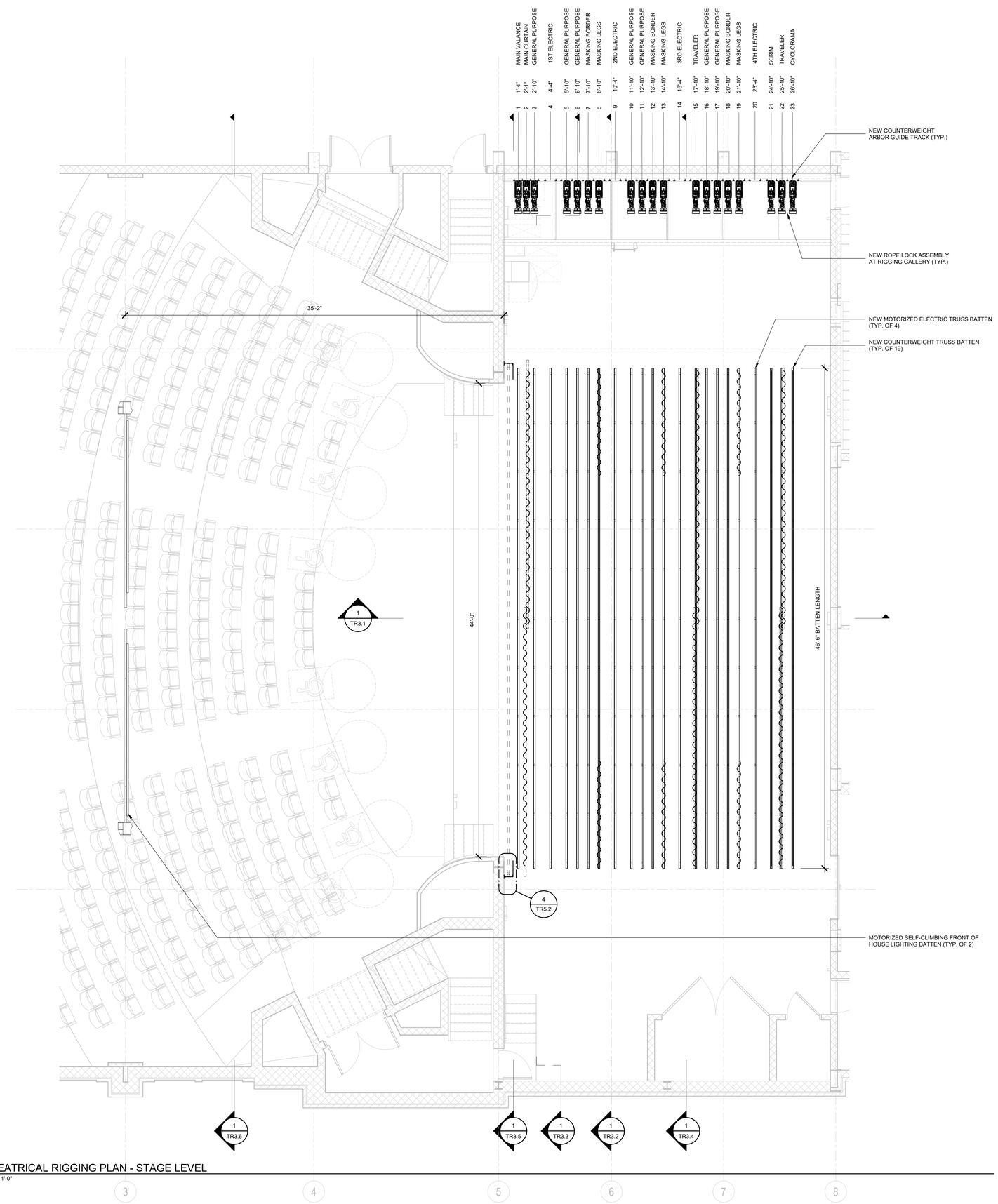
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1 THEATRICAL RIGGING PLAN - STAGE LEVEL
1/4" = 1'-0"

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CONSTRUCTION DOCUMENTS	11/06/2025

KEY PLAN

N

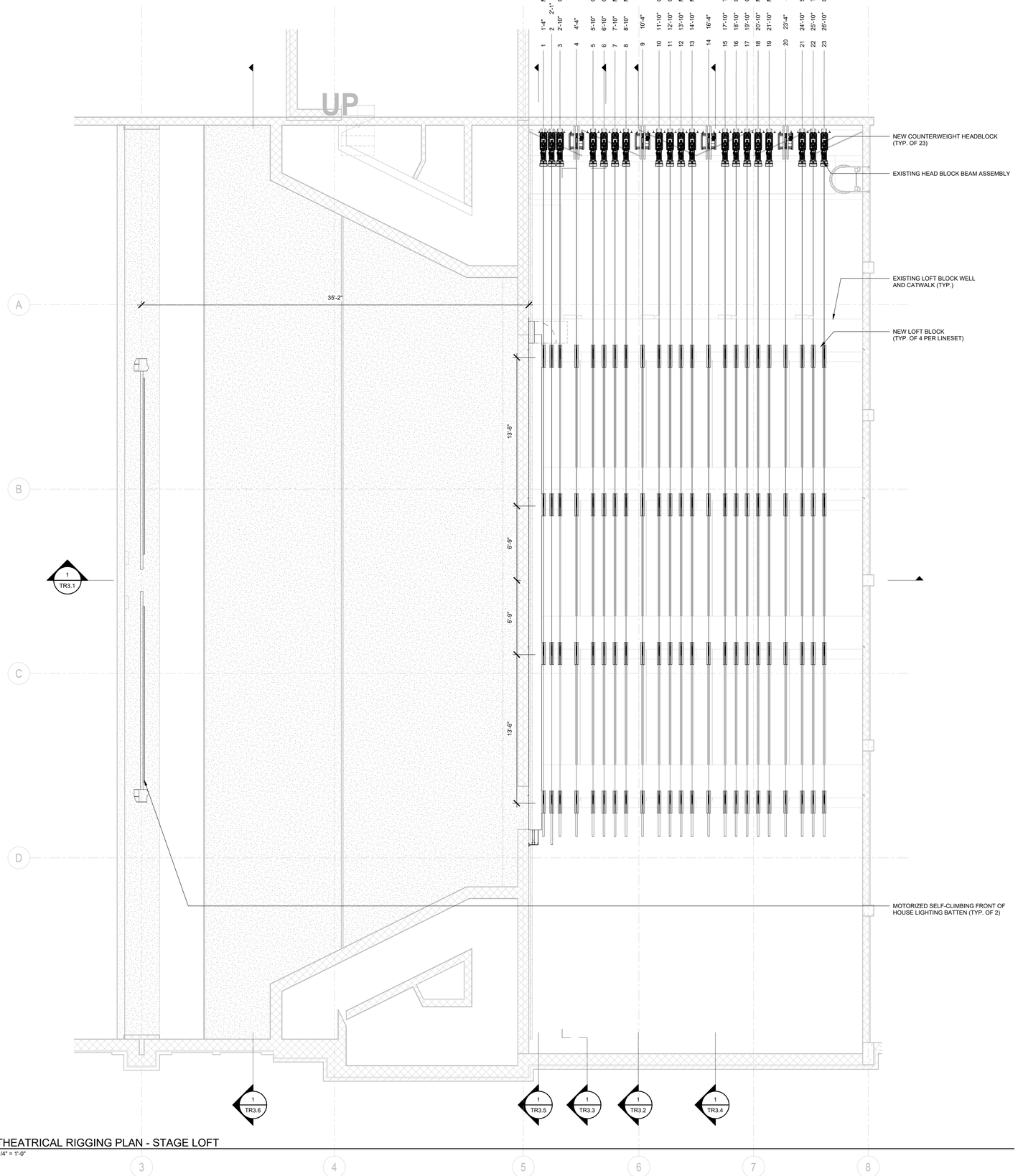
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SHEET TITLE
THEATRICAL RIGGING PLAN

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1 THEATRICAL RIGGING PLAN - STAGE LOFT
1/4" = 1'-0"

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CONSTRUCTION DOCUMENTS	11/06/2025

KEY PLAN

N

JOB NO. 2616.11

SHEET TITLE
THEATRICAL RIGGING PLAN

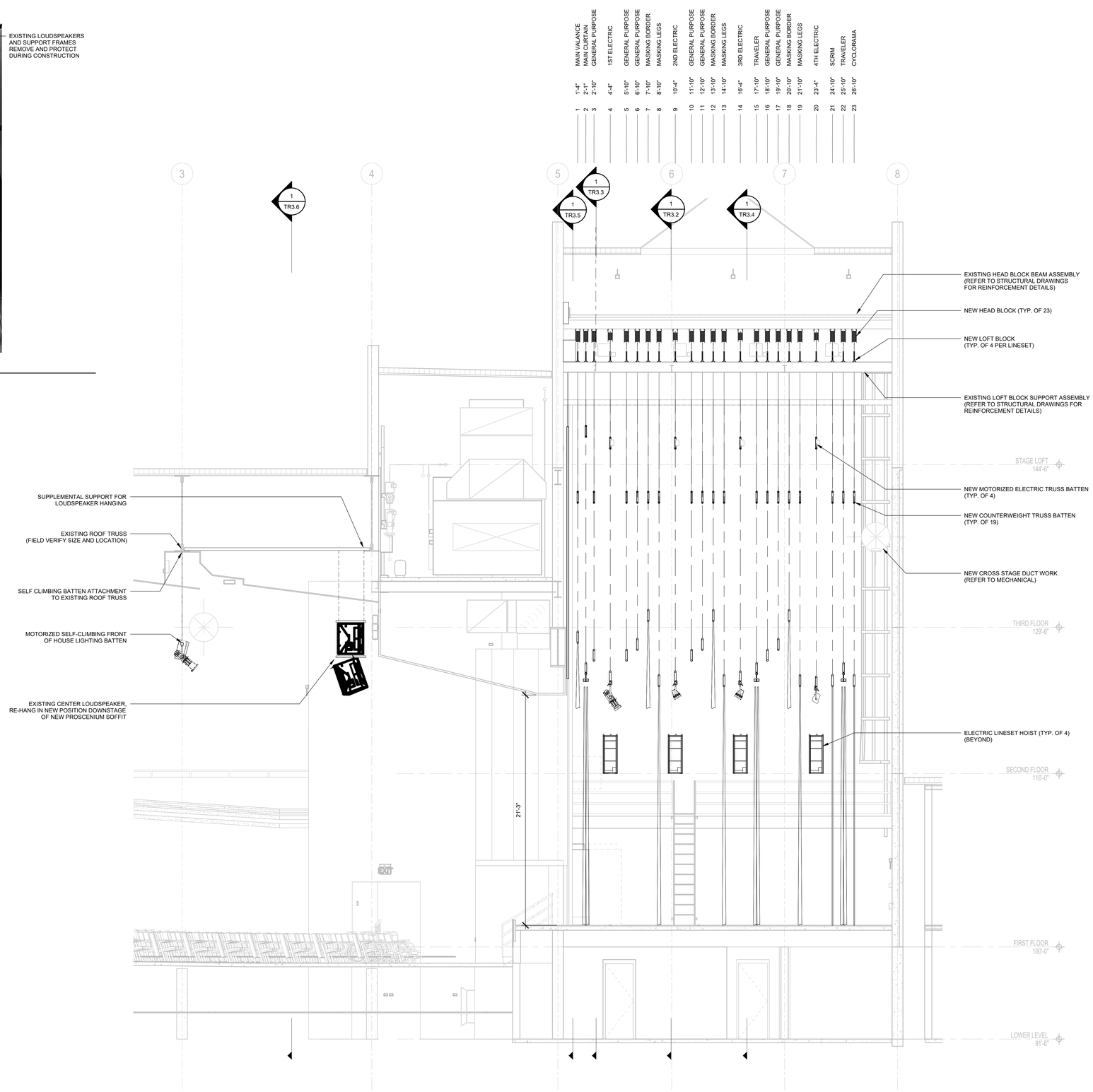
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EXISTING LOUDSPEAKERS AND SUPPORT FRAMES REMOVE AND PROTECT DURING CONSTRUCTION

2 EXISTING LOUDSPEAKER IMAGE
NOT TO SCALE



1 THEATRICAL RIGGING CENTERLINE SECTION
1/4" = 1'-0"

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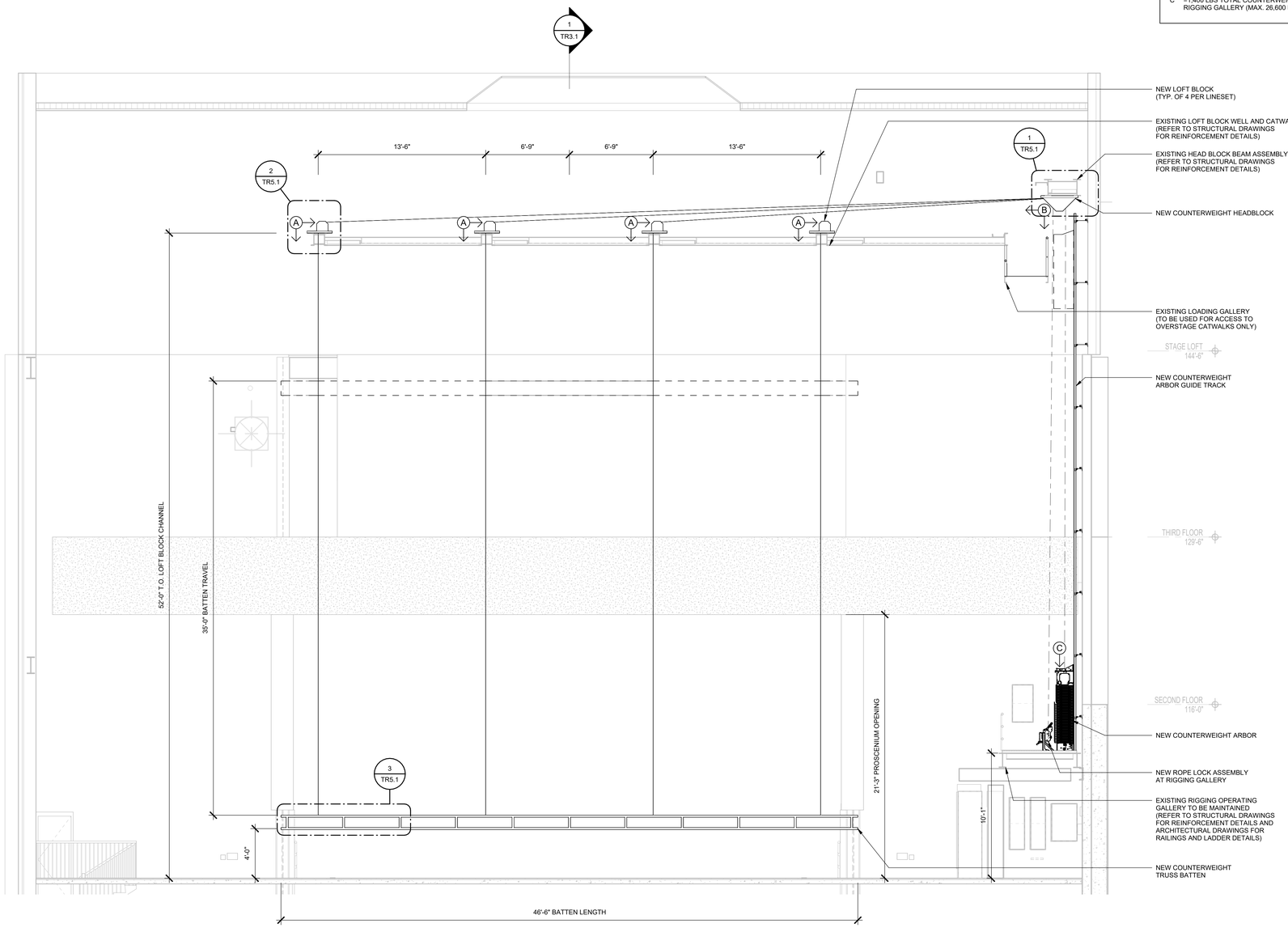
SHEET TITLE
THEATRICAL RIGGING CENTERLINE SECTION

SHEET NO.
TR3.1

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LOADING CRITERIA	
A	= 350 LBS/LIN. FT ON RIGGING LOFT BLOCK BEAMS FROM COUNTERWEIGHT RIGGING SYSTEM. INCLUDES BOTH HORIZONTAL AND VERTICAL VECTORS.
B	=1,400 LBS/LIN. FT. ON HEAD BLOCK BEAM ASSEMBLY INCLUDES BOTH HORIZONTAL AND VERTICAL VECTORS.
C	=1,400 LBS TOTAL COUNTERWEIGHT LOAD FOR EACH LINESET AT RIGGING GALLERY (MAX. 26,600 LBS).



1 THEATRICAL RIGGING TRANSVERSE SECTION
1/4" = 1'-0"

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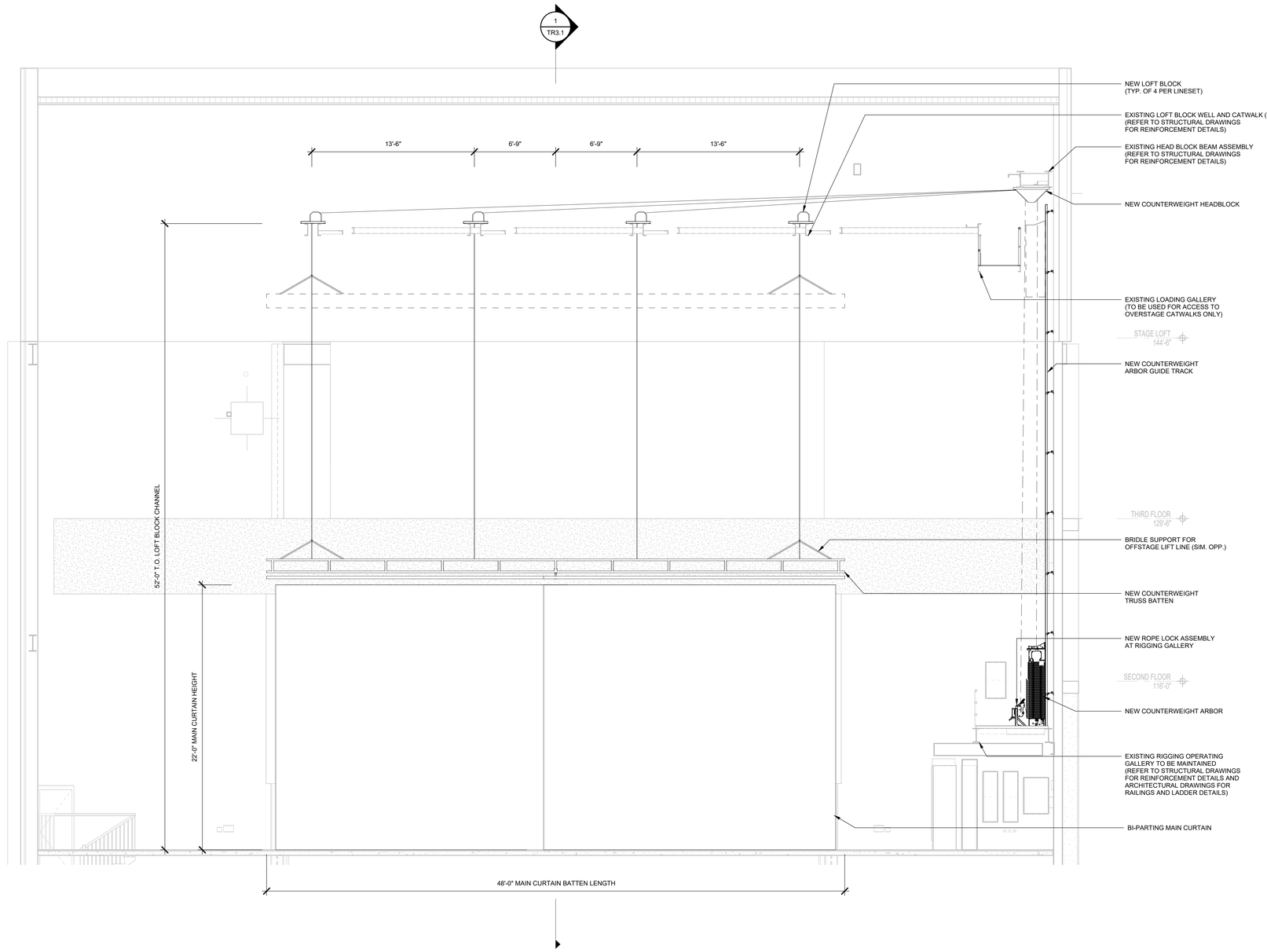
ISSUANCES	DATE
DESIGN DEVELOPMENT	08/09/2025
CONSTRUCTION DOCUMENTS	11/06/2025

JOB NO. 2616.11

SHEET TITLE
THEATRICAL RIGGING TRANSVERSE SECTION

SHEET NO.
TR3.2

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1 THEATRICAL RIGGING TRANSVERSE SECTION - MAIN CURTAIN
1/4" = 1'-0"

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LSD Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

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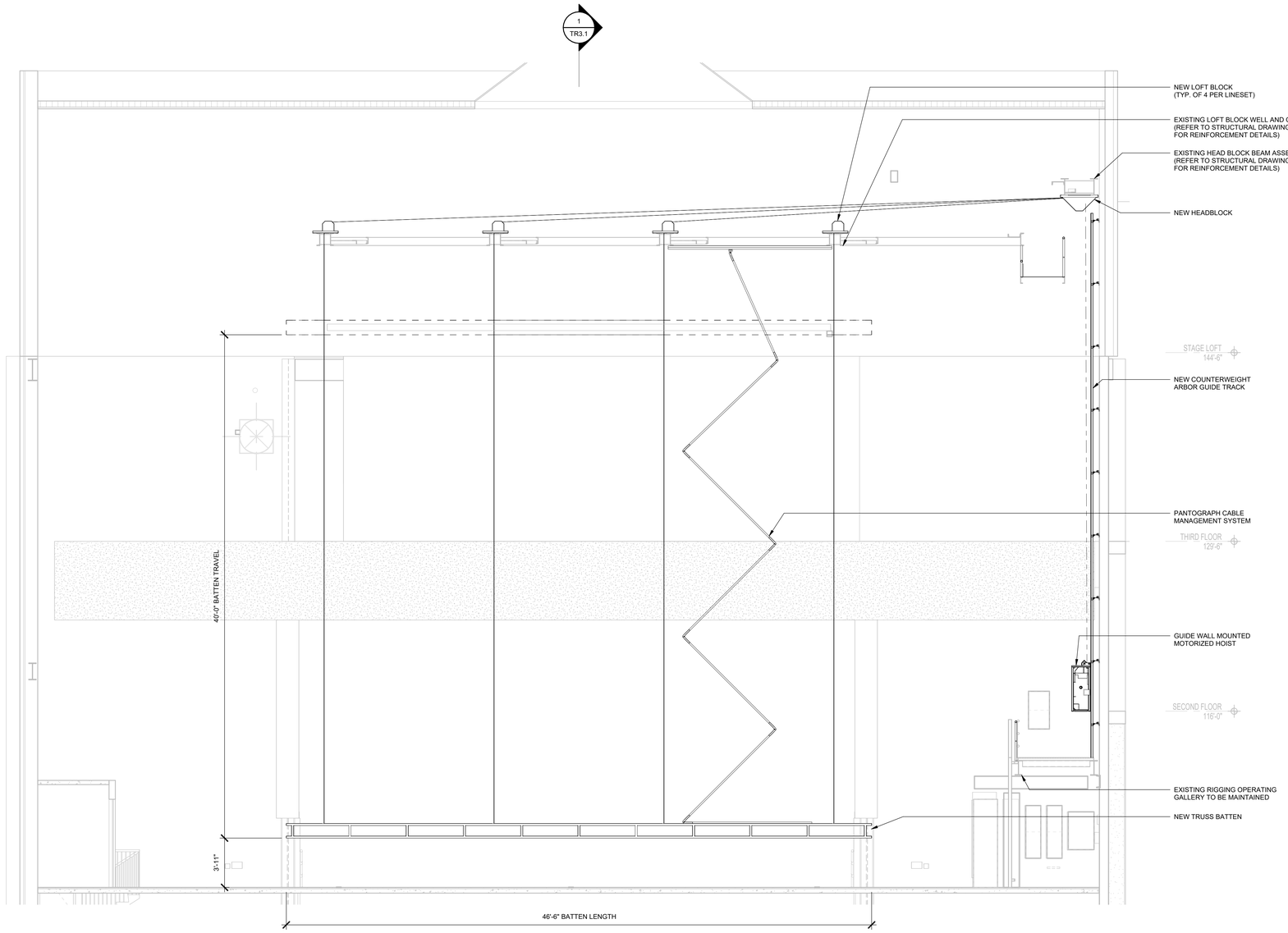
ISSUANCES	DATE
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SHEET TITLE
THEATRICAL RIGGING TRANSVERSE SECTION

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1 THEATRICAL RIGGING TRANSVERSE SECTION - ELECTRIC
1/4" = 1'-0"

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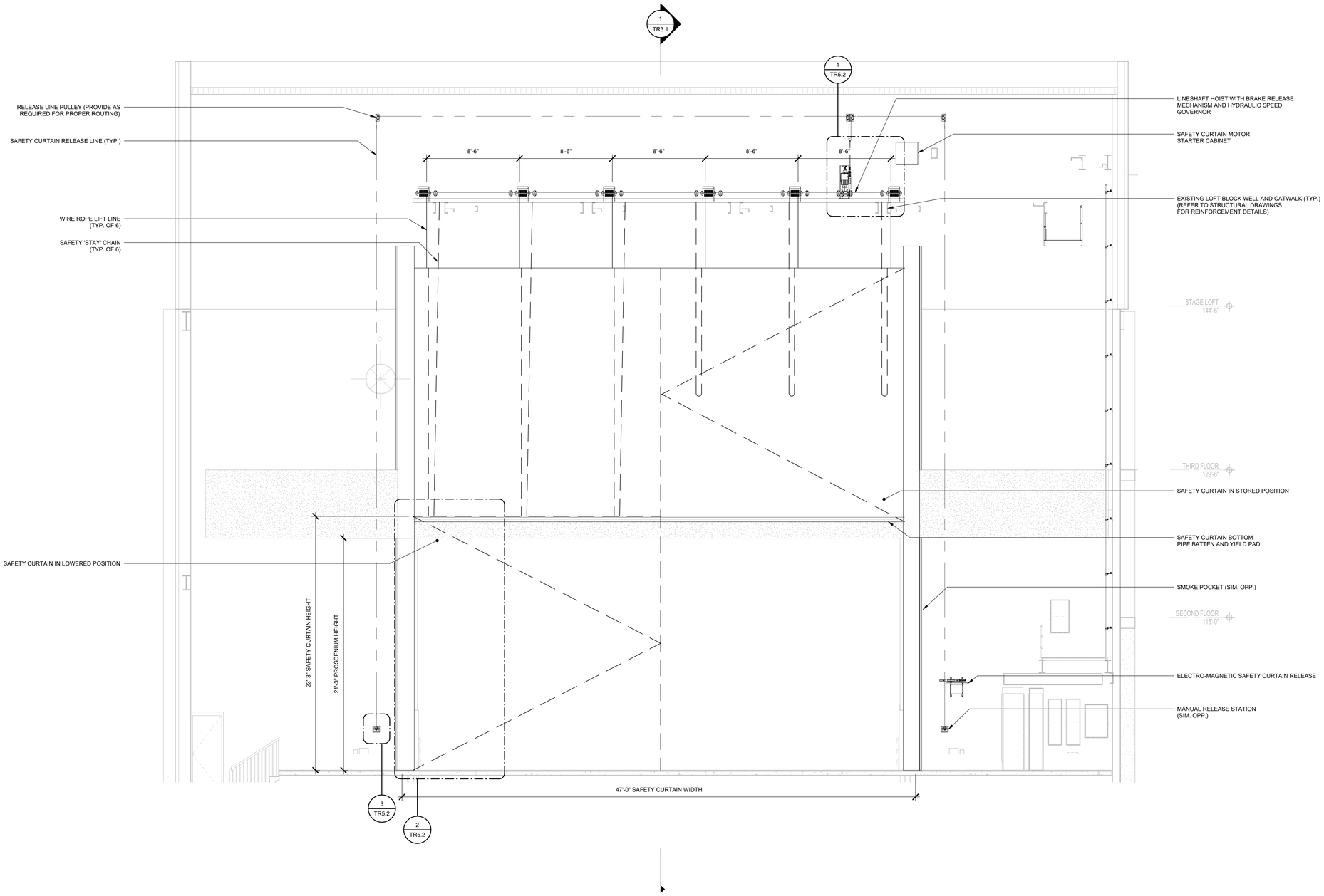
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SHEET TITLE
THEATRICAL RIGGING TRANSVERSE SECTION

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1 THEATRICAL RIGGING TRANSVERSE SECTION - PROSCENIUM SAFETY CURTAIN
1/4" = 1'-0"

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LANSING SCHOOL DISTRICT
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ISSUANCES	DATE
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CONSTRUCTION DOCUMENTS	11/06/2025

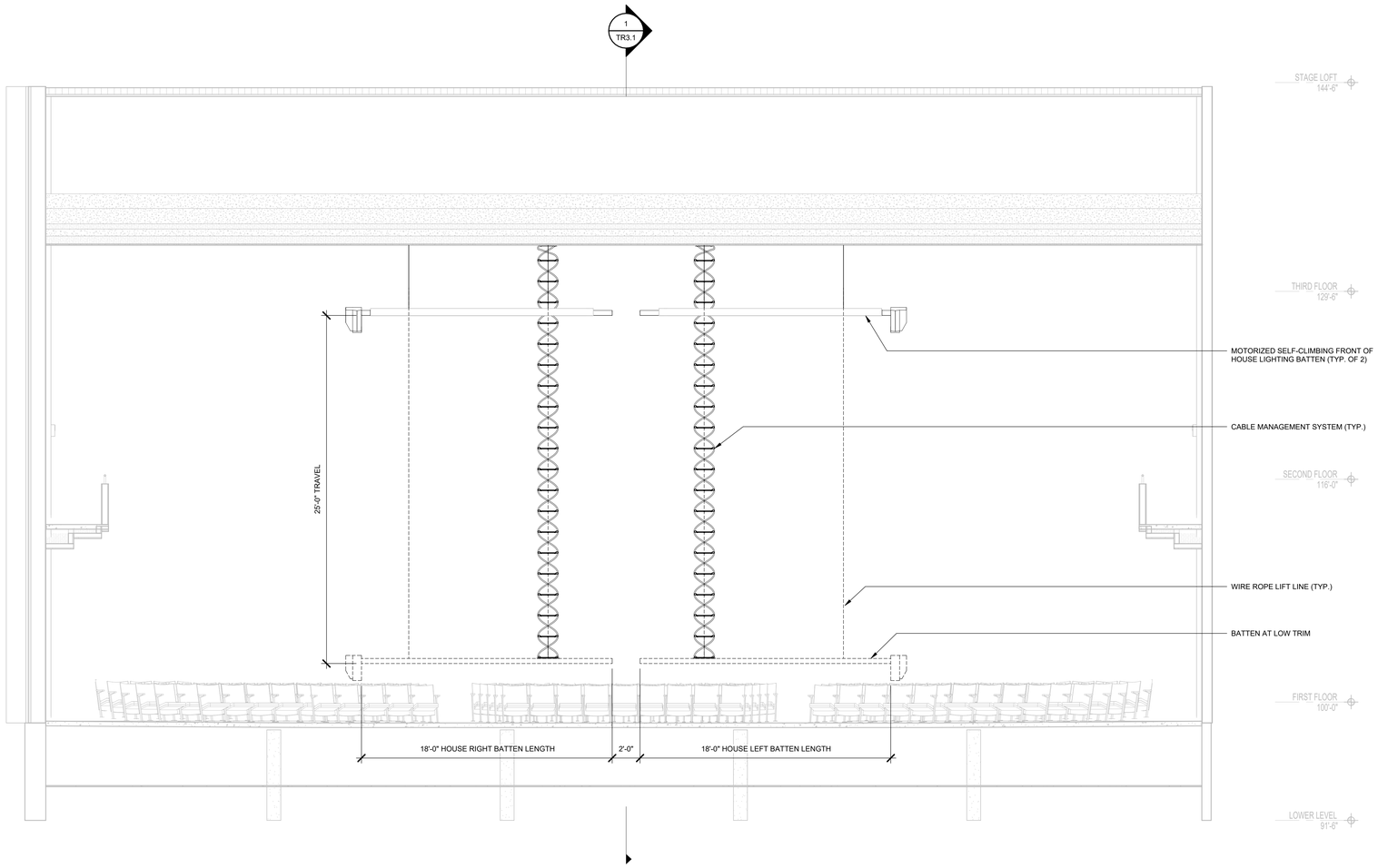
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SHEET TITLE
THEATRICAL RIGGING TRANSVERSE SECTION

SHEET NO.:
TR3.5

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1 THEATRICAL RIGGING TRANSVERSE SECTION - FRONT OF HOUSE LIGHTING
1/4" = 1'-0"

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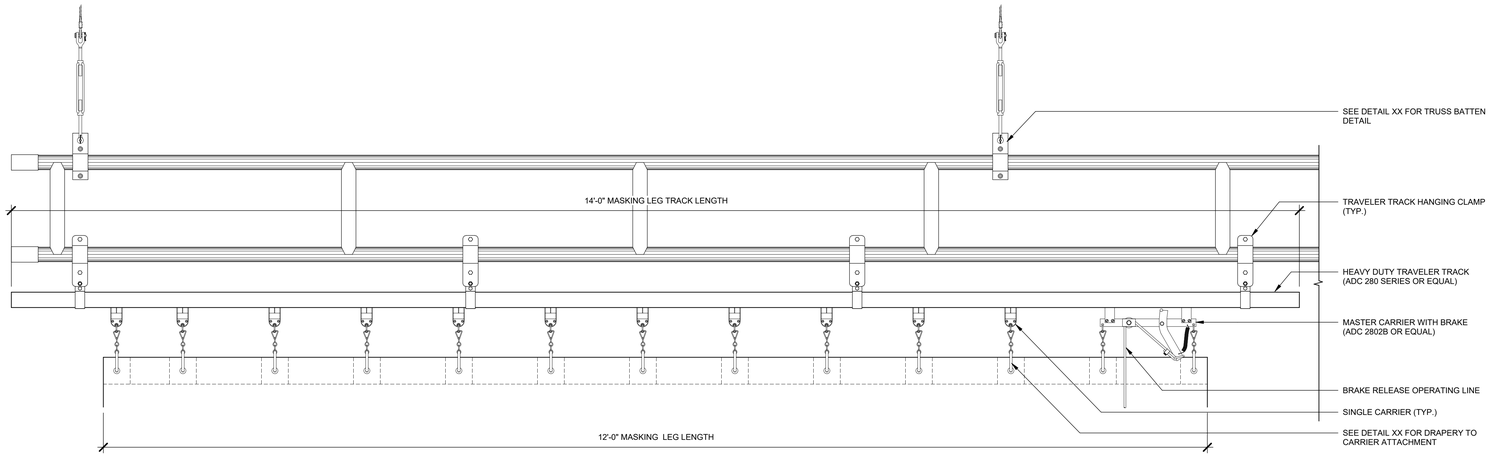
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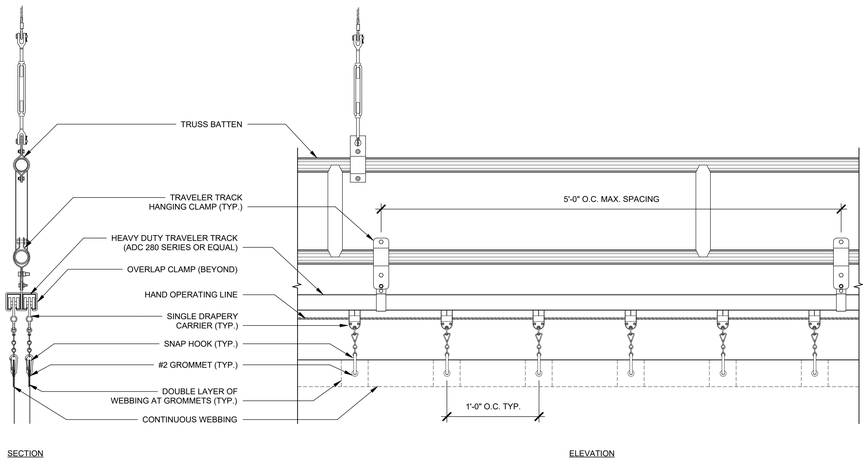
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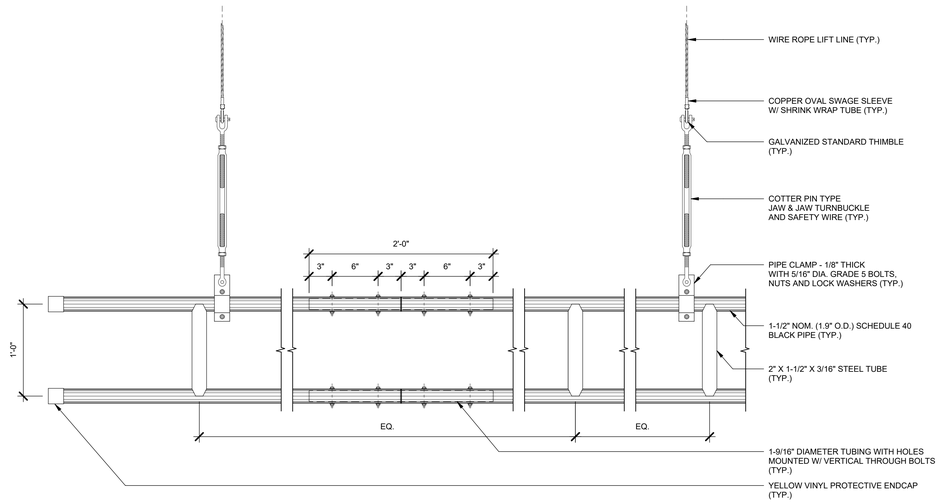
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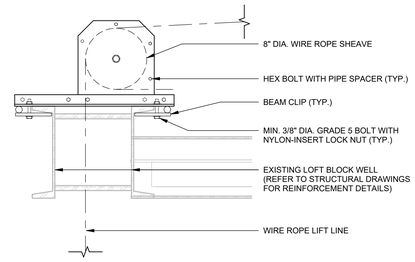
5 MASKING LEG TRACK TO TRUSS BATTEN MOUNTING DETAIL
1 1/2" = 1'-0"



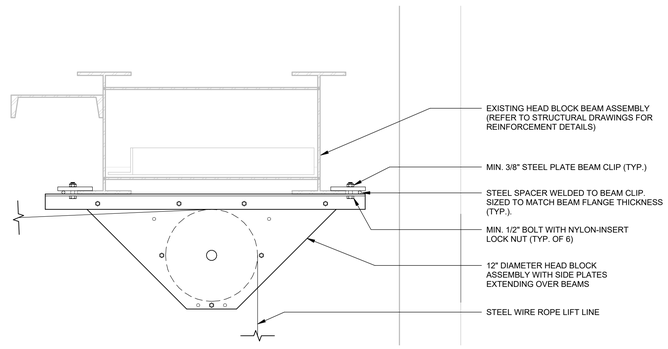
4 DOUBLE TRACK TO TRUSS BATTEN CONNECTION
1 1/2" = 1'-0"



3 TRUSS BATTEN DETAIL
1 1/2" = 1'-0"



2 LOFT BLOCK MOUNTING DETAIL
1 1/2" = 1'-0"



1 HEAD BLOCK MOUNTING DETAIL
1 1/2" = 1'-0"

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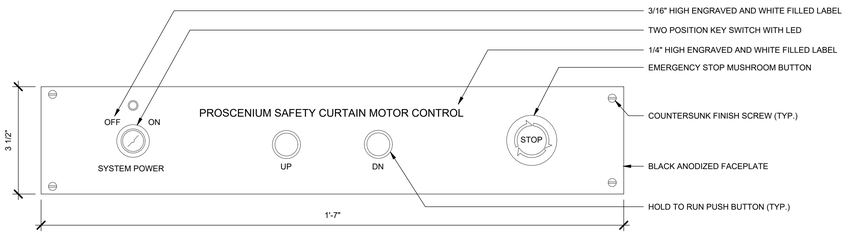
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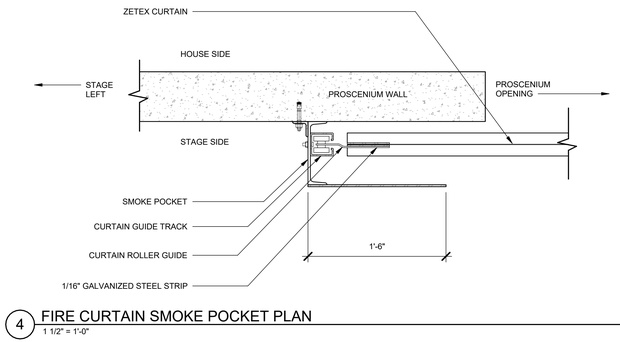
SHEET TITLE
THEATRICAL RIGGING DETAILS

SHEET NO.
TR5.1

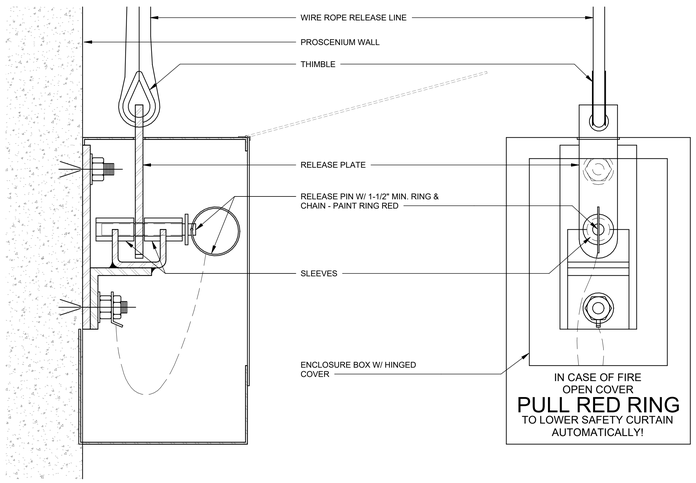
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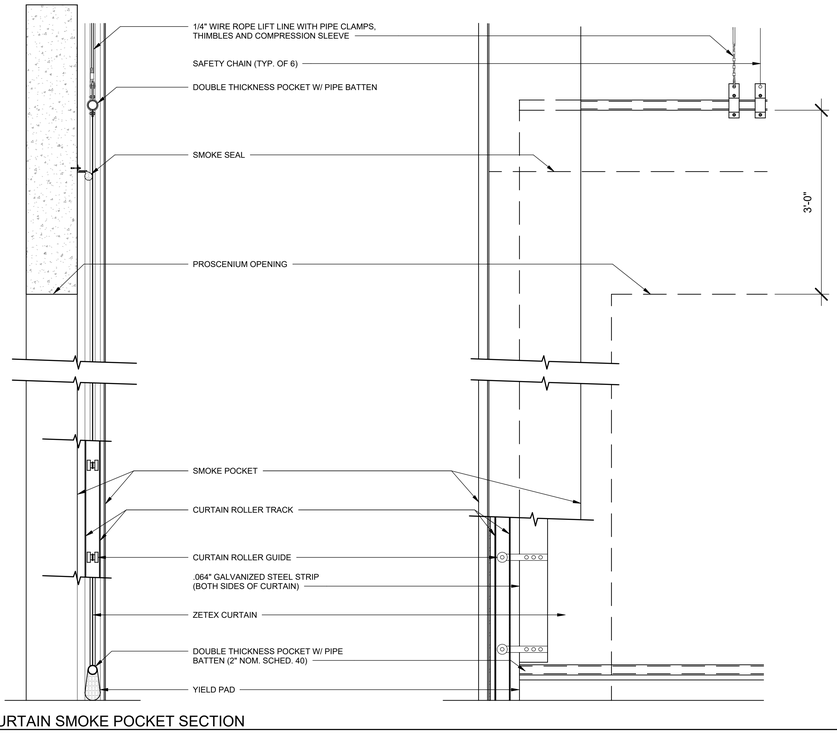
5 FIRE CURTAIN CONTROL PANEL
6" = 1'-0"



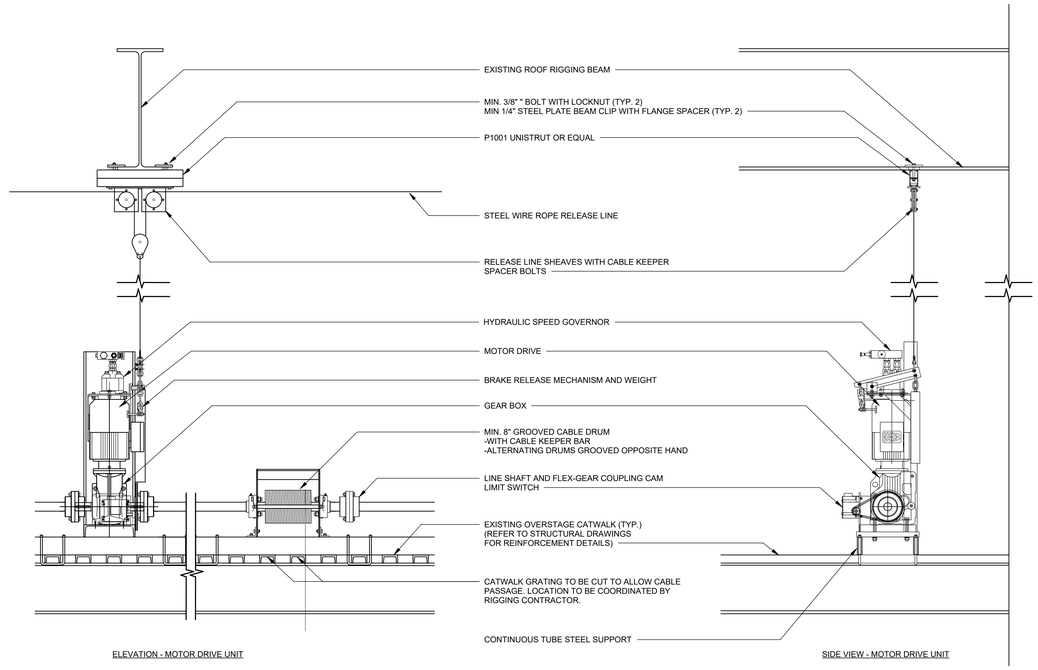
4 FIRE CURTAIN SMOKE POCKET PLAN
1 1/2" = 1'-0"



3 FIRE CURTAIN RELEASE STATION
6" = 1'-0"



2 FIRE CURTAIN SMOKE POCKET SECTION
1" = 1'-0"



1 FIRE CURTAIN DETAIL
1" = 1'-0"

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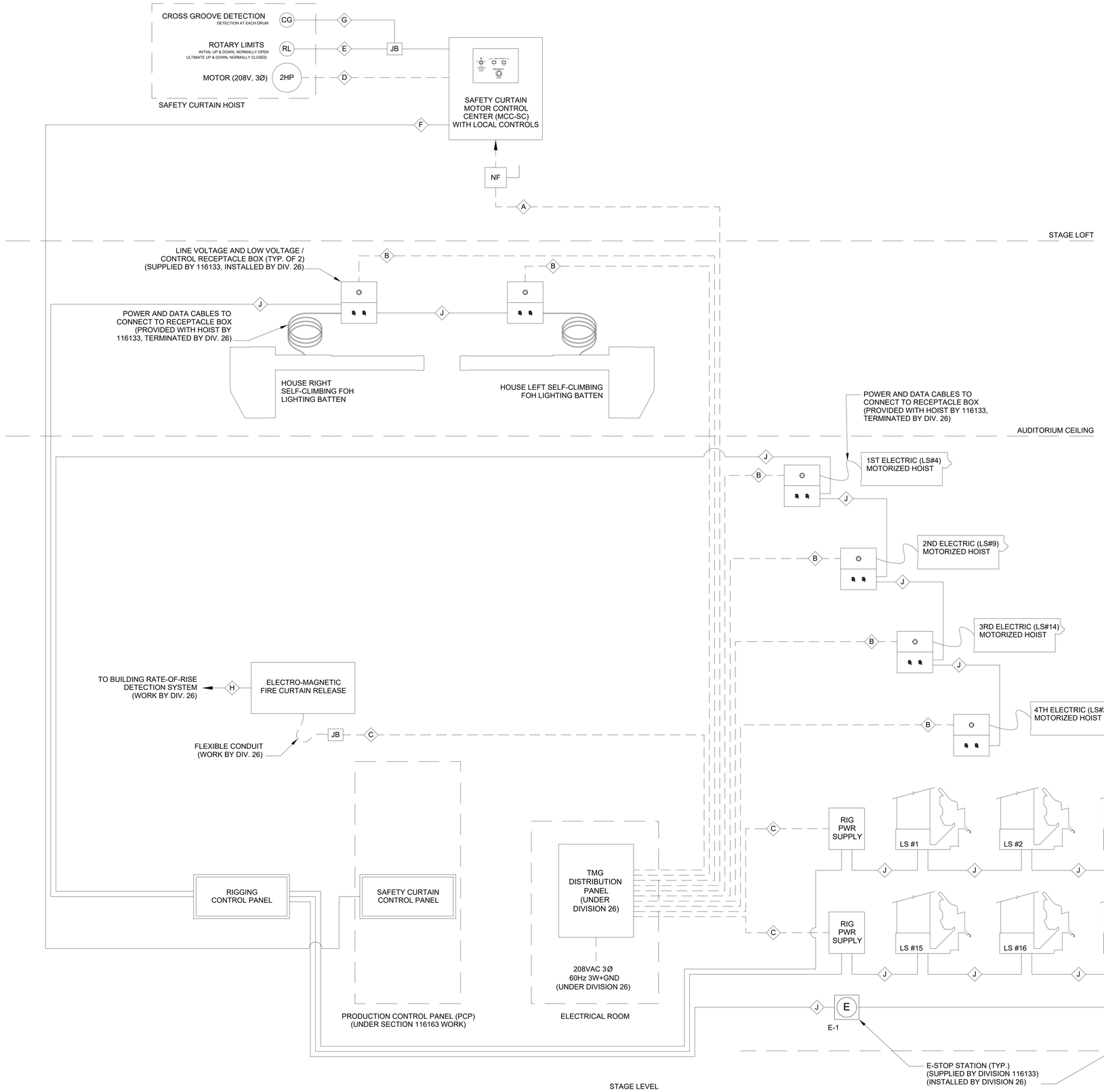
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SHEET TITLE
THEATRICAL RIGGING DETAILS

SHEET NO.
TR5.2

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1 THEATRICAL RIGGING RISER DIAGRAM
NOT TO SCALE

WIRING KEY

- A — 3W+GND 3P 30A FEED — TO BE VERIFIED BY 11 61 33
- B — 3W+GND 3P 20A FEED — TO BE VERIFIED BY 11 61 33
- C — 2W+GND 1P 20A FEED — TO BE VERIFIED BY 11 61 33
- D — (6) #12 AWG (MOTOR: L1, L2, L3, + GRND, BRAKE: B4, B5) — TO BE VERIFIED BY 11 61 33
- E — (7) #14 AWG (LIMITS) — TO BE VERIFIED BY 11 61 33
- F — (10) #14 AWG (CONTROL) — TO BE VERIFIED BY 11 61 33
- G — (2) #14 AWG (CROSS GROOVE DETECTION) — TO BE VERIFIED BY 11 61 33
- H — (2) #14 AWG (RATE-OF-RISE SIGNAL) — TO BE VERIFIED BETWEEN 11 61 33 & DIV. 28
- J — BELDEN 1583A (CONTROL DATA) — TO BE VERIFIED BETWEEN 11 61 33
- — — POWER
- ——— CONTROL/DATA
- NF — NON-FUSED DISCONNECT (PROVIDE BY DIV. 26)
- JB — JUNCTION BOX (PROVIDE BY DIV. 26)

NOTES:

1. ALL WIRE RUNS MUST NOT EXCEED 300 FEET.
2. WIRE TYPES ARE SHOWN FOR DESIGN INTENT ONLY. ACTUAL WIRE TYPES TO BE DETERMINED BY THE THEATRICAL RIGGING CONTRACTOR.
3. ALL CONDUIT, WIRE, POWER FEEDS, DISCONNECTS, PULL/JUNCTION BOXES AND FINAL FIELD TERMINATIONS BY ELECTRICAL CONTRACTOR UNLESS OTHERWISE NOTED.

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THEATRICAL RIGGING RISER DIAGRAM

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THEATRICAL RIGGING LINESET SCHEDULE

*EXCLUDES BATTEN SELF-WEIGHT AND PERMANENTLY ATTACHED EQUIPMENT (DEAD LOADS)
**INCLUDES BATTEN SELF-WEIGHT AND PERMANENTLY ATTACHED EQUIPMENT (DEAD LOADS)

LINESET	DESCRIPTION	DIST. FROM DATUM	END-USER WLL (lbs)*	ARBOR CAPACITY (lbs)**	MACHINE CAPACITY (lbs)	SPEED	ARBOR HEIGHT	COUNTER WEIGHT	BATTEN LENGTH	LIFT LINES		MAX. TRAVEL	BATTEN TYPE	NOM. LOFT BLOCK DIAMETER	NOM. HEAD BLOCK DIAMETER	NOTES
										QTY	SIZE					
0	FIRE CURTAIN	0'-0"			1000	20 FPM			47'-0"	6	1/4"	46'-0"	PIPE			
1	MAIN VALANCE	1'-4"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
2	MAIN CURTAIN	2'-1"	864	1200			6'-0"	6"	48'-0"	4	1/4"	22'-0"	TRUSS	8"	12"	
3	GENERAL PURPOSE	2'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
4	1ST ELECTRIC	4'-4"			1400	30 FPM			46'-6"	4	1/4"	40'-0"	TRUSS	8"	12"	
5	GENERAL PURPOSE	5'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
6	GENERAL PURPOSE	6'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
7	MASKING BORDER	7'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
8	MASKING LEGS	8'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
9	2ND ELECTRIC	10'-4"			1400	30 FPM			46'-6"	4	1/4"	40'-0"	TRUSS	8"	12"	
10	GENERAL PURPOSE	11'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
11	GENERAL PURPOSE	12'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
12	MASKING BORDER	13'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
13	MASKING LEGS	14'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
14	3RD ELECTRIC	16'-4"			1400	30 FPM			46'-6"	4	1/4"	40'-0"	TRUSS	8"	12"	
15	TRAVELER	17'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
16	GENERAL PURPOSE	18'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
17	GENERAL PURPOSE	19'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
18	MASKING BORDER	20'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
19	MASKING LEGS	21'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
20	4TH ELECTRIC	23'-4"			1400	30 FPM			46'-6"	4	1/4"	40'-0"	TRUSS	8"	12"	
21	SCRIM	24'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
22	TRAVELER	25'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	
23	CYCLORAMA	26'-10"	875	1200			6'-0"	6"	46'-6"	4	1/4"	35'-0"	TRUSS	8"	12"	

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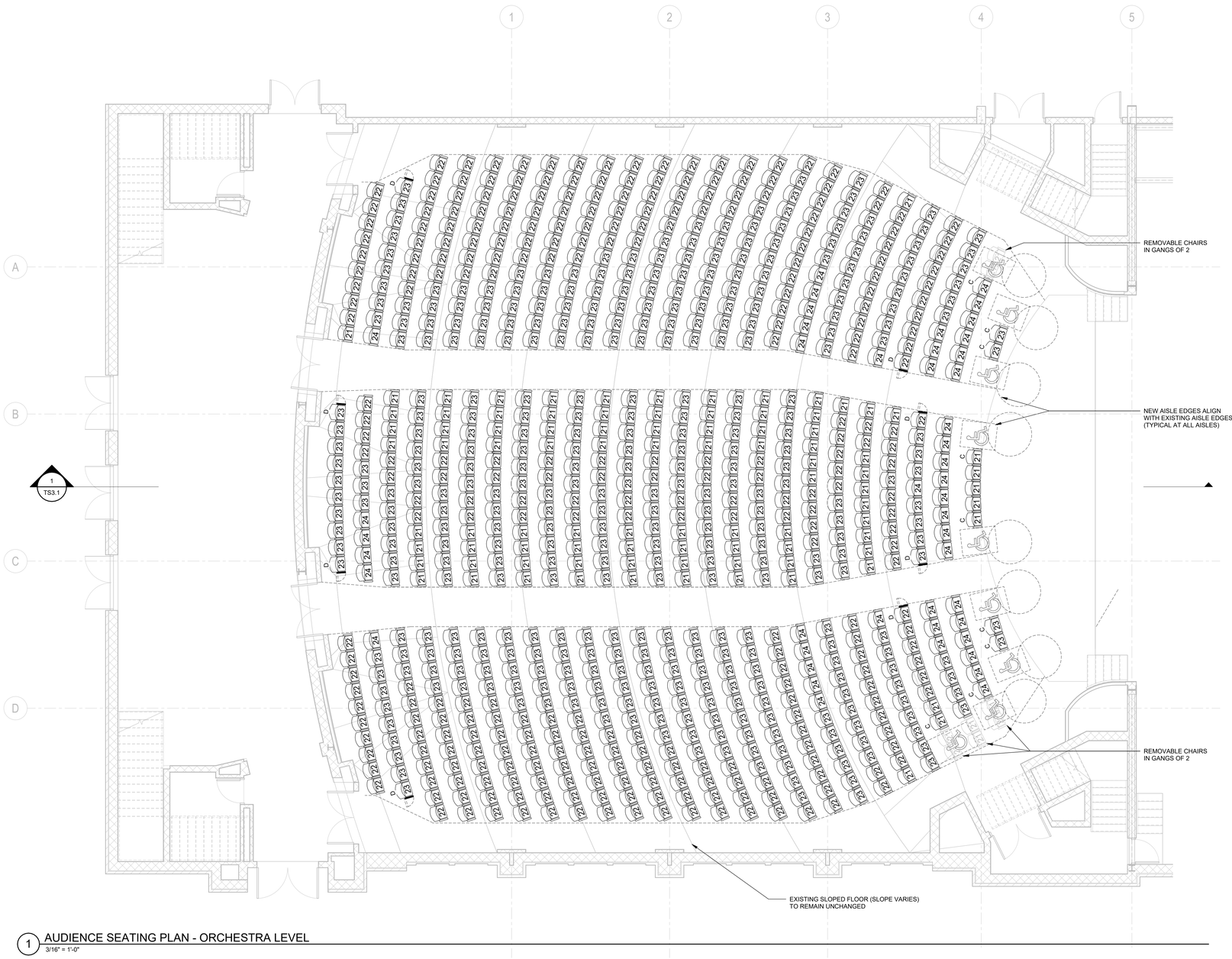
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SHEET TITLE
THEATRICAL RIGGING SCHEDULE

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TR6.2

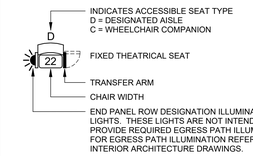
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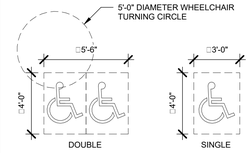
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1 AUDIENCE SEATING PLAN - ORCHESTRA LEVEL
3/16" = 1'-0"

SEATING KEY





WHEELCHAIR SPACES
FRONT AND REAR ENTRY
(WITH MINIMUM CLEAR DIMENSIONS)

GENERAL NOTES

1. SEATING LAYOUT INDICATES DESIGN INTENT ONLY. FINAL LAYOUT ON SHOP DRAWINGS INCLUDING CHAIR DIMENSIONS AND QUANTITIES ARE THE SOLE RESPONSIBILITY OF THE THEATRICAL SEATING CONTRACTOR.
2. CLEAR AISLE DIMENSIONS INDICATED ON THE DRAWINGS ARE TO BE FOLLOWED WHEN PREPARING SHOP DRAWINGS. THESE DIMENSIONS ARE BASED ON PROJECT CODE REQUIREMENTS.
3. VERIFY ALL DIMENSIONS AND CONDITIONS IN FIELD PRIOR TO PREPARATION OF SHOP DRAWINGS.
4. WHEN LAYING OUT SEATS IN ROWS WHICH CONTAIN VARYING WIDTH SEATS, ADHERE TO THE FOLLOWING GUIDELINES WHERE POSSIBLE:
   - A NARROWER SEAT IS TO BE MOUNTED ADJACENT TO AN AISLE.
   - A WIDER SEAT IS TO BE MOUNTED ADJACENT TO SIDE WALLS OR RAILINGS
   - THE REMAINING VARYING WIDTH SEATS ARE TO BE DISTRIBUTED THROUGHOUT THE ROW SO THAT NARROW SEATS ARE NOT MOUNTED ADJACENT TO ONE ANOTHER.
   - WHERE POSSIBLE, SEATS SHOULD BE STAGGERED FROM ROW TO ROW.
5. ALL EQUIPMENT BY SEATING CONTRACTOR UNLESS OTHERWISE NOTED.
6. AISLE LIGHT FIXTURES PREWIRED BY SEATING CONTRACTOR AND TERMINATED BY DIVISION 26. AISLE LIGHT JUNCTION BOX, WIRE, AND CONDUIT PROVIDED BY DIVISION 26.
7. AISLE LIGHT TRANSFORMER(S) SUPPLIED BY SEATING CONTRACTOR AND INSTALLED BY DIVISION 26.
8. ROW LETTER AND SEAT NUMBER SCHEME SHALL BE CONFIRMED DURING THE SEATING SHOP DRAWING PROCESS.

SEATING TOTALS

	ORCHESTRA
21" SEATS	91
22" SEATS	305
23" SEATS	374
24" SEATS	45
REMOVABLE	8
WHEELCHAIRS	9
TOTAL	832

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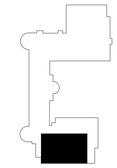
Apeiro Design

LSD Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

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KEY PLAN

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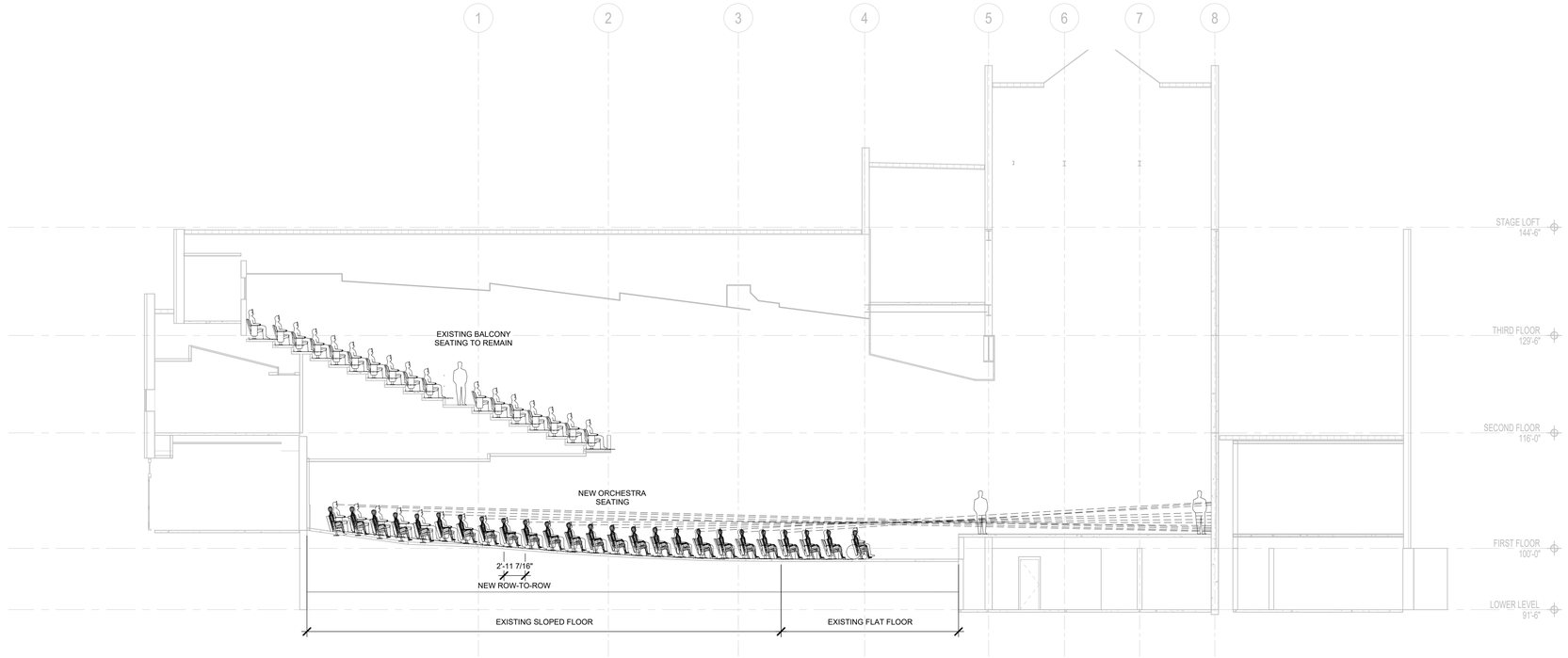
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SHEET TITLE
AUDIENCE SEATING PLAN

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TS1.1

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1 AUDIENCE SEATING CENTERLINE SECTION
1/8" = 1'-0"

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KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK
Apeiro Design

Sexton HS Auditorium Remodel

LSD

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

ISSUANCES	DATE
DESIGN DEVELOPMENT	08/09/2025
CONSTRUCTION DOCUMENTS	11/06/2025

JOB NO. 2616.11

SHEET TITLE
AUDIENCE SEATING SECTION

SHEET NO.
TS3.1

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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. CENTERLINES OF FRAMING MEMBERS COINCIDE WITH COLUMN CENTERLINES, UNLESS NOTED OTHERWISE.

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. 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.

16. 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:

   - 2021 MICHIGAN BUILDING CODE
   - ASCE 7, MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES

   - TMS 402/602, BUILDING CODE REQUIREMENTS AND SPECIFICATIONS 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

   - ANSI/SDI RD, STANDARD FOR STEEL ROOF DECK

   - AISI S100, NORTH AMERICAN SPECIFICATIONS FOR THE DESIGN OF COLD-FORMED STEEL MEMBERS

DESIGN CRITERIA

1. GENERAL
   - STEEL DESIGN — LRFD
   - MASONRY DESIGN — ASD
   - RISK CATEGORY — III

2. DEAD LOADS (SUPERIMPOSED)
   - ROOF — 15.0 PSF
   - RIGGING CATWALKS — 10.0 PSF
   - LOADING GALLERY — 10.0 PSF

3. LIVE LOADS
   - ROOF — 20.0 PSF
   - RIGGING CATWALKS — 20.0 PSF
   - LOADING GALLERY — 20.0 PSF
   - THEATER LOADING — SEE S2.1

4. SNOW LOADS
   - 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) — 20.8 PSF
   - MINIMUM SNOW LOAD (P_{MIN}) — 22.0 PSF

5. WIND LOADS
   - BASIC WIND SPEED (V) — 114 MPH
   - EXPOSURE CATEGORY — B

6. EARTHQUAKE LOADS
   - SEISMIC SITE CLASS — D
   - DESIGN SPECTRAL ACCELERATION (S_{DS}) — 0.099
   - DESIGN SPECTRAL ACCELERATION (S_{D1}) — 0.074
   - SEISMIC DESIGN CATEGORY — B
   - SEISMIC IMPORTANCE FACTOR (I_E) — 1.25
   - ORDINARY PLAIN MASONRY BEARING WALLS (R) — 2.00
   - SEISMIC RESPONSE COEFFICIENT (C_S) — 0.062

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:
   - MASONRY UNIT STRENGTHS
   - MORTAR/GROUT MIX DESIGNS
   - ANCHOR RODS
   - STRUCTURAL STEEL

EXISTING MASONRY - PATCHING, FILLING-IN, REBUILDING, TUCK POINTING

1. ALL MASONRY CONSTRUCTION SHALL CONFORM TO:
   - 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. SALVAGED MASONRY UNITS SHALL BE USED WITH CAUTION, ESPECIALLY IF THE UNITS TO BE REUSED ARE COMMON BUILDING BRICKS. THE MASONRY CONTRACTOR SHALL READ "TECHNICAL NOTE 15 – SALVAGED BRICK" PUBLISHED BY THE BRICK INDUSTRY ASSOCIATION, (BIA). CARE SHALL BE TAKEN TO NOT RE-USE ANY SOFT UNDER BURNED UNITS FROM INTERIOR WYTHE BRICK. THE MASON CONTRACTOR SHALL COORDINATE ALL ACTIVITIES AND METHODS THROUGH THE ARCHITECT.

3. NEW MASONRY CONSTRUCTION SHALL BE SOLIDLY TOOTHED INTO EXISTING MASONRY TO THE FULL THICKNESS OF THE EXISTING CONSTRUCTION. SEE DRAWINGS FOR FURTHER NOTES AND DETAILS.

4. MORTAR FOR TOOTHING IN, REPAIRING, AND TUCK POINTING SHALL CONFORM TO ASTM C270. MORTAR TO BE TYPE N WITH THE HIGHEST PERMISSIBLE LIME CONTENT.

5. TUCK POINTING SHALL BE PERFORMED IN ACCORDANCE WITH INSTRUCTIONS FOUND IN "TECHNICAL NOTE 46 – MAINTENANCE OF BRICK MASONRY" PUBLISHED BY THE BRICK INDUSTRY ASSOCIATION. ALL TUCK-POINTING MORTAR SHALL BE PRE-HYDRATED, PER TECHNICAL NOTE 46. "ALL DRY INGREDIENTS SHOULD BE THOROUGHLY MIXED. ONLY ENOUGH CLEAN WATER SHOULD BE ADDED TO THE DRY MIX TO PRODUCE A DAMP CONSISTENCY WHICH WILL RETAIN ITS SHAPE WHEN FORMED INTO A BALL. THE MORTAR SHOULD BE MIXED TO THIS DAMPENED CONDITION FOR 1 TO 1½ HR. BEFORE ADDING WATER FOR PLACEMENT.... WATER SHOULD BE ADDED TO THE PRE-HYDRATED MORTAR TO BRING IT TO A WORKABLE CONSISTENCY; (SOMEWHAT DRIER THAN CONVENTIONAL MORTAR)."

6. NEW MULTI-WYTHE MASONRY WALL SECTIONS SHALL BE CONSTRUCTED SIMILAR TO THE EXISTING CONSTRUCTION. BOND IN MULTI-WYTHE BRICK WALLS SHALL BE ACCOMPLISHED THROUGH THE USE OF MASONRY HEADER COURSES BETWEEN WYTHES AT EVERY SIXTH COURSE. THE COLLAR JOINTS OF ALL WALLS SHALL BE FILLED SOLIDLY WITH MORTAR AS THE WALL IS BUILT UP. BOND BETWEEN WYTHES IN BRICK AND BLOCK WALLS SHALL BE ACCOMPLISHED THROUGH THE USE OF METAL TIES OF SIMILAR DESIGN TO THE EXISTING TIES. FREQUENCY OF METAL TIES SHALL BE 16" OC VERTICAL X 16" OC HORIZONTAL TYPICALLY AND 8" OC VERTICAL X 8" OC HORIZONTAL ADJACENT TO HEADS, JAMBS, AND SILLS OF OPENINGS.

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.

METAL STAIRS, LANDINGS AND RAILINGS

1. FRAMING DESIGN OF METAL STAIRS, LANDINGS, AND RAILINGS SHALL BE BY METAL STAIR MANUFACTURER. SUBMIT SHOP DRAWINGS AND CALCULATIONS FOR APPROVAL PRIOR TO FABRICATION.

2. PLATE STRINGERS WILL NOT BE ACCEPTABLE. USE CHANNEL STRINGERS ONLY WITH MINIMUM SIZE MC12 X 14.3. STAIRS SHALL HAVE CONCRETE FILLED METAL PAN TREADS AND LANDINGS.

3. PREFABRICATED METAL STAIRS, LANDINGS, AND RAILINGS SHALL CONFORM TO ALL APPLICABLE PROVISIONS OF THE STATE OF THE PROJECT, "THE METAL STAIR MANUAL" AMP 510 BY ARCHITECTURAL METAL PRODUCTS DIVISION OF NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM) AND "PIPE RAILING MANUAL" ANSI/NAAMM AMP 521 BY NAAMM. NAAMM DOCUMENTS ARE AVAILABLE AT WWW.NAAMM.ORG. BEARING STRESSES AT MEMBERS WHICH BEAR INTO THE EXISTING MASONRY WALLS SHALL NOT EXCEED 100 PSI DUE TO FULL DEAD PLUS LIVE LOAD.

STRUCTURAL STEEL

1. STEEL MATERIALS SHALL CONFORM TO THE FOLLOWING MINIMUM REQUIREMENTS UNLESS NOTED OTHERWISE:
   - W-SHAPES, C-SHAPES, MC-SHAPES — ASTM A992, MIN 50 KSI
   - ANGLES, M-SHAPES, S-SHAPES — ASTM A572, 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 & BARS — ASTM A572, MIN 50 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 36
   - WELD ELECTRODES — E70XX

3. ALL BOLTED CONNECTIONS ARE BEARING TYPE CONNECTIONS MADE WITH 3/4" DIAMETER HIGH-STRENGTH BOLTS IN 13/16" DIAMETER OPEN HOLES INSTALLED TO THE SNUG TIGHT CONDITION, UNLESS NOTED OTHERWISE.

4. 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.

5. SPLICES SHALL BE ALLOWED ONLY AT LOCATIONS SPECIFICALLY INDICATED ON THE STRUCTURAL DRAWINGS UNLESS APPROVED OTHERWISE BY THE STRUCTURAL ENGINEER OF RECORD.

6. DO NOT USE OVERSIZED OR SLOTTED HOLES FOR ANY CONNECTIONS UNLESS SPECIFICALLY INDICATED ON THE DRAWINGS OR APPROVED BY THE STRUCTURAL ENGINEER OF RECORD.

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. GROUT BENEATH COLUMN BASE PLATES SHALL BE INSTALLED AS NOTED IN "THE AISC CODE OF STANDARD PRACTICE" AFTER THE STEEL FRAMING ABOVE THE BASE PLATE IS PLUMB AND HELD IN PLACE WITH TEMPORARY GUYING, IF NECESSARY, AND PRIOR TO POURING ANY SUPPORTED SLABS ON METAL DECK THAT ARE SUPPORTED BY THE FRAME OR CONSTRUCTING ANY ENGAGED WALLS THAT WOULD PREVENT PROPER PLUMB OF THE FRAME FROM BEING ACHIEVED.

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.

STRUCTURAL STEEL REQUIREMENTS PER:
STEEL DECK INSTITUTE QUALITY CONTROL AND QUALITY ASSURANCE

TABLE 1.1 - INSPECTION OR EXECUTION TASKS PRIOR TO DECK PLACEMENT

TASK	QC	QA
Verify compliance of materials (deck and all accessories) with construction documents, including profiles, material properties, and base metal thickness	Perform	Perform
Document acceptance or rejection of deck and deck accessories	Perform	Perform

TABLE 1.2 - INSPECTION OR EXECUTION TASKS AFTER DECK PLACEMENT

TASK	QC	QA
Verify compliance of deck and all accessories installation with const. docs	Perform	Perform
Verify deck materials are represented by the mill certifications that comply with the construction documents	N/A	Perform
Document acceptance or rejection of installation of deck and accessories	Perform	Perform

TABLE 1.3 - INSPECTION OR EXECUTION TASKS PRIOR TO DECK WELDING

TASK	QC	QA
Welding procedure specifications (WSP) available	Observe	Observe
Manufacturer certifications for welding consumables available	Observe	Observe
Material identification (type/grade)	Observe	Observe
Check welding equipment	Observe	Observe

TABLE 1.4 - INSPECTION OR EXECUTION TASKS DURING DECK WELDING

TASK	QC	QA
Use of qualified welders	Observe	Observe
Control and handling of welding consumables	Observe	Observe
Environmental conditions (wind speed, moisture, temperature)	Observe	Observe
WSP followed	Observe	Observe

TABLE 1.5 - INSPECTION OR EXECUTION TASKS AFTER DECK WELDING

TASK	QC	QA
Verify size and location of welds, including support, sidelap, perimeter welds	Perform	Perform
Welds meet visual appearance criteria	Perform	Perform
Verify repair activities	Perform	Perform
Document acceptance or rejection of welds	Perform	Perform

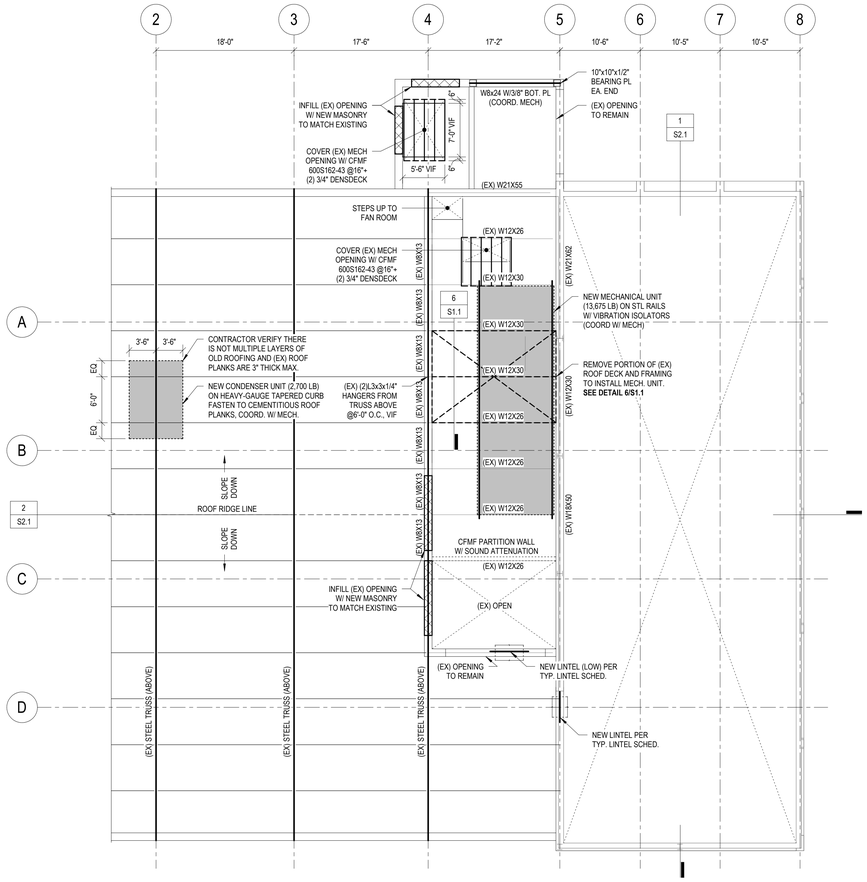
TABLE 1.6 - INSPECTION OR EXECUTION TASKS PRIOR TO MECHANICAL FASTENING

TASK	QC	QA
Manufacturer installation instructions available for mechanical fasteners	Observe	Observe
Proper tools available for fastener installation	Observe	Observe
Proper storage for mechanical fasteners	Observe	Observe

TABLE 1.7 - INSPECTION OR EXECUTION TASKS DURING MECHANICAL FASTENING

TASK	QC	QA
Fasteners are positioned as required	Observe	Observe
Fasteners are installed in accordance with manufacturer's instructions	Observe	Observe

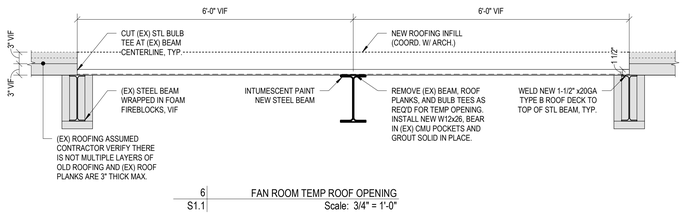
**TABL



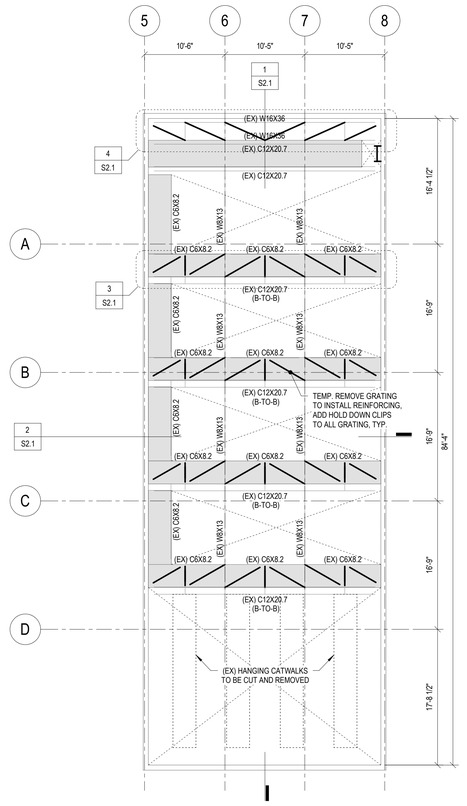
3 S1.1 FAN ROOM FRAMING PLAN
Scale: 1/8" = 1'-0"

FRAMING PLAN NOTES:

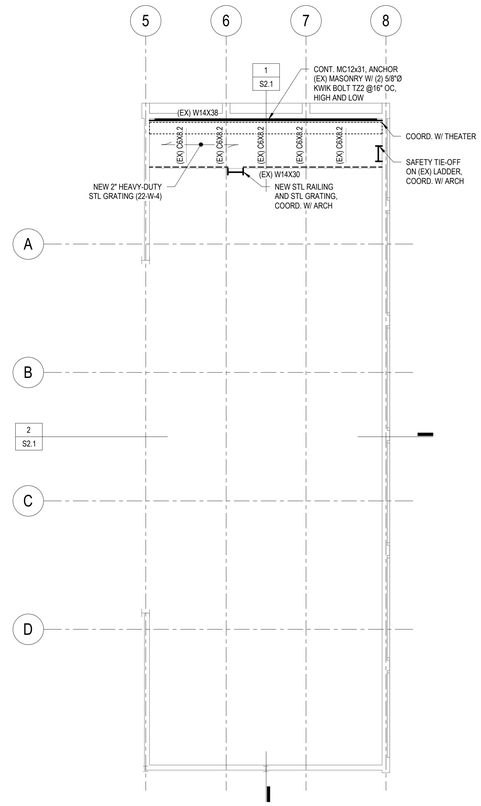
1. REFER TO SHEET S0.1 FOR STANDARD NOTES AND TYPICAL DETAILS
2. GENERAL CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND EXISTING CONDITIONS PRIOR TO CONSTRUCTION
3. VERIFY ALL EXISTING DIMENSIONS WITH ARCHITECTURAL DRAWINGS
4. [+/- x'-xx"] DENOTES ELEVATION FROM GIVEN DATUM



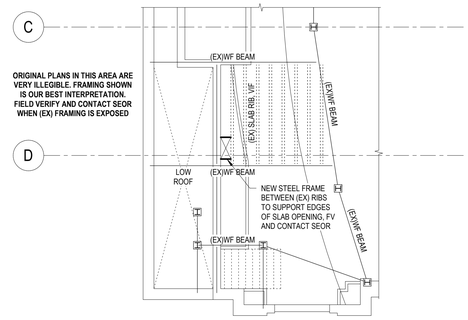
6 S1.1 FAN ROOM TEMP ROOF OPENING
Scale: 3/4" = 1'-0"



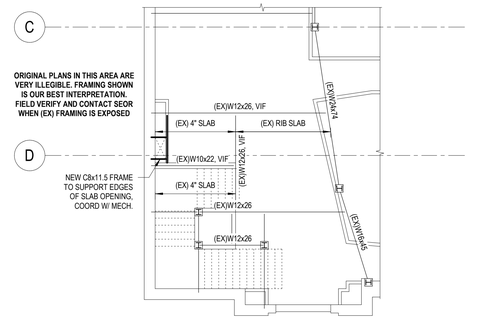
2 S1.1 FLY LOFT FRAMING PLAN
Scale: 1/8" = 1'-0"



1 S1.1 LOADING GALLERY FRAMING PLAN
Scale: 1/8" = 1'-0"



5 S1.1 LOBBY - 3RD FLOOR FRAMING PLAN
Scale: 1/8" = 1'-0"



4 S1.1 LOBBY - 2ND FLOOR FRAMING PLAN
Scale: 1/8" = 1'-0"

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KINGSCOTT
PORTAGE | CHELSEA | GRAND RAPIDS | ROYAL OAK

J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

ISSUANCES	DATE
BID & CONSTRUCTION	11/07/2025

KEY PLAN

N

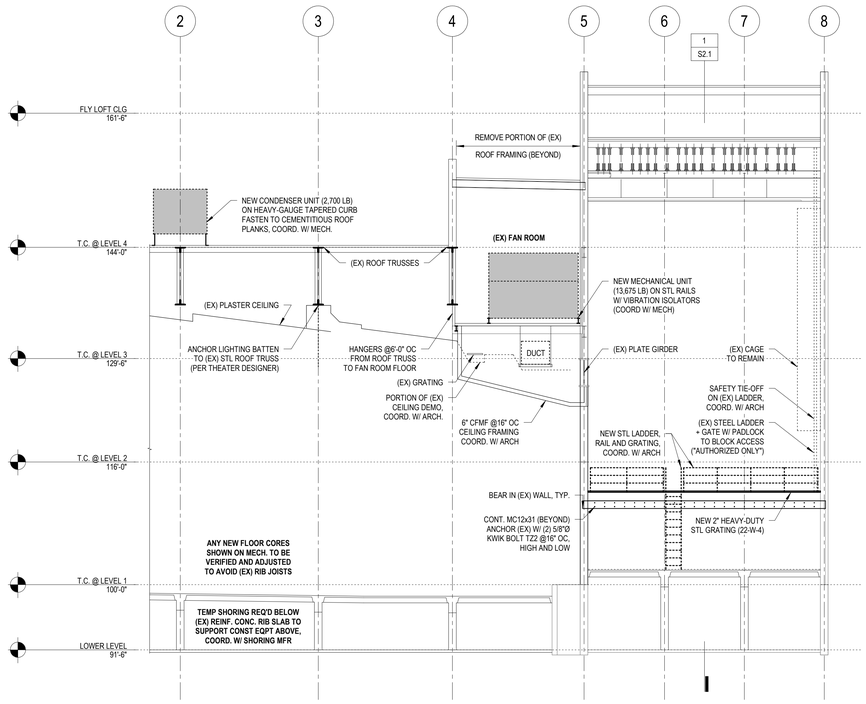
JOB NO. 2616.11

SHEET TITLE

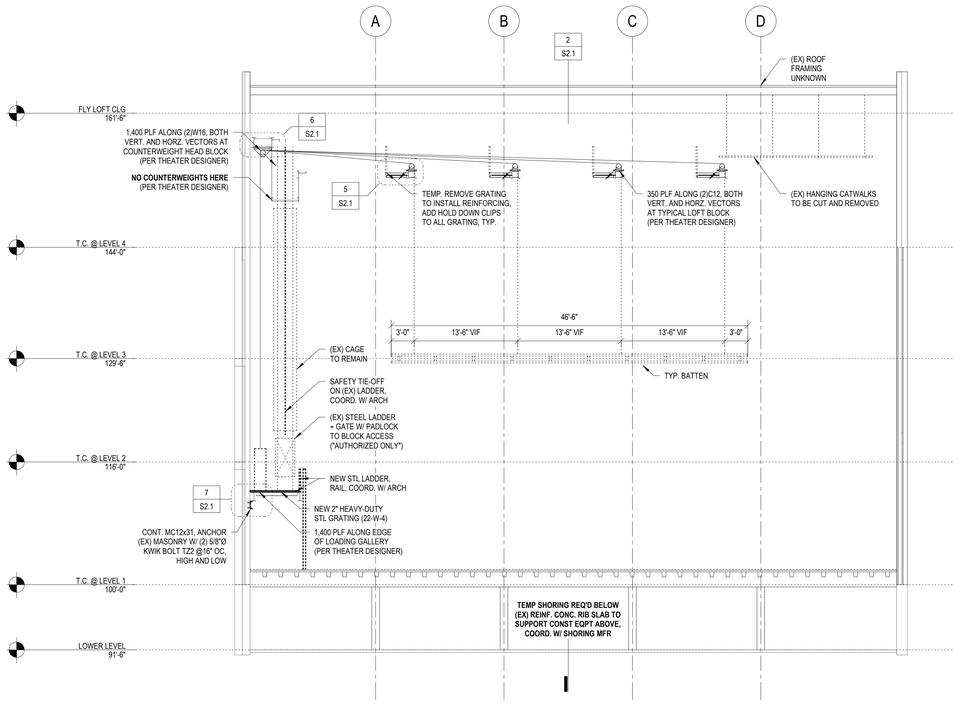
AUDITORIUM AND FAN ROOM FRAMING PLANS

SHEET NO.

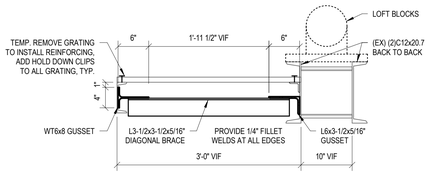
S1.1



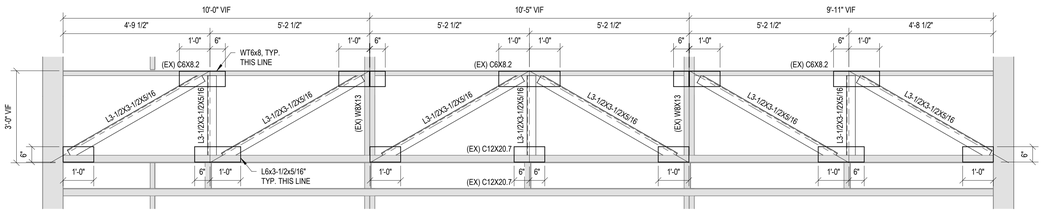
2 S2.1 STAGE SECTION (LOOKING SOUTH)
Scale: 1/8" = 1'-0"



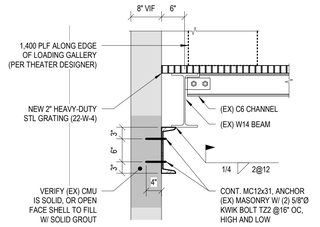
1 S2.1 STAGE SECTION (LOOKING WEST)
Scale: 1/8" = 1'-0"



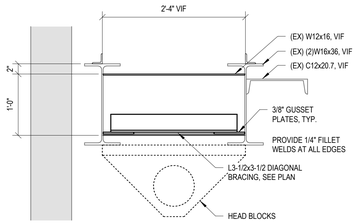
5 S2.1 LOFT BLOCK REINFORCING DETAIL
Scale: 1" = 1'-0"



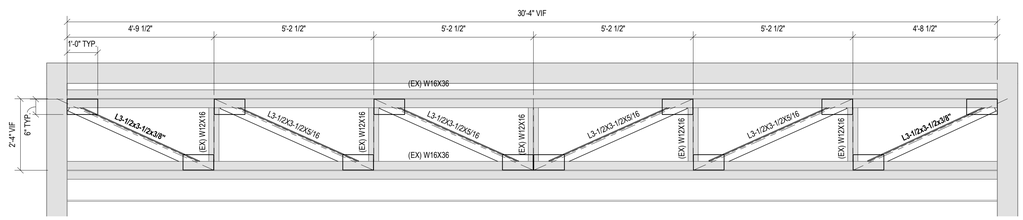
3 S2.1 LOFT BLOCK REINFORCING PLAN
Scale: 1/2" = 1'-0"



7 S2.1 LOADING GALLERY REINFORCING DETAIL
Scale: 3/4" = 1'-0"



6 S2.1 HEAD BLOCK REINFORCING DETAIL
Scale: 1" = 1'-0"



4 S2.1 HEAD BLOCK REINFORCING PLAN
Scale: 1/2" = 1'-0"

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LANSING SCHOOL DISTRICT

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ISSUANCES	DATE
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JOB NO. 2616.11

SHEET TITLE
AUDITORIUM SECTIONS AND DETAILS

SHEET NO.
S2.1

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
GHX	GROUND HEAT EXCHANGER
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE

MECHANICAL ABBREVIATIONS

ABBREV.	DESCRIPTION
HB	HOSE BIBB
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
GHXR	GROUND 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
GHXS	GROUND 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
2021	MICHIGAN BUILDING CODE
2021	MICHIGAN REHABILITATION CODE
2021	MICHIGAN MECHANICAL CODE
2021	MICHIGAN ENERGY CODE
2015	INTERNATIONAL FIRE CODE
2012	NFPA 101 WITH BFS AMENDMENTS
2017	MICHIGAN ACCESSIBILITY CODE
-	AMERICANS WITH DISABILITIES ACT ACCESSIBILITIES GUIDELINE (ADA-AG)

DRAWING INDEX

SHEET NO	DESCRIPTION
M0.0	MECHANICAL GENERAL INFORMATION
MD1.0	LOWER LEVEL MECHANICAL DEMOLITION PLAN
MD1.1	FIRST FLOOR MECHANICAL DEMOLITION PLAN
MD1.2	SECOND FLOOR MECHANICAL DEMOLITION PLAN
MD1.3	THIRD FLOOR MECHANICAL DEMOLITION PLAN
MD1.4	ROOF MECHANICAL DEMOLITION PLAN
MH1.0	LOWER LEVEL MECHANICAL HVAC PLAN
MH1.1	FIRST FLOOR MECHANICAL HVAC PLAN
MH1.2	SECOND FLOOR MECHANICAL HVAC PLAN
MH1.3	THIRD FLOOR MECHANICAL HVAC PLAN
M1.4	ROOF MECHANICAL PLAN
M4.0	ENLARGED MECHANICAL PLANS
M4.1	ENLARGED MECHANICAL PLANS
M5.0	MECHANICAL DETAILS
M5.1	MECHANICAL DETAILS
M6.0	MECHANICAL SCHEDULES
M6.1	MECHANICAL SCHEDULES
M8.0	CONTROL DIAGRAMS
M8.1	CONTROL DIAGRAMS

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

4 / M5.2 — SECTION NO. 4; SHEET M5.2 ON WHICH SECTION IS DRAWN

6 / M5.2 — SECTION NO. 6; **SECTION**; SCALE: 1/4" = 1'- 0"; SHEET M5.2 ON WHICH SECTION IS CUT (ENLARGED PARTIAL PLAN SIMILAR)

X-R — SYSTEM RISER DESIGNATION; RISER NUMBER

S: SANITARY / VENT
D: DOMESTIC WATER
H: HVAC PIPING
SP: STAIRWELL PRESSURIZATION
V: VENTILATION
E: EXHAUST

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LANSING SCHOOL DISTRICT
102 McPherson Ave, Lansing, MI 48915

STATE OF MICHIGAN — STEVEN R. DIBERARDINE — ENGINEER — No. 6201041574 — PROFESSIONAL ENGINEER
11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

JOB NO. 2616.11

SHEET TITLE
MECHANICAL GENERAL INFORMATION

SHEET NO.
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4000 W. Eleven Mile Road Berkley, MI 48072
Phone 248.399.1900 Fax 248.399.1901
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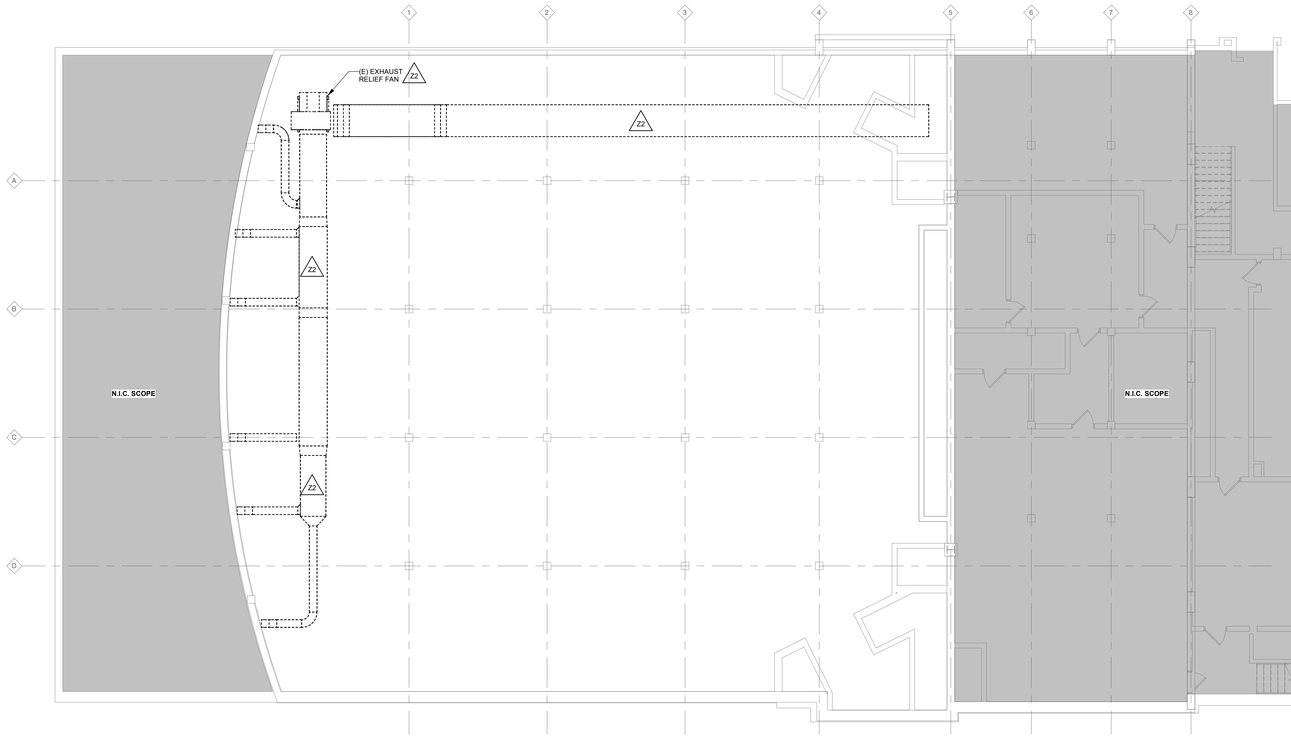
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THINK RECYCLE



LOWER LEVEL MECHANICAL DEMOLITION PLAN
SCALE: 1/8" = 1'-0"

MECHANICAL DEMOLITION NOTES

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STATE OF MICHIGAN
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ENGINEER
No. 6201041574
LICENSED PROFESSIONAL ENGINEER
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ISSUANCES	DATE
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KEY PLAN

N

JOB NO. 2616.11

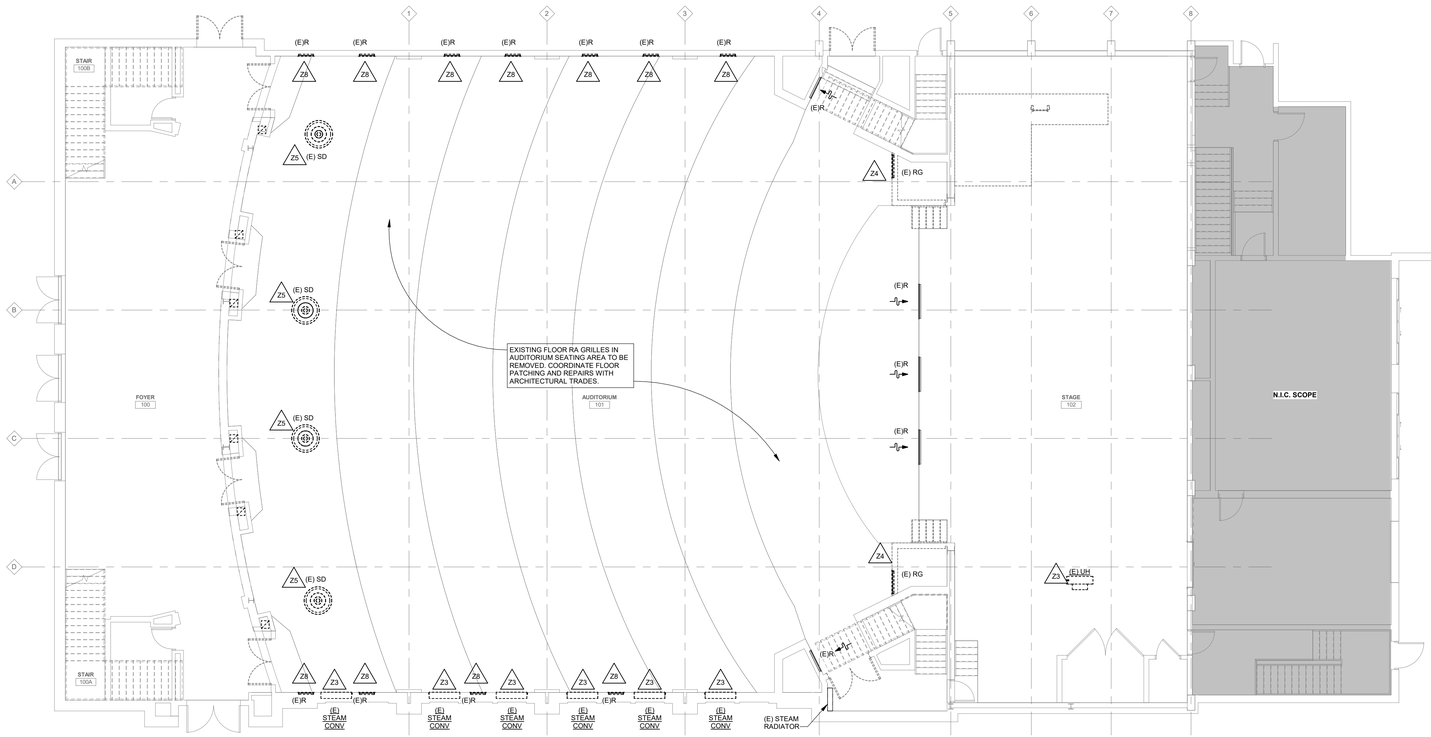
SHEET TITLE
LOWER LEVEL MECHANICAL DEMOLITION PLAN

SHEET NO.
MD1.0

Strategic Energy Solutions®
4000 W. Eleven Mile Road Berkley, MI 48072
Phone 248.399.1900 Fax 248.399.1901
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FIRST FLOOR MECHANICAL DEMOLITION PLAN

SCALE: 1/8" = 1'-0"

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STATE OF MICHIGAN
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ENGINEER
No. 6201041574
LICENSED PROFESSIONAL ENGINEER

11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

KEY PLAN

JOB NO. 2616.11

SHEET TITLE

FIRST FLOOR MECHANICAL DEMOLITION PLAN

SHEET NO.

MD1.1

Strategic Energy Solutions®
4000 W. Eleven Mile Road Berkley, MI 48072
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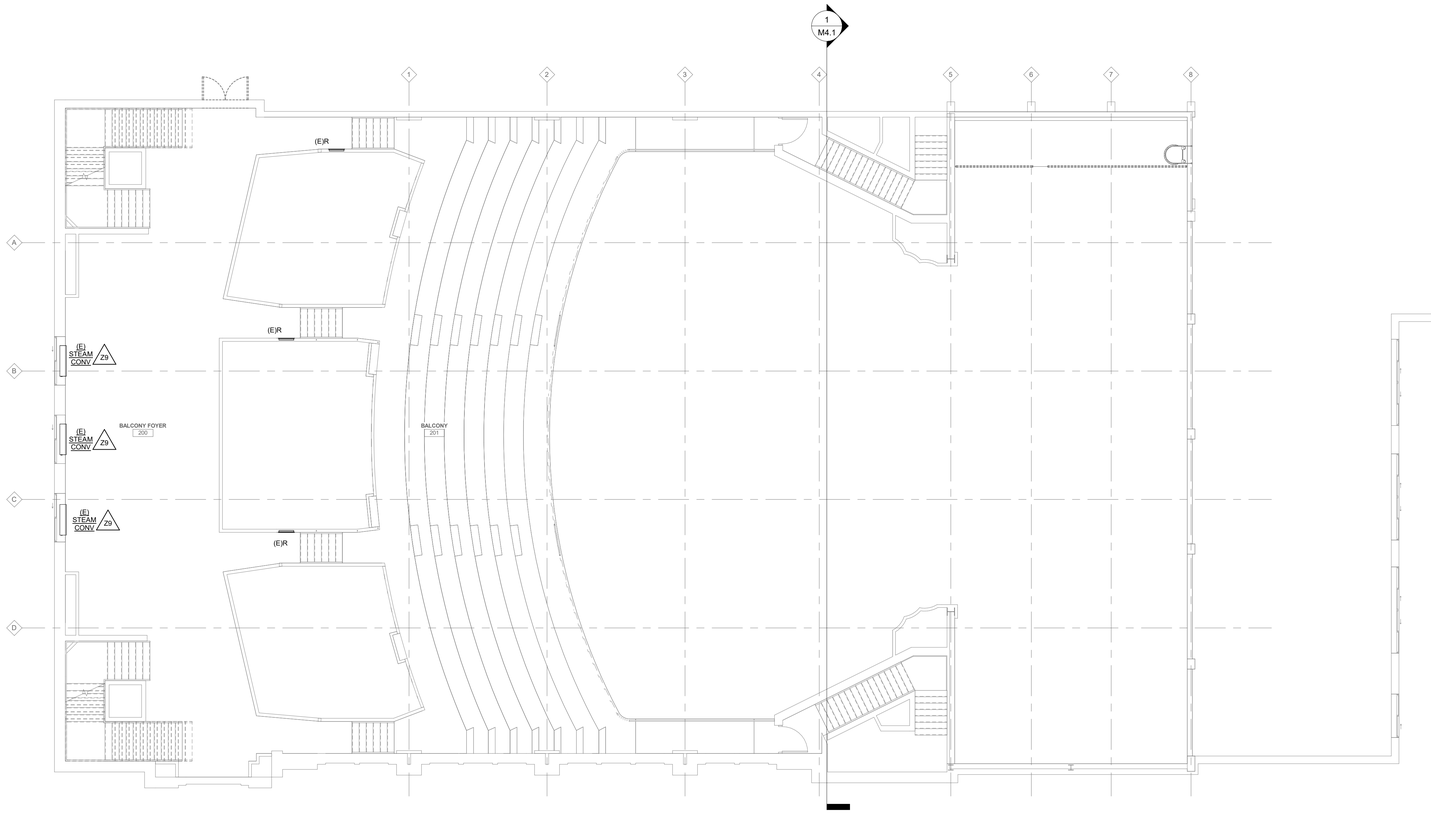
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SECOND FLOOR MECHANICAL DEMOLITION PLAN
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KEY PLAN

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JOB NO. 2616.11

SHEET TITLE
SECOND FLOOR MECHANICAL DEMOLITION PLAN

SHEET NO.
MD1.2

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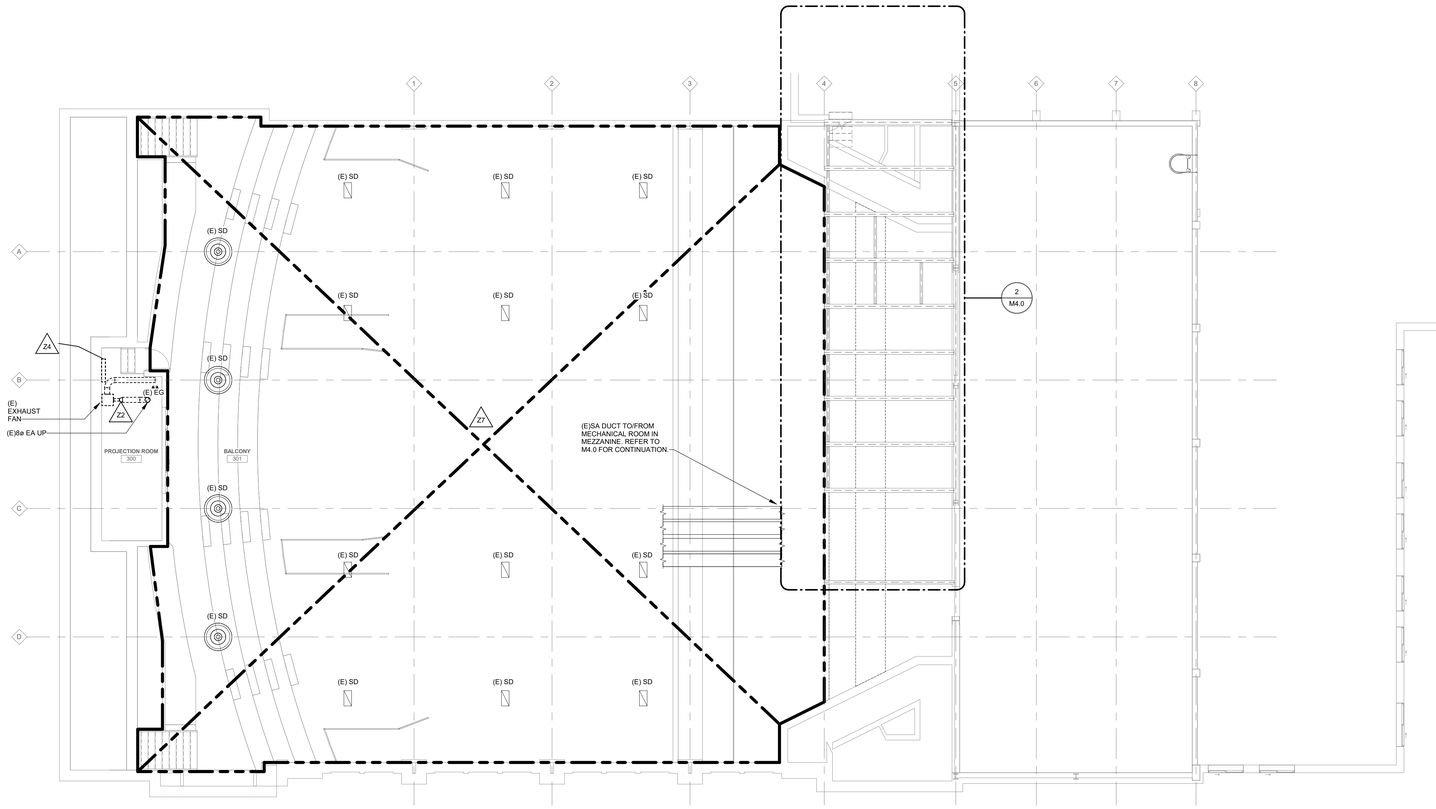
Z5 REMOVE EXISTING CEILING GRILLE/REGISTER/DIFFUSER UNDER SECOND FLOOR BALCONY CEILING. EXISTING DUCTWORK ABOVE CEILING TO BE CAPPED AND ABANDONED IN PLACE. COORDINATE CEILING PATCHING AND REPAIRS WITH ARCHITECTURAL TRADES AS REQUIRED.

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Z9 EXISTING STEAM CONVECTOR TO BE DISCONNECTED AND ABANDONED IN PLACE. REMOVE SECTION OF STEAM PIPE AS REQUIRED AND CAP. FIELD VERIFY PIPE ROUTING, SIZE AND LOCATION PRIOR TO REMOVAL.



THIRD FLOOR MECHANICAL DEMOLITION PLAN
SCALE: 1/8" = 1'-0"

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LANSING SCHOOL DISTRICT

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STATE OF MICHIGAN
STEVEN R. DIBERARDINE
ENGINEER
No. 6201041574
REGISTERED PROFESSIONAL ENGINEER
11/07/2025

ISSUANCES	DATE
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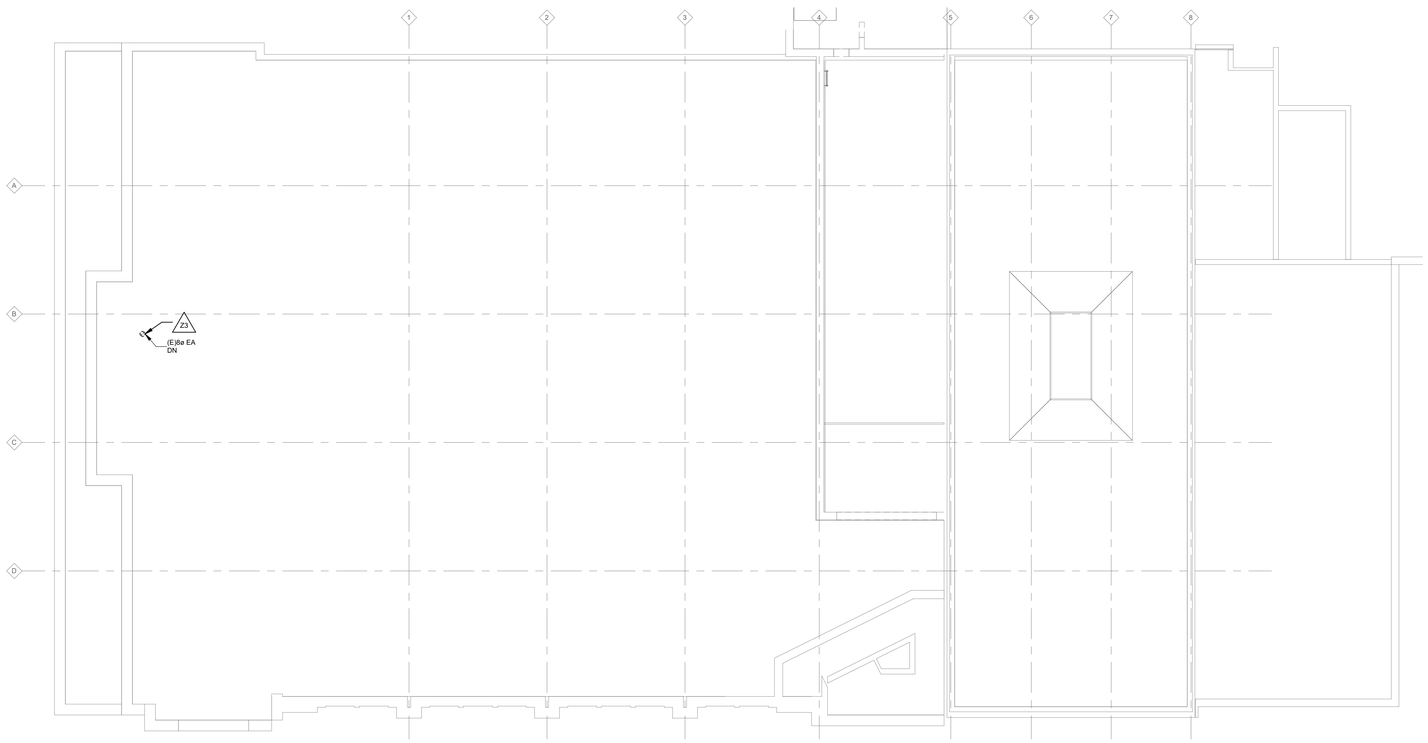
KEY PLAN

JOB NO. 2616.11

SHEET TITLE
THIRD FLOOR MECHANICAL DEMOLITION PLAN

SHEET NO.
MD1.3

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4000 W. Eleven Mile Road Berkley, MI 48072
Phone 248.399.1900 Fax 248.399.1901
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ROOF MECHANICAL DEMOLITION PLAN
SCALE: 1/8" = 1'-0"

MECHANICAL DEMOLITION NOTES

1. THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF WORK TO BE PERFORMED. THE EXACT EXTENT OF DEMOLITION SHALL BE AS REQUIRED BY THE NEW WORK.
2. PRIOR TO COMMENCEMENT OF WORK, CONTRACTOR SHALL VISIT THE SITE AND BECOME FAMILIAR WITH EXISTING SITE CONDITIONS, SYSTEMS, AND UTILITIES. NOTIFY ARCHITECT OF ANY INTERFERENCES OR DISCREPANCIES.
3. VERIFY DEPTH, SIZE, LOCATIONS AND CONDITION OF EXISTING UTILITIES IN THE FIELD, INCLUDING POINTS OF CONNECTION PRIOR TO STARTING ANY WORK.
4. ANY INTERRUPTIONS OF EXISTING SERVICES AND/OR EQUIPMENT SHALL BE PERFORMED AT A TIME APPROVED IN ADVANCE BY THE OWNER'S REPRESENTATIVE SO AS NOT TO INTERFERE WITH THE PRESENT BUILDING'S OPERATION.
5. ALL ITEMS ON DEMOLITION PLANS SHALL BE CONSIDERED EXISTING UNLESS OTHERWISE NOTED. ALL WORK INDICATED ON PLANS HAS BEEN LOCATED PER EXISTING DRAWINGS AND/OR FIELD OBSERVATION AND REQUIRES FIELD VERIFICATION.
6. ALL ITEMS INDICATED WITH BROKEN LINES SHALL BE REMOVED COMPLETE, WITH ALL RELATED ITEMS INCLUDING HANGERS, SUPPORTS, INSULATION, CONTROLS, ETC. CAP ALL OPEN ENDED PIPES AND DUCTS.
7. ALL EXISTING WORK TO REMAIN SHALL BE PROTECTED FROM DAMAGE. WHERE DUCT OR PIPE INSULATION HAS BEEN DAMAGED DURING DEMOLITION, THE CONTRACTOR SHALL REPAIR INSULATION AS REQUIRED TO MATCH EXISTING.
8. THE OWNER SHALL HAVE FIRST RIGHT OF REFUSAL ON ALL EQUIPMENT BEING REMOVED. ALL ITEMS REMOVED SHALL BE LEGALLY DISPOSED OF. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EXISTING RELOCATED AND OWNER PROVIDED EQUIPMENT.

MECHANICAL DEMOLITION KEYNOTES

Z1 REMOVE EXISTING AIR HANDLING UNIT IN MEZZANINE SPACE AND ALL ASSOCIATED COMPONENTS COMPLETE INCLUDING, BUT NOT LIMITED TO FANS, STEAM COILS, DUCTWORK, SUPPORTS, DAMPERS, CONTROLS, ETC. DISCONNECT AND REMOVE STEAM PIPING AS REQUIRED FOR EQUIPMENT REMOVAL. TEMPORARILY CAP AND PREPARE FOR NEW CONNECTION. COORDINATE ALL FLOOR/WALL/ROOF PATCHING AND REPAIRS WITH ARCHITECTURAL TRADES AS REQUIRED. WHERE DUCT IS EMBEDDED IN WALLS THAT IS EXISTING TO REMAIN, REMOVE DUCTWORK TO WALL AND ABANDON IN PLACE. ALL DEMO WORK SHALL BE COORDINATED WITH NEW WORK. REFER TO NEW WORK DRAWINGS FOR FURTHER INFORMATION.

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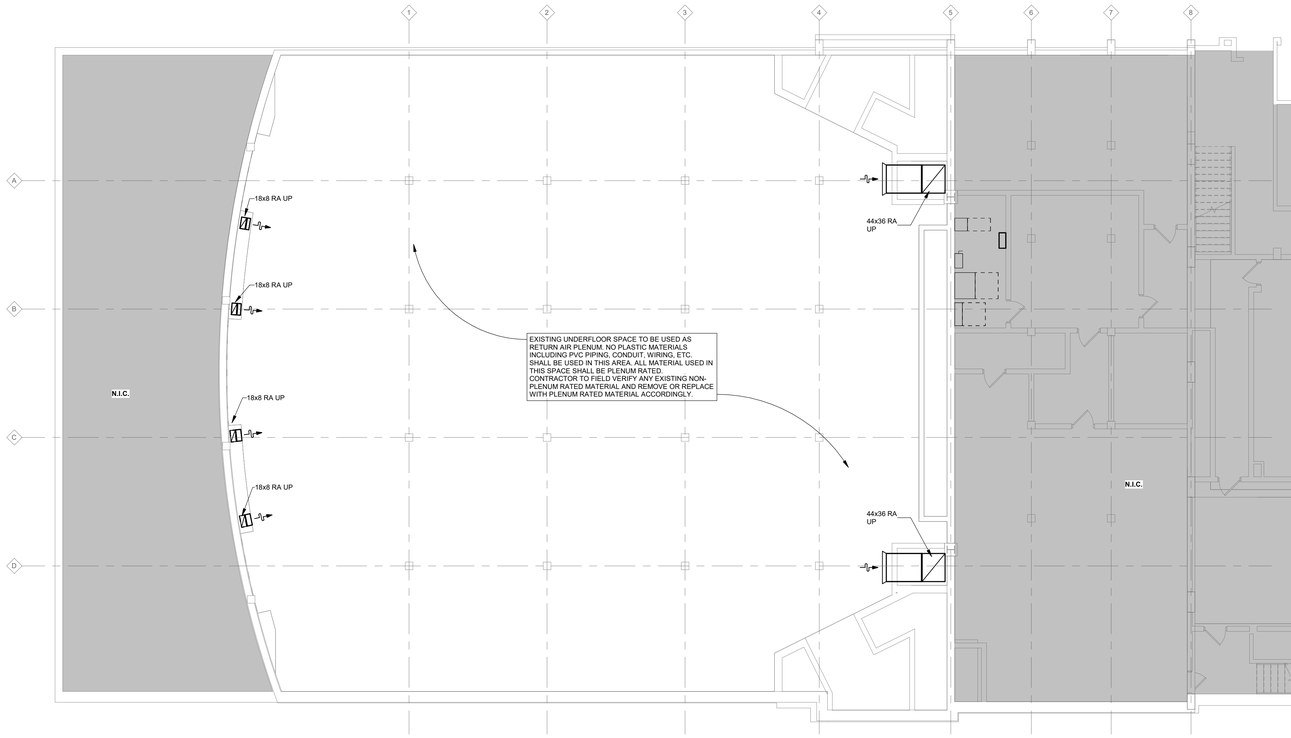
SHEET TITLE
ROOF MECHANICAL DEMOLITION PLAN

SHEET NO.
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LOWER LEVEL MECHANICAL HVAC PLAN
SCALE: 1/8" = 1'-0"

HVAC GENERAL NOTES

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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. THE CONTRACTOR SHALL REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATION OF GRILLES, REGISTERS, AND DIFFUSERS.
8. COORDINATE AND PROVIDE ACCESS DOORS IN HARD CEILING AREAS FOR ACCESS TO BALANCING DAMPERS, ETC. REFER TO ARCHITECTURAL DRAWINGS FOR CEILING TYPES.
9. BRANCH DUCTWORK TO GRILLES, REGISTERS AND DIFFUSERS SHALL BE THE SAME SIZE AS THE GRILLE, REGISTER OR DIFFUSER NECK SIZE WHERE NO DUCT SIZE IS INDICATED ON PLAN.
10. MAXIMUM LENGTH OF FLEXIBLE DUCT SHALL BE 5'-0".
11. FOR EQUIPMENT VALVING, COMPONENT, AND PIPING ARRANGEMENT, REFER TO PIPING DIAGRAMS AND DETAILS.
12. PAINT ALL VISIBLE INTERIOR SURFACES OF EXHAUST/RETURN GRILLES, REGISTERS AND VISIBLE ASSOCIATED DUCTWORK FLAT BLACK.
13. WHERE CEILING OR UNDERFLOOR SPACE IS USED AS A RETURN AIR PLENUM NO PLASTIC MATERIALS INCLUDING PVC PIPING, CONDUIT, WIRING, ETC. SHALL BE USED. ALL MATERIAL INTHE PLENUM SPACE IS TO BE PLENUM RATED.
14. 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.
15. PAINT ALL EXPOSED DUCTWORK IN AUDITORIUM AND STAGE AREA TO MATCH ARCHITECTURAL COLORS. COORDINATE WITH ARCHITECT AS REQUIRED.
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17. 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.

HVAC KEYNOTES

H1 PROVIDE AND INSTALL NEW RA GRILLE AT SAME LOCATION AS EXISTING. FIELD VERIFY SIZE, QUANTITY AND LOCATION PRIOR TO INSTALLATION.

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LANSING SCHOOL DISTRICT

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STATE OF MICHIGAN
STEVEN R. DIBERARDINE
ENGINEER
No. 6201041574
LICENSED PROFESSIONAL ENGINEER
11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

KEY PLAN

N

JOB NO. 2616.11

SHEET TITLE
LOWER LEVEL MECHANICAL HVAC PLAN

SHEET NO.
MH1.0

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4000 W. Eleven Mile Road Berkley, MI 48072
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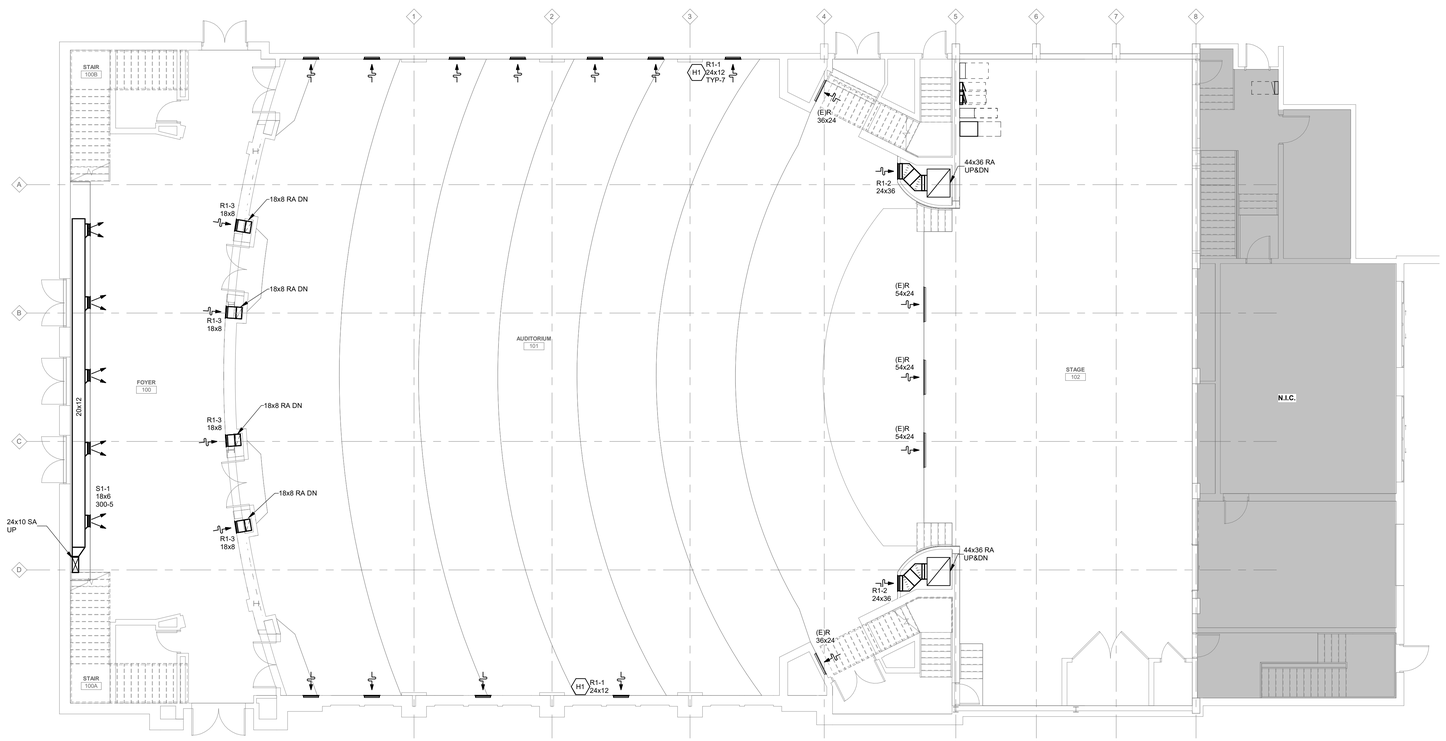
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FIRST FLOOR MECHANICAL HVAC PLAN
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Strategic Energy Solutions®
4000 W. Eleven Mile Road Berkley, MI 48072
Phone 248.399.1900 Fax 248.399.1901
www.sesnet.com

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11. FOR EQUIPMENT VALVING, COMPONENT, AND PIPING ARRANGEMENT, REFER TO PIPING DIAGRAMS AND DETAILS.
12. PAINT ALL VISIBLE INTERIOR SURFACES OF EXHAUST/RETURN GRILLES, REGISTERS AND VISIBLE ASSOCIATED DUCTWORK FLAT BLACK.
13. WHERE CEILING OR UNDERFLOOR SPACE IS USED AS A RETURN AIR PLENUM NO PLASTIC MATERIALS INCLUDING PVC PIPING, CONDUIT, WIRING, ETC. SHALL BE USED. ALL MATERIAL INTHE PLENUM SPACE IS TO BE PLENUM RATED.
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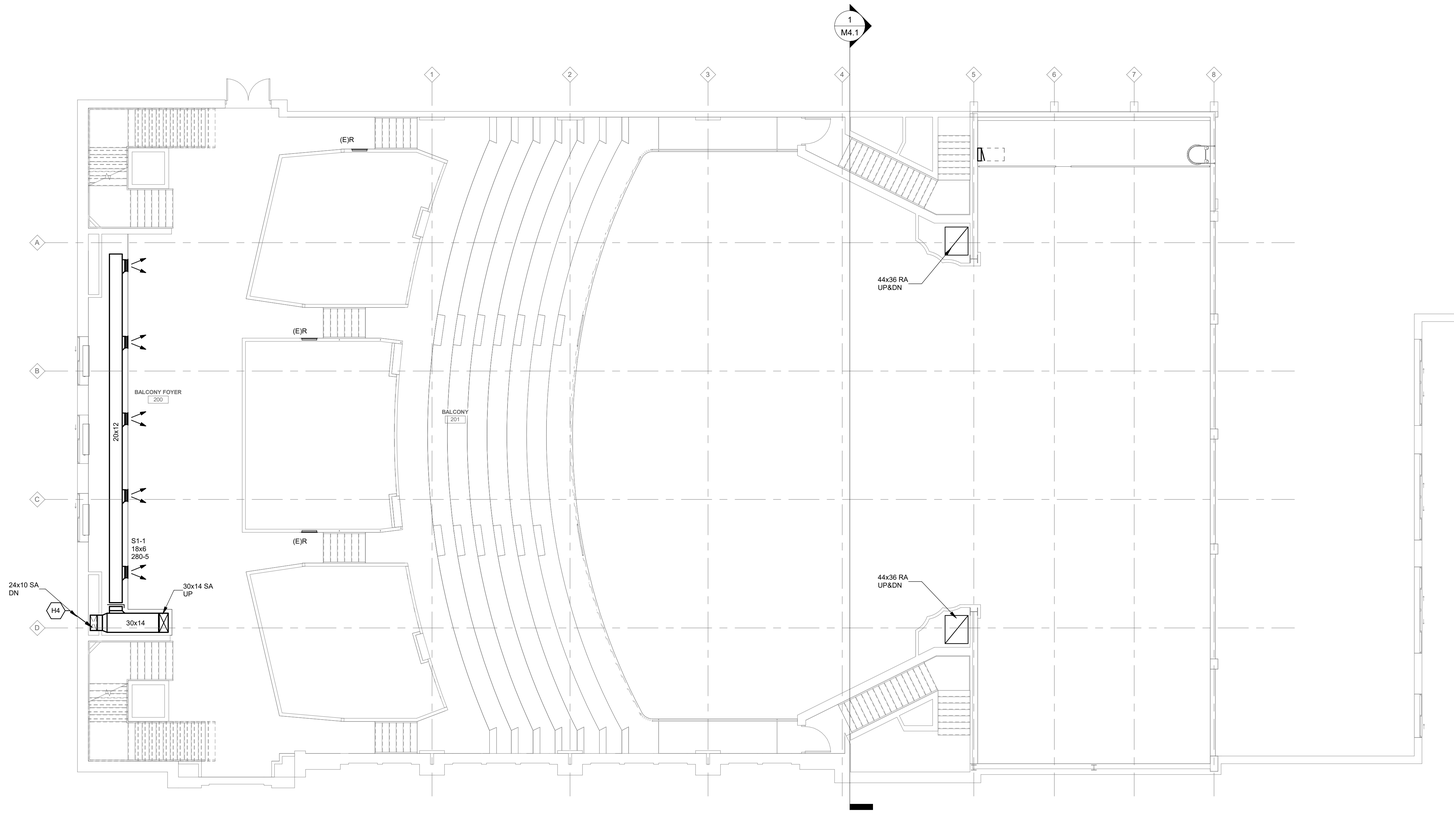
HVAC KEYNOTES

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SECOND FLOOR MECHANICAL HVAC PLAN
SCALE: 1/8" = 1'-0"

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J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

STATE OF MICHIGAN
STEVEN R. DIBERARDINE
ENGINEER
No. 6201041574
LICENSED PROFESSIONAL ENGINEER
11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

KEY PLAN

JOB NO. 2616.11

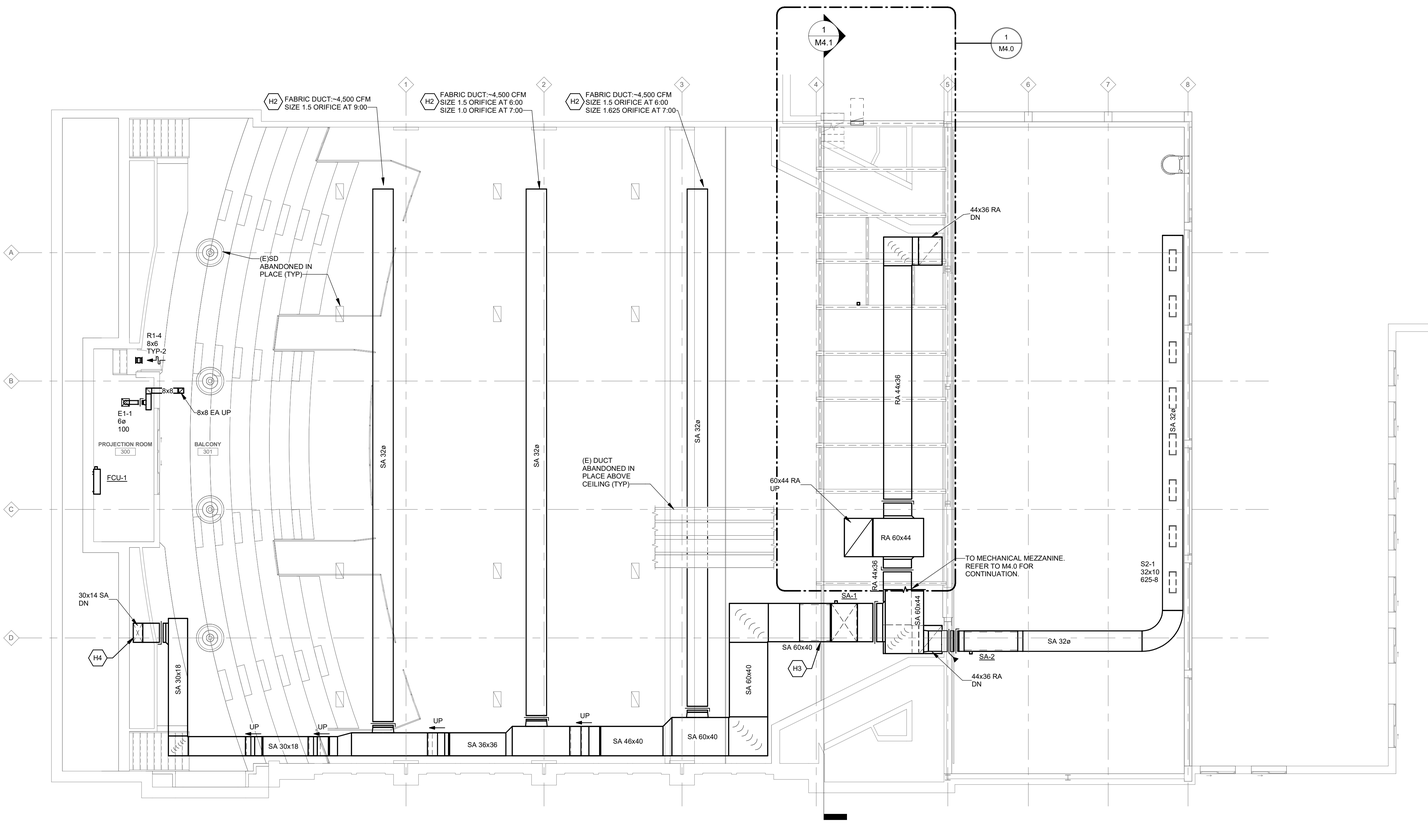
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SHEET TITLE
SECOND FLOOR MECHANICAL HVAC PLAN

SHEET NO.
MH1.2

Strategic Energy Solutions®
4000 W. Eleven Mile Road Berkley, MI 48072
Phone 248.399.1900 Fax 248.399.1901
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THIRD FLOOR MECHANICAL HVAC PLAN
SCALE: 1/8" = 1'-0"

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STATE OF MICHIGAN
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ENGINEER
No. 6201041574
REGISTERED PROFESSIONAL ENGINEER
11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
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KEY PLAN

N

JOB NO. 2616.11

SHEET TITLE
THIRD FLOOR MECHANICAL HVAC PLAN

SHEET NO.
MH1.3

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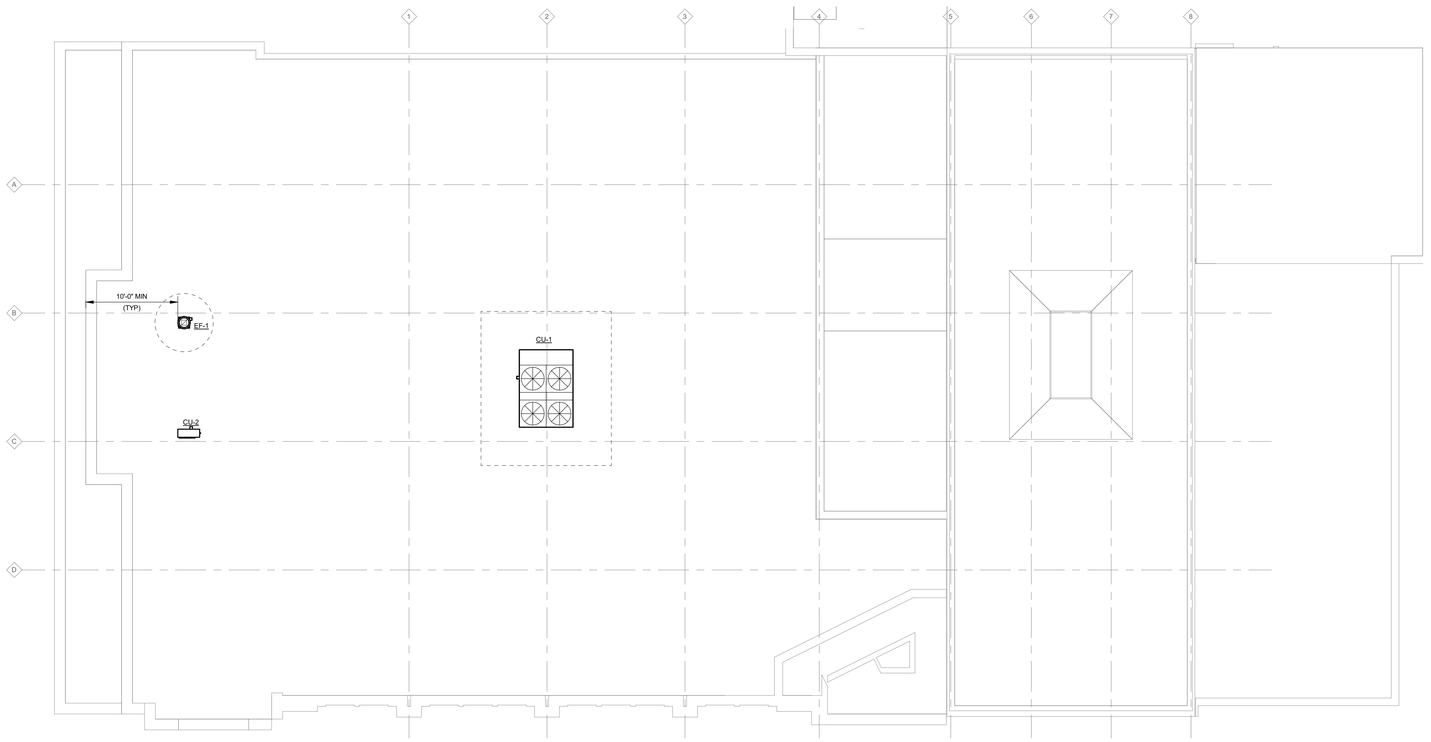
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4000 W. Eleven Mile Road Berkley, MI 48072
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ROOF MECHANICAL PLAN
SCALE: 1/8" = 1'-0"

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LANSING SCHOOL DISTRICT

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STATE OF MICHIGAN
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ENGINEER
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KEY PLAN

JOB NO. 2616.11

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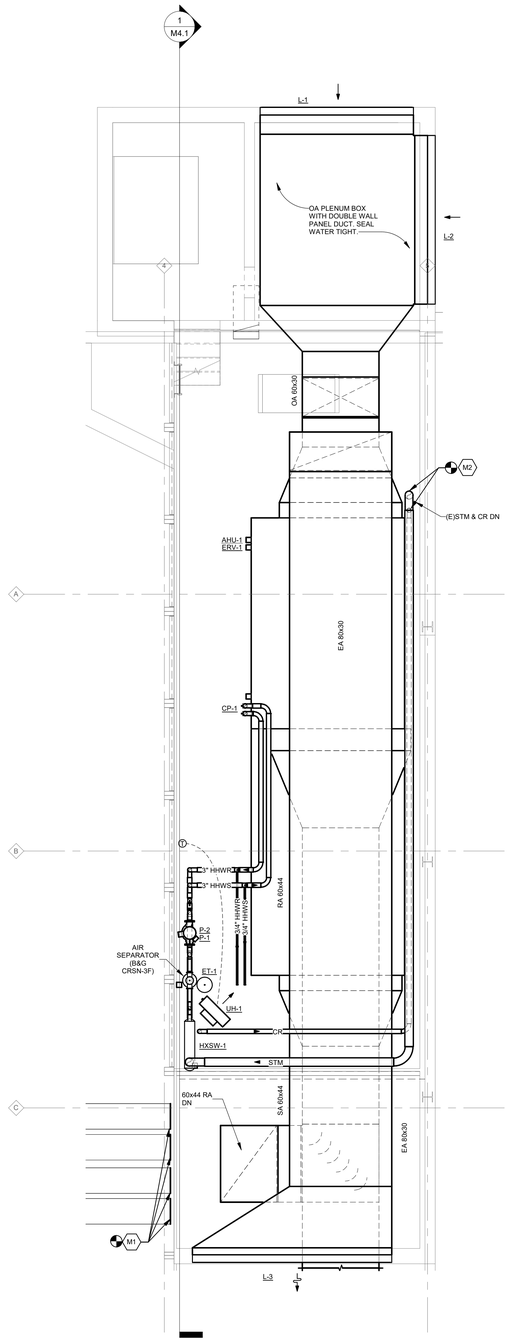
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ROOF MECHANICAL PLAN

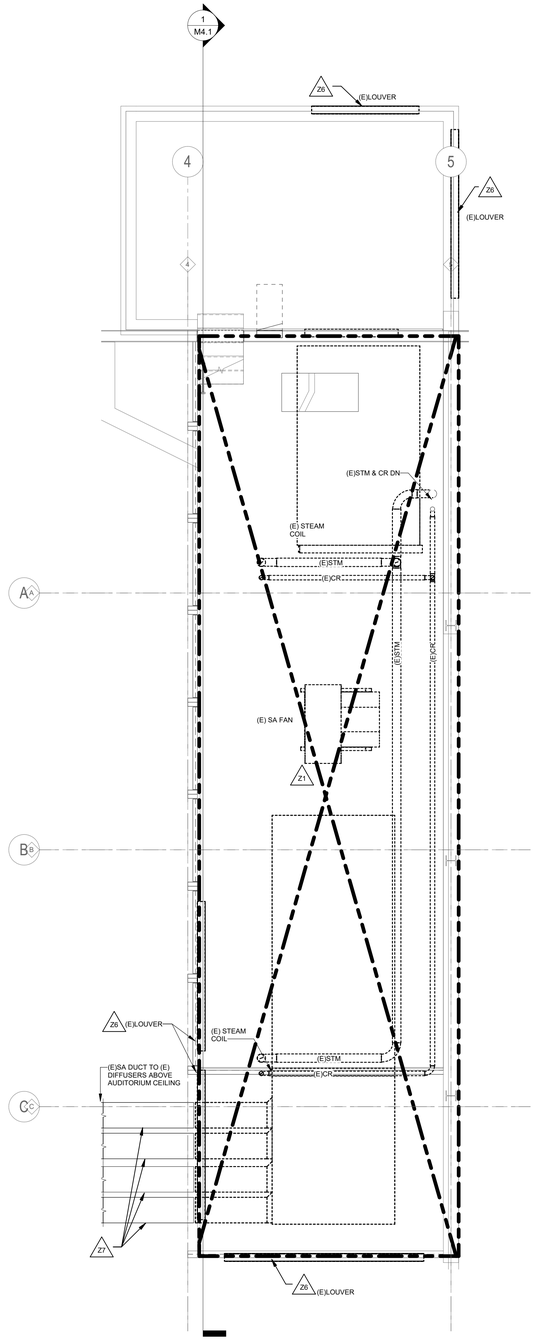
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M1.4

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ENLARGED MECHANICAL ROOM NEW WORK PLAN
SCALE: 1/4" = 1'-0"



ENLARGED MECHANICAL ROOM DEMOLITION PLAN
SCALE: 1/4" = 1'-0"

MECHANICAL DEMOLITION NOTES

1. THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF WORK TO BE PERFORMED. THE EXACT EXTENT OF DEMOLITION SHALL BE AS REQUIRED BY THE NEW WORK.
2. PRIOR TO COMMENCEMENT OF WORK, CONTRACTOR SHALL VISIT THE SITE AND BECOME FAMILIAR WITH EXISTING SITE CONDITIONS, SYSTEMS, AND UTILITIES. NOTIFY ARCHITECT OF ANY INTERFERENCES OR DISCREPANCIES.
3. VERIFY DEPTH, SIZE, LOCATIONS AND CONDITION OF EXISTING UTILITIES IN THE FIELD, INCLUDING POINTS OF CONNECTION PRIOR TO STARTING ANY WORK.
4. ANY INTERRUPTIONS OF EXISTING SERVICES AND/OR EQUIPMENT SHALL BE PERFORMED AT A TIME APPROVED IN ADVANCE BY THE OWNER'S REPRESENTATIVE SO AS NOT TO INTERFERE WITH THE PRESENT BUILDING'S OPERATION.
5. ALL ITEMS ON DEMOLITION PLANS SHALL BE CONSIDERED EXISTING UNLESS OTHERWISE NOTED. ALL WORK INDICATED ON PLANS HAS BEEN LOCATED PER EXISTING DRAWINGS AND/OR FIELD OBSERVATION AND REQUIRES FIELD VERIFICATION.
6. ALL ITEMS INDICATED WITH BROKEN LINES SHALL BE REMOVED COMPLETE, WITH ALL RELATED ITEMS INCLUDING HANGERS, SUPPORTS, INSULATION, CONTROLS, ETC. CAP ALL OPEN ENDED PIPES AND DUCTS.
7. ALL EXISTING WORK TO REMAIN SHALL BE PROTECTED FROM DAMAGE. WHERE DUCT OR PIPE INSULATION HAS BEEN DAMAGED DURING DEMOLITION, THE CONTRACTOR SHALL REPAIR INSULATION AS REQUIRED TO MATCH EXISTING.
8. THE OWNER SHALL HAVE FIRST RIGHT OF REFUSAL ON ALL EQUIPMENT BEING REMOVED. ALL ITEMS REMOVED SHALL BE LEGALLY DISPOSED OF. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EXISTING RELOCATED AND OWNER PROVIDED EQUIPMENT.

MECHANICAL DEMOLITION KEYNOTES

Z1 REMOVE EXISTING AIR HANDLING UNIT IN MEZZANINE SPACE AND ALL ASSOCIATED COMPONENTS COMPLETE INCLUDING, BUT NOT LIMITED TO FANS, STEAM COILS, DUCTWORK, SUPPORTS, DAMPERS, CONTROLS, ETC. DISCONNECT AND REMOVE STEAM PIPING AS REQUIRED FOR EQUIPMENT REMOVAL. TEMPORARILY CAP AND PREPARE FOR NEW CONNECTION. COORDINATE ALL FLOOR/WALL/ROOF PATCHING AND REPAIRS WITH ARCHITECTURAL TRADES AS REQUIRED. WHERE DUCT IS EMBEDDED IN WALLS THAT IS EXISTING TO REMAIN, REMOVE DUCTWORK TO WALL AND ABANDON IN PLACE. ALL DEMO WORK SHALL BE COORDINATED WITH NEW WORK. REFER TO NEW WORK DRAWINGS FOR FURTHER INFORMATION.

Z2 REMOVE EXISTING EXHAUST/RELIEF FAN AND ALL ASSOCIATED COMPONENTS COMPLETE INCLUDING, BUT NOT LIMITED TO DUCTWORK, SUPPORTS, GRILLES/REGISTERS, DAMPERS, CONTROLS, ETC. COORDINATE ALL FLOOR/WALL/ROOF PATCHING WITH ARCHITECTURAL TRADES AS REQUIRED. WHERE DUCT IS EMBEDDED IN WALLS THAT IS EXISTING TO REMAIN, REMOVE DUCTWORK TO WALL AND ABANDON IN PLACE. ALL DEMO WORK SHALL BE COORDINATED WITH NEW WORK. REFER TO NEW WORK DRAWINGS FOR FURTHER INFORMATION.

Z3 REMOVE EXISTING STEAM CONVECTOR / CUH / UH AND ALL ASSOCIATED COMPONENTS COMPLETE INCLUDING, BUT NOT LIMITED TO STEAM PIPING, REGULATORS, VALVES, FITTINGS, ETC. COORDINATE ALL FLOOR/WALL PATCHING AND REPAIRS WITH ARCHITECTURAL TRADES AS REQUIRED. REFER TO NEW WORK PLANS FOR FURTHER INFORMATION.

Z4 REMOVE EXISTING GRILLE/REGISTER/DIFFUSER AND ALL ASSOCIATED COMPONENTS COMPLETE. REMOVE EXISTING DUCTWORK BACK TO MAIN AS INDICATED. COORDINATE ANY WALL PATCHING AND REPAIRS WITH ARCHITECTURAL TRADES AS REQUIRED. REFER TO NEW WORK PLANS FOR FURTHER INFORMATION

Z5 REMOVE EXISTING CEILING GRILLE/REGISTER/DIFFUSER UNDER SECOND FLOOR BALCONY CEILING. EXISTING DUCTWORK ABOVE CEILING TO BE CAPPED AND ABANDONED IN PLACE. COORDINATE CEILING PATCHING AND REPAIRS WITH ARCHITECTURAL TRADES AS REQUIRED.

Z6 REMOVE EXISTING WALL LOUVER AND ASSOCIATED COMPONENTS COMPLETE. COORDINATE WALL PATCHING AND REPAIRS WITH ARCHITECTURAL TRADES. FIELD VERIFY EXACT SIZE AND LOCATION PRIOR TO REMOVAL. REFER TO NEW WORK PLANS FOR FURTHER INFORMATION.

Z7 EXISTING DUCTWORK ABOVE AUDITORIUM CEILING AREA TO BE CAPPED AND ABANDONED IN PLACE ALONG WITH ALL ASSOCIATED DIFFUSERS. FIELD VERIFY EXISTING DUCT BRANCHES QUANTITY, SIZES, AND ROUTING PRIOR TO COMMENCEMENT OF WORK. REFER TO NEW WORK PLANS FOR ADDITIONAL INFORMATION.

Z8 REMOVE AND REPLACE EXISTING GRILLE/REGISTER/DIFFUSER IN KIND. EXISTING DUCTWORK TO BE SAVAGED AND REUSED. COORDINATE WALL PATCHING AND REPAIRS AS REQUIRED WITH ARCHITECTURAL TRADES. REFER TO NEW WORK PLANS FOR FURTHER INFORMATION.

Z9 EXISTING STEAM CONVECTOR TO BE DISCONNECTED AND ABANDONED IN PLACE. REMOVE SECTION OF STEAM PIPE AS REQUIRED AND CAP. FIELD VERIFY PIPE ROUTING, SIZE AND LOCATION PRIOR TO REMOVAL.

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MECHANICAL ENLARGED KEYNOTES

M1 CAPPED AND ABANDONED SA DUCT ABOVE AUDITORIUM CEILING.

M2 EXTEND EXISTING STEAM AND CONDENSATE PIPING TO NEW HEAT EXCHANGER HXSW-1 AS INDICATED. FIELD VERIFY PIPE SIZES AND MATCH EXISTING STEAM AND CONDENSATE PIPE SIZES. FIELD VERIFY EXACT PIPE ROUTING AND LOCATION PRIOR TO INSTALLATION AND REWORK AS NEEDED. PROVIDE PIPE CURB WHERE PIPE PENETRATES FLOOR. REFER TO PIPE CURB DETAIL.

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STEVEN R. DIBERARDINE
ENGINEER
No. 6201041574
REGISTERED
11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

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4000 W. Eleven Mile Road Berkley, MI 48072
Phone 248.399.1900 Fax 248.399.1901
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SES Project # 25 0588 18

JOB NO. 2616.11

SHEET TITLE
ENLARGED MECHANICAL PLANS

SHEET NO.
M4.0

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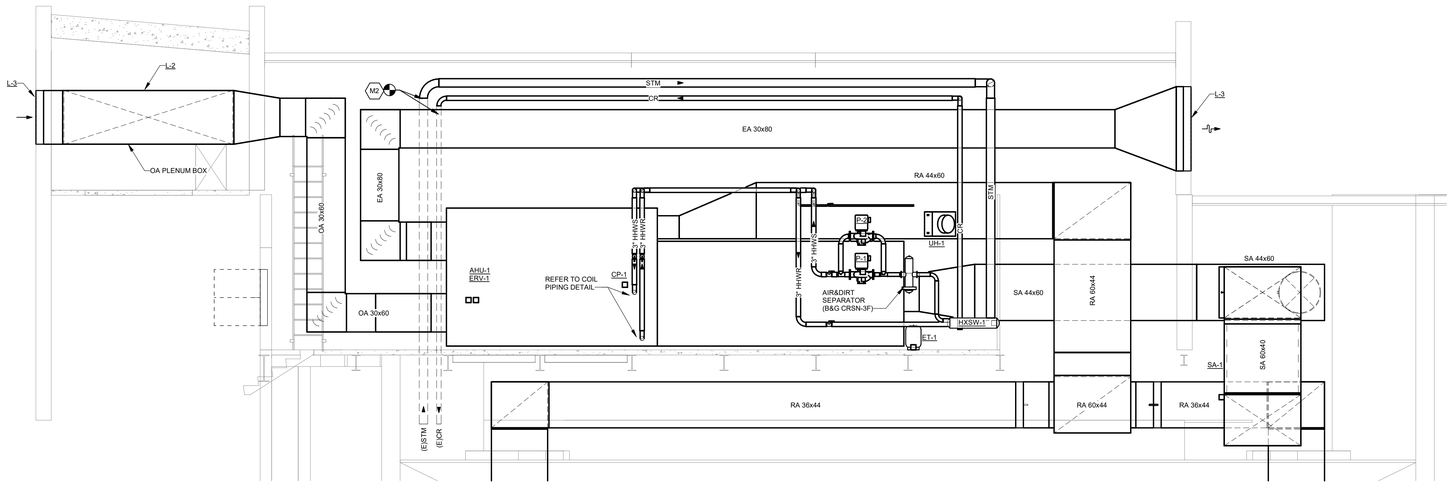
HVAC GENERAL NOTES

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. THE CONTRACTOR SHALL REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATION OF GRILLES, REGISTERS, AND DIFFUSERS.
8. COORDINATE AND PROVIDE ACCESS DOORS IN HARD CEILING AREAS FOR ACCESS TO BALANCING DAMPERS, ETC. REFER TO ARCHITECTURAL DRAWINGS FOR CEILING TYPES.
9. BRANCH DUCTWORK TO GRILLES, REGISTERS AND DIFFUSERS SHALL BE THE SAME SIZE AS THE GRILLE, REGISTER OR DIFFUSER NECK SIZE WHERE NO DUCT SIZE IS INDICATED ON PLAN.
10. MAXIMUM LENGTH OF FLEXIBLE DUCT SHALL BE 5'-0".
11. FOR EQUIPMENT VALVING, COMPONENT, AND PIPING ARRANGEMENT, REFER TO PIPING DIAGRAMS AND DETAILS.
12. PAINT ALL VISIBLE INTERIOR SURFACES OF EXHAUST/RETURN GRILLES, REGISTERS AND VISIBLE ASSOCIATED DUCTWORK FLAT BLACK.
13. WHERE CEILING OR UNDERFLOOR SPACE IS USED AS A RETURN AIR PLENUM NO PLASTIC MATERIALS INCLUDING PVC PIPING, CONDUIT, WIRING, ETC. SHALL BE USED. ALL MATERIAL INTHE PLENUM SPACE IS TO BE PLENUM RATED.
14. 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.
15. PAINT ALL EXPOSED DUCTWORK IN AUDITORIUM AND STAGE AREA TO MATCH ARCHITECTURAL COLORS. COORDINATE WITH ARCHITECT AS REQUIRED.
16. CONNECTION TO EQUIPMENT SHALL BE VERIFIED WITH MANUFACTURER'S CERTIFIED DRAWINGS. TRANSITIONS TO ALL EQUIPMENT SHALL BE VERIFIED AND PROVIDED FOR EQUIPMENT FURNISHED.
17. 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.

MECHANICAL ENLARGED KEYNOTES

M1 CAPPED AND ABANDONED SA DUCT ABOVE AUDITORIUM CEILING.

M2 EXTEND EXISTING STEAM AND CONDENSATE PIPING TO NEW HEAT EXCHANGER HXSW-1 AS INDICATED. FIELD VERIFY PIPE SIZES AND MATCH EXISTING STEAM AND CONDENSATE PIPE SIZES. FIELD VERIFY EXACT PIPE ROUTING AND LOCATION PRIOR TO INSTALLATION AND REWORK AS NEEDED. PROVIDE PIPE CURB WHERE PIPE PENETRATES FLOOR. REFER TO PIPE CURB DETAIL.



ENLARGED MECHANICAL EQUIPMENT SECTION

SCALE: 1/4" = 1'-0"

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Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

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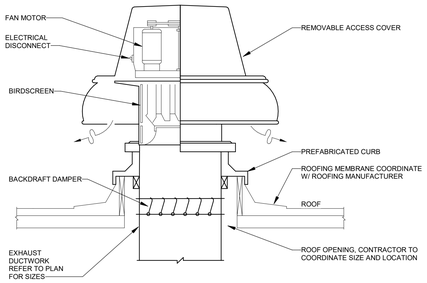
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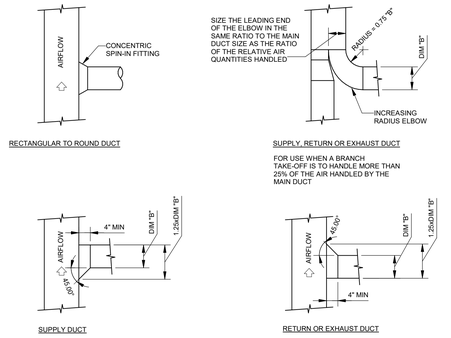
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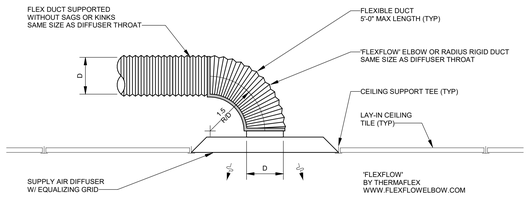
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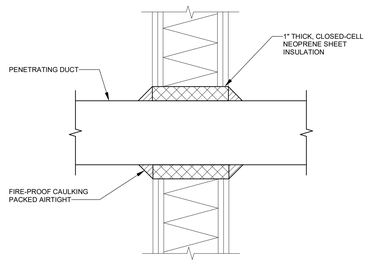
EXHAUST FAN- ROOF MOUNTING DETAIL
NO SCALE



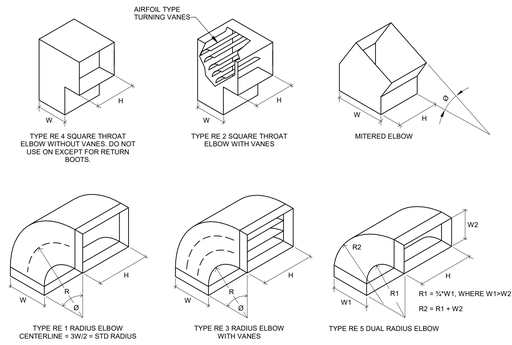
DUCT RECTANGULAR BRANCH TAKE-OFF DETAILS
NO SCALE



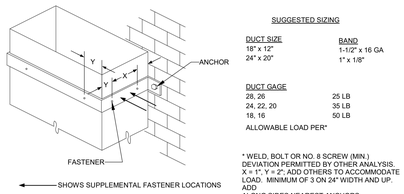
DIFFUSER- SUPPLY AIR DETAIL
NO SCALE



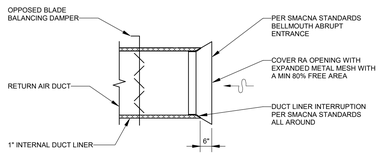
DUCT PENETRATION THRU NOISE CRITICAL PARTITION
NO SCALE



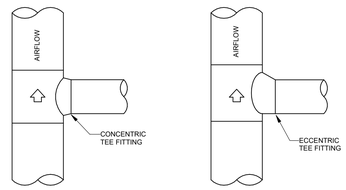
DUCT RECTANGULAR SHEETMETAL ELBOWS
NO SCALE



DUCT SUPPORT- WALL STRAP
NO SCALE



PLENUM RETURN BELLMOUTH W DAMPER
NO SCALE



FLAT OVAL DUCT BRANCH TAKE-OFF SIMILAR

DUCT ROUND BRANCH TAKE-OFF DETAILS
NO SCALE

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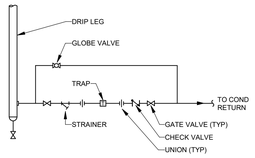
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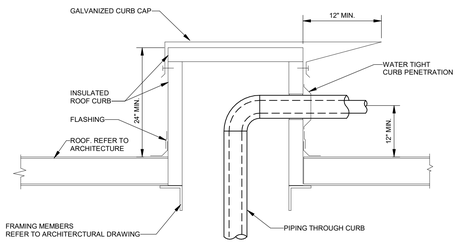
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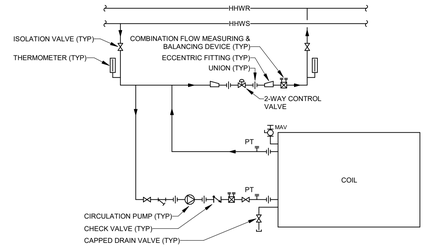
NOTES:

1. FOR HEATING COILS AND END OF MAIN DRIPS, PROVIDE FLOAT & THERMOSTATIC TRAPS SIZED AT TWICE THE CONDENSATE LOAD.
2. FOR VALVES AND FITTINGS, SEE PIPING STANDARD IN SPECIFICATION.
3. FOR HUMIDIFIERS, PROVIDE INVERTED BUCKET TRAPS IN ACCORDANCE WITH HUMIDIFIER MANUFACTURER'S INSTRUCTIONS.

STEAM - CONDENSATE DRIP-TRAP DETAIL
NO SCALE

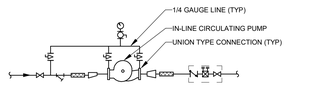


PIPE CURB HORIZONTAL PENETRATION DETAIL
NO SCALE



NOTES:
1. COIL SHALL BE PROVIDED WITH DRAIN AND VENT CONNECTIONS.
2. INSTALL PIPING WITH OFFSET TO ALLOW COIL REMOVAL.
3. PUMP SHALL BE SUPPORTED INDEPENDENTLY FROM PIPING.

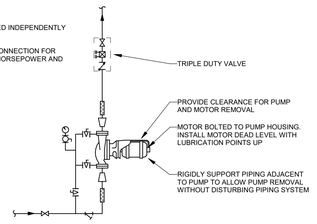
HEATING AHU COIL W/ CIRC. PUMP PIPING DIAGRAM (2-WAY VALVE)
NO SCALE



HORIZONTAL INSTALLATION

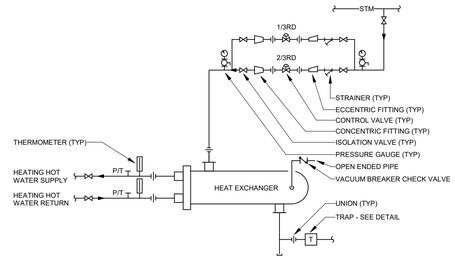
NOTES:

1. PUMP SHALL BE SUPPORTED INDEPENDENTLY FROM PIPING.
2. PROVIDE WITH FLEXIBLE CONNECTION FOR PUMPS WITH MOTORS 1/2 HORSEPOWER AND GREATER.

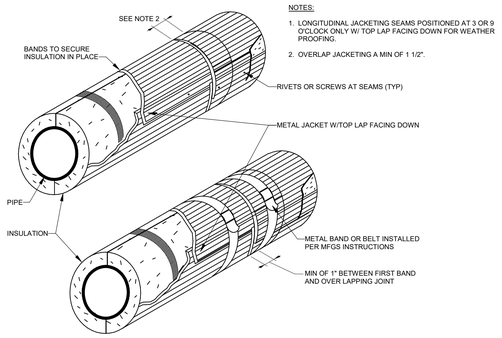


UP FLOW VERTICAL INSTALLATION

INLINE PUMP PIPING DIAGRAM
NO SCALE



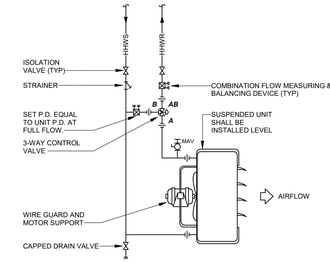
STEAM SHELL AND TUBE HEAT EXCHANGER DETAIL
NO SCALE



NOTES:

1. LONGITUDINAL JACKETING SEAMS POSITIONED AT 3 OR 9 O'CLOCK ONLY W/ TOP LAP FACING DOWN FOR WEATHER PROOFING.
2. OVERLAP JACKETING A MIN OF 1 1/2".

FIELD APPLIED METAL JACKETING OVER PIPE INSULATION
NO SCALE



NOTES:

1. IF COIL HAS VENT AND/OR DRAIN CONNECTIONS THEY ARE TO BE USED IN LIEU OF INSTALLING IN PIPING AS INDICATED.
2. CONTRACTOR SHALL VERIFY AND COORDINATE PIPING CONNECTION LOCATIONS WITH FINAL APPROVED MANUFACTURER SUBMITTAL.
3. CONNECT BRANCH PIPING AT BOTTOM OF MAINS.
4. PROVIDE 90° "SWING ARM" CONNECTION TO MAIN TO ALLOW FOR PIPING EXPANSION AND CONTRACTION.

UNIT HEATER - HOT WATER PIPING DIAGRAM (3 WAY VALVE)
NO SCALE

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AIR HANDLING UNIT SCHEDULE - (SPLIT DX - HHW)

			SUPPLY FAN						EXHAUST FAN						DX COOLING COIL							HEATING COIL							FILTERS		ELECTRICAL					DISCONNECT			STARTER					
																	AIR						AIR			WATER																	
UNIT ID	TOTAL SUPPLY (CFM)	MINIMUM OA (CFM)	FAN QUANTITY	ESP (IN WG)	FAN TYPE	DRIVE TYPE	BLOWER (HP) (EACH)	BHP (EACH)	FAN QUANTITY	ESP (IN WG)	FAN TYPE	DRIVE TYPE	BLOWER (HP) (EACH)	BHP (EACH)	TOTAL CAPACITY (MBH)	SENSIBLE CAPACITY (MBH)	EDB (°F)	EWB (°F)	LDB (°F)	LWB (°F)	APD (IN WG)	REFRIGERANT TYPE	MIN. TOTAL CAPACITY (MBH)	EAT (°F)	LAT (°F)	APD (IN WG)	FLOW (GPM)	EWT (°F)	LWT (°F)	MAX. WPD (FT HD)	PRE FILTER	FINAL FILTER	MOCP	MCA	FLA	VOLTS	PHASE	FURN. BY	INST. BY	TYPE	TYPE	FURN. BY	INST. BY	UNIT WEIGHT (LBS)	MANUFACTURER / MODEL NO.	REMARKS
AHU-1	21400	8870	6	2.00	ECM	DIRECT	6	5.6	4	1.50	ECM	DIRECT	6	5.6	963	593	80	68.2	55	54	0.50	R-454B	2274	38	88	0.24	115	160	120	6.00	MERV 8	MERV 13	70	66	64	460	3	MFR	MFR	VFD	VFD	MFR	MFR	12,675	ADAPTIVAIR	-

NOTES:
1. DUCT SMOKE DETECTORS ON UNIT SUPPLY AND RETURN FOR AIRFLOW OVER 1900 CFM. DETECTORS SHALL BE BY DIVISION 28. TCC SHALL WIRE FROM DETECTOR TO UNIT SHUTOFF.
2. TEMPERATURE CONTROLS BY MFR WITH BACNET INTERFERENCE TO BE FULLY INTEGRATED INTO EXISTING BMS. REFER TO CONTROLS DIAGRAM AND SOO.
3. ALL FANS SELECTED FOR RTUS MUST MEET REQUIREMENTS OF ASHRAE STANDARD 90.1-2016, SECTION 6.5.3.1.2. WHEN INDUCTION MOTORS ARE USED THEN THE REQUIREMENT IS TO USE THE NEXT AVAILABLE NEMA NAMEPLATE HORSEPOWER MOTOR, AND WHEN ECM'S ARE USED THE REQUIREMENT IS TO USE THE NEXT AVAILABLE ECM NAMEPLATE HORSEPOWER MOTOR. REFER TO INTERPRETATION IC90.1-2013-11 ADDITIONAL INFORMATION.
4. MOUNT ON 4" HOUSEKEEPING PAD UNLESS OTHERWISE NOTED. COORDINATE WITH STRUCTURAL.
5. MAINTAIN UNIT SERVICE CLEARANCES ON FRONT, BACK, SIDE, AND TOP OF UNIT.
6. COORDINATE FIELD INSTALLATION OF ALL EQUIPMENT SHIPPED LOOSE FROM MANUFACTURER.
7. ANY ITEM IN CONTRACT DOCUMENTS NOT INCLUDED BY MANUFACTURER SHALL BE PROVIDED BY DIVISION 23. VERIFY WITH FINAL APPROVED EQUIPMENT SUBMITTAL.
8. PROVIDE WITH SPRING VIBRATION ISOLATORS.
9. PROVIDE WITH HOT GAS RE-HEAT COIL:
   A. ~510 MBH @ 75°F LAT.
10. FIRST 10 FT OF SA AND RA DUCT FROM AHU SHALL BE PROVIDED WITH 1" ACOUSTICAL LINER.

ENERGY RECOVERY SECTION SCHEDULE

		ENTHALPY WHEEL - SUMMER								ENTHALPY WHEEL - WINTER					
		OUTSIDE AIR				EXHAUST AIR				OUTSIDE AIR		EXHAUST AIR			
UNIT ID	RTU OR AHU UNIT ID	EDB (°F)	EWB (°F)	LDB (°F)	LWB (°F)	EDB (°F)	RH	LDB (°F)	LWB (°F)	EDB (°F)	LDB (°F)	EDB (°F)	RH	LDB (°F)	REMARKS
ERV-1	AHU-1	95	75	80	68	75	60	90	73	-10	49.9	72	30	13.6	

NOTES:
1. WHEEL TYPE ENERGY RECOVERY SECTION IS INTEGRAL TO ASSOCIATED AHU.
2. WHEELS AND MOTORS SHALL BE EC OR PROVIDED WITH VFD. MFR RECOMMENDED DEFROST GUIDELNIES.
3. REFER TO AHU CONTROL DIAGRAMS FOR SOO.

OUTSIDE AIR VENTILATION SCHEDULE

UNIT ID	AREA SERVED	ASSOCIATED EQUIPMENT	CEILING HEIGHT (FT)	FLOOR AREA (FT^2)	OCCUPANCY CLASSIFICATION	2021 MMC			VENTILATION					
						PEOPLE RATE (CFM/PP)	AREA RATE (CFM/FT^2)	DENSITY #/ 1000 SF	DEFAULT PEOPLE	ACTUAL PEOPLE	PEOPLE OA (CFM)	AREA OA (CFM)	AIR DISTR. EFFECTIVENESS	MINIMUM EA REQUIRED (CFM)	MINIMUM OA REQUIRED (CFM)
102	STAGE	AHU-1	62.5	2768	STAGE	10	0.06	70	194	80	800	166	0.80	-	1,210
101	AUDITORIUM	AHU-1	16	6997	AUDITORIUM	5	0.06	150	1,050	800	4,000	420	0.80	-	5,525
201 & 301	BALCONY	AHU-1	13.5	4490	AUDITORIUM	5	0.06	150	674	100	500	269	0.80	-	965
100	FOYER	AHU-1	16	1526	LOBBIES (THEATRERS)	5	0.06	150	229	150	750	92	0.80	-	1,055
200	BALCONY FOYER	AHU-1	13.5	1454	CORRIDORS	0	0.06	0	0	0	0	87	0.80	-	110
300	PROJECTION ROOM	CU-3 / FCU-1	8.5	189	OFFICE SPACE	5	0.06	5	1	3	15	11	0.80	-	35

NOTES:
1. OCCUPANT DENSITIES AND OUTSIDE AIR FLOW RATES BASE ON MICHIGAN MECHANICAL CODE TABLE 403.3.

CONDENSING UNIT SCHEDULE

						FAN		COMPRESSOR		ELECTRICAL				DISCONNECT					
UNIT ID	UNIT SERVED	NOMINAL TONNAGE	MINIMUM EER	DESIGN AMBIENT (°F)	NO. OF FANS	RPM	HP (EACH)	NO.	TYPE	MOCP	MCA	FLA	VOLTS	PHASE	FURN. BY	INST. BY	TYPE	UNIT WEIGHT (LBS)	MANUFACTURER / MODEL NO.	REMARKS
CU-1	AHU-1	67	11.5	95	4	1140	1.5	4	SCROLL	150	122	114	460	3	MFR	MFR	SWITCH	2700	AAON / CFA-080-D-A-3	-

NOTES:
1. PERFORMANCE BASED ON R-454B REFRIGERANT.
2. PROVIDE WITH SPRING VIBRATION ISOLATORS.
3. ROOF CURB TO BE TAPERED TO ACCOUNT FOR ROOF SLOPE. COORDINATE WITH STRUCTURAL.
4. INSTALL REFRIGERANT PIPING PER MFR'S REQUIREMENTS AND RECOMMENDATIONS. CONTRACTOR/MFR TO VERIFY MAX REFRIGERANT RUN LENGTH PRIOR TO ORDERING.
5. INSULATE ALL REFRIGERANT PIPING. PIPING INSULATION ON ROOF SHALL BE UV RESISTANT. PRE-INSULATED LINESETS WILL NOT BE ACCEPTED.
6. PERFORMANCE BASED ON R454B REFRIGERANT.
7. PROVIDE WEATHER TIGHT CURB WITH CAP FOR PIPE PENETRATION. REFER TO DETAILS.

EXHAUST FAN SCHEDULE

						MOTOR				ELECTRICAL		DISCONNECT						
UNIT ID	SERVING	TYPE	AIRFLOW (CFM)	ESP (IN WG)	FAN (RPM)	BHP	HP	RPM	DRIVE TYPE	VOLTS	PHASE	FURN. BY	INST. BY	TYPE	CURB HEIGHT (IN)	UNIT WEIGHT (LBS)	MANUFACTURER / MODEL NO.	REMARKS
EF-1	PROJECTION ROOM	DOWNBLAST	150	0.25	1273	0.01	1/15	1273	DIRECT	115	1	MFR	MFR	SWITCH	18"	36	GREENHECK / G-070-VG	-

NOTES:
1. PROVIDE WITH GRAVITY BACKDRAFT DAMPER.

GRILLE, REGISTER AND DIFFUSER SCHEDULE

		AIRFLOW (CFM)			NECK SIZE (IN)	MAX AIR PD (IN-WG)	MAX NC	THROW PATTERN	THROW (FT) [50 FPM - 100 FPM - 150 FPM]	MOUNTING	BORDER	MATERIAL	FINISH	ACCESSORY	MANUFACTURER / MODEL NO.	REMARKS
UNIT ID	TYPE	MIN FLOW	MAX FLOW	FACE SIZE (IN)												
E1-1	PERFORATED FACE	0	100	12x12	6ø	0.05	20	-	-	LAY IN CEILING	TYPE 3	STEEL	WHITE	-	PRICE / PDDR	-
R1-1	LOUVERED GRILLE	0	750	NECK+1 3/4	24x12	0.10	20	0° DEFLECTION	-	SIDEWALL	F	STEEL	NOTE 2	-	PRICE / 530/L	-
R1-3	LOUVERED GRILLE	0	450	NECK+1 3/4	18x8	0.10	20	0° DEFLECTION	-	SIDEWALL	F	STEEL	NOTE 2	-	PRICE / 530/L	-
R1-4	LOUVERED GRILLE	0	130	NECK+1 3/4	8x6	0.10	20	45° DEFLECTION	-	SIDEWALL	F	STEEL	NOTE 2	-	PRICE / 530/L	-
S1-1	LOUVERED GRILLE	0	400	NECK+1 3/4	18x6	0.10	20	22° DOUBLE DEFLECTION	14-20-28	SIDEWALL	F	STEEL	NOTE 2	OPPOSED BLADE DAMPER	PRICE / 520/L	-
S2-1	LOUVERED GRILLE	0	1000	NECK+1 3/4	32x10	0.10	20	22° DOUBLE DEFLECTION	12-17-35	SIDEWALL	F	STEEL	NOTE 2	-	PRICE / SDG	-

NOTES:
1. REFER TO ARCHITECTURAL CEILING PLAN AND COORDINATE FRAME TYPE ACCORDINGLY.
2. COORDINATE GRD CUSTOM COLORS AND FINISHES WITH ARCHITECT PRIOR TO ORDERING.

MINI-SPLIT INDOOR UNIT SCHEDULE

							DIMENSIONS			ELECTRICAL					DISCONNECT					
UNIT ID	UNIT TYPE	ASSOCIATED OUTDOOR UNIT ID	AREA SERVED	SUPPLY (WET COIL) (CFM)	TOTAL CAPACITY (MBH)	SENSIBLE CAPACITY (MBH)	LENGTH (IN)	WIDTH (IN)	HEIGHT (IN)	MOCP	MCA	FLA	VOLTS	PHASE	FURN. BY	INST. BY	TYPE	MANUFACTURER / MODEL NO.	REMARKS
FCU-1	WAL-MOUNTED	CU-2	PROJECTION ROOM	705	24	24	46"	12"	14"	-	-	-	115	1	MFG	MFG	NON-FUSED	MITSUBISHI / PKA-AK24NL	-

NOTES:
1. INDOOR UNIT POWERED BY OUTDOOR UNIT SEE SCHEDULE FOR ELECTRICAL REQUIREMENTS.
2. PERFORMANCE BASED ON R-454B REFRIGERANT.
3. PROVIDE WITH REMOTE THERMOSTAT.
4. PROVIDE WITH UNIT POWERED, SHIPPED LOOSE CONDENSATE PUMP. PUMP CONDENSATE DRAIN UP THROUGH ROOF AND DISCHARGE ABOVE ROOF.
5. PROVIDE DRAIN PAN WITH OVERFLOW SWITCH.
6. UNIT TO OPERATE FROM PACKAGED CONTROLS.

MINI-SPLIT OUTDOOR UNIT SCHEDULE

		COOLING				HEATING		FAN		COMPRESSOR		ELECTRICAL					DISCONNECT					
UNIT ID	ASSOCIATED INDOOR UNIT ID	NOMINAL TONNAGE	MINIMUM SEER	DESIGN AMBIENT (°F)	NO. OF FANS	CAPACITY (MBH)	DESIGN AMBIENT (°F)	CFM	HP	NO.	TYPE	MOCP	MCA	FLA	VOLTS	PHASE	FURN. BY	INST. BY	TYPE	UNIT WEIGHT (LBS)	MANUFACTURER / MODEL NO.	REMARKS
CU-2	FCU-1	2	22.6	95	1	-	0	1940	1/10	1	TWIN ROTARY	37	22	25	208	1	MFG	MFG	-	155	MITSUBISHI / PUZ-AH24NL	-

NOTES:
1. INSTALL REFRIGERANT PIPING PER MFR'S REQUIREMENTS AND RECOMMENDATIONS. CONTRACTOR/MFR TO VERIFY MAX REFRIGERANT RUN LENGTH PRIOR TO ORDERING.
2. INSULATE ALL REFRIGERANT PIPING. PIPING INSULATION ON ROOF SHALL BE UV RESISTANT. PRE-INSULATED LINESETS WILL NOT BE ACCEPTED.
3. PERFORMANCE BASED ON R454B REFRIGERANT.
4. PROVIDE WEATHER TIGHT CURB WITH CAP FOR PIPE PENETRATION. REFER TO DETAILS.
5. INSTALL UNIT OF 18" ROOF STANDS. COORDINATE WITH STRUCTURAL AS REQUIRED.
6. PROVIDE WITH LOW AMBIENT KIT.
7. SINGLE POINT POWER THROUGH OUTDOOR UNIT.

LOUVER SCHEDULE

UNIT ID	SERVICE	FACE SIZE (IN)	ACTIVE SECTION (IN)	AIRFLOW (CFM)	FREE AREA (SQFT)	FREE AREA VELOCITY (FPM)	MAX PRESSURE DROP (IN WG)	MATERIAL	MANUFACTURER / MODEL NO.	REMARKS
L-1	AHU-1 OA	120x42	119.75x41.75	10,000	20	500	0.05	ALUMINUM	GREENHECK / ESD-635-120x42	INTAKE
L-2	AHU-1 OA	132x42	131.75x41.75	11,400	21.6	527	0.05	ALUMINUM	GREENHECK / ESD-635-132x42	INTAKE
L-3	AHU--1 EA	156x66	155.75x65.75	21,400	43.6	491	0.05	ALUMINUM	GREENHECK / ESD-635-156x66	EXHAUST

NOTES:
1. PROVIDE WITH BIRD SCREENS.
2. BEGINNING POINT OF WATER PENETRATIONS SHALL BE 1,000 FPM MIN.
3. COORDINATE LOUVER COLORS AND FINISHES WITH ARCHITECT.
4. COORDINATE LOUVER OPENINGS WITH STRUCTURAL AND ARCHITECTURAL TRADES AS REQUIRED.

SOUND ATTENUATOR SCHEDULE

		MODULES		VEL. @ DIL RATING	MINIMUM REQUIRED RADINS IN dB (HERTZ)							AIRFLOW (CFM)	MAX. PD (IN WG)	MANUFACTURER / MODEL NO.	REMARKS
UNIT ID	SYSTEM	NO.	SIZE (IN) W x H x L		63	125	250	500	1000	2000	4000	8000				
SA-1	AHU-1 SA DUCT	1	60x40x62	984	9	13	17	23	26	27	24	21	16400	0.23	PRICE / ERM62/XD	ELBOW ATTENUATOR
SA-2	AHU-1 SA DUCT	1	32x84	895	9	14	26	52	54	51	30	19	5000	0.16	PRICE / CS	CIRCULAR ATTENUATOR

NOTES:
1. CONTRACTOR TO VERIFY DIMENSIONS AGAINST SHOP DRAWINGS PRIOR TO ORDERING.
2. LENGTH SHOWN FOR ELBOW ATTENUATORS IS CENTER LINE LENGTH.
3. PRESSURE DROP ASSUMES IDEAL INLET AND OUTLET CONDITIONS.

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J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT
102 McPherson Ave, Lansing, MI 48915

STATE OF MICHIGAN
STEVEN R. DIBERARDINE
ENGINEER
No. 6201041574
REGISTERED PROFESSIONAL ENGINEER
11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

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SHEET TITLE
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PUMP SCHEDULE

UNIT ID	SYSTEM SERVED	TYPE	FLOW (GPM)	HEAD (FT)	MIN % EFF	ELECTRICAL				DISCONNECT			STARTER			MANUFACTURER / MODEL NO.	REMARKS
						BHP	HP	VOLTS	PHASE	FURN. BY	INST. BY	TYPE	TYPE	FURN. BY	INST. BY		
CP-1	AHU-1	INLINE	115	25	67	1.07	1.5	208	1	ELEC	ELEC	HOA	HOA	ELEC	ELEC	BELL & GOSSETT / E-90	-
P-1	HHW	INLINE	116	40	65	1.8	3	208	3	MFR	ELEC	VFD	VFD	MFR	MFR	BELL & GOSSETT / E-90	-
P-2	HHW	INLINE	116	40	65	1.8	3	208	3	MFR	ELEC	VFD	VFD	MFR	ELEC	BELL & GOSSETT / E-90	-

NOTES:
1. PERFORMANCE IS BASED ON WATER UNLESS NOTED OTHERWISE.
2. PUMPS SHALL BE NON-OVERLOADING.
3. WHEN VFD CONTROL IS SPECIFIED, PROVIDE WITH NEMA PREMIUM EFFICIENT MOTOR WITH AEGIS SHAFT GROUNDING RINGS.

STEAM TO WATER HEAT EXCHANGER SCHEDULE

UNIT ID	SYSTEM SERVED	TYPE	CAPACITY (MBH)	STEAM		WATER				MANUFACTURER / MODEL NO.	REMARKS
				INLET PRESSURE (PSIG)	FLOW (LBS/HR)	FLOW (GPM)	EWT (°F)	LWT (°F)	WPD (FT HD)		
HXSW-1	HEATING HOT WATER	SHELL & TUBE	2285	10.00	2387	116	120	160	6.00	BELL & GOSSETT / QSU-103-4	-

NOTES:

1. PERFORMANCE IS BASED ON WATER UNLESS NOTED OTHERWISE.
2. INSTALL HEAT EXCHANGER PER MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS. MAINTAIN EQUIPMENT CLEARANCES REQUIRED TO PERMIT REMOVAL OF TUBE BUNDLES WITH MINIMUM DISTURBANCE TO INSTALLED EQUIPMENT AND PIPING.
3. SUPPORT HEAT EXCHANGER FROM STRUCTURE. COORDINATE WITH STRUCTURAL TRADES AS REQUIRED.
4. PIPE RELIEF VALVE AND DRAIN VALVE TO NEAREST FD.
5. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.

EXPANSION TANK SCHEDULE

UNIT ID	SYSTEM SERVED	TYPE	MIN PSIG	MAX PSIG	MIN (°F)	MAX (°F)	SYSTEM VOLUME (GAL)	TANK VOLUME (GAL)	DIA (IN)	HEIGHT (IN)	MANUFACTURER / MODEL NO.	REMARKS
ET-1	HXSW-1	DIAPHRAGM	10.00	30.00	40	160	60	8	12"	19"	B&G / D15	

NOTES:
1. PERFORMANCE IS BASED ON WATER UNLESS NOTED OTHERWISE.

HOT WATER UNIT HEATER SCHEDULE

UNIT ID	CAPACITY (MBH)	AIRFLOW (CFM)	LAT @ 60° EAT (°F)	WATER				ELECTRICAL			MANUFACTURER / MODEL NO.	REMARKS
				FLOW (GPM)	EWT (°F)	LWT (°F)	WPD (FT HD)	HP	VOLTS	PHASE		
UH-1	30	1040	86	2	160	120	0.10	1/10	120	1	ZEHNDER RITTLING / RH-86	

NOTES:
1. MANUFACTURER TO PROVIDE WITH FACTORY MOUNTED STARTER AND DISCONNECT.
2. PROVIDE WITH REMOTE THERMOSTAT.

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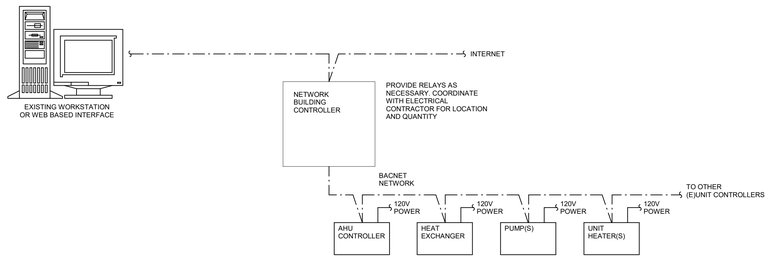
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	SENSOR PROBE
	DISCONNECT SWITCH
	AVERAGING SENSOR
	DISPERSION TUBE
	PARALLEL BLADE DAMPER
	OPPOSED BLADE DAMPER
	BACKFLOW DAMPER
FM	FLOW MEASURING STATION
DPS	BUILDING PRESSURE SENSOR
C / C	CHILLED WATER COIL
D / X	DX COIL
	ELECTRIC HEATING ELEMENT
H / X	GAS HEATING COIL
H / C	HEATING HOT WATER COIL
	ENERGY RECOVERY WHEEL
	FAN
	PLENUM FAN
	PROP FAN

AI	ANALOG INPUT
AO	ANALOG OUTPUT
DI	DIGITAL INPUT
DO	DIGITAL OUTPUT
VP	VIRTUAL POINT
CO_2	CARBON DIOXIDE STAT
H	HUMIDISTAT
T	THERMOSTAT
CO_2	CARBON DIOXIDE SENSOR
CO	CARBON MONOXIDE SENSOR
H	HUMIDTY SENSOR
NOx	NOX SENSOR
OS	OCCUPANCY SENSOR
T	TEMPERATURE SENSOR
ECM	ELECTRONIC COMMUTATED MOTOR
MS	MOTOR STARTER
SS	START STOP
VFD	VARIABLE VREQUENCY DRIVE
BI	BIPOLAR IONIZATION
C	CURRENT SENSOR
CFM	CFM SENSOR
CM	CONTROL MODULE
CS	CURRENT SWITCH
CT	CURRENT TRANSDUCER
DPS	DIFFERENTIAL PRESSURE SENSOR
DPT	DIFFERENTIAL PRESSURE TRANSMITTER
DS	DOOR SWITCH
ES	END SWITCH
F	FLOW SWITCH
FM	FLOW METER
LL	LOW LIMIT / FREEZE STAT
LS	LIMIT SWITCH
M	DAMPER MOTOR
PS	PRESSURE SWITCH
R	CONTROL RELAY
SD	SMOKE DETECTOR
SP	STATIC PRESSURE
TD	TIME DELAY RELAY

	PUMP
	FILTER
DPT	SINGLE FILTER WITH DIFFERENTIAL PRESSURE TRANSMITTER
DPT	DOUBLE FILTER WITH DIFFERENTIAL PRESSURE TRANSMITTER

Controls Symbols Legend
NO SCALE

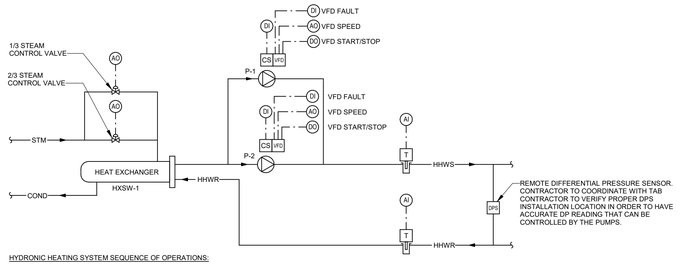


GENERAL CONTROLS INTENT:

GENERAL INTENT:
1. INTEGRATE NEW AND EXISTING COMPONENTS INTO EXISTING BMS. UPDATE GRAPHICS AND SEQUENCES ACCORDINGLY TO REFLECT NEW EQUIPMENT.

BUILDING AUTOMATION SYSTEM NOTES:
1. CONFIGURATION AND ORDER OF CONTROLLER CONNECTION IS FOR REPRESENTATION PURPOSES ONLY. TCC CONTROL SYSTEM DRAWINGS SHALL REFLECT ACTUAL AS-BUILT CONDITIONS, INCLUDING ORDER IN WHICH CONTROLLERS ARE CONNECTED WITHIN THE NETWORK. DDC PANELS SHALL BE LOCATED IN MECHANICAL, STORAGE, OR CUSTODIAL SPACES WITH 120V CONTROL POWER AT EACH. WHERE DDC PANELS AND/OR POWER SUPPLIES ARE REQUIRED, IT IS THE TCC RESPONSIBILITY TO PROVIDE POWER TO THOSE PANELS AND COORDINATE WITH THE ELECTRICAL ENGINEER/CONTRACTOR. IT SHOULD BE NOTED THAT ADDITIONAL ELEMENTS SUCH AS GENERAL VALVES, OTHER NON-ACTIVELY CONTROLLED DEVICES, AND/OR OTHER NETWORK COMMUNICATION DEVICES (SUCH AS SWITCHES,GATEWAYS, ROUTERS, SERVERS, ETC.) MAY NOT BE SHOWN ON CONTROLS DRAWINGS. REFER TO THE DETAILS, PROJECT PLANS, AND SPECIFICATIONS FOR ADDITIONAL DEVICES AND INSTRUCTIONS THAT ARE REQUIRED IN THE CONSTRUCTION OF THESE SYSTEMS.
2. ALL CONTROL POINTS SHALL BE TRENDABLE. AFTER THE SYSTEM IS BALANCED, COMMISSIONED, AND OPERATIONAL, TRENDING WILL BE REQUIRED TO VERIFY THE ACCURACY AND ACCEPTABILITY OF THE CONTROL SEQUENCES. PROVIDE ADDITIONAL ADJUSTMENTS AND/OR CHANGES IN STRATEGY IN ORDER TO HONE BUILDING OPERATION AND OPTIMIZE ENERGY USAGE. ALL SET POINTS SHALL BE OPERATOR ADJUSTABLE THROUGH THE BMS AT THE OPERATOR'S WORKSTATION (OWS).
3. PROVIDE PROGRAMMING FOR ADDITIONAL ALARMS AS REQUESTED BY THE OWNER AND/OR ENGINEER.
4. SEE FLOOR PLANS, SPECIFICATIONS, AND SHOP DRAWINGS FOR MINIMUM CLEARANCE OF ALL MECHANICAL EQUIPMENT AND CONTROL DEVICES. MAINTAIN ACCEPTABLE CLEARANCE IN ALL AREAS REQUIRED FOR SERVICE AND ACCESS OF MECHANICAL EQUIPMENT AS PER ANY APPLICABLE CODES AND/OR MANUFACTURER RECOMMENDATIONS. MAINTAIN CODE-REQUIRED MINIMUM CLEARANCES ABOVE AND IN FRONT OF ALL ELECTRICAL PANELS, INCLUDING THOSE INCLUDED AS A PART OF MECHANICAL EQUIPMENT.
5. ALL POINTS SHALL BE INCLUDED ON GRAPHICS THROUGH BMS AT OWS.
6. FOR EQUIPMENT PROVIDED WITH BACNET OR MODBUS CONTROLLERS/COMMUNICATION INTERFACES, PROVIDE SUB-GRAPHICS THROUGH THE BMS AT THE OWS. THE GRAPHIC SHALL DISPLAY ALL POINTS LISTED IN INDIVIDUAL CONTROL DIAGRAMS. PROVIDE ADDITIONAL READ/WRITE POINTS UPON REQUEST BY THE OWNER FOR SUCH EQUIPMENT.
7. PROVIDE ALL DEVICES SHOWN IN THE DIAGRAMS NOT PROVIDED BY THE UNIT MANUFACTURER AS REQUIRED TO PROVIDE THE DESIRED SEQUENCE OF OPERATION. REFER TO INDIVIDUAL CONTROL DIAGRAMS.
8. UNLESS OTHERWISE NOTED, ROOM THERMOSTATS, CO2 SENSORS AND/OR HUMIDISTATS SHALL HAVE SET-POINT ADJUSTMENT CAPABILITY AND TEMPERATURE/HUMIDITY DISPLAY.

DDC SYSTEM ARCHITECTURE
NO SCALE



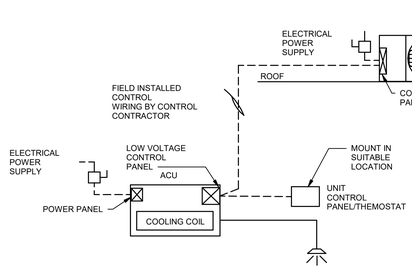
HYDRONIC HEATING SYSTEM SEQUENCE OF OPERATIONS:

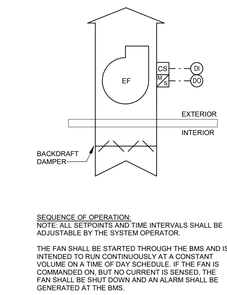
NOTE: ALL SETPOINTS AND TIME INTERVALS SHALL BE ADJUSTABLE BY THE SYSTEM OPERATOR.

1. ONE OF THE TWO PUMPS SHALL BE DESIGNATED "LEAD PUMP" AND THE OTHER PUMPS SHALL SERVE AS THE STANDBY PUMP. WHEN THE HYDRONIC HEATING SYSTEM IS ENABLED, THE BMS SHALL ENERGIZE THE LEAD PUMP.
2. THE CONTROLLER SHALL MODULATE PUMP SPEED TO MAINTAIN HEATING GOT WATER DIFFERENTIAL PRESSURE AS SET BY THE TAB CONTRACTOR. THE VFDs MINIMUM SPEED SHALL NOT DROP BELOW 20% (ADJ)
3. THE BMS SHALL ALTERNATE PUMP OPERATION BASED ON RUN TIME HOURS OR AT THE BEGINNING OF EACH WEEK.
4. EACH PUMP WILL PROVE OPERATION TO THE BMS WITH ITS CURRENT SWITCH. IF A PUMP FAILS, AN ALARM WILL BE SENT TO THE BMS AND THE STANDBY PUMP WILL BE ACTIVATED.
5. ON CALL FOR HEATING, THE 1/3 CONTROL VALVE SHALL BE MODULATED TO MAINTAIN THE LEAVING WATER TEMPERATURE, AS REQUIRED. WHEN THE 1/3 CONTROL VALVE IS AT THE MAXIMUM OPEN POSITION, FOR 10 MINUTES, IT SHALL CLOSE AND THE 2/3 CONTROL VALVE SHALL MODULATE TO MAINTAIN THE LEAVING WATER TEMPERATURE. WHEN THE 2/3 CONTROL VALVE IS AT ITS MAXIMUM OPEN POSITION FOR 10 MINUTES, THE 1/3 CONTROL VALVE SHALL MODULATE TO MAINTAIN THE LEAVING WATER TEMPERATURE. AS THE DEMAND FOR HEATING DECREASES, THE REVERSE SHALL HAPPEN.
6. DISCHARGE WATER TEMPERATURE SET POINT SHALL BE RESET BASED ON OUTSIDE AIR TEMPERATURE. REFER TO SCHEDULE.
7. IF THE PUMPS ARE DE-ENERGIZED, THE CORRESPONDING CONTROL VALVES SHALL REMAIN CLOSED.

HEATING HOT WATER SUPPLY RESET SCHEDULE	
OUTSIDE AIR TEMPERATURE	LEAVING WATER TEMPERATURE
>60°F	120°F
45°F - 60°F	130°F
30°F - 45°F	140°F
15°F - 30°F	150°F
<15°F	160°F

HYDRONIC HEATING SYSTEM CONTROL DIAGRAM
NO SCALE

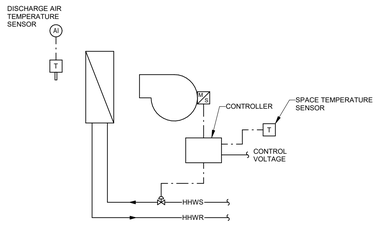




SEQUENCE OF OPERATION:
NOTE: ALL SETPOINTS AND TIME INTERVALS SHALL BE ADJUSTABLE BY THE SYSTEM OPERATOR.

THE FAN SHALL BE STARTED THROUGH THE BMS AND IS INTENDED TO RUN CONTINUOUSLY AT A CONSTANT VOLUME ON A TIME OF DAY SCHEDULE. IF THE FAN IS COMMANDED ON, BUT NO CURRENT IS SENSED, THE FAN SHALL BE SHUT DOWN AND AN ALARM SHALL BE GENERATED AT THE BMS.

ROOF MOUNTED EXHAUST FAN
NO SCALE



CONTROL:

1. UNLESS NOTED OTHERWISE, PROVIDE DDC CONTROLLER FOR UNIT HEATERS.
2. UPON A CALL FOR HEATING, THE CONTROLLER SHALL MODULATE THE CONTROL VALVE AND ENERGIZE FAN TO MAINTAIN TEMPERATURE SET POINT.
3. THE FOLLOWING INFORMATION SHALL BE DISPLAYED AT THE CONTROL SYSTEM FRONT END: U/H STATUS & ZONE TEMPERATURE, FAN START/STOP, FAN STATUS, DISCHARGE AIR TEMPERATURE, CONTROL VALVE POSITION, ZONE TEMPERATURE AND ZONE SETPOINT.

TYPICAL CABINET UNIT HEATER CONTROL DIAGRAM
NO SCALE

SEQUENCE OF OPERATION

THE ACU IS EQUIPPED WITH A DIRECT EXPANSION COOLING COIL. THE ACU & ITS ASSOCIATED CONDENSING UNIT ARE OPERATED BY ITS OWN INTEGRAL CONTROLS TO MAINTAIN SPACE TEMPERATURE SETPOINT.

DX MODE: WHEN THE ACU CALLS FOR COOLING THE CONDENSER FAN IS ENABLED & STAGED THROUGH ITS PACKAGED CONTROLS TO MAINTAIN TEMPERATURE SETPOINT.

THE ROOM AIR CONDITIONING UNIT AND ASSOCIATED OUTDOOR CONDENSING UNIT SHALL OPERATE THROUGH ITS INTERNAL CONTROLS (COOLING, HUMIDIFICATION) TO MAINTAIN TEMPERATURE AND HUMIDITY SETPOINTS (72 DEG. F/30 % RH, ADJUSTABLE).

THESE SETPOINTS SHALL BE USER ADJUSTABLE THROUGH THE BMS.

ACU CONTROL DIAGRAM
NO SCALE

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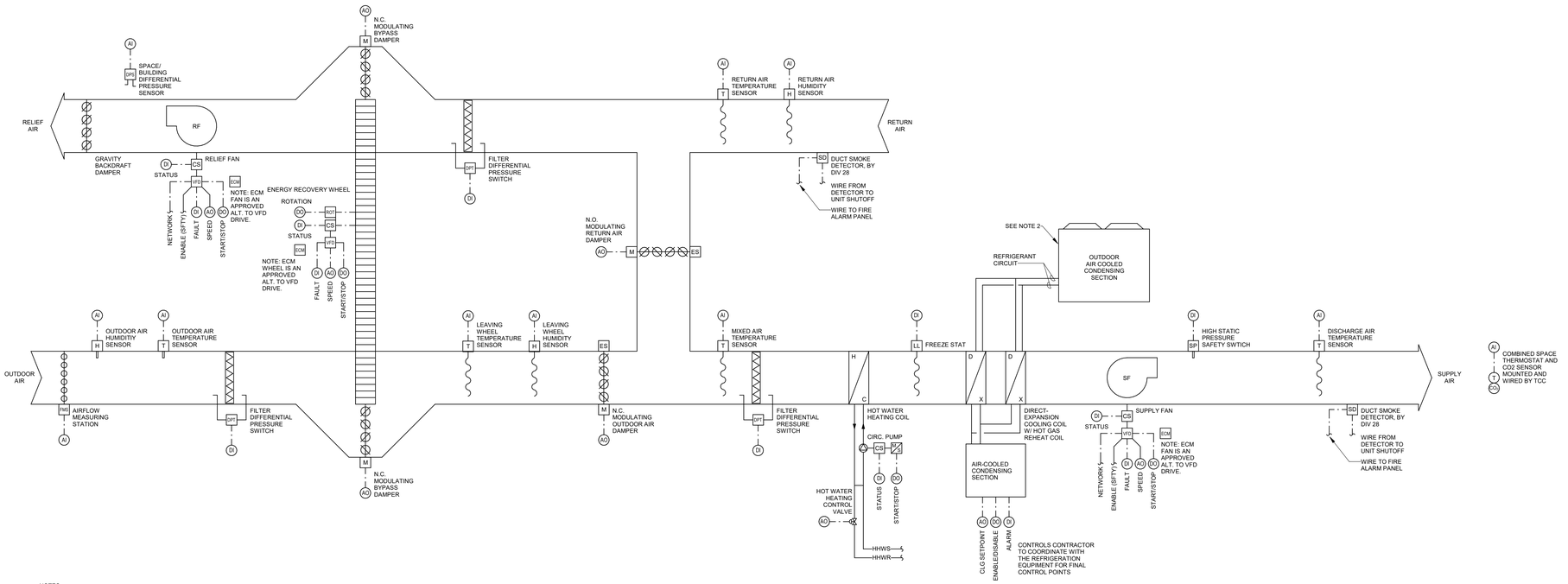
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CONTROL DIAGRAMS

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NOTES:
1. CONTROLS CONTRACTOR TO COORDINATE WITH REFRIGERATION EQUIPMENT FOR FINAL CONTROL POINTS.
2. WIRING BETWEEN INDOOR AND OUTDOOR TO BE PROVIDED BY TEMPERATURE CONTROLS CONTRACTOR.

SEQUENCE OF OPERATIONS:

GENERAL

THE SINGLE-ZONE VAV AIR-HANDLING UNIT SEQUENCES HEREIN DEPICT GENERAL INTENT OF OPERATION AND ARE TO BE PERFORMANCE BASED. FOR COMPLETE PROCEDURAL FUNCTIONALITY, THE UNITS SHALL FOLLOW THE GUIDELINES IN ASHRAE 90.1-2013 CHAPTER 6, AHRAE 62.1-2016, AND ASHRAE GUIDELINE 36 CHAPTERS 5.1-5.4, 5.15, AND 5.18 WITHOUT EXPLICIT STATEMENT. IMPLEMENTATIONS THAT PROVIDE THE SAME FUNCTIONAL RESULTS USING DIFFERENT UNDERLYING DETAILED LOGIC WILL BE ACCEPTABLE.

CONTROLS TO BE SUPPLIED BY THE MANUFACTURER WITH BACNET INTERFACE. MANUFACTURER TO PROVIDE REFRIGERATION MANAGEMENT CONTROLLER/CONTROLS SEQUENCING. TCC TO FULLY INTEGRATE UNIT INTO BMS. COORDINATE REQUIRED POINTS FROM REFRIGERATION CONTROLLER TO AHU CONTROLLER/BMS.

AT MINIMUM, PROVIDE A GRAPHICAL REPRESENTATION OF THE DIAGRAM AND ASSOCIATED POINTS INDICATED ABOVE. ALL ADDITIONAL POINTS NOT STRICTLY REQUIRING GRAPHICAL REPRESENTATION, SHALL STILL BE READ/WRITE ACCESSIBLE AT THE OWS/BAS. ALL SETPOINTS, TIMERS, DEADBANDS, SCHEDULES, ETC. LISTED HEREIN THE SEQUENCE SHALL BE ADJUSTABLE BY THE SYSTEM OPERATOR. VALUES FOR ALL POINTS, INCLUDING HARDWARE POINTS, SHALL BE OVERRIDABLE. EXCEPTIONS CAN BE MADE REGARDING MACHINE OR LIFE SAFETY.

EQUIPMENT MOTORS INTENDED TO BE MODULATED CAN BE PROVIDED WITH EITHER VARIABLE FREQUENCY DRIVES OR ELECTRONIC COMMUTATED MOTOR; SEQUENCE MAY USED INTERCHANGEABLE

THE ROOFTOP UNIT SHALL BE CAPABLE OF OPERATING IN THE FOLLOWING MODES AS DETERMINED BY THE ZONE GROUPS ASSOCIATED WITH THE UNIT: (1) OCCUPIED, (2) COOLDOWN, (3) UNOCCUPIED COOLING, (4) WARMUP, (5) UNOCCUPIED HEATING, AND (6) UNOCCUPIED MODE.

MINIMUM DISCHARGE AIR TEMPERATURE SETPOINT SHALL BE 55ºF. **MAXIMUM DISCHARGE AIR TEMPERATURE** SHALL BE 95ºF.

UNOCCUPIED CONTROL:

DURING UNOCCUPIED MODE, THE OUTDOOR AIR DAMPER SHALL BE FULLY CLOSED. THE RETURN AIR DAMPER SHALL BE FULLY OPEN. THE SUPPLY FAN SHALL BE OFF. THE TEMPERATURE CONTROL LOOP SHALL BE SET TO DEADBAND.

DURING UNOCCUPIED MODE, THE AHU CONTROLLER OR BAS SHALL CONTINUOUSLY POLL THE ZONE TEMPERATURE SENSOR. IF THE ZONE TEMPERATURE SENSOR FALLS OUTSIDE OF THE UNOCCUPIED SETPOINT RANGES, THE UNIT SHALL BE ENABLED AND RUN IN UNOCCUPIED HEATING OR UNOCCUPIED COOLING MODES UNTILL THE UNOCCUPIED SETPOINTS ARE 1ºF ABOVE OR BELOW UNOCCUPIED SETPOINT RESPECTIVELY.

WHEN UNOCCUPIED COOLING MODE IS INITIATED BY THE AHU CONTROLLER OR BAS, THE SUPPLY AIR TEMPERATURE CONTROL LOOP SHALL BE ENABLED AND OPERATE TO MAINTAIN **MINIMUM DISCHARGE AIR TEMPERATURE** AS MEASURED AT THE DISCHARGE AIR TEMPERATURE SENSOR.

WHEN UNOCCUPIED HEATING MODE IS INITIATED BY THE AHU CONTROLLER OR BAS, THE SUPPLY AIR TEMPERATURE CONTROL LOOP SHALL BE ENABLED AND OPERATE UP TO A **MAXIMUM DISCHARGE AIR TEMPERATURE** AS MEASURED AT THE DISCHARGE AIR TEMPERATURE SENSOR. THE OUTDOOR AIR DAMPER SHALL BE FULLY CLOSED. THE RETURN AIR DAMPER SHALL BE FULLY OPEN.

FACILITY COOLDOWN / WARMUP CONTROL:

THE FACILITY COOLDOWN / WARMUP SEQUENCES SHALL USE A CALCULATED OPTIMIZED START ROUTINE PRIOR TO SCHEDULED OCCUPIED MODE. THE MORNING WARM-UP / COOL-DOWN ROUTINE SHALL BE INITIATED BY THE BAS. DEFAULT FACILITY COOLDOWN / WARMUP START TIME SHALL BE SIXTY MINUTES.

DURING FACILITY COOLDOWN / WARMUP MODE, THE OUTDOOR AIR DAMPER SHALL BE FULLY CLOSED. THE RETURN AIR DAMPER SHALL BE FULLY OPEN. EXCEPTION: IF ECONOMIZER MODE WOULD RESULT IN AN OVERALL MECHANICAL ENERGY SAVINGS, THEN OUTDOOR AIR DAMPER SHALL BE OPENED.

WHEN FACILITY COOLDOWN MODE IS INITIATED BY THE AHU CONTROLLER OR BAS, THE SUPPLY AIR TEMPERATURE CONTROL LOOP SHALL BE ENABLED AND OPERATE TO MAINTAIN **MINIMUM DISCHARGE AIR TEMPERATURE** AS MEASURED AT THE DISCHARGE AIR TEMPERATURE SENSOR.

WHEN FACILITY WARMUP MODE IS INITIATED BY THE AHU CONTROLLER OR BAS, THE SUPPLY AIR TEMPERATURE CONTROL LOOP SHALL BE ENABLED AND OPERATE UP TO THE **MAXIMUM DISCHARGE AIR TEMPERATURE** AS MEASURED AT THE DISCHARGE AIR TEMPERATURE SENSOR. NOTE: ZONE REHEAT SHALL BE THE SECOND STAGE OF HEATING (AS REQUIRED).

FACILITY COOLDOWN/ WARMUP MODES SHALL SWTICH TO OCCUPIED MODE OPPERATION ONCE THE SPACE TEMPERATURE REACHES THE OCCUPIED SETPOINT OR OCCUPIED TIME.

HEATING HOT WATER CIRCULATION PUMP CONTROL:

WHENEVER THE OUTDOOR AIR TEMPERATURE IS BELOW 40°F OR THERE IS A CALL FOR HEATING, THE HEATING COIL FREEZE PUMP SHALL BE ENERGIZED AND RUN CONTINUOUSLY. THE PUMP SHALL PROVE FLOW TO THE BMS SYSTEM WITH ITS CURRENT SWITCH. IF THE PUMP FAILS, AN ALARM SHALL BE GENERATED AT THE BAS

OUTDOOR AIR CONTROL:

WHEN IN OCCUPIED MODE, THE AHU CONTROLLER OR BAS SHALL INCLUDE MEANS TO AUTOMATICALLY REDUCE OUTDOOR AIR INTAKE AIRFLOW BELOW DESIGN RATES IN RESPONSE TO CHANGES IN SPACE CO2 CONCENTRATION LEVELS.

UPON RISING CO2 CONCENTRATION LEVELS, THE OUTDOOR AIR DAMPER ACTUATOR SHALL MODULATE OPEN. THE AHU OUTDOOR DAMPER ACTUATOR SHALL NOT MODULATE BEYOND ITS SCHEDULED MAXIMUM VENTILATION SETPOINT (SEE VENTILATION SCHEDULE) UNLESS IN ECONOMIZER MODE.

INVERSELY, UPON FALLING CO2 CONCENTRATION LEVELS, THE OUTDOOR AIR DAMPER ACTUATOR SHALL MODULATE CLOSED. DAMPER POSITION LIMITED TO NO LESS THAN THE BUILDING COMPONENT OUTDOOR AIRFLOW.

OUTDOOR AIRFLOW RATE SHALL BE MEASURED BY AIRFLOW MEASURING DEVICE.

ECONOMIZER (DRY-BULB):

DURING UNOCCUPIED MODE, THE BYPASS DAMPER(S) SHALL BE CLOSED.

WHILE IN OCCUPIED MODE, IF THE OUTDOOR AIR TEMPERATURE IS LESS THAN THE RETURN AIR TEMPERATURE, THE UNIT SHALL MODULATE THE BYPASS DAMPER TO MAINTAIN THE DISCHARGE AIR TEMPERATURE AND MINIMIZE THE TOTAL MECHANICAL COOLING. THE ECONOMIZER IS THE FIRST STAGE OF COOLING. THE WHEEL SHALL STOP.

IF THE OUTDOOR AIR TEMPERATURE EXCEEDS RETURN AIR TEMPERATURE OR IF THE OUTDOOR AIR TEMPERATURE EXCEEDS 75°F, THE BYPASS DAMPER SHALL CLOSE.

IF THE OUTDOOR AIR TEMPERATURE IS LOWER THAN 45°F, THE BYPASS DAMPER(S) SHALL CLOSE.

ENTHALPY WHEEL CONTROL:

DURING UNOCCUPIED MODE, THE ENTHALPY WHEEL SHALL BE STOPPED.

IN OCCUPIED MODE, IF THE OUTDOOR AIR ENTHALPY (CALCULATED) IS GREATER THAN THE RETURN AIR ENTHALPY (CALCULATED) OR IF THE OUTDOOR AIR TEMPERATURE EXCEEDS 75°F, THE UNIT SHALL MODULATE THE ENTHALPY WHEEL TO MAX SPEED. AT CONDITION, THE ENTHALPY WHEEL SHALL BE THE FIRST STAGE OF COOLING.

IN OCCUPIED MODE, WHENEVER THE OUTDOOR AIR TEMPERATURE IS LESS THAN THE DISCHARGE AIR TEMPERATURE, THE ENTHALPY WHEEL SHALL MODULATE SPEED TO MAINTAIN REQUIRED DISCHARGE TEMPERATURE. THE ENTHALPY WHEEL SHALL BE THE FIRST STAGE OF HEATING.

IF UNIT HAS PACKAGED CONTROLS, MANUFACTURER SEQUENCES SHALL GOVERN.

ENTHALPY WHEEL DEFROST CONTROL:

THE UNITS CONTROLLER SHALL PROVIDE MEANS TO PROTECT WHEEL FROM FROSTING. CONSULT MANUFACTURER LITERATURE.

A FROST/CONDENSATE PREVENTION CRAWL MODE SHALL BE USED TO PREVENT BUILD UP OF ICE. WHEN THE CRAWL MODE IS ENABLED, THE BYPASS DAMPERS WILL RAMP TO 100% BYPASS, AND THE ENERGY WHEEL'S VARIABLE FREQUENCY DRIVE WILL BE COMMANDED TO MINIMUM.

FIRE ALARM MODE CONTROL:

THE SUPPLY FAN SHALL SHUT DOWN WHEN ANY AUTOMATIC OR MANUAL FIRE ALARM DEVICE IS PLACED INTO ALARM BY THE BUILDING FIRE ALARM CONTROL PANEL VIA THE FIRE ALARM CONTROL MODULE. NEXT, THE OUTDOOR AIR DAMPER SHALL CLOSE AND THE UNIT SHALL BE DISABLED.

SYSTEM SHALL MANUALLY RESET FOLLOWING AN ALARM EVENT.

RELIEF FAN CONTROL:

PROVIDE OFFSET TO MAINTAIN BUILDING POSITIVE BUILDING PRESSURE (0.03 - 0.05 IN W.C.). DPS MOUNTED AND WIRED BY TCC.

ENABLE, DISABLE, AND MODULATE EXHAUST FAN BASED ON BUILDING PRESSURE CONTROL. REFER TO ASHRAE G36 5.16.9.

SETPOINTS:

UNOCCUPIED SPACE COOLING SETPOINT SHALL BE 85ºF (ADJ.)
UNOCCUPIED SPACE HEATING SETPOINT SHALL BE 65ºF (ADJ.)
OCCUPIED SPACE COOLING SETPOINT SHALL BE 70ºF (ADJ.) 60% RH* (ADJ.)
OCCUPIED SPACE HEATING SETPOINT SHALL BE 70ºF (ADJ.)

*RELATIVE HUMIDITY WILL NOT BE DIRECTLY CONTROLLED. THIS IS A CONDITION THAT CAN BE EXPECTED UNDER NORMAL OPERATING CONDITIONS.

SUPPLY FAN AND SUPPLY AIR TEMPERATURE CONTROL:

SUPPLY FAN SPEED AND TEMPERATURE SEQUENCE SHALL IMPLEMENT ASHRAE G36 SECTION 5.18.4 AND GENERALLY FOLLOW THE LOGIC BELOW:

THE SUPPLY FAN SHALL RUN WHEN THE SYSTEM IS OPERATING IN ALL MODES EXCEPT UNOCCUPIED MODE.

THE SUPPLY FAN SHALL BE AUTOMATICALLY STARTED AND STOPPED BY THE AHU CONTROLLER OR BAS.

UPON PROOF OF SUCCESSFUL START AND OPERATION OF THE SUPPLY FAN, THE OUTDOOR AIR DAMPER SHALL OPEN TO ITS MINIMUM POSITION INITIALLY.

PROVIDE A RAMP FUNCTION TO PREVENT CHANGES IN FAN SPEED OF MORE THAN 10% PER MIN.

AS SPACE TEMPERATURE INCREASES, THE UNIT SHALL MODULATE ECONOMIZER DAMPERS (WHEN ECONOMIZER MODE IS ENABLED) AND/OR SHALL MODULATE THE DX COOLING SYSTEM TO MAINTAIN SPACE TEMPERATURE SETPOINT. THE COOLING SYSTEM WILL CONTINUE TO MODULATE UP UNTIL THE DISCHARGE AIR TEMPERATURE REACHES THE **MINIMUM DISCHARGE AIR TEMPERATURE**. AT WHICH POINT, BOTH THE MECHANICAL COOLING SYSTEM AND THE SUPPLY FAN WILL MODULATE UP TOGETHER TO MAINTAIN SPACE AIR TEMPERATURE SETPOINT AND **MINIMUM DISCHARGE AIR TEMPERATURE**.

AS SPACE TEMPERATURE BEGINS TO DECREASES, THE PROCESS SHALL WORK IN REVERSE ORDER.

AS SPACE TEMPERATURE DECREASES, THE UNIT SHALL MODULATE THE HEATING HOT WATER CONTROL VALVE TO MAINTAIN SPACE TEMPERATURE SETPOINT. THE HEATING SYSTEM WILL CONTINUE TO MODULATE UP UNTIL THE DISCHARGE AIR TEMPERATURE REACHES THE **MAXIMUM DISCHARGE AIR TEMPERATURE**. AT WHICH POINT, BOTH THE MECHANICAL HEATING SYSTEM AND THE SUPPLY FAN WILL MODULATE UP TOGETHER TO MAINTAIN SPACE AIR TEMPERATURE SETPOINT AND **MAXIMUM DISCHARGE AIR TEMPERATURE**.

AS SPACE TEMPERATURE BEGINS TO INCREASE, THE PROCESS SHALL WORK IN REVERSE ORDER.

DEHUMIDIFICATION CONTROL:

DEHUMIDICATION MODE SHALL BE ENABLED DURING NORMAL AHU OPPERATION WHEN THE SUPPLY FAN IS PROVEN ON, THE RETURN AIR HUMIDITIY RAISES ABOVE 60% RH, AND THE OUTDOOR TEMPERATURE IS ABOVE 55°F.

WHEN ENABLED, THE AHU CONTROLLER SHALL DISABLE THE ECONOMIZER. NEXT, THE DX COOLING SYSTEM SHALL MODULATE THE MECHANICAL COOLING SYSTEM TO OVERCOOL THE AIR, LOWERING THE MOISTURE CONTENT. THE MODULATING HOT GAS REHEAT SYSTEM SHALL BE USED TO MAINTIAN THE DISCHRAGE AIR TEMPERATURE SETPOINT. ONCE THE RETURN AIR HUMIDITY LOWERS TO 55% RH DEHUMIDIFICATION MODE SHALL BE DISABLED.

ALARMS AND SAFETIES

PROVIDE ALL RELEVANT ALARMS TO NOTIFY SYSTEM OPERATORS OF MAINTENANCE, PERFORMANCE, EQUIPMENT, OR LIFE-SAFETY ERRORS AND FAULTS. REFER TO MANUFACTURER INFORMATION, CODE REQUIREMENTS, AND ASHRAE 36 RECOMMENDATIONS FOR ADDITIONAL SAFETIES AND ALARMS.

HIGH STATIC PRESSURE SAFETY SWITCH: WHEN THE SAFETY SWITCH IS TRIPPED, DISABLE SUPPLY FAN (HARDWIRED) AND GENERATE AN ALARM AT THE BAS. ALL OTHER COMPONENTS SHALL RETURN TO AN UNOCCUPIED/OFF CONTROL MODE. HIGH PRESSURE SHALL BE SET TO TRIP AT 4" W.G. AND SHALL BE RESET MANUALLY AT THE UNIT.

FREEZE STAT: WHEN A FREEZE CONDITION OCCURS, DISABLE SUPPLY FAN (HARDWIRED) AND GENERATE AN ALARM AT THE BAS. ALL OTHER COMPONENTS SHALL RETURN TO AN UNOCCUPIED/OFF CONTROL MODE. FREEZE STAT SHALL BE SET TO TRIP AT 40°F AND SHALL BE RESET MANUALLY AT THE UNIT.

DUCT SMOKE DETECTOR: WHEN SMOKE IS DETECTED, DISABLE SUPPLY FAN AND RELIEF FAN (HARDWIRED) AND GENERATE AN ALARM AT THE BAS. ALL OTHER COMPONENTS SHALL RETURN TO AN UNOCCUPIED/OFF CONTROL MODE.

FILTER DIFFERENTIAL SWTICH: WHEN DIFFERENTIAL PRESSURE ACCROSS THE FILTERS EXCEEDS ALLOWABLE LIMIT, GENERATE AN ALARM AT THE BAS.

FAN STATUS: THE BAS SHALL MONITOR FAN CURRENT SWITCHES. IF STATUS DOES NOT MATCH COMMAND OUTPUT, DISABLE FAN AND GENERATE AN ALARM AT THE BAS. ALL OTHER COMPONENTS SHALL RETURN TO AN UNOCCUPIED/OFF CONTROL MODE.

DAMPER POSITION: KNOWLEDGE OF DAMPER POSITION SHALL BE REQUIRED. A MODULATING (ANALOG) ACTUATOR OR FLOATING ACTUATOR CAN BE USED. IF DAMPER POSITION IS DETERMINED BY THE BAS TO BE INCORRECT, GENERATE AN ALARM AT THE BAS.

VALVE POSITION: KNOWLEDGE OF VALVE POSITION SHALL BE REQUIRED. IF VALVE POSITION IS DETERMINED BY THE BAS TO BE INCORRECT, GENERATE AN ALARM AT THE BAS.

OUTDOOR AIR DAMPER POSITION: THE OUTDOOR AIR DAMPER SHALL FAIL CLOSED. IF THE OUTDOOR AIR DAMPER FAILS TO OPEN/MODULATE, AS INDICATED BY THE END SWITCH, GENERATE AN ALARM AT THE BAS.

RETURN AIR DAMPER POSITION: THE RETURN AIR DAMPER SHALL FAIL OPEN. IF THE RETURN AIR DAMPER FAILS TO CLOSE/MODULATE, AS INDICATED BY THE END SWITCH, GENERATE AN ALARM AT THE BAS.

DISCHARGE AIR TEMPERATURE: IF DISCHARGE AIR TEMPERATURE FALLS OUT OF THE ALLOWABLE RANGE OF 5°F FOR A TIME PERIOD 10 MINUTES, GENERATE AN ALARM AT THE BAS.

SINGLE-ZONE VAV AHU W/ DX W/ HGR, HHW, ERW CONTROLS DIAGRAM

NO SCALE

TYPICAL FOR: AHU-1

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KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

J.W.

STATE OF MICHIGAN
STEVEN R. DIBERARDINE
ENGINEER
No. 6201041574
PROFESSIONAL ENGINEER

11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

JOB NO. 2616.11

SHEET TITLE
CONTROL DIAGRAMS

SHEET NO.
M8.1

SES
Strategic Energy Solutions®
4000 W. Eleven Mile Road Berkley, MI 48072
Phone 248.399.1900 Fax 248.399.1901
www.sesnet.com
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SES Project # 25 0588 18

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#6 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
CR	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
CO	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
	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
FR	FLOOR RECEPTACLE
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
2021	MICHIGAN BUILDING CODE
2021	MICHIGAN ENERGY CODE
2015	MICHIGAN RESIDENTIAL CODE
2021	MICHIGAN REHABILITATION CODE
2023	MICHIGAN ELECTRICAL CODE RULES, PART 8
2023	NATIONAL ELECTRICAL CODE (NFPA 70)
2013	NFPA 20
2019	NFPA 72
2012	NFPA 101
2019	NFPA 110
2017	MICHIGAN ACCESSIBILITY CODE
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

SHEET NO	DESCRIPTION
E0.0	ELECTRICAL GENERAL INFORMATION
E0.1	LIGHTING SCHEDULES
ED1.0	LOWER LEVEL POWER DEMOLITION PLAN
ED1.1	FIRST FLOOR POWER DEMOLITION PLAN
ED1.2	SECOND FLOOR POWER DEMOLITION PLAN
ED1.3	THIRD FLOOR & STAGE CATWALK POWER DEMOLITION PLANS
ED2.1	FIRST FLOOR LIGHTING DEMOLITION PLAN
ED2.2	SECOND FLOOR LIGHTING DEMOLITION PLAN
ED2.3	THIRD FLOOR & STAGE CATWALK LIGHTING DEMOLITION PLANS
EP1.0	LOWER LEVEL POWER PLAN
EP1.1	FIRST FLOOR POWER PLAN
EP1.2	SECOND FLOOR POWER PLAN
EP1.3	THIRD FLOOR & STAGE CATWALK POWER PLANS
EP1.4	ROOF POWER PLAN
EL1.0	LOWER LEVEL LIGHTING PLAN
EL1.1F	FIRST FLOOR LIGHTING PLAN - FLOOR
EL1.1	FIRST FLOOR LIGHTING PLAN
EL1.2	SECOND FLOOR LIGHTING PLAN
EL1.3	THIRD FLOOR & STAGE CATWALK LIGHTING PLANS
E4.0	ENLARGED POWER PLANS
E6.0	PANEL SCHEDULES AND DETAILS
E7.0	ELECTRICAL RISER DIAGRAM

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LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

STATE OF MICHIGAN — SCOTT E. TOWNSEND — ENGINEER — No. 6201050450 — PROFESSIONAL

11/07/2025

ISSUANCES	DATE
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JOB NO. 2616.11

SHEET TITLE

ELECTRICAL GENERAL INFORMATION

SHEET NO.

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SES
Strategic Energy Solutions®
4000 W. Eleven Mile Road Berkley, MI 48072
Phone 248.399.1900 Fax 248.399.1901
www.sesnet.com

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LIGHTING CONTROLS MATRIX

TAG NUMBER	SPACE TYPE	PARAMETERS												SEQUENCE OF OPERATIONS
		MANUAL ON/OFF SWITCH	DIMMING SWITCH	OVERRIDE SWITCH	MULTI ZONE CONTROL	KEY SWITCH	TIMECLOCK	OCCUPANCY SENSOR	PHOTOCONTROL DIMMING	EXTERIOR PHOTOCELL	COLOR TUNING	DMX	BACNET INTEGRATION	
1	AUDITORIUM, STAGE											X		CONTROLLED VIA CONTROLLED BREAKERS IN THEATRICAL PANEL. PANEL BY OTHERS.
2	PROJECTION ROOM	X	X					X						LOCAL CONTROL SWITCH WITH ON/OFF AND DIM FUNCTION.
3	WORKROOM	X	X					X						MANUAL ON/AUTOMATIC OFF WITHIN 20 MIN OF OCCUPANTS LEAVING SPACE (VACANCY MODE). CONTINUOUS DIMMING.

LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	MANUFACTURER	MODEL	WATTAGE	LUMENS	VOLTAGE	CCT	CRI	REMARKS	ALTERNATE MANUFACTURER | MODEL #1	ALTERNATE MANUFACTURER | MODEL #2
	AISLE TAPE LIGHT			<varies>							
L1	1' X 1' RECESSED DOWNLIGHT. DMX DRIVER REQUIRED.	KIRLIN	LRC-10KLD 5000L 120 SKL WFL -30K D5	55 W	5000 LUMENS	120	3000K	80 CRI		L.C. DOANE VRF1 SERIES	LSI XSPS SERIES
L2	4" WIDE DIRECT LINEAR PENDANT.	LITHONIA LIGHTING	CLX L96 10000LM SEF FDL MVOLT GZ1 40K 80 CRI WH ZACVH M100	92 W	10,000 LUMENS	UNV	4000K	80 CRI		COLUMBIA MPS SERIES	HE WILLIAMS 75 SERIES
L3	1" SURFACE MOUNTED ILLUMINATED TRANSITION TAPE LIGHT.	TRIVOLI	SATT CE 30 06 C X	1 W	60 LUMENS/FT	UNV	3000K	80 CRI	WATTAGE SHOWN IS PER LINEAR FOOT. REFER TO LIGHTING PLANS FOR RUN LENGTHS.	PRIMUS LED AISLE LIGHTING	ENGINEER APPROVED EQUAL
L4	TRACK HEAD.	JUNO LIGHTING	R605L 30K 80CRI PDIM FL BL	10 W	500 LUMENS	120	3000K	80 CRI		CONTECH CTL905 SERIES	AMERLUX PARI XS SERIES
L5	4" WIDE DIRECT LINEAR PENDANT.	LITHONIA LIGHTING	CLX L48 5000LM SEF FDL MVOLT GZ1 40K 80 CRI WH ZACVH M100	384 W	5,000 LUMENS	UNV	4000K	80 CRI		COLUMBIA MPS SERIES	HE WILLIAMS 75 SERIES
L6	4" DIAMETER WALL MOUNT CYLINDER FIXTURE. DOWNLIGHT ONLY. DMX DRIVER REQUIRED.	GOTHAM	IVO4CYL WC D 30LM 40K 80CRI 45D DARK MVOLT DMX L9 JBX	28 W	3000 LUMENS	UNV		80 CRI		LIGHT HEADED 5" PIPE SERIES	ALW CORE 4 SERIES
T1	TRACK FOR LIGHTS.	JUNO LIGHTING	T 8FT BL	0 W	N/A	120				CONTECH SINGLE CIRCUIT TRACK	AMERLUX PARI XS SERIES
X1	LED THERMOPLASTIC EXIT SIGN. BLACK FINISH	LITHONIA LIGHTING	LQM S 3 R 120/277 M6	3 W	N/A	UNV	RED LETTERS	N/A	REFER TO PLANS FOR MOUNTING STYLE. DIRECTIONAL ARROWS, AND NUMBER OF FACES.	COMPASS CCE EXIT SERIES	BEGHELLI EPX SERIES

INVERTER EQUIPMENT SCHEDULE

TYPE	DESCRIPTION	MANUFACTURER	MODEL	WATTAGE	REMARKS
INV1	1500W LIGHTING INVERTER. 90MINUTE UL 924 LISTED	IOTA	IIS 1.5KVA	1356 W	208V-1PH IN, 120V-1PH OUT, IF REQUIRED PROVIDE NEUTRAL.

INV1 SCHEDULE

TYPE	WATTAGE	COUNT	LEVEL
L1	385 W	7	FIRST FLOOR
L1	495 W	9	THIRD FLOOR
L2	368 W	4	STAGE LOFT
X1	24 W	8	FIRST FLOOR
X1	15 W	5	SECOND FLOOR
X1	6 W	2	THIRD FLOOR
TOTAL LOAD:	1293 W		

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LIGHTING SCHEDULES

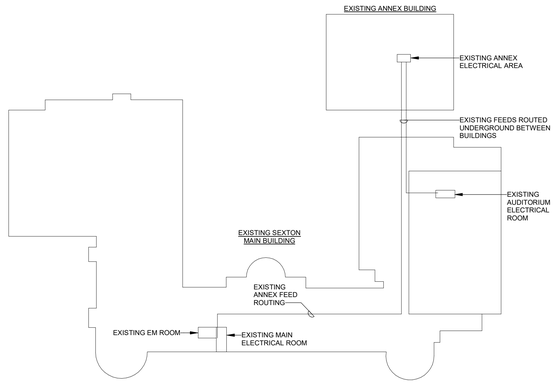
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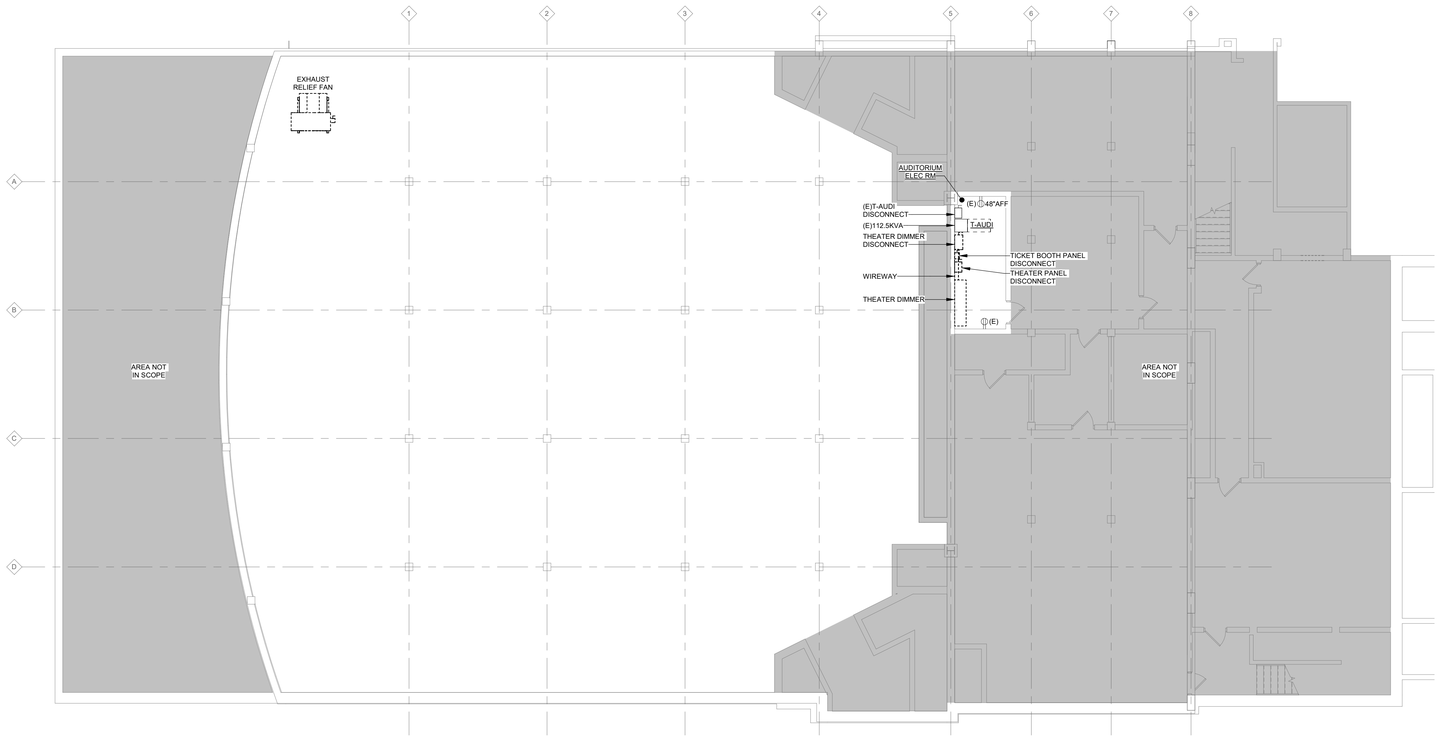
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LOWER LEVEL POWER COMPOSITE PLAN - FOR REFERENCE
NO SCALE



LOWER LEVEL POWER DEMOLITION PLAN
SCALE: 1/8" = 1'-0"

ELECTRICAL DEMOLITION NOTES

1. VISIT THE SITE PRIOR TO SUBMISSION OF BID TO EXAMINE THE EXISTING CONDITIONS AND THE EXTENT OF DEMOLITION WORK.
2. EXAMINE THE DRAWINGS OF OTHER TRADES, BE FAMILIAR WITH THE DEMOLITION REQUIRED BY OTHER TRADES.
3. PERFORM ALL INCIDENTAL ELECTRICAL DEMOLITION AND/OR RELOCATION OF DEVICES AND EQUIPMENT REQUIRED TO FACILITATE THE DEMOLITION WORK OF OTHER TRADES.
4. COORDINATE WITH NEW WORK PLANS, ONE LINE, AND RISER DIAGRAMS FOR EXTENT OF DEMOLITION WORK.
5. COORDINATE ANY SHUTDOWN OF EXISTING SERVICES AND EQUIPMENT REMAINING IN USE WITH OWNERS' REPRESENTATIVE. WHERE EXISTING BUILDING SERVICE IS REQUIRED TO BE SHUT DOWN, INCLUDE ALL ASSOCIATED OVERTIME COST TO PERFORM THIS WORK DURING EVENING AND WEEKENDS. INCLUDE ALL COSTS FOR PROVIDING TEMPORARY POWER.
6. REMOVE ALL CONDUIT AND WIRE BACK TO NEAREST UPSTREAM DEVICE REMAINING IN SERVICE.
7. WHERE DEMOLITION WORK AFFECTS ELECTRICAL SERVICE TO DOWNSTREAM DEVICES TO REMAIN; EXTEND CONDUIT AND WIRE AS REQUIRED TO MAINTAIN ELECTRICAL SERVICE.
8. PROVIDE BLANK COVER PLATES WHERE SWITCHES AND DEVICES ARE REMOVED AND WALL REMAINS INTACT. MARK ALL UNUSED CIRCUIT BREAKERS AS "SPARE".
9. CONTRACTOR TO TAG ALL CIRCUITS AT BOTH ENDS AFFECTED BY THIS SCOPE OF WORK.
10. CONTRACTOR SHALL PROVIDE UPDATED, TYPED-IN DIRECTORIES FOR ALL PANELS AFFECTED BY THIS SCOPE OF WORK.
11. CONTRACTOR SHALL VERIFY ALL UNDERGROUND AND IN-SLAB UTILITIES LOCATIONS PRIOR TO SAW CUTTING OR PENETRATING ANY FLOOR SLABS. CONTRACTOR SHALL REPAIR ALL UTILITIES DAMAGED BY SAW CUTTING.

ELECTRICAL DEMOLITION KEYNOTES

D1 REMOVE ALL EXISTING EXIT SIGNS, EMERGENCY BATTERY UNITS, AND LIGHT FIXTURES, ASSOCIATED CONTROL OCCUPANCY SENSORS, WALL SWITCHES, AND WIRING BACK TO SOURCE. NEW LIGHTING TO BE FEED THROUGH THEATRICAL PANEL BY OTHERS. REFER TO LIGHTING PLANS FOR NEW WORK.

D2 DEMOLISH ELECTRICAL FEEDS TO SEATING AND FLOOR RECEPTACLES, COMPLETE BACK TO SOURCE. DEMOLISHED FLOOR PENETRATIONS AT RECEPTACLES AND CONDUIT STUBS TO BE FILLED.

D3 REMOVE ALL EXISTING POWER FOR CATWALK RIGGING COMPLETE BACK TO SOURCE.

D4 RECEPTACLE TO BE RELOCATED. DEMOLISH ELECTRICAL DEVICE AT THIS LOCATION. MAINTAIN EXISTING WIRING FOR EXTENSION TO NEW DEVICE LOCATION IN NEW WORK.

D5 DEMOLISH ALL ELECTRICAL RECEPTACLES, CONDUIT, WIREWAYS, AND PULLBOXES ON AND ATTACHED TO PLATFORM, COMPLETE BACK TO SOURCE.

D6 DEMOLISH DEVICE AND DEVICE COVER PLATE., MAINTAIN WIRING AND JUNCTION BOX FOR RE-CONNECTION AT SAME LOCATION IN NEW WORK.

D7 REMOVE WIRE AND CONDUIT COMPLETE BACK TO SOURCE FEEDING DEMOLISHED THEATRICAL LIGHTING.

D8 REMOVE WIRING AND CONDUIT BACK TO SOURCE. COORDINATE WITH ARCHITECTURAL FOR PATCH AND COVERING OF REMAINING WALL PENETRATION.

D9 REUSE EXISTING LOCAL NORMAL LIGHTING CIRCUIT FOR NEW LIGHT FIXTURES. EXTEND/REWORK EXISTING FEEDERS AND WIRE AS REQUIRED. CONNECT NEW LIGHT FIXTURES TO NEW LIGHT CONTROLS IN EXISTING JUNCTION BOXES AND PROTECTED IN DEMOLITION PHASE. PROVIDE NEW LOW VOLTAGE WIRING AS REQUIRED.

D10 COORDINATE WITH MECHANICAL TRADES TO DEMOLISH ALL WIRE AND CONDUIT FOR CONTROLS, DISCONNECTS, AND DEVICES COMPLETE BACK TO SOURCE FOR MECHANICAL EQUIPMENT BEING DEMOLISHED BY MECHANICAL TRADES.

D11 DEMOLISH JUNCTION BOX SERVING SPEAKER CLUSTER BEING RELOCATED BY THEATRICAL TRADES. MAINTAIN DURING WIRE DURING DEMOLITION FOR RE-USE IN NEW WORK.

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J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

STATE OF MICHIGAN
SCOTT E. TOWNSEND
ENGINEER
No. 6201050400
PROFESSIONAL
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KEY PLAN

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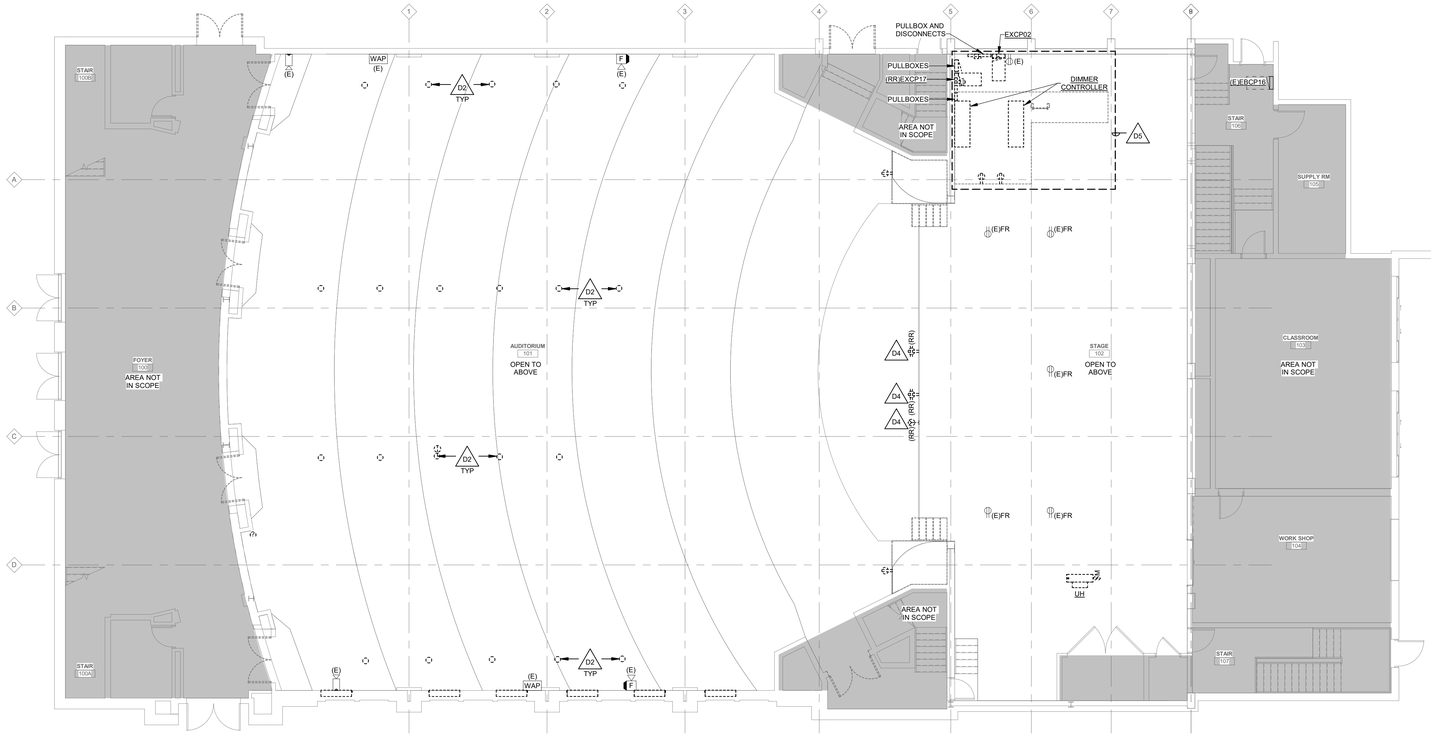
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LOWER LEVEL POWER DEMOLITION PLAN

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FIRST FLOOR POWER DEMOLITION PLAN

SCALE: 1/8" = 1'-0"

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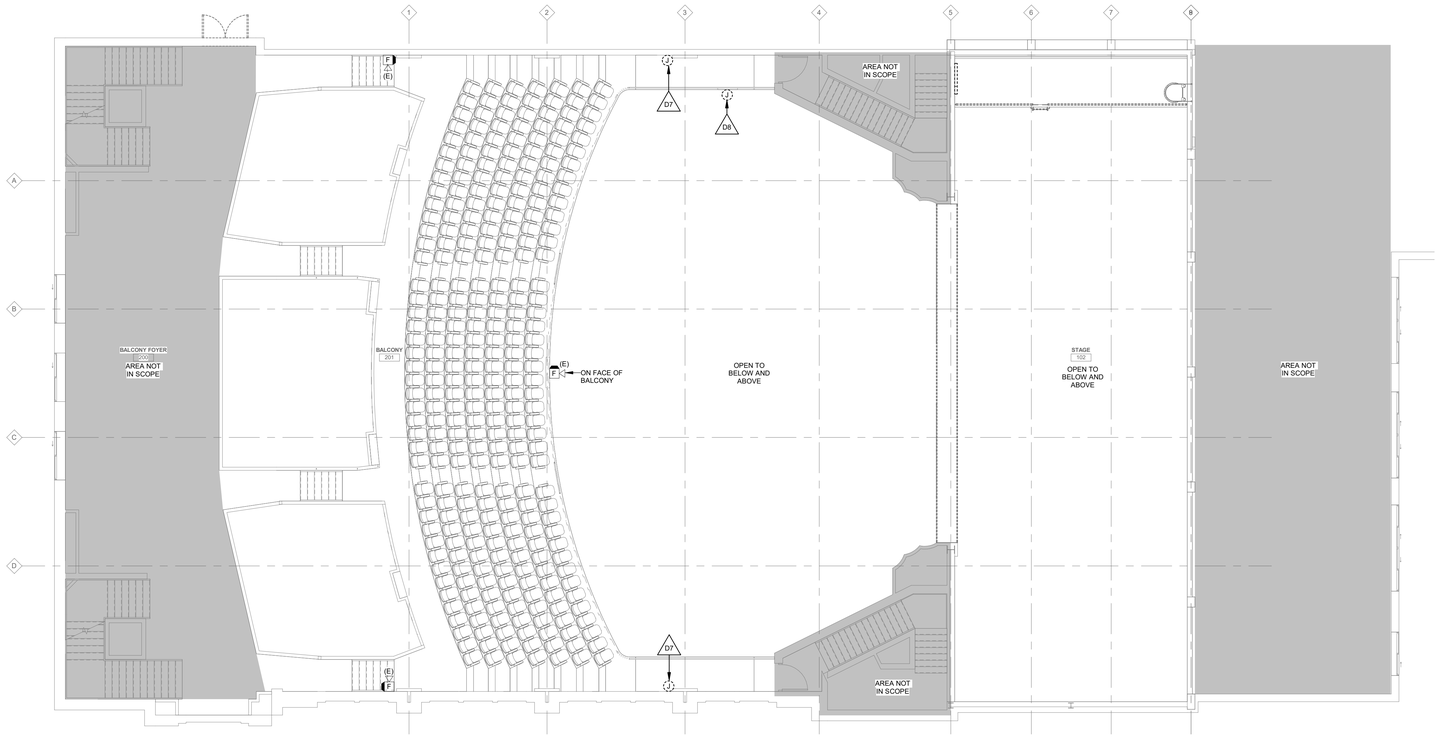
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SECOND FLOOR POWER DEMOLITION PLAN

SCALE: 1/8" = 1'-0"

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J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

STATE OF MICHIGAN
SCOTT E. TOWNSEND
ENGINEER
No. 6201050400
PROFESSIONAL

11/07/2025

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CONSTRUCTION DOCUMENTS	11.07.2025

KEY PLAN

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JOB NO. 2616.11

SHEET TITLE

SECOND FLOOR POWER DEMOLITION PLAN

SHEET NO.

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4000 W. Eleven Mile Road Berkley, MI 48072
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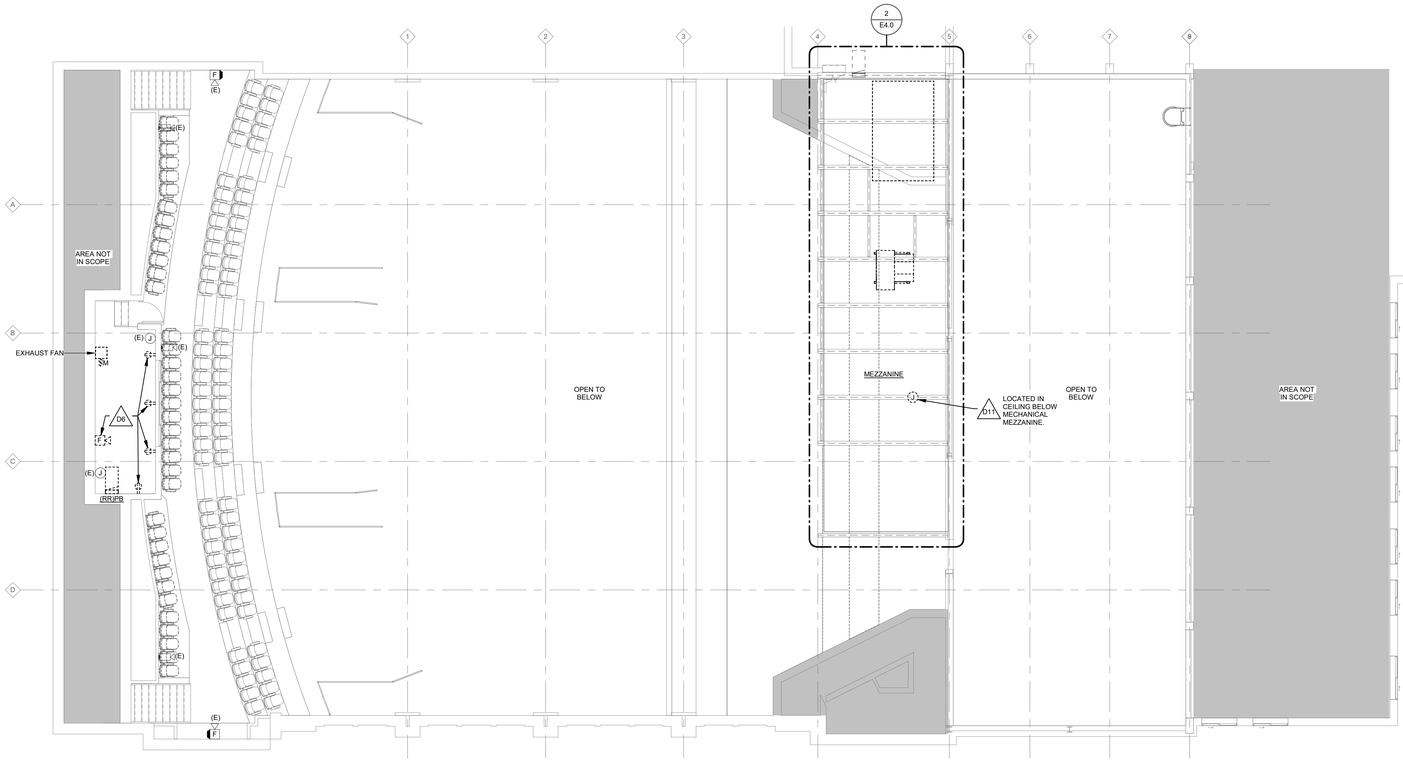
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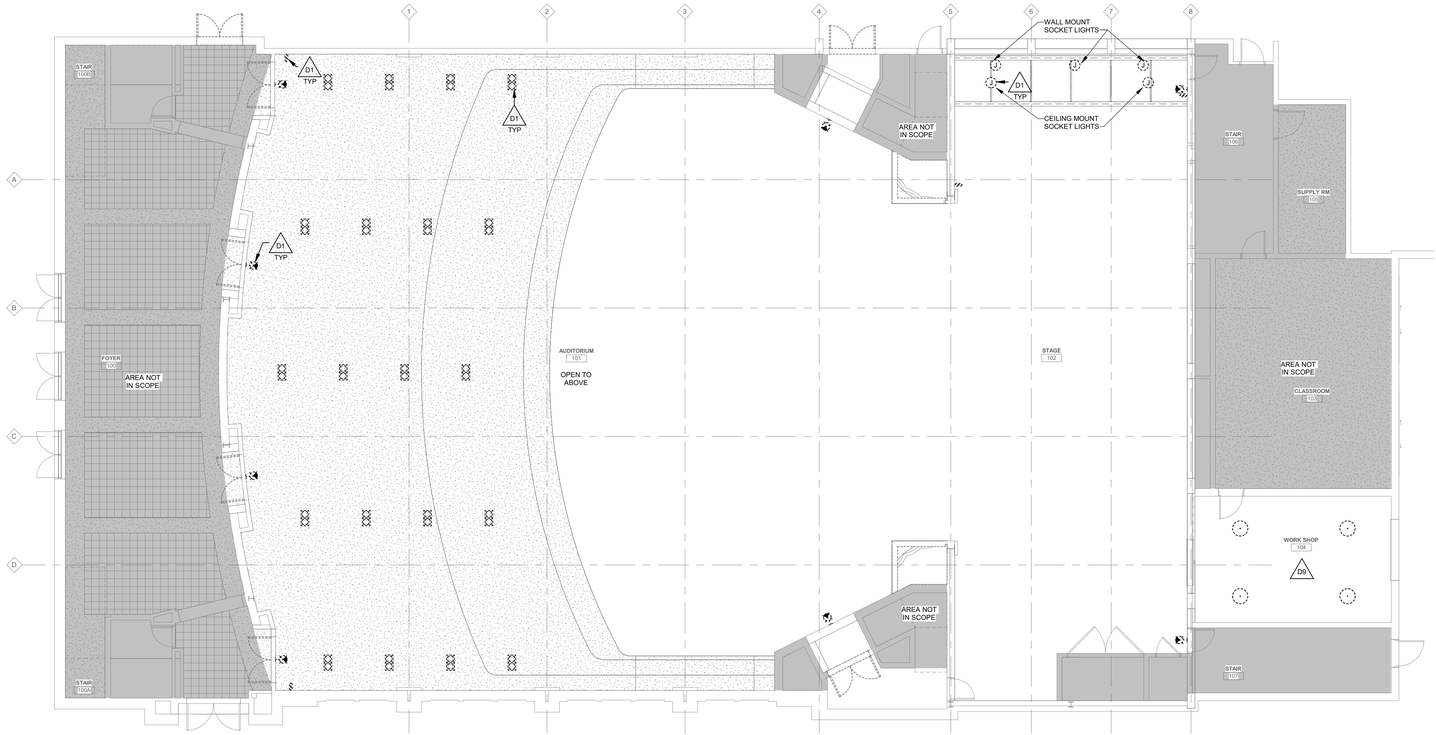
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FIRST FLOOR LIGHTING DEMOLITION PLAN
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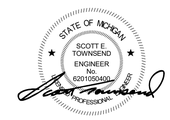
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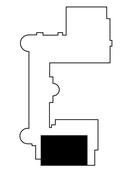
LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915



11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025



KEY PLAN

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JOB NO. 2616.11

SHEET TITLE

FIRST FLOOR LIGHTING DEMOLITION PLAN

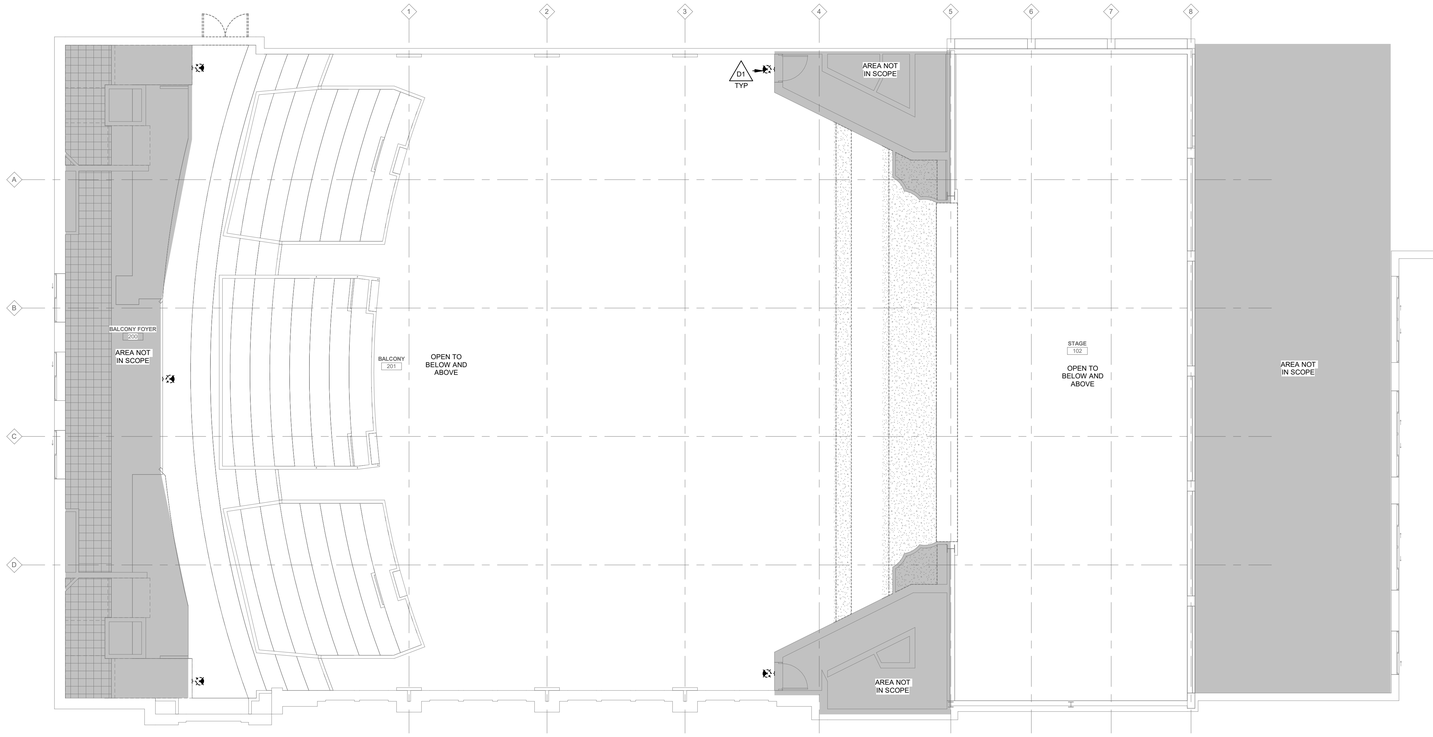
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Strategic Energy Solutions®
4000 W. Eleven Mile Road Berkley, MI 48072
Phone 248.399.1900 Fax 248.399.1901
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SECOND FLOOR LIGHTING DEMOLITION PLAN

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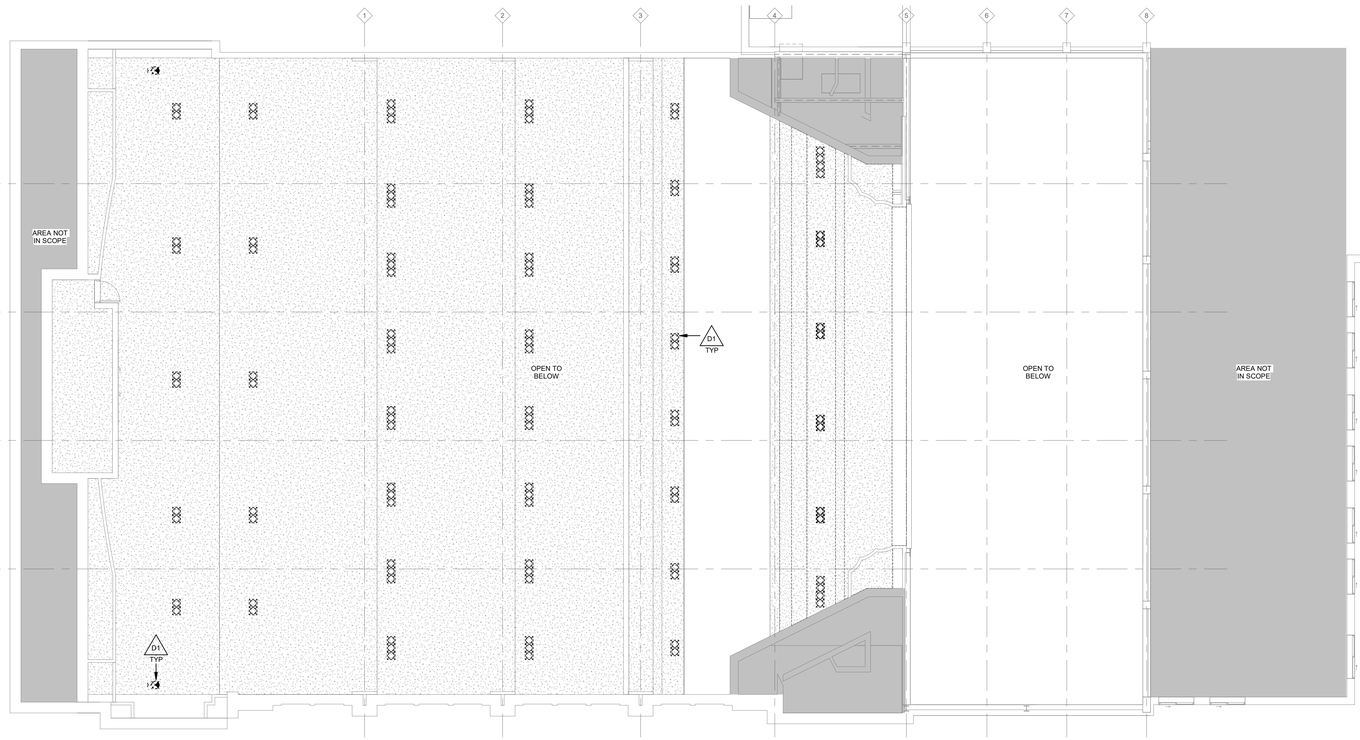
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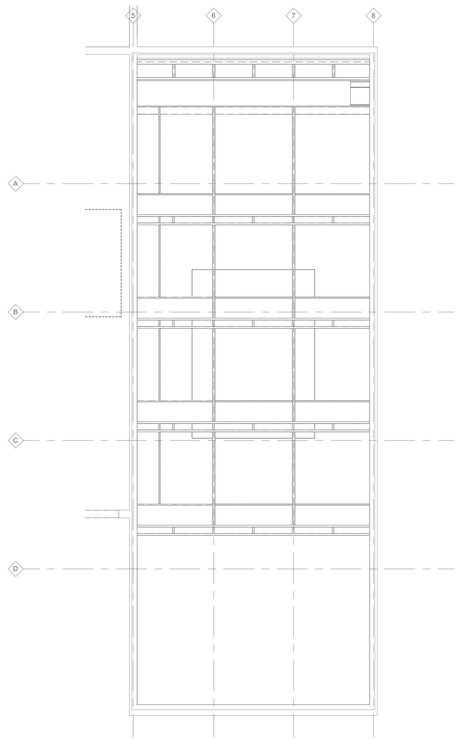
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D11 DEMOLISH JUNCTION BOX SERVING SPEAKER CLUSTER BEING RELOCATED BY THEATRICAL TRADES. MAINTAIN DURING WIRE DURING DEMOLITION FOR RE-USE IN NEW WORK.



THIRD FLOOR LIGHTING DEMOLITION PLAN
SCALE: 1/8" = 1'-0"



STAGE CATWALK LIGHTING DEMOLITION PLAN
SCALE: 1/8" = 1'-0"

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LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

STATE OF MICHIGAN
SCOTT E. TOWNSEND
ENGINEER
No. 6201050400
PROFESSIONAL

11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

KEY PLAN

N

JOB NO. 2616.11

SHEET TITLE
THIRD FLOOR & STAGE CATWALK LIGHTING DEMOLITION PLANS

SHEET NO.
ED2.3

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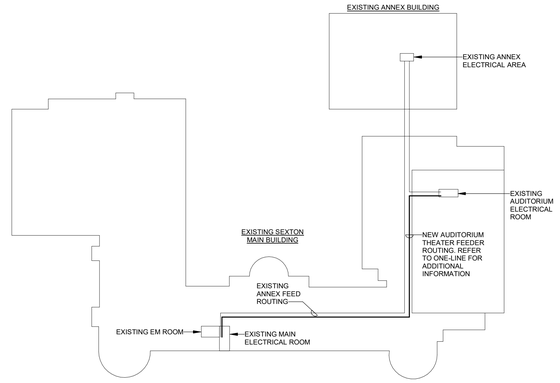
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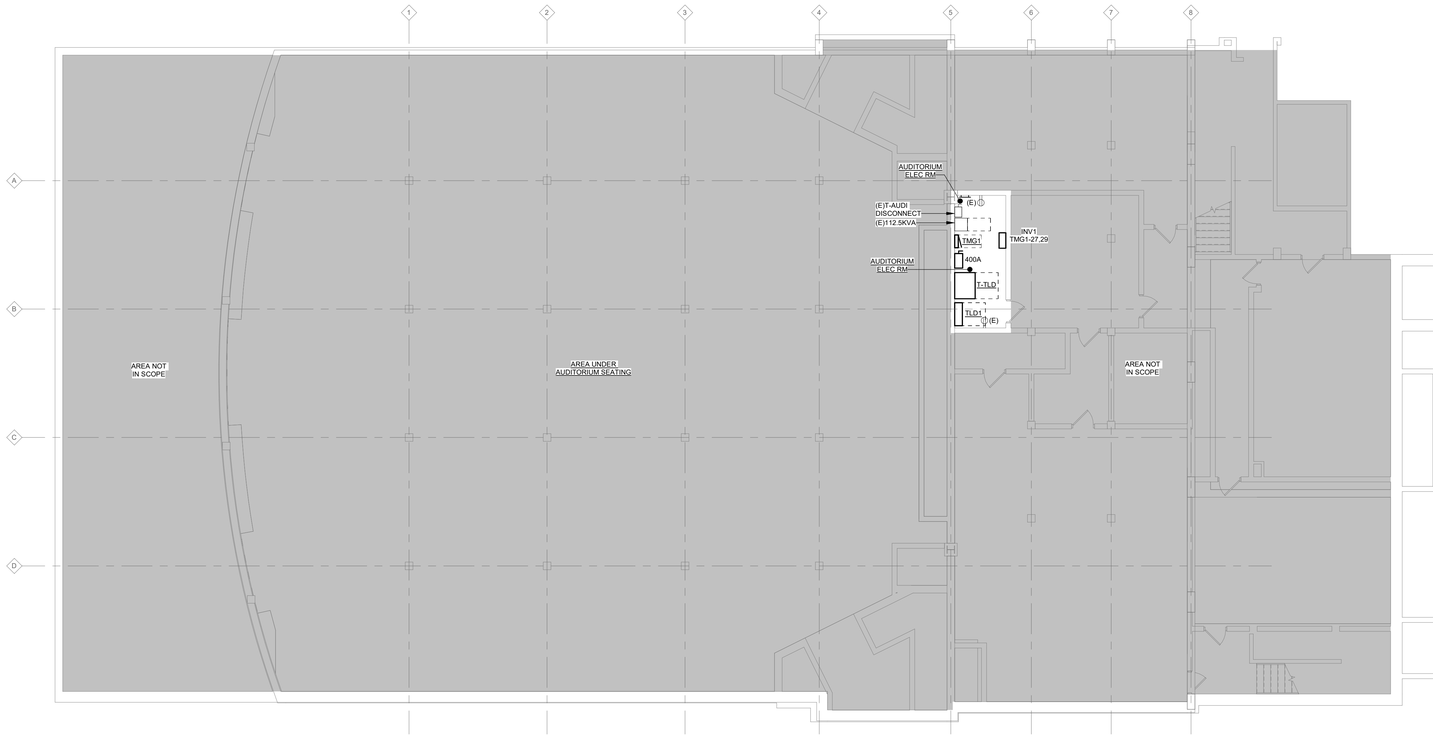
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LOWER LEVEL ELECTRICAL COMPOSITE PLAN
NO SCALE



LOWER LEVEL POWER PLAN
SCALE: 1/8" = 1'-0"

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. ALL NEW 15- AND 20-AMPERE, 125- AND 250-VOLT NONLOCKING-TYPE RECEPTACLES TO BE LISTED TAMPER-RESISTANT TYPE THROUGHOUT THIS SCHOOL. EXCEPTIONS TO THIS INCLUDE RECEPTACLES LOCATED MORE THAN 5.5 FEET ABOVE THE FLOOR AND SINGLE OR DUPLEX RECEPTACLES FOR DEDICATED APPLIANCES THAT ARE NOT READILY ACCESSIBLE. ANY EXISTING RECEPTACLES THAT ARE INCLUDED IN THE SCOPE OF RENOVATION WORK SHALL BE UPDATED PER NEW RECEPTACLE NOTES ABOVE AS WELL.

POWER KEYNOTES

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102 McPherson Ave, Lansing, MI 48915

J.W.

STATE OF MICHIGAN
SCOTT E TOWNSEND
ENGINEER
No. 6201050402
PROFESSIONAL
11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

KEY PLAN

N

JOB NO. 2616.11

SHEET TITLE
LOWER LEVEL POWER PLAN

SHEET NO.
EP1.0

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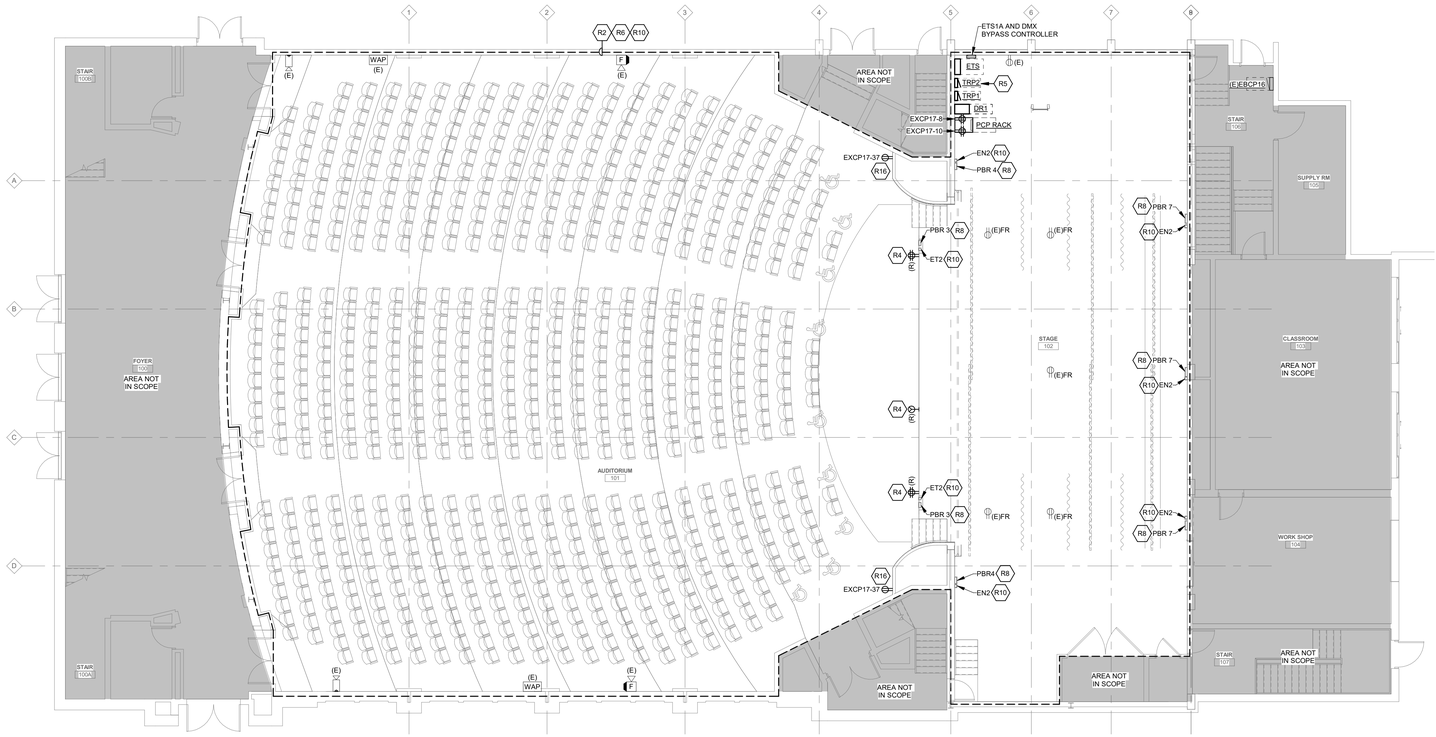
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FIRST FLOOR POWER PLAN

SCALE: 1/8" = 1'-0"

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J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

STATE OF MICHIGAN
SCOTT E. TOWNSEND
ENGINEER
No. 6201060400
PROFESSIONAL ENGINEER

11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

KEY PLAN

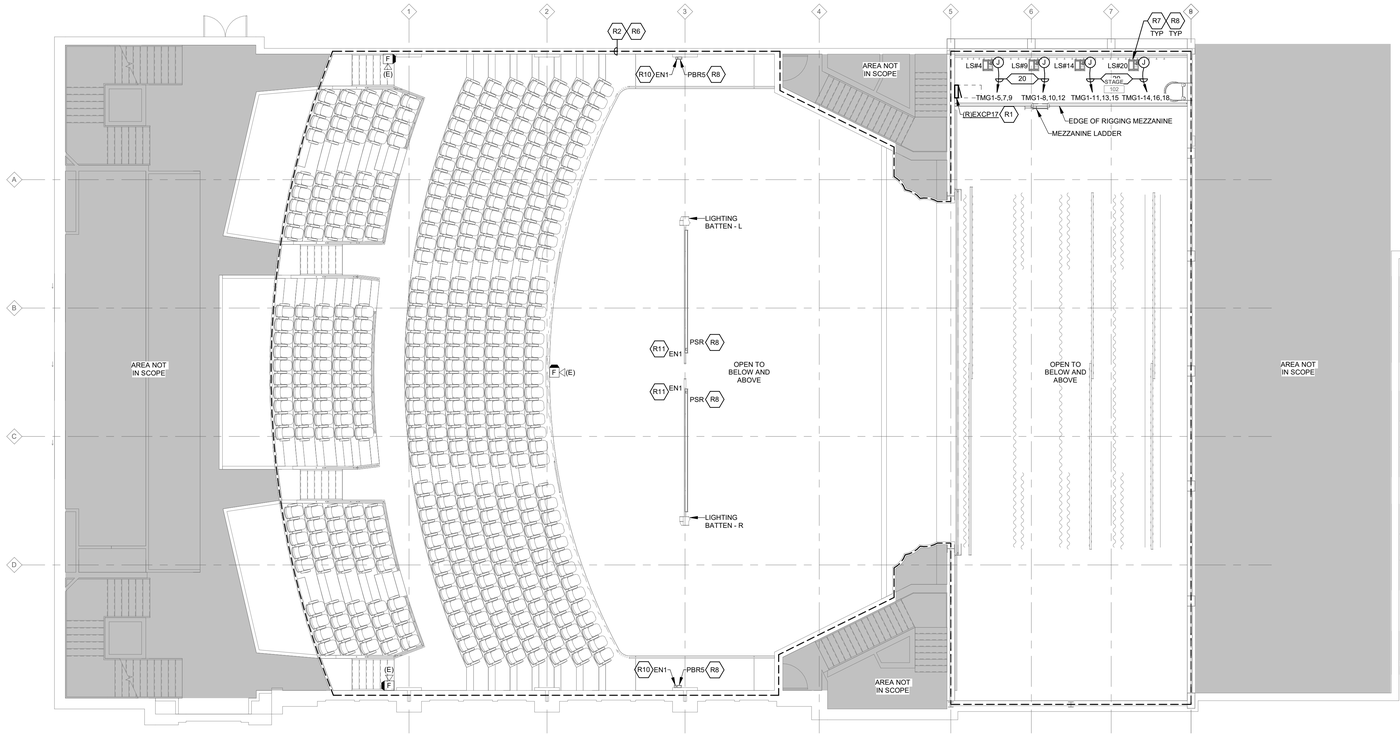
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JOB NO. 2616.11

SHEET TITLE
FIRST FLOOR POWER PLAN

SHEET NO.
EP1.1

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SECOND FLOOR POWER PLAN
SCALE: 1/8" = 1'-0"

POWER GENERAL NOTES

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KEY PLAN

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JOB NO. 2616.11

SHEET TITLE
SECOND FLOOR POWER PLAN

SHEET NO.
EP1.2

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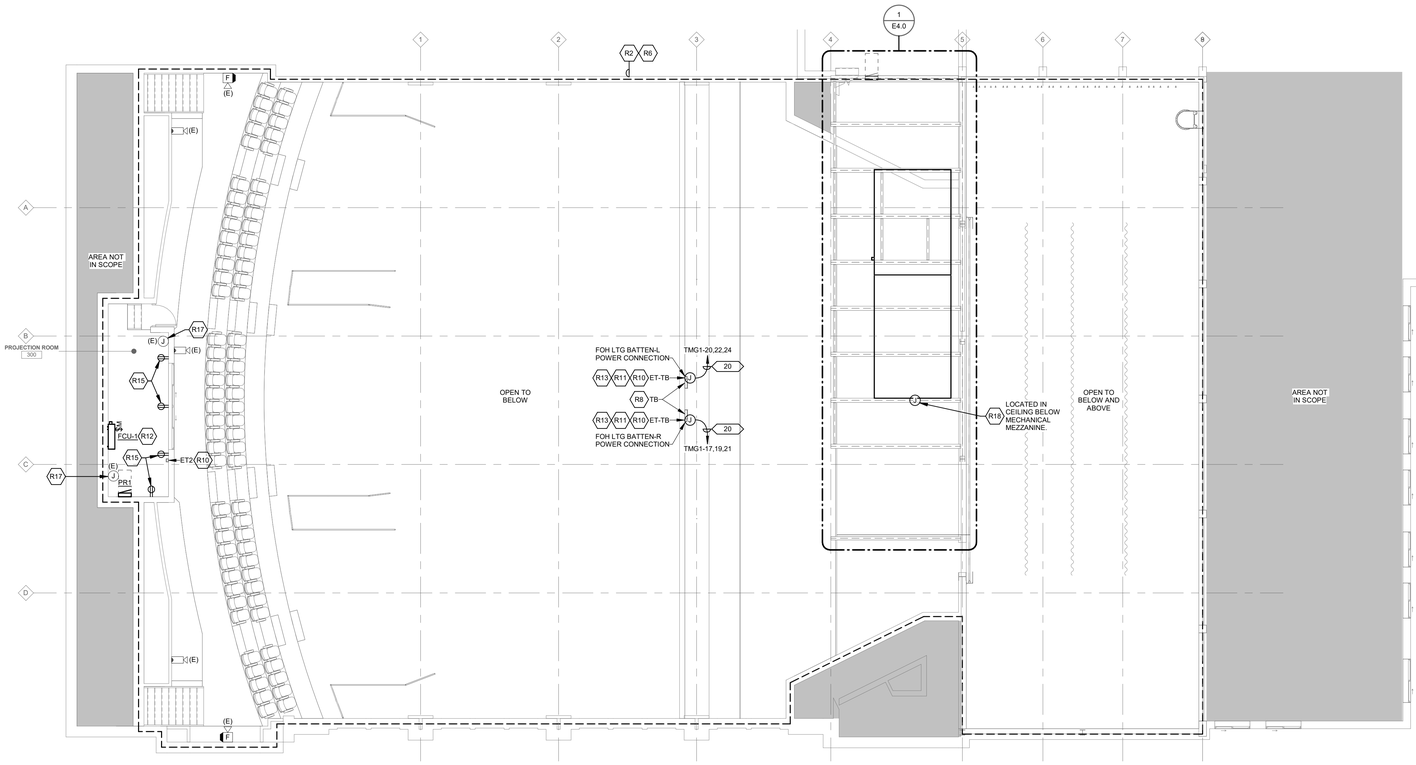
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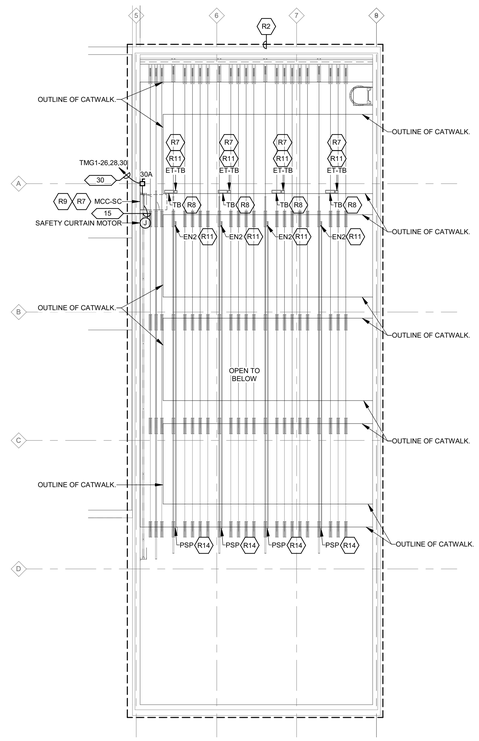
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NOTE: ELECTRICAL CONTRACTOR TO REFER TO AUDITORIUM TECHNICAL SYSTEMS SHEETS WITHIN BUILDING SET FOR FULL SCOPE OF ELECTRICAL WORK RELATED TO AUDITORIUM CONSTRUCTION INCLUDING BUT NOT LIMITED TO: REQUIRED CONDUIT SIZES AND PATHS; THEATRICAL LIGHTING LOCATIONS, CONTROL WIRING, AND CIRCUITING; THEATRICAL EQUIPMENT REQUIREMENTS AND LOCATIONS; AND ALL ROUGH IN WORK INCLUDING BOX TYPES, MOUNTING HEIGHTS, AND EXACT LOCATIONS FOR ALL DIVISION 26 WORK WITHIN SPACE.



THIRD FLOOR POWER PLAN
SCALE: 1/8" = 1'-0"



STAGE CATWALK POWER PLAN
SCALE: 1/8" = 1'-0"

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LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

STATE OF MICHIGAN
SCOTT E. TOWNSEND
ENGINEER
No. 6201050400
PROFESSIONAL
11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

KEY PLAN

JOB NO. 2616.11

N

SHEET TITLE

THIRD FLOOR & STAGE CATWALK POWER PLANS

SHEET NO.

EP1.3

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4000 W. Eleven Mile Road Berkley, MI 48072
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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. ALL NEW 15- AND 20-AMPERE, 125- AND 250-VOLT NONLOCKING-TYPE RECEPTACLES TO BE LISTED TAMPER-RESISTANT TYPE THROUGHOUT THIS SCHOOL. EXCEPTIONS TO THIS INCLUDE RECEPTACLES LOCATED MORE THAN 5.5 FEET ABOVE THE FLOOR AND SINGLE OR DUPLEX RECEPTACLES FOR DEDICATED APPLIANCES THAT ARE NOT READILY ACCESSIBLE. ANY EXISTING RECEPTACLES THAT ARE INCLUDED IN THE SCOPE OF RENOVATION WORK SHALL BE UPDATED PER NEW RECEPTACLE NOTES ABOVE AS WELL.

POWER KEYNOTES

R1 PROVIDE NEW PULLBOX MOUNTED ON WALL ABOVE RELOCATED PANEL EBCP-17 FOR USE IN EXTENDING FEEDERS. COORDINATE FINAL SIZE AND LOCATION WITH EXISTING CONDITIONS.

R2 ELECTRICAL CONTRACTOR TO PROVIDE EQUIPMENT INTERCONNECTING LINE VOLTAGE, DMX AND/OR LOW VOLTAGE WIRE AND CONDUIT FOR THEATRICAL AND ELECTRICAL DEVICES. REFER TO THEATER DRAWING FOR ADDITIONAL INFORMATION AND ELECTRICAL CONTRACTOR SCOPE.

R3 EQUIPMENT DISCONNECT PROVIDED BY MANUFACTURER. EC TO PROVIDE POWER CONNECTION FOR EQUIPMENT AS INDICATED. COORDINATE INSTALLATION WITH MECHANICAL TRADES AND FINAL EQUIPMENT SUBMITTAL POWER REQUIREMENTS.

R4 PROVIDE NEW RECESSED RECEPTACLES. EXTEND EXISTING BRANCH CIRCUIT FEED TO NEW LOCATION.

R5 EXTEND LIGHTING CIRCUITS FROM DEMOLISHED PANEL EXCP02 TO NEW THEATER PANEL TRP2. COORDINATE WITH EXISTING CONDITIONS. PROVIDE PULLBOXES AS REQUIRED. COORDINATE WITH THEATER CONTRACTOR PRIOR TO ROUGH-IN.

R6 PROVIDE NEW FACEPLATES AND RECEPTACLES IN-PLACE AT EXISTING TO REMAIN RECEPTACLES IN AREA INDICATED. MAINTAIN ALL EXISTING FIRE ALARM AUDIO AND VISUAL DEVICES, WAP AND SECURITY DEVICES.

R7 PROVIDE LOW VOLTAGE CABLE FROM INDICATED DEVICE TO PRODUCTION CONTROL PANEL. COORDINATE WITH THEATER DRAWINGS FOR MORE INFORMATION.

R8 PROVIDE ELECTRICAL CONNECTION TO POWERED THEATER DEVICE. COORDINATE WITH THEATER SET FOR ELECTRICAL ADDITIONAL INFORMATION.

R9 E.C. TO MAKE ALL FINAL CONNECTIONS BETWEEN MCC-SC AND SAFETY CURTAIN HOIST.

R10 PROVIDE DMX CABLE FROM INDICATED DEVICE TO PRODUCTION CONTROL PANEL. COORDINATE WITH THEATER DRAWINGS FOR MORE INFORMATION.

R11 PROVIDE LOW VOLTAGE CABLE FROM ET-TB TO EN DEVICE. REFER TO THEATRICAL DETAILS ON SHEET TL5.2 AND DIAGRAM ON TL6.1 FOR MORE INFORMATION.

R12 FCU-1 IS FED FROM CU-2 ON ROOF. PROVIDE INTERCONNECTING ELECTRICAL FEED. E.C. TO MAKE ALL 120/208V CONNECTION TERMINATIONS.

R13 PROVIDE DEVICE FEEDS THROUGH CATWALK. COORDINATE WITH ARCHITECTURAL AND STRUCTURAL PLANS.

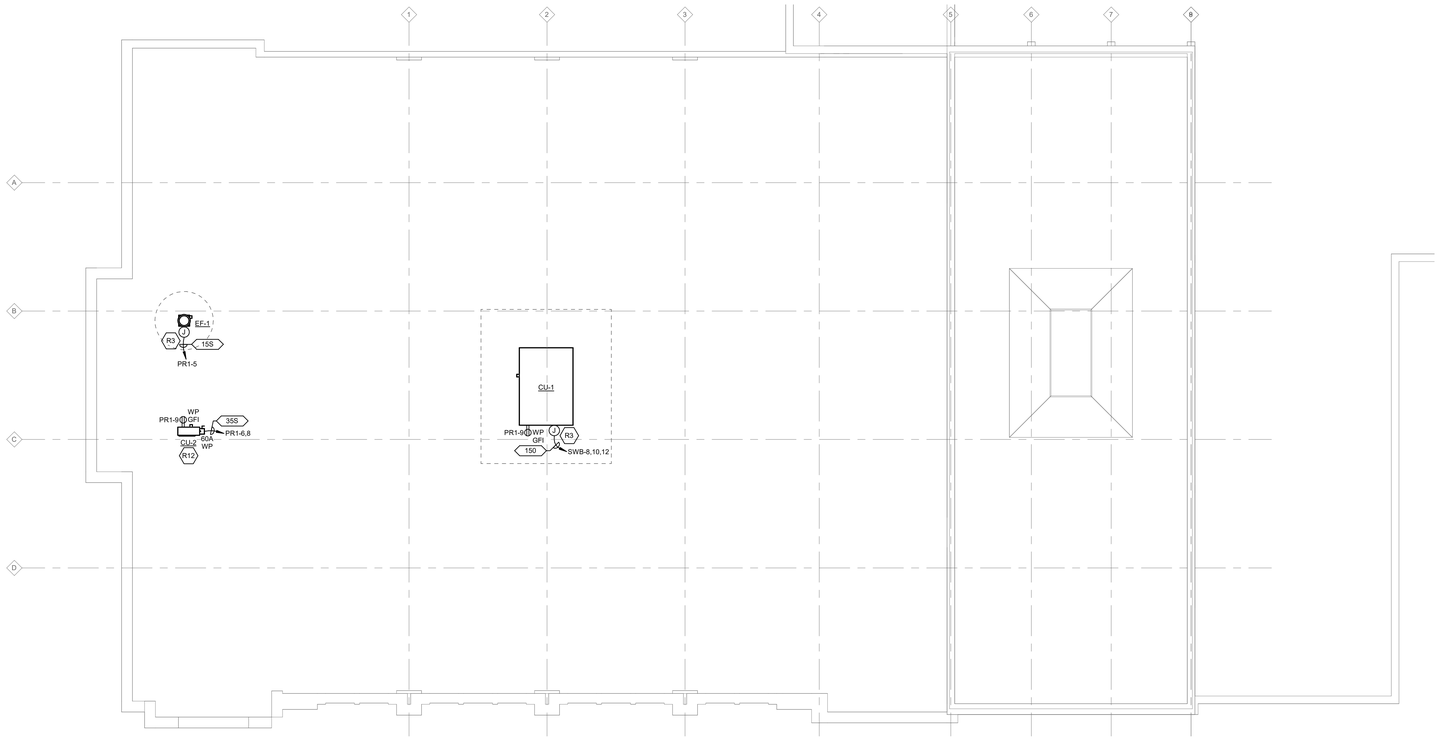
R14 PROVIDE POWER FROM TP1 FOR PSP DEVICE AS INDICATED IN THEATRICAL DRAWINGS. REFER TO THEATRICAL DETAILS ON SHEET TL5.3 AND DIAGRAM ON TL6.1 FOR MORE INFORMATION.

R15 REPLACE DEMOLISHED RECEPTACLE IN PLACE WITH NEW. PROVIDE NEW BLACK COVER PLATE.

R16 PROVIDE NEW RECESSED RECEPTACLE IN NEW STAGE SIDE WALL. COORDINATE INSTALLATION WITH MECHANICAL CONTRACTOR PRIOR TO ROUGH-IN.

R17 PROVIDE NEW COVER PLATES AT EXISTING TO REMAIN JUNCTION BOX.

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ROOF POWER PLAN
SCALE: 1/8" = 1'-0"

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ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

KEY PLAN

N

JOB NO. 2616.11

SHEET TITLE
ROOF POWER PLAN

SHEET NO.
EP1.4

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LIGHTING GENERAL NOTES

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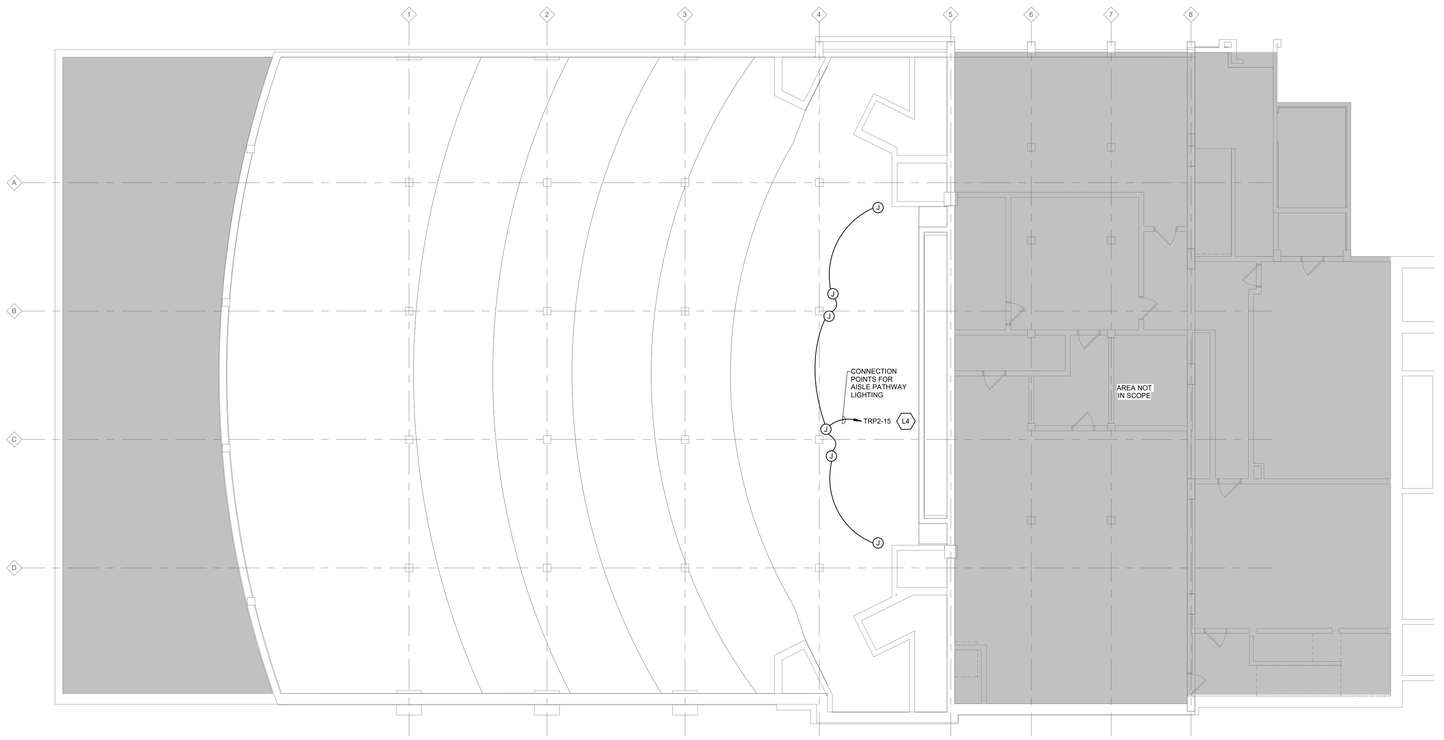
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L3 CONNECT NEW LUMINAIRES TO EXISTING CIRCUIT FEEDING THIS SPACE.

L4 PROVIDE ONE 60 WATT POWER SUPPLY. MODEL # ADUL-80-1-5-12-DIN. LOCATE IN LOWER LEVEL IN ADJACENT ACCESSIBLE SPACE TO J-BOXES.



LOWER LEVEL LIGHTING PLAN
SCALE: 1/8" = 1'-0"

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STATE OF MICHIGAN
SCOTT E. TOWNSEND
ENGINEER
No. 6201060400
PROFESSIONAL ENGINEER

11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

KEY PLAN

N

JOB NO. 2616.11

SHEET TITLE
LOWER LEVEL LIGHTING PLAN

SHEET NO.
EL1.0

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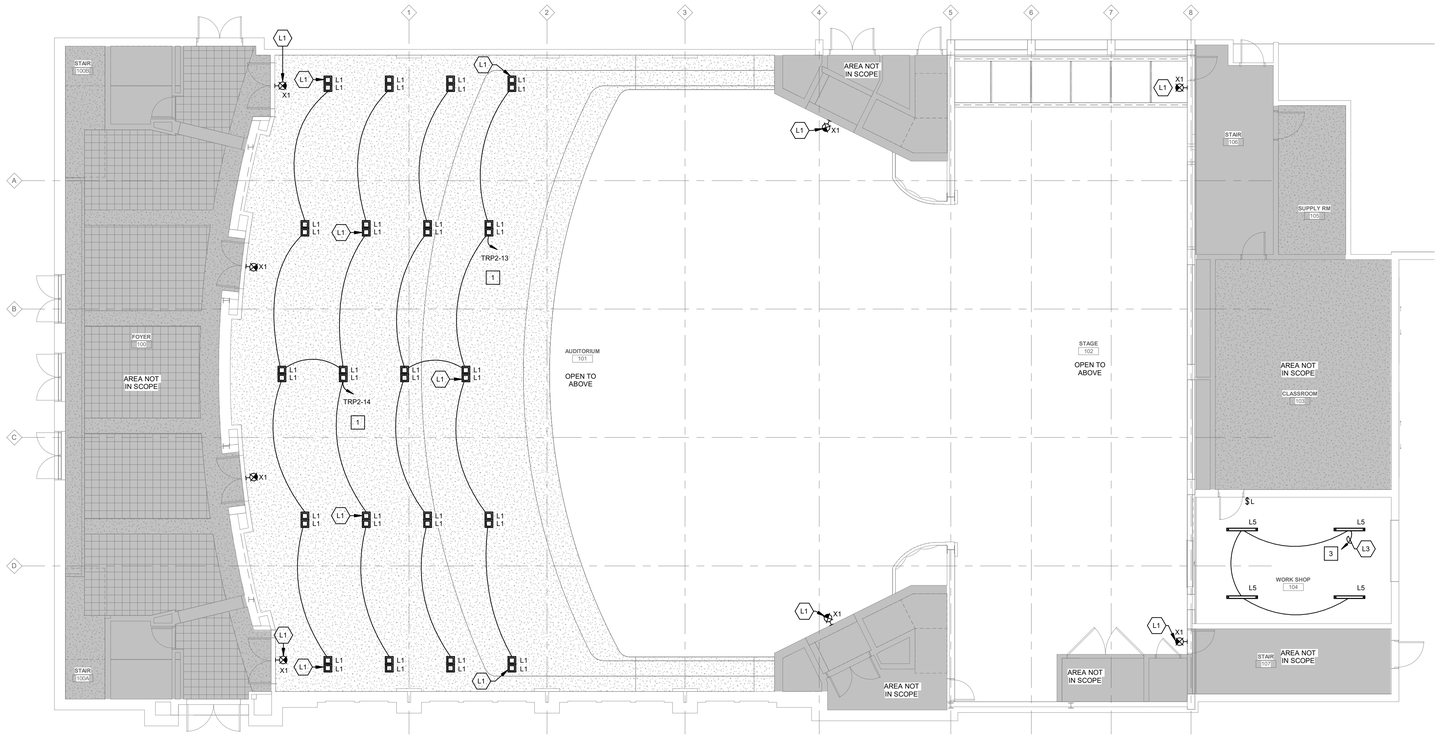
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FIRST FLOOR LIGHTING PLAN
SCALE: 1/8" = 1'-0"

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LANSING SCHOOL DISTRICT

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STATE OF MICHIGAN
SCOTT E. TOWNSEND
ENGINEER
No. 6201060400
PROFESSIONAL ENGINEER
11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

KEY PLAN

JOB NO. 2616.11

N

SHEET TITLE
FIRST FLOOR LIGHTING PLAN

SHEET NO.
EL1.1

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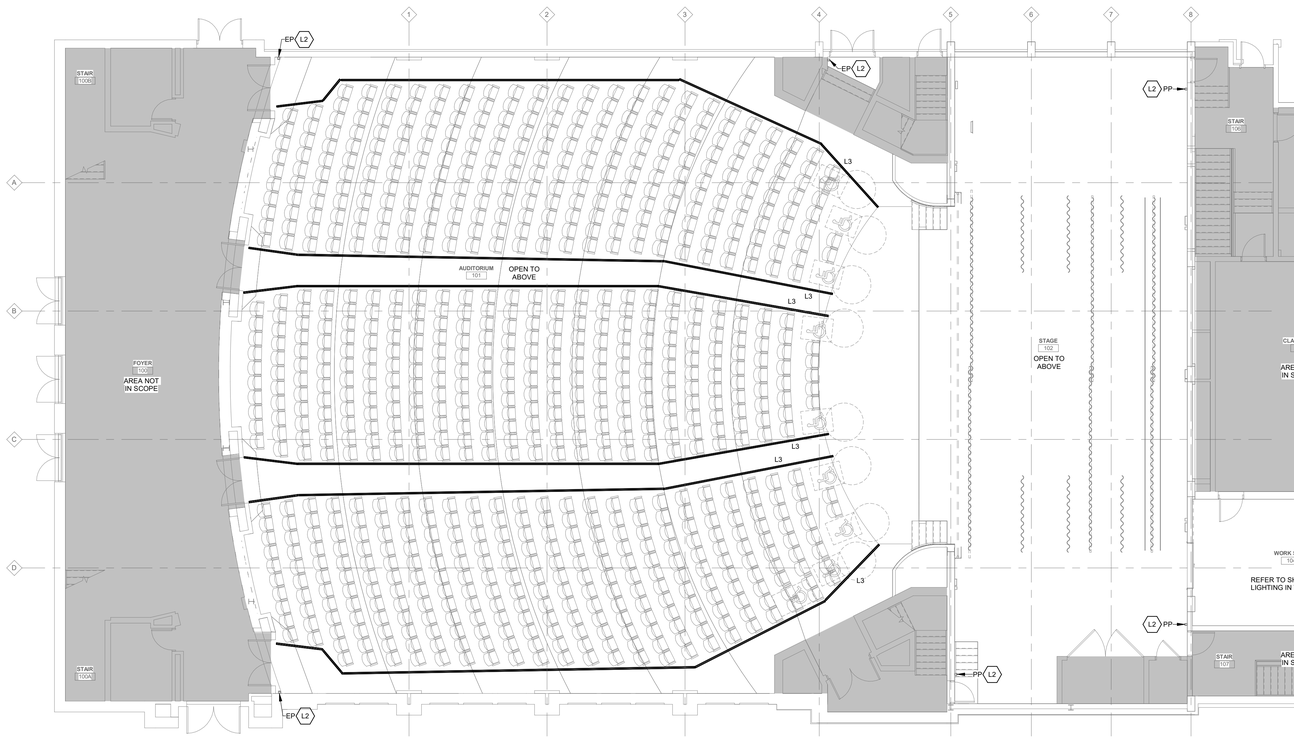
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FIRST FLOOR LIGHTING PLAN - FLOOR
SCALE: 1/8" = 1'-0"

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11/07/2025

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CONSTRUCTION DOCUMENTS	11.07.2025

KEY PLAN

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JOB NO. 2616.11

SHEET TITLE
FIRST FLOOR LIGHTING PLAN - FLOOR

SHEET NO.
EL1.1F

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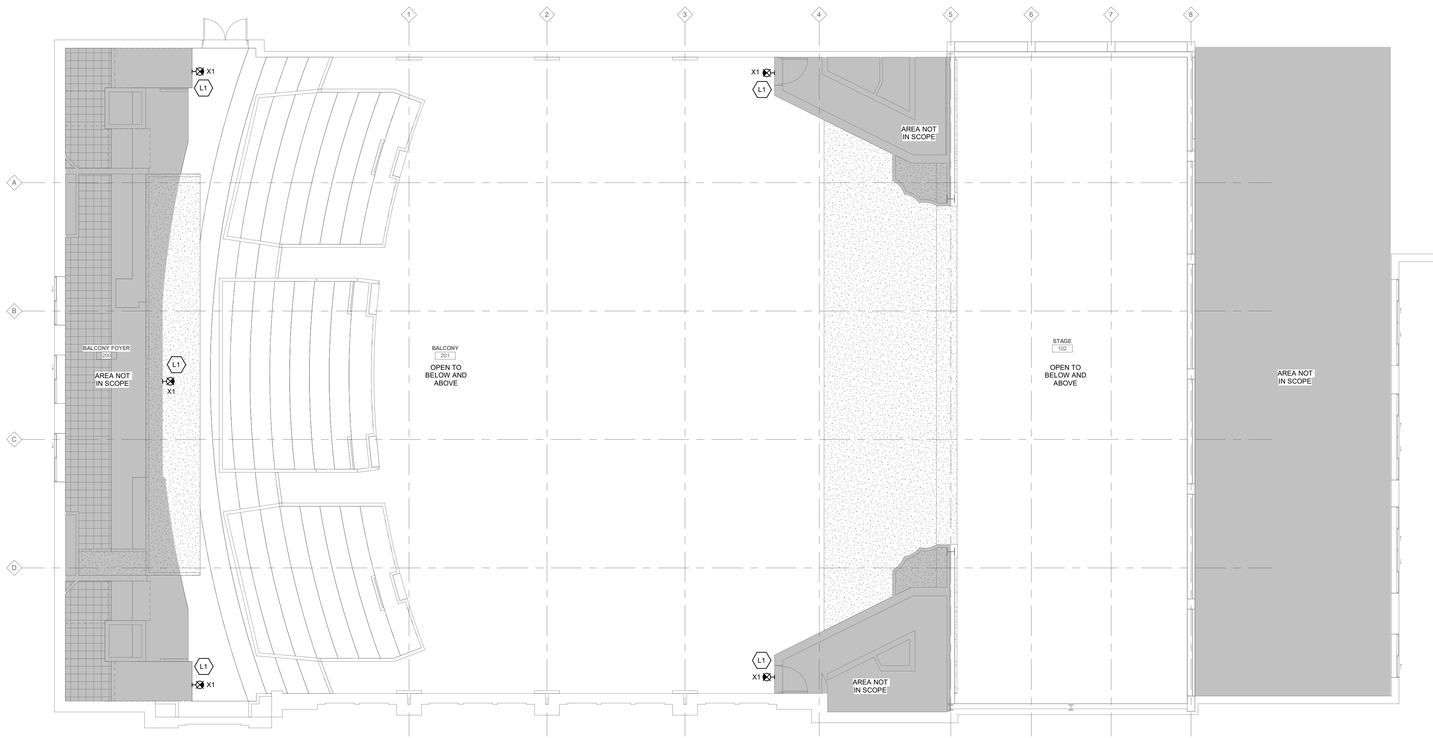
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SECOND FLOOR LIGHTING PLAN
SCALE: 1/8" = 1'-0"

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STATE OF MICHIGAN
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ENGINEER
No. 6201060400
PROFESSIONAL ENGINEER
11/07/2025

ISSUANCES	DATE
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KEY PLAN

JOB NO. 2616.11

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SHEET TITLE
SECOND FLOOR LIGHTING PLAN

SHEET NO.
EL1.2

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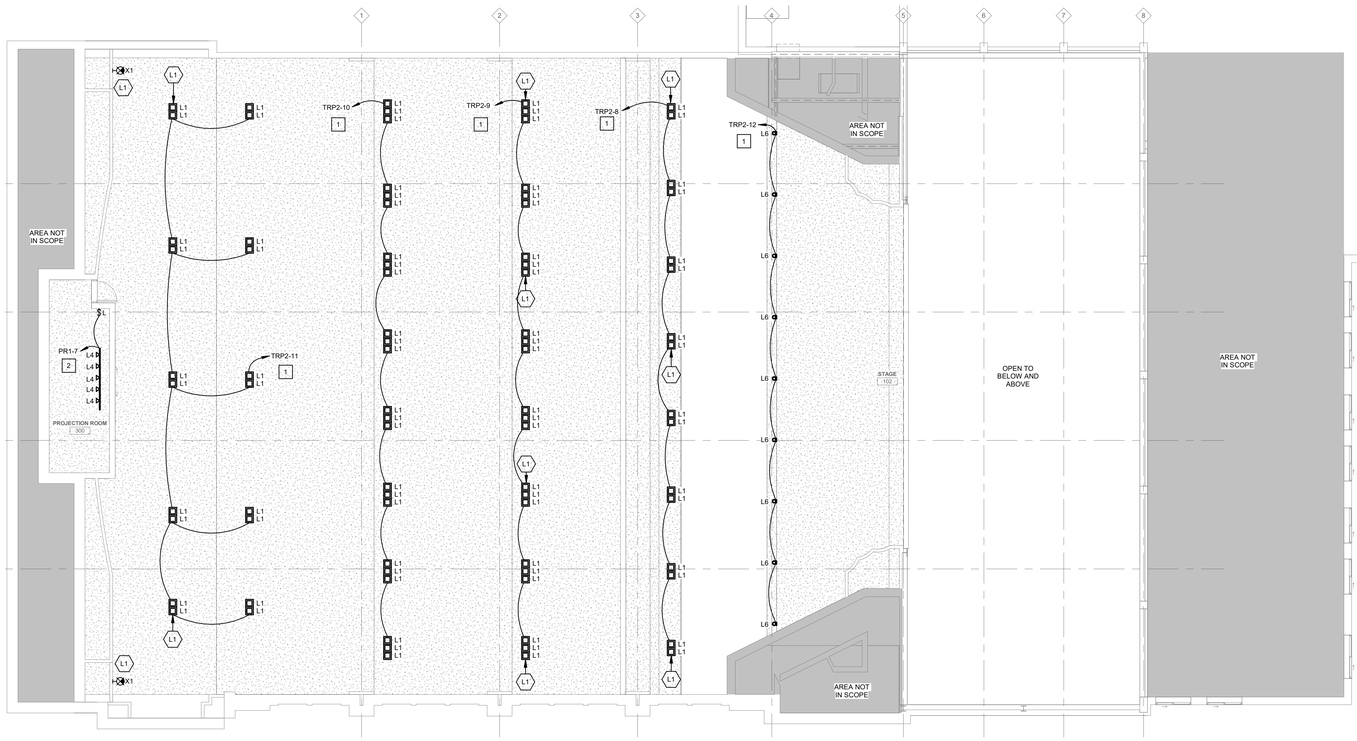
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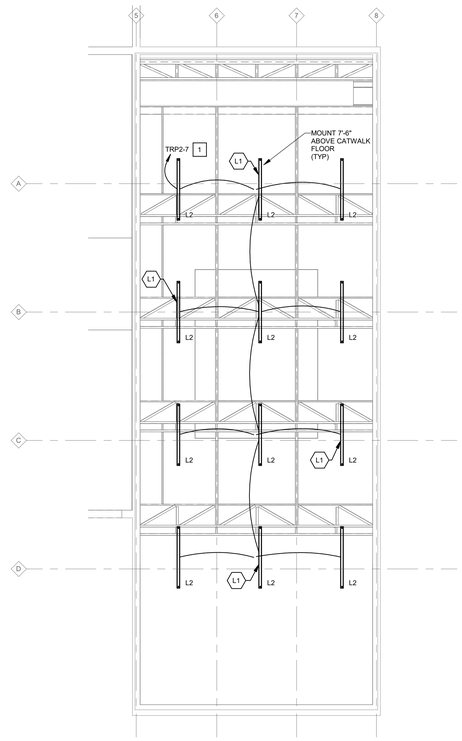
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THIRD FLOOR LIGHTING PLAN
SCALE: 1/8" = 1'-0"



STAGE CATWALK LIGHTING PLAN
SCALE: 1/8" = 1'-0"

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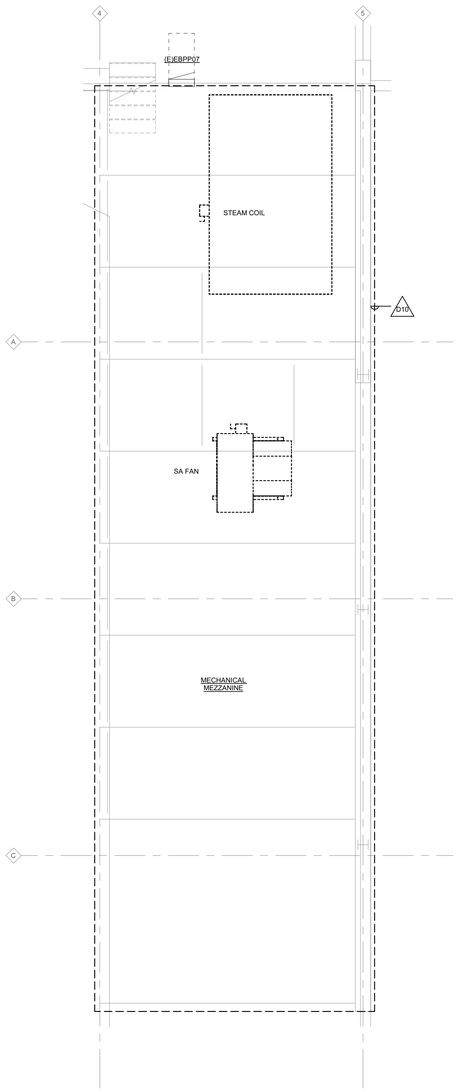
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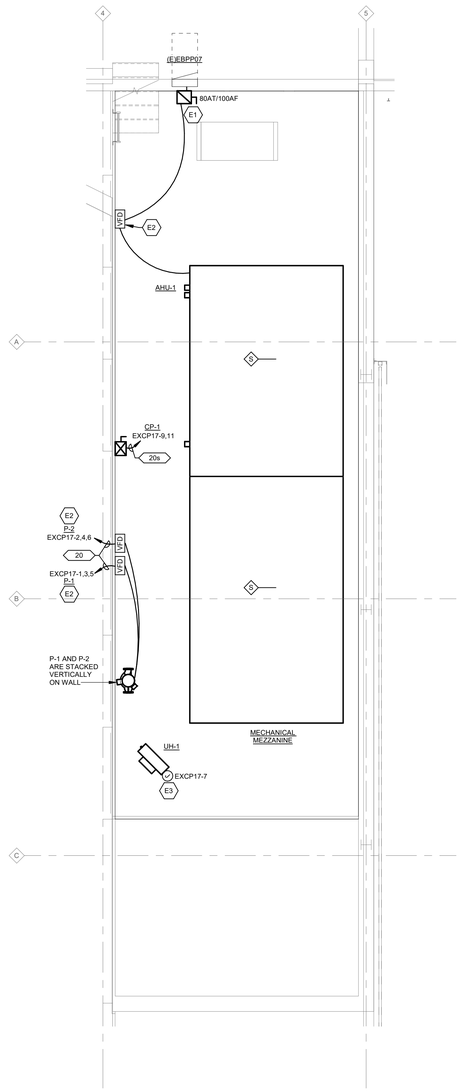
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2 ED1.3 ENLARGED MECHANICAL MEZZANINE POWER DEMOLITION PLAN
SCALE: 1/4" = 1'-0"



1 EP1.3 ENLARGED MECHANICAL MEZZANINE POWER PLAN
SCALE: 1/4" = 1'-0"

ELECTRICAL DEMOLITION NOTES

1. VISIT THE SITE PRIOR TO SUBMISSION OF BID TO EXAMINE THE EXISTING CONDITIONS AND THE EXTENT OF DEMOLITION WORK.
2. EXAMINE THE DRAWINGS OF OTHER TRADES, BE FAMILIAR WITH THE DEMOLITION REQUIRED BY OTHER TRADES.
3. PERFORM ALL INCIDENTAL ELECTRICAL DEMOLITION AND/OR RELOCATION OF DEVICES AND EQUIPMENT REQUIRED TO FACILITATE THE DEMOLITION WORK OF OTHER TRADES.
4. COORDINATE WITH NEW WORK PLANS, ONE LINE, AND RISER DIAGRAMS FOR EXTENT OF DEMOLITION WORK.
5. COORDINATE ANY SHUTDOWN OF EXISTING SERVICES AND EQUIPMENT REMAINING IN USE WITH OWNERS' REPRESENTATIVE. WHERE EXISTING BUILDING SERVICE IS REQUIRED TO BE SHUT DOWN, INCLUDE ALL ASSOCIATED OVERTIME COST TO PERFORM THIS WORK DURING EVENING AND WEEKENDS. INCLUDE ALL COSTS FOR PROVIDING TEMPORARY POWER.
6. REMOVE ALL CONDUIT AND WIRE BACK TO NEAREST UPSTREAM DEVICE REMAINING IN SERVICE.
7. WHERE DEMOLITION WORK AFFECTS ELECTRICAL SERVICE TO DOWNSTREAM DEVICES TO REMAIN; EXTEND CONDUIT AND WIRE AS REQUIRED TO MAINTAIN ELECTRICAL SERVICE.
8. PROVIDE BLANK COVER PLATES WHERE SWITCHES AND DEVICES ARE REMOVED AND WALL REMAINS INTACT. MARK ALL UNUSED CIRCUIT BREAKERS AS "SPARE".
9. CONTRACTOR TO TAG ALL CIRCUITS AT BOTH ENDS AFFECTED BY THIS SCOPE OF WORK.
10. CONTRACTOR SHALL PROVIDE UPDATED, TYPED-IN DIRECTORIES FOR ALL PANELS AFFECTED BY THIS SCOPE OF WORK.
11. CONTRACTOR SHALL VERIFY ALL UNDERGROUND AND IN-SLAB UTILITIES LOCATIONS PRIOR TO SAW CUTTING OR PENETRATING ANY FLOOR SLABS. CONTRACTOR SHALL REPAIR ALL UTILITIES DAMAGED BY SAW CUTTING.

ELECTRICAL DEMOLITION KEYNOTES

D1 REMOVE ALL EXISTING EXIT SIGNS, EMERGENCY BATTERY UNITS, AND LIGHT FIXTURES, ASSOCIATED CONTROL, OCCUPANCY SENSORS, WALL SWITCHES, AND WIRING BACK TO SOURCE. NEW LIGHTING TO BE FEED THROUGH THEATRICAL PANEL BY OTHERS. REFER TO LIGHTING PLANS FOR NEW WORK.

D2 DEMOLISH ELECTRICAL FEEDS TO SEATING AND FLOOR RECEPTACLES, COMPLETE BACK TO SOURCE. DEMOLISHED FLOOR PENETRATIONS AT RECEPTACLES AND CONDUIT STUBS TO BE FILLED.

D3 REMOVE ALL EXISTING POWER FOR CATWALK RIGGING COMPLETE BACK TO SOURCE.

D4 RECEPTACLE TO BE RELOCATED. DEMOLISH ELECTRICAL DEVICE AT THIS LOCATION. MAINTAIN EXISTING WIRING FOR EXTENSION TO NEW DEVICE LOCATION IN NEW WORK.

D5 DEMOLISH ALL ELECTRICAL RECEPTACLES, CONDUIT, WIREWAYS, AND PULLBOXES ON AND ATTACHED TO PLATFORM, COMPLETE BACK TO SOURCE.

D6 DEMOLISH DEVICE AND DEVICE COVER PLATE., MAINTAIN WIRING AND JUNCTION BOX FOR RE-CONNECTION AT SAME LOCATION IN NEW WORK.

D7 REMOVE WIRE AND CONDUIT COMPLETE BACK TO SOURCE FEEDING DEMOLISHED THEATRICAL LIGHTING.

D8 REMOVE WIRING AND CONDUIT BACK TO SOURCE. COORDINATE WITH ARCHITECTURAL FOR PATCH AND COVERING OF REMAINING WALL PENETRATION.

D9 REUSE EXISTING LOCAL NORMAL LIGHTING CIRCUIT FOR NEW LIGHT FIXTURES. EXTEND/REWORK EXISTING FEEDERS AND WIRE AS REQUIRED. CONNECT NEW LIGHT FIXTURES TO NEW LIGHT CONTROLS IN EXISTING JUNCTION BOXES AND PROTECTED IN DEMOLITION PHASE. PROVIDE NEW LOW VOLTAGE WIRING AS REQUIRED.

D10 COORDINATE WITH MECHANICAL TRADES TO DEMOLISH ALL WIRE AND CONDUIT FOR CONTROLS, DISCONNECTS, AND DEVICES COMPLETE BACK TO SOURCE FOR MECHANICAL EQUIPMENT BEING DEMOLISHED BY MECHANICAL TRADES.

D11 DEMOLISH JUNCTION BOX SERVING SPEAKER CLUSTER BEING RELOCATED BY THEATRICAL TRADES. MAINTAIN DURING WIRE DURING DEMOLITION FOR RE-USE IN NEW WORK.

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. ALL NEW 15- AND 20-AMPERE, 125- AND 250-VOLT NONLOCKING-TYPE RECEPTACLES TO BE LISTED TAMPER-RESISTANT TYPE THROUGHOUT THIS SCHOOL. EXCEPTIONS TO THIS INCLUDE RECEPTACLES LOCATED MORE THAN 5.5 FEET ABOVE THE FLOOR AND SINGLE OR DUPLEX RECEPTACLES FOR DEDICATED APPLIANCES THAT ARE NOT READILY ACCESSIBLE. ANY EXISTING RECEPTACLES THAT ARE INCLUDED IN THE SCOPE OF RENOVATION WORK SHALL BE UPDATED PER NEW RECEPTACLE NOTES ABOVE AS WELL.

ELECTRICAL ENLARGED KEYNOTES

E1 PROVIDE FUSED DISCONNECT BETWEEN PANEL EBPP07-4 AND NEW MECHANICAL EQUIPMENT.

E2 EQUIPMENT VFD FURNISHED BY MANUFACTURER. EC TO PROVIDE POWER CONNECTION TO EQUIPMENT AS INDICATED. COORDINATE INSTALLATION WITH MECHANICAL TRADES AND FINAL EQUIPMENT SUBMITTAL POWER REQUIREMENTS.

E3 EQUIPMENT DISCONNECT PROVIDED BY MANUFACTURER. EC TO PROVIDE POWER CONNECTION FOR EQUIPMENT AS INDICATED. COORDINATE INSTALLATION WITH MECHANICAL TRADES AND FINAL EQUIPMENT SUBMITTAL POWER REQUIREMENTS.

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J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

STATE OF MICHIGAN
SCOTT E TOWNSEND
ENGINEER
No. 6201050400
PROFESSIONAL ENGINEER

11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

JOB NO. 2616.11

SHEET TITLE
ENLARGED POWER PLANS

SHEET NO.
E4.0

Strategic Energy Solutions®
4000 W. Eleven Mile Road Berkley, MI 48072
Phone 248.399.1900 Fax 248.399.1901
www.sesnet.com

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PANEL NAME: PR1

PANEL LOCATION: PROJECTION ROOM 300
ENCLOSURE: TYPE 1
MOUNTING: RECESSED

MAIN: MLO
BUSSING: 125 A
GROUND BUS: STANDARD
NEUTRAL: 100.00%

VOLTAGE: 120/208 Single
PHASE: 1
WIRE: 3
MIN A.I.C. RATING: 22K

CKT	DESCRIPTION	BKR SIZE	P	A		B		C		P	BKR SIZE	DESCRIPTION	CKT
1	(E)BLACK BOX	30 A	1	2160	500					1	15 A	(E)LTG - PROJECTION BOOTH	2
3	(E)BOARD	15 A	1			500	500			1	15 A	(E)SUBWOOFER/ CLUSTER	4
5	EF-1 - ROOF	15 A	1	264	2288								6
7	LTG - CONTROL ROOM	20 A	1			50	2288			2	35 A	CU-3 - ROOF	8
9	REC - ROOF MAINTENANCE	20 A	1	360	0					1	20 A	SPARE	10
11	SPARE	20 A	1			0	--			1	--	SPACE	12
13	SPARE	20 A	1	0	--					1	--	SPACE	14
15	SPACE	--	1			--	--			1	--	SPACE	16
17	SPACE	--	1	--	--					1	--	SPACE	18
19	SPACE	--	1			--	--			1	--	SPACE	20
21	SPACE	--	1	--	--					1	--	SPACE	22
23	SPACE	--	1			--	--			1	--	SPACE	24
		TOTAL LOAD:		5572 VA		3338 VA							
		TOTAL AMP:		51 A		32 A							

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED LOAD	PANEL TOTALS	
HVAC	4576 VA	100.00%	4576 VA		
Motor	264 VA	125.00%	330 VA	**CONNECTED LOAD:**	9 kVA
RECEPTACLE	360 VA	100.00%	360 VA	**DEMAND LOAD:**	9 kVA
POWER	3160 VA	100.00%	3160 VA	**TOTAL CONNECTED:**	43 A
LIGHTING	550 VA	125.00%	688 VA	**TOTAL DEMAND:**	44 A

NOTES:

(R)PANEL NAME: EXCP17

PANEL LOCATION: STAGE 102
ENCLOSURE: TYPE 1
MOUNTING: SURFACE

MAIN: MLO
BUSSING: 225 A
GROUND BUS: STANDARD
NEUTRAL: 100.00%

VOLTAGE: 120/208 Wye
PHASE: 3
WIRE: 4
MIN A.I.C. RATING: 22K

CKT	DESCRIPTION	BKR SIZE	P	A		B		C		P	BKR SIZE	DESCRIPTION	CKT
1				1321	1321								2
3	**P-1 - MECHANICAL MEZZANINE**	**20 A**	3			1321	1321			3	**20 A**	**P-2 - MECHANICAL MEZZANINE**	4
5								1321	1321				6
7	**REC & UH-1 - MECHANICAL MEZZANINE**	**20 A**	1	860	1200					1	**20 A**	**REC - PCP STAGE RACK**	8
9	**Motor**	**20 A**	2			1040	1200			1	**20 A**	**REC - PCP STAGE RACK**	10
11								1040	--	1	--	SPACE	12
13	FRONT OF THE HOUSE LEFT	20 A	1	1060	1060					1	20 A	EXISTING LOAD	14
15	FRONT OF STAGE	20 A	1			1060	1060			1	20 A	EXISTING LOAD	16
17	FROM OF STAGE RIGHT	20 A	1					1060	1060	1	20 A	EXISTING LOAD	18
19	EXISTING LOAD	20 A	1	1060	1060					1	20 A	EXISTING LOAD	20
21	BRICK STAGE LEFT WALL	20 A	1			1060	1060			1	20 A	EXISTING LOAD	22
23	PROP ROOM	20 A	1					1060	1060	1	20 A	EXISTING LOAD	24
25	EXISTING LOAD	20 A	1	1060	1060					1	20 A	EXISTING LOAD	26
27	EXISTING LOAD	20 A	1			1060	1060			1	20 A	EXISTING LOAD	28
29	EXISTING LOAD	20 A	1					1060	5572	2	60 A	PR1 (PROJECTION ROOM)	30
31	EXISTING LOAD	20 A	1	1060	3338								32
33	EXISTING LOAD	20 A	1			1060	0			2	100 A	**SPARE**	34
35	EXISTING LOAD	20 A	1					1060	0				36
37	**REC - FRONT OF STAGE**	20 A	1	360	0					3	60 A	**SPARE**	38
39	SPACE	--	1			--	0						40
41	SPACE	--	1					--	0				42
		TOTAL LOAD:		15820 VA		12302 VA		15614 VA					
		TOTAL AMP:		136 A		103 A		134 A					

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED LOAD	PANEL TOTALS	
HVAC	5076 VA	100.00%	5076 VA		
Motor	10270 VA	109.65%	11261 VA	**CONNECTED LOAD:**	44 kVA
RECEPTACLE	3480 VA	100.00%	3480 VA	**DEMAND LOAD:**	45 kVA
Spare	21200 VA	100.00%	21200 VA	**TOTAL CONNECTED:**	121 A
POWER	3160 VA	100.00%	3160 VA	**TOTAL DEMAND:**	125 A
LIGHTING	550 VA	125.00%	688 VA		

NOTES:
BREAKERS SHOWN AS BOLD ARE NEW. ALL OTHERS ARE EXISTING TO REMAIN.
DESCRIPTIONS SHOWN AS BOLD INDICATE NEW CIRCUITING AND CIRCUIT NAME.

PANEL NAME: TRP2

PANEL LOCATION: STAGE 102
ENCLOSURE: TYPE 1
MOUNTING: SURFACE

MAIN: 225 A
BUSSING: 225 A
GROUND BUS: STANDARD
NEUTRAL: 100.00%

VOLTAGE: 120/208 Wye
PHASE: 3
WIRE: 4
MIN A.I.C. RATING: 22K

CKT	DESCRIPTION	BKR SIZE	P	A		B		C		P	BKR SIZE	DESCRIPTION	CKT
1	**(E)LTG - EXIT LVL1	20 A	1	800	800					1	20 A	**(E)LTG - STAGE	2
3	**(E)LTG - EXIT LVL2	20 A	1			800	800			1	20 A	**(E)LTG - FOYER LVL2	4
5	**(E)LTG - WALKING LIGHTS - BALCONY	20 A	1					800	800	1	20 A	**(E)LTG - STAIRWAY	6
7	H LTG - STAGE LIGHTS	20 A	1	1104	880					1	20 A	H LTG - UPPER 1ST ROW FROM STAGE L1's	8
9	H LTG - UPPER 2ND ROW FROM STAGE L1's	20 A	1			1320	1320			1	20 A	H LTG - UPPER 3RD ROW FROM STAGE L1's	10
11	H LTG - UPPER 4TH AND 5TH ROW FROM STAGE L1's	20 A	1					1100	252	1	20 A	H LTG - UPPER SOFFIT STAGE, WALL MNT.	12
13	H LTG - BELOW 2ND FL BALCONY 1ST, 2ND ROWS	20 A	1	1100	1100					1	20 A	H LTG - BELOW 2ND FL BALCONY 3RD, 4TH ROWS	14
15	H LTG - AISLE FLOOR TAPE LIGHTS	20 A	1			500	0			1	20 A	SPARE	16
17	SPARE	20 A	1					0	0	1	20 A	SPARE	18
19	SPACE	20 A	1	0	--					1	--	SPACE	20
21	SPACE	--	1			--	--			1	--	SPACE	22
23	SPACE	--	1					--	--	1	--	SPACE	24
25	SPACE	--	1	--	--					1	--	SPACE	26
27	SPACE	--	1			--	--			1	--	SPACE	28
29	SPACE	--	1					--	--	1	--	SPACE	30
31	SPACE	--	1	--	--					1	--	SPACE	32
33	SPACE	--	1			--	--			1	--	SPACE	34
35	SPACE	--	1					--	--	1	--	SPACE	36
37	SPACE	--	1	--	--					1	--	SPACE	38
39	SPACE	--	1			--	--			1	--	SPACE	40
41									--	1	--	SPACE	42
		TOTAL LOAD:		5784 VA		4740 VA		2952 VA					
		TOTAL AMP:		50 A		42 A		25 A					

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED LOAD	PANEL TOTALS	
LIGHTING	13476 VA	125.00%	16845 VA		
				CONNECTED LOAD:	13 kVA
				DEMAND LOAD:	17 kVA
				TOTAL CONNECTED:	37 A
				TOTAL DEMAND:	47 A

NOTES:
**INDICATES EXISTING LIGHTING BRANCH CIRCUIT FEED EXTENDED FROM DEMOLISHED EXCP02 ON STAGE. REFER TO ED1.1 FOR MORE INFORMATION.

PANEL NAME: TLD1

PANEL LOCATION:
ENCLOSURE: TYPE 1
MOUNTING: FLOOR

MAIN: 800 A
BUSSING: 800 A
GROUND BUS: STANDARD
NEUTRAL: 200.00%

VOLTAGE: 120/208 Wye
PHASE: 3
WIRE: 4
MIN A.I.C. RATING: 22K

CKT	DESCRIPTION	BKR SIZE	P	A		B		C		P	BKR SIZE	DESCRIPTION	CKT
1				76667	19333								2
3	DR1 (THEATRICAL LIGHTING DIMMER RACK BY THEATRICAL CONTRACTOR)	600 A	3			76667	19333			3	225 A	TRP1 (THEATRICAL LIGHTING CONTROLLED BY THEATRICAL CONTRACTOR))	4
5								76667	19333				6
7				5784	0					1	20 A	SPARE	8
9	TRP2 (HOUSE LIGHTING)	225 A	3			4740	0			1	20 A	SPARE	10
11								2952	--	1	--	SPACE	12
13	SPARE	20 A	1	0	--					1	--	SPACE	14
15	SPARE	20 A	1			0	--			1	--	SPACE	16
17	SPACE	--	1					--	--	1	--	SPACE	18
19	SPACE	--	1	--	--					1	--	SPACE	20
21	SPACE	--	1			--	--			1	--	SPACE	22
23	SPACE	--	1					--	--	1	--	SPACE	24
25	SPACE	--	1	--	--					1	--	SPACE	26
27	SPACE	--	1			--	--			1	--	SPACE	28
29	SPACE	--	1					--	--	1	--	SPACE	30
31	SPACE	--	1	--	--					1	--	SPACE	32
33	SPACE	--	1			--	--			1	--	SPACE	34
35	SPACE	--	1					--	--	1	--	SPACE	36
37				0	--					1	--	SPACE	38
39	POWER SENSING BREAKER	15 A	3			0	--			1	--	SPACE	40
41								0	--	1	--	SPACE	42
		TOTAL LOAD:		101784 VA		100740 VA		98952 VA					
		TOTAL AMP:		850 A		842 A		825 A					

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED LOAD	PANEL TOTALS	
RECEPTACLE	288000 VA	51.74%	149000 VA		
LIGHTING	13476 VA	125.00%	16845 VA	**CONNECTED LOAD:**	301 kVA
				DEMAND LOAD:	166 kVA
				TOTAL CONNECTED:	837 A
				TOTAL DEMAND:	460 A

NOTES:

PANEL NAME: TMG1

PANEL LOCATION:
ENCLOSURE: TYPE 1
MOUNTING: SURFACE

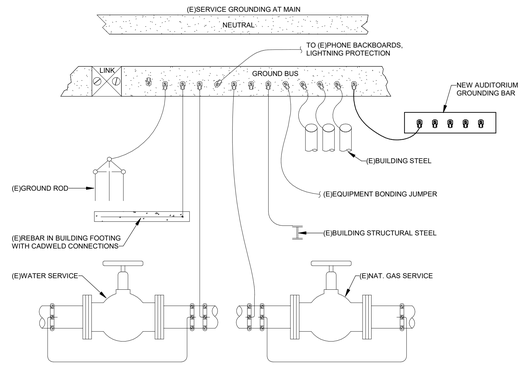
MAIN: 400 A
BUSSING: 400 A
GROUND BUS: STANDARD
NEUTRAL: 100.00%

VOLTAGE: 120/208 Wye
PHASE: 3
WIRE: 4
MIN A.I.C. RATING: 22K

CKT	DESCRIPTION	BKR SIZE	P	A		B		C		P	BKR SIZE	DESCRIPTION	CKT
1				7836	15820								2
3	EBCP60 - TICKET BOOTH	100 A	2			6880	12302			3	225 A	(R)EXCP17 - STAGE MEZZANINE	4
5								1321	15614				6
7	LS#4 - STAGE RIG MEZZANINE	20 A	3	1321	1321					1	20 A	LS#9 - STAGE RIG MEZZANINE	8
9						1321	1321			3			10
11								1321	1321				12
13	LS#14 - STAGE RIG MEZZANINE	20 A	3	1321	1321					1	20 A	LS#20 - STAGE RIG MEZZANINE	14
15						1321	1321			3			16
17								1321	1321				18
19	FOH LTG BATTEN-R - AUDITORIUM CEILING	20 A	3	1321	1321					1	20 A	FOH LTG BATTEN-L - AUDITORIUM CEILING	20
21						1321	1321			3			22
23	RIG POWER SUPPLY 1	20 A	1					1200	1321				24
25	RIG POWER SUPPLY 2	20 A	1	1200	2702					1	20 A	MCC-SC - STAGE WALL	26
27	INV1 - BASEMENT AUDI ELECTRICAL ROOM	20 A	2			678	2702			3	30 A		28
29								678	2702				30
31	SPARE	20 A	1	0	0					1	20 A	SPARE	32
33	SPACE	--	1			--	0			1	20 A	SPARE	34
35	SPACE	--	1					--	--	1	--	SPACE	36
37	SPACE	--	1	--	--					1	--	SPACE	38
39	SPACE	--	1			--	--			1	--	SPACE	40
41	SPACE	--	1					--	--	1	--	SPACE	42
		TOTAL LOAD:		35484 VA		30488 VA		28120 VA					
		TOTAL AMP:		299 A		257 A		234 A					

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED LOAD	PANEL TOTALS	
HVAC	5076 VA	100.00%	5076 VA		
Motor	32388 VA	103.06%	33379 VA	**CONNECTED LOAD:**	94 kVA
RECEPTACLE	5960 VA	100.00%	5960 VA	**DEMAND LOAD:**	98 kVA
Spare	21200 VA	100.00%	21200 VA	**TOTAL CONNECTED:**	261 A
POWER	17738 VA	100.00%	17738 VA	**TOTAL DEMAND:**	273 A
LIGHTING	12630 VA	125.00%	15768 VA		

NOTES:



NEUTRAL/GROUNDING SYSTEM
NO SCALE

KINGSCOTT
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J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

STATE OF MICHIGAN
SCOTT E TOWNSEND
ENGINEER
No. 6201050490
PROFESSIONAL

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JOB NO. 2616.11

SHEET TITLE
PANEL SCHEDULES AND DETAILS

SHEET NO.
E6.0

SES
Strategic Energy Solutions®
4000 W. Eleven Mile Road Berkley, MI 48072
Phone 248.399.1900 Fax 248.399.1901
www.sesnet.com

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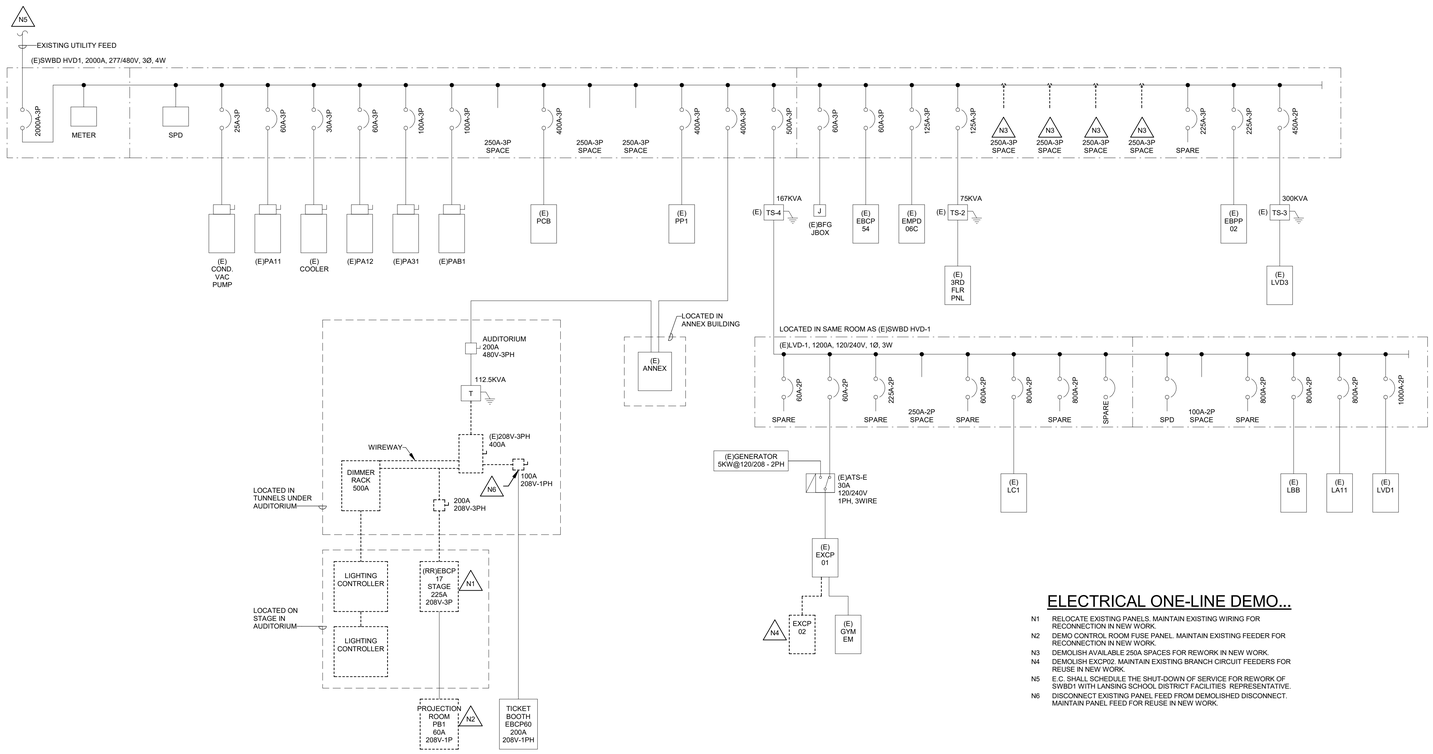
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DRY TYPE TRANSFORMER SCHEDULE - 480VD TO 208Y/120V

KVA	PRIMARY BREAKER OR FUSE	FEEDER (AMPS)	PRIMARY WIRE SIZE	SECONDARY BREAKER OR FUSE	FEEDER (AMPS)	SECONDARY WIRE SIZE
3	10A	10TP	3#12 & 1#12 GND IN 3/4"C	15A	15TS	4#12 & 1#12 GND IN 3/4"C
4.5	15A	15TP	3#12 & 1#12 GND IN 3/4"C	20A	20TS	4#12 & 1#12 GND IN 3/4"C
6	12A	12TP	3#12 & 1#12 GND IN 3/4"C	25A	25TS	4#10 & 1#10 GND IN 3/4"C
9	20A	20TP	3#12 & 1#12 GND IN 3/4"C	35A	35TS	4#8 & 1#10 GND IN 3/4"C
15	25A	25TP	3#10 & 1#10 GND IN 3/4"C	60A	60TS	4#6 & 1#10 GND IN 1"C
22	35A	35TP	3#8 & 1#10 GND IN 3/4"C	80A	80TS	4#4 & 1#8 GND IN 1 1/4"C
30	45A	45TP	3#8 & 1#10 GND IN 3/4"C	110A	110TS	4#2 & 1#6 GND IN 1 1/4"C
45	70A	70TP	3#4 & 1#8 GND IN 1"C	175A	175TS	4#2/0 & 1#6 GND IN 2"C
75	125A	125TP	3#1 & 1#6 GND IN 1 1/4"C	300A	300TS	4-350 KCMIL & 1#4 GND IN 3"C
112.5	175A	175TP	3#2/0 & 1#6 GND IN 1 1/2"C	400A	400TS	4-500 KCMIL & 1#3 GND IN 3"C
150	225A	225TP	3#4/0 & 1#4 GND IN 2"C	600A	600TS	(2) 4-350 KCMIL & 1#1 GND IN 3"C
200	300A	300TP	3-350 KCMIL & 1#4 GND IN 2 1/2"C	700A	700TS	(2) 4-500 KCMIL & 1#1/0 GND IN 3 1/2"C
225	350A	350TP	3-500 KCMIL & 1#3 GND IN 3"C	800A	800TS	(2) 4-500 KCMIL & 1#1/0 GND IN 3 1/2"C
300	450A	450TP	(2) 3#4/0 & 1#2 GND IN 2"C	1000A	1000TS	(3) 4-500 KCMIL & 1#2/0 GND IN 3 1/2"C
400	600A	600TP	(2) 3-350 KCMIL & 1#1 GND IN 2 1/2"C	1200A	1200TS	(4) 4-350 KCMIL & 1#3/0 GND IN 3"C
500	800A	800TP	(2) 3-500 KCMIL & 1#1/0 GND IN 3"C	1600A	1600TS	(5) 4-500 KCMIL & 1#4/0 GND IN 3 1/2"C
750	1200A	1200TP	(4) 3-350 KCMIL & 1#3/0 GND IN 2 1/2"C	2500A	2500TS	(7) 4-500 KCMIL & 1-350 KCMIL GND IN 3 1/2"C

NOTES:

1. THE PRIMARY AND SECONDARY BREAKERS OR FUSES ARE LOCATED IN SWITCHBOARD OR PANELBOARD UNLESS SHOWN OTHERWISE.
2. THE SECONDARY NEUTRAL OF DRY-TYPE TRANSFORMERS SHALL BE GROUNDED PER NATIONAL ELECTRICAL CODE AND LOCAL CODE.
3. THIS TRANSFORMER SCHEDULE IS A MASTER LIST. EVERY TRANSFORMER SIZE LISTED MAY NOT BE USED IN EVERY PACKAGE. SEE PLANS FOR ACTUAL SIZES USED.

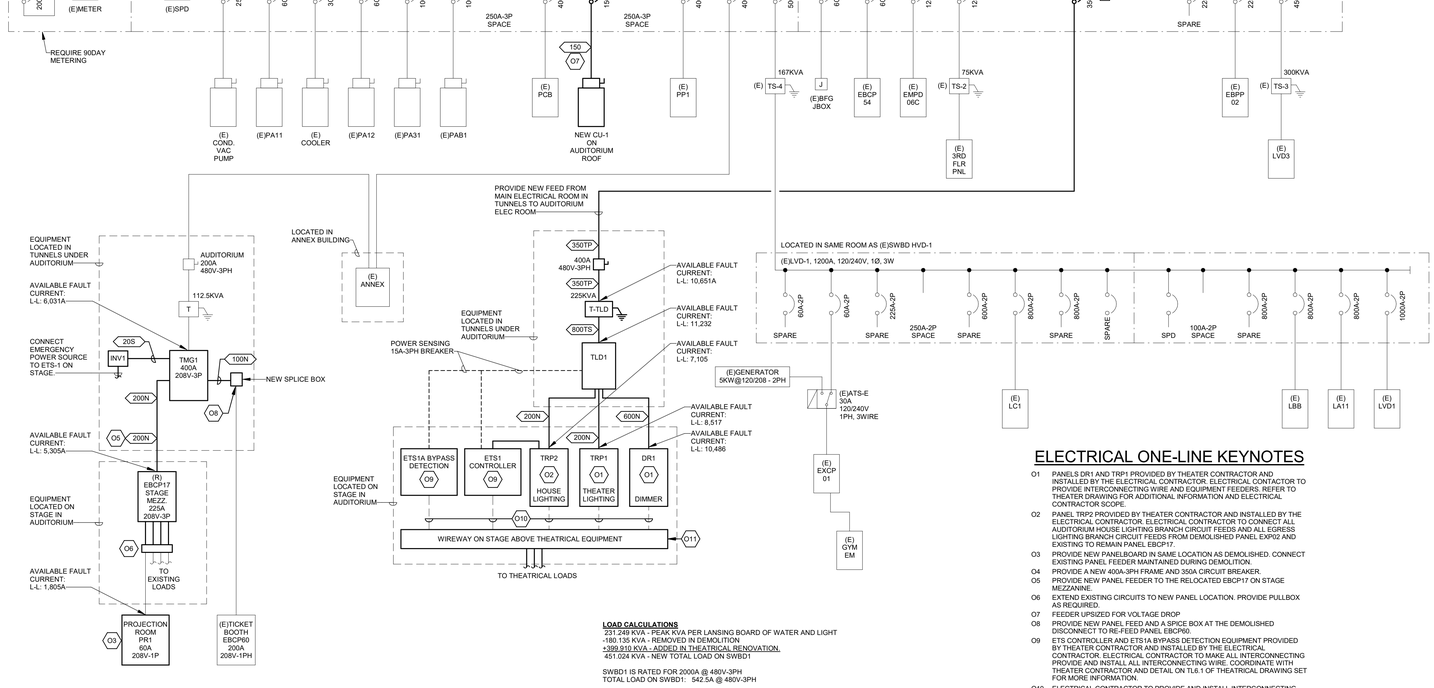


ELECTRICAL ONE-LINE DIAGRAM - DEMOLITION

NO SCALE

ELECTRICAL ONE-LINE DEMO...

- N1 RELOCATE EXISTING PANELS. MAINTAIN EXISTING WIRING FOR RECONNECTION IN NEW WORK.
- N2 DEMO CONTROL ROOM FUSE PANEL. MAINTAIN EXISTING FEEDER FOR RECONNECTION IN NEW WORK.
- N3 DEMOLISH AVAILABLE 250A SPACES FOR REWORK IN NEW WORK.
- N4 DEMOLISH EXCP02. MAINTAIN EXISTING BRANCH CIRCUIT FEEDERS FOR REUSE IN NEW WORK.
- N5 E.C. SHALL SCHEDULE THE SHUT-DOWN OF SERVICE FOR REWORK OF SWBD1 WITH LANSING SCHOOL DISTRICT FACILITIES REPRESENTATIVE.
- N6 DISCONNECT EXISTING PANEL FEED FROM DEMOLISHED DISCONNECT. MAINTAIN PANEL FEED FOR REUSE IN NEW WORK.



LOAD CALCULATIONS
231.249 KVA - PEAK KVA PER LANSING BOARD OF WATER AND LIGHT
-180.135 KVA - REMOVED IN DEMOLITION
+399.910 KVA - ADDED IN THEATRICAL RENOVATION.
451.024 KVA - NEW TOTAL LOAD ON SWBD1

SWBD1 IS RATED FOR 2000A @ 480V-3PH
TOTAL LOAD ON SWBD1: 542.5A @ 480V-3PH

ELECTRICAL ONE-LINE DIAGRAM - NEW WORK

NO SCALE

ELECTRICAL ONE-LINE KEYNOTES

- O1 PANELS DR1 AND TRP1 PROVIDED BY THEATER CONTRACTOR AND INSTALLED BY THE ELECTRICAL CONTRACTOR. ELECTRICAL CONTACTOR TO PROVIDE INTERCONNECTING WIRE AND EQUIPMENT FEEDERS. REFER TO THEATER DRAWING FOR ADDITIONAL INFORMATION AND ELECTRICAL CONTRACTOR SCOPE.
- O2 PANEL TRP2 PROVIDED BY THEATER CONTRACTOR AND INSTALLED BY THE ELECTRICAL CONTRACTOR. ELECTRICAL CONTRACTOR TO CONNECT ALL AUDITORIUM HOUSE LIGHTING BRANCH CIRCUIT FEEDS AND ALL EGRESS LIGHTING BRANCH CIRCUIT FEEDS FROM DEMOLISHED PANEL EXP02 AND EXISTING TO REMAIN PANEL EBCP17.
- O3 PROVIDE NEW PANELBOARD IN SAME LOCATION AS DEMOLISHED. CONNECT EXISTING PANEL FEEDER MAINTAINED DURING DEMOLITION.
- O4 PROVIDE A NEW 400A-3PH FRAME AND 350A CIRCUIT BREAKER.
- O5 PROVIDE NEW PANEL FEEDER TO THE RELOCATED EBCP17 ON STAGE MEZZANINE.
- O6 EXTEND EXISTING CIRCUITS TO NEW PANEL LOCATION. PROVIDE PULLBOX AS REQUIRED.
- O7 FEEDER UPSIZED FOR VOLTAGE DROP
- O8 PROVIDE NEW PANEL FEED AND A SPICE BOX AT THE DEMOLISHED DISCONNECT TO RE-FEED PANEL EBCP60.
- O9 ETS CONTROLLER AND ETS1A BYPASS DETECTION EQUIPMENT PROVIDED BY THEATER CONTRACTOR AND INSTALLED BY THE ELECTRICAL CONTRACTOR. ELECTRICAL CONTRACTOR TO MAKE ALL INTERCONNECTING PROVIDE AND INSTALL ALL INTERCONNECTING WIRE. COORDINATE WITH THEATER CONTRACTOR AND DETAIL ON TL6.1 OF THEATRICAL DRAWING SET FOR MORE INFORMATION.
- O10 ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL INTERCONNECTING BELDEN DMX WIRE. REFER TO THEATRICAL DRAWINGS TL6.1 FOR MORE INFORMATION.
- O11 WIREWAY PROVIDED AND INSTALLED BY ELECTRICAL CONTRACTOR.

THESE DRAWINGS AND THE WORK REPRESENTED THEREIN ARE THE PROPERTY OF AND CONTROLLED BY KINGSCOTT ASSOCIATES AND MAY NOT BE USED OR REPRODUCED WITHOUT PERMISSION.
LAST PRINTED: 11/7/2025 3:37:14 PM
Autodesk Docs://SD Sexton HS Auditorium Improvements/25 0588 18_LSD Sexton HS Auditorium Revit_MEP_2025.rvt

KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

J.W. Sexton HS Auditorium Remodel

LANSING SCHOOL DISTRICT

102 McPherson Ave, Lansing, MI 48915

STATE OF MICHIGAN
SCOTT E. TOWNSEND
ENGINEER
No. 6201050400
PROFESSIONAL
11/07/2025

ISSUANCES	DATE
DESIGN DEVELOPMENT	08.08.2025
CONSTRUCTION DOCUMENTS	11.07.2025

Strategic Energy Solutions®
4000 W. Eleven Mile Road Berkley, MI 48072
Phone 248.399.1900 Fax 248.399.1901
www.sesnet.com
© 2025 SES, INC.
SES Project # 25 0588 18

JOB NO. 2616.11

SHEET TITLE
ELECTRICAL RISER DIAGRAM

SHEET NO.
E7.0

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PURFR016 – 7/7/08 – Version 5

LANSING SCHOOL DISTRICT
PURCHASING DEPARTMENT
519 W. KALAMAZOO ST., ROOM 200
LANSING MI 48933
(517) 755-3030
FAX (517) 755-3019

SUPPLIER/VENDOR APPLICATION
(Please type or print)

MARK ONE:
☐ New Application
☐ Update
Date: _____

W-9 form attached? ☐ YES ☐ NO

DUN & BRADSTREET RATING (if available)

NAME OF COMPANY	**FEDERAL ID NUMBER (OR) SOCIAL SECURITY NUMBER** **Submit copy of W-9 form with application**
ADDRESS TO WHICH BIDDING FORMS AND PURCHASE ORDERS ARE TO BE MAILED – STREET NO., CITY, STATE, ZIP CODE	
ADDRESS TO WHICH PAYMENTS ARE TO BE MAILED – STREET NO., CITY, STATE, ZIP CODE	
PARENT COMPANY AND ADDITIONAL OFFICE LOCATIONS IN MICHIGAN (May attach separate sheet)	
E-MAIL ADDRESS: **For Purchase orders to be emailed**	**WEB SITE:**
TYPE OF ORGANIZATION **☐Individual ☐Partnership ☐Corporation**	**TELEPHONE #:** _____ **FACSIMILIE #:** _____

PERSONS TO CONTACT AND THOSE AUTHORIZED TO SIGN BIDS AND CONTRACTS IN YOUR NAME (if agent, so specify)

Name	Official Capacity	Telephone No.

PLEASE LIST ON THE REVERSE SIDE CLASSES OF EQUIPMENT, SUPPLIES, MATERIALS, AND/OR SERVICES ON WHICH YOU DESIRE TO BID.

☐ Do you require a hard copy of verbal orders? Yes ____ No _____ Do you accept Procurement Cards? Yes _____ No _____

☐ Electronic Disk Catalog ☐ Electronic Ordering

Please complete the following:
STANDARD PAYMENT TERMS: _____ PROMPT PAY DISCOUNT: _____ STANDARD DELIVERY TIME:_____

PLEASE COMPLETE BELOW

Please list percentage and circle category that applies:

MINORITY OWNED: _____% Native-American Asian-Pacific American African-American Hispanic-American Asian-Indian American

WOMEN OWNED: _____% White Native-American Asian-Pacific American African-American Hispanic-American Asian-Indian American

DISABLED: _____% SMALL BUSINESS: Yes _____ No _____
Business located within LANSING SCHOOL District Yes ____ No_____

Are you certified? If so, list agencies _____ Certificate Number: _____

SIGNATURE OF PERSON AUTHORIZED TO SIGN THIS APPLICATION
_____

NAME AND TITLE OF PERSON SIGNING (Please type or print)
_____

COMMODITY LIST

Please place a checkmark (√) by the appropriate code and provide a detailed description of the commodities and/or services offered. If the complete NAICS Code is known please include this number in the description area.
Website URL address for NAICS is: http://www.census.gov/epcd/www/naics.html

NAICS CODE ***DESCRIPTION***

____11 – Agriculture, Forestry, Fishing and Hunting

____21 – Mining

____22 – Utilities

____23 – Construction

____31-33 – Manufacturing

____42 – Wholesale Trade

____44-45 – Retail Trade

____48-49 – Transportation and Warehousing

____51 – Information

____52 – Finance and Insurance

____53 – Real Estate and Rental and Leasing

____54 – Professional, Scientific and Technical Services

____55 – Management of Companies and Enterprises

____56 – Administrative & Support, Waste Management & Remediation Services

____61 – Educational Services

____62 – Health Care and Social Assistance

____71 – Arts, Entertainment and Recreation

____72 – Accommodation and Foodservices

____81 – Other Services (except Public Administration)

____92 – Public Administration

____99 – Unclassified Establishments

CATEGORY (Check below the category which applies to the applicant)
☐ (A) Manufacturer or Producer ☐ (B) Wholesaler ☐ (C) Retailer ☐ (D) Mfgr's Agent ☐ (E) Distributor
☐ (F) Service Establishment

Committed to Quality

STATEMENT OF NO BID

NOTE: IF YOU DO NOT INTEND TO BID, PLEASE RETURN THIS FORM ONLY TO:

Lansing School District
519 W KALAMAZOO ST
LANSING, MI 48933

BID NO: #_____

PHONE: 517-755-3030
FAX: 517-755-3019

We, the undersigned, have declined to bid on the above noted bid for the following reasons:

_____ Insufficient time to respond to the invitation to Bid.

_____ Request for Proposal I unclear.

_____ Do not offer this product or service.

_____ Our schedule will not permit us to perform.

_____ Unable to meet the specifications

_____ Specifications are unclear (Please explain below)

_____ Remove us from your Bidder Mailing List

_____ Other (Please specify below)

REMARKS:

_____
_____
_____
_____

Company Name:_____
Signature:_____
Date: _____Telephone:_____Fax:_____

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: _____

Book	Policy Manual
Section	3000 Professional Staff
Title	NONDISCRIMINATION AND EQUAL EMPLOYMENT OPPORTUNITY
Code	po3122
Status	Active
Adopted	November 1, 2016
Last Revised	June 22, 2023

3122 - **NONDISCRIMINATION AND EQUAL EMPLOYMENT OPPORTUNITY**

The Board of Education does not discriminate on the basis of race, color, national origin, sex (including sexual orientation and gender identity), disability, age, religion, height, weight, marital or family status, military status, ancestry, genetic information, or any other legally protected category, (collectively, "Protected Classes"), in its programs and activities, including employment opportunities.

Definitions:

Words used in this policy shall have those meanings defined herein; words not defined herein shall be construed according to their plain and ordinary meanings.

Race is inclusive of traits historically associated with race, including, but not limited to, hair texture and protective hairstyles. For purposes of this definition, "protective hairstyles" includes, but is not limited to, such hairstyles as braids, locks, and twists.

Complainant is the individual who alleges, or is alleged, to have been subjected to unlawful discrimination/retaliation, regardless of whether the person files a formal complaint or is pursuing an informal resolution to the alleged discrimination/retaliation.

Respondent is the individual who has been alleged to have engaged in unlawful discrimination/retaliation, regardless of whether the Reporting Party files a formal complaint or is seeking an informal resolution to the alleged discrimination/retaliation.

School District community means students and Board employees (i.e., administrators, and professional and classified staff), as well as Board members, agents, volunteers, contractors, or other persons subject to the control and supervision of the Board.

Third Parties include, but are not limited to, guests and/or visitors on School District property (e.g., visiting speakers, participants on opposing athletic teams, parents), vendors doing business with, or seeking to do business with, the Board, and other individuals who come in contact with members of the School District community at school-related events/activities (whether on or off District property).

Day(s): Unless expressly stated otherwise, the term "day" or "days" as used in this policy means a business day(s) (i.e., a day(s) that the Board office is open for normal operating hours, Monday - Friday, excluding State-recognized holidays).

For purposes of this policy, "military status" refers to a person's status in the uniformed services, which includes the performance of duty, on a voluntary basis, or involuntary basis, in a uniformed service including active duty, active duty for training, initial active duty for training, inactive duty for training, full-time National Guard duty. It also includes the period of time for which a person is absent from employment for the purpose of an examination to determine the fitness of the person to perform any such duty as listed above.

District Compliance Officers

The Board designates the following individuals to serve as the District's "Compliance Officers" (also known as "Civil Rights Coordinators") (hereinafter referred to as the "COs").

Darin Walter
Title IX - Public Safety
517-755-2037
519 W Kalamazoo
Lansing, MI 48933
darin.walter@lansingschools.net

Erin Miracle
Human Resources Manager
517-755-2010
519 W Kalamazoo
Lansing, MI 48933
Erin.miracle@lansingschools.net

The names, titles, and contact information of these individuals will be published annually on the School District's website and in the staff handbooks, and in the School District Annual Report to the public

The COs are responsible for coordinating the District's efforts to comply with applicable Federal and State laws and regulations, including the District's duty to address in a prompt and equitable manner any inquiries or complaints regarding discrimination/retaliation or denial of equal access. The COs shall also verify that proper notice of nondiscrimination for Title II of the Americans with Disabilities Act (as amended), Title VI and Title VII of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973 (as amended), and the Age Discrimination in Employment Act of 1975 is provided to staff members and the general public. A copy of each of the Acts and regulations on which this notice is available upon request from the CO.

Reports and Complaints of Unlawful Discrimination and Retaliation

Employees are required to report incidents of unlawful discrimination and/or retaliation to an administrator, supervisor, or other District-level official so that the Board may address the conduct. Any administrator, supervisor, or other District-level official who receives such a report shall file it with the CO within two (2) days.

Employees who believe they have been unlawfully discriminated/retaliated against are entitled to utilize the complaint process set forth below. Initiating a complaint, whether formally or informally, will not adversely affect the Complainant's employment. While there are no time limits for initiating complaints under this policy, individuals should make every effort to file a complaint as soon as possible after the conduct occurs while the facts are known and potential witnesses are available.

The COs will be available during regular school/work hours to discuss concerns related to unlawful discrimination/retaliation. COs shall accept reports of unlawful discrimination/retaliation directly from any member of the School District community or a Third Party, or received reports that are initially filed with another Board employee. Upon receipt of a report of alleged discrimination/retaliation, the CO will contact the Complainant and begin either an informal or formal complaint process (depending on the Complainant's request and the nature of the alleged discrimination/retaliation), or the CO will designate a specific individual to conduct such a process. The CO will provide a copy of this policy to the Complainant and the Respondent. In the case of a formal complaint, the CO will prepare recommendations for the Superintendent or oversee the preparation of such recommendations by a designee. All members of the School District community must report incidents of discrimination/retaliation that are reported to them to the CO within two (2) business days of learning of the incident/conduct.

Any Board employee who directly observes unlawful discrimination/retaliation is obligated, in accordance with this policy, to report such observations to one of the COs within two (2) business days. Additionally, any Board employee who observes an act of unlawful discrimination/retaliation is expected to intervene to stop the misconduct, unless circumstances make such an intervention dangerous, in which case the staff member should immediately notify other Board employees and/or local law enforcement officials, as necessary, to stop the misconduct. Thereafter, the CO or designee must contact the Complainant within two (2) business days to advise of the Board's intent to investigate the alleged wrongdoing.

Investigation and Complaint Procedure (See Form 3122 F2)

Except for sex discrimination and/or Sexual Harassment that is covered by Policy 2266 - Nondiscrimination on the Basis of Sex in Education Programs or Activities, any employee who alleges to have been subjected to unlawful discrimination or retaliation may seek resolution of the complaint through the procedures described below. The formal complaint procedures

involve an investigation of the individual's claims of discrimination/retaliation and a process for rendering a decision regarding whether the charges are substantiated.

Due to the sensitivity surrounding complaints of unlawful discrimination or retaliation, timelines are flexible for initiating the complaint process; however, individuals are encouraged to file a complaint within thirty (30) days after the conduct occurs. Once the formal complaint process is begun, the investigation will be completed in a timely manner (ordinarily, within fifteen (15) business days of the complaint being received).

The procedures set forth below are not intended to interfere with the rights of any individual to pursue a complaint of unlawful discrimination or retaliation with the United States Department of Education Office for Civil Rights or Equal Employment Opportunity Commission ("EEOC").

Informal Complaint Procedure

The goal of the informal complaint procedure is to promptly stop inappropriate behavior and facilitate resolution through an informal means, if possible. The informal complaint procedure is provided as a less formal option for an employee who alleges unlawful discrimination or retaliation. This informal procedure is not required as a precursor to the filing of a formal complaint. The informal process is only available in those circumstances where the Complainant and the Respondent mutually agree to participate in it.

The Complainant may proceed immediately to the formal complaint process and individuals who participate in the informal procedure may request that the informal process be terminated at any time to move to the formal complaint process.

All complaints involving a District employee or any other adult member of the School District community and a student will be formally investigated.

As an initial course of action, if a Complainant feels comfortable and safe doing so, the individual should tell or otherwise inform the Respondent that the allegedly discriminatory/retaliatory conduct that it is inappropriate and must stop. The Complainant should address the alleged misconduct as soon after it occurs as possible. The COs are available to support and counsel the Complainant when taking this initial step or to intervene on behalf of the individual if requested to do so. A Complainant who is uncomfortable or unwilling to directly approach the Respondent about the inappropriate conduct may file an informal or a formal complaint. In addition, with regard to certain types of unlawful discrimination (e.g., sex discrimination), the CO may advise against the use of the informal complaint process.

A Complainant who alleges unlawful discrimination/retaliation may make an informal complaint, either orally or in writing: 1) to a building administrator; 2) directly to one of the COs; and/or 3) to the Superintendent or other District-level employee.

All informal complaints must be reported to one of the COs who will either facilitate an informal resolution as described below or appoint another individual to facilitate an informal resolution.

The School District's informal complaint procedure is designed to provide the Complainant with a range of options aimed at bringing about a prompt resolution of their concerns. Depending upon the nature of the complaint and the wishes of the Complainant, informal resolution may involve, but not be limited to, one or more of the following:

A. Advising the Complainant about how to communicate concerns to the Respondent.

B. Distributing a copy of Policy 3122 – Nondiscrimination and Equal Employment Opportunity to the individuals in the school building or office where the Respondent works.

C. If both parties agree, the CO may arrange and facilitate a meeting or mediation between the Complainant and the Respondent to work out a mutual resolution.

While there are no set time limits within which an informal complaint must be resolved, the CO or designee is directed to attempt to resolve all informal complaints within fifteen (15) business days of receiving the informal complaint. If the Complainant is dissatisfied with the informal complaint process, the Complainant may proceed to file a formal complaint and, as stated above, either party may request that the informal process be terminated at any time to move to the formal complaint process.

Formal Complaint Procedure

If a complaint is not resolved through the informal complaint process, if one of the parties requested that the informal complaint process be terminated to move to the formal complaint process, or if the Complainant, from the outset, elects to file a formal complaint, or the Compliance Officer(s) determines the allegations are not appropriate for resolution through the informal process, the formal complaint process shall be implemented.

A Complainant may file a formal complaint, either orally or in writing, with a principal, the CO, Superintendent, or other District official. Due to the sensitivity surrounding complaints of unlawful discrimination and retaliation, timelines are flexible for initiating the complaint process; however, individuals should make every effort to file a formal complaint within thirty (30) days after the conduct occurs. If a Complainant informs a principal, Superintendent, or other District official, either orally or in writing, about any complaint of discrimination/retaliation, that employee must report such information to the CO/designee within two (2) business days.

Throughout the course of the process, the CO should keep the parties reasonably informed of the status of the investigation and the decision-making process.

All formal complaints must include the following information to the extent known: the identity of the Respondent; a detailed description of the facts upon which the complaint is based (i.e., when, where, and what occurred); a list of potential witnesses; and the resolution sought by the Complainant.

If the Complainant is unwilling or unable to provide a written statement including the information set forth above, the CO shall ask for such details in an oral interview. Thereafter, the CO will prepare a written summary of the oral interview, and the Complainant will be asked to verify the accuracy of the reported charge by signing the document.

Upon receiving a formal complaint, the CO will consider whether any action should be taken in the investigatory phase to protect the Complainant from further discrimination or retaliation, including, but not limited to, a change of work assignment or schedule for the Complainant and/or the Respondent. In making such a determination, the CO should consult the Complainant to assess whether the individual agrees with the proposed action. If the Complainant is unwilling to consent to the proposed change, the CO may still take whatever actions deemed appropriate in consultation with the Superintendent.

Within two (2) business days of receiving the complaint, the CO or designee will initiate a formal investigation to determine whether the Complainant has been subjected to unlawful discrimination/retaliation.

Simultaneously, the CO will inform the Respondent that a formal complaint has been received. The Respondent will be informed about the nature of the allegations and provided with a copy of any relevant policies and/or administrative guidelines, including Policy 3122 - Nondiscrimination and Equal Employment Opportunity. The Respondent must also be informed of the opportunity to submit a written response to the formal complaint within five (5) days.

Although certain cases may require additional time, the CO or a designee will attempt to complete an investigation into the allegations of discrimination/retaliation within fifteen (15) business days of receiving the formal complaint. The investigation will include:

A. interviews with the Complainant;

B. interviews with the Respondent;

C. interviews with any other witnesses who may reasonably be expected to have any information relevant to the allegations;

D. consideration of any documentation or other information presented by the Complainant, Respondent, or any other witness that is reasonably believed to be relevant to the allegations.

At the conclusion of the investigation, the CO/designee shall prepare and deliver a written report to the Superintendent that summarizes the evidence gathered during the investigation and provides recommendations based on the evidence and the definition of unlawful discrimination/retaliation as provided in Board policy and State and Federal law as to whether the Respondent has engaged in unlawful harassment/retaliation of the Complainant. The CO's recommendations must be based upon the totality of the circumstances. In determining if discrimination or retaliation occurred, a preponderance of evidence standard will be used. The CO may consult with the Board’s legal counsel before finalizing the report to the Superintendent.

Absent extenuating circumstances, within five (5) business days of receiving the report of the CO or the designee, the Superintendent must either issue a written decision regarding whether the charges have been substantiated or request further investigation. A copy of the Superintendent's final decision will be delivered to both the Complainant and the Respondent.

If the Superintendent requests additional investigation, the Superintendent must specify the additional information that is to be gathered, and such additional investigation must be completed within five (5) business days. At the conclusion of the additional investigation, the Superintendent must issue a final written decision as described above.

If the Superintendent determines the Respondent engaged in unlawful discrimination/retaliation toward the Complainant, the Superintendent must identify what corrective action will be taken to stop, remedy, and prevent the recurrence of the discrimination/retaliation. The corrective action should be reasonable, timely, age-appropriate, effective, and tailored to the

specific situation.

The Board reserves the right to investigate and resolve a complaint or report of unlawful discrimination/retaliation regardless of whether the employee alleging the unlawful discrimination/retaliation pursues the complaint. The Board also reserves the right to have the formal complaint investigation conducted by an external person in accordance with this policy or in such other manner as deemed appropriate by the Board or its designee.

The right of a person to a prompt and equitable resolution of the complaint shall not be impaired by the person's pursuit of other remedies such as the filing of a complaint with the Office for Civil Rights, the filing of charges with local law enforcement, or the filing of a civil action in court. Use of this internal complaint process is not a prerequisite to the pursuit of other remedies.

Privacy/Confidentiality

The District will employ all reasonable efforts to protect the rights of the Complainant, the Respondent(s), and the witnesses as much as possible, consistent with the Board's legal obligations to investigate, to take appropriate action, and to conform with any discovery or disclosure obligations. All records generated under the terms of this policy shall be maintained as confidential to the extent permitted by law. Confidentiality, however, cannot be guaranteed. Additionally, the Respondent must be provided with the Complainant's identity.

During the course of a formal investigation, the CO or designee will instruct each person who is interviewed about the importance of maintaining confidentiality. Any individual who is interviewed as part of an investigation is expected not to disclose to third parties any information that is learned or provided during the course of the investigation.

Sanctions and Monitoring

The Board shall vigorously enforce its prohibitions against unlawful discrimination/retaliation by taking appropriate action reasonably calculated to stop and prevent further misconduct. While observing the principles of due process, a violation of this policy may result in disciplinary action up to and including the discharge of an employee. All disciplinary action will be taken in accordance with applicable State law and the terms of the relevant collective bargaining agreement(s). When imposing discipline, the Superintendent shall consider the totality of the circumstances involved in the matter. In those cases where unlawful discrimination/retaliation is not substantiated, the Board may consider whether the alleged conduct nevertheless warrants discipline in accordance with other Board policies, consistent with the terms of the relevant collective bargaining agreement(s).

Where the Board becomes aware that a prior remedial action has been taken against an employee, all subsequent sanctions imposed by the Board and/or Superintendent shall be reasonably calculated to end such conduct, prevent its recurrence, and remedy its effect.

Retaliation

Retaliation against a person who makes a report or files a complaint alleging unlawful harassment/retaliation or participates as a witness in an investigation is prohibited. Neither the Board nor any other person may intimidate, threaten, coerce or interfere with any individual because the person opposed any act or practice made unlawful by any Federal or State civil rights law, or because that individual made a report, formal complaint, testified, assisted or participated or refused to participate in any manner in an investigation, proceeding, or hearing under those laws and/or this policy, or because that individual exercised, enjoyed, aided or encouraged any other person in the exercise or enjoyment of any right granted or protected by those laws and/or this policy.

Retaliation against a person for making a report of discrimination, filing a formal complaint, or participating in an investigation or meeting is a serious violation of this policy that can result in the imposition of disciplinary sanctions/consequences and/or other appropriate remedies.

Formal complaints alleging retaliation may be filed according to the internal complaint process set forth above.

The exercise of rights protected under the First Amendment of the United States Constitution does not constitute retaliation prohibited under this policy.

Education and Training

In support of this policy, the Board promotes preventative educational measures to create greater awareness of unlawful discriminatory practices. The Superintendent shall provide appropriate information to all members of the School District community related to the implementation of this policy and shall provide training for District students and staff where appropriate. All training, as well as all information provided regarding the Board's policy and discrimination in general, will be age and content appropriate.

Retention of Investigatory Records and Materials

The Compliance Officer(s) is responsible for overseeing the retention of all records that must be maintained pursuant to this policy. All individuals charged with conducting investigations under this policy shall retain all documents, electronically stored information ("ESI"), and electronic media (as defined in Policy 8315) created and/or received as part of an investigation, which may include but not be limited to:

A. all written reports/allegations/complaints/grievances/statements/responses pertaining to an alleged violation of this policy;

B. any narratives that memorialize oral reports/allegations/complaints/grievances/statements/responses pertaining to an alleged violation of this policy;

C. any documentation that memorializes the actions taken by District personnel or individuals contracted or appointed by the Board to fulfill its responsibilities related to the investigation and/or the District's response to the alleged violation of this policy;

D. written witness statements;

E. narratives, notes from, or audio, video, or digital recordings of witness interviews/statements;

F. e-mails, texts, or social media posts that directly relate to or constitute evidence pertaining to an alleged violation of this policy (i.e., not after-the-fact commentary about or media coverage of the incident);

G. notes or summaries prepared contemporaneously by the investigator in whatever form made (e.g., handwritten, keyed into a computer or tablet, etc.), but not including transitory notes whose content is otherwise memorialized in other documents;

H. written disciplinary sanctions issued to students or employees and other documentation that memorializes oral disciplinary sanctions issued to students or employees for violations of this policy;

I. dated written determinations/reports (including summaries of relevant exculpatory and inculpatory evidence) and other documentation that memorializes oral notifications to the parties concerning the outcome of the investigation, including any consequences imposed as a result of a violation of this policy;

J. documentation of any supportive measures offered and/or provided to the Complainant and/or Respondent, including no-contact orders issued to both parties, the dates the no-contact orders were issued, and the dates the parties acknowledged receipt of the no-contact orders;

K. documentation of all actions taken, both individual and systemic, to stop the discrimination or harassment, prevent its recurrence, eliminate any hostile environment, and remedy its discriminatory effects;

L. copies of the Board policy and/or procedures/guidelines used by the District to conduct the investigation, and any documents used by the District at the time of the alleged violation to communicate the Board's expectations to students and staff with respect to the subject of this policy (e.g., Student Codes of Conduct and/or Employee Handbooks);

M. copies of any documentation that memorializes any formal or informal resolutions to the alleged discrimination or harassment.

The documents, ESI, and electronic media (as defined in Policy 8315) retained may include public records and records exempt from disclosure under Federal (e.g., FERPA, ADA) and/or State law – e.g., student records and confidential medical records.

The documents, ESI, and electronic media (as defined in Policy 8315) created or received as part of an investigation shall be retained in accordance with Policy 8310, Policy 8315, Policy 8320, and Policy 8330 for not less than three (3) years, but longer if required by the District's records retention schedule.

Revised 10/19/17
Revised 11/15/18
T.C. 3/8/21
Revised 12/02/21
T.C. 6/22/23

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Legal	M.C.L. 37.2101 et seq., 37.1101 et seq.
	20 U.S.C. Section 1681, Title IX of Education Amendment Act
	20 U.S.C. Section 1701 et seq., Equal Educational Opportunities Act of 1974
	20 U.S.C. Section 7905, Boy Scouts of America Equal Access Act
	29 C.F.R. Part 1635
	29 U.S.C. 701 et seq., Rehabilitation Act of 1973 as amended
	34 C.F.R. Part 110 (7/27/93)
	42 U.S.C. 2000e et seq., Civil Rights Act of 1964
	42 U.S.C. 2000ff et seq., The Genetic Information Nondiscrimination Act
	42 U.S.C. 6101 et seq., Age Discrimination Act of 1975
	42 U.S.C. 12101 et seq., The Americans with Disabilities Act of 1990, as amended
	Fourteenth Amendment, U.S. Constitution

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 #3122, 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 ____

General Conditions and Instructions to Bidders

1. Proposals shall be submitted on forms furnished by the owner. The proposal shall be in accordance with the specifications listed, which are available at the Lansing School District Purchasing Office.

   Any variance from the specifications shall be fully explained in writing by the bidder and all prices quoted shall be on a unit price basis.

2. **MAILING OF PROPOSALS**:

   Proposals shall be mailed in an opaque, sealed envelope and shall be clearly marked describing the project upon which the bid is made.

3. No oral, telegraphic facsimile, or electronic mail proposals or modifications will be considered.

4 **WITHDRAWAL OF BIDS**:

   Any bidder may withdraw their bid at any time prior to the scheduled time of opening the bids upon the presentation of proper identification. After the opening of the bids, no proposal shall be withdrawn for a period of ninety (90) days.

5. **PROPOSAL FORMS AND SIGNATURES**:

   Proposals shall be made on the proper forms provided by the owner. All spaces shall be properly filled in with ink or typewriter. The signatures shall be in longhand in ink by an authorized representative.

6. **BRANDS**:

   The naming of a manufacturer, brand or model number shall not be considered as excluding other brands or models. Specifically, similar products with comparable construction, material and workmanship shall be considered as equal. However, the Board of Education of the Lansing School District shall evaluate the merits of all bids submitted and reserves the right to accept or reject any or all bids.

   It is the intent of the attached specifications to define the minimum quality of equipment acceptable. The product lines of nationally recognized manufacturers who regularly advertise, promote and distribute catalog products to the school market are required.

7. **SAMPLES:**

   Samples shall be submitted upon request at the expense of each bidder. Theses samples will be retained as control items until the completion of the delivery and installation.

8. **AGENDA**:

   Any modifications of contract documents will be issued in the form of an addendum.

   All addenda issued during the bidding time shall become part of the specifications. A copy of the addendum shall be sent to all bidders. No verbal statements by the owner shall be considered as authoritative. No request for explanations can be processed within four (4) days immediately prior to the bid opening date.

9. **VARIATIONS FROM MATERIALS SPECIFED:**

   All variations form the specified material or equipment shall be fully explained and included with the bid. Manufacturer numbers shall be used in all cases.

10. **ROYALATIES AND PATENTS:**

    The contract shall pay for all royalties and patents, and shall defend all suits for claims or infringements on patent rights and save the owner harmless from loss on account thereof.

11. **CLEAN-UP:**

    The contractor shall at all times, keep the premises free from accumulations of waste materials or same caused by the work; and upon completing the work, shall remove all work related rubbish from and about the building and shall leave the work broom clean, or it equivalent. In the case of dispute, the owner may remove the rubbish and charge the cost to the contractor, as the owner shall determine.

12. **FEDERAL, STATE AND MUNICIPAL TAXES:**

    Each proposal submitted shall include, and the contractor shall pay, all taxed which are levied by the Federal, State and Municipal Governments, on labor, and for materials entering into the work. The owner reserves the right to require evident of payment of such taxes prior to final payment. The school district is exempt from Federal Excise Tax.

General Conditions and Instructions to Bidders

13. **QUALIFICATIONS OF BIDDERS:**

The owner may request any or all bidders to submit any of the following information before the award of the contracts.

A. A bidder's performance record
B. The address and description of bidder's equipment, plant or permanent place of business.
C. An itemized list of the bidder's equipment, plant and personnel.
D. A bidder's financial statement.
E. A description of any project which the bidder has completed.
F. Such additional information as will satisfy the owner that the bidder is adequately prepared to fulfill the contract.
G. Description of work which will be done simultaneously with the owner's project.

14. **NOTICE OF AWARD:**

The contracts shall be deemed as having been awarded when the formal notice of acceptance of their proposal has been duly served upon the intended awardees (normally by purchase order) by some officer of agent of the owner duly authorized to give such notice.

15. **GUARANTEE:**

Each contract shall furnish the owner a written guarantee running for one (1) year, or longer as required herein, after the final payment covering all work in the contract. Any defects in workmanship or materials for which a claim is submitted within this period shall be corrected.

16. **DOCUMENTS:**

The Proposals submitted shall be based upon the specifications contained herein.

17. **RIGHTS OF ACCEPTANCE OR REJECTION:**

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

18. Contractors and subcontractors are required not to discriminated against any employee or applicant for employment, to be employed in t the performance of this contract, with respect to hire, tenure, terms, conditions or privileges of employment because of race, color, religion, national origin, or ancestry or also because of age or sex, except based on a bonafide occupational qualification. Breach of this covenant of purchasing agreement as provided in the Michigan Fair Employment Practices Act and may be processed there under. See Policy 6320.

policy

PURCHASING

Procurement of all supplies, materials, equipment, and services paid for from District funds shall be made in accordance with all applicable Federal and State statutes, Board policies, and administrative procedures. Standards of conduct covering conflicts of interest and governing the actions of its employees engaged in the selection, award, and administration of contracts are established in Policy 1130, Policy 3110, and Policy 4110 – Conflict of Interest.

All procurement transactions shall be conducted in a manner that encourages full and open competition and in accordance with good administrative practice and sound business judgement.

Each year the State of Michigan informs the School of the legal amount for purchases which require a formal bidding process of a single item.

It is the policy of the Board that the Superintendent adhere to the following:

A. Seek informal price quotations on purchases in excess of $3,000.

B. When the purchase of, and contract for, single items of supplies, materials, or equipment is less than the amount allowed by State statute, but exceeds $10,000 the Superintendent shall whenever possible, require three (3) competitive price quotations.

Purchases in a single transaction that are in excess of the dollar amount permitted by State statute shall require competitive bids and, whenever possible, have at least three (3) such bids for substantiation of purchase and shall require approval of the Board prior to purchase.

policy

Competitive Bids

Competitive bids are not required for items purchased through the cooperative bulk purchasing program operated by the Michigan Department of Management and Budget pursuant to M.C.L. 18.1263.

Competitive bids are not required for food purchases, unless food purchased in a single transaction costs $100,000 or more.

When food purchased in a single transaction exceeds $100,000, the Superintendent shall, whenever possible, require three (3) competitive price quotations.

Bids shall be sealed and shall be opened by the Director of Purchasing in the presence of at least one (1) witness. All orders or contracts should be awarded to the lowest responsible bidder; however, consideration can be given to:

A. the quality of the item(s) to be supplied;

B. its conformity with specifications;

C. suitability to the requirements of the school;

D. delivery terms;

E. past performance of vendor.

In addition to the factors above, the Board may consider and provide a preference to bidders

A. which use a Michigan-based business as the primary contractor.

B. which use one (1) or more Michigan-based business as subcontractors.

policy

For purposes of this preference a Michigan-based business means a business that would qualify for a Michigan preference for procurement contracts under M.C.L. 18.1268, which requires that the businesses certify that since inception or during the last twelve (12) months it has done one of the following:

A. have filed a Michigan business tax return showing an allocation of income tax base to Michigan

B. have filed a Michigan income tax return showing income generated in or attributed to Michigan

C. withheld Michigan income tax from compensation paid to the bidder's owners and remitted the tax to the Michigan Department of Treasury

This preference shall not apply to any procurement or project using Federal funds, nor shall it be used if it would violate any Federal law or requirements.

The Board reserves the right to reject any and all bids.

Contracts may be awarded by the Superintendent without Board approval for any single item or group of identical items costing less than the dollar amount permitted by State Statute. All other contracts require Board approval prior to purchase.

Bid Protest

A bidder who wishes to file a bid protest must file such notice and follow procedures prescribed by the Request For Proposals (RFP) or the individual bid specifications package, for resolution. Bid protests must be filed in writing with the Office of the Superintendent within seventy-two (72) hours of the opening of the bids in protest.

Within five (5) days of receipt of a protest, the Superintendent shall review the protest as submitted and render a decision regarding the merits of the protest and any impact on the acceptance and rejection of bids submitted. Notice of the filing of a bid protest shall be communicated to the Board and shall be so noted in any subsequent recommendation for the acceptance of bids and awarding of contracts.

Failure to file a notice of intent to protest, or failure to file a formal written protest within the time prescribed, shall constitute a waiver of proceedings.

policy

General Provisions

The Superintendent is authorized to purchase all items within budget allocations.

The Board should be advised, for prior approval, of all purchases of equipment, materials, and services when the purchase

A. was not contemplated during the budgeting process.

B. exceeds the previously Board approved amount by ten percent (10%).

The Superintendent is authorized to make emergency purchases, without prior approval, of those goods and/or services needed to keep the school in operation. Such purchases shall be brought to the Board's attention at the next regular meeting.

In order to promote efficiency and economy in the operation of the school, the Board requires that the Superintendent periodically estimate requirements for standard items or classes of items and make quantity purchases on a bid basis to procure the lowest cost consistent with good quality.

Whenever storage facilities or other conditions make it impractical to receive total delivery at any one time, the total quantity to be shipped but with staggered delivery dates, shall be made a part of the bid specifications.

Before placing a purchase order, the Superintendent shall check as to whether the proposed purchase is subject to bid, whether sufficient funds exist in the budget, and whether the material might be available elsewhere in the school. All purchase orders shall be numbered consecutively.

policy

The Superintendent shall determine the amount of purchase which shall be allowed without a properly signed purchase order. Employees may be held personally responsible for anything purchased without a properly signed purchase order or authorization.

The Board may acquire office equipment as defined in law by lease, by installment payments, by entering into lease-purchase agreements, or by lease with an option to purchase, provided the contract sets forth the terms of such a purchase.

Procurement – Federal Grants

The Superintendent shall maintain a procurement and contract administration system in accordance with the USDOE requirements (34 CFR 80.36) for the administration and management of Federal grants and federally-funded programs. The District shall maintain a compliance system that requires contractors to perform in accordance with the terms, conditions, and specifications of their contracts or purchase orders. Except as otherwise noted, procurement transactions shall conform to the provisions of this policy and administrative guidelines (AG 6320).

M.C.L. 380.1267, 380.1274 et seq.

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policy

NEW SCHOOL CONSTRUCTION, RENOVATION

Before beginning construction of a new school building, or an addition, repair or renovation of an existing school building, except emergency repairs, the Board of Education, shall obtain competitive bids on all the material and labor required for the complete construction of a proposed new building or addition to or repair or renovation of an existing school building which exceeds the State statutory limit.

This policy does not apply to buildings, renovations, or repairs costing less than the statutory limit or to repair work normally performed by District employees.

The Board shall advertise for the bids required under subsection:

A. By placing an advertisement for bids at least once in a newspaper of general circulation in the area where the building or addition is to be constructed or where the repair or renovation of an existing building is to take place and by posting an advertisement for bids for at least two (2) weeks on the Department of Management and Budget website on a page on the website maintained for this purpose or on a website maintained by a school organization and designated by the Department of Management and Budget for this purpose.

B. By submitting the request for bids for placement on the Michigan Department of Management and Budget's website for school organizations, including a link to the District's website.

C. The advertisement for bids shall do all of the following:

1. specify the date and time by which all bids must be received by the Board at a designated location;

2. state that the Board will not consider or accept a bid received after the date and time specified for bid submission;

3. identify the time, date, and place of a public meeting at which the Board or its designee will open and read aloud each bid received by the Board by the date and time specified in advertisement;

4. state that the bid shall be accompanied by a sworn and notarized statement disclosing any familial relationship that exists between the owner or any employee of the bidder and any member of the Board or the Superintendent of the District. A Board shall not accept a bid that does not include this sworn and notarized disclosure statement.

D. The Board shall require each bidder for a contract under this policy, to file with the Board security in an amount not less than 1/20 of the amount of the bid conditioned to secure the District from loss or damage by reason of the withdrawal of the bid or by the failure of the bidder to enter a contract for performance, if the bid is accepted by the Board.

E. The Board shall not open, consider, or accept a bid that the Board receives after the date and time specified for bid submission in the advertisement for bids as described in subsection C of this policy.

F. At a public meeting identified in the advertisement for bids described in subsection C of this policy, the Board or its designee shall open and read aloud each bid that the Board received at or before the time and date for bid submission specified in the advertisement for bids. The Board may reject any or all bids, and if all bids are rejected, shall readvertise in the manner required by this policy.

The Board may consider and provide a preference to bidders:

1. which use a Michigan-based business as the primary contractor.

2. which use one (1) or more Michigan-based business(es) as subcontractors.

For purposes of this preference a Michigan-based business means a business that would qualify for a Michigan preference for procurement contracts under M.C.L. 18.1268, which requires that the businesses certify that since inception or during the last twelve (12) months it has done one of the following:

1. have filed a Michigan business tax return showing an allocation of income tax base to Michigan

2. have filed a Michigan income tax return showing income generated in or attributed to Michigan

3. withheld Michigan income tax from compensation paid to the bidder's owners and remitted the tax to the Michigan Department of Treasury

This preference shall not apply to any procurement or project using Federal funds, nor shall it be used if it would violate any Federal law or requirements.

G. The competitive bid threshold amount specified in this policy ($20,959 for 2009) is adjusted each year by multiplying the amount for the immediately preceding year by the percentage by which the average consumer price index for all items for the twelve (12) months ending August 31st of the year in which the adjustment is made differs from that index's average for the twelve (12) months ending on August 31st of the immediately preceding year and adding that product to the maximum amount that applied in the immediately preceding year, rounding to the nearest whole dollar. The current exempt amount must be confirmed with the Michigan Department of Education prior to issuing contracts for construction, renovation, or repair which exceed the amount listed in this policy.

M.C.L. 380.1267

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NEW POLICY - VOL. 30, NO. 2

PROCUREMENT – FEDERAL GRANTS/FUNDS

Procurement of all supplies, materials, equipment, and services paid for from Federal funds or District matching funds shall be made in accordance with all applicable Federal, State, and local statutes and/or regulations, the terms and conditions of the Federal grant, Board of Education policies, and administrative procedures.

The Superintendent shall maintain a procurement and contract administration system in accordance with the USDOE requirements (2 CFR 200.317-.326) for the administration and management of Federal grants and Federally-funded programs. The District shall maintain a contract administration system that requires contractors to perform in accordance with the terms, conditions, and specifications of their contracts or purchase orders. Except as otherwise noted, procurement transactions shall conform to the provisions of the District's documented general purchasing Policy 6320 and AG 6320.

All District employees, officers, and agents who have purchasing authority shall abide by the standards of conduct covering conflicts of interest and governing the actions of its employees, officers, and agents engaged in the selection, award, and administration of contracts as established in Policy 1130, Policy 3110 and Policy 4110 – Conflict of Interest.

The District will avoid acquisition of unnecessary or duplicative items. Additionally, consideration shall be given to consolidating or breaking out procurements to obtain a more economical purchase. And, where appropriate, an analysis shall be made of lease versus purchase alternatives, and any other appropriate analysis to determine the most economical approach. These considerations are given as part of the process to determine the allowability of each purchase made with Federal funds.

To foster greater economy and efficiency, the District may enter into State and local intergovernmental agreements where appropriate for procurement or use of common or shared goods and services.

Competition

All procurement transactions shall be conducted in a manner that encourages full and open competition and that is in accordance with good administrative practice and sound business judgement. In order to promote objective contractor

performance and eliminate unfair competitive advantage, the District shall exclude any contractor that has developed or drafted specifications, requirements, statements of work, or invitations for bids or requests for proposals from competition for such procurements.

Some of the situations considered to be restrictive of competition include, but are not limited to, the following:

A. unreasonable requirements on firms in order for them to qualify to do business;

B. unnecessary experience and excessive bonding requirements;

C. noncompetitive contracts to consultants that are on retainer contracts;

D. organizational conflicts of interest;

E specification of only a "brand name" product instead of allowing for an "*or equal*" product to be offered and describing the performance or other relevant requirements of the procurement; and

F. any arbitrary action in the procurement process.

Further, the District does not use statutorily or administratively imposed State, local, or tribal geographical preferences in the evaluation of bids or proposals, unless (1) an applicable Federal statute expressly mandates or encourages a geographic preference; or (2) the District is contracting for architectural and engineering services, in which case geographic location may be a selection criterion provided its application leaves an appropriate number of qualified firms, given the nature and size of the project, to compete for the contract.

To the extent that the District uses a pre-qualified list of persons, firms or products to acquire goods and services, the pre-qualified list includes enough qualified sources as to ensure maximum open and free competition. The District allows vendors to apply for consideration to be placed on the list annually.

Solicitation Language

The District shall require that all solicitations incorporate a clear and accurate description of the technical requirements for the material, product, or service to be procured. Such description shall not, in competitive procurements, contain features which unduly restrict competition. The description may include a statement of the qualitative nature of the material, product or service to be procured and, when necessary, shall set forth those minimum essential characteristics and standards to which it shall conform if it is to satisfy its intended use. Detailed product specifications should be avoided if at all possible.

When it is impractical or uneconomical to make a clear and accurate description of the technical requirements, a "brand name or equivalent" description may be used as a means to define the performance or other salient requirements of procurement. The specific features of the named brand which shall be met by offers shall be clearly stated; and identify all requirements which the offerors shall fulfill and all other factors to be used in evaluating bids or proposals.

The Board will not approve any expenditure for an unauthorized purchase or contract.

Procurement Methods

The District shall utilize the following methods of procurement:

Micro-purchases

Procurement by micropurchase is the acquisition of supplies or services, the aggregate dollar amount of which does not exceed $3000. To the extent practicable, the District shall distribute micro-purchases equitably among qualified suppliers. Micro-purchases may be made without soliciting competitive quotations if Superintendent considers the price to be reasonable. The District maintains evidence of this reasonableness in the records of all purchases made by this method.

Small Purchases

Small purchase procedures provide for relatively simple and informal procurement methods for securing services, supplies, and other property that does not exceed the competitive bid threshold established annually by the State. Small purchase procedures require that price or rate quotations shall be obtained from an adequate number of qualified sources.

Sealed Bids

Sealed, competitive bids shall be obtained when the purchase of, and contract for, single items of supplies, materials, or equipment which amounts to the amount allowed by Michigan statute and when the Board determines to build, repair, enlarge, improve, or demolish a school building/facility the cost of which will exceed the amount allowed by Michigan statute.

In order for sealed bidding to be feasible, the following conditions shall be present:

1. a complete, adequate, and realistic specification or purchase description is available;

2. two (2) or more responsible bidders are willing and able to compete effectively for the business; and

3. the procurement lends itself to a firm fixed price contract and the selection of the successful bidder can be made principally on the basis of price.

When sealed bids are used, the following requirements apply:

1. Bids shall be solicited in accordance with the provisions of State law and Policy 6320. Bids shall be solicited from an adequate number of qualified suppliers, providing sufficient response time prior to the date set for the opening of bids. The invitation to bid shall be publicly advertised.

2. The invitation for bids will include product/contract specifications and pertinent attachments and shall define the items and/or services required in order for the bidder to properly respond.

3. All bids will be opened at the time and place prescribed in the invitation for bids; bids will be opened publicly.

4. A firm fixed price contract award will be made in writing to the lowest responsive and responsible bidder. Where specified in bidding documents, factors such as discounts, transportation cost, and life cycle costs shall be considered in determining which bid is lowest. Payment discounts may only be used to determine the low bid when prior experience indicates that such discounts are usually taken.

5. The Board reserves the right to reject any or all bids for sound documented reason.

Competitive Proposals

Procurement by competitive proposal, normally conducted with more than one source submitting an offer, is generally used when conditions are not appropriate for the use of sealed bids or in the case of a recognized exception to the sealed bid method.

If this method is used, the following requirements apply:

1. Requests for proposals shall be publicized and identify all evaluation factors and their relative importance. Any response to the publicized requests for proposals shall be considered to the maximum extent practical.

2. Proposals shall be solicited from an adequate number of sources.

3. The District shall use its written method for conducting technical evaluations of the proposals received and for selecting recipients.

4. Contracts shall be awarded to the responsible firm whose proposal is most advantageous to the program, with price and other factors considered.

The District may use competitive proposal procedures for qualifications-based procurement of architectural/engineering (A/E) professional services whereby competitors' qualifications are evaluated and the most qualified competitor is selected, subject to negotiation of fair and reasonable compensation. The method, where price is not used as a selection factor, can only be used in procurement of A/E professional services. It cannot be used to purchase other types of services though A/E that firms are a potential source to perform the proposed effort.

Noncompetitive Proposals

Procurement by noncompetitive proposals allows for solicitation of a proposal from only one source and may be used only when one or more of the following circumstances apply:

1. the item is available only from a single source

2. the public exigency or emergency for the requirement will not permit a delay resulting from competitive solicitation

3. the Federal awarding agency or pass-through entity expressly authorizes noncompetitive proposals in response to a written request from the District

4. after solicitation of a number of sources, competition is determined to be inadequate

Contract/Price Analysis

The District shall perform a cost or price analysis in connection with every procurement action in excess of $150,000, including contract modifications. A cost analysis generally means evaluating the separate cost elements that make up the total price, while a price analysis means evaluating the total price, without looking at the individual cost elements.

The method and degree of analysis is dependent on the facts surrounding the particular procurement situation; however, the District shall come to an independent estimate prior to receiving bids or proposals.

When performing a cost analysis, the District shall negotiate profit as a separate element of the price. To establish a fair and reasonable profit, consideration is given to the complexity of the work to be performed, the risk borne by the contractor, the contractor's investment, the amount of subcontracting, the quality of its record of past performance, and industry profit rates in the surrounding geographical area for similar work.

Time and Materials Contracts

The District uses a time and materials type contract only (1) after a determination that no other contract is suitable; and (2) if the contract includes a ceiling price that the contractor exceeds at its own risk. Time and materials type contract means a contract whose cost to the District is the sum of the actual costs of materials, and direct labor hours charged at fixed hourly rates that reflect wages, general and administrative expenses, and profit.

Since this formula generates an open-ended contract price, a time-and-materials contract provides no positive profit incentive to the contractor for cost control or labor efficiency. Therefore, the District sets a ceiling price for each contract that the contractor exceeds at its own risk. Further, the District shall assert a high degree of oversight in order to obtain reasonable assurance that the contractor is using efficient methods and effective cost controls.

Suspension and Debarment

The District will award contracts only to responsible contractors possessing the ability to perform successfully under the terms and conditions of the proposed procurement. All purchasing decisions shall be made in the best interests of the District and shall seek to obtain the maximum value for each dollar expended. When making a purchasing decision, the District shall consider such factors as (1) contractor integrity; (2) compliance with public policy; (3) record of past performance; and (4) financial and technical resources.

The Superintendent shall have the authority to suspend or debar a person/corporation, for cause, from consideration or award of further contracts. The District is subject to and shall abide by the nonprocurement debarment and suspension regulations implementing Executive Orders 12549 and 12689, 2 CFR Part 180.

Suspension is an action taken by the District that immediately prohibits a person from participating in covered transactions and transactions covered under the Federal Acquisition Regulation (48 CFR chapter 1) for a temporary period, pending completion of an agency investigation and any judicial or administrative proceedings that may ensue. A person so excluded is suspended. (2 CFR Part 180 Subpart G)

Debarment is an action taken by the Superintendent to exclude a person from participating in covered transactions and transactions covered under the Federal Acquisition Regulation (48 CFR chapter 1). A person so excluded is debarred. (2 CFR Part 180 Subpart H)

The District shall not subcontract with or award subgrants to any person or company who is debarred or suspended. For contracts over $25,000, the District shall confirm that the vendor is not debarred or suspended by either checking the Federal government's System for Award Management, which maintains a list of such debarred or suspended vendors at www.sam.gov; collecting a certification from the vendor; or adding a clause or condition to the covered transaction with that vendor. (2 CFR Part 180 Subpart C)

Bid Protest

The District maintains the following protest procedures to handle and resolve disputes relating to procurements and, in all instances, discloses information regarding the protest to the awarding agency.

A bidder who wishes to file a bid protest shall file such notice and follow procedures prescribed by the Request For Proposals (RFPs) or the individual bid specifications package, for resolution. Bid protests shall be filed in writing with the Superintendent within seventy-two (72) hours of the opening of the bids in protest.

Within five (5) days of receipt of a protest, the Superintendent shall review the protest as submitted and render a decision regarding the merits of the protest and any impact on the acceptance and rejection of bids submitted. Notice of the filing of a bid protest shall be communicated to the Board and shall be so noted in any subsequent recommendation for the acceptance of bids and awarding of contracts.

Failure to file a notice of intent to protest, or failure to file a formal written protest within the time prescribed, shall constitute a waiver of proceedings.

Maintenance of Procurement Records

The District maintains records sufficient to detail the history of all procurements. These records will include, but are not necessarily limited to the following: rationale for the method of procurement, selection of contract type, contractor selection or rejection, and the basis for the contract price (including a cost or price analysis).

Applicable laws and regulations:
2 C.F.R. 200.317 - .326

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policy

PREVAILING WAGE COORDINATOR

It is the purpose of this policy to comply with State and Federal regulations concerning prevailing wage rate.

The Michigan Department of Consumer and Industry Services; Wage and Hour Division will determine the prevailing wage rate in the locality where the work is to be performed.

The Superintendent shall designate a Prevailing Wage Coordinator for this District.

The Prevailing Wage Coordinator will submit to the Superintendent, for Board of Education approval, procedures for monitoring compliance with prevailing wage laws. S/He will request the Michigan Department of Consumer and Industry Services; Wage and Hour Division to establish the prevailing wage rate in this District for school construction or renovation projects. A schedule of those wages must be attached to the specifications for the work, and printed on any bidding blanks. A copy of the bidding blank must be filed with the Michigan Department of Consumer and Industry Services; Wage and Hour Division prior to the award of any contract. Thereafter, any contract which is awarded must include a provision that each laborer, workman, or mechanic employed by the contractor will be paid at a rate not less than the prevailing wage rate. On the first pay date, the contractors and subcontractors must provide each employee with written notification of his/her job classification and the prevailing wage rate for his/her job classification, unless the employee is covered by a collective bargaining agreement.

M.C.L. 408.551 et seq.

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policy

COOPERATIVE PURCHASING

The Board of Education recognizes the advantages of centralized purchasing in that volume buying tends to maximize value for each dollar spent. The Board, therefore, encourages the administration to seek advantages in savings that may accrue to this District through joint agreements for the purchase of supplies, equipment, or services with the governing body(ies) of other governmental units.

The Board authorizes the Business Manager to negotiate such joint purchase agreements for services, supplies, and equipment which may be determined to be required from time to time by the Board and which the Board may otherwise lawfully purchase for itself, with governmental contracting units as may be appropriate in accordance with State law, the policies of this Board, and the dictates of sound purchasing procedures.

Cooperative or joint purchases require an agreement approved by the Board and the participating contracting body(ies) which shall specify the categories of equipment and supplies to be purchased; the manner of advertising for bids and of awarding contracts; the method of payment by each participating party and such other matters as may be deemed necessary to carry out the purposes of the agreement. Such agreements are subject to all legal bidding requirements.

M.C.L. 124.1 et seq.

policy

LOCAL PURCHASING

The Board of Education recognizes its position as a major purchaser in this community, and while it is the intention of the Board to purchase materials and supplies of quality at the lowest possible cost through widespread competition, if all other considerations are equal, the Board prefers to purchase within the District from established local merchants.

The Board authorizes the Superintendent to award purchases placed in accordance with law, this policy, and all policies of the Board otherwise applicable to local merchants when

A. their quotation is competitive, within a percentage determined by the Board,

B. freight charges are a factor,

C. maintenance service may be required,

D. promptness of delivery is a consideration,

provided that all statutes pertaining to public purchasing are duly observed.

policy

VENDOR RELATIONS

The Board of Education shall not enter a contract knowingly with any supplier of goods or services to this District under which any Board member or officer, employee, or agent of this School District has any pecuniary or beneficial interest, direct or indirect, unless the person has not solicited the contract or participated in the negotiations leading up to the contract. This prohibition shall not prevent any person from receiving royalties upon the sale of any textbook of which s/he is the author and which has been properly approved for use in the schools of this District.

For the purpose of this policy "beneficial interest" shall be determined in accordance with M.C.L. 15.321 et seq.

Board members and school personnel shall not accept any gifts or favors from vendors which might, in any way, influence their recommendations on the eventual purchase of equipment, supplies, or services.

All sales persons, regardless of product, shall clear with the Superintendent's Office before contacting any teachers, students, or other personnel of the School District. Purchasing personnel shall not show any favoritism to any vendor. Each order shall be placed in accordance with policies of the Board on the basis of quality, price, and delivery with past service a factor if all other considerations are equal.

M.C.L. 15.321 et seq.



In order to maintain the public trust, your local school district Board of Education should consider and adopt a resolution containing at least some, if not all, of the factors listed below.

Each factor should be discussed thoroughly by school board members, the architects and construction managers involved in any school construction because of the potential impact they will have on a project.

Your construction manager and design professional will then include these factors in the construction bid documents so all bidders know that in addition to price these items will be considered when construction bids are reviewed.

EXPERIENCE. Institutional building projects are expected to last 50-75 years. Therefore school board members should review the past experience of all construction professionals to ensure that they have pertinent experience on similar institutional projects. In so doing, the board members can evaluate whether local contractors should be considered for the project and only if they have the required experience should they be considered.

REFERENCES. School board members should investigate the references of their construction professionals from past clients doing similar institutional work. Construction professionals must supply pertinent references from their past clients, including information regarding performance and jobsite cooperation.



FINANCIAL CONDITION. A good financial rating means stability on the job and all through the project. Construction professionals must show they are financially prepared to perform the work they are bidding on. School boards must obtain information concerning a bidder's financial capability, any outstanding claims against them and bank references. A poor financial condition can affect the quality of materials, equipment and workers used on the project. It also can result in substantial project delays and unsafe schools.

SAFETY & ACCIDENTS. Construction professionals with a good safety and EMR record will be more productive. An employer has an obligation according to the Michigan Occupational Safety and Health Act (MIOSHA) to provide a place of employment free from recognized hazards likely to cause death or serious physical harm. Every employee has the right to a safe and healthy workplace. An employer must provide training in the recognition and avoidance of hazards and specific training called for in the MIOSHA standards.

RESUME OF SUPERVISORY PERSONNEL. Beyond a construction professional's experience with similar institutional projects, it is important for board members to evaluate the resumes of the supervisory personnel of all construction professionals on their project. All supervisory personnel should have pertinent experience and adequate education and training to complete your project.

INSURANCE & SURETY BONDING. Construction professionals must show proof of adequate and relevant insurance coverage for a particular project and must prove their compliance with workers' compensation statutes. School boards must set minimum standards for insurance coverage. Construction professionals that cannot provide proper coverage may be unable to fulfill project obligations. A measure of a construction professional's stability is shown in the ability to secure the required bonding.

USE OF A TRAINED LOCAL WORKFORCE. Employing local construction professionals and skilled craft workers on a project can be an attractive goal for school boards. Local craft workers, their friends and family, in all probability use those schools. However, it is necessary to determine if the construction professional has ready access to a qualified, experienced workforce to build your project.

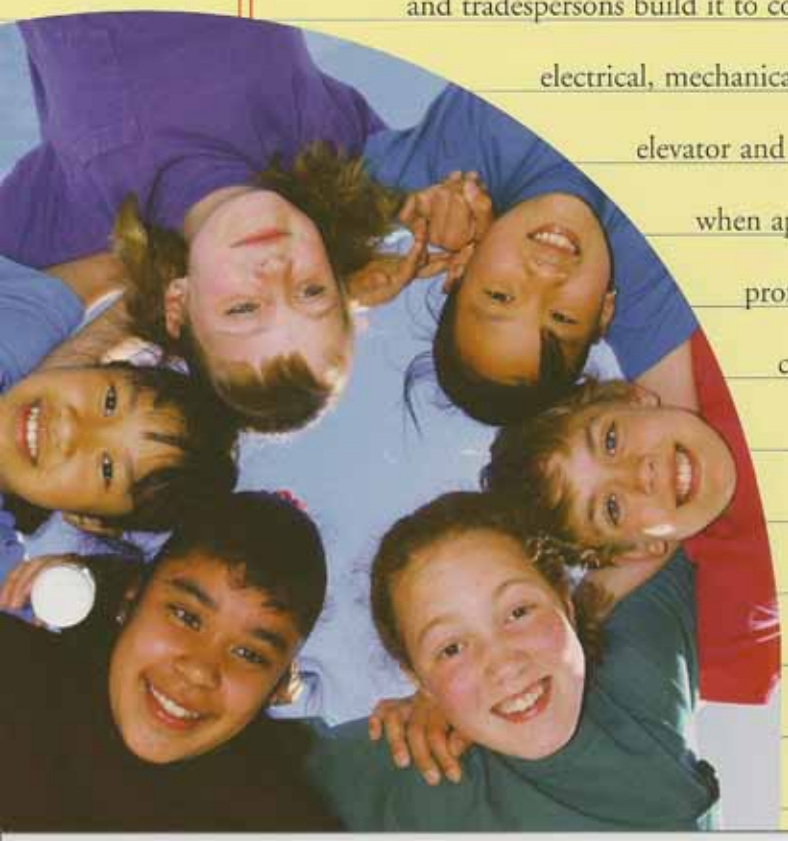
PREVAILING WAGE. Use of prevailing wage requirements ensures that school boards secure the best qualified construction professionals to perform work on their projects. Construction professionals should compete for projects on the basis of their management practices, not by paying sub-standard wages. Utilization of prevailing wage will allow the construction professional to pay locally determined wages and benefits to attract qualified skilled craft workers.

EMPLOYEE HEALTH INSURANCE & PENSION BENEFITS. School districts can maintain and promote their community's health care and craft employees by requiring the construction professional to use prevailing wage, which includes health insurance and pension benefits. Construction professionals who provide such benefits to their craft personnel demonstrate a commitment to developing a stable workforce, which is a key component to a quality project and to the health of the community.

WORKFORCE SOURCE & PROPER EMPLOYEE CLASSIFICATION. School boards can ensure that their project will be built by qualified construction professionals by ensuring contractor access to a skilled workforce. School districts should examine carefully the source of building trades craft employees. School districts should ask prospective construction professionals to identify the source of the workforce they intend to use on the project. Construction professionals who staff the project with personnel hired from help-wanted ads or employment agencies might not have sufficient competence and ability to complete a quality project on schedule.

REGISTERED UNITED STATES DEPARTMENT OF LABOR, BUREAU OF APPRENTICESHIP & TRAINING PROGRAMS. School boards know the value of high quality training and education. Responsible contractors know that better training equals better buildings. Bureau of Apprenticeship and Training (BAT) approved training programs create more productive craft workers. A construction professional's ability to staff a school construction project with qualified trades' workers is the key to success. Contractors, who bid on school construction projects should maintain, participate in and contribute to bona fide apprentice training programs recognized by the U.S. D.O.L./B.A.T. Trained craft workers promote cost effectiveness, timeliness, safety and quality on school construction work. Companies who employ skilled and trained workers, educated in their trade, deliver exceptional work. Moreover, every registered U.S. D.O.L./B.A.T., program must meet twenty-two standards of apprenticeship regulated and audited by the U.S. D.O.L./B.A.T., as outlined in 29 CFR 29.5.

LICENSING. School boards get a better building when highly competent construction professionals and tradespersons build it to code. State law establishes licensing requirements for electrical, mechanical, plumbing, boiler and elevator contractors, and electrical, elevator and plumbing craft workers. Proper licensing and certification, when applicable, show school boards that construction professionals bidding the job have been tested and are competent to perform the work. All responsible construction professionals must provide documented proof of licensing and certification. This will allow school boards to contact licensing and certification agencies to verify the bidder's history and determine if any complaints or judgments have been filed against them.



COMPLIANCE WITH REGULATORY AGENCIES. School boards get a higher quality building when local, state and federal regulations are followed. Compliance with the EPA, MIOSHA, OSHA and other agencies helps school boards evaluate the construction professional's willingness to follow rules. It also ensures that the bidding contractors are aware of the policies that affect them. Contractor adherence to wage and hour standards, record keeping guidelines, child labor regulations and other components of the Fair Labor Standards Act are good indicators of a stable workforce. Construction craft workers who are treated fairly and receive proper pay and benefits are more likely to produce high quality work which helps ensure a safe learning environment for Michigan children.

CIVIL SUITS/ARBITRATION/HISTORY. A school board will have their building projects completed without costly legal entanglements if they select a responsible contractor with a 'clean' legal history. School boards should contract with construction professionals that build according to contract – not in spite of the contract. School districts should carefully examine a contractor's litigation history and the final disposition of any arbitration claims brought against him/her. A contractor with an unusually high level of adverse claims might indicate that the school board should disqualify the contractor.

Michigan Association for Responsible Contracting

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CHRISTMAN
SINCE 1894



PROJECT SAFETY MANUAL

Lansing School District

Statement of Safety Program

It is a fundamental value of The Christman Company that safety always is a primary consideration. It is our policy and a top priority to do all in our power to provide a safe work place for all workers and to mandate the use of good safety practices. Adherence to established safety standards and procedures is required of everyone at all times on the Lewton Project site.

There is no phase of the operation that has greater importance than accident prevention and the preservation of human resources.

This Project Specific Safety Program has been developed in support of these concepts to serve as a reference in assisting all project trade contractors in satisfying their responsibility "to provide a safe, healthful work place, free of recognized hazards."

The Christman Company
Austin Brown
Assistant Project Manager

The Christman Company
Andrew Dobbs
Project Manager

The Christman Company
Rob Crowe
Vice President

The Christman Company
Donald V. Staley
Vice President/Safety Director

Date: February 23, 2023

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I. Introduction

This Project Safety Manual provides an administrative structure within which The Christman Company and subcontractors present on the Project site shall provide for the safety and health of their employees and other individuals affected by their activities and for the protection of property. This Manual does not relieve subcontractors of any of their traditional or specific legal responsibilities with respect to occupational safety and health or the protection of property. Instead, this Manual provides for coordination among the various subcontractors' individual programs, monitoring of subcontractors' conformance with their individual programs, and the requirements of this Manual, initiation of corrective actions when nonconformances are identified, and documentation of safety related programs, meetings, and incidents. This Project Safety Manual for Lewton has been developed to assist all subcontractors working at the Project site in satisfying their responsibility to provide a safe and healthful work place, free of recognized hazards, for their employees.

All employees, subcontractors, trades people, and visitors are required to watch The Christman Company Safety Orientation Video prior to performing work at the site. The video may be viewed at the site office.

II. Implementation Responsibility

Each and every person working at the Project site shall be responsible to be knowledgeable of the contents of this Manual and comply with every requirement contained herein.

III. Subcontractor Safety Programs

Each subcontractor is required to submit a copy of its written safety program to The Christman Company prior to commencing work at the Project site. Each program shall meet the requirements of the codes and regulations of OSHA, local and other authorities having jurisdiction over the work to be performed and shall include disciplinary procedures and safety orientation training procedures applicable to subcontractor personnel.

Each subcontractor safety program shall include, as a minimum, the following requirements:

A. All trades are to complete a Jobsite Hazards Analysis (JHA) form every day for all work activities.
B. Conduct weekly safety (Tool Box) meetings.
C. Monitor jobsite safety issues daily.
D. Conduct fire inspections.
E. Review project specific requirements with employees.
F. Conduct tool and equipment inspections.
G. Review all personal protective equipment with employees.
H. Address fall protection measures.
I. Address Right-To-Know regulations, including Safety Data Sheets (SDS')

J. Provide hazardous material awareness training.

IV. Discipline Policy

All Subcontractors entering onto this Project are required to comply with all aspects of the project safety program requirements. Those that do not adhere to this program will be subject to this discipline policy. The Project will utilize a three step process for minor infractions; repeat or major offenses of the safety program are subject to immediate removal from the Project.

1. Any re-entry employment programs for safety violations will be initiated only by The Christman Company Superintendent and Project Manager.

2. Verbal warning - The verbal warning **shall be considered given** at the signing of the contract. This warning is to be communicated by the Subcontractor to **all** Subcontractor personnel prior to entering this Project.

3. Written warning - The second warning will be a written warning, documented, with a copy sent to the employee's Supervisor and Corporate Office.

4. A written warning, at the discretion of The Christman Company Superintendent, can result in either removal from the Project or re-orientation of the safety program. The re-orientation will be attended by both the violator and his/her Foreman. This re-orientation may consist of:
    - Video training in the related area of the violation
    - Written verification by the employee that he/she is capable of identifying the hazards related to the violation.
    - The completion of a written Job Hazard Analysis by the employee and his Foreman for the task in which the violation occurred.

5. In addition, any Foreman that has had his/her crew members attend three (3) re-orientation sessions for any reason is subject to removal from the Project.

6. The third infraction of the same safety program issue will result in removal from the Project.

7. Any Foreman, General Foreman, or Superintendent who forces or directs any employee to violate a safety procedure, will be removed from the Project immediately.

8. Any violation deemed threatening to life, limb or major property damage will be grounds for immediate removal from the Project.

Subcontractors will comply with all provisions of The Christman Company's safety program. In the event of Subcontractor's noncompliance, the Subcontract may be canceled, terminated, or suspended, in whole or in part, and The Christman Company may complete the work at the cost of the Subcontractor in accordance with the Subcontract Agreement.

V. Weekly Safety Meetings

The Christman Company will hold weekly construction coordination/safety meetings. All active, on-site subcontractors shall be represented at these meetings. At the beginning of each meeting current safety topics, issues, concerns and problems will be discussed.

Each active, on-site subcontractor shall conduct weekly toolbox meetings. Every worker active on site shall attend. Each subcontractor shall furnish the following documentation to The Christman Company after each toolbox meeting: date, topic(s) discussed, names of attendees, subcontractor's name, and any safety concerns noted.

VI. Safety Inspections

The Christman Company's Project Superintendent will conduct informal inspections of conditions, practices and equipment on a daily basis. The Christman Company's Safety Manager shall schedule visits to the Project site, unannounced, to inspect the work in progress. All safety discrepancies noted shall be reviewed with the Project Superintendent responsible to ensure that corrective measures are implemented.

Supervisors of all active on-site subcontractors are responsible to conduct daily inspections of conditions, practices, and equipment relating to their work areas/activities. Safety discrepancies discovered, along with the corrective measures taken, shall be reviewed with The Christman Company Project Superintendent.

VII. Drug/ Substance Abuse Testing Program

A. **Any employee injured at the Project site and needing offsite medical attention will be tested for alcohol and drugs.** If the injured party was hurt by the action of another person who was not injured, this person must also submit to substance abuse testing. Additionally, any employee causing or contributing to a major incident not resulting in injury will be tested for alcohol and drugs. An employee who tests positive for illegal substances or alcohol will not be allowed to return to the project site. Any employee who refuses to submit to substance abuse testing will not be allowed to work at the project site.

B. It is the responsibility of the employer to make sure that the testing is performed at the time of the incident. It is also the responsibility of the employer to cover any costs incurred due to the testing. Results of the testing will be considered confidential. **An employee that is tested late (not within 8 hours of the incident) will be considered as "not tested" and will not be allowed to return to work on the project site.**

Notes:

1. Visitors and delivery personnel are not included.
2. The drug-screening test shall include testing for cannabinoids, depressants, dissociative anesthetics, hallucinogens, opioids and morphine derivatives, and stimulants. **Refer to Attachment I.**

VIII. Hazardous Material Control Program

Each subcontractor is responsible for the safe storage, use and disposal of any hazardous material required to perform their scope of work. Each subcontractor using such materials shall provide The Christman Company with a copy of their Hazardous Material Control Program before any of his material is delivered to the Project site. Each program shall, at a minimum, include the following:

A. Identification and classification of hazardous materials
B. Safety and health precautions
C. Training in safe storage, handling and use
D. Transporting, labeling, packaging, documenting and disposal requirements
E. Safety Data Sheets (SDS) for all chemicals

Each subcontractor is to submit to The Christman Company a complete list of hazardous chemicals that may be used at the Project site along with a copy of a Safety Data Sheet (SDS) for each. Copies of any subsequent SDS amendments, additions, or corrections shall also be promptly submitted. Additionally, a list of the chemicals that are on site is to be submitted to The Christman Company.

The Christman Company will maintain a master file of all jobsite SDS' for every subcontractor in the on-site Project office. This information will be made available to any employee upon request.

It is the responsibility of each subcontractor to provide proper and adequate employee training as required under this Act.

Compliance with the storage, use and disposal requirements as outlined on labels and SDS's is mandatory for all users; full understanding of these requirements is expected of all users and suppliers of hazardous materials.

IX. Existing Hazardous Material

The Christman Company Site Manager and / or Superintendent and Owner/Client shall review all areas of the Project site for existence of hazardous materials, such as asbestos and lead. If asbestos exists in areas that involve construction work, the Owner/Client shall arrange to remove the asbestos before any construction work takes place in each area.

If lead-based paint exists in areas, which involve construction work, each Subcontractor working in the areas shall be responsible for complying with the requirements of the OSHA standard for lead exposure. The recognition of possible contaminated areas is key to avoiding exposure. If you discover an area that you suspect lead may be present you are to bring it to the attention of The Christman Company Project Superintendent.

Proper communication regarding the hazardous materials is to be conveyed to all people that may possibly be exposed to the hazard.

Remember - If a suspect hazardous material is discovered notify The Christman Company's Project Superintendent immediately.

X. Personal Protective Equipment and Clothing

Each subcontractor shall supply each of their workers with the proper safety equipment, take any necessary precautions to maintain the equipment according to current regulations and specifications and accept responsibility to assure that proper safety equipment is used when required. All workers shall be required to wear appropriate personal protective equipment and clothing where there is an exposure to hazardous conditions and where needed to reduce hazards to the worker. The following list represents the minimum requirements:

A. Outer Garments

1. Suitable outerwear is defined as clothing designed to protect from expected hazards. Outer garments should be well fitting. Short sleeve garments may be worn where no hazards to exposure exist. **High Visibility Shirts or Vests must be worn at all times.** For daytime and nighttime work within the right-of-way, apparel shall be labeled as meeting the requirements of ANSI 107-1999 standard performance for Class 2 risk exposure. For the same condition described above but the activity is flagging traffic, a type 3 is to be used.

Tank tops or "muscle shirts" are not permitted. Full pants are to be worn. Neckties should not be worn when working around moving machinery. All employees are to avoid loose sleeves, frills or trims that could present hazards. Racist or profane slogans on outer garments are not permitted.

B. Gloves

Hands are to be protected as dictated by working conditions. Gloves, mittens or hand leathers will be of the type consistent with the hazards present.

C. Hardhats

Hardhats must be worn on site at all times. Acceptable hardhats must meet the requirements of ANSI Standard Z89.1 – Type 1 Class E.

D. Eye and Face Protection

A. Safety glasses are required at all times. Acceptable safety glasses must meet the requirements of the most current ANSI Standard Z87.1.

B. Employees shall be required to wear proper eye and face protection during operations where a hazard or risk of injury exists from flying objects or particles, harmful contacts, exposures such as glare, liquids, injurious radiation, electrical flash, or a combination of these hazards.

C. Contact lenses or US food and drug administration standard hardened lenses shall not be considered as eye protection.

D. An employee who needs corrective lenses in spectacles where eye protection is required shall be protected by one of the following:

a. Spectacles whose protective lenses provide optical correction.
b. Goggles that can be worn over the corrective lenses without disturbing the adjustment of the spectacles.
c. Goggles that incorporate corrective lenses mounted behind the protective lenses.

E. Face and eye protection equipment shall be of proper size to fit the employee and protect against the intrusion of foreign objects. Face and eye protection shall be kept clean and in good repair. Equipment with structural or optical defects shall not be used.

F. Face shields and goggles shall be used, as required, to provide eye and face protection when safety glasses are insufficient.

G. Employees shall wear welding helmets with filter lenses when engaged in welding, cutting, or burning operations or the employee shall wear safety glasses with side shields or goggles under the shield when the shield is raised and is exposed to flying objects. Manufactured welding shields shall be placed around the work area to prevent flash exposure to other employees.

E. Jewelry

Bracelets, necklaces, rings and earrings are not to be worn during operations where they present hazards to the wearer.

F. Foot Protection

Work boots or approved safety shoes are to be worn at all times on the project. Special safety footwear for protection against exposure to electrical shock, chemicals, acids, caustics, and hot or molten materials may be required and it is the responsibility of the employer to provide their employees with the appropriate "special footwear" if it is deemed necessary. If an employee is using a Jack Hammer toe guards are required.

G. Personal Protective Equipment

The use of personal protective gear, such as gloves, respirators, coveralls, safety glasses, ear protection, and the like, will be required as conditions demand and shall be reviewed at the time of employee orientation or when assigning duties. The contractor is required to supply all required PPE to their employees.

H. Respirators

Any Subcontractor responsible to perform work that requires respiratory protection shall have a written respiratory program in place. A copy of the program shall be submitted to The Christman Company's Superintendent before commencement of any work activities that require the use of respirators. At a minimum, each respiratory protection program shall provide each employee with training relative to the need for use, fitting, fit testing, cleaning and storage of respirators.

I. Fall Protection

Policy: 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), precast erection, roofing activities and masonry work including overhand laying operations.

Exceptions: The safe use of ladders up to twenty-four (24) feet in length.

Unacceptable means of compliance: Safety monitors.

Example of an acceptable means of compliance: A warning barrier fifteen (15) feet from the potential fall hazard. The exception to this will be for roofers performing roofing activities. They will be allowed to move closer to the edge and establish their warning barrier at six (6) feet. Anyone required to cross the fifteen (15) foot or six (6) foot barrier line must comply with the fall protection policy. The barrier shall consist of ropes, chains or wires supported by stanchion posts erected as follows:

- The system shall be flagged at no more than six (6) foot intervals with a high-visibility material.
- The system shall be rigged and supported in such a way that its lowest point (including sag) is no less than thirty-four (34) inches from the walking/ working surface and its highest point is no more than thirty-nine (39) inches from the walking / working surface.
- After the system is erected, the stanchions shall be capable of resisting, without tipping over, a force of at least sixteen (16) pounds applied horizontally against the stanchion, thirty (30) inches above the walking / working surface, perpendicular to the warning line, and in the direction of the floor, roof or platform edge.
- The system line shall have a minimum tensile strength of 500 pounds and after being attached to the stanchions, shall be capable of supporting without breaking, the loads applied to the stanchions noted in the above item.
- The line shall be attached at each stanchion in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in adjacent sections before the stanchion tips over.

XI. Emergency Telephone Numbers

Emergency telephone numbers for the ambulance, hospital, fire department, and police shall be posted in each jobsite office at each phone. Each contractor shall furnish The Christman Company with the emergency contact phone numbers for all key project personnel (e.g. jobsite supervisors, project managers, foreman, etc.). Contact numbers shall include mobile home, pager and other phone numbers available and necessary to access key personnel in the event of a project emergency. Distribution of these numbers will be limited and considered confidential.

XII. First Aid

Each subcontractor shall provide The Christman Company with the name or names of each designated first-aid certified worker. Each subcontractor is required to have at least one (1) certified worker on site during periods when the subcontractor is active.

The Christman Company will have a first aid kit on site at the Project office. Each subcontractor shall also provide a first aid kit on site.

XIII. Injury/ Accident Reporting and Investigation

Any worker incurring an injury while working at the **Lewton** Project site shall report the injury to his supervisor immediately. **All injuries shall be verbally reported to The Christman Company the day of the incident/accident, followed up in writing on the proper forms, within twenty-four (24) hours.** Each incident/accident shall be documented using an accident investigation report similar to The Christman Company report (refer to Attachment II). In the event of an accident, the following steps shall be taken:

A. Make sure that accident victim receives appropriate medical attention. This may involve calling paramedics, arranging transportation to a hospital, or sending victim to a clinic depending on severity of injury.
B. Notify The Christman Company's Superintendent immediately regardless of the seriousness of the incident or accident. This includes property damage.
C. Perform a thorough investigation of all facts and circumstances surrounding the accident. This should include:
    1. Photographs of the accident site and any other pertinent areas or conditions, which document the circumstances existing at the time of the accident.
    2. Determine who, if anyone witnessed the accident. Obtain names, addresses and phone numbers and get written statements from them as to what they saw and any other facts they may be aware of regarding the accident and its cause.
    3. Interview the accident victim to hear his/her explanation of how the accident occurred.
    4. Fully complete an accident investigation report and submit a copy to The Christman Company's Superintendent.

    All accidents resulting in property damage shall be reported immediately to The Christman Company Project Superintendent in order to allow for documentation of the extent of damage and determination of any required corrective action.

XIV. Assured Grounding Program

This program may be used to ensure that the scheduled inspection and safety condition of construction electrical equipment grounding conductors is satisfactory. The program applies to all extension cords and receptacles not part of the permanent building or structural wiring.

A. Inspection Procedure

The inspection procedure for all extension cords, attachment caps, plug/receptacle sets and equipment powered by a plug-in cord will include visual inspection at the beginning of each shift for signs of damage, defects, missing pins or insufficient insulation. Defective equipment will be removed from service until repaired and / or replaced.

B. Test Procedure

The test procedure for all extension cords and receptacles that are not permanent wiring includes testing for electrical conduction and correct attachment to the equipment ground conductor. The frequency of these tests will be as follows:

1. Prior to the first use.
2. Before equipment is returned to service following any repairs.
3. Before equipment is used following an incident which may have resulted in equipment damage.
4. At intervals not exceeding three months. Quarters and tape color should be coded following inspection. Winter (January through March) will be coded in white; Spring (April through June) will be coded in green; Summer (July through September) will be coded in red; and Fall (October through December) will be coded in brown.

Testing for each quarter is expected to occur between 15 days prior to and 15 days after the beginning of that quarter.

Each subcontractor is responsible for assigning a properly qualified person to coordinate their Assured Grounding Program and ensure compliance with this procedure and any other applicable codes and regulations.

Other forms of testing will be accepted as long as the record documentation of the testing can be provided upon request.

XV. General Jobsite Safety Rules

Violation of any of the following general jobsite safety rules is considered to be extremely serious and a detriment to the safety and welfare of all workers. Violation of these safety rules will be cause for disciplinary action up to and including permanent removal from the project.

A. Report all injuries to the field office. Get first aid promptly.
B. Keep your mind on your work at all times. No horseplay on the job.
C. Personal safety equipment must be worn as prescribed for each job, such as: safety glasses for eye protection when sawing or chipping concrete or masonry; hard hats at all times within the confines of the Project site; gloves when handling materials that are harmful to the skin; safety shoes for protection against foot injuries – no tennis shoes, sneakers, or other light duty shoes.

D. Keep your shirt on to prevent sunburn and to protect against acid burns, steam burns, weld splatter and cuts. Minimum clothing for upper body is a "T" shirt. Legs to be protected by long pants – no shorts allowed.
E. If any part of your body should come in contact with an acid or a caustic substance, rush to the nearest water available and flush over the affected part. Secure medical aid as soon as possible.
F. Watch where you are walking. Don't run.
G. The unauthorized use, sale, possession or distribution of alcohol, narcotics, drugs or controlled substances while working or working while under the influence of these substances is prohibited.
H. Do not distract the attention of fellow workers – to do so may cause injury.
I. Sanitation facilities are provided for your use. Use them.
J. Good housekeeping is a must. Keep your work area free from rubbish and debris. Keep materials, tools, and equipment in a neat and orderly fashion.
K. Do not use a compressor to blow dust or dirt from your clothes, hair, face, or hands.
L. Use a respirator when working on operations where dust or fumes are present.
M. Never work aloft if you are afraid to do so, are subject to dizzy spells, or if you are apt to be nervous or sick.
N. In case of injury to a fellow worker, go for help. Never move an injured person unless it is absolutely necessary – further injury may result. Keep the injured as comfortable as possible and utilize jobsite first aid supplies until medics arrive.
O. Know where firefighting equipment is located and learn how to use it.
P. Learn to lift correctly – with the legs, not the back. If a load is too heavy, GET HELP.
Q. Riding material hoists, crane ball, and sideboards or with your legs dangling over the ends or sides of trucks is not permitted.
R. Do not use power tools and equipment until you have been properly instructed in their use and operation. Be sure that all guards are in place. Do not remove, displace, damage, or destroy any safety device or safeguard furnished or provided for use on the job, nor interfere with the use thereof.
S. Rope off or barricade danger areas. Do not enter an area, which has been roped off or barricaded.
T. If you must work around backhoes, cranes, trucks, and dozers, make sure operators are aware of your presence. All mobile equipment must have backup alarms.
U. Never oil, lubricate or fuel equipment while it is running or in motion.
V. Trenches 4 ft. in depth must have a ladder and over 5 ft. must be shored or sloped as required. Keep out of trenches or cuts that have not been properly sloped or shored. Inspect trenches and banks daily. Backfill material must not be stored closer than two feet from top of bank.
W. Use the "four and one" rule when using a ladder – one foot of base for every four feet of height. Always secure the bottom of the ladder with cleats and/or safety feet. Lash off the top of the ladder to avoid shifting. Ladders must extend three feet above a landing for proper use. Defective ladders must be properly tagged and removed from service.
X. Erect scaffolds according to manufacturers' recommendations.
Y. Use only extension cords of the three prong type and protected with a GFCI.

Z. The use of fall protection with safety lines when working from unprotected high places is mandatory. Always keep your lines as tight as possible.
AA. Never throw anything "overboard". Someone may be passing below.
AB. Open fires are prohibited.
AC. Floor perimeter and floor openings shall be properly guarded at all times. Perimeter cabling must be flagged. All covers for floor openings must be secured and marked, "Hole Cover Do Not Remove". A "hole" means a gap or void 2 inches or more in its least dimension, in a floor, roof, or other walking/working surface. Note – this includes mechanical and electrical sleeves.
AD. All personnel operating a manlift or forklift must be certified.
AE. No radios, MP3 players or personal listening devices are allowed on site.

XVI. Housekeeping

A clean work place is a safe work place. Every subcontractor and worker shall be responsible to adhere to the following housekeeping guidelines:

A. Pick up and dispose of trash and debris on a daily basis. A sufficient number of trash receptacles shall be provided and emptied with regularity.
B. **Work areas are to be kept clean, orderly and floors are to be swept daily.**
C. Leads, hoses, and extension cords shall be hung up with a nonconductive material, off all floors, stairways, and walkways.
D. Trash such as drinking cups, cans, and scraps from lunch are not to be thrown down, but disposed of properly in marked containers.
E. Materials, equipment, concrete forms, pipe, etc., are to be orderly stacked so as not to obstruct walkways, doors, stairways, ladders, other points of access or egress, etc.
F. Oil, grease, and other such liquid spills shall be cleaned up at the time of spill and are not to be left unattended.
G. Participation in mandatory cleanup programs if the project requires it.

XVII. Ancillary Safety Procedures

A. Lockout/Tagout – a procedure for cutting off all sources of energy or flow of medium to a piece of equipment or system. Refer to Attachment III.
B. Confined Space Entry – a procedure to assure that workers who perform work in a confined space is protected. Refer to Attachment IV.
C. Cranes – all cranes and cable (wire rope), rigged hoisting equipment shall have a current annual inspection by an accredited agency prior to working at this site. Contractors also are required to maintain a current annual inspection for the duration of the work. An accredited agency is a third party, which is recognized by the Department of Labor, Occupation Safety and Health Agency. A copy of the annual certification must be submitted to the respective general contractor immediately upon arrival on site. Rigging must be inspected and have required capacity tags.

D. Powder-Actuated Tool Operator – each powder-actuated tool operator will be certified in accordance with OSHA requirements. Operators will carry their certification card on their person while operating powder-actuated tools.

F. Hole Covers – Any contractor / trade that creates or exposes a hole or opening in a floor or wall is responsible to immediately protect the opening in accordance with OSHA regulations. At a minimum the hole is to be protected by barricades or a secured cover that is sufficient in strength to support any potential load that may be imposed. Additionally, anyone who removes a hole cover is responsible to protect the area while the exposure is present and to re-secure the cover or protection once the work is completed for that shift.

XVIII. Tobacco Use Protocol

Smoking and the use of all other tobacco products, is strictly prohibited within the boundaries of the Lewton project. The use of any tobacco product will be permitted off site. Violation of this policy will be cause for disciplinary action up to and including permanent removal from the project.

XIX. Crane Inspections

Each crane used at the Project site shall have a current annual crane inspection report, which documents that the crane has been inspected within the current year in accordance with established OSHA standards.

XX. Visitor Policy

All visitors to the Project site must report to The Christman Company Project Office upon arrival. All visitors shall comply with the policies and procedures of this Project Safety Manual while on site. Visitors are required to watch The Christman Company safety orientation video and sign the visitor release form. Visitors not sufficiently familiar with the jobsite shall be accompanied at all times by employees familiar with the Project. Visitors must wear a hardhat, Hi-Visibility shirt or safety vest, and proper footwear at all times while on site. Other PPE such as safety glasses are to be worn when the conditions warrant such protection. The contractor requesting approval of the visitor is responsible to issue the proper PPE that may be required.

XXI. Fire Prevention and Protection

A. Fire Prevention

1. Housekeeping
   Proper Housekeeping practices by all subcontractors will help to establish and maintain free and unobstructed egress from the project site. Housekeeping of the project is to be maintained by all subcontractors performing work on the site. It is each subcontractor's responsibility to report areas of the jobsite that present a likelihood of fire to The Christman Company superintendent. Depending on the

type of construction and the participation of the subcontractors in daily housekeeping efforts, The Christman Company may create and enforce a mandatory cleanup policy that will be adhered to by all subcontractors.

2. Storage of Flammable and Combustible Liquids

   A. General Requirements
      1. Only approved containers and portable tanks will be used for storage and handling of flammable and combustible liquids.
      2. Approved metal safety cans will be used for handling and use of flammable liquids in quantities greater than one gallon. Plastic containers are prohibited. Flammable liquid materials may be used and handled in original shipping containers.
      3. For storage, use and handling of flammable liquids in quantities of one gallon or less, only the original container or approved metal safety cans may be used.
      4. Flammable or combustible liquids are not to be stored in areas used for exits, stairways or other high-traffic areas.
      5. No storage of flammable or combustible materials is to occur on any roof.

   B. Indoor Storage

      1. No flammable materials may be stored inside.
      2. Materials, which will react with water and create a fire hazard, shall not be stored in the same room with flammable or combustible liquids.

   C. Outdoor Storage

      1. All storage areas are to be created as to prevent the contamination of surrounding areas in the event of a spill. Proper consideration is to be given to the runoff of rainwater vs. the control of spilled or leaking materials.
      2. Containers less than 60 gallons in size are to be placed in areas not to exceed a total of 1,100 gallons. Containers are to be separated by a five feet clearance and will not be nearer than 20 feet to a structure.
      3. Portable tanks will not be nearer than 20 feet from any structure.

   D. Gas and Oxygen Bottles

      1. Full and/or partially used compressed gas cylinders must be attached to approved carts and turned off after each use.
      2. All compressed gas cylinders regardless of content amount (full, partially full or empty), shall be properly stored and secured in the area designated by The Christman Company.

3. Valve protecting caps shall always be in place when cylinders are not connected for use.
4. When moving a cylinder, be sure to remove all gauges prior to the move. Be sure to use a rack when lifting a cylinder to and from upper elevations. Never move a cylinder by rolling it or by dropping it down to lower elevations.
5. Oxygen cylinders must be stored 20 feet away from fuel cylinders or separated by a solid 1- hour divider. Storage is considered as not being used within the next shift of work or 24-hour period, which is ever shorter. Oil and grease must be kept away from oxygen cylinders.
6. Compressed gas cylinders shall be legibly marked with the chemical or trade name of the gas. Marking shall be by stenciling, stamping, or labeling and shall not be readily removable.
7. All L.P.G. not connected for use must be properly stored in the designated area. NO EXCEPTIONS!

E. Temporary Heat

1. Temporary heaters must be installed and serviced by authorized technicians only.
2. Housekeeping in the area of the heater is extremely important and all subcontractors are responsible to insure that no materials are stored near the heater or in such a fashion that they may create a hazardous condition.
3. All temporary fuel burning heaters are to have functioning safety valves that will eliminate fuel flow in the event of flame outage.
4. If a heater is to operate for an extended period of time it must have a daily scheduled inspection to insure that it is operating correctly and that the area is clear of possible obstructions.
5. The Christman Company superintendent may assign maintenance, operation, and inspection responsibilities to a subcontractor.
6. All subcontractors are responsible to notify The Christman Company immediately in the event of a malfunctioning heater or potential for a hazardous condition.

F. Hot Work Operations and Permit Procedures

Many of Christman projects are within existing operating facilities. Clients may have established procedures at their facilities to ensure all safety precautions have been taken prior to initiating operations involving Hot Work. Additionally, Hot Work permits may be issued by Client operations personnel to control the work within operating areas and ensure that operator/maintenance/construction personnel are aware of client required safe work practices. It is the responsibility of all personnel entering client controlled operating areas to obtain the proper Client authorization and appropriate work permits. The Christman Company shall be informed of any intended Hot Work prior to initiating. The

Christman Company will coordinate our Hot Work permitting program with any other existing program being implemented by the Client. Regardless if the Client has a Hot Work procedure, NO Hot Work shall take place without first coordinating with The Christman Company.

The purpose of this procedure is to eliminate the potential for injury to personnel and damage to equipment and property due to fire, sparks, heat or explosion resulting from cutting, welding and similar hot work.

A "Hot Work Permit" will be required by The Christman Company when using any equipment, tools or apparatus capable of generating heat, sparks or flames in any restricted areas; enclosed interior areas or as determined by the project superintendent or site safety manager (Refer to attached Hot Work Permit). The Christman Company, through designation of a Permit Authorizing Individual (PAI), will ensure adherence to this Hot Work permit procedure. Failure to comply with this Hot Work Permit procedure may result in immediate and permanent removal from the project. The discipline policy as described in section IV of the project specific safety manual will be enforced.

Upon issuance of the proper work permit by Christman or the Client's representative, the PAI shall completely perform the required actions indicated on the permit, check all boxes on the permit, and sign off on it. The PAI shall print their name and sign the work permit verifying he has reviewed the permit and understands the limitations and requirements within.
Upon receiving the permit, it is the responsibility of the PAI to review the permit with his employees/crew explaining the precautions and limitations of the proposed task and assure that the permit system is implemented correctly.

The following conditions apply to all hot work permits:

- The contractor will be responsible for providing all the required training, materials, personnel and protective equipment to conduct all hot work.
- Contractor personnel who perform fire watch duties must be trained to perform the task and trained to use a fire extinguisher.
- A permit is not valid for more than one shift. In any case, the duration of the Hot Work Permit shall not exceed 12 hours. A new permit is to be issued if the job/task duration exceeds 12 hours.
- Prior to starting operations, the working areas and any levels below must be reviewed to assure that flammable material and equipment has been removed from harm's way.
- Adjacent contractors have been informed of the impending hot work.
- Contractor supplied firefighting equipment must be in place and readily available for worker use.
- A restricted zone must be established outside of the working area and at any areas levels accessible below.
- A fire watch must be established and maintained for a designated period after hot work has been completed. The duration of the fire watch is dependent

upon the type of hot work being performed and the working area. Fire watch can range from one (1) to two (2) hours.

- Hot work permits must be prominently displayed within the hot work area and available for review. Workers assigned to fire watch duty must be readily identifiable and within the area. Fire watch must be maintained through break and lunch periods.

Occasionally Special conditions may apply to hot work permits, based on the environment of the work area and the type of operations being performed. Special conditions to the permit may include the following:

- Fume monitoring and control measures.
- Flame retardant ground and wall coverings.
- Extended fire watch
- Dosing or spray down of work areas after hot work completion.
- Use of smoke and carbon monoxide detectors.
- Oxygen and gas monitoring.

Hot work permits are to be collected by the PAI at the expiration of the permit, conclusion of task or end of shift. After the permit has been closed out they are to be submitted to The Christman Company superintendent or site safety manager for review.

Copies of the permit will be retained by The Christman Company for the duration of the project.

B. Fire Protection

1. A means of egress shall be established and maintained. Each subcontractor is responsible to notify The Christman Company if the means of egress is not obvious or if it is obstructed.

2. The rules for evacuation will be posted on the project bulletin board area adjacent to the other OSHA required postings. If the location of the work is such that posting of the rules is not feasible, a copy of the rules and a map of the evacuation route (if applicable) will be given to each subcontractor working on the project. It is the responsibility of each subcontractor to make their employees aware of any such posted or otherwise conveyed rules, maps or procedures for the safe and orderly evacuation of the project.

3. Emergency phone numbers shall be posted next to each phone in the jobsite trailer or office.

4. Firefighting equipment shall be provided by the subcontractor for protection of their employees. In some cases, The Christman Company may provide "common area"

protection. Each subcontractor is to coordinate their efforts to comply with this rule with The Christman Company superintendent. Defective equipment shall be immediately replaced and brought to the attention of The Christman Company superintendent.

5. Fire walls and exit stairways required for the completed buildings are given construction priority. Fire doors with automatic closing devices shall be hung on openings as soon as practicable.

6. Retain existing fire separations in buildings undergoing alterations or demolition until operations necessitate their removal.

C. Employee Emergency Action Plan

The Christman Company's project superintendent shall be the person in command in the event of a fire or other emergency. It shall be his responsibility to oversee that employees are evacuated and the emergency response team is notified. The superintendent shall designate another employee as second in command. Fires and other emergencies shall be reported to the superintendent immediately. All employees are required to familiarize themselves with the evacuation plan for the site and with the designated contacts for emergency response team.

In the event of a fire or other emergency, employees shall evacuate the building through the nearest exit after determining it is safe to do so. Upon exit from the unsafe area, the employee should contact his superintendent and coordinate efforts to call the emergency response team (911). Each foreman or superintendent is responsible for a head count of their employees after evacuation. The Christman Company superintendent is to be notified of any missing employees.

If critical operations must be conducted or continued within or near an unsafe area during a fire or other emergency and the superintendent deems that limited activity may continue in the area, the superintendent shall establish a plan to monitor those employees in the unsafe area as well as a way to quickly evacuate them should the conditions become worse. If monitoring and quick evacuation are not possible, the operations shall be abandoned until conditions improve.

All employees are responsible for the joint welfare of all other employees. During evacuation, ambulatory employees trained in first-aid/CPR are responsible to assess the conditions of non-ambulatory employees and assist in their evacuation. Employees who cannot be moved must be reported to the superintendent upon evacuation.

CHRISTMAN
SINCE 1894

Project Name/Number

Project Safety Manual

Date: February 23, 2023

PROJECT SAFETY MANUAL

SUBCONTRACTOR AND TRADE CONTRACTOR ACKNOWLEDGEMENT

I hereby acknowledge receipt and comprehension of the policies and procedures set forth in this Manual and agree to comply with its directives.

In addition, I hereby agree to comply with any field or trade-related guidelines as they apply to the portion of work for which I have been contracted and will incorporate them into the ongoing safety effort. I also understand and agree to comply with any State and Federal OSHA and ANSI regulations, standards, codes and rules as they apply to my portion of the work.

_____
(Signed)

_____
(Print Name)

_____
(Title)

_____
(Company Name)

_____
(Date)

Please sign and fill out the information requested above and return to The Christman Company.