

Project Name: Mt. Hope School – New BuildProject No.: 221125-140Architect: C2AEDate: 7/31/2023Bid Package No.: 2Bid Due Date: 08/03/2023

This Addendum is issued to inform the bidders of modifications in the scope of work being bid for this project.

A. Documents included in this Addendum and dated [07/31/2023]:

- **C2AE Addendum 3:**

- **Specification Section(s):**

- 230900-Instrumentation and Control for HVAC;

- **Drawing(s):**

- S-101B; S-103A; S-103B; S-301; S-302; S-501; S-502; S-503; A-001; A-101A; A-101B; A-111A; A-111B; A-121A; A-121B; A-314; A-401; A-407; A-408; I-001; I-101; I-101A; I-101B; P-110A; P-111A; P-301; P-401; P-501; M-111B; M-401; M-601; M-603; M-701; ES01; E111A; E211A; E211B; E301; E302; E401; E411; E502; E601

- **Project Manual**

- **WC02**

- a. Added Specific Note and Detail 13; Provide and install $\frac{3}{4}$ DCW line added in Addendum 3 beyond 5' from the footprint of the building. WC 27 responsible for installation and tie within 5' of the building footprint.

- **WC20**

- a. Revise Specific Note and Details #4; Furnish and install all athletic equipment including but not limited to telescopic stands/bleachers, basketball equipment, volleyball equipment, scoreboards, Gaga-Ball Pit, and gymnasium safety wall pads, including all accessories for a complete installation.
 - b. Added Specific Note and Details #7A; 7A. Provide, install, and maintain temporary plywood protection for wall penetrations/openings required to be covered for security, weather, climate, or misc. requirements. To be funded by this WC allowance, not to include the installation and maintenance of the temporary plywood wall referenced in note #7.
 - c. Increased allowance for WC 20 from \$30,000 to \$40,000.

- **WC 27**

- a. Added Specific Note and Detail 11; Provide and install $\frac{3}{4}$ " DCW as noted in Addendum 3 drawing. This WC responsible to install 5' outside the building footprint.

- **Bid Form**

- Added Unit Price for WC 05 Level 2 to Level 3 Finish.

- **RFI Questions & Answers (to date).**

B. Bids are due [8/03/2023].

- **Include in your bid the increase or decrease for all materials, labor, supervision, overhead and profit required to properly and completely execute the work described in this Addendum.**
- **Acknowledge receipt of this Addendum on the Bid Proposal Form.**

The applicable provisions of the Contract Documents shall govern all work included herein unless specifically noted otherwise.

END OF ADDENDUM NO. [3]

Addendum 3

Project No.:	22-0116	Date:	July 28, 2023
Project:	Mt. Hope Lansing School District SB-1785 Ingham County, MI	A/E Firm:	C2AE
Owner:	Lansing School District 519 West Kalamazoo Street Lansing, MI 48933	Project Manager:	Steve Jurczuk

The following changes, revisions, modifications, etc. shall be incorporated into the contract documents, specifications, and plans.

BID FORM

A3.1 The Bidder shall acknowledge receipt of Addenda #3 by indicating so in the spaces provided on Bid Form

SPECIFICATIONS

A3.2 Refer to Section 230900 – Instrumentation and Control for HVAC (reissued):
Revise specification section as indicated.

DRAWINGS

- A3.3 Refer to Sheets S-101B and S-503 (reissued):
Clarify roof deck conditions and details.
- A3.4 Refer to Sheets S-103A and S-103B (reissued):
1. Revise masonry shear wall reinforcement spacing for wall type M-2.
 2. Add notes for fully grouted CMU cores for acoustics.
 3. Clarify Masonry Wall Reinforcement Schedule Note 4.
- A3.5 Refer to Sheet S-301 (reissued):
Add notes for coordination of steel framing for reading nooks.
- A3.6 Refer to Sheet S-302 (reissued):
Revise masonry lintel connection detail to steel post.
- A3.7 Refer to Sheet S-501 (reissued):
Add typical footing for outdoor classroom pavilion structure.

- A3.8 Refer to Sheet S-502 (reissued):
Clarify bond beam locations and elevations.
- A3.9 Refer to Sheet A-001 (reissued):
Partition type clarification.
- A3.10 Refer to Sheets A-101A, A-101B, A-121A, A-121B and A-408 (reissued):
Revise corridor locker layout and size.
- A3.11 Refer to Sheet A-111A (reissued):
Modify Reflected Ceiling Plan General Notes to reflect the following:
1. Note 7 exceptions for Cafeteria and Gymnasium added.
 2. Revise ceiling height in rooms 315, 316, 318A, and 322 to be 9'-0" AFF.
 3. Note 10 added to reinforce paint selection for Cafeteria Ceiling Exposed Ductwork.
- A3.12 Refer to Sheet A-111B (reissued):
Modify Reflected Ceiling Plan General Notes to reflect the following:
1. Note 7 exceptions for Cafeteria and Gymnasium added.
 2. Note 10 added to reinforce paint selection for Cafeteria Ceiling Exposed Ductwork.
- A3.13 Refer to Sheet A-314 (reissued):
Detail 4 finish clarification, roof screen steel to be galvanized.
- A3.14 Refer to Sheet A-401 (reissued):
Detail 1 and 2 Wood Niche detail notes.
- A3.15 Refer to Sheet A-407 (reissued):
Clarify corridor accent wall tiles and verify 12'-9" is the correct dimension. Tile group typical centered on wall.
- A3.16 Refer to Sheet I-001 (reissued):
Modify material schedule to reflect the following:
1. AWP-2, AWP-3, AWP-4 Manufacturer name was added.
 2. AWP-5, AWP-6, AWP-7, AWP-8 changed to Sound Seal Series S-2100 to reflect Impact Resistant properties.
 3. WF-1 reselected due to lack of availability in the United States.
 4. WD-2 Niche Wood material and finish clarified.
 5. TP-1 modify Toilet Partition line.
 6. Add ACP-3 to materials schedule. Armstrong Optima, White in a White grid, 24"x24"x1", 15/16 grid.
- A3.17 Refer to Sheet I-101 (reissued):
1. Floor hatching for cafeteria stairs, stage and ramp modified to reflect RF-2.
 2. Tile wall accent notation added to water fountain in 201 Corridor adjacent to Janitor 213.
 3. Resilient base for cafeteria stage area modified to reflect RB-1.
- A3.18 Refer to Sheet I-101A (reissued):
1. Floor hatching for cafeteria stairs, stage and ramp modified to reflect RF-2.
 2. Resilient base for cafeteria stage area modified to reflect RB-1.

- A3.19 Refer to Sheet I-101B (reissued):
Add tile wall accent notation to water fountain in 201 Corridor adjacent to Janitor 213.
- A3.20 Refer to Sheet P-110A (reissued):
1. Change keynote from P06 TO P10 as shown near G/2.
 2. Add underground irrigation piping as indicated at NE corner of building.
- A3.21 Refer to Sheet P-111A (reissued):
1. Revise DCW piping near room 405 and provide irrigation components as indicated.
 2. Tag floor cleanouts as FCO.
 3. Revise DHWR line size in Corridor 301 as shown.
- A3.22 Refer to Sheet P-301 (reissued):
Within room 307 change sink tag to "ST-1". Revise vent piping layout.
- A3.23 Refer to Sheet P-401 (reissued):
1. Add domestic water riser diagram.
 2. Revise kitchen domestic water heating piping diagram as indicated.
 3. Revise building domestic water heating piping diagram as indicated.
- A3.24 Refer to Sheet P-501 (reissued):
1. Add water saver trap primer detail.
 2. Change title of multiple trap primer detail as indicated.
- A3.25 Refer to Sheet M-111B (reissued):
1. Revise keynote SM07 verbiage as indicated.
 2. Extend N/S duct in room 204 as shown.
- A3.26 Refer to Sheet M-401 (reissued):
1. Revise natural gas riser diagram as shown.
 2. Revise new meter natural gas load schedule information as shown.
- A3.27 Refer to Sheet M-601 (reissued):
1. Revise duct system application schedule as shown.
 2. Revise VFD schedule as shown.
- A3.28 Refer to Sheet M-603 (reissued):
Revise piping system application schedule as shown.
- A3.29 Refer to Sheet M-701 (reissued):
Add VFD / ECM Motor Control Diagram.
- A3.30 Refer to Sheet ES01 (reissued):
Revise layout of site electrical distribution equipment.
- A3.31 Refer to Sheet E-111A (reissued):
Added select light fixtures to generator as indicated for egress lighting.

A3.32 Refer to Sheet E-211A (reissued):

1. Revise noting for surface mounted raceway above teaching wall in classrooms.
2. Add notes for portable generator docking station and NEMA 3R CT Cabinet.
3. Add note for corridor cable tray requirements.

A3.33 Refer to Sheet E-211B (reissued):

1. Revise bleacher power requirements to 208V-3PH.
2. Revise noting for surface mounted raceway above teaching wall in classrooms.
3. Add note for corridor cable tray requirements.

A3.34 Refer to Sheet E-301 (reissued):

Add power connection for electronic trap primer.

A3.35 Refer to Sheet E-302 (reissued):

1. Revise layout of generator and medium voltage transformer.
2. Add 2000A CT Cabinet.
3. Clarify equipment concrete pad requirements.
4. Add power for DWH-1 and DWH-2.
5. Revise detail for typical classroom conduit routing.

A3.36 Refer to Sheet E-401 (reissued):

1. Add VFD control for RTU-1, RTU-3, and RTU-9.
2. Add HWHP-1 and HWHP-2 to emergency standby power.

A3.37 Refer to Sheet E-411 (reissued):

1. Revise panel schedule K1 to indicate 400A rating.
2. Add (2) trap primer circuits to panelboard K1.
3. Add (4) circuits to panelboard RP1.
4. Revise gym motorized bleacher circuit to be 208V-3PH in panelboard RP3.

A3.38 Refer to Sheet E-502 (reissued):

Revise Interactive Flat Panel and Teacher Workstation details to align with Technology.

A3.39 Refer to Sheet E-601 (reissued):

Revise Lighting Fixture Schedule as indicated.

SECTION 230900 - INSTRUMENTATION AND CONTROL FOR HVAC – ADDENDUM 3

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Division 20, Common Work Results for Mechanical, requirements apply to this section.
- C. Division 01 Section 013100 “Project Management and Coordination”, applies to this section and will require the contractors’ participation in the Above Ceiling Coordination Program.
- D. Division 01 Section 019113 “General Commissioning Requirements”, applies to this section and will require the contractors’ participation in the commissioning process.
- E. Division 26 Section 260500 “Common Work Results for Electrical” requirements apply to this section and requires contractor participation in the Above Ceiling Coordination Program.

1.2 DEFINITIONS

- A. BAS: Building Automation System
- B. DDC: Direct Digital Control
- C. EMS: Energy Management System consisting of BAS (typically with a PC and support software), DDC controllers, and networking software/hardware/wiring.
- D. I/O: Input/output
- E. BACnet: A communications protocol for implementing interoperable controllers established by ASHRAE
- F. MS/TP: Master-slave/token-passing network for BACnet
- G. PC: Personal computer
- H. PID: Proportional plus integral plus derivative

1.3 SYSTEM DESCRIPTION

- A. In accordance to the scope of work, the system shall also provide a graphical, web-based, operator interface that allows for instant access to any system through a standard browser. ~~The Systems Integrator (SI) contractor, under separate contract will provide PC-based programming workstations.~~ Microcomputer controllers of modular design providing distributed processing capability and allowing future expansion of both input/output points and processing/control functions will be provided by the BAS contractor.
- B. For this project, the system shall consist of the following components:
1. Administration and Programming Workstation(s): The ~~SI Systems Integrator~~ BAS supplier shall include Operation software and architecture as described in Part 2 of the specification. These workstations must be running the standard workstation software developed and tested by the manufacturer of the network server controllers and the standalone controllers. No third party front-end workstation software will be acceptable. Workstations must conform to the B-OWS BACnet device profile. All field level controllers must have the ability to be programmed by site personnel from a BAS contractor supplied and licensed programming tool or N4 embedded programming tool jar file.
 2. Web-Based Operator Workstations: The ~~SI Systems Integrator~~ BAS contractor supplier shall furnish licenses for web connection to the BAS system. Web-based users shall have access to all system points and graphics, shall be able to receive and acknowledge alarms, and shall be able to control setpoints and other parameters. All engineering work, such as trends, reports, graphics, etc. that are accomplished from the WorkStation shall be available for viewing through the web browser interface without additional changes. The web-based interface must conform to the B-OWS BACnet device profile. There will be no need for any additional computer based hardware to support the web-based user interface.
 3. Ethernet-based Network Router and/or Network Server Controller(s): The BAS system supplier shall furnish needed quantity of Ethernet-based Network Server Controllers as described in Part 2 of the specification. These controllers will connect directly to the Operator Workstation over Ethernet at a minimum of 100mbps, and provide communication to the Standalone Digital Control Units and/or other Input/Output Modules. All field level controllers must have the ability to be programmed by site personnel from a BAS contractor supplied and licensed programming tool or N4 embedded programming tool jar file. Network Server Controllers shall conform to BACnet device profile B-BC. Network controllers that utilize RS232 serial communications to communicate with the workstations will not be accepted. Network Controllers shall be tested and certified by the BACnet Testing Laboratory (BTL) as BACnet Building Controllers (B-BC).

4. Standalone Digital Control Units (SDCUs): Provide the necessary quantity and types of SDCUs to meet the requirements of the project for mechanical equipment control including air handlers, central plant control, and terminal unit control. Each SDCU will operate completely standalone, containing all of the I/O and programs to control its associated equipment. All field level controllers must have the ability to be programmed by site personnel from a BAS contractor supplied and licensed programming tool or N4 embedded programming tool jar file. Each BACnet protocol SDCU shall conform to the BACnet device profile B-AAC. BACnet SDCUs shall be tested and certified by the BACnet Testing Laboratory (BTL) as BACnet Advanced Application Controllers (B-AAC).
- C. The Local Area Network (LAN) shall be either a 10 or 100 Mbps Ethernet network supporting BACnet, Modbus, XML and HTTPS for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Server Controllers (NSCs), user workstations and a local host computer system.
- D. The Enterprise Ethernet (IEEE 802.3) LAN shall utilize Carrier Sense Multiple/Access/Collision Detect (CSMA/CD), Address Resolution Protocol (ARP) and User Datagram Protocol (UDP) operating at 10 or 100 Mbps.
- E. The system shall enable an open architecture that utilizes BACnet functionality to assure interoperability between all system components. Native support for BACnet protocol are required to assure that the project is fully supported by the HVAC open protocols to reduce future building maintenance, upgrade, and expansion costs.
- F. The AAC shall be capable of communicating as a BACnet IP device communicating at 10/100 Mbps on a TCP/IP trunk. The ANSI / ASHRAE™ Standard 135-2004, BACnet protocol is required to assure that the project is fully supported by the leading HVAC open protocol to reduce future building maintenance, upgrade, and expansion costs.
- G. The system shall provide support for Modbus TCP and RTU protocols natively, and not require the use of gateways.
- H. Complete temperature control system to be DDC with electronic sensors and electronic/electric actuation of Mechanical Equipment Room (MER) valves and dampers and electronic actuation of terminal equipment valves and actuators as specified herein. The BMS is intended to seamlessly connect devices throughout the building regardless of subsystem type, i.e. variable frequency drives and power metering should easily coexist on the same network channel.
 1. The supplied system must incorporate the ability to access all data using HTML5 enabled browsers without requiring proprietary operator interface and configuration programs. The system shall not require JAVA to be enabled in the browser.
 2. Data shall reside on a supplier-installed server for all database access.
 3. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network.

- I. All work described in this section shall be installed, wired, circuit tested and calibrated by factory certified technicians qualified for this work and in the regular employment of the approved manufacturer's local field office. The approved manufacturer's local field office shall have a minimum of 5 years of installation experience with the manufacturer and shall provide documentation in the bid and submittal package verifying longevity of the installing company's relationship with the manufacturer when requested. Supervision, hardware and software engineering, calibration and checkout of the system shall be by the employees of the approved manufacturer's local field office and shall not be subcontracted. The control contractor shall have an in-place support facility within 120 miles of the site with factory certified technicians and engineers, spare parts inventory and all necessary test and diagnostic equipment for the installed system, and the control contractor shall have 24 hours/day, 7 days/week emergency service available.

1.4 SUMMARY

- A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.
 1. Provide Building Automation System (BAS) as shown in the contract documents and described herein.
 2. Provide interface to BAS via BACnet as shown in the contract documents and described herein.
 3. Provide DDC System as shown in the contract documents and described herein.
 4. Sequences modified as a result of start-up, checkout, fine tuning, and/or commissioning shall be resubmitted to the Architect for record.
 5. Systems integration: The installing contractor is responsible for and shall provide the integration of the DDC with the existing web-based graphical user interface, including (but not limited to):
 - a. Insuring that the new DDC Controllers shall interface to the existing web-based graphical user interface. There are three levels of system architecture: a campus-wide Management Level Network (MLN) that is Ethernet based IP protocol, a high performance peer-to-peer Building Level Network (BLN), and an Application Specific Controller Floor Level Network (FLN). Access to all levels from the web-based graphical user interface appears transparent to the user when accessing data graphically or developing control programs.
 - b. New DDC Controllers shall be fully and readily accessible from existing graphical user workstations.
 - c. If required for networking, a network interface controller including hardware and panel, software (or firmware), and coordinating electrical power ~~and~~ UPS back-up **if required by Owner** per the contract documents.
 - d. Providing expansion of and/or upgrading of any network panel software/firmware and/or memory size to accommodate the additional point database and communication traffic (bandwidth) caused by accessing information across the network from the Owner's web-based graphical user interface for graphical display purposes. Inclusive with this is necessary memory or bandwidth for trend data collection.

- e. Coordination with the Owner's IT group in terms of their providing for the additional bandwidth requirements as a result of the installation.
 - f. All new graphics shall comply with existing district graphical standards. If software upgrades of existing graphics are required, such upgrades of the graphic user interface shall be provided as part of this project.
- B. Related Sections include the following:
- 1. Division 20 Section 200519 "Meters and Gages" for measuring equipment that relates to this Section.
 - 2. Division 26 Section 260943 "Network Lighting Controls" for requirements that relate to this Section.

1.5 SYSTEM PERFORMANCE

- A. Comply with the following performance requirements:
- 1. Graphic Display: Display graphic with minimum 30 dynamic points with current data within 5 seconds.
 - 2. Graphic Refresh: Update graphic with minimum 30 dynamic points with current data within 2 seconds.
 - 3. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.
 - 4. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.
 - 5. Alarm Response Time: Annunciate alarm at workstation within 15 seconds. Multiple workstations must receive alarms within five seconds of each other.
 - 6. Program Execution Frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.
 - 7. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.
 - 8. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:
 - a. Water Temperature: Plus or minus 1-degree F.
 - b. Water Flow: Plus or minus 5 percent of full scale.
 - c. Water Pressure: Plus or minus 2 percent of full scale.
 - d. Space Temperature: Plus or minus 1-degree F.
 - e. Ducted Air Temperature: Plus or minus 1-degree F.
 - f. Outside Air Temperature: Plus or minus 2-degrees F.
 - g. Averaging Air Temperature: Plus or minus 2-degrees F.
 - h. Dew Point Temperature: Plus or minus 2.7-degrees F.
 - i. Temperature Differential: Plus or minus 0.27-degrees F.
 - j. Relative Humidity: Plus or minus 5-percent relative humidity (% RH).
 - k. Airflow (Terminal): Plus or minus 5-% FS.
 - l. Air Pressure (Space): Plus or minus 0.0005-inches wg.
 - m. Air Pressure (Ducts): Plus or minus 0.02-inches wg.
 - n. Carbon Dioxide: Plus or minus 50-ppm CO₂.
 - o. Electrical: Plus or minus 2-percent of reading (volts/amps/watts).

1.6 SEQUENCE OF OPERATION

- A. Sequences of Operation are included on the temperature control drawings (plans).

1.7 SUBMITTALS

- A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.
1. Building Automation System: Include technical data for operator workstation, operating system software, color graphics; editors for graphics, point database, and programming; software licensing, software updates during construction, and other third-party applications.
 2. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for remote operator's terminal, operator display menus, interface equipment to BAS, DDC Controllers, Unitary Controllers, Application Specific Controllers (e.g. Air Terminal Controller), transducers/transmitters, sensors, control dampers, damper actuators, control valves, valve actuators, relays/switches, auxiliary control panels.
 3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
1. Bill of materials of equipment indicating quantity, manufacturer, and model number.
 2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
 3. Wiring Diagrams: Power, signal, and control wiring.
 4. Details of control panel faces, including controls, instruments, and labeling.
 5. Written description of sequence of operation.
 6. Schedule of dampers including size, leakage, and flow characteristics.
 - a. Coordinate dampers sizes with sheet metal and/or mechanical contractor before submitting.
 7. Schedule of valves including flow characteristics.
 8. Schedule of Terminal Equipment Controllers; e.g. air terminals, unit ventilators, etc.
 9. DDC System Hardware:
 - a. Wiring diagrams for control units with termination numbers.
 - b. Schematic diagrams and floor plans for field sensors and control hardware.
 - c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.
 10. Control System Software: List of color graphics indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.

11. Controlled Systems:
 - a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
 - b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
 - c. Written description of sequence of operation including schematic diagram.
 - d. Points list.
- C. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with ASHRAE 135.
- D. Samples for Initial Selection: For each color required, of each type of thermostat or sensor cover with factory-applied color finishes.
- E. Samples for Verification: For each color required, of each type of thermostat or sensor cover.
- F. Software and Firmware Operational Documentation: Include the following:
 1. Software operating and upgrade manuals
 2. Program Software Backup: On a USB Drive.
 3. Device address list
 4. Printout of software application and graphic screens
 5. Software licenses required by and installed for DDC workstations and control systems
- G. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.
- H. Field quality control test reports
- I. Installing contractor's commissioning reports
- J. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. Include the following:
 1. Maintenance instructions and list of spare parts for each type of control device and the compressed air station.
 2. Interconnection wiring diagrams with identified and numbered system components and devices.
 3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
 4. Inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
 5. Calibration records and list of set points.

1.8 QUALITY ASSURANCE

- A. All bidders must be building automation contractors in the business of installing direct digital control building automation systems for a minimum of 5 years.

1. The Building Management System contractor shall have a full service facility within 120 miles of the project that is staffed with engineers trained and certified by the manufacturer in the configuration, programming and service of the automation system. The contractor's technicians shall be fully capable of providing instructions and routine emergency maintenance service on all system components.
 2. Any installing contractor, not listed as prequalified in the Approved Manufacturer's section, shall submit credentials as detailed in the Pre-bid Submittal section for the engineer's review 2 weeks prior to bid date. Failure to follow the attached formats shall disqualify potential alternate bidders. Credentials must attest that the contractor meets all requirements of the specification and the Engineers judgment regarding approval to bid as an acceptable installer after reviewing the data will be final.
 3. The following contractors have been pre-qualified for installation and programming:
 - a. SC Tech
 - b. ControlNET
 - c. Grand Valley Automation
- B. All bidders must be authorized distributors or branch offices of the manufacturers specified.
- C. Each point in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the BAS will be tested against the appropriate sequence of operation specified herein. Successful completion of the system test shall constitute the beginning of the warranty period. A written report will be submitted to the owner indicating that the installed system functions in accordance with the plans and specifications.
- D. The BAS system supplier shall commission and set in operating condition all major equipment and systems, such as the hot water heating and all air handling systems, in the presence of the equipment manufacturer's representatives, as applicable, and the Owner and Architect's representatives. If the vendor is providing an AFDD/CC system, use of the analytics shall be used to help commission the system.
- E. Startup Testing shall be performed for each task on the startup test checklist, which shall be initialed by the technician and dated upon test was completion along with any recorded data such as voltages, offsets or tuning parameters. Any deviations from the submitted installation plan shall also be recorded.
- F. Required elements of the startup testing include:
1. Measurement of voltage sources, primary and secondary
 2. Verification of proper controller power wiring.
 3. Verification of component inventory when compared to the submittals.
 4. Verification of labeling on components and wiring.
 5. Verification of connection integrity and quality (loose strands and tight connections).
 6. Verification of bus topology, grounding of shields and installation of termination devices.

7. Verification of point checkout.
 8. Each I/O device is landed per the submittals and functions per the sequence of control.
 9. Analog sensors are properly scaled and a value is reported
 10. Binary sensors have the correct normal position and the state is correctly reported.
 11. Analog outputs have the correct normal position and move full stroke when so commanded.
 12. Binary outputs have the correct normal state and respond appropriately to energize/de-energize commands.
 13. Documentation of analog sensor calibration (measured value, reported value and calculated offset).
 14. Documentation of Loop tuning (sample rate, gain and integral time constant).
- G. A performance verification test shall also be completed for the operator interaction with the system. Test elements shall be written to require the verification of all operator interaction tasks including, but not limited to the following.
1. Graphics navigation.
 2. Trend data collection and presentation.
 3. Alarm handling, acknowledgement and routing.
 4. Time schedule editing.
 5. Application parameter adjustment.
 6. Manual control.
 7. Report execution.
 8. Automatic backups.
 9. Web Client access.
- H. A Startup Testing Report and a Performance Verification Testing Report shall be provided upon test completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.
- B. System Software: Update to latest version of software at Project completion.

1.10 COORDINATION

- A. Coordinate location of thermostats, humidistats, DDC control sensors, and other exposed control sensors with plans and room details before installation.
- B. Coordinate equipment with Division 26 Section "Network Lighting Controls" to achieve compatibility with equipment that interfaces with that system.
- C. Coordinate equipment with Division 28 Section "Digital Addressable Fire-Alarm Systems" to achieve compatibility with equipment that interfaces with that system.

- D. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.
- E. Coordinate equipment with Division 26 Section "Panelboards" and panel schedules to achieve compatibility with starter coils, ~~and~~ annunciation devices, .
- F. Coordinate installation of control dampers, smoke dampers, HVAC equipment isolation dampers, and pipe-mounted sensors and instruments with the mechanical and/or plumbing contractor.
- G. Coordinate installation of duct, space, outdoor, or building static pressure sensors with the finished surfaces, installing contractor and the Architect prior to installation.
- H. Coordinate installation of any exterior wall or roof-mounted sensors, instruments, or controllers required for the temperature control system with the General Contractor and the Architect prior to installation.
- I. Coordinate the color selection process of any sensor or device intended to be mounted on finished surfaces with the Architect prior to installation.

1.11 OWNERSHIP

- A. The Owner shall retain licenses to software for this project.
- B. The Owner shall sign a copy of the manufacturer's standard software and firmware licensing agreement as a condition off this contractor. Such license shall grant use of all programs and application software to the Owner as defined by the manufacturer's license agreement, but shall protect the manufacturer's rights to disclosure of Trade Secrets contained within such software.
- C. The licensing agreement shall not preclude the use of the software by individuals under contract to the owner for commissioning, servicing or altering the system in the future. Use of the software by individuals under contract to the owner shall be restricted to use on the owner's computers and only for the purpose of commissioning, servicing, or altering the installed system.
- D. All project developed software, files and documentation shall become the property of the Owner. These include but are not limited to:
 - 1. Server and workstation software
 - 2. Application programming tools
 - 3. Configuration tools
 - 4. Network diagnostic tools
 - 5. Addressing tools
 - 6. Application files
 - 7. Configuration files
 - 8. Graphic files
 - 9. Report files
 - 10. Graphic symbol libraries
 - 11. All documentation

1.12 WARRANTY

- A. The control system shall be guaranteed for a period of two years after final approval by the Owner. The guarantee shall be provided for a completely installed system, including all components, parts, and assemblies of the control system. The guarantee shall cover parts, materials, and labor to locate and correct any defects in materials or workmanship.
- B. The Contractor shall initiate the warranty period by formally transmitting to the Owner commencement notification of the period for the system and devices accepted. The warranty period begins when these devices are formally accepted by the Owner (refer to ACCEPTANCE PROCEDURE below).
- C. Contact information shall be provided for quick service engineering assistance concerning hardware and software problems. There shall be provisions made for getting manufacturer certified diagnostic and repair personnel on the scene quickly should the need arise. There shall also be a software expert familiar with the software of this machine who can be easily contacted.
- D. This system shall be inspected by the control system Contractor for a four-hour period once each quarter during the warranty period to run diagnostic tests and also provide maintenance instructions to the operating personnel.
- E. The control system Contractor shall give the Owner 24 hours prior notification of each maintenance trip during the contract guarantee period. In addition, the Contractor shall furnish the Owner and Engineer a written record of each maintenance trip, number of employees present, time involved and work accomplished.
- F. Owner shall be able to make changes to database, when prior database is stored on disk in case of error in change, without affecting or voiding warranty.

1.13 MAINTENANCE

- A. The control system Contractor shall provide and maintain on site working spare parts for the control system during the warranty period including DDC Controllers, power supplies, modules, sensors, floor level (subnet) devices, transformers, etc. The owner will be custodian of these spare parts and shall be authorized to utilize them in performing first level maintenance. The control contractor shall refurbish/replace spare parts in exchange for failed items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Product: Subject to compliance with requirements, provide products by one of the following pre-qualified manufacturers:
 - 1. Distech Controls, Inc.
 - 2. Delta Controls
 - 3. Schneider Electric USA (includes Tour Anderson, Invensys, Andover Controls)

2.2 OPEN, INTEROPERABLE SYSTEM ARCHITECTURE

- A. General
 - 1. The Building Automation System (BAS) shall consist of Network Server/Controllers (NSCs) and a family of Standalone Digital Control Units (SDCUs). Administration and Programming Workstations (APWs) and Web-based Operator Workstations (WOWs) are provided by SI. Alarm notifications, scheduling, reporting and information management for the entire facility, and Wide Area Network (WAN) if applicable will be provided by SI. All field level controllers must have the ability to be programmed by site personnel from a BAS contractor supplied and licensed programming tool or N4 embedded programming tool jar file.
 - 2. An Enterprise Level BAS provided by SI shall consist of an Enterprise Server, which enables multiple NSCs (including all graphics, alarms, schedules, trends, programming, and configuration) to be accessible from a single Workstation simultaneously for operations and engineering tasks.
 - 3. The Enterprise Level BAS shall support built-in reporting functionality without dependency on other software.
 - 4. The Enterprise Level BAS shall support standard accessing of data for third party reporting or analytics software.
 - 5. The Enterprise Level BAS shall be able to host up to 250 servers, or NSCs, beneath it.
 - 6. The system shall be designed with a top-level 10/100bT Ethernet network, using the BACnet/IP, and/or Modbus TCP protocol.
- B. Modbus RTU/ASCII (and J-bus), Modbus TCP, BACnet MS/TP, BACnet IP, and WebServices shall be native to the NSCs. There shall not be a need to provide multiple NSCs to support all the network protocols, nor should there be a need to supply additional software to allow all three protocols to be natively supported.
- C. A sub-network of SDCUs using the BACnet IP, BACnet MS/TP protocol shall connect the local, stand-alone controllers with Ethernet-level Network Server Controllers/IP Routers.
- D. The fieldbus layer shall support all of the following types of SDCUs:
 - 1. BACnet IP SDCU requirements: The system shall consist of one or more BACnet/IP field buses managed by the Network Server Controller.
 - 2. BACnet MS/TP SDCU requirements: (Only where shown on the control architecture drawings)
- E. The system shall consist of one or more BACnet MS/TP field buses managed by the Network Server Controller. Minimum speed shall be 38.4 kbps. The field bus layer consists of an RS485, token passing bus that supports Standalone Digital Control Units (SDCUs) for operation of HVAC. These devices shall conform to BACnet standard 135-2004. The NSCs shall be capable of at least two BACnet MS/TP field buses per NSC.
- F. The BAS shall be capable of being segmented, through software, into multiple local area networks (LANs) distributed over a wide area network (WAN). Workstations can

manage a single LAN (or building), and/or the entire system with all portions of that LAN maintaining its own, current database.

- G. All NSCs, Workstation(s) and Servers shall be capable of residing directly on the owner's Ethernet TCP/IP LAN/WAN with no required gateways. Furthermore, the NSC's, Workstation(s), and Server(s) shall be capable of using standard, commercially available, off-the-shelf Ethernet infrastructure components such as routers, switches and hubs. With this design the owner may utilize the investment of an existing or new enterprise network or structured cabling system. This also allows the option of the maintenance of the LAN/WAN to be performed by the owner's Information Systems Department as all devices utilize standard TCP/IP components. All added BAS supplied switches and routers must be approved by owner's Information Systems Department.
- H. System Expansion
 - 1. The BAS system shall be scalable and expandable at all levels of the system using the same software interface, and the same TCP/IP level and fieldbus level controllers. Systems that require replacement of either the workstation software or field controllers in order to expand the system shall not be acceptable.
 - 2. Web-based operation shall be supported directly by the NSCs and require no additional software.
 - 3. The system shall be capable of using graphical and/or line application programming language for the Network Server Controllers.
 - 4. The system shall be able to operate normally and without restriction at multiple software version levels with the only requirement that each element of the hierarchy be at least as new a version as the newest version in the level below it. In other words, Enterprise Servers will be able to manage NSCs of different version provided that the Enterprise Server was the same or more recent version than the most recent NSC version.
- I. All Network Server Controllers must natively support the BACnet IP, BACnet MS/TP, Modbus TCP, Modbus RTU (RS-485 and RS-232), and Modbus ASCII protocols.

2.3 OPERATOR WORKSTATION REQUIREMENTS:

A. General

1. The operator workstation portion of the BAS shall consist of one or more full-powered configuration and programming workstations, and one or more web-based operator workstations. For this project provide a minimum of 3 concurrent client licenses at the enterprise level. Client licenses are licenses that can be used for variable designations of the users choosing; i.e. operator, engineering, or web capabilities.
2. The programming and configuration workstation software shall allow any user with adequate permission to create and/or modify any or all parts of the NSC and/or Enterprise Server database. All field level controllers must have the ability to be programmed by site personnel from a BAS contractor supplied and licensed programming tool or N4 embedded programming tool jar file.
3. At the NSC level, there shall be no cap on concurrent web-based workstations (webstations) other than what the CPU capacity can support.
4. All configuration workstations shall be desktop personal computers operating under the Microsoft Windows operating system. The application software shall be capable of communication to all Network Server Controllers and shall feature high-resolution color graphics, alarming, trend charting. It shall be user configurable for all data collection and data presentation functions.
5. A minimum of 1 physical Workstation shall be allowed on the Ethernet network. In this client/server configuration, any changes or additions made from one workstation will automatically appear on all other workstations since the changes are accomplished to the databases within the NSC. Systems with a central database will not be acceptable.

B. N4 Supervisor, Administration/Programming Workstation, and Webstation requirements

1. The N4 Supervisor shall consist of the following:
 - a. Processor
 - 1) Minimum: Intel Xeon CPU E5-2640 x64 (or better) compatible with dual and quad core processors
 - b. Memory
 - 1) 64GB or higher recommended
 - c. Operating systems:
 - 1) Microsoft Windows 10 64-bit
 - 2) Microsoft Windows 11 64-bit
 - 3) Microsoft Windows Server 2016
 - 4) Microsoft Windows Server 2019
 - d. 10/100MBPS Ethernet NIC
 - e. Storage
 - 1) Minimum: 1TB or higher
 - 2) Solid State Drive recommended
 - f. Required additional software:
 - 1) Microsoft .Net 4.7.2 and later
 - g. License agreement for all applicable software

2. The Workstation shall consist of the following:
 - a. Processor
 - 1) Minimum: Intel Core i5 @ 2.0 GHz or equivalent
 - 2) Recommended: Intel Core i5 @ 3.0 GHz or better
 - b. Memory
 - 1) Minimum: 8GB or higher
 - c. Operating systems:
 - 1) Microsoft Windows 10 64-bit
 - 2) Microsoft Windows 11 64-bit
 - 3) Microsoft Windows Server 2016
 - 4) Microsoft Windows Server 2019
 - d. 10/100MBPS Ethernet NIC
 - e. Storage
 - 1) Minimum: 20GB
 - 2) Recommended: 1TB
 - 3) Solid State Drive recommended
 - f. Required additional software:
 - 1) Microsoft .Net 4.7.2 and later
 - g. License agreement for all applicable software
 3. Web-Based Operator PC Requirements
 - a. Any user on the network can access the system, using the following software:
 - b. Minimum:
 - 1) Google Chrome 61 or higher
 - 2) Mozilla Firefox 60 or higher
 - 3) Microsoft Edge (EdgeHTML) 16 or higher
 - 4) Safari 11.1 or higher
 - c. Recommended:
 - 1) Google Chrome 71 or higher
 - 2) Mozilla Firefox 64 or higher
 - 3) Microsoft Edge (EdgeHTML) 17 or higher
 - 4) Safari 11.4 or higher
- C. General Administration and Programming Workstation Software
1. System architecture shall be truly client server in that the Workstation shall operate as the client while the NSCs shall operate as the servers. The client is responsible for the data presentation and validation of inputs while the server is responsible for data gathering and delivery.
 2. The workstation functions shall include monitoring and programming of all DDC controllers. All field level controllers must have the ability to be programmed from the N4 workstation software.
 3. Monitoring consists of alarming, reporting, graphic displays, long term data storage, automatic data collection, and operator-initiated control actions such as schedule and setpoint adjustments.

4. Programming of SDCUs shall be capable of being done either off-line or on-line from any operator workstation. All information will be available in graphic or text displays stored at the NSC. Graphic displays will feature animation effects to enhance the presentation of the data, to alert operators of problems, and to facilitate location of information throughout the DDC system. All operator functions shall be selectable through a mouse.
- D. User Interface:
1. The BAS workstation software shall allow the creation of a custom, browser-style interface linked to the user when logging into any workstation. Additionally, it shall be possible to create customized workspaces that can be assigned to user groups. This interface shall support the creation of “hot-spots” that the user may link to view/edit any object in the system or run any object editor or configuration tool contained in the software. Furthermore, this interface must be able to be configured to become a user’s “PC Desktop” – with all the links that a user needs to run other applications. This, along with the Windows user security capabilities, will enable a system administrator to setup workstation accounts that not only limit the capabilities of the user within the BAS software, but may also limit what a user can do on the PC and/or LAN/WAN. This might be used to ensure, for example, that the user of an alarm monitoring workstation is unable to shutdown the active alarm viewer and/or unable to load software onto the PC.
 2. System shall be able to automatically switch between displayed metric vs. imperial units based on the workstation/webstations localization.
 3. The BMS workstation/webstations shall be capable of multiple language display, including English, Spanish, German, French, Japanese, Italian, Finnish, Portuguese, Swedish, Russian, and traditional and simplified Chinese. The multiple languages shall not require additional add on software from the standard workstation installer and shall be selectable within said workstation.
 4. Webstations shall have the capability to automatically re-direct to an HTTPS connection to ensure more secure communications.
 5. Personalized layouts and panels within workstations shall be extended to webstations to ensure consistent user experiences between the two user interfaces.
 6. Webstations shall give the user the same capabilities within the graphics pages as are given within the workstation but shall be mobile responsive for use on smaller devices.
 7. Servers and clients shall have the ability to be located in different time zones, which are then synchronized via the NTP server.
 8. Workstation shall indicate at all times the communication status between it and the server.
 9. The BMS web interface shall enable presentation mode whereby any functionality for interactivity shall be disabled.
 10. The BMS web interface shall automatically detect light mode and dark mode settings in the operating system and adapt accordingly.
 11. The BMS web interface shall allow override of the operating systems light/dark mode settings so that the setting can be enabled independent of the operating system's setting.
 12. The BMS web interface shall automatically respond and adapt to different screen sizes and orientations from smart phone to smart televisions of any size.

13. The BMS web interface shall support slideshow functionality.
 14. The BMS web interface shall support full screen mode displaying Alarm views / graphics / dashboards / Custom Reports.
- E. User Access and Permissions
1. The BMS system shall allow for creation of one account per user.
 2. The BMS shall support Groups where User Accounts associated with the group can inherit group permissions.
 3. The BMS shall be able to specify each user account / group accessibility to each object in the system.
 4. The BMS permission system shall be possible to integrate with Windows Active directory.
 5. The BMS shall be able to report on the permission level across account / group for review / archiving / audit.
 6. This username/password combination shall be linked to a set of capabilities within the software, set and editable only by user with system administrator privileges. The sets of capabilities shall include: edit or View only, Acknowledge alarms, Enable/disable Program and change values.
 7. The system shall allow the above capabilities to be applied independently to each and every class of object in the system.
 8. The BMS shall support integration with Windows Active Directory for user log on credentials.
 9. The BMS shall support configurable reminder for "Days until password expires".
 10. The BMS shall support configurable password policy across:
 - a. Minimum number of characters
 - b. Minimum number of lowercase characters
 - c. Minimum number of numeric characters
 - d. Minimum number of special characters
 - e. Number of consecutive unique passwords before reuse
 - f. No more than three repeating identical characters
 11. The BMS user account management shall support password policy with the following components:
 - a. Mandatory change of password at first logon with default credentials
 - b. Disabling of all imported user accounts by default
 - c. Custom password complexity rules and its enforcement
 - d. Custom password reuse and its enforcement
 - e. Configurable black listing of passwords to limit the use of common known passwords (e.g. password)
 - f. Password aging rules
 12. The BMS shall be capable of enabling an anonymous access (guest account) to previously engineered views such as dashboards, graphics, etc. with configurable permissions and without username or password.
 13. It shall be possible to configure the BMS system so that the guest account is used by default to simplify presentation of Kiosk Mode across multiple screens
 14. The BMS shall provide time configurability to logout the user and to revert to a preconfigured presentation view, such as offered by the Guest account functionality.

15. The BMS shall provide configurability in managing access and permission levels based on location, IP addresses and address ranges, Schedule and Time of day and combination thereof.

F. System Security

1. The BMS system supplier shall be subjected to regular and verifiable best practice cyber security testing by the system supplier. Results of this testing shall be made available upon request prior to deployment of the system.
2. The BMS system supplier shall provide cyber security service incident escalation through help desk on a 7/24/365 basis.
3. The BMS shall support configuration for inactivity auto log-off of logged clients
4. The BMS system shall support Self-Signed Certificates, Default Certificates and/or Certification Authority (CA) certificates.
5. The BMS client communications (web access or rich client access) shall support TLS 1.2 encryption or higher
6. The BMS shall allow configuration in disabling all devices and software that support HTTP and require access via HTTPS.
7. The BMS must be able to Alarm or generate notification on failed access attempts
8. The BMS Servers shall support SNMP V3 monitoring of network performance and stack statistics for the purpose of managing denial of service attacks
9. The Integrated Control Platform shall support the feature to alarm on a predetermined period of time until the default password for each device is changed from the default factory setting.
10. The Integrated Control Platform shall support encrypted password authentication for all web services whether serving or consuming.
11. The BMS shall have the capability to use blacklisted and whitelisted IPs/MAC addresses to gate access
12. The BMS shall have the capability to differentiate, limit or enable, user access depending on Client's IP address/range (where) and time of day (when) the user is accessing the system.

G. Configuration Interface:

1. The workstation software shall use a familiar Windows Explorer style interface for an operator or programmer to view and/or edit any object (controller, point, alarm, report, schedule, etc.) in the entire system. In addition, this interface shall present a "network map" of all controllers and their associated points, programs, graphics, alarms, and reports in an easy to understand structure. All object names shall be alphanumeric and use Windows long filename conventions.

2. The configuration interface shall also include support for user defined object types. These object types shall be used as building blocks for the creation of the BAS database. They shall be created from the base object types within the system input, output, string variables, setpoints, etc., alarm algorithms, alarm notification objects, reports, graphics displays, schedules, and programs. Groups of user defined object types shall be able to be set up as a predefined aggregate of subsystems and systems. The configuration interface shall support copying/pasting and exporting/importing portions of the database for additional efficiency. The system shall also maintain a link to all "child" objects created. If a user wishes to make a change to a parent object, the software shall ask the user if he/she wants to update all of the child objects with the change.

H. Color Graphic Displays

1. The system shall allow for the creation of user defined, color graphic displays for the viewing of mechanical and electrical systems, or building schematics. These graphics shall contain point information from the database including any attributes associated with the point (engineering units, etc.). In addition, operators shall be able to command equipment or change setpoints from a graphic through the use of the mouse.
2. Requirements of the color graphic subsystem include:
 - a. At a minimum, the user shall have the ability to import .gif, .png, .bmp, .jpeg, .tif, and CAD generated picture files as background displays, and layering shall be possible.
 - b. The system shall support HTML5 enabled graphics.
 - c. It shall be possible for the user to use JavaScript to customize the behavior of each graphic.
 - d. The editor shall use Scalable Vector Graphics (SVG) technology.
 - e. A built-in library of animated objects such as dampers, fans, pumps, buttons, knobs, gauges, and graphs which can be "dropped" on a graphic through the use of a software configuration "wizard". These objects shall enable operators to interact with the graphic displays in a manner that mimics their mechanical equivalents found on field installed control panels.
 - f. Support for high DPI icons shall be included and automatically chosen if viewing on a high definition display such as Retina or 4K displays.
 - g. Using the mouse, operators shall be able to adjust setpoints, start or stop equipment, modify PID loop parameters, or change schedules.
 - h. Status changes or alarm conditions must be able to be highlighted by objects changing screen location, size, color, text, blinking or changing from one display to another.
 - i. Ability to link graphic displays through user defined objects, alarm testing, or the result of a mathematical expression. Operators must be able to change from one graphic to another by selecting an object with a mouse - no menus will be required.
 - j. It shall be possible to create and save graphical components and JavaScript code in reusable and transferrable, customized libraries.
 - k. Graphics should rescale based on whatever monitor or viewing device is being used.
 - l. Be able to create graphics on varying layers that can be moved and repeated.

- m. Be able to create graphics within varying window panes that can be moved and/or re-referenced. For example, creating the graphical menu within a pane and referencing it on every graphics page, therefore not rebuilding thus allowing for a single spot for updates that get pushed to all the pages that reference it.
 - n. The ability to create re-usable cascading menus.
 - o. The ability to have multiple instances of a graphic and edit one instance to change all.
 - 3. Additionally, the Graphics Editor portion of the Engineering Software shall provide the following capabilities:
 - a. Create and save pages.
 - b. Group and ungroup symbols.
 - c. Modify an existing symbol.
 - d. Modify an existing graphic page.
 - e. Rotate and mirror a symbol.
 - f. Place a symbol on a page.
 - g. Place analog dynamic data in decimal format on a page.
 - h. Place binary dynamic data using state descriptors on a page.
 - i. Create motion through the use of animated .gif files or JavaScript.
 - j. Place test mode indication on a page.
 - k. Place manual mode indication on a page.
 - l. Place links using a fixed symbol or flyover on a page.
 - m. Links to other graphics.
 - n. Links to web sites.
 - o. Links to notes.
 - p. Links to time schedules.
 - q. Links to any .exe file on the operator work station.
 - r. Links to .doc files.
 - s. Assign a background color.
 - t. Assign a foreground color.
 - u. Place alarm indicators on a page.
 - v. Change symbol/text/value color as a function of an analog variable.
 - w. Change a symbol/text/value color as a function of a binary state.
 - x. Change symbol/text/value as a function of a binary state.
- I. The software shall allow for the automatic collection of data and reporting from any controller or NSC. The frequency of data collection shall be user-configurable.
- J. Alarm Management
 - 1. The software shall be capable of accepting alarms directly from NSCs or controllers, or generating alarms based on evaluation of data in controllers and comparing to limits or conditional equations configured through the software. Any alarm (regardless of its origination) will be integrated into the overall alarm management system and will appear in all standard alarm reports, be available for operator acknowledgment, and have the option for displaying graphics, or reports.
 - 2. Alarm management features shall include:
 - a. A minimum of 1000 alarm notification levels at the NSC, workstation, and webstation levels.

- b. Each notification level will establish a unique set of parameters for controlling alarm display, distribution, acknowledgment, keyboard annunciation, and record keeping.
- c. At the N4 Supervisor level the minimum number of active and viewable alarms shall be 10,000.
- d. It shall be possible for the user to sort, filter and search on any available criteria such as priority, category, origin, alarm type, etc.
- e. An active alarm viewer shall be included which can be customized for each user or user type to a hide or display any alarm attributes.
- f. It shall be possible to present alarms with configurable colors based on priority, category, origin, alarm type, etc.
- g. It shall be possible to linking files/documents/hyperlinks/navigation links/graphics link to an alarm for easy access upon occurrence
- h. Automatic logging in the database of the alarm message, point name, point value, source device, timestamp of alarm, username and time of acknowledgement, username and time of alarm silence (soft acknowledgement).
- i. Alarm notifications must support multiple distribution methods within one notification
- j. On alarm, it shall be possible to notify via email to a preconfigured list of recipients. through a Simple Mail Transfer Protocol (SMTP) or secure email using Simple Mail Transfer Protocol Secure (SMTPS). No special software interfaces shall be required and no email client software must be running in order for email to be distributed. The email notification shall be able to be sent to an individual user or a user group.
- k. On alarm, it shall be possible to notify via SNMP
- l. On alarm, it shall be possible to notify via file (on disk) that would be consumable by other alarm management services
- m. An operator shall have the capability to assign an alarm to another user of the system.
- n. Individual alarms shall be able to be assigned to a user automatically via a preconfigured list of users and date/time. For example, a critical high temp alarm can be configured to be assigned to a Facilities Dept or to a Central Alarming workstation depending on time/date.
- o. Playing an audible sound on alarm initiation or return to normal.
- p. It shall be possible assigning a custom audio sound to each alarm / alarm-criteria (priority, category, origin, alarm type, etc.)
- q. The active alarm viewer can be configured such that an operator must confirm that all of the steps in a check list have been accomplished prior to acknowledging the alarm.
- r. The active alarm viewer shall, if filtered, show the quantity of visible and total number of alarms that are not equal to 'normal' and the quantity of disabled and hidden alarms.
- s. The alarm viewer can be configured to auto hide alarms when triggered.
- t. An operator shall have the capability to save and apply alarm favorites.
- u. Alarms shall be configurable such that an operator must type in text in an alarm entry and/or pick from a drop-down list of user actions for certain alarms.

- v. Alarms shall be configurable such that an operator must type in text in an alarm entry and/or pick from a drop-down list of causes for certain alarms. This ensures accountability (audit trail) for the response to critical alarms.
 - w. It shall be possible to configure user-actions via user/group permissions when responding to an alarm
 - x. All operator actions responding to an alarm must be audit trailed.
- K. Static Paginated Reporting / Custom Reporting
 - 1. The BMS Software and Network Servers shall support built-in native reporting capability without dependency on any external software
 - 2. It shall be possible to generate custom reports manually, via Schedule, Alarm triggered or custom conditions (e.g. program/schedule/etc.)
 - 3. The Custom Reporting shall have no dependency on external database
 - 4. The Custom Reporting shall have the capability of reporting on the full range of available data, most recent to historical data.
 - 5. It shall be possible to generate reports containing current active alarms
 - 6. The Building Management System software shall natively be capable of producing custom reports in txt, xlsx and pdf file formats.
 - 7. The Custom Report capability at the BMS software shall support digital signing of pdf for traceability and authenticity.
- L. Scheduling
 - 1. From the workstation or webstation, it shall be possible to configure and download schedules for any of the controllers on the network.
 - 2. Time of day schedules shall be in a calendar style and viewable in both a graphical and tabular view.
 - 3. Schedules shall be programmable for a minimum of one year in advance.
 - 4. To change the schedule for a particular day, a user shall simply select the day and make the desired modifications.
 - 5. Additionally, from the operator webstations, each schedule will appear on the screen viewable as the entire year, monthly, week and day. A simple mouse click shall allow switching between views. It shall also be possible to scroll from one month to the next and view or alter any of the schedule times.
 - 6. Schedules will be assigned to specific controllers and stored in their local RAM memory. Any changes made at the workstation will be automatically updated to the corresponding schedule in the controller.
 - 7. It shall be possible to assign a lead schedule such that shadow/local schedules are updated based upon changes in the Lead.
 - 8. It shall be possible to assign a list(s) of exception event days, dates, date ranges to a schedule.
 - 9. It shall be possible to view combined views showing the calendar and all prioritized exemptions on one screen.
 - 10. It should accommodate a minimum of 16 priority levels.
 - 11. Values should be able to be controlled directly from a schedule, without the need for special program logic.
- M. Programmer's Environment
 - 1. Programming in the NSC shall be in graphical block format.

2. Programming of the NSC shall be available offline from system prior to deployment into the field. All engineering tasks shall be possible, except, of course, the viewing of live tasks or values.
 3. The programmer's environment will include access to a superset of the same programming language supported in the SDCUs.
 4. NSC devices will support a graphical function block programming language.
 5. It shall be possible to save custom programs as libraries for reuse throughout the system. A wizard tool shall be available for loading programs from a library file in the program editor.
 6. It shall be possible to view graphical programming live and real-time from the Workstation.
 7. Key terms should appear when typing (IntelliType).
 8. Applications should be able to be assigned different priorities and cycle times for a prioritized execution of different function.
 9. The system shall be able to create objects that allow common objects such as power meters, VFD drives, etc. to be integrated into the system with simple import actions without the need of complicated programming or configuration setups.
- N. Saving/Reloading
1. The workstation software shall have an application to save and restore NSC and field controller memory files.
 2. For the NSC, this application shall not be limited to saving and reloading an entire controller – it must also be able to save/reload individual objects in the controller. This allows off-line debugging of control programs, for example, and then reloading of just the modified information.
- O. Audit Trail
1. The workstation software shall automatically log and timestamp every operation that a user performs at a workstation, from logging on and off a workstation to changing a point value, modifying a program, enabling/disabling an object, viewing a graphic display, running a report, modifying a schedule, etc.
 2. It shall be possible to view a history of alarms, user actions, and commands for any system object individually or at least the last 5000 records of all events for the entire system from Workstation.
 3. The N4 Supervisor shall be able to store up to 5 million events.
 4. The event view shall support viewing of up to 100,000 events.
 5. It shall be possible to save custom filtered views of event information that are viewable and configurable in Workstation.
 6. It shall be capable to search and view all forced values within the system.
- P. Fault Tolerant N4 Supervisor Operation (Top level NSC)
1. A single component failure in the system shall not cause the entire system to fail. All system users shall be informed of any detectable component failure via an alarm event. System users shall not be logged off as a result of a system failure or switchover.

Q. Web-based Operator Software

1. General:

- a. Day-to-day operation of the system shall be accessible through a standard web browser interface, allowing technicians and operators to view any part of the system from anywhere on the network.
- b. The system shall be able to be accessed on site via a mobile device environment with, at a minimum, access to overwrite and view system values.
- c. Through the browser interface, operators must be able to view pre-defined groups of points, with their values updated automatically.

2. Graphic Displays

- a. The browser-based interface must share the same graphical displays as the Administration and Programming Workstations, presenting dynamic data on site layouts, floor plans, and equipment graphics. The browser's graphics shall support commands to change setpoints, enable/disable equipment and start/stop equipment.
- b. Through the browser-based interface, operators must be able to navigate through the entire system, and change the value or status of any point in any controller. Changes are effective immediately to the controller, with a record of the change stored in the system database.
- c. System shall have out-of-the-box dashboards that enable customizable views of live data which can be public to all users or capable to make them specific to a user based on log in credentials.
- d. The user shall have the ability to create custom dashboards.
- e. The dashboards shall have a kiosk mode which allows for occupant level data display on monitors or tablets throughout the building.

3. Alarm Management

- a. Systems requiring additional client software to be installed on a PC for viewing the webstation from that PC will not be considered.
- b. Through the browser interface, a live alarm viewer identical to the alarm viewer on the Administration and Programming workstation shall be presented, if the user's password allows it. Users must be able to receive alarms, silence alarms, and acknowledge alarms through a browser. If desired, specific operator text must be able to be added to the alarm record before acknowledgement, attachments shall be viewable, and alarm checklists shall be available.

R. Groups and Schedules

1. Through the browser interface, operators must be able to view pre-defined groups of points, with their values updated automatically.
2. Through the browser interface, operators must be able to change schedules – change start and stop times, add new times to a schedule, and modify calendars.

S. User Accounts and Audit Trail

1. The same user accounts shall be used for the browser interface and for the operator workstations. Operators must not be forced to memorize multiple passwords.

- T. All commands and user activity through the browser interface shall be recorded in the system's activity log, which can be later searched and retrieved by user, date, or both.

2.4 NETWORK SERVER CONTROLLERS (NSC: ALSO KNOWN AS JACE-8000)

- A. Network Server Controllers shall combine both network routing functions, control functions, and server functions into a single unit.
- B. The BACnet NSC shall be classified as a "native" BACnet device, supporting the BACnet Network Server Controller (B-BC) profile. Controllers that support a lesser profile such as B-SA are not acceptable. NSCs shall be tested and certified by the BACnet Testing Laboratory (BTL) as BACnet Network Server Controllers (B-BC).
- C. The Network Server Controller shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the NRS.
- D. The NSCs shall be capable of whitelisting IPs to restrict access to a pre-defined list of hosts or devices.
- E. Whitelisting of file extensions for documents shall be capable.
- F. Encrypted and authenticated communication shall be configurable for non-open protocol communications using TLS 1.2.
- G. The NSCs shall support Simple Network Management Protocol version 3 (SNMPv3) for monitoring of the NSCs using a Network Management Tool.
- H. The NSCs shall support remote system logging for used by System Information and Event Monitoring (SIEM) software.
- I. They shall also be responsible for monitoring and controlling their own HVAC equipment such as an AHU or boiler.
- J. They shall also contain graphics, trends, trend charts, alarm views, and other similar presentation objects that can be served to workstations or web-based interfaces. A sufficient number of NSCs shall be supplied to fully meet the requirements of this specification and the attached point list.
- K. It shall be capable of executing application control programs to provide:
 - 1. Calendar functions
 - 2. Scheduling
 - 3. Trending
 - 4. Alarm monitoring and routing
 - 5. Time synchronization by means of an Internet site including automatic synchronization
 - 6. Native integration of LonWorks controller data and Modbus controller data or BACnet controller data and Modbus controller data
 - 7. Network Management functions for all LonWorks based devices

L. Hardware Specifications

1. Memory:
 - a. The operating system of the controller, application programs, and all other portions of the configuration database, shall be stored in non-volatile, FLASH memory. Servers/Controllers shall contain enough memory for the current application, plus required history logging, plus a minimum of 20% additional free memory.
2. Each JACE-8000 shall provide the following on-board hardware for communication:
 - a. Two 10/100b Ethernet for communication to Workstations, other NRCs, IP field bus controllers, other SDCUs, and onto the internet.
 - 1) The two Ethernet ports shall support active switch and BACnet/IP communication protocols.
 - 2) Support IPv4 addressing
 - 3) Ethernet port 1 shall support static or DHCP client configuration for communication to Workstation or other NSCs
 - 4) Ethernet port 2 shall support switch mode or DHCP server to set addressing of DHCP client devices
 - 5) It shall be possible to disable Ethernet port 2
 - 6) In DHCP server mode, the Ethernet port 2 shall support 50 BACnet/IP field controllers in daisy chain configuration directly from the port
 - 7) Where a switch is needed, use an approved model from owner's information technology dept.
 - b. Two RS-485 ports for communication to BACnet MSTP bus or serial Modbus (software configurable)
 - c. One device USB port
 - d. One host USB port
3. The NSC shall conform to a small footprint no larger than 100W x 125H x 75D mm (3.94W x 4.92H x 2.95D in).

M. Modular Expandability:

1. The system shall employ a modular I/O design to allow expansion. Input and output capacity is to be provided through plug-in modules of various types. It shall be possible to combine I/O modules as desired to meet the I/O requirements for individual control applications.
2. One shall be able to "hot-change" (hot-swap) the I/O modules preserving the system on-line without any intervention on the software; addressing and configuration shall be automatic.
3. If for any reason the backplane of the modular I/O system were to fail, I/O module addresses will be protected.

- N. Hardware Override Switches:
1. All digital outputs shall, optionally, include three position manual override switches to allow selection of the ON, OFF, or AUTO output state. These switches shall be built into the unit and shall provide feedback to the controller so that the position of the override switch can be obtained through software. In addition each analog output shall be equipped with an override potentiometer to allow manual adjustment of the analog output signal over its full range, when the 3 position manual override switch is placed in the ON position.
- O. Universal Input Temperatures
1. All universal inputs directly connected to the NSC via modular expansion shall be capable of using the following thermistors for use in the system without any external converters needed.
 - a. 10 kohm Type I
 - b. 10 kohm Type II
 - c. 10 kohm Type III
 - d. 10 kohm Type IV
 - e. Linearized 10 kohm Type V (FD w/11k shunt)
 - f. Linearized 10 kohm
 - g. 1.8 kohm
 - h. 1 kohm
 - i. 20 kohm
 - j. 2.2 kohm
 2. In addition to the above, the system shall be capable of using the below RTD sensors, however it is not required that all universal inputs be compatible with them.
 - a. PT100
 - b. PT1000
 - c. Ni1000
- P. Local Status Indicator Lamps:
1. The NSC shall provide as a minimum LED indication of CPU status, Ethernet LAN status, and field bus status. For each input or output, provide LED indication of the value of the point (On/Off). The LED indication shall support software configuration to set whether the illumination of the LED corresponds to On or Off or whether the color when illuminated is Red or Green.
- Q. Real Time Clock (RTC):
1. Each NSC shall include a real time clock, accurate to 10 seconds per day. The RTC shall provide the following: time of day, day, month, year, and day of week. Each NSC will allow for its own UTC offset, depending upon the time zone. When the time zone is set, the NSC will also store the appropriate times for daylight savings time.
 2. The RTC date and time shall also be accurate, up to 10 days, when the NSC is powerless.
 3. No batteries may be used to for the backup of the RTC.

- R. Power Supply:
1. The 24 VDC power supply for the NSCs shall provide 30 watts of available power for the NSC and associated IO modules. The system shall support the use of more than one power supply if heavily power consuming modules are required.
 2. The power supply, NSC, and I/O modules shall connect power wise and communication wise via the separate terminal base allowing for ease of replacement and no separate or loose wiring.
- S. Automatic Restart After Power Failure:
1. Upon restoration of power after an outage, the NSC shall automatically and without human intervention update all monitored functions, resume operation based on current, synchronize time and status, and implement special start-up strategies as required.
- T. Data Retention:
1. During a power failure, the NSC shall retain all programs, configuration data, historical data, and all other data that is configured to be retained. There shall be no time restriction for this retention and it must not use batteries to achieve it.
- U. Software Specifications
1. The operating system of the controller, application programs, and all other portions of the configuration database such as graphics, trends, alarms, views, etc., shall be stored in non-volatile, FLASH memory. There will be no restrictions placed on the type of application programs in the system. Each NSC shall be capable of parallel processing, executing all control programs simultaneously. Any program may affect the operation of any other program. Each program shall have the full access of all I/O facilities of the processor. This execution of control function shall not be interrupted due to normal user communications including interrogation, program entry, printout of the program for storage, etc.
 2. Each NSC shall have an available capacity of 4 GB of memory. This shall represent 2 GB for application and historical data and 2 GB dedicated for backup storage.
- V. User Programming Language:
1. The application software shall be user programmable. This includes all strategies, sequences of operation, control algorithms, parameters, and setpoints. The source program shall be either a script-based structured text or graphical function block based and fully programmable by the user. The language shall be structured to allow for the configuration of control programs, schedules, alarms, reports, telecommunications, local displays, mathematical calculations, and histories. Users shall be able to place comments anywhere in the body of either script or function block programs.
 2. Network Server Controllers that use a "canned" program method will not be accepted.
- W. Control Software:
1. The NSC shall have the ability to perform the following pre-tested control algorithms:
 - a. Proportional, Integral plus Derivative Control (PID)

- b. Two Position Control
 - c. Digital Filter
 - d. Ratio Calculator
 - e. Equipment Cycling Protection
- X. Mathematical Functions:
- 1. Each controller shall be capable of performing basic mathematical functions (+, -, *, /), squares, square roots, exponential, logarithms, Boolean logic statements, or combinations of both. The controllers shall be capable of performing complex logical statements including operators such as >, <, =, and, or, exclusive or, etc. These must be able to be used in the same equations with the mathematical operators and nested up to five parentheses deep.
- Y. NSCs shall have the ability to perform any or all of the following energy management routines:
- 1. Time of Day Scheduling
 - 2. Calendar Based Scheduling
 - 3. Holiday Scheduling
 - 4. Temporary Schedule Overrides
 - 5. Optimal Start
 - 6. Optimal Stop
 - 7. Night Setback Control
 - 8. Enthalpy Switchover (Economizer)
 - 9. Peak Demand Limiting
 - 10. Temperature Compensated Duty Cycling
 - 11. CFM Tracking
 - 12. Heating/Cooling Interlock
 - 13. Hot Water Reset
- Z. History Logging:
- 1. Each NSC controller shall be capable of LOCALLY logging any input, output, calculated value or other system variable either over user defined time intervals ranging from 1 second to 1440 minutes or based upon a user configurable change of value. A minimum of 1000 logs, with a minimum of 100,000 records, shall be stored. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logged data shall be downloadable to a higher level NSC long term archiving based upon user-defined time intervals, or manual command.
 - 2. For extended trend logging a minimum of 1500 trends shall be capable, with a minimum number of 600,000 records within.
 - 3. Management of a power meter replacement to ensure meter log data is accurate shall be possible in the NSC.
 - 4. Every hardware input and output point, hosted within the NSC and attached I/O modules, shall be trended automatically without the requirement for manual creation, and each of these logs shall log values based upon a change of value and store at least 500 trend samples before replacing the oldest sample with new data.

5. The presentation of logged data shall be built into the server capabilities of the NSC. Presentation can be in time stamped list formats or in a chart format with fully configurable pen colors, weights, scales and time spans.
6. Tooltips shall be present, magnetic, and visible based on users preference.
7. Comments shall be visible whenever viewing the trend log list.
8. System shall give indication of memory usage and be able to alert the user if too many logs are allocated.
9. The BMS software and Network Servers shall support recording of all historical data, independent of any limitation in its local memory, which will be readily available for reporting and analysis without additional configurations or actions.
10. All historical data shall be available for use by the operator to access in BMS or a third-party reporting systems.

AA. Alarm Management:

1. For each system point, alarms can be created based on high/low limits or in comparison to other point values. All alarms will be tested each scan of the NSC and can result in the display of one or more alarm messages or reports.
2. There is no limit to the number of alarms that can be created for any point
3. Alarms can be configured to be generated based upon a single system condition or multiple system conditions.
4. Alarms will be generated based on an evaluation of the alarm conditions and can be presented to the user in a fully configurable order, by priority, by time, by category, etc. These configurable alarm views will be presented to a user upon logging into the system regardless of whether the log in takes place at a WorkStation or a Webstation.
5. The alarm management system shall support the ability to create and select cause and action notes to be selected and associated with an alarm event. Checklists shall also be possible in order to present to an operator a suggested mode of troubleshooting. When acknowledging an alarm, it shall be possible to assign it to a user of the system such that the user is notified of the assignment and is made responsible for the alarm resolution.
6. Alarms must be capable of being routed to any BACnet workstation that conforms to the B-OWS device profile and uses the BACnet/IP protocol.

BB. Embedded Web Server

1. Each NSC must have the ability to serve out web pages containing the same information that is available from the WorkStation. The development of the screens to accomplish shall not require any additional engineering labor over that required to show them at the WorkStation itself.
2. The NSC shall be configurable to logging all Embedded Web Server access attempts
3. The NSC shall have the option to redirect HTTP based Embedded Web Server connections to secure, HTTPS connections.
4. The NSC shall authenticate and authorize all users connecting to the Embedded Web Server
5. The NSC shall provide to ability to configure an automatic logoff for Embedded Web Server users that have not had any activity for an adjustable time period.

- CC. The NSC controller shall comply with the following regulatory certifications
1. CE – EN 61000-6-3
 2. CE – EN 61000-6-2
 3. CE – EN 61010-1
 4. CE – EN 61326-1
 5. FCC CFR 47 Part 15 Class A
 6. RCM
 7. RoHS 2011/65/EU
 8. China RoHS SJ/T 11364-2014
 9. UL916 Energy Management equipment
- DD. HMI
1. The NSC shall have an option for a tablet display
 2. The tablet display shall be an industrial grade Human Machine Interface (HMI) that can be locked to the building management application to create a dedicated tool for local operation and maintenance.
 3. The tablet display shall provide an easy-to-use interface through which users and engineers can locally access NSC's
 4. The tablet display shall always start in a kiosk mode ensuring the end user can only use the device using the installed integration with the NSC.
 5. The tablet display shall always require a password on start up
 6. The tablet display shall require a password after a defined period of inactivity
 7. The tablet display shall support being handheld or being installed on a control cabinet.
 8. The tablet display user interface shall provide touchscreen navigation making it easy to operate and maintain the system.
 9. The tablet display shall support robust physical panel mounting mechanisms provided with the product.
 10. The tablet display shall have a screen size of 255mm or 10.1 inches
 11. The tablet display shall support a screen resolution of 1280 by 800 pixels
 12. The tablet display shall have a 16:10 aspect ratio
 13. The tablet display shall be based on the Android platform
 14. The tablet display shall have an IP54 rated frame that helps protect against dust and moisture.
 15. The tablet display shall be powered by a 24 VDC power supply
 16. The tablet display can be powered by a 24 VDC through the Y-shaped cable
 17. The tablet display shall be able to communicate with the NSC over a wired (USB) connection running BACnet IP over USB.
 18. The tablet display shall have an accessory Wi-Fi Module is an option instead of using USB for communication.
 - a. Through the Wi-Fi module, you can establish wireless communication between the tablet display and the NCS connected to a wireless access point.
 - b. The Wi-Fi module shall have an adhesive mount Wi-Fi antenna.
 - c. The Wi-Fi module shall be compliant with IEEE 802.11 b/g/n
 - d. The Wi-Fi module shall support enhanced wireless security using 64-bit and 128-bit WEP encryption
 19. The tablet display shall connect to the NSC using only secure, HTTPS connections via the WebStation functionality of the NSC

20. The tablet display shall connect using a specific user and password combination defined as part of the NSC configuration

2.5 BACNET IP FIELDBUS CONTROLLERS

- A. Controllers – BACnet/IP Protocol
 1. All BACnet/IP Fieldbus controllers shall be BACnet Testing Laboratory listed (v12 or later) as specified BACnet Advanced Application Controller (B-AAC)
 2. All BACnet/IP Fieldbus controllers shall use the following communication specifications and achieve performance as specified herein:
 - a. All controllers shall be able to communicate peer-to-peer without the need for a NSC
 - b. Any BACnet/IP Fieldbus controllers on the Ethernet Data Link/Physical layer shall be able to act as a Master to allow for the exchange and sharing of data variables and messages with any other controller connected on the same communication cabling. Slave controllers are not acceptable.
- B. The BACnet/IP Fieldbus controllers shall be equipped with 2x 10/100bT Ethernet communication ports with active switch and will support BACnet/IP communication protocols with the following configurations:
 1. Supporting IPv4 addressing
 2. Supporting Static IP setting, DHCP client and Auto-IP address acquisition
 3. It shall be possible to disable Ethernet port 2
- C. Topologies
 1. BACnet/IP Fieldbus controllers shall support daisy chain topology of up to 50 controllers. In case of any disruption to the communication, a system alarm shall notify the NSC/BMS of the point disruption has occurred.
 2. BACnet/IP Fieldbus Controllers shall support RSTP loop whereby up to 39 controllers are supported.
 - a. In case of any disruption there shall be no communication interruption
 - b. In case of any disruption there shall be system alarms that will inform the operator of the disruption
- D. Performance
 1. Each BACnet/IP Fieldbus Controllers shall have a 32-bit microprocessor operating at 500 MHz and support a BACnet protocol stack in accordance with the ANSI/ASHRAE Standard 135-2008 and the BACnet Device Profile supported.
 2. They shall be multi-tasking, real-time digital control processors consisting of communication controllers, controls processing, power supplies with built-in inputs and outputs.
- E. Programmability
 1. The BACnet/IP Fieldbus controllers shall support both script programming language and graphical that will be consistent with the NSC.
 2. The control program will reside within the same enclosure as the input/output circuitry, that reads inputs and controls outputs

3. All control sequences programmed into the BACnet/IP Fieldbus Controllers shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.
4. BACnet/IP Fieldbus controllers shall communicate with the Network Server Controller (NSC) via a BACnet/IP connection at a baud rate of not less than 100 Mbps
5. BACnet/IP Fieldbus controllers shall support a dedicated communications port for connecting and supplying power to a matching room temperature and/or humidity sensor and/or CO2 and/or presence detector that does not utilize any of the I/O points of the controller.
6. BACnet/IP Fieldbus controllers (Excluding VAV) shall support an add-on display to supply and provide access in real-time for monitoring inputs and overriding of outputs
7. The override functionality must be supported by a dedicated processor to assure reliable operation (overriding of output)
8. Each BACnet/IP Fieldbus controller shall have sufficient memory, to support its own operating system and databases, including:
 - a. Control processes
 - b. Energy management applications
 - c. Alarm management
 - d. Historical/trend data
 - e. Maintenance support applications
 - f. Custom processes
 - g. Manal override monitoring
9. Each BACnet/IP Fieldbus controller shall support local trend data up to 2x the built-in I/O and at a minimum be capable of holding 5 days @ 15 min intervals locally.
10. The BACnet/IP Fieldbus controller analog or universal input shall use a 16 bit A/D converter.
11. The BACnet/IP Fieldbus controller analog or universal output shall use a 10 bit D/A converter.
12. Built-in I/O: each BACnet/IP Fieldbus controllers shall support:
 - a. At minimum 8 and up to 20 configurable IO channels to monitor and to control the following types of inputs and outputs without the addition of equipment inside or outside the DDC Controller cabinet.
 - 1) Universal Inputs – the following thermistors for use in the system without any external converters needed.
 - a) 10 kohm Type I
 - b) 10 kohm Type II
 - c) 10 kohm Type III
 - d) 10 kohm Type IV
 - e) Linearized 10 kohm Type V (FD w/11k shunt)
 - f) Linearized 10 kohm
 - g) 1.8 kohm
 - h) 1 kohm
 - i) 20 kohm
 - j) 2.2 kohm
 - k) PT100
 - l) PT1000
 - m) Ni1000

- 2) Analog inputs
 - a) Current Input - 0-20 mA
 - b) Voltage Input 0-10 Vdc
 - 3) Digital inputs from dry contact closure, pulse accumulators, voltage sensing.
 - 4) Digital outputs
 - 5) Analog outputs of 4-20 mA and/or 0-10 Vdc
13. Real Time Clock (RTC):
 - a. Provide internal clocks for all BACnet Controllers (B-AAC) using BACnet time synchronization services.
 - 1) Automatically synchronize system clocks daily from an operator-designated controller.
 - 2) The system shall automatically adjust for daylight saving time.
 - b. Each BACnet/IP Fieldbus controller shall include a real time clock, accurate to +/-1 minute per month.
 - c. The RTC shall provide the following: time of day, day, month, year, and day of week.
 - d. The RTC date and time shall also be accurate up to 7 days, from when the BACnet/IP Fieldbus controller has lost power with no reliance on.
14. The BACnet/IP Fieldbus controller for Variable Air Volume (VAV) applications
 - a. The BACnet/IP Fieldbus controller for VAV applications shall include a built-in 'flow thru' differential pressure transducer
 - b. The VAV differential pressure transducer shall have a measurement range of 0 to 1 in. W.C. and measurement accuracy of $\pm 5\%$ at 0.001 to 1 in. W.C. and a minimum resolution of 0.001 in. W.C., insuring primary air flow conditions shall be controlled and maintained to within $\pm 5\%$ of setpoint at the specified minimum and maximum air flow parameters
 - c. The BACnet/IP FieldBus controller for VAV applications shall support a dedicated commissioning tool for air flow balancing
 - d. The BACnet/IP Fieldbus controller for VAV applications shall require no programming for air balancing algorithm
 - e. All balancing parameters shall be synchronized in NSC
15. Each BACnet/IP Fieldbus controller shall have a minimum of 10% spare capacity for each point type represented on the controller for future point connection
16. Power Requirements. 24VDC (21 to 33 VDC) and 24 VAC +/-20% with local transformer power
17. The BACnet/IP Fieldbus controller shall comply with the following regulatory certifications
 - a. CE - EMCD 2014/30/EU
 - b. CE LVD 2014/35/EU
 - c. FCC CFR 47 Part 15 Class B
 - d. RCM
 - e. RoHS 2011/65/EU
 - f. China RoHS SJ/T 11364-2014
 - g. UL2043 (Plenum space mounting)
 - h. UL916 Open-Energy Management equipment
 - i. UL916 Energy Management equipment

18. Intelligent Space Sensor Interface –
 - a. The BACnet/IP Fieldbus controllers shall support a dedicated RJ45 communication port to communicate and power up to 4 intelligent wall mount sensors without the use of on-board inputs or outputs
 - b. It shall be possible to disable the RJ45 communication port.
19. The BACnet/IP Fieldbus controller for Connected Room solutions
 - a. All BACnet/IP Fieldbus controllers shall be BACnet Testing Laboratory listed (v14 or later) as specified BACnet Advanced Application Controller (B-AAC)
 - b. All BACnet/IP Fieldbus controllers shall use the following communication specifications and achieve performance as specified herein:
 - 1) All controllers shall be able to communicate peer-to-peer without the need for an NSC
 - 2) Any BACnet/IP Fieldbus controllers on the Ethernet Data Link/Physical layer shall be able to act as a Master to allow for the exchange and sharing of data variables and messages with any other controller connected on the same communication cabling. Slave controllers are not acceptable.
 - c. The BACnet/IP Fieldbus controllers shall be equipped with 2x 10/100bT Ethernet communication ports with active switch and will support BACnet/IP communication protocols with the following configurations:
 - 1) Supporting IPv4 addressing
 - 2) Supporting Static IP setting, DHCP client and Auto-IP address acquisition
 - 3) It shall be possible to disable Ethernet port 2
 - 4) Each BACnet/IP controller shall be configurable to restrict communications to only whitelisted IP addresses.
 - d. Topologies
 - 1) BACnet/IP Fieldbus controllers shall support daisy chain topology of up to 50 controllers. In case of any disruption to the communication, a system alarm shall notify the NSC/BMS of the point disruption has occurred.
 - 2) BACnet/IP Fieldbus Controllers shall support RSTP loop whereby up to 39 controllers are supported.
 - a) In case of any disruption there shall be no communication interruption
 - b) In case of any disruption there shall be system alarms that will inform the operator of the disruption
 - e. Performance
 - 1) Each BACnet/IP Fieldbus Controllers shall have a 32-bit microprocessor operating at 500 MHz and support a BACnet protocol stack in accordance with the ANSI/ASHRAE Standard 135-2012 and the BACnet Device Profile supported.
 - 2) They shall be multi-tasking, real-time digital control processors consisting of communication controllers, controls processing, power supplies with built-in inputs and outputs.
 - 3) Each BACnet/IP Fieldbus Controllers shall support upgrade of its firmware with no impact to its operation

- f. Programmability
 - 1) The BACnet/IP Fieldbus controllers shall support graphical programming that will be consistent with the NSC.
 - 2) The control program will reside within the same enclosure as the input/output circuitry, that reads inputs and controls outputs
 - 3) All control sequences programmed into the BACnet/IP Fieldbus Controllers shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.
 - 4) The BACnet/IP Fieldbus controllers shall communicate with the Network Server Controller (NSC) via a BACnet/IP connection at a baud rate of not less than 100 Mbps
 - 5) The BACnet/IP Fieldbus controllers shall support two RS485 communication ports for connecting and supplying power to a range of protocol types
 - a) BACnet/IP Fieldbus controllers shall support configurable selection of the supported protocol on the RS485 communications ports,
 - b) BACnet/IP Fieldbus controllers shall support a communications capability for connecting and supplying power to a matching room temperature and/or humidity sensor and/or CO2 and/or presence detector that does not utilize any of the I/O points of the controller.
 - c) BACnet/IP Fieldbus controllers shall support a communications capability for connecting and supplying power to a matching connected module for the purpose of control of lights and blinds that do not utilize any of the I/O points of the controller
 - d) BACnet/IP Fieldbus controllers shall support a communications capability for connecting to open market Modbus devices
- g. Each BACnet/IP Fieldbus controller shall have sufficient memory, to support its own operating system and databases, including:
 - 1) Control processes
 - 2) Energy management applications
 - 3) Alarm management
 - 4) Historical/trend data
 - 5) Maintenance support applications
 - 6) Custom processes
- h. In the case of communication disruption between the BACnet/IP Fieldbus controller and NSC/BMS, each BACnet/IP Fieldbus controller shall support storage of local trend data up to 2x the number of its built-in I/O at the collection rate of 5 min for 5 days.
- i. The BACnet/IP Fieldbus controller analog or universal input shall use a 16-bit A/D converter.
- j. The BACnet/IP Fieldbus controller analog or universal output shall use a 10-bit D/A converter.

- k. Built-in I/O: each BACnet/IP Fieldbus controllers shall support:
 - 1) Up to 8 configurable IO channels to monitor and to control the following types of inputs and outputs without the addition of equipment inside or outside the DDC Controller cabinet.
 - a) Universal Inputs – the following thermistors for use in the system without any external converters needed.
 - b) 10K Ohm Type I
 - c) 10K Ohm Type II
 - d) 10K Ohm Type III
 - e) 10K Ohm Type IV
 - f) Linearized 10K Ohm Type V (FD w/11k shunt)
 - g) Linearized 10K Ohm
 - h) 1.8K Ohm
 - i) 1K Ohm
 - j) 20K Ohm
 - k) 2.2K Ohm
 - l) PT100
 - m) PT1000
 - n) Ni1000 ,
 - o) Voltage Input - 0-10 Vdc
 - p) Digital inputs from dry contact closure, pulse accumulators, voltage sensing.
 - q) Digital outputs
 - r) Analog outputs 0-10 Vdc
- l. Internal Clock
 - 1) Provide internal clocks for all BACnet Controllers (B-AAC) using BACnet time synchronization services.
 - a) Automatically synchronize system clocks daily from an operator-designated controller.
 - b) The system shall automatically adjust for daylight saving time.
 - 2) Each BACnet/IP Fieldbus controller shall include a real time clock, accurate to +/-1 minute per month.
 - 3) The RTC shall provide the following: time of day, day, month, year, and day of week.
 - 4) The RTC date and time shall also be accurate up to 7 days, from when the BACnet/IP Fieldbus controller has lost power with no reliance on batteries
- m. Each BACnet/IP Fieldbus controller shall have a minimum of 10% spare capacity for each point type represented on the controller for future point connection
- n. Power Requirements. 24VDC (21 to 33 VDC) and 24 VAC +/-20% with local transformer power
- o. Power Requirements. A line voltage version shall be available 230 VAC
- p. In the case of power disruption, each BACnet/IP Fieldbus controller shall support power failure recovery within 10 seconds and resume operation from where the disruption had occurred
- q. The BACnet/IP Fieldbus controller shall be able to be plenum mounted (UL2043 compliant)

- r. The BACnet/IP Fieldbus controller shall meet the open class standard of UL916 permitting its installation without secondary enclosure where appropriate
- s. The BACnet/IP Fieldbus controller shall comply with the following regulatory certifications
 - 1) CE - EMCD 2014/30/EU
 - 2) CE LVD 2014/35/EU
 - 3) FCC CFR 47 Part 15 Class B
 - 4) RCM
 - 5) RoHS 2011/65/EU
 - 6) China RoHS SJ/T 11364-2014
 - 7) UL2043 (Plenum space mounting)
 - 8) UL916 Open-Energy Management equipment
 - 9) UL916 Energy Management equipment
- t. Intelligent Space Sensor Interface - The BACnet/IP Fieldbus controllers shall support an RJ45 communication port to communicate and power up to 4 intelligent wall mount sensors without the use of on-board inputs or outputs
 - 1) It shall be possible to disable the RJ45 communication port
- 20. The BACnet/IP Fieldbus controller for remote IO
 - a. It shall be possible to extend Inputs / Outputs required in NSC or BACnet/IP Fieldbus Controllers over the IP network
 - b. The BACnet/IP IO expansion device shall be equipped with 2x 10/100bT Ethernet communication ports with active switch supporting the following configurations:
 - 1) Supporting IPv4 addressing
 - 2) Supporting Static IP setting, DHCP client and Auto-IP address acquisition
 - 3) It shall be possible to disable Ethernet port 2
 - c. The BACnet/IP IO expansion device shall support daisy and RSTP topologies
 - d. The BACnet/IP I/O expansion device shall be capable of sharing its local I/O resources with one or multiple applications distributed across one or multiple NSCs or BACnet/IP Fieldbus Controllers.
 - e. The BACnet/IP I/O expansion device shall support BACnet Alarm and Trend locally
 - f. Outputs of the BACnet/IP I/O expansion device shall support user configurable fallback value that is triggered in case of communication disruption.
- F. The Intelligent Space Sensor shall be capable of displaying measured space temperature from 0 to 50 °C (32 to 122 °F) with accuracy of ± 0.2 °C (± 0.4 °F) selectable for 0.1 or 1 degree display resolution of °F or °C
 - 1. Sensing Element: 10k Type 3 Thermistor
 - 2. Accuracy of ± 0.2 °C (± 0.4 °F)
 - 3. Resolution: 0.1 or 1 degree display resolution
 - 4. Range: 0 to 50 °C (32 to 122 °F)

- G. The Intelligent Space Sensor shall have the option for humidity sensor support sensing humidity from 0 % RH to 100 % RH Digital humidity indication (selectable for 0.1 or 1% RH with selectable display resolution of 0.1 or 1 % RH
 - 1. Accuracy: ± 2 % RH
 - 2. Resolution: 0.1 or 1 % RH
 - 3. Range: 0 % RH to 100 % RH
- H. The Intelligent Space Sensor shall have the option for support of CO2 sensor with display resolution with 0 to 2000 ppm resolution
 - 1. Accuracy: ± 30 ppm $\pm 2\%$ of measured value
 - 2. Range: 0 to 2,000 ppm
 - 3. Operating elevation: 0 to 16,000 ft.
 - 4. Temperature dependence: 0.11% FS per °F
 - 5. Stability: <2% of FS over life of sensor (15 years)
 - 6. Sensing method: Non-dispersive infrared (NDIR), diffusion sampling
- I. The Intelligent Space Sensor shall have the option for motion sensor
- J. Display options: The Intelligent Space Sensor shall be capable of displaying the following elements:
 - 1. Space temperature
 - 2. Cooling space temperature set point
 - 3. Heating space temperature set point
 - 4. Current heating or cooling mode
 - 5. Current occupancy mode
 - 6. Fan speed
 - 7. Current time

2.6 BACNET FIELDBUS AND BACNET SDCUS

- A. Networking
 - 1. IP Network: All devices that connect to the WAN shall be capable of operating at 10 megabits per second or 100 megabits per second.
 - 2. IP To Field Bus Routing Devices
 - a. A Network Server Controller shall be used to provide this functionality.
 - b. These devices shall be configurable locally with IP crossover cable and configurable via the IP network.
 - c. The routing configuration shall be such that only data packets from the field bus devices that need to travel over the IP level of the architecture are forwarded.
- B. Field Bus Wiring and Termination
 - 1. The wiring of components shall use a bus or daisy chain concept with no tees, stubs, or free topology.
 - 2. Each field bus shall have a termination resistor at both ends of each segment.
 - 3. The field bus shall support the use of wireless communications.
- C. Repeaters
 - 1. Repeaters are required to connect two segments.

2. Repeaters shall be installed in an enclosure. The enclosure may be in an interstitial space.
- D. Field Bus Devices
1. General Requirements
 - a. Devices shall have a light indicating that they are powered.
 - b. Devices shall be locally powered. Link powered devices (power is furnished from a central source over the field bus cable) are not acceptable.
 - c. Application programs shall be stored in a manner such that a loss of power does not result in a loss of the application program or configuration parameter settings. (Battery backup, flash memory, etc.)
- E. Advance Application Controllers (B-AAC)
1. The key characteristics of a B-AAC are:
 - a. They have physical input and output circuits for the connection of analog input devices, binary input devices, pulse input devices, analog output devices, and binary output devices. The number and type of input and output devices supported will vary by model.
 - b. They may or may not provide support for additional input and output devices beyond the number of circuits that are provided on the basic circuit board. Support for additional I/O shall be provided by additional circuit boards that physically connect to the basic controller.
 - c. The application to be executed by a B-AAC is created by an application engineer using the vendor's application programming tool.
 - d. If local time schedules are embedded, the B-AAC shall support the editing of time schedule entries from any BACnet OWS that supports the BACnet service for writing of time schedule parameters.
 - e. If local trend logging is embedded, the B-AAC shall support the exporting of trend log data to any BACnet OWS that supports the read range BACnet service for trending.
 - f. If local alarm message initiation is embedded, the B-AAC shall:
 - 1) Deliver alarm messages to any BACnet OWS that supports the BACnet service for receiving alarm messages and is configured to be a recipient of the alarm message.
 - 2) Support alarm acknowledgement from any BACnet OWS that supports the BACnet service for executing alarm/event acknowledgement,
 - g. Shall support the reading of analog and binary data from any BACnet OWS or Building Controller that supports the BACnet service for the reading of data.
 - h. Shall support the control of the out of service property and assignment of value or state to analog and binary objects from any BACnet OWS that supports writing to the out of service property and the value property of analog and binary objects.
 - i. Shall support the receipt and response to Time Synchronization commands from a BACnet Building Controller.
 - j. Shall support the "Who is" and "I am." BACnet services.
 - k. Shall support the "Who has" and "I have." BACnet services.

2. Analog Input Circuits
 - a. The resolution of the A/D chip shall not be greater than 0.01 Volts per increment. For an A/D converter that has a measurement range of 0 to 10 VDC and is 10 bit, the resolution is 10/1024 or 0.00976 Volts per increment.
 - b. For non-flow sensors, the control logic shall provide support for the use of a calibration offset such that the raw measured value is added to the (+/-) offset to create a calibration value to be used by the control logic and reported to the Operator Workstation (OWS).
 - c. For flow sensors, the control logic shall provide support for the use of an adjustable gain and an adjustable offset such that a two-point calibration concept can be executed (both a low range value and a high range value are adjusted to match values determined by a calibration instrument).
 - d. For non-linear sensors such as thermistors and flow sensors the B-AAC shall provide software support for the linearization of the input signal.
3. Binary Input Circuits
 - a. Dry contact sensors shall wire to the controller with two wires.
 - b. An external power supply in the sensor circuit shall not be required.
4. Pulse Input Circuits
 - a. Pulse input sensors shall wire to the controller with two wires.
 - b. An external power supply in the sensor circuit shall not be required.
 - c. The pulse input circuit shall be able to process up to 20 pulses per second.
5. True Analog Output Circuits
 - a. The logical commands shall be processed by a digital to analog (D/A) converter chip. The 0% to 100% control signal shall be scalable to the full output range which shall be either 0 to 10 VDC, 4 to 20 milliamps or 0 to 20 milliamps or to ranges within the full output range (Example: 0 to 100% creates 3 to 6 VDC where the full output range is 0 to 10 VDC).
 - b. The resolution of the D/A chip shall not be greater than 0.04 Volts per increment or 0.08 milliamps per increment.
6. Binary Output Circuits
 - a. Single pole, single throw or single pole, double throw relays with support for up to 230 VAC and a maximum current of 2 amps.
 - b. Voltage sourcing or externally powered triacs with support for up to 30 VAC and 0.5 amps at 24 VAC.
7. Program Execution
 - a. Process control loops shall operate in parallel and not in sequence unless specifically required to operate in sequence by the sequence of control.
 - b. The sample rate for a process control loop shall be adjustable and shall support a minimum sample rate of 1 second.
 - c. The sample rate for process variables shall be adjustable and shall support a minimum sample rate of 1 second.
 - d. The sample rate for algorithm updates shall be adjustable and shall support a minimum sample rate of 1 second.
 - e. The application shall have the ability to determine if a power cycle to the controller has occurred and the application programmer shall be able to use the indication of a power cycle to modify the sequence of controller immediately following a power cycle.

8. Local Interface
 - a. The controller shall support the connection of a portable interface device such as a laptop computer or vendor unique hand-held device. The ability to execute any tasks other than viewing data shall be password protected. Via this local interface, an operator shall be able to:
 - 1) Adjust application parameters.
 - 2) Execute manual control of input and output points.
 - 3) View dynamic data.
- F. Application Specific Devices
 1. Application specific devices shall have fixed function configurable applications.
 2. If the application can be altered by the vendor's application programmable tool, the device is an advanced application controller and not an application specific device.
 3. Application specific devices shall be BTL certified.
- G. Room controllers
 1. For connected room solutions that do not require integrated lighting and blind busses built into a singular unit, the system shall include a BACnet MS-TP enabled controller specifically designed for room control.
 2. The controller shall communicate via BACnet MS-TP. It should also be capable of MODBUS RTU communication.
 3. The controller shall be capable of controlling fan coil units, cooling VVT zones with reheat, fin-tube radiators, cabinet heaters, radiant panel heaters, electric re-heat zones, terminal reheats, rooftop units (1H1C, 2H2C, 3H2C, MH2C), or heat pumps, if necessary.
 4. The controller shall house an onboard temperature sensor, and options for onboard humidity and occupancy sensor.
 5. The controller shall utilize a touch screen interface and have multiple options for casings and fascias. The screen shall be a TFT transmissive LED backlit LCD touchscreen with at least 5 color options.
 6. Controller will have password protection to prevent unauthorized access to the configuration menu parameters.
 7. The controller will have integrated Zigbee wireless communications with predefined profiles for Zigbee door and window switches, occupancy sensors, water leakage detectors, CO2 sensors, and additional temperature and humidity sensors.
 8. The controller will be capable of hosting at least 10 Zigbee sub devices.
 9. The controller will be capable of being programmed with customizable scripts via the open programming language Lua. It shall be equipped with at least 256KB of SRAM with 80KB configurable/reserved for Lua scripting purposes

2.7 DDC SENSORS AND POINT HARDWARE

- A. Temperature Sensors
 1. Basis of design Manufacturers: Veris Industries or BAS manufacturer equivalent
 2. All temperature devices shall use thermistors or RTDs accurate to +/- 1 degree F over a range of -30 to 230 degrees F. Space temperature sensors shall be accurate to +/- .5 degrees F over a range of 40 to 100 degrees F.

3. Room Sensor: Standard space sensors shall be available in an off white enclosure made of high impact ABS plastic. Basis of Design: Veris TW Series
 - a. Where manual overrides are required, the sensor housing shall feature an optional sliding mechanism for adjusting the space temperature setpoint.
 4. Duct Probe Sensor: Sensing element shall be fully encapsulated in potting material within a stainless steel probe. Useable in air handling applications where the coil or duct area is less than 14 square feet. Basis of Design: Veris TD Series
 5. Duct Averaging Sensor: Averaging sensors shall be employed in ducts which are larger than 14 square feet. The averaging sensor tube shall contain at least one thermistor for every 3 feet, with a minimum tube length of 6 feet. The averaging sensor shall be constructed of rigid or flexible copper tubing. Basis of Design: Veris TA Series
 6. Pipe Immersion Sensor: Immersion sensors shall be employed for measurement of temperature in all chilled and hot water applications as well as refrigerant applications. Provide sensor probe length suitable for application. Provide each sensor with a corresponding pipe-mounted sensor well, unless indicated otherwise. Sensor wells shall be stainless steel for non-corrosive fluids below 250 degrees F and 300 series stainless steel for all other applications. Basis of Design: Veris TI Series
 7. Outside Air Sensor: Provide the sensing element on the building's north side. Sensing element shall be fully encapsulated in potting material within a stainless steel probe. Probe shall be encased in PVC solar radiation shield and mounted in a weatherproof enclosure. Operating range -40 to 122 F, Basis of Design: Veris TO Series
 8. A pneumatic signal shall not be allowed for sensing temperature.
- B. Humidity Wall Transmitter
1. Basis of Design Manufacturer: Veris Industries or BAS manufacturer equivalent
 2. Transmitters shall be accurate to +/- 3% at full scale.
 3. Transmitter shall have replaceable sensing element.
 4. Sensor type shall be thin-film capacitive.
 5. Sensor element shall contain multipoint calibration on-board in nonvolatile memory
 6. Operating range shall be 0 - 100% RH noncondensing, 50 to 95 F
 7. Output shall be field selectable 4-20 mA or 0-5/0-10 VDC.
 8. Transmitter shall accept 12-30 VDC or 24 VAC supply power.
 9. Transmitter shall be available in an off white enclosure made of high impact ABS plastic for mounting on a standard electrical box.
 10. Transmitter shall have option of having an LCD display
 11. Transmitter shall have option of being NIST certified
 12. Transmitter shall have option of an integrated temperature sensor
 13. Basis of Design: Veris HWL Series
- C. Humidity Duct Transmitter
1. Basis of Design Manufacturer: Veris Industries or BAS manufacturer equivalent
 2. Transmitters shall be accurate to +/- 3 % at full scale.
 3. Transmitter shall be fully encapsulated in potting material within a stainless steel probe.
 4. Transmitter shall have replaceable sensing element.

5. Sensor type shall be thin-film capacitive.
6. Sensor element shall contain multipoint calibration on-board in nonvolatile memory
7. Operating range shall be 0 - 100% RH noncondensing, -40 to 122 F
8. Output shall be 4-20 mA or 0-5/0-10 VDC.
9. Transmitter shall accept 12-30 VDC or 24 VAC supply power.
10. Transmitter shall have option of being NIST certified
11. Transmitter shall have option of an integrated temperature sensor
12. Basis of Design: Veris HD Series

D. Humidity Outdoor Transmitter

1. Basis of Design Manufacturer: Veris Industries or BAS manufacturer equivalent
2. Transmitters shall be accurate to +/- 3% at full scale.
3. Transmitter shall be fully encapsulated in potting material within a stainless steel probe. Probe shall be encased in PVC solar radiation shield and mounted in a weatherproof enclosure.
4. Transmitter shall have replaceable sensing element.
5. Sensor type shall be thin-film capacitive.
6. Sensor element shall contain multipoint calibration on-board in nonvolatile memory
7. Operating range shall be 0 - 100% RH noncondensing, -40 to 122 F
8. Output shall be 4-20 mA or 0-5/0-10 VDC.
9. Transmitter shall accept 12-30 VDC or 24 VAC supply power.
10. Transmitter shall have option of being NIST certified
11. Transmitter shall have option of an integrated temperature sensor
12. Basis of Design: Veris HO Series

E. Carbon Dioxide Wall Transmitter:

1. Basis of Design Manufacturer: Veris Industries or BAS manufacturer equivalent
2. Sensor type shall be Non-dispersive infrared (NDIR).
3. Accuracy shall be ± 30 ppm $\pm 2\%$ of measured value with annual drift of ± 10 ppm. Minimum five year recommended calibration interval.
4. Repeatability shall be ± 20 ppm $\pm 1\%$ of measured value
5. Response Time shall be <60 seconds for 90% step change
6. Outputs shall be field selectable Protocol: BACnet with SPDT Relay 1A@30VDC
7. Transmitter shall accept 12-30 VDC or 24 VAC supply power.
8. Temperature Range: 32° to 122°F (CO2 only), or 50° to 95°F (with humidity option)
9. Output range shall be programmable 0-2000 or 0-5000 ppm
10. Transmitter shall be available in an off white enclosure for mounting on a standard electrical box.
11. Transmitter shall have an option of an LCD display for commissioning and provide additional faceplate to conceal LCD display where occupants may misinterpret CO2 readings.
12. Transmitter shall have option of an integrated temperature sensor and/or humidity sensor
13. Basis of Design: Veris CWL

F. Carbon Dioxide Duct Transmitter:

1. Basis of Design Manufacturer: Veris Industries or BAS manufacturer equivalent
2. Sensor type shall be Non-dispersive infrared (NDIR).
3. Accuracy shall be ± 30 ppm $\pm 2\%$ of measured value with annual drift of ± 10 ppm. Minimum five year recommended calibration interval.
4. Repeatability shall be ± 20 ppm $\pm 1\%$ of measured value
5. Response Time shall be <60 seconds for 90% step change
6. Outputs shall be field selectable Analog: 4-20mA or 0-5/0-10VDC with SPDT Relay 1A@30VDC
7. Transmitter shall accept 12-30 VDC or 24 VAC supply power.
8. Temperature Range: 32° to 122°F
9. Output range shall be programmable 0-2000 or 0-5000 ppm
10. Enclosure shall not require remote pickup tubes and make use of integrated H-beam probe to channel air flow to sensor.
11. Enclosure lid shall require no screws and make use of snap on features for attachment
12. Enclosure shall be made of high impact ABS plastic
13. Transmitter shall have option of an LCD display
14. Transmitter shall have option of an integrated temperature sensor and/or humidity sensor
15. Basis of Design: Veris CDL

G. Air Pressure Transmitters.

1. Basis of Design Manufacturer: Veris Industries or BAS manufacturer equivalent
2. Sensor shall be microprocessor profiled ceramic capacitive sensing element
3. Transmitter shall have 14 selectable ranges from 0.1 – 10" WC
4. Transmitter shall be $\pm 1\%$ accurate in each selected range including linearity, repeatability, hysteresis, stability, and temperature compensation.
5. Transmitter shall be field configurable to mount on wall or duct with static probe
6. Transmitter shall be field selectable for Unidirectional or Bidirectional
7. Maximum operating pressure shall be 200% of design pressure.
8. Output shall be field selectable 4-20 mA or 0-5/0-10 VDC linear.
9. Transmitter shall accept 12-30 VDC or 24 VAC supply power
10. Response time shall be field selectable T95 in 20 sec or T95 in 2 sec
11. Transmitter shall have an LCD display
12. Units shall be field selectable for WC or PA
13. Transmitter shall have provision for zeroing by pushbutton or digital input.
14. Transmitter shall be available with a certification of NIST calibration
15. Basis of Design: Veris model PXU.

H. Liquid Differential Pressure Transmitters:

1. Basis of Design Manufacturer: Veris Industries or BAS manufacturer equivalent
2. Transmitter shall be microprocessor based
3. Transmitter shall use two independent gauge pressure sensors to measure and calculate differential pressure
4. Transmitter shall have 4 switch selectable ranges
5. Transmitter shall have test mode to produce full-scale output automatically.
6. Transmitter shall have provision for zeroing by pushbutton or digital input.
7. Transmitter shall have field selectable outputs of 0-5V, 0-10V, and 4-20mA.
8. Transmitter shall have field selectable electronic surge damping

9. Transmitter shall have an electronic port swap feature
 10. Transmitter shall accept 12-30 VDC or 24 VAC supply power
 11. Sensor shall be 17-4 PH stainless steel where it contacts the working fluid.
 12. Performance:
 - a. Accuracy shall be $\pm 1\%$ F.S. and $\pm 2\%$ F.S. for lowest selectable range
 - b. Long term stability shall be $\pm 0.25\%$
 - c. Sensor temperature operating range shall be -4° to 185°F
 - d. Operating environment shall be 14° to 131°F ; 10-90% RH noncondensing
 - e. Proof pressure shall be 2x max. F.S. range
 - f. Burst pressure shall be 5x max. F.S. range
 13. Transmitter shall be encased in a NEMA 4 enclosure
 14. Enclosure shall be white powder-coated aluminum
 15. Transmitter shall be available with a certification of NIST calibration
 16. Transmitter shall be preinstalled on a bypass valve manifold
 17. Basis of Design: Veris PW
- I. Current Sensors
1. Current status switches shall be used to monitor fans, pumps, motors and electrical loads. Current switches shall be available in split core models, and offer either a digital or an analog signal to the automation system. Basis of Design manufacturer is Veris Industries or BAS manufacturer equivalent
- J. Current Status Switches for Constant Load Devices
1. Basis of Design Manufacturer: Veris Industries or BAS manufacturer equivalent
 2. General: Factory programmed current sensor to detect motor undercurrent situations such as belt or coupling loss on constant loads. Sensor shall store motor current as operating parameter in non-volatile memory. Push-button to clear memory.
 3. Visual LED indicator for status.
 4. Split core sensor, induced powered from monitored load and isolated to 600 VAC rms. Sensor shall indicate status from 0.5 A to 175 A.
 5. Normally open current sensor output. 0.1A at 30 VAC/DC.
 6. Basis of Design: Veris Model H608.
- K. Current Status Switches for Constant Load Devices (Auto Calibration)
1. Basis of Design Manufacturer: Veris Industries or BAS manufacturer equivalent
 2. General: Microprocessor based, self-learning, self-calibrating current switch. Calibration-free status for both under and overcurrent, LCD display, and slide-switch selectable trip point limits. At initial power-up automatically learns average current on the line with no action required by the installer
 3. Split core sensor, induced powered from monitored load and isolated to 600 VAC rms. Sensor shall indicate status from 2.5 A to 200 A.
 4. Display: Backlit LCD; illuminates when monitored current exceeds 4.5A
 5. Nominal Trip Point: $\pm 40\%$, $\pm 60\%$, or on/off (user selectable)
 6. Normally open current sensor output. 0.1A at 30 VAC/DC.
 7. Basis of Design: Veris Model H11D.
- L. Current Status Switches for Variable Frequency Drive Application
1. Basis of Design Manufacturer: Veris Industries or BAS manufacturer equivalent

2. General: Microprocessor controlled, self-learning, self-calibrating current sensor to detect motor undercurrent and overcurrent situations such as belt loss, coupling shear, and mechanical failure on variable loads. Sensor shall store motor current as operating parameter in non-volatile memory. Push-button to clear memory and relearn.
3. Visual LED indicator for status.
4. Alarm Limits: $\pm 20\%$ of learned current in every 5 Hz freq. band
5. Split core sensor, induced powered from monitored load and isolated to 600 VAC rms. Sensor shall indicate status from 1.5 A to 150 A and from 12 to 115 Hz.
6. Normally open current sensor output. 0.1A at 30 VAC/DC.
7. Basis of Design: Veris Model H614.

2.8 STATUS SENSORS AND DEVICES - ELECTRIC

- A. Status Input for Fan: Differential pressure switch with pilot-duty rated contacts and adjustable range of 0- to 5-inch wg.
 1. Manufacturers:
 - a. Cleveland Controls.
- B. Status Input for Pump: Liquid differential pressure switch with pilot-duty rated contacts and adjustable pressure range of 20- to 60-psig and differential pressure range of 5- to 30-psig, SPDT contacts pilot-duty rated or for application, $\frac{1}{4}$ " female NPT pipe connections.
 1. Manufacturers:
 - a. United Electric Controls.
- C. Sensing Inputs for Electric Motors:
 1. Manufacturers:
 - a. American Aerospace Controls.
 2. Current Transformer/Transmitter: Comply with ISA 50.00.01, current-sensing, fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current and 1 percent full-scale accuracy, for AC or DC applications.
 3. Voltage Transformer/Transmitter (100- to 600-V AC): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy, for AC or DC applications.
 4. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor, for AC and DC applications.
- D. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.
 1. Manufacturer's
 - a. DDC equipment manufacturer's recommended product
- E. Water Flow Switch: Bellows-actuated mercury or snap-acting type with pilot-duty rating, stainless-steel or bronze paddle, with appropriate range and differential adjustment, in NEMA 250, Type 1 enclosure.

1. Manufacturers:
 - a. Xylem.
 - b. I.T.M. Instruments.
- F. Liquid Leak Detectors
 1. Liquid detectors shall utilize microchip technology for detection of conductive liquids through one of the following types of sensors: gold-plated probes, self-adhesive sensor tape with copper electrodes and durable cotton cover, or rope type sensor. Detectors shall be selected based on the best use for the application. Power requirement shall be 11-27 VAC or VDC and have a green LED normal operation indicator. Unit shall have a SPDT pilot duty low voltage alarm contact. Unit shall be waterproof and rustproof. A red LED shall indicate the presence of liquid. Unit shall have an adjustable setpoint.
 2. Approved Manufacturers:
 - a. R. E. Technologies.
 - b. Dorlen Products. (Water Alert)
- G. Control Relay: Monitors or controls AC or DC motors or other equipment (as required), with cover, with visual indicator when energized, and two SPDT contacts rated 120/250 VAC at 8 Amps.
 1. Manufacturers:
 - a. Dayton.
 - b. Omron.
 - c. Functional Devices.
- H. Damper End Switch (limit switch): Fully encapsulated, mercury-type, damper end switch with two contacts per switch; one for interlock wiring and one for DDC input.
 1. Manufacturers:
 - a. KELE Controls part number TS-470-2.
- I. Emergency Power-Off (EPO) Push-button: ADA compliant, push-button switch with clear cover to prevent inadvertent closure. Push-to-activate push-button, key-to-reset feature, and providing two SPDT contacts rated 120/250 VAC at 10 Amps.
 1. Manufacturers:
 - a. Safety Technology International – model SS-2212PO.
- J. Boiler EPO Contactor: Electrically operated, electrically held; provide contactor in NEMA-12 rated enclosure. Six (6) normally closed contacts rated 120/250 VAC at 20 Amps.
 1. Manufacturers:
 - a. Allen-Bradley.
 - b. Cutler-Hammer.
 - c. Square-D.

2.9 OCCUPANCY, DAYLIGHTING, AND PHOTO-ELECTRIC SENSORS

- A. Refer to Division 26 Section "Lighting Control Devices" for equipment that relates to this Section.

2.10 FLOW METERS

- A. Liquid Flow Meters: (Electro-Magnetic Type)
1. Manufacturers (Water or Glycol/Water):
 - a. ABB.
 - b. Siemens.
 - c. EMCO.
 - d. Rosemount.
 - e. Krohne.
 2. The meter system shall consist of a primary flow sensor and transmitter. The flow sensor shall be equipped with 150-lb. flanges. The meter system shall be installed with all necessary grounding components and gaskets per manufacturer's instructions. The meter shall be capable of bi-directional operation. The meter shall be sized appropriately for the range of flow for the system. The electrodes shall be stainless steel or Hasteloy C. The transmitter shall be provided with a remote mounting bracket, cable, integral LCD display, NEMA 4X housing, and shall indicate flow rate, totalize flow, and shall have an isolated 2-wire 4-20 mA linear output signal and a pulsed output signal for totalization. The transmitter shall be capable of being field calibrated and reprogrammed from the outside housing via magnetic probe or integral keypad menu switching. Unit electronics shall have noise immunity. The primary flow sensor and transmitter shall be mounted in accessible locations. Unit shall have the capability to maintain flow total in non-volatile memory. The flow meter shall be provided with a 1-year warranty and application non-degraded performance guarantee. The flow meter and transmitter as a unit shall have the following minimum characteristics:
 - a. Flow meter Liner:
 - b. Heating hot water, domestic hot water, and other water systems operating at or above 110-degrees F: Teflon
 - c. Accuracy:
 - d. At 1- to 33-feet per second velocity: plus or minus 0.5-% of rate.
 - e. At 0.3-feet per second velocity: $\pm 2\%$ of rate.
 - f. Each unit shall be factory calibrated for the specified flow and shall be calibrated in both directions if the application is bi-directional. Calibration shall be a minimum of three point. Specific performance test data shall be furnished with the meter.
 - g. Each meter shall provide two analog 4- to 20-mA signals or a single 4-to 20-mA signal and a digital contact closure on reverse flow.
 3. Provide a phenolic tag for each transmitter to identify service and meter ID number (i.e. HOT WATER HEATING FLOW, FM-1, etc.).

2.11 DDC BTU METERING

- A. DDC BTU metering shall be accomplished using the following equipment at each metering point:
1. One (1) liquid flow meter unit with current-loop transmitter as specified elsewhere in this section.
 - a. Flow meter range shall be 125% of the maximum expected flow capacity.

2. Two (2) high-precision matched temperature sensor assemblies with current-loop transmitters. Sensors with stainless steel wells shall be installed in each respective supply and return pipe as shown on project drawings for ferrous piping (use copper or brass wells for copper piping).
 - a. Manufacturers: MINCO and TCS
 - b. Temperature sensors shall be a matched pair selected for this application.
 - c. Temperature sensor accuracy shall be plus or minus 0.1-degrees F at calibration temperature. Calibration temperature for heating hot water is 140.0-degrees F
 3. These devices shall be wired to a local DDC panel. Calculations for instantaneous and totalized load shall be incorporated into the panel control code, and the necessary virtual points shall be created to allow remote monitoring and trending via the DDC system.
- B. DDC shall perform BTU computations using linear, square law, or multi-point linearization data interpretation, as needed, based on the flow meter used. Inputs shall include:
1. 4- to 20-ma signal from hydronic flow meter
 2. 4- to 20-ma signal from two, high-accuracy, immersion temperature sensors
- C. Input devices shall be rated for the environment in which they are installed. DDC shall perform rate of flow calculations as well as monitor the flow and totalize it weekly, monthly, and yearly. These values shall be available at the BAS in graphical format for operator monitoring. Flow rate alarms shall be programmed for low flow and high flow conditions.
- D. Provide an equipment tag for each transmitter device to identify service and ID number

2.12 THERMOSTATS

- A. Manufacturers:
1. Distech Controls
 2. Delta Controls
 3. Schneider Electric
 4. Erie Controls.
 5. Danfoss Inc.
 6. Heat-Timer Corporation.
 7. Sauter Controls Corporation.
 8. Tekmar Control Systems.
 9. Theben AG - Lumilite Control Technology.
- B. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed setpoint adjustment, 55- to 85-degrees F setpoint range, and 2-degrees F maximum differential.
- C. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch or equivalent solid-state type, with heat anticipator; listed for electrical rating; with concealed setpoint adjustment, 55- to 85-degrees F setpoint range, and 2-degrees F maximum differential.

1. Selector Switch: Integral, manual, On-Off-Auto.
- D. Remote-Bulb Thermostats: On-off or modulating type, liquid filled to compensate for changes in ambient temperature; with copper capillary and bulb, unless otherwise indicated.
 1. Bulbs in water lines with separate wells of same material as bulb.
 2. Bulbs in air ducts with flanges and shields.
 3. Averaging Elements: Copper tubing with either single- or multiple-unit elements, extended to cover full width of duct or unit; adequately supported.
 4. Scale settings and differential settings are clearly visible and adjustable from front of instrument.
 5. On-Off Thermostat: With precision snap switches and with electrical ratings required by application.
 6. Modulating Thermostats: Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.
- E. Immersion Thermostat: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range and adjustable setpoint.
- F. Airstream Thermostats: Two-pipe, fully proportional, single-temperature type; with adjustable setpoint in middle of range, adjustable throttling range, plug-in test fitting or permanent pressure gage, remote bulb, bimetal rod and tube, or averaging element.
- G. Electric, High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic- reset switch that trips if temperature sensed across any 12-inches of bulb length is equal to or above setpoint.
 1. Bulb Length: Minimum 20-feet.
 2. Quantity: One thermostat for every 20-sq. ft. of coil surface.
- H. Heating/Cooling Valve-Top Thermostats: Proportional acting for proportional flow, with molded-rubber diaphragm, remote-bulb liquid-filled element, direct and reverse acting at minimum shutoff pressure of 25-psig, and cast housing with position indicator and adjusting knob.

2.13 HUMIDISTATS

- A. Manufacturers:
 1. MAMAC Systems.
 2. Rotronic Instrument Corp.
- B. Electric:
 1. Room or Duct-Mounted Humidistats: Electric insertion, 2-position type, with adjustable 2 percent RH throttling range, 20 to 90 percent RH operating range, and single- or double-pole contacts. Calibrated for +/- 5% RH accuracy.

2.14 CONTROL VALVES

- A. Manufacturers

1. Belimo

B. Ball Valves

1. $\frac{1}{2}$ " to $\frac{3}{4}$ " Ball Valve
 - a. Forged brass body rated at no less than 600 psi, chrome plated brass ball with blowout proof stem or optional stainless steel ball with blowout proof stem,
 - b. Valves are to be in two-way and three-way configurations.
 - c. Connection: Female NPT end fittings, Teflon® PTFE seat, characterizing disc glass filled PEEK providing equal percentage flow curve on two-way valve.
 - d. Operating Temperature 20...250°F chilled or hot water with up to 60% glycol solution.
 - e. Two-way and Bypass port should be ANSI Class IV (0.01% of Cv) seat leakage.
 - f. Rangeability must be at least 300:1.
 - g. Tool-less actuator connection.
 - h. System Static Pressure Limit should be 600 psig (4137 Pa)
 - i. Basis of Design: Schneider Electric VBB/VBS Ball Valves, or BAS manufacturer equivalent
 - j. $\frac{1}{2}$ " to 3" 2-way and $\frac{1}{2}$ " to 2" 3-way Ball Valves
 - 1) Valves must be for control of hot or chilled water, or solutions of up to 50% glycol.
 - 2) Ball valves must have close-offs of 40...130 psi depending on size.
 - 3) Valves will provide CVs from 0.33...266 depending on size.
 - 4) Valve characterizing insert, is to be made of glass-filled Noryl™ and provide equal percentage flow.
 - 5) Valve body is to be made of forged brass ASTM B283-06 and rated for static pressure of 360 psi at fluid temperatures of 20...250°F (-7...121°C).
 - 6) All valves are to have balls made of nickel/chromium plated brass with two-way valves having stainless steel balls as an option. All valve stems are to be stainless steel with reinforce Teflon® EPDM O-ring seals.
 - 7) 2-way valves are to be ANSI Class IV (0.01% of Cv) shutoff. 3-way valves are to be ANSI Class IV (0.01% of Cv) piped coil-side outlet to the port A only.
 - 8) Fluid (water) temperature are a minimum 20°F (-7°C) and a maximum of 250°F (121°C).
2. Globe Valves (Bronze $\frac{1}{2}$ " to 2")
3. Control Valves: Factory fabricated, with body material, and pressure class based on maximum pressure and temperature rating of piping system with a body rating of not less than 400 psig at 150°F, 321 psig at 281°F per ANSI B16.15.
4. Valves two way NPS 2" and Smaller: Operator, stem and plug assembly, and spring-loaded PTFE/EPDM valve stem packing cartridge must be removable for future replacement to restore the valves back to their original condition. Material grade properties must meet the fluid temperature and pressure requirements:
 - a. Standard duty bronze body, 316 stainless steel vertical stem, brass plug, soft seal, and bronze seat, renewable packing cartridge, and

- screwed/sweat/flared ends. Valves shall have allowable media temperature of 20°F ...281°F to assure reliability with dual temperature applications.
- b. Heavy duty bronze body, 316 stainless steel vertical stem, 316 stainless steel plug, soft seal, and 316 stainless steel seat, renewable packing cartridge, and screwed ends. Valves shall have allowable media temperature of 20°F ...340°F to assure to assure reliability with dual temperature applications.
 - c. High temperature bronze body, 316 stainless steel vertical stem, 316 stainless steel plug, and 316 stainless steel seat, renewable packing cartridge, and screwed ends. Valves shall have allowable media temperature of 20°F ...400°F.
 - d. Two-way fluid system globe valves shall have the following characteristics:
 - 1) Rangeability: Greater than 100:1 for all valves with flow coefficients of 0.4 and higher to provide stable control under light load conditions.
 - 2) Maximum Allowable Seat Leakage: Standard and heavy duty valves must be designed to meet ANSI Class V (0.0005 ml per minute per "of orifice diameter per psi differential) up to 35 psi close off differential pressure and ANSI Class IV seat leakage (maximum 0.01% of full open valve capacity) above 35 psi with appropriate actuator. High temperature valves must meet ANSI Class III seat leakage (maximum 0.1% of full open valve capacity).
 - 3) The valve must be able to operate with a full-open operating differential of no less than 87 psi.
 - 4) Flow Characteristics: Modified equal percentage characteristics for standard duty water applications and modified linear for heavy duty and high temperature steam applications with gradual opening for light loads.
 - 5) Sizing:
 - a) Two Position Water: Line size or size using a differential pressure of 1 psi.
 - b) Modulating Water: 2 PSI or as listed on schedules.
 - e. Valves 3-Way mixing (two inlets and one outlet) NPS 2" and Smaller:
 - 1) Operator, stem and plug assembly, and spring-loaded PTFE/EPDM valve stem packing cartridge must be removable for future replacement to restore the valves back to their original condition. Material grade properties must meet the fluid temperature and pressure requirements:
 - a) Standard duty bronze body, 316 stainless steel vertical stem, brass plug, and bronze seat, renewable packing cartridge, and screwed or sweat ends. Valves shall have allowable media temperature of 20°F...281°F to assure reliability with dual temperature applications.
 - b) Heavy duty bronze body, 316 stainless steel vertical stem, 316 stainless steel plug, and 316 stainless steel seat, renewable disc and packing cartridge, and screwed ends. Valves shall have allowable media temperature of 20°F ...340°F to assure reliability with dual temperature applications.
 - f. 3-Way mixing hydronic system globe valves shall have the following characteristics:

- 1) Rangeability: Greater than 100:1 for all valves to provide stable
- 2) Maximum Allowable Seat Leakage: A port must be designed to meet ANSI Class V (0.0005 ml per minute per "of orifice diameter per psi differential) up to 35 psi close off differential pressure and ANSI IV seat leakage (maximum 0.01% of full open valve capacity) above 35 psi with appropriate actuator. B port must meet ANSI Class III seat leakage (maximum 0.1% of full open valve capacity).
- 3) The valve must be able to operate with a full-open operating differential of 87 psi.
- 4) Flow Characteristics: Modified linear characteristics with gradual opening for light loads.
- 5) Sizing: Modulating Water: Maximum 2 psi or as listed on schedules.
- g. Valves 3-Way diverting (one inlet and two outlets) NPS 2" and Smaller:
 - 1) Operator, stem and plug assembly, and spring-loaded PTFE/EPDM valve stem packing cartridge must be removable for future replacement to restore the valves back to their original condition. Valves must be designed specifically for diverting service, and mixing valves designed for mixing service must not be used for diverting applications. Material grade properties must meet the fluid temperature and pressure requirements:
 - a) Standard duty bronze body, 316 stainless steel vertical stem, brass plug, and bronze seat, renewable disc and packing cartridge, and screwed ends. Valves shall have allowable media temperature of 20°F ...281°F to assure reliability with dual temperature applications.
- h. 3-Way diverting hydronic system globe valves shall have the following characteristics:
 - 1) Rangeability: Greater than 100:1 for all valves to provide stable control under light load conditions.
 - 2) Maximum Allowable Seat Leakage: ANSI Class III seat leakage (maximum 0.1% of full open valve capacity).
 - 3) Maximum Allowable Pressure Differential: 35 psi in an open position.
 - 4) Flow Characteristics: Modified linear characteristics with gradual opening for light loads.
 - 5) Sizing:
 - a) Modulating Water: Maximum 2 psi or as listed on schedules
- i. Required Certifications: Pressure Equipment Directive (PED 97/23/EC), RoHS (Restriction of Hazardous Substances) and REACH (Regulation, Evaluation, Authorization, and Restriction of Chemicals), Canadian Registration Number.
- j. Valve and Operator: To assure maximum performance and operation of the valve assembly both the valve and the actuator must be tested and approved by the valve manufacturer to assure compatibility of all components and performance to the specifications.
5. Butterfly Valves
 - a. Valve body are to be polyester coated iron ASTM A126 lug mating with ANSI class 125/150 flanges.
 - b. Disc Type: Ductile iron nylon 11 coated.
 - c. Valve Stem:

- d. 2...8" 416 stainless steel double D stem.
- e. Valve seat: EPDM tongue and groove seat and molded O-ring flange seat
- f. Flow Characteristics: Modified equal percentage.
- g. Close-Off Pressure Rating: Bubble-tight shutoff (no leakage).
- h. Valve fluid temperature rating: -40...250°F (-40...121°C) 9. Valve will have two (2) inch extended neck (because of heat). 10. Valve must except pneumatic or electric/electronic actuators 11. Valves must have a minimum of a two (2) year warranty.
- i. Valve will have two (2) inch extended neck (because of heat).
- j. Valve must accept pneumatic or electric/electronic actuators.
- k. Valves must have a minimum of a two (2) year warranty.
- 6. Flanged Valves
 - a. Bodies: Shall be American Factory fabricated with ASTM A 126 Class B cast iron body material with the pressure class within the maximum pressure and temperature rating of the piping system. (125 body rating with not less than 200 psig at 150°F, decreasing to 169 psig at 281F per ANSA B16.1)
 - b. Serviceability: 2-Way valve operators, stem and plug assemblies and spring-loaded PTFE/EPDM valve stem packing cartridges must be removable for future replacement to restore the valves back to their original condition.
 - c. Construction: Material grades must meet the fluid temperature and pressure requirement temperatures of 20°F ...281°F to assure reliability throughout all application temperature ranges.
 - d. Packings: Shall be cartridges suitable for replacement as units withstanding the full operating temperature ranges, including daily and seasonal fluctuations of water, 60% glycol and steam fluids.
 - e. Characteristics
 - 1) Rangeability: Two way, 100:1 and greater for stable control under light load.
 - 2) Shutoff, 2-Way: Leakage allowed: ANSI Class IV (0.01% of max flow)
 - 3) 3-Way: Leakage allowed: ANSI Class III (0.1% of max flow)
 - 4) Flow curves: 2-Way modified equal percentage characteristic.
 - 5) Mixing and Diverting: Linear, modified with gradual opening for light loads.
 - f. Piping
 - 1) Diverting valves, with the common port at the bottom can be used for mixing.
 - 2) Mixing valves with the common port at the end must not be used for diverting applications.
 - g. Sizing
 - 1) Two Position Water: Line size or size using a differential pressure of 1 psi.
 - 2) Modulating Water: 2 PSI or as listed on schedules.
 - h. Certifications for All Models: Pressure Equipment Directive (PED 97/23/EC), RoHS (Restriction of Hazardous Substances) and REACH (Regulation, Evaluation, Authorization, and Restriction of Chemicals)

2.15 CONTROL VALVE ACTUATORS

- A. Manufacturers
 - 1. Belimo
- B. $\frac{1}{2}$ " to $\frac{3}{4}$ " Ball Valve Actuators
 - 1. Size for torque required for valve close-off pressure for system design.
 - 2. Coupling: Direct coupled to valve body without use of external devices/tools
 - 3. Auxiliary End Switch (optional) to be SPST 24 Vac/Vdc, 101 mA to 5 mA maximum on selected two-position models.
 - 4. Controller Signal Two-position, Floating or Proportional (0...5 Vdc, 0...10 Vdc, 5...10 Vdc, or 4...20 mA dc). Design allows for change via DIP switches without removal of cover.
 - 5. Manual operating lever and position indicator must be standard.
 - 6. Power Requirements: 24 Vac for floating, proportional, and 110...230 Vac for two position multi-voltage types
 - 7. Actuators must be available with either Spring Return (SR) or Non-Spring Return (NSR) models.
 - 8. Operating Temperature Limit Floating is to be 32...140°F (0...60°C) Proportional 32...140°F (0...60°C) Two-Position 32...169°F (0...76°C)
 - 9. Wiring (depending on model) Removable Terminal Block, 10 ft. (3.05 m) Plenum Cable, 18 in. (45 cm) Appliance Wire
 - 10. Locations must be rated NEMA 2, IEC IP31. (Indoor Use Only.) Actuators with terminal block or plenum cable leads are plenum rated per UL file number E9429.
 - 11. Agency Listings: ISO 9001, cULus, and CE.
- C. $\frac{1}{2}$ " to 3" 2-way and $\frac{1}{2}$ " to 2" 3-way Ball Valves Actuators
 - 1. Size for torque required for valve close-off pressure for system design.
 - 2. Actuators are to be available in spring return (SR) and non-spring return (NSR) models. Spring Return (SR) actuators are to provide a choice to return direction.
 - 3. Actuators are to be available in models for two-position, floating and proportional control.
 - 4. All actuator models are to be equipped with pigtail leads, manual override, and auxiliary switch(es)
 - 5. Operating temperatures' Floating Non-Spring Return (NSR) with 33 lb.-in. of torque must be -25 to 130 °F (-32 to 55°C). All other actuators are to -22 to 140 °F (-30 to 60 °C)
 - 6. Actuators must be NEMA 2 rated.
 - 7. Agency Listings: ISO 9001, cULus, and CE.
- D. $\frac{1}{2}$ " to 2" Bronze, Linear Globe Valve Actuators/67 or 78 lbs. force
 - 1. Actuator must have bi-color LED status indication for motion indication, auto calibration and alarm notification.
 - 2. When the actuator is properly mounted must have a minimum of a NEMA 2 (IP53) rating.
 - 3. Actuators are to be non-spring return.
 - 4. Actuators are to be floating (used for two-position) or proportional models.

5. Proportional models will have optional models with a position output signal with field selectable 2...10 Vdc and 0...10 Vdc input signals and selectable input signal direct or reverse acting.
 6. Actuator must have auto calibration which provides precise control by scaling the input signal to match the exact travel of the valve stem
 7. Actuators must come in models with Pulse Width Modulated (PWM) with field selectable 0.59 to 2.93 sec and 0.1 to 25.5 sec input signal ranges with a position output signal
 8. Actuators must have manual override with automatic release.
 9. Models with position feedback output signal include field selectable 2...10 Vdc or 0...5 Vdc output signal
 10. Removable wiring screw terminal with ½" conduit opening.
 11. Actuator operating temperature ranges:
 - a. When controlling fluid up to 266°F (130°C) = ambient air temperature is to be 23...131°F (-5...55°C)
 - b. Fluid up to 281°F (138°C) = 23...127°F (-5...53°C)
 - c. Fluid up to 340°F (171°C) = 23...115°F (-5...46°C)
 - d. Fluid up to 400°F (204°C) = 23...102°F (-5...39°C)
 12. Actuator agency Listings: cUL-us LISTED mark, NEMA 2, NEC class 2 FCC part-15 class B, Canadian ICES-003, ESA registered, Plenum rated per UL 20430
- E. ½" to 2" Bronze, Linear Globe Valve Actuators/105 lbs. force
1. Actuators must have Two- Position, Floating, and Proportional models.
 2. Proportional models will a controller input signal of either a 0...10 Vdc, 2...10 Vdc, 4...20 mAdc, 0...3 Vdc, or 6...9 Vdc. Control function direct/reverse action is switch selectable on most models.
 3. Actuator force is to be 105 lb. (467 newton) with ½" (13 mm) nominal linear stroke
 4. Power requirements 24 Vac, 120 Vac or 230 Vac depending on model.
 5. Actuator housings rated for up to NEMA 2/ IP54.
 6. Actuator is to have overload protection throughout stroke.
 7. Actuator Operating temperature -22...140°F (-30...60°C) up to a maximum valve fluid temperature of 366°F (186°C).
 8. Actuator must automatically set input span to match valve travel.
 9. Actuator must have manual override to allow positioning of valve and preload.
 10. Actuator is to be spring return.
 11. Actuator is to mount directly to valves without separate linkage.
 12. Actuator agency Listings: UL 873, CUL: UL
- F. ½" to 2" Bronze, Linear Globe Valve Actuators/220 lbs. force
1. Actuators must have Two- Position for a SPST controller, Floating for a SPST controller, and Proportional models will a controller input signal of either a 0...10 Vdc, 2...10 Vdc, 4...20 mAdc, or 6...9 Vdc. Control function direct/reverse action is jumper selectable
 2. Actuator is to be spring return.
 3. Actuator will have 220 lb. force (979 newton) with ½" (13 mm) or 1" (25 mm) nominal linear stroke
 4. Feedback on proportional model with 2...10 Vdc (max. 0.5 mA) output signal or to operate up to four like additional slave actuators.

5. Actuator operating temperature is 0...140°F (-18...60°C) up to a maximum valve fluid temperature of 281°F (138°C), 0...120°F (-18...49°C) up to a maximum valve fluid temperature of 300°F (149°C), 0...100°F (-18...38°C) up to a maximum valve fluid temperature of 340°F (171°C), 0...90°F (-18...32°C) up to a maximum valve fluid temperature of 366°F (186°C).
 6. Actuator must automatically set input span to match valve travel
 7. Actuator is to have a 24 Vac power supply on Two-position and Proportional models and 120 Vac on Two-position models.
 8. Actuator housings rated for up to NEMA 2/ IP54
 9. Actuator must have manual override to allow positioning of valve and preload
 10. Actuator is to mount directly to vales without separate linkage.
 11. Actuator agency Listings: UL 873, CUL: UL
- G. ½" to 2" Bronze, Linear Globe Valve Actuators with linkage SR
1. Actuators with 35, 60, 133, or 150 lb.-in of force depending on model.
 2. Actuator housings rated for up to NEMA 2/ IP54 with a 150 lb.-in. rated a NEMA 4.
 3. Actuators are to be spring return.
 4. Actuators are to have Two-position, Floating and Proportional models.
 5. Actuators must have overload protection throughout rotation.
 6. Actuator have an optional built-in auxiliary switch to provide for interfacing or signaling on selected models.
 7. Actuator agency listings: UL-873, C22-2 No.24-83, CUL0
- H. ½" to 2" Bronze Body, Linear Globe Valve Actuators with linkage SR & NSR
1. Actuators are to be either floating SPDT control or proportional control 0...10, 2...10 Vdc or 4...20 mA with a 500-ohm resistor included.
 2. Actuators are to be direct/reverse with selectable DIP switches.
 3. Actuators are to have 90 lb. (400N), 180 lb. (800N), or 337 lb. (1500N) of force on Non-Spring Return (NSR) 157 lb. of force on the Spring Return model. Note: Not every actuator is for every valve.
 4. Actuators are to be powered with 24 Vac or 24 Vdc.
 5. All Non-Spring Return (NSR) actuators are to be NEMA 2, vertical mount only. Spring Return (SR) actuators are to have NEMA 4 models.
 6. Actuators must have manual override to allow positioning of the valve.
 7. Actuators must have selectable valve sequencing and flow curves of either equal percentage or linear.
 8. Actuators must have internal torque protection throughout stroke.
 9. Actuator operating temperature is 14...122°F (-10...50°C) for chilled water applications, 14...113°F (-10...45°C) up to a maximum valve fluid temperature of 281°F (138°C), 14...107°F (-10...42°C) up to a maximum valve fluid temperature of 300°F (149°C), 14...100°F (-10...38°C) up to a maximum valve fluid temperature of 340°F (171°C), 14...90°F (-10...32°C) up to a maximum valve fluid temperature of 366°F (186°C).
 10. Actuator agency listings (North America) UL873, cULus, RCM, CE
- I. 2 ½" to 6" Cast Iron Flanged Globe Valve Linear Actuators with linkage
1. Actuators are to be either floating SPDT control or proportional control 0...10, 2...10 Vdc or 4...20 mA with a 500-ohm resistor included.
 2. Actuators are to direct/reverse acting with selectable DIP switch.

3. Actuators are to have 180 lb. (800N) or 337 lb. (1500N) of force.
 4. Actuators will need a 24 Vac or Vdc power supply.
 5. Actuators are to be rated NEMA 2, vertical mount only.
 6. Actuators must have manual override to allow positioning of the valve.
 7. Actuators must have selectable valve sequencing and flow curves of either equal percentage to linear.
 8. Actuators must have Internal torque protection throughout stroke.
 9. Actuator operating temperature is 14...122°F (-10...50°C) for chilled water applications, 14...113°F (-10...45°C) up to a maximum valve fluid temperature of 281°F (138°C), 14...107°F (-10...42°C) up to a maximum valve fluid temperature of 300°F (149°C).
 10. Actuator agency listings (North America) UL873, cULus, RCM, CE
- J. 2-½" to 6" Cast Iron Flanged Globe Valve Actuators/220 lbs. force.
1. Actuators must have Two- Position for a SPST controller, Floating for a SPST controller, and Proportional models will a controller input signal of either a 0...10 Vdc, 2...10 Vdc, 4...20 mA, or 6...9 Vdc. Control function direct/reverse action is jumper selectable.
 2. Actuator is to be spring return.
 3. Actuator will have 220 lb. force (979 newton) with ½" (13 mm) or 1" (25 mm) nominal linear stroke.
 4. Feedback on proportional model with 2...10 Vdc (max. 0.5 mA) output signal or to operate up to four like additional slave actuators.
 5. Actuator must automatically set input span to match valve travel.
 6. Actuator Operating temperature 0...140°F (-18...60°C) up to a maximum valve fluid temperature of 300°F (149°C).
 7. Actuator is to have a 24 Vac power supply on Two-position and Proportional models and 120 Vac on Two-position models.
 8. Actuator housings rated for up to NEMA 2/IP54.
 9. Actuator must have manual override to allow positioning of valve and preload.
 10. Actuator is to mount directly to vales without separate linkage.
 11. Actuator agency Listings: UL 873, CUL: UL.
- K. 2-½" to 6" Cast Iron Flanged Globe Valve Actuators with linkage SR.
1. Actuators with 60, 133, or 150 lb.-in of force depending on model.
 2. Actuator housings rated for up to NEMA 2/ IP54 with a 150 lb.-in. rated a NEMA 4.
 3. Actuators are to be spring return.
 4. Actuators are to have Two-position, Floating and Proportional models.
 5. Actuators must have overload protection throughout rotation.
 6. Actuator have an optional built-in auxiliary switch to provide for interfacing or signaling on selected models.
 7. Actuator agency listings: UL-873, C22-2 No.24-83, CUL0.
 8. Basis of Design: Schneider Electric SmartX, or approved equal.
- L. 2" to 18" 2-Way and 2" to 16" 3-Way Linear Butterfly Valve Actuator with linkage NSR
1. The butterfly valve actuators are to be Non-Spring Return (NSR) two-position and proportional taking 0...10 Vdc or 4...20 mA models. All Actuators are to be NEMA 4, manual override (hand wheel) two auxiliary switches, and built-in heater.

2. Actuator close-offs and CVs must be appropriate for the valve size in a typical HVAC application.
 3. Actuators must be available in 24 Vac and 120 Vac models.
 4. Actuators must have Internal wiring isolation for parallel wiring multiple units that eliminates the risk of feedback from one actuator to another. .
 5. Actuator operating temperature shall be -40...150°F (-40...60°C).
 6. Actuator agency listings (North America) UL, CSA and CE
- M. 2" to 4" 2-Way and 3-Way Butterfly Valve Actuators SR
1. The butterfly valve actuators are to be Spring Return (SR) two-position and proportional taking 2...10 Vdc or 4...20 mA models. All Actuators are to be NEMA 2.
 2. Actuator close-offs and CVs must be appropriate for the valve size in a typical HVAC application.
 3. Actuators must be available in 24 Vac models.
 4. Actuators shall have two SPDT auxiliary switch models.
 5. Actuators must have Internal wiring isolation for parallel wiring multiple units that eliminates the risk of feedback from one actuator to another.
 6. Actuator operating temperature shall be -22...140°F (-12...60°C).
 7. Actuator agency listings (North America) UL, CSA and CE
- N. 2" to 6" 2-Way and 3-Way Butterfly Valve Actuators NSR
1. The butterfly valve actuators are to be Non-Spring Return (NSR) two-position and proportional taking 0...10 Vdc or 4...20 mA models. All Actuators are to be NEMA 2.
 2. Actuator close-offs and CVs must be appropriate for the valve size in a typical HVAC application.
 3. Actuators must be available in 24 Vac models.
 4. Actuators shall have two SPDT auxiliary switch models.
 5. Actuators must have Internal wiring isolation for parallel wiring multiple units that eliminates the risk of feedback from one actuator to another.
 6. Actuator operating temperature shall be -4...122°F (-2...50°C).
 7. Actuator agency listings (North America) UL, CSA and CE

2.16 DAMPERS

- A. Manufacturers:
1. American Warming and Ventilating.
 2. Ruskin
 3. Greenheck
 4. Mestek.
 5. TAMCO.
 6. United Enertech Corp.
- B. Automatic dampers, furnished by the Building Automation Contractor shall be single or multiple blade as required. Dampers are to be installed by the HVAC Contractor under the supervision of the BAS system supplier. All blank-off plates and conversions necessary to install smaller than duct size dampers are the responsibility of the Sheet Metal Contractor.

- C. Damper frames are to be constructed of 13 gauge galvanized sheet steel mechanically joined with linkage concealed in the side channel to eliminate noise as friction. Compressible spring stainless steel side seals and acetyl or bronze bearings shall also be provided.
 - 1. Damper blade width shall not exceed eight inches. Seals and 3/8-inch square steel zinc plated pins are required. Blade rotation is to be parallel or opposed as shown on the schedules.
 - 2. For high performance applications, control dampers will meet or exceed the UL Class I leakage rating.
 - 3. Provide opposed blade dampers for modulating applications and parallel blade for two position control.

2.17 DAMPER ACTUATORS

- A. Manufacturers:
 - 1. Belimo
- B. Direct-coupled type non-hydraulic designed for minimum 100,000 full-stroke cycles at rated torque.
- C. Direct-coupled damper actuators must have a five-year warrantee.
- D. Size for torque required for damper seal at maximum design conditions and valve close-off pressure for system design.
- E. Direct-coupled damper actuators should accommodate 3/8", 1/2" 1.05" round or 3/8" ...1/2" and 3/4" square damper shafts.
- F. Actuator operating temperature minimum requirements: 44, 88 and 133 lb.-in. are – 25°F...130°F (–32°C...55°C). The 30, 35, 60, 150 and 300 lb.-in. are -25°...140°F (-30°C... 60 °C). The 270 are -22°...122°F (-30°C... 50 °C).
- G. Overload protected electronically throughout rotation except for selected Floating actuators the have a mechanical clutch.
- H. Spring Return Actuators: Mechanical fail safe shall incorporate a spring-return mechanism.
- I. Non-Spring Return Actuators shall stay in the position last commended by the controller with an external manual gear release to allow positioning when not powered.
- J. Power Requirements: 24Vac/dc
- K. Proportional Actuators controller input range from 0...10 Vdc, 2...10 Vdc or 4...20 mA models.
- L. Housing: Minimum requirement NEMA type 2 with NEMA type 4 available for applications requiring higher ratings.

- M. Actuators with a microprocessor should not be able to be modified by an outside source (cracked or hacked).
- N. Actuators of 133 and 270 lb.-in. of torque or more should be able to be tandem mount or "gang" mount.
- O. Agency Listings: ISO 9001, cULus, CE and CSA

2.18 CONTROL CABLE

- A. Electronic and fiber-optic cables for control wiring are specified in Division 26 Low Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 GENERAL

- A. In addition to the requirements specified herein, execution shall be in accordance with the requirements of other specifications and Drawings.
- B. Examine equipment exterior and interior prior to installation. Report any damage and do not install any equipment that is structurally, moisture, or mildew damaged.
- C. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.
- D. Install equipment in accordance with reviewed product data, final shop drawings, manufacturer's written instructions and recommendations, and as indicated on the Drawings.
- E. Provide final protection and maintain conditions in a manner acceptable to the manufacturer that shall help ensure that the equipment is without damage at time of Substantial Completion.
- F. Code Compliance
 - 1. All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations. Should any discrepancy be found between wiring specifications.
- G. Cleanup
 - 1. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract.

3.2 SYSTEM ACCEPTANCE TESTING

- A. All application software will be verified and compared against the sequences of operation.

- B. Control loops will be exercised by inducing a setpoint shift of at least 10% and observing whether the system successfully returns the process variable to setpoint. Record all test results and attach to the Test Results Sheet.
- C. Test each alarm in the system and validate that the system generates the appropriate alarm message, that the message appears at all prescribed destinations (workstations or printers), and that any other related actions occur as defined (i.e. graphic panels are invoked, reports are generated, etc.). Submit a Test Results Sheet to the owner.
- D. Perform an operational test of each unique graphic display and report to verify that the item exists, that the appearance and content are correct, and that any special features work as intended. Submit a Test Results Sheet to the owner.
- E. Perform an operational test of each third party interface that has been included as part of the automation system. Verify that all points are properly polled, that alarms have been configured, and that any associated graphics and reports have been completed. If the interface involves a file transfer over Ethernet, test any logic that controls the transmission of the file, and verify the content of the specified information.

3.3 INSTALLATION

- A. Hardware Installation Practices for Wiring
 - 1. All controllers are to be mounted vertically and per the manufacturer's installation documentation.
 - 2. The 120VAC power wiring to each Ethernet or Remote Site controller shall be a dedicated run, with a separate breaker. Each run will include a separate hot, neutral and ground wire. The ground wire will terminate at the breaker panel ground. This circuit will not feed any other circuit or device.
 - 3. A true earth ground must be available in the building. Do not use a corroded or galvanized pipe, or structural steel.
 - 4. Wires are to be attached to the building proper at regular intervals such that wiring does not droop. Wires are not to be affixed to or supported by pipes, conduit, etc.
 - 5. Conduit in finished areas will be concealed in ceiling cavity spaces, plenums, furred spaces and wall construction. Exception; low profile surface mounted raceway may be used in finished areas on masonry walls with architect/engineer approval. All surface raceway in finished areas must be color matched to the existing finish.
 - 6. Conduit, in non-finished areas where possible, will be concealed in ceiling cavity spaces, plenums, furred spaces, and wall construction. All conduit to be concealed.
 - 7. Wires are to be kept a minimum of three (3) inches from hot water piping.
 - 8. Where sensor wires leave the conduit system, they are to be protected by a plastic insert.
 - 9. Provide fire caulking at all rated penetrations.
- B. Installation Practices for Field Devices
 - 1. Well-mounted sensors will include thermal conducting compound within the well to insure good heat transfer to the sensor.

2. Actuators will be firmly mounted to give positive movement and linkage will be adjusted to give smooth continuous movement throughout 100 percent of the stroke.
3. Relay outputs will include transient suppression across all coils. Suppression devices shall limit transients to 150% of the rated coil voltage.
4. Water line mounted sensors shall be removable without shutting down the system in which they are installed.
5. For duct static pressure sensors, the high pressure port shall be connected to a metal static pressure probe inserted into the duct pointing upstream. The low pressure port shall be left open to the plenum area at the point that the high pressure port is tapped into the ductwork.
6. For building static pressure sensors, the high pressure port shall be inserted into the space via a metal tube. Pipe the low pressure port to the outside of the building.

C. Wiring, Conduit, and Cable

1. All wire will be copper and meet the minimum wire size and insulation class listed below:
 - a. Power - 12 Gauge - 600 Volt
 - b. Class One - 14 Gauge Std. - 600 Volt
 - c. Class Two - 18 Gauge Std. - 300 Volt
 - d. Class Three - 18 Gauge Std. - 300 Volt
 - e. Communications - Per Mfr.
2. Power and Class One wiring may be run in the same conduit.
3. Class Two and Three wiring and communications wiring may be run in the same conduit. (Separate from Power and Class One wiring)
4. Where different wiring classes terminate within the same enclosure, maintain clearances, and install barriers per the National Electric Code.
5. Where wiring is required to be installed in conduit, EMT shall be used. Conduit shall be minimum 1/2 inch galvanized EMT. Set screw fittings are acceptable for dry interior locations. Watertight compression fittings shall be used for exterior locations and interior locations subject to moisture. Provide conduit seal-off fitting where exterior conduits enter the building or between areas of high temperature/moisture differential.
6. Flexible metallic conduit (max. 3 feet) shall be used for connections to motors, actuators, controllers, and sensors mounted on vibration producing equipment. Liquid-tight flexible conduit shall be use in exterior locations and interior locations subject to moisture.
7. Junction boxes shall be provided at all cable splices, equipment termination, and transitions from EMT to flexible conduit. Interior dry location J-boxes shall be galvanized pressed steel, nominal four-inch square with blank cover. Exterior and damp location JH-boxes shall be cast alloy FS boxes with threaded hubs and gasketed covers.
8. Where the space above the ceiling is a supply or return air plenum, the wiring shall be plenum rated. Teflon wiring can be run without conduit above suspended ceilings. EXCEPTION: Any wire run in suspended ceilings that is used to control outside air dampers or to connect the system to the fire management system shall be in conduit.
9. Fiber optic cable shall include the following sizes; 50/125, 62.5/125 or 100/140.

10. Only glass fiber is acceptable, no plastic.
 11. Fiber optic cable shall only be installed and terminated by an experienced contractor. The BAS system supplier shall submit to the Engineer the name of the intended contractor of the fiber optic cable with his submittal documents.
- D. Enclosures
1. For all I/O requiring field interface devices, these devices where practical will be mounted in a field interface panel (FIP). The Contractor shall provide an enclosure which protects the device(s) from dust, moisture, conceals integral wiring and moving parts.
 2. FIPs shall contain power supplies for sensors, interface relays and contactors, and safety circuits.
 3. The FIP enclosure shall be of steel construction with baked enamel finish; NEMA 1 rated with a hinged door and keyed lock. The enclosure will be sized for twenty percent spare mounting space. All locks will be keyed identically.
 4. All wiring to and from the FIP will be to screw type terminals. Analog or communications wiring may use the FIP as a raceway without terminating. The use of wire nuts within the FIP is prohibited.
 5. All outside mounted enclosures shall meet the NEMA-4 rating.
 6. The wiring within all enclosures shall be run in plastic track. Wiring within controllers shall be wrapped and secured.
- E. Identification
1. Identify all control wires with labeling tape or sleeves using words, letters, or numbers that can be exactly cross-referenced with as-built drawings.
 2. All field enclosures, other than controllers, shall be identified with a Bakelite nameplate. The lettering shall be in white against a black or blue background.
 3. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with name plates.
 4. All I/O field devices inside FIP's shall be labeled.
- F. Existing Controls.
1. Existing controls which are to be reused and are found to be defective requiring replacement, will be noted to the Owner. The Owner will be responsible for all material and labor costs associated with their repair.
- G. Location
1. The location of sensors is per mechanical and architectural drawings.
 2. Space humidity or temperature sensors will be mounted away from machinery generating heat, direct light and diffuser air streams.
 3. Outdoor air sensors will be mounted on the north building face directly in the outside air. Install these sensors such that the effects of heat radiated from the building or sunlight is minimized.
 4. Field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.
- H. Software Installation
1. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any

operating system software or other third party software necessary for successful operation of the system.

3.4 TRAINING

- A. The BAS system supplier shall provide both on-site and classroom training at substantial completion to the Owner's representative and maintenance personnel per the following description:
- B. On-site training shall consist of a minimum of **(8-24)** hours of hands-on instruction geared at the operation and maintenance of the systems. The curriculum shall include:
 - 1. System Overview
 - 2. System Software and Operation
 - 3. System access
 - 4. Software features overview
 - 5. Changing setpoints and other attributes
 - 6. Scheduling
 - 7. Editing programmed variables
 - 8. Displaying color graphics
 - 9. Running reports
 - 10. Workstation maintenance
 - 11. Viewing application programming
 - 12. Operational sequences including start-up, shutdown, adjusting and balancing.
 - 13. Equipment maintenance
- C. A follow up on-site training shall occur 6 months after owner occupancy of the building and shall consist of a minimum of **(8-16)** hours of re-training the above items.

3.5 DATABASE CONFIGURATION.

- A. The Contractor will provide all labor to configure those portions of the database that are required by the points list and sequence of operation.

3.6 POINT TO POINT CHECKOUT.

- A. Each I/O device (both field mounted as well as those located in FIPs) shall be inspected and verified for proper installation and functionality. A checkout sheet itemizing each device shall be filled out, dated and approved by the Project Manager for submission to the owner or owner's representative.

3.7 WORKSTATION CHECKOUT

- A. A checkout of all front end equipment shall be conducted to verify proper operation of both hardware and software. A checkout sheet itemizing each device and a description of the associated tests shall be prepared and submitted to the owner or owner's representative by the completion of the project.

3.8 BAS FIELD CONTROLLERS CHECKOUT

- A. A checkout of all field devices shall be conducted to verify proper operation of both hardware and software. A checkout sheet itemizing each device and a description of the associated tests shall be prepared and submitted to the owner or owner's representative by the completion of the project

3.9 DOCUMENTATION

- A. As built software documentation will include the following:
 - 1. Descriptive point lists
 - 2. Application program listing
 - 3. Application programs with comments.
 - 4. Printouts of all reports.
 - 5. Alarm list.
 - 6. Printouts of all graphics
 - 7. Commissioning and System Startup

3.10 AN ELECTRONIC COPY OF ALL DATABASES, CONFIGURATION FILES, OR ANY TYPE OF FILES CREATED SPECIFICALLY FOR EACH SYSTEM.

3.11 ADJUSTING

- A. Calibrating and Adjusting:
 - 1. Calibrate installed devices and instruments, whether electric or pneumatic.
 - 2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
 - 3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
 - 4. Control System Inputs and Outputs:
 - a. Check analog inputs at 0, 50, and 100 percent of span.
 - b. Check analog outputs using milli-ampere meter at 0, 50, and 100 percent output.
 - c. Check digital inputs using jumper wire.
 - d. Check digital outputs using ohmmeter to test for contact making or breaking.
 - e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.
 - 5. Flow:
 - a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
 - b. Manually operate flow switches to verify that they make or break contact.
 - 6. Pressure:
 - a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
 - b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.
 - 7. Temperature:

- a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
 - b. Calibrate temperature switches to make or break contacts.
 8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
 9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
 10. Provide diagnostic and test instruments for calibration and adjustment of system.
 11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.
- B. Adjust initial temperature, CO, CO₂, static pressure, humidity, etc., set points.
- C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

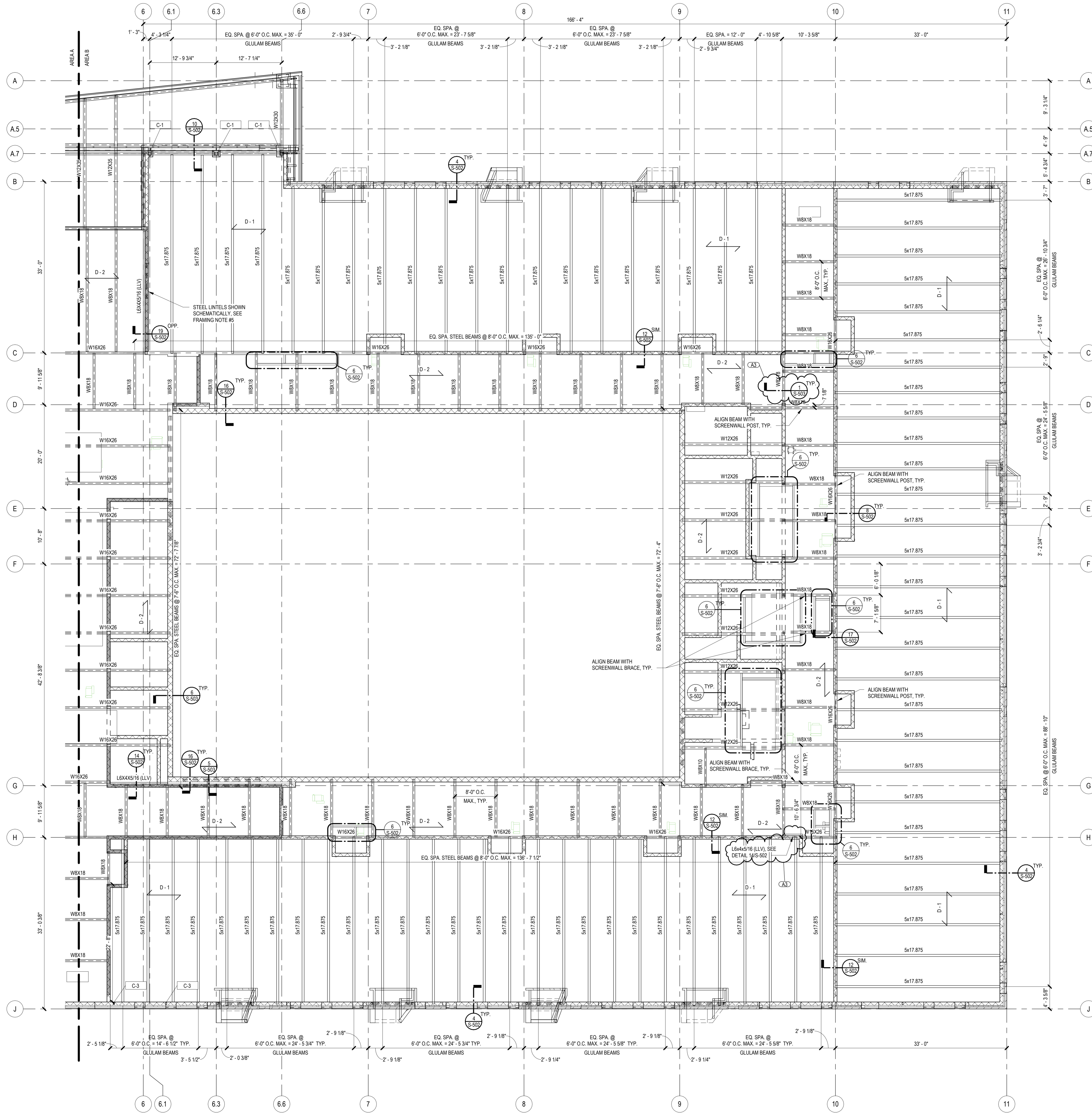
3.12 GRAPHIC DISPLAY GENERATION

- A. Provide the following graphic displays as a minimum at the operator workstations, arranged in logical penetration paths:
1. Overall campus layout which shows all of the buildings on the Owner's campus.
 2. Individual building layout or isometric for each building connected to the system.
 3. Floor plans for each floor within each building, with display of present values of space conditions sensed by connected space sensors, display of the name of the air handler associated with each space sensor, display of the room number in which the sensor is located and color coding to indicate whether the sensed space condition is within the acceptable range, is too high, or is too low. TC Contractor shall confirm Owner desired room names prior to graphics generation which may differ from the room names indicated on construction documents.
 4. Schematic diagram for each HVAC system. Each system schematic display shall include at least the following:
 - a. Schematic arrangement of ductwork, fans, dampers, coils, valves, piping, pumps, equipment etc.
 - b. System name.
 - c. Area served.
 - d. Present value or status of all inputs, along with present setpoint.
 - e. Present percent open for each damper, valve, etc. based on commanded position.
 - f. Reset schedule parameters for all points, where applicable.
 - g. Present occupancy mode.
 - h. Present economizer mode, where applicable.
 - i. Present outside air temperature.
 - j. Associated space conditions and setpoints, where applicable.
 - k. Status of application programs (e.g., warm-up, night cycle, duty cycle, etc.).

- I. Color coding to indicate normal and abnormal values, alarms, etc.
5. Manual override capability for each on/off or open/closed controlled digital output (for fans, pumps, 2-position dampers and valves, etc.) and each modulating analog output (for dampers, valves, VFD speed modulation type points, etc.) shall be provided. Graphic display of output point auto or manual override status shall be provided.
6. Sequence of operation in written (text) format for each HVAC system.
7. Overall BAS system schematic.
8. System management graphic for each network device and/or DDC panel.
9. Provide a separate page for critical alarm summary.

B. Contractor to provide graphics that are fully operational prior to commissioning.

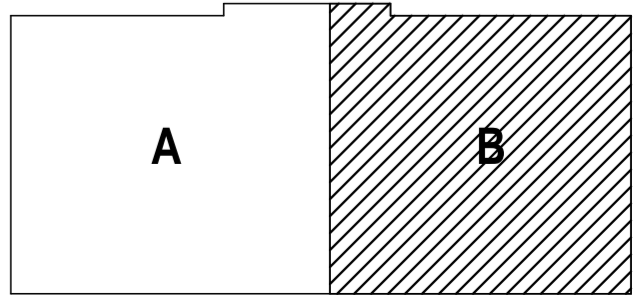
END OF SECTION 230900



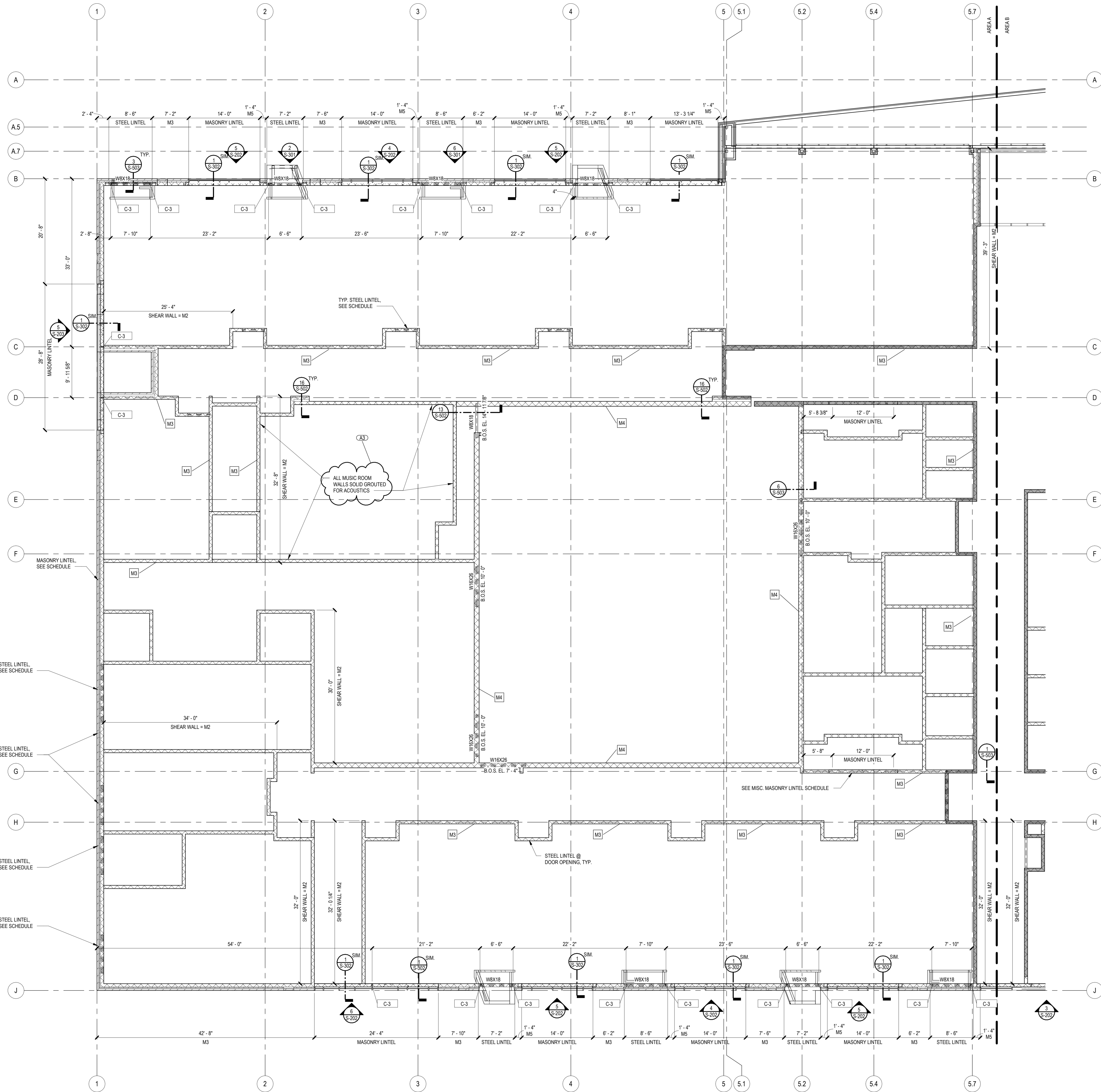
- LOW ROOF FRAMING NOTES**
- DESIGN LOADS
LIVE LOAD, CONSTRUCTION 25 PSF
DEAD LOAD (WOOD GLULAM FRAMING):
TECTUM DECK 6 PSF
ROOFING & INSULATION 7 PSF
MISCELLANEOUS DL 7 PSF
TOTAL DEAD LOAD 20 PSF
DEAD LOAD (STEEL BEAM FRAMING):
STEEL DECK 3 PSF
ROOFING & INSULATION 7 PSF
MISCELLANEOUS DL 10 PSF
TOTAL DEAD LOAD 20 PSF
2. PROVIDE LOOSE BEARING PLATES FOR STEEL BEAMS BEARING ON CMU WALLS. STEEL PLATES TO BE MINIMUM 7" X 7" X 3/8" W/ (2) 1/2" X 8" HEADED STUDS (U.N.O.) IN SOLID GROUTED CORES.
3. TYPICAL TOP OF BOND BEAM ELEVATION = 112'-8"
TOP OF 12" TALL BOND BEAM AT EXTERIOR WALL = 115'-0"
4. BEAM ELEVATIONS ARE TOP OF STEEL AND WOOD ELEVATIONS (U.N.O.).
LOW ROOF (TOP OF BEAM ELEVATION) FOR WOOD & STEEL = 115'-0"
CANOPY (T.O.S. EL.) = 115'-5 1/2"
5. NOT ALL STEEL LINTELS ARE SHOWN FOR CLARITY. COORDINATE STEEL LINTEL ELEVATIONS AND LOCATIONS WITH ARCHITECTURAL PLANS. REFER TO MISCELLANEOUS STEEL LINTEL SCHEDULE FOR SIZE AND DETAILS.
6. STAGGER STEEL BEAM BEARING LOCATIONS WHERE NECESSARY. PROVIDE 8" MINIMUM SPACINGS BETWEEN BEAM CENTERS.
7. CMU WALL CORES MUST BE SOLID GROUTED A MINIMUM 12" IN EITHER HORIZONTAL DIRECTION FROM CENTER OF GLULAM BEAM HANGERS. STAGGER STEEL BEAMS AS NECESSARY.
8. SEE GENERAL NOTES ON SHEET S-001 FOR MORE INFORMATION.

ROOF DECK	
MARK	DESCRIPTION
D-1	TECTUM E ROOF DECK PANEL PER SPECIFICATION. FASTEN TO END SUPPORTS W/ S1PT SCREWS, #10 DIAMETER S1PT SCREWS MINIMUM 3" PER WOOD BEAM PER PANEL AND 12" O.C. SIDES AND ENDS. 1-1/2" MIN. PENETRATION INTO WOOD FRAMING AND CMU LAP TECTUM PANELS 3.5" MIN. OVER TOP OF CMU WALL.
D-2	3/16-32, GRADE 50 STEEL ROOF DECK (1", 20 GA.), FASTEN TO END SUPPORTS W/ X-EMP-19 L15 HILTI POWDER ACTUATED FASTENERS, IN A 363 PATTERN, AND WITH (2) HILTI SLC 01 SIDELAP CONNECTORS IN EACH SIDELAP PER SPAN. (3) SPAN MINIMUM.
D-3	2.00A, GRADE 40 ACOUSTICAL DOVETAIL STEEL ROOF DECK (2", 20 GA.), FASTEN TO END SUPPORTS W/ X-EMP-19 L15 HILTI POWDER ACTUATED FASTENERS, IN A 24.54 PATTERN, AND WITH (2) HILTI SLC 01 SIDELAP CONNECTORS IN EACH SIDELAP PER SPAN. (3) SPAN MINIMUM.

COLUMN SCHEDULE						
MARK	MEMBER	BASE PLATE	QTY.	ANCHOR BOLTS		
				SIZE	MIN. EMBED.	COMMENTS
C-1	HSS6X6X3/8	12" X 12" X 3/4"	4	3/4"Ø	12"	BP-1
C-2	HSS4X4X5/16	11" X 5" X 1/2"	4	3/4"Ø	N/A	BP-2
C-3	HSS5X3X3/8	7" X 7" X 1/2"	4	1/2"Ø	12"	BP-3



KEY PLAN
NOT TO SCALE

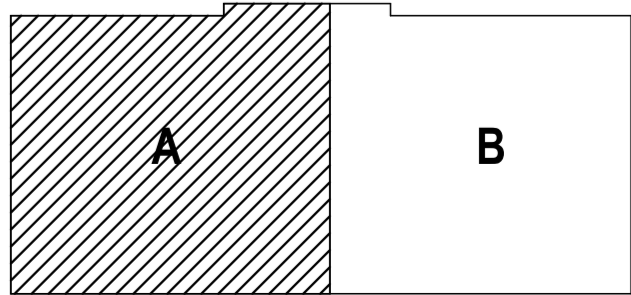


MASONRY FRAMING PLAN - AREA A
1/8" = 1'-0"

COLUMN SCHEDULE						
MARK	MEMBER	BASE PLATE	ANCHOR BOLTS			
			QTY.	SIZE	MIN. EMBED.	COMMENTS
C-1	HSS6X6X3/8	12" X 12" X 3/4"	4	3/4"	12"	BP-1
C-2	HSS4X4X3/8	11" X 9" X 1/2"	4	3/4"	N/A	BP-2
C-3	HSS6X3X3/8	7" X 7" X 1/2"	4	1/2"	12"	BP-3

MASONRY WALL REINFORCEMENT SCHEDULE			
MARK	WALL	VERTICAL REIN.	COMMENTS
M1	8" CMU	(1) #4 @ 54" O.C.	PARTITION WALL
M2	8" CMU	(1) #4 @ 54" O.C.	INTERIOR SHEAR WALL
M3	8" CMU	(1) #4 @ 48" O.C.	INTERIOR BEARING WALL AND EXTERIOR BEARING WALL W/ VENEER CLADDING
M4	12" CMU	(1) #5 @ 72" O.C.	EXTERIOR / INTERIOR BEARING WALL W/ VENEER CLADDING
M5	8" CMU	(1) #4 @ 8" O.C.	EXTERIOR BEARING WALL
M6	12" CMU	(1) #5 @ 48" O.C.	EXTERIOR SHEAR WALL

- NOTES:
1. VERTICAL WALL REINFORCEMENT SHALL BE LAPPED WITH FOOTING DOWEL BARS AND SOLID GROUTED, FULL WALL HEIGHT.
 2. PROVIDE HORIZONTAL LADDER REINFORCING AT 16" O.C. TYP. SEE SPECIFICATIONS FOR WIRE SIZE.
 3. PROVIDE (2) VERTICAL BARS IN SOLID GROUTED CORES ADJACENT TO WALL OPENINGS (TYP.). RUN BARS FULL WALL HEIGHT AND DOWEL INTO FOUNDATION WALL TO AVOID LINTEL INTERFERENCE DO NOT INSTALL IN FIRST CORE ADJACENT TO OPENING. GROUT REINFORCED CORE AND MIMIC CORE SOLID TO FOUNDATION.
 4. PROVIDE HORIZONTAL BOND BEAMS AS REQUIRED FOR A MAXIMUM BOND BEAM SPACING OF 12'-8" IN 8" CMU WALLS AND A MAXIMUM BOND BEAM SPACING OF 16'-0" IN 12" CMU WALLS. ADDITIONAL INTERMEDIATE LOCATIONS SHOWN ON DETAILS. UNLESS OTHERWISE NOTED, BOND BEAM REINFORCING SHALL BE (2) #5 BARS CONTINUOUS.
 5. ALL MASONRY SUPPORTING BEAMS SHALL INCLUDE BOTTOM PLATE AND BRICK ANGLES PER LINTEL SCHEDULE. GALVANIZE LINTELS SUPPORTING EXTERIOR MASONRY.
 6. ALL MASONRY WORK SHALL BE DONE IN ACCORDANCE WITH LATEST ACI 530 SPECIFICATIONS. MASONRY UNITS SHALL CONFORM TO ASTM C910/91M GRADE SW AS APPLICABLE. USE TYPE M OR S MORTAR, 1m USED IN DESIGN = 2150 PSI.
 7. BEAM AND LINTEL BEARING ON MASONRY WALLS SHALL BE A MINIMUM OF 7". SEE PLAN FOR LINTEL AND BEARING PLATE SIZES.
 8. AT CONTROL JOINTS CONTINUE HORIZONTAL REINFORCEMENT THROUGH THE JOINT AT THE TOP OF THE WALL. VERTICAL REINFORCING TO BE WITHIN 8" OF CONTROL JOINT EACH SIDE.
 9. AT CORNERS AND END OF WALLS VERTICAL REINFORCEMENT TO BE WITHIN 8" AND LAPPED WITH FOUNDATION WALL STEEL.
 10. MASONRY WALLS NOT TAGGED ON PLAN TO BE UNREINFORCED, TYPE M1.



KEY PLAN
NOT TO SCALE

REVISIONS		
REV.	DESCRIPTION	DATE
A3	ADDENDUM 3	28.JUL.2023

PROJ. #:	220116
DATE:	23-JUN-2023
SHEET	

S-103A

Addendum #3

LANSING SCHOOL DISTRICT
Mt. Hope
1215 E. Mt. Hope Ave., Lansing, MI 48910

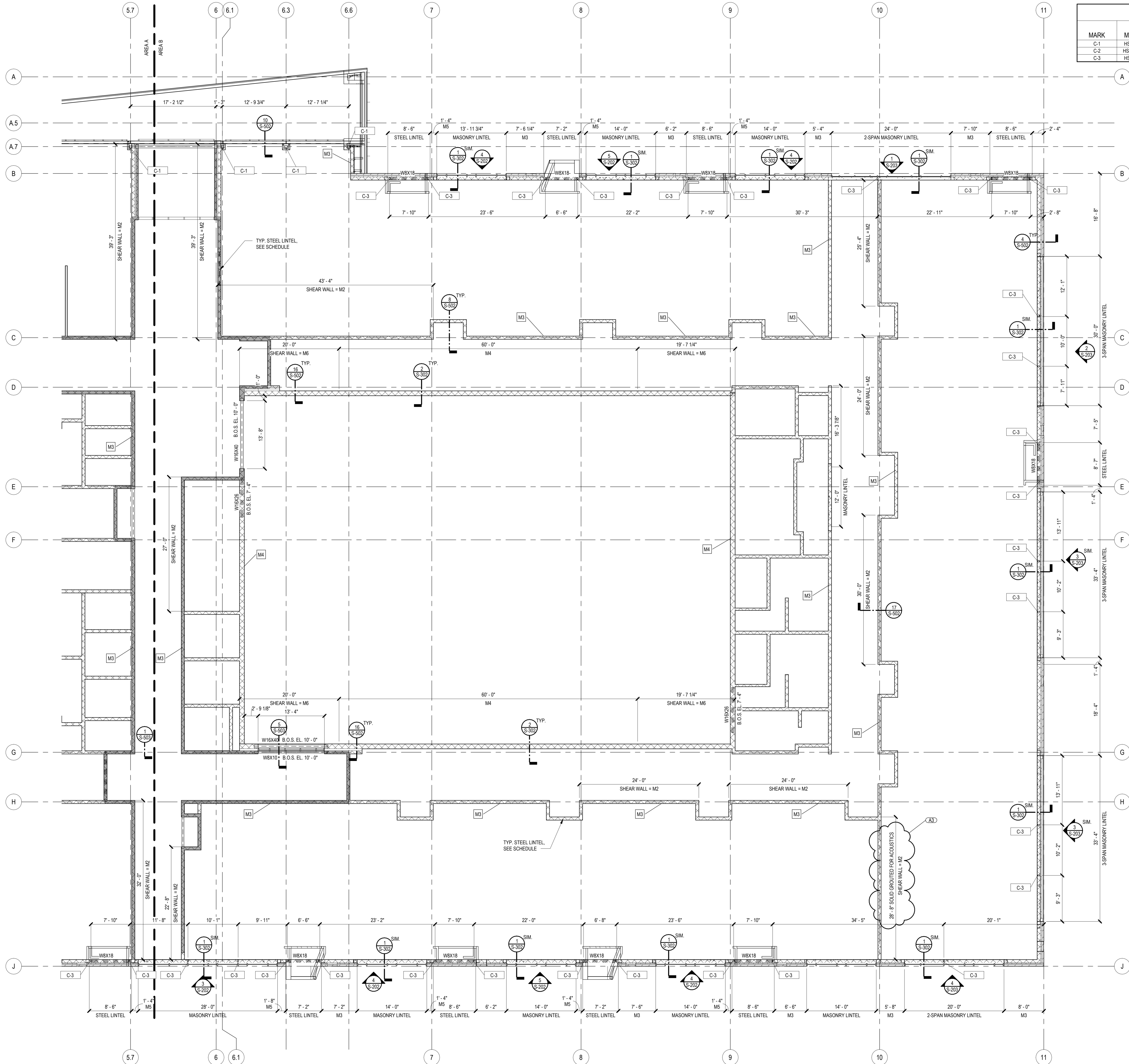
MASONRY FRAMING PLAN -
AREA A

Stantec



c2oe
architecture + engineering

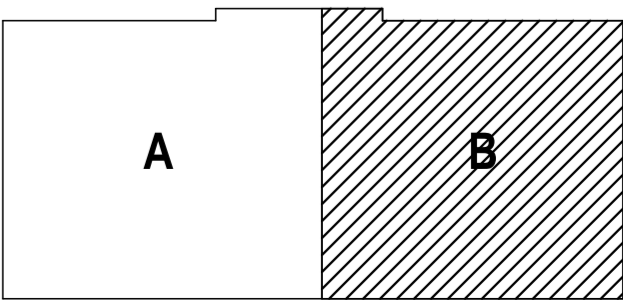
www.c2oe.com



COLUMN SCHEDULE						
MARK	MEMBER	BASE PLATE	ANCHOR BOLTS			COMMENTS
			QTY.	SIZE	MIN. EMBED.	
C-1	HSS6X6X3/8	12" X 12" X 3/4"	4	3/4"	12"	BP-1
C-2	HSS6X6X3/8	11" X 5" X 1/2"	4	3/4"	N/A	BP-2
C-3	HSS5X3X3/8	7" X 7" X 1/2"	4	1/2"	12"	BP-3

MASONRY WALL REINFORCEMENT SCHEDULE			
MARK	WALL	VERTICAL REINFORCEMENT	COMMENTS
M1	8" CMU	(1) #4 @ 54" O.C.	PARTITION WALL
M2	8" CMU	(1) #4 @ 54" O.C.	INTERIOR SHEAR WALL
M3	8" CMU	(1) #4 @ 48" O.C.	INTERIOR BEARING WALL AND EXTERIOR BEARING WALL W/ VENEER CLADDING
M4	12" CMU	(1) #5 @ 72" O.C.	EXTERIOR / INTERIOR BEARING WALL W/ VENEER CLADDING
M5	8" CMU	(1) #4 @ 8" O.C.	EXTERIOR BEARING WALL
M6	12" CMU	(1) #5 @ 48" O.C.	EXTERIOR SHEAR WALL

- NOTES:
- VERTICAL WALL REINFORCEMENT SHALL BE LAPPED WITH FOOTING DOWEL BARS AND SOLID GROUTED, FULL WALL HEIGHT.
 - PROVIDE HORIZONTAL LADDER REINFORCING AT 18" O.C. TYP. SEE SPECIFICATIONS FOR WIRE SIZE.
 - PROVIDE (2) VERTICAL BARS IN SOLID GROUTED CORES ADJACENT TO WALL OPENINGS (TYP.). RUN BARS FULL WALL HEIGHT AND DOWEL INTO FOUNDATION WALL TO AVOID LINTEL INTERFERENCE. DO NOT INSTALL IN FIRST CORE ADJACENT TO OPENING. GROUT REINFORCED CORE AND JAMB CORE SOLID TO FOUNDATION.
 - PROVIDE HORIZONTAL BOND BEAMS AS REQUIRED FOR A MAXIMUM BOND BEAM SPACING OF 12' 0" IN 8" CMU WALLS AND A MAXIMUM BOND BEAM SPACING OF 18' 0" IN 12" CMU WALLS. ADDITIONAL INTERMEDIATE LOCATIONS SHOWN ON DETAILS. UNLESS OTHERWISE NOTED, BOND BEAM REINFORCING SHALL BE (2) #6 BARS CONTINUOUS.
 - ALL MASONRY SUPPORTING BEAMS SHALL INCLUDE BOTTOM PLATE AND BRICK ANGLES PER LINTEL SCHEDULE. GALVANIZE LINTELS SUPPORTING EXTERIOR MASONRY.
 - ALL MASONRY WORK SHALL BE DONE IN ACCORDANCE WITH LATEST ACI 530 SPECIFICATIONS. MASONRY UNITS SHALL CONFORM TO ASTM C90/C90M GRADE SW AS APPLICABLE. USE TYPE N OR S MORTAR. FIN USED IN DESIGN = 2150 PSI.
 - BEAM AND LINTEL BEARING ON MASONRY WALLS SHALL BE A MINIMUM OF 7". SEE PLAN FOR LINTEL AND BEARING PLATE SIZES.
 - AT CONTROL JOINTS CONTINUE HORIZONTAL REINFORCEMENT THROUGH THE JOINT AT THE TOP OF THE WALL. VERTICAL REINFORCING TO BE WITHIN 8" OF CONTROL JOINT EACH SIDE.
 - AT CORNERS AND END OF WALLS VERTICAL REINFORCEMENT TO BE WITHIN 8" AND LAPPED WITH FOUNDATION WALL STEEL.
 - MASONRY WALLS NOT TAGGED ON PLAN TO BE UNREINFORCED, TYPE M1.



KEY PLAN
NOT TO SCALE

LANSING SCHOOL DISTRICT
Mt. Hope
1215 E. Mt. Hope Ave., Lansing, MI 48910

MASONRY FRAMING PLAN -
AREA B

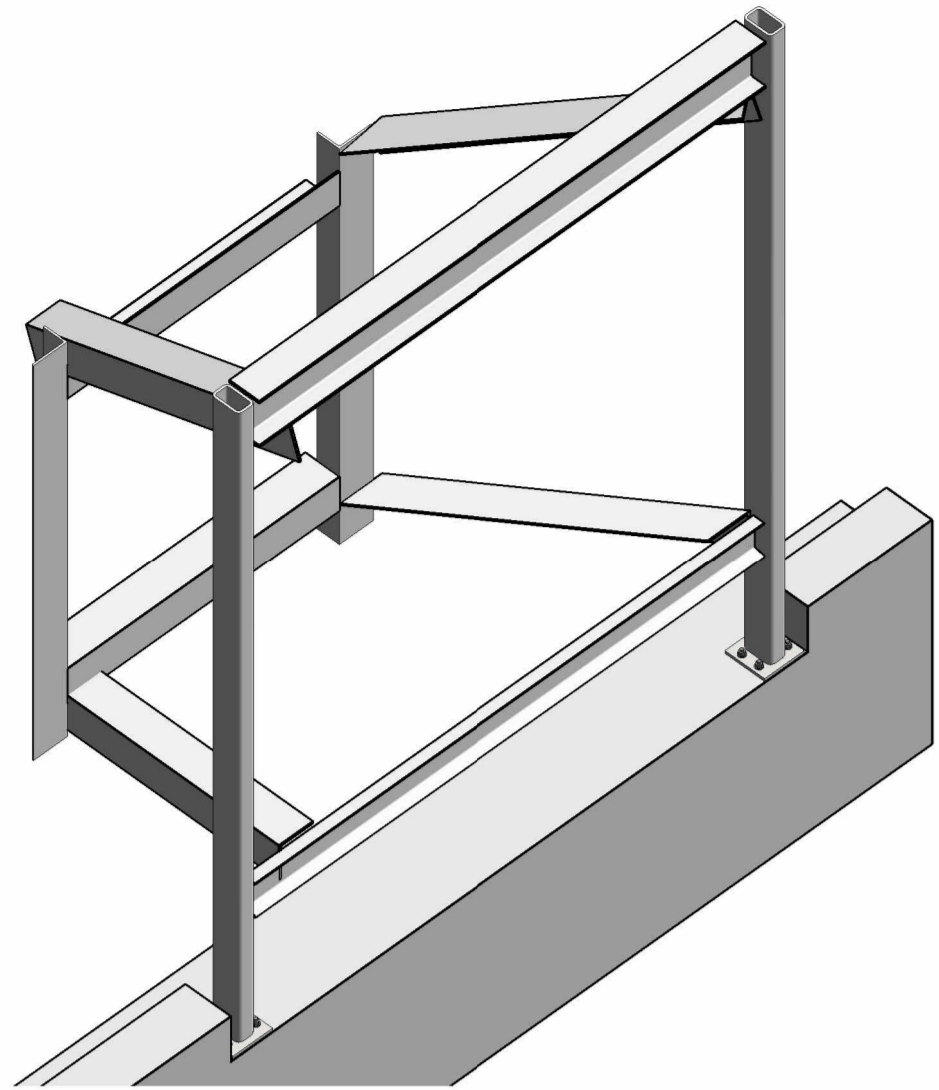
REVISIONS		
REV.	DESCRIPTION	DATE
AD	ADDENDUM 3	28.01.2023

PROJ. #: 220116
DATE: 23-JUN-2023

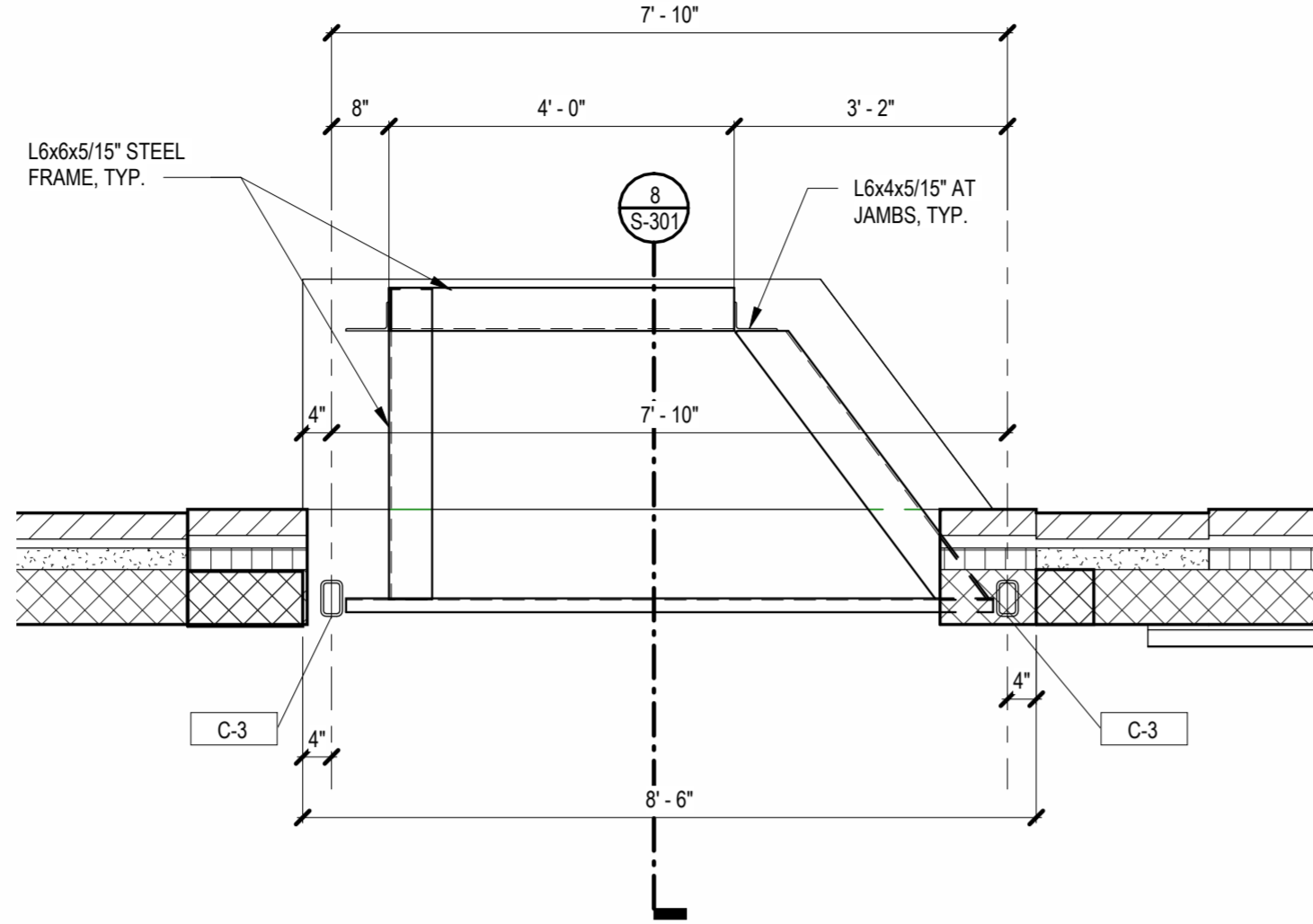
SHEET

S-103B

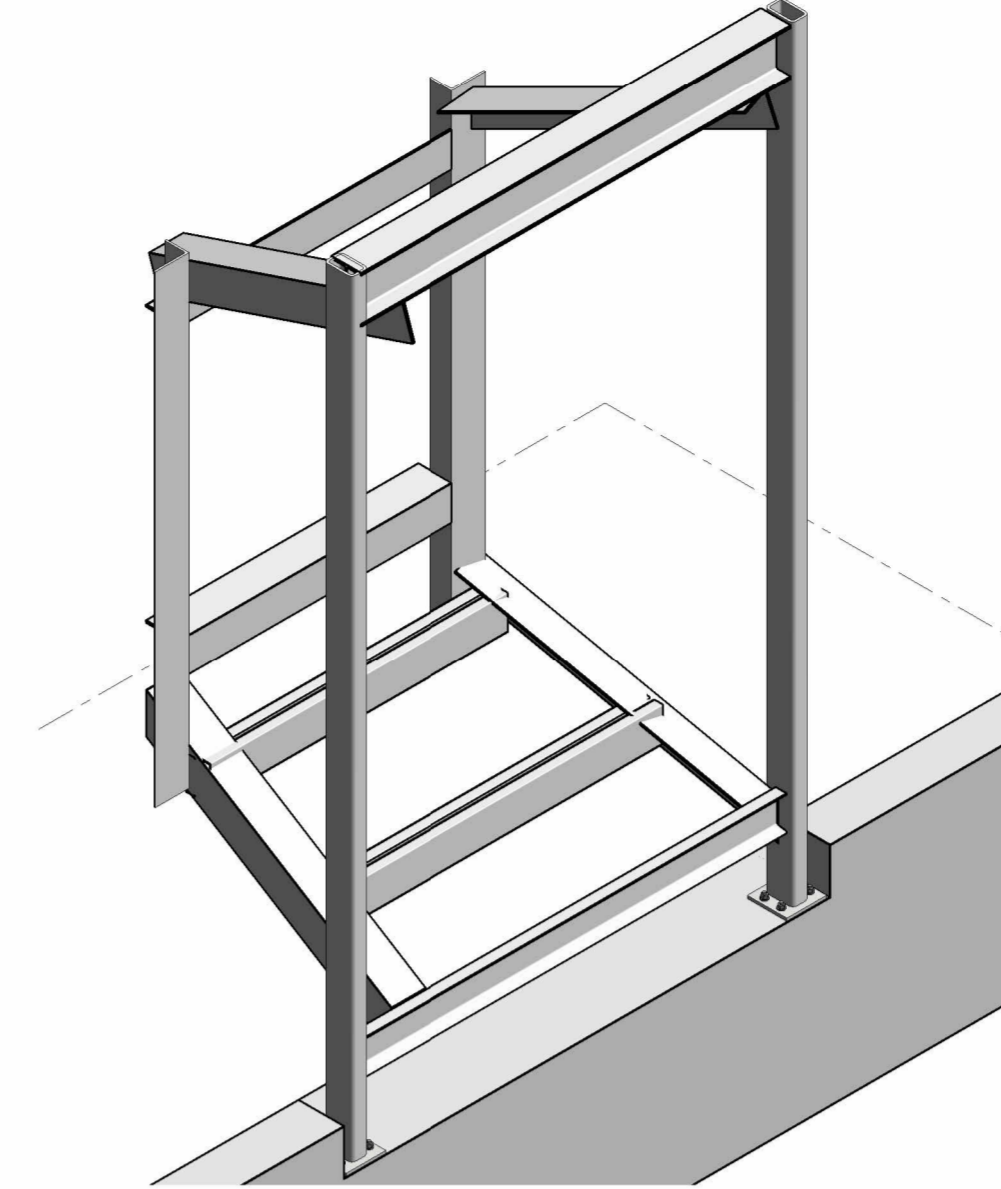
Addendum #3



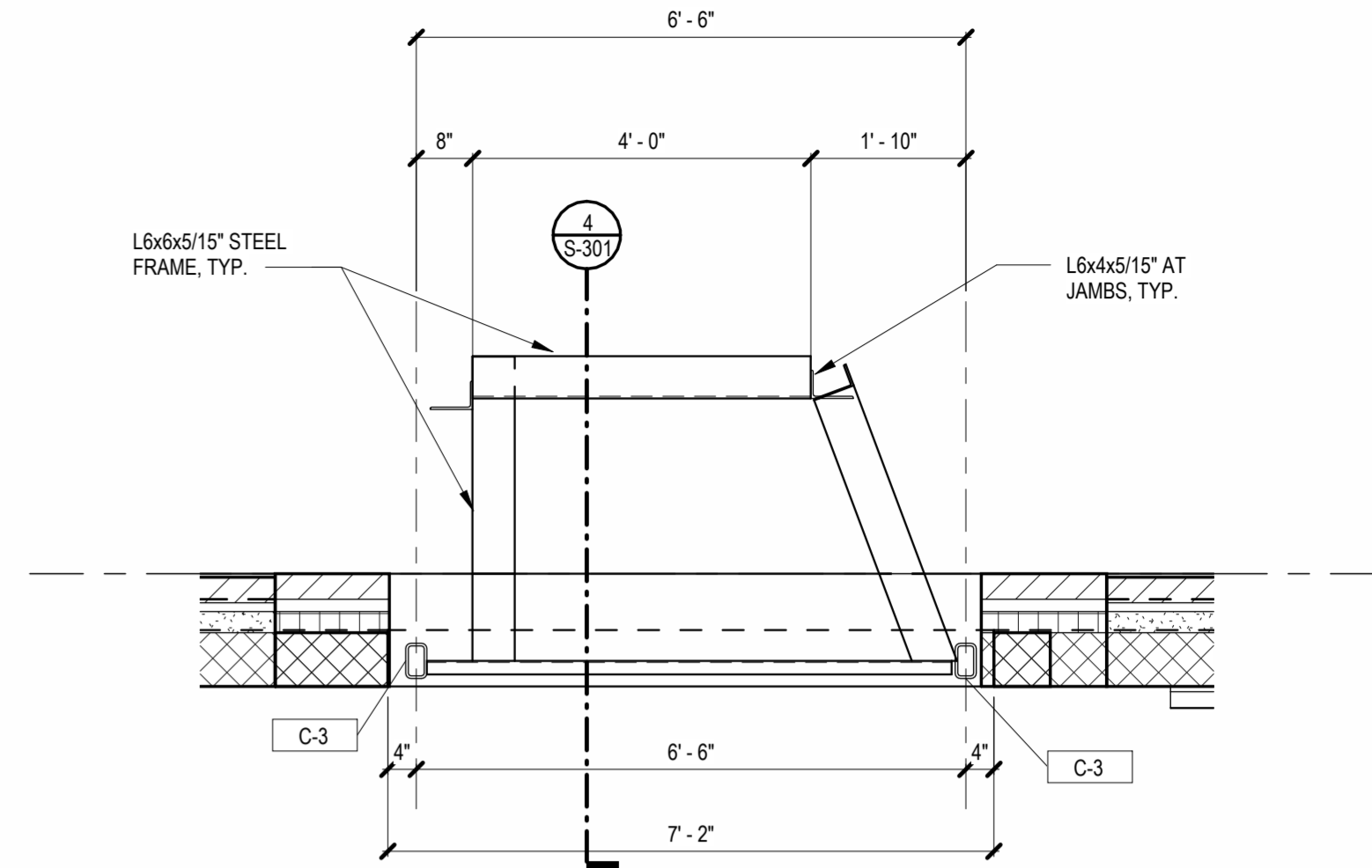
7 ISOMETRIC VIEW - READING NOOK A



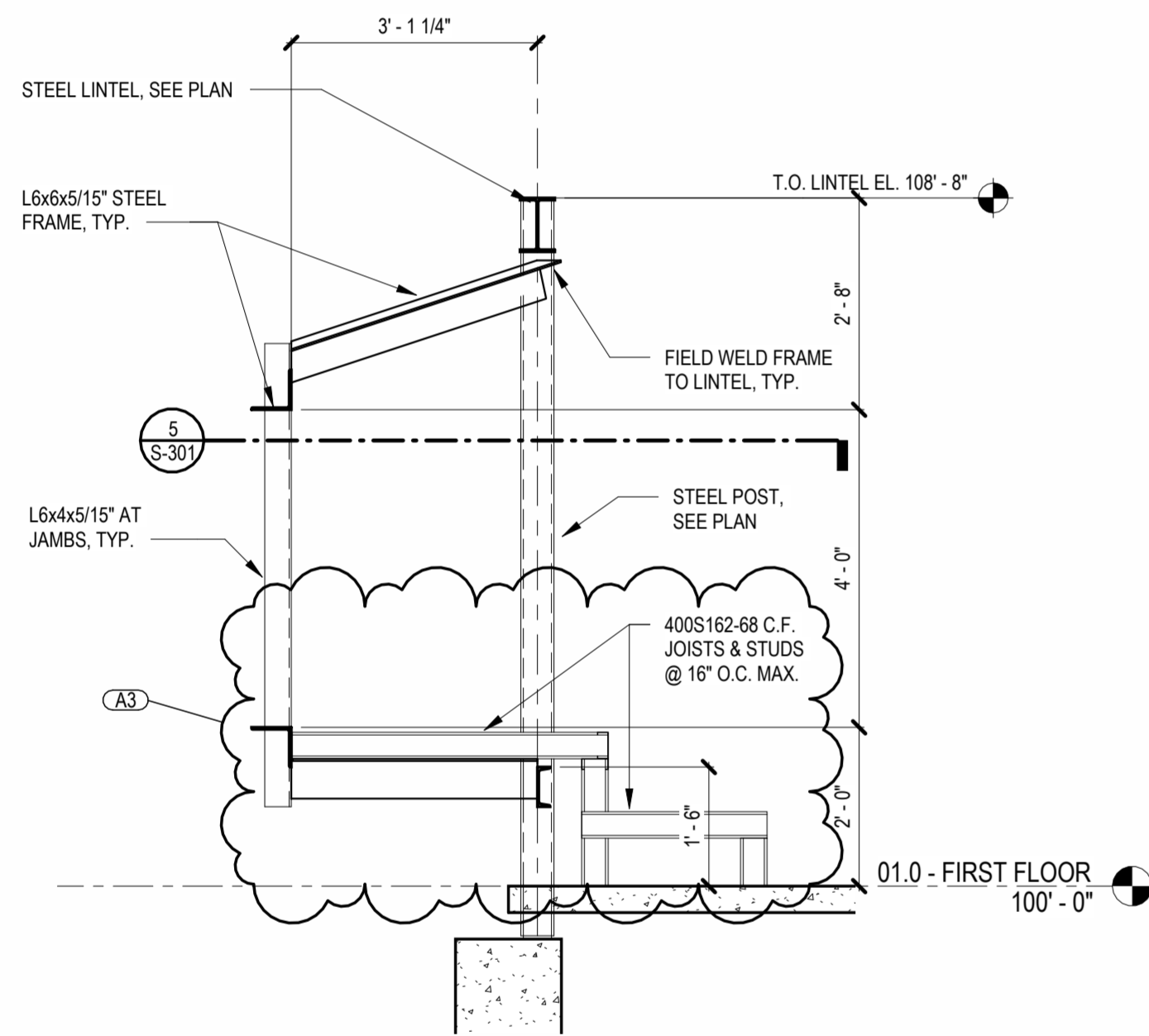
5 ENLARGED FRAMING PLAN - READING NOOK A
1/2" = 1'-0"



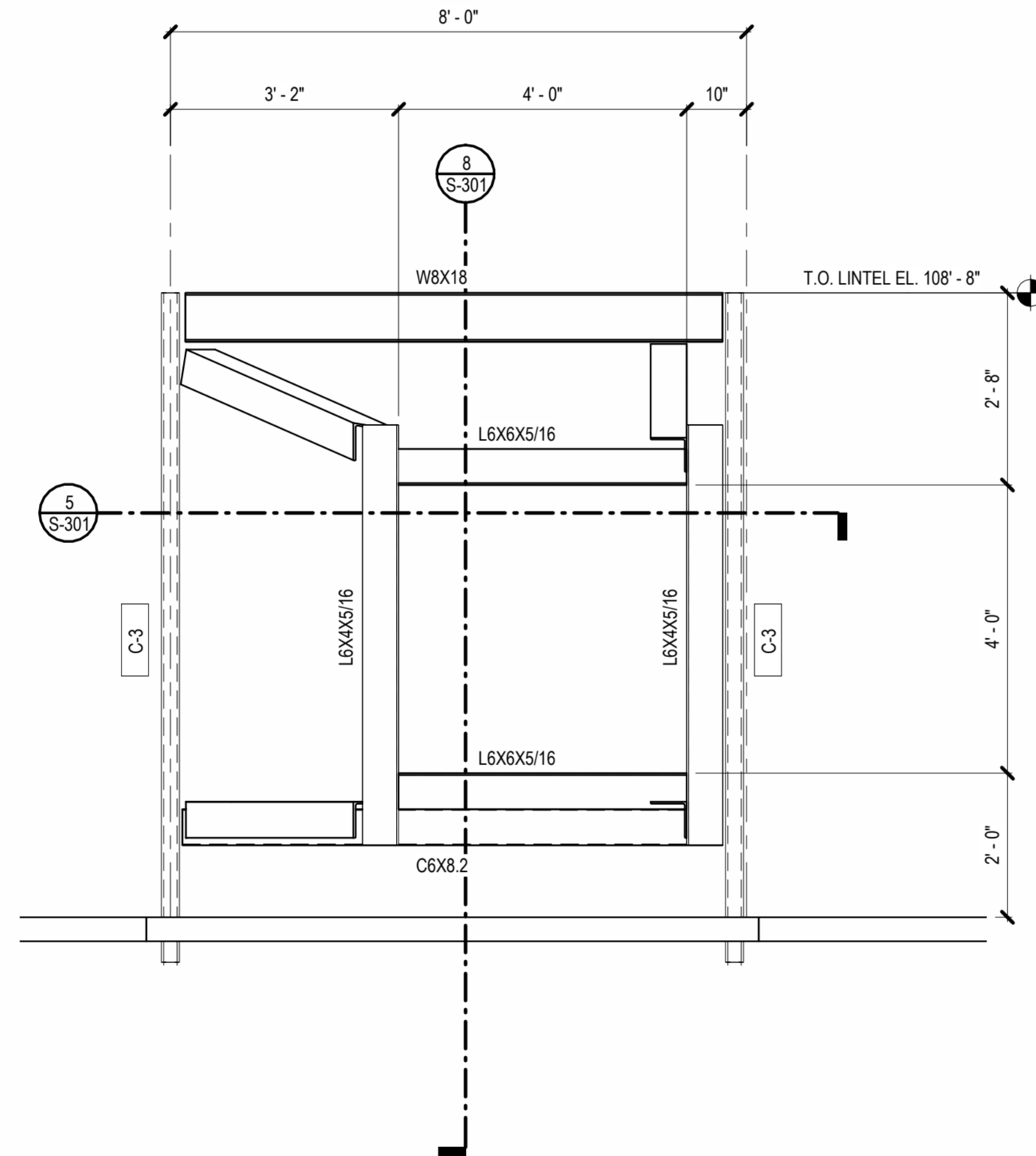
3 ISOMETRIC VIEW - READING NOOK B



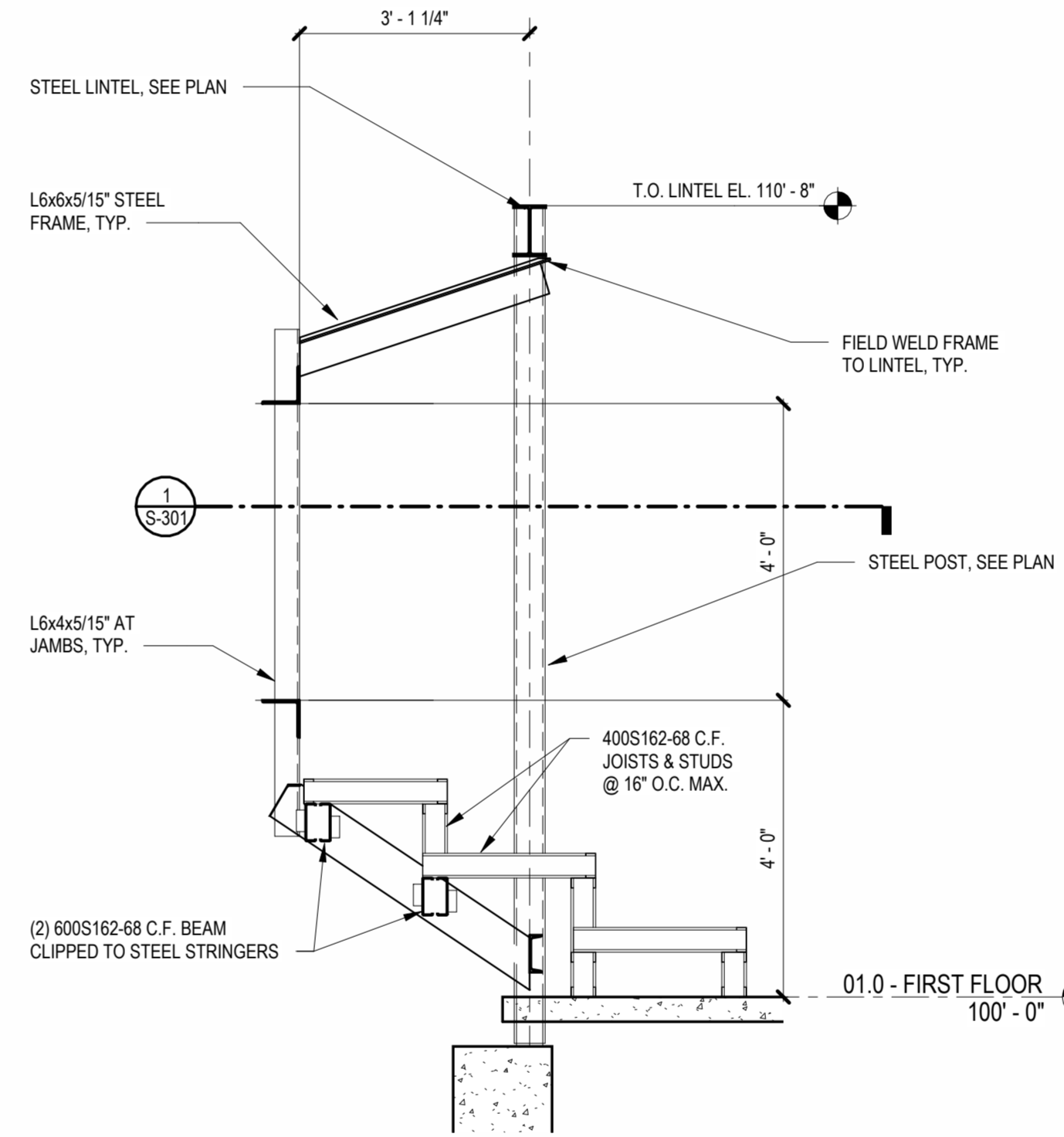
1 ENLARGED FRAMING PLAN - READING NOOK B
1/2" = 1'-0"



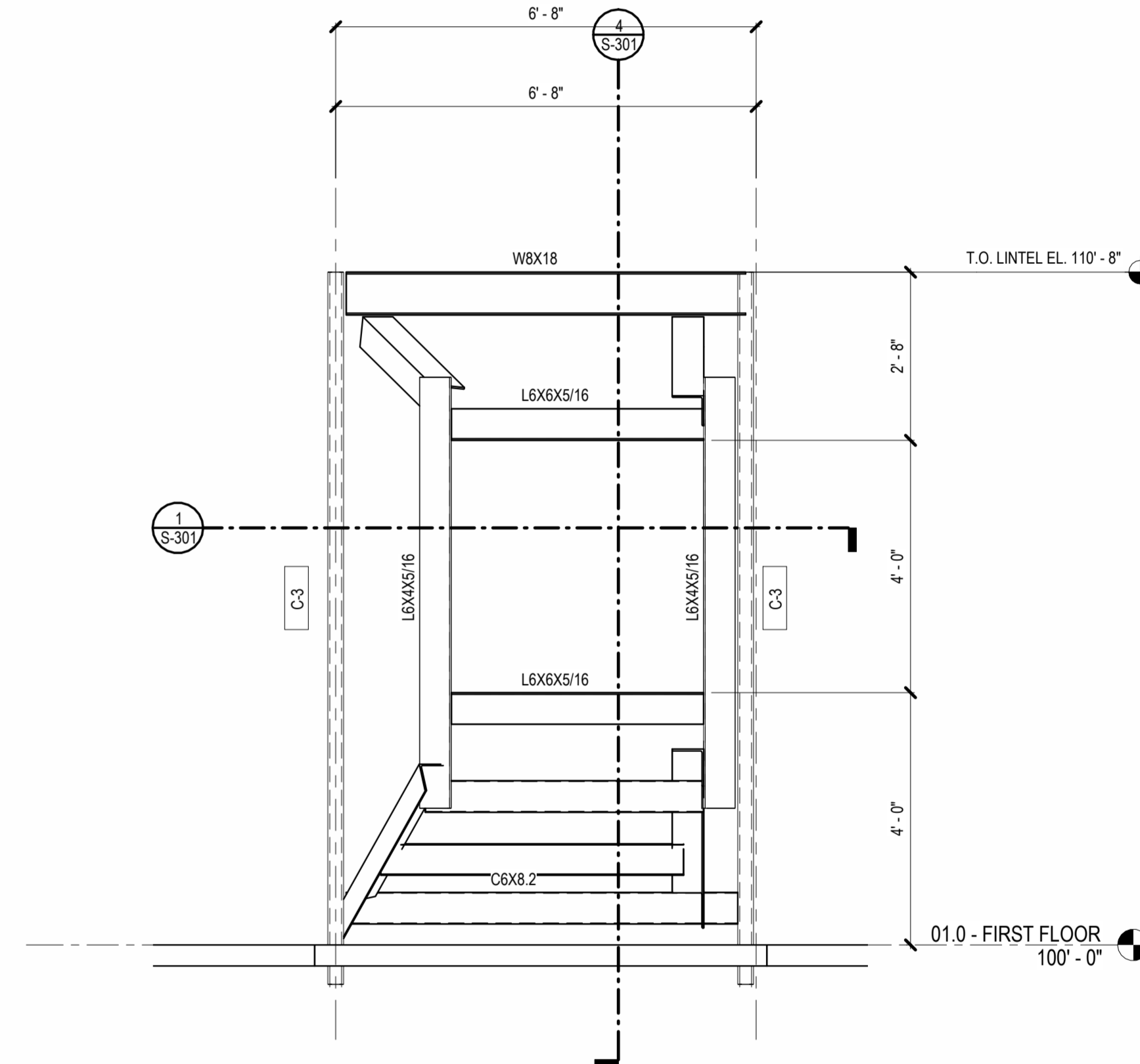
8 WALL SECTION - READING NOOK A
1/2" = 1'-0"



6 FRAMING ELEVATION - READING NOOK A
1/2" = 1'-0"



4 WALL SECTION - READING NOOK B
1/2" = 1'-0"

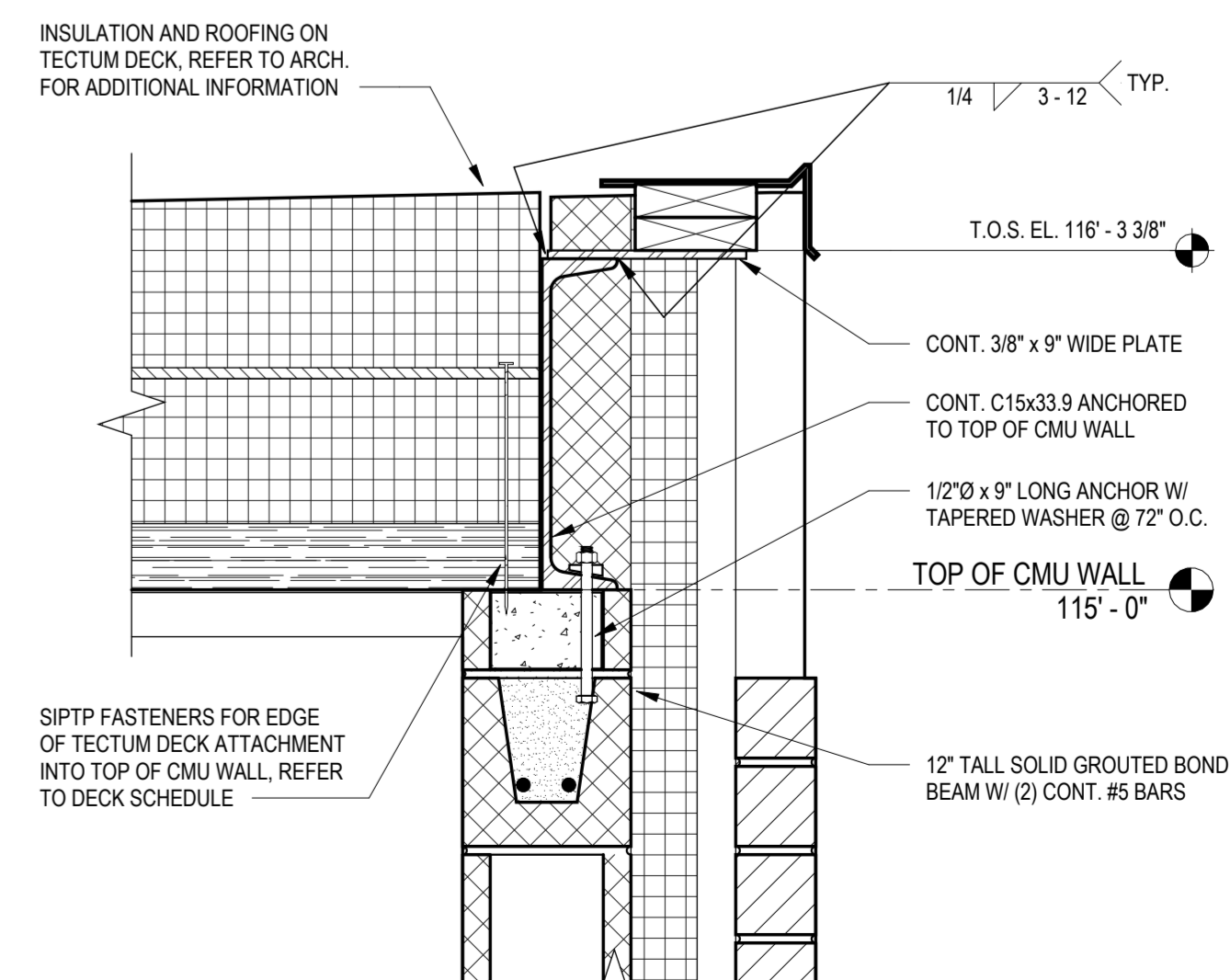
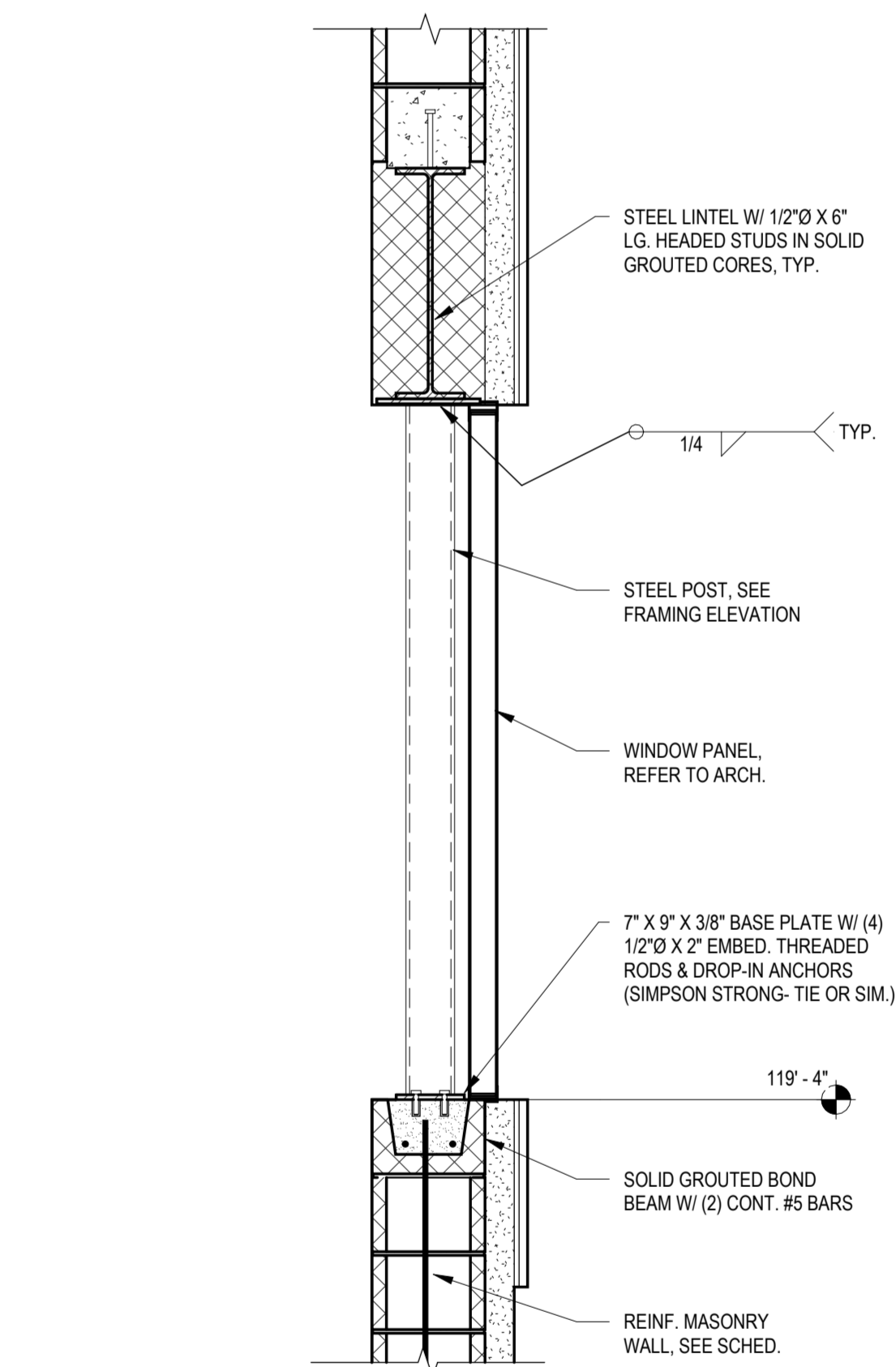
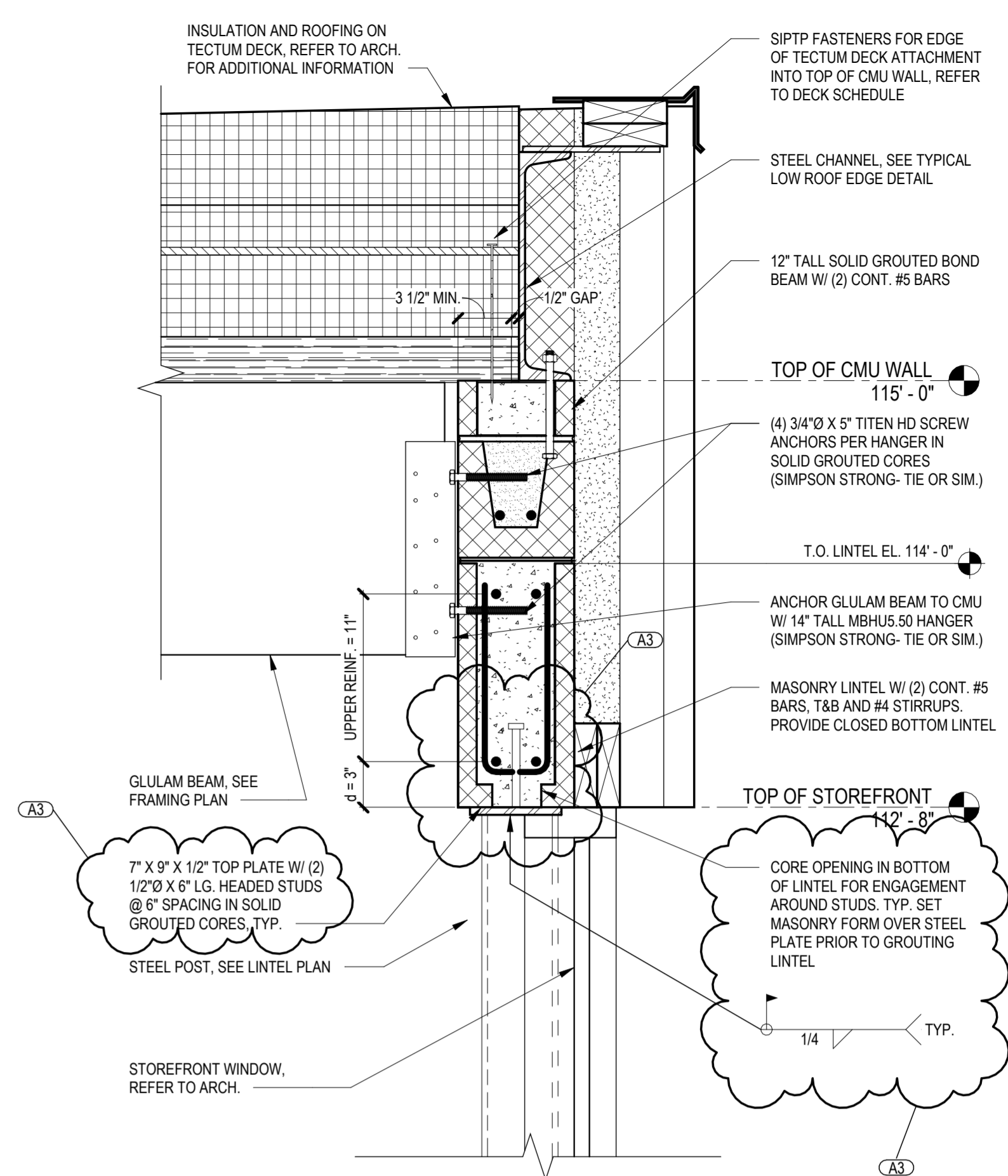
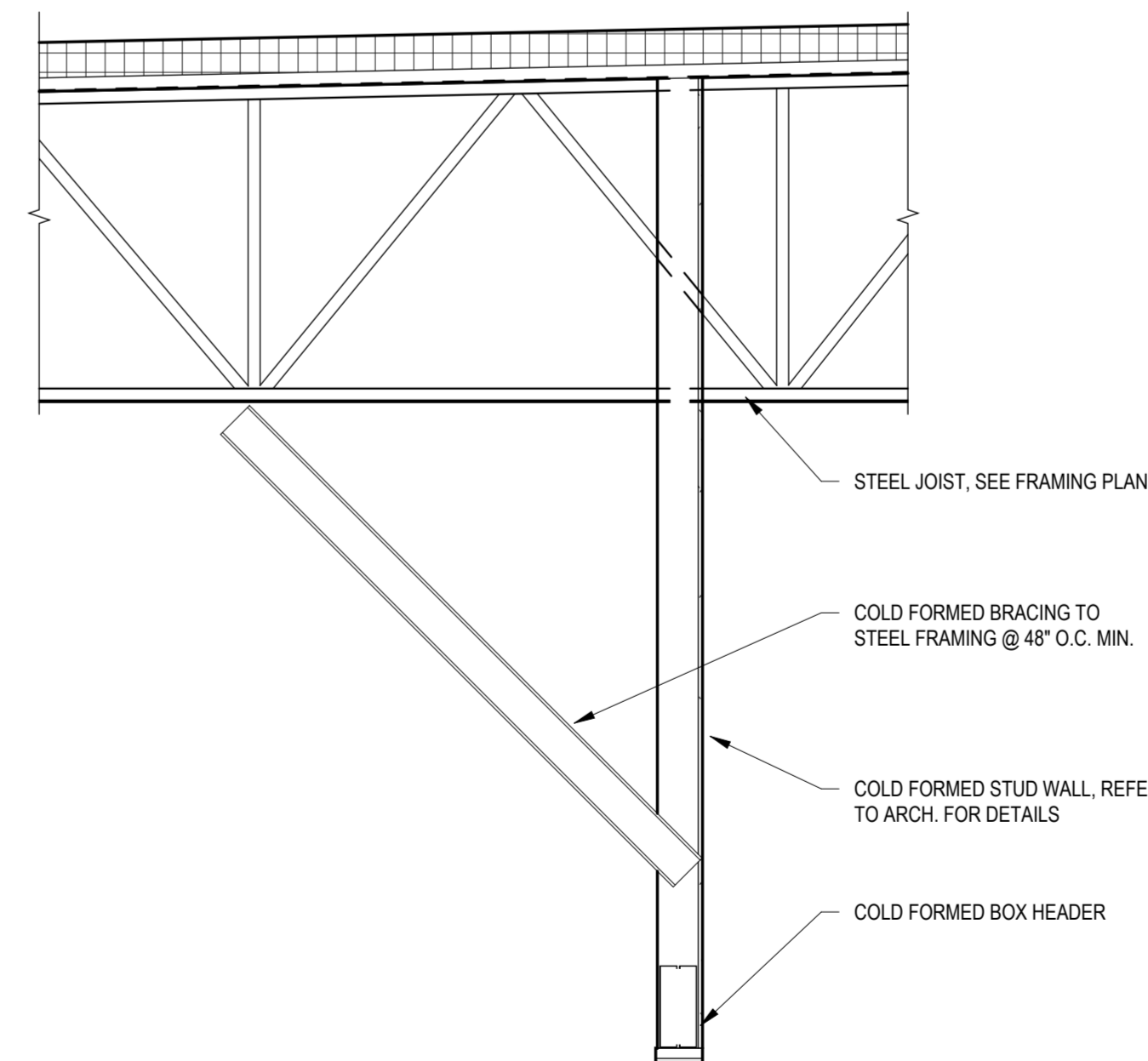
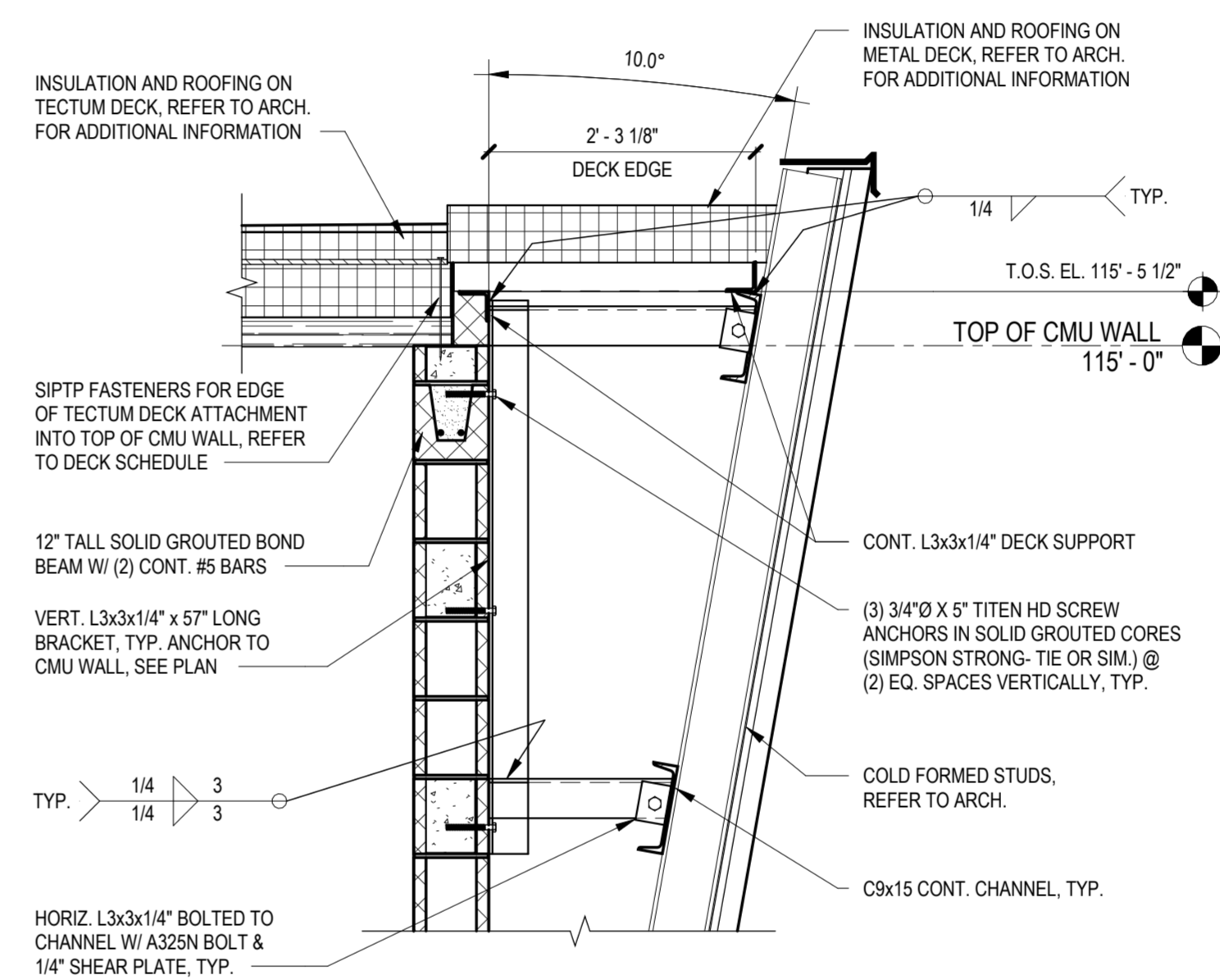
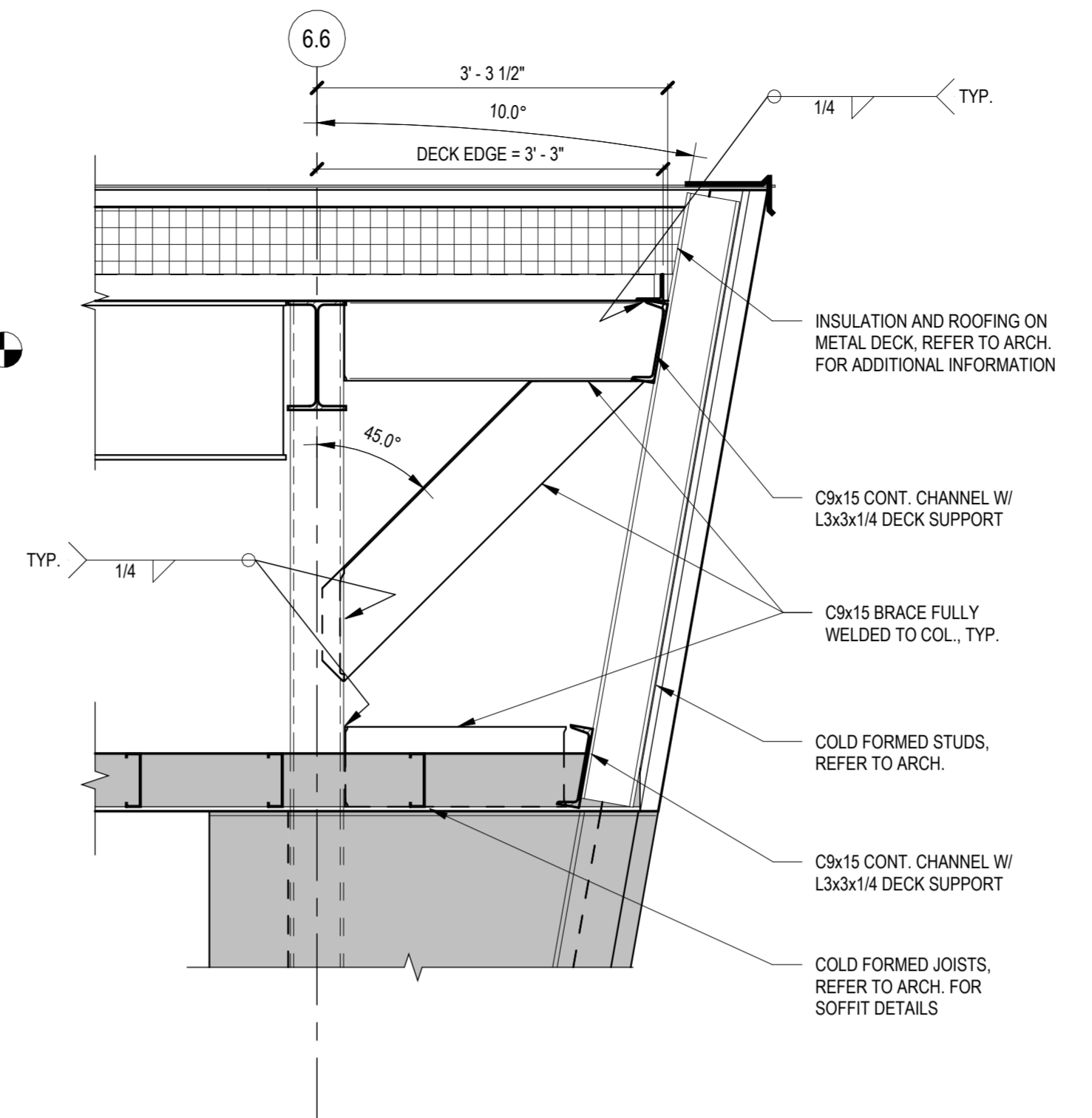
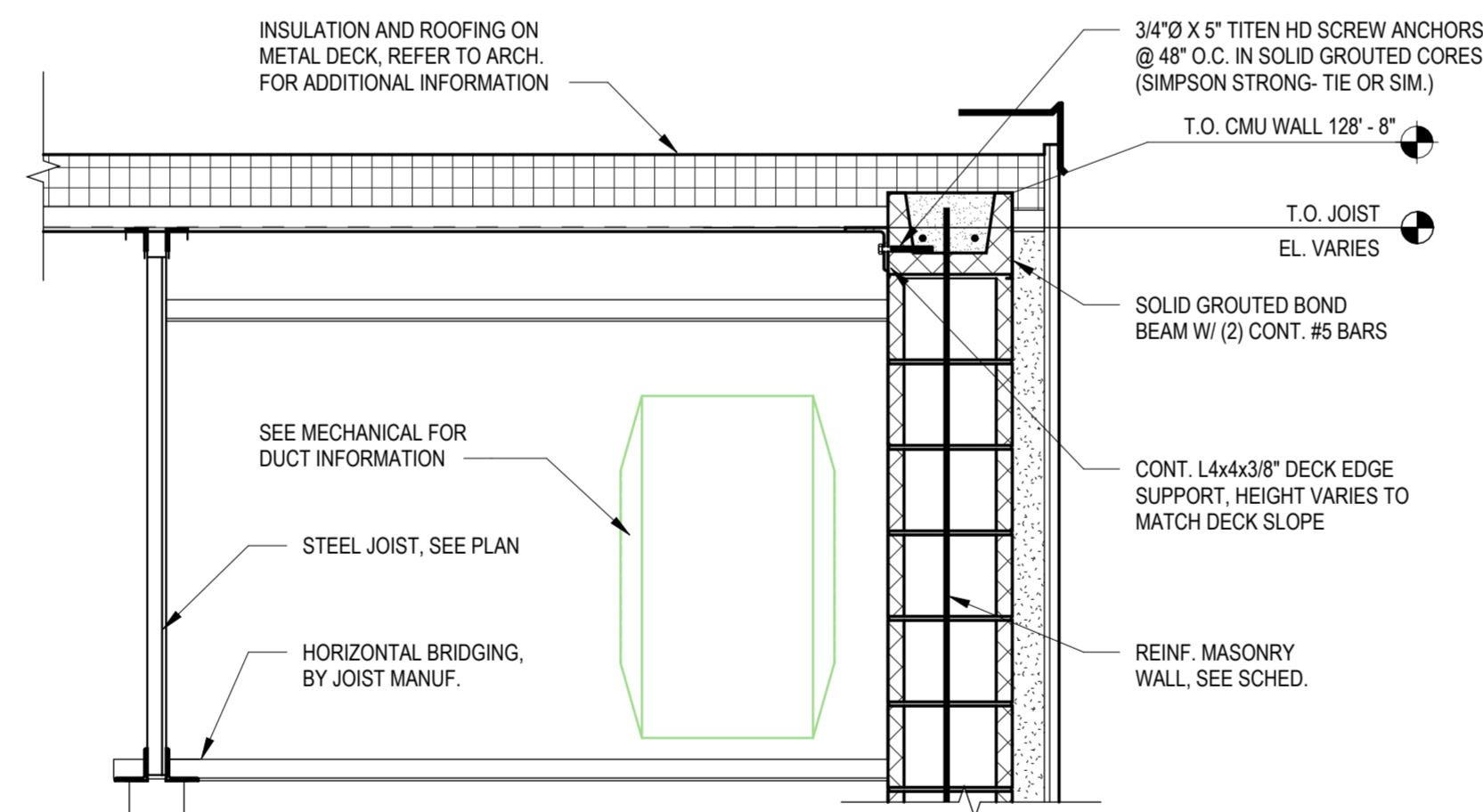
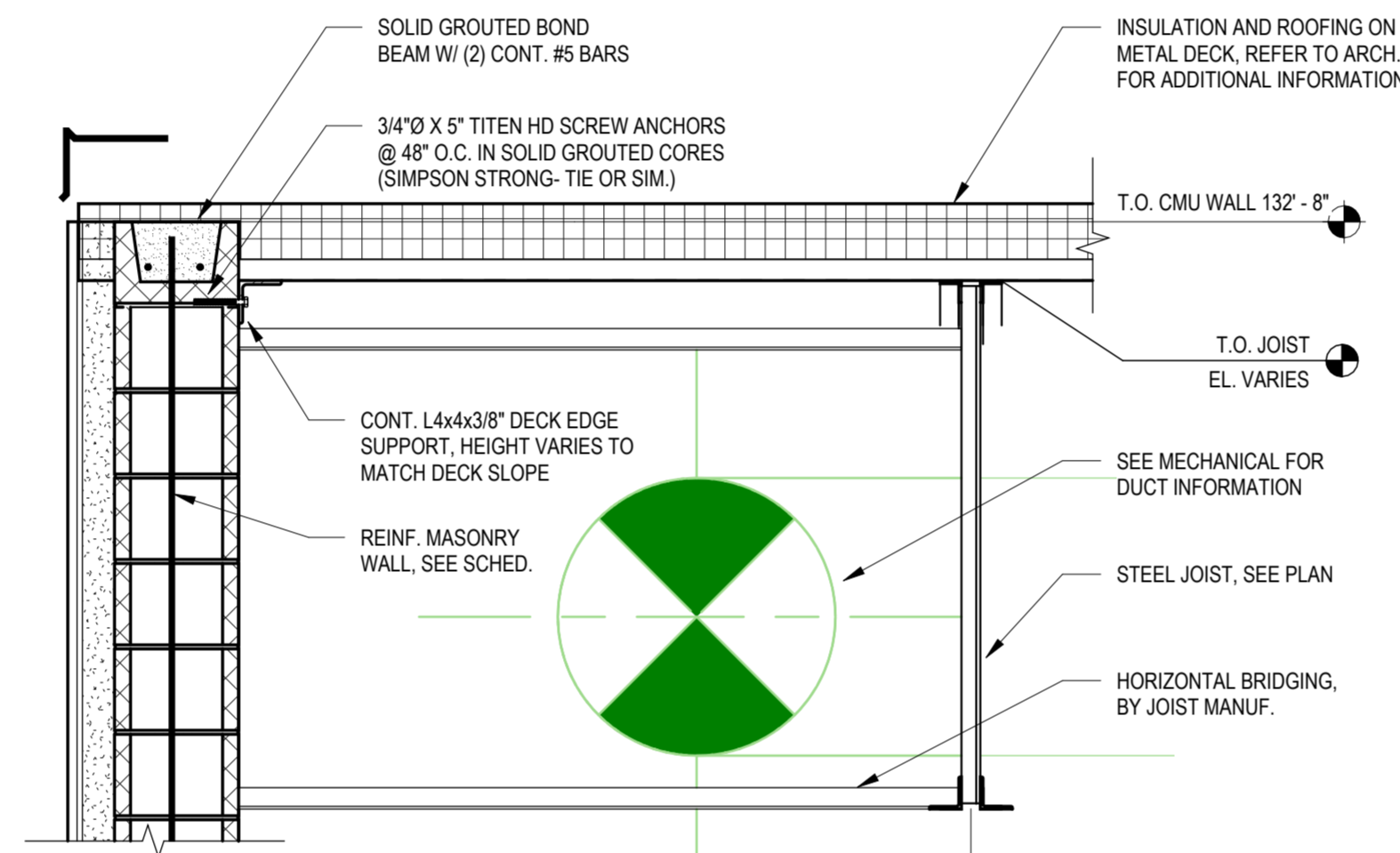
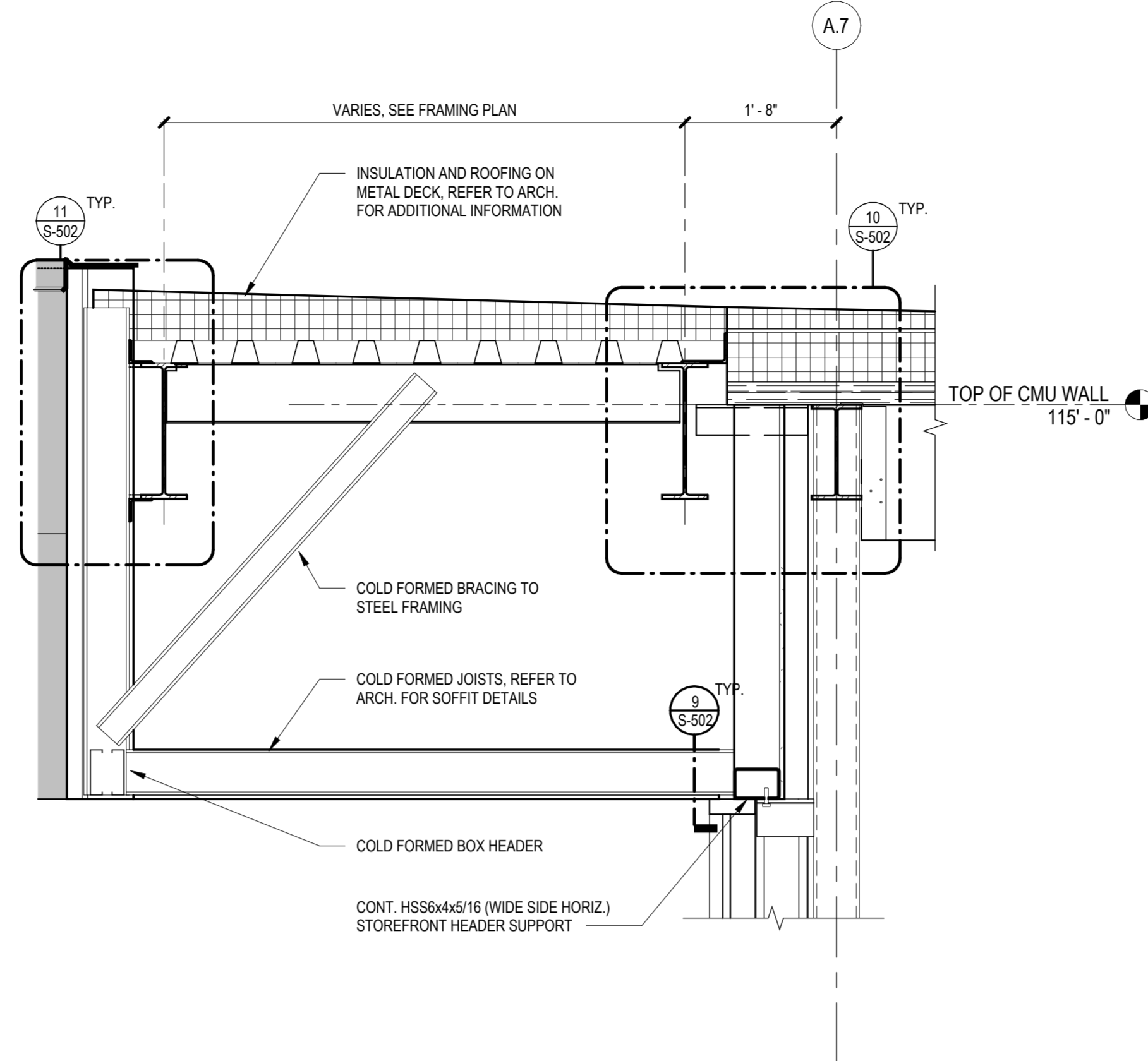
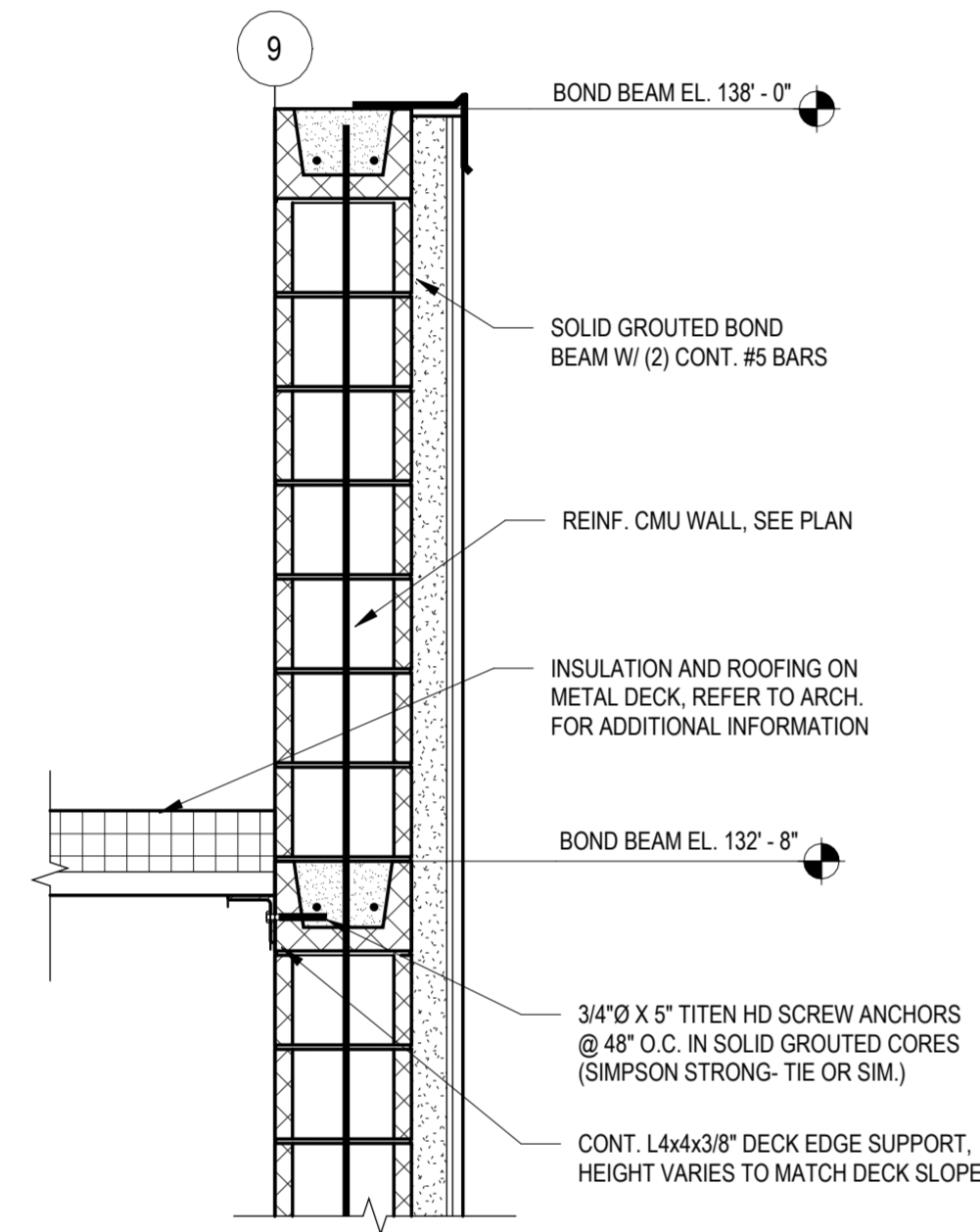
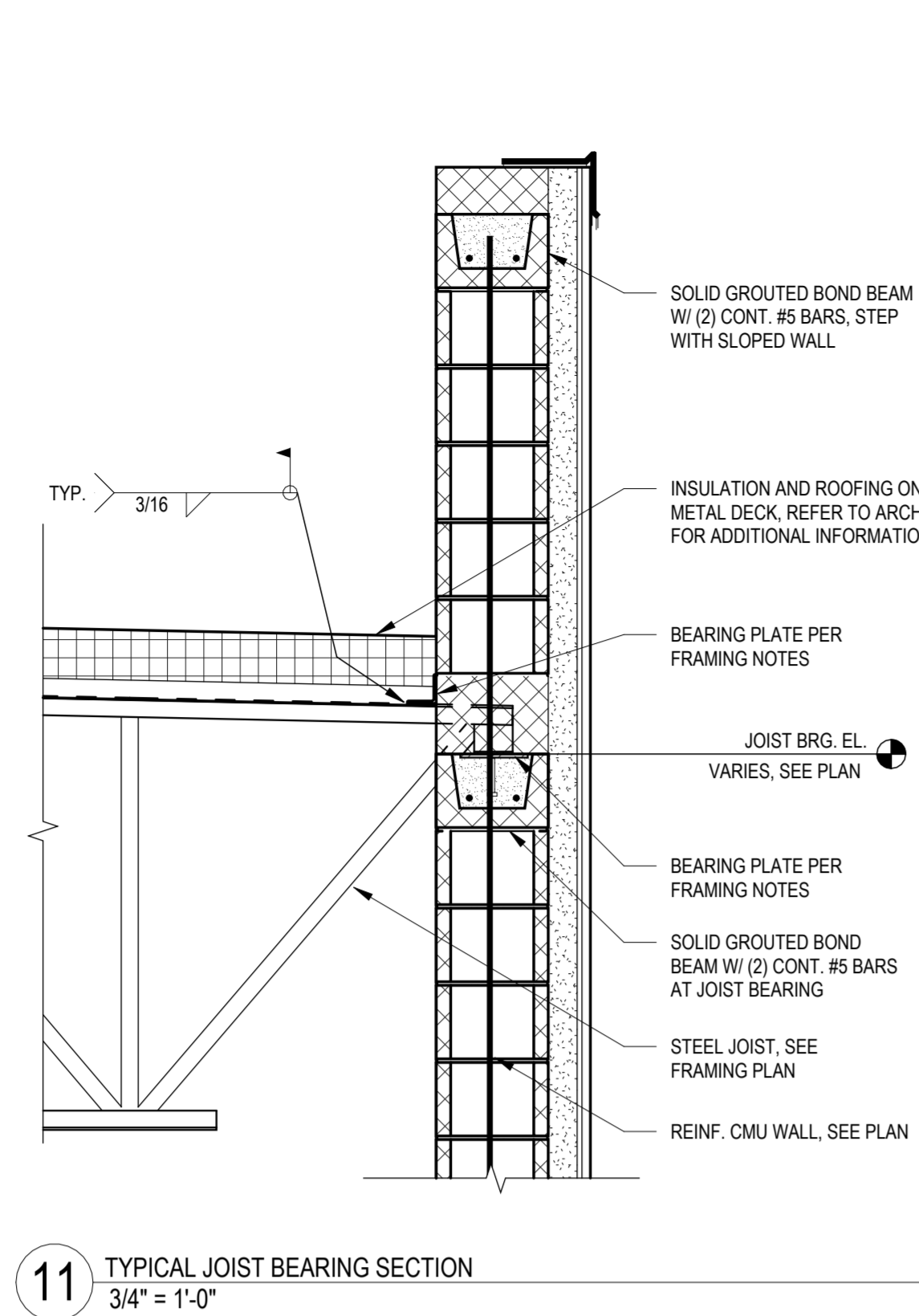


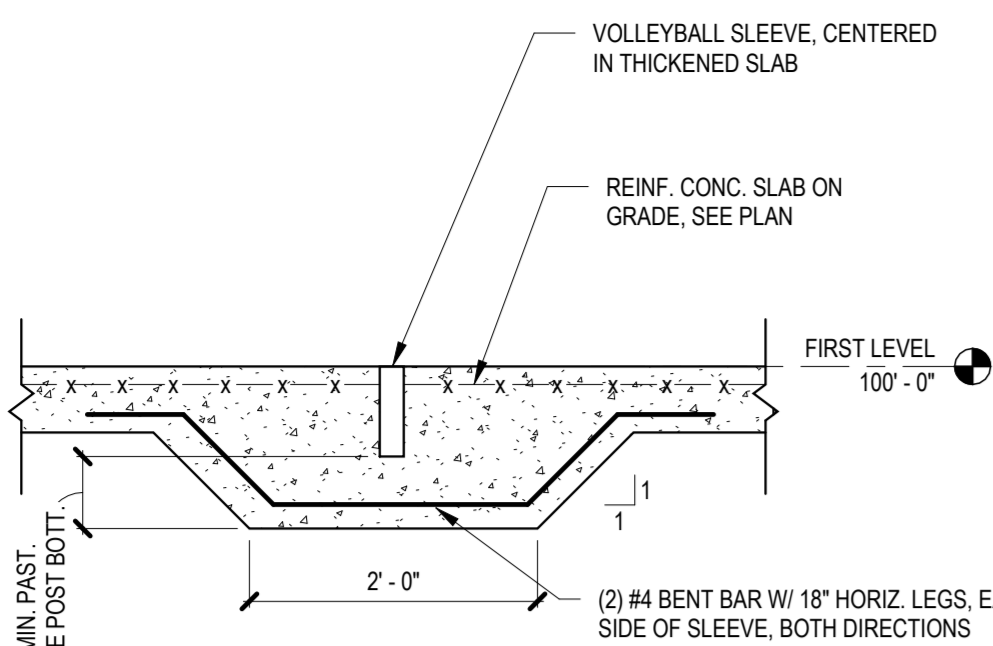
2 FRAMING ELEVATION - READING NOOK B
1/2" = 1'-0"

READING NOOK FRAMING NOTES

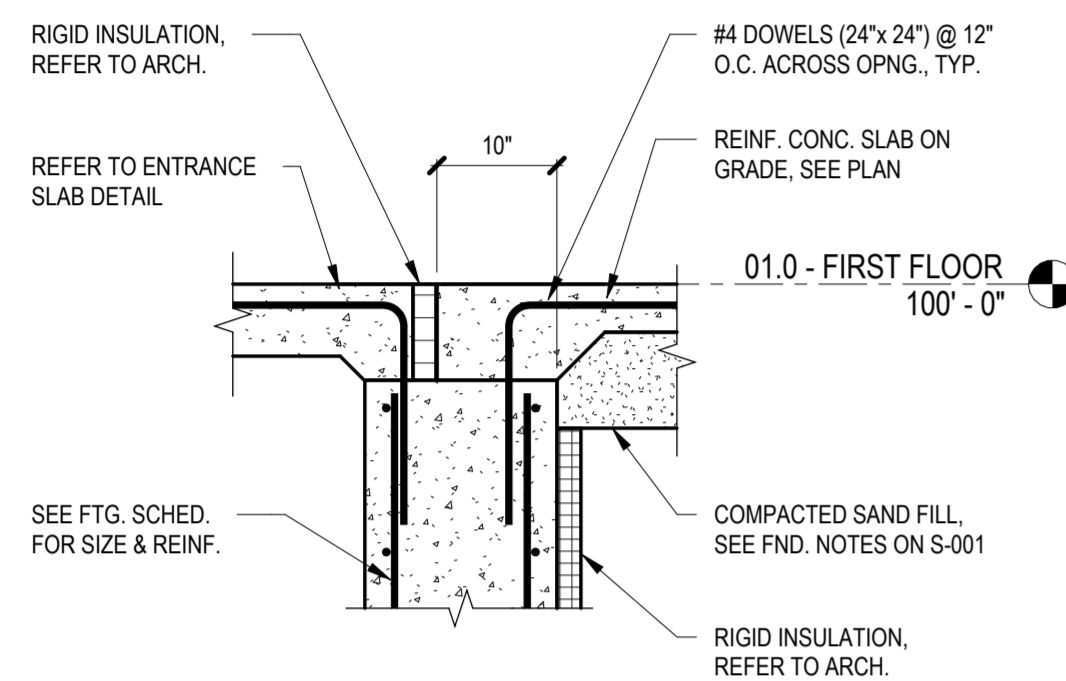
- COORDINATE STEEL FRAMING SHOWN ON THIS SHEET WITH OVERALL NOOK SHAPE AND CONFIGURATION ON ARCHITECTURAL DRAWINGS. VERIFY STEEL LOCATIONS BASED ON WALL PANEL THICKNESSES.
- FRAMING AND CONNECTIONS SHOWN SCHEMATICALLY. CONNECTION DETAILS MAY REQUIRE FIELD FABRICATION. ALTERNATIVE STEEL SHAPES AND SIZES MUST BE SUBMITTED FOR REVIEW.
- ALL STEEL CONNECTIONS TO BE FULLY WELDED WITH MINIMUM 3/16" FILLET WELDS ALL AROUND. FABRICATOR TO ASSIGN CONNECTIONS WITH SHEAR TABS AS REQUIRED FOR ASSEMBLY.
- COLD-FORMED JOISTS ARE SHOWN FOR BUILT-UP STEP CONSTRUCTION. THICKNESS AND DEPTH OF JOISTS SHOWN ARE MINIMUM SIZES.
- DESIGN LOADS

LIVE LOAD:
BUILT-UP STEPS 100 PSF MAXIMUM

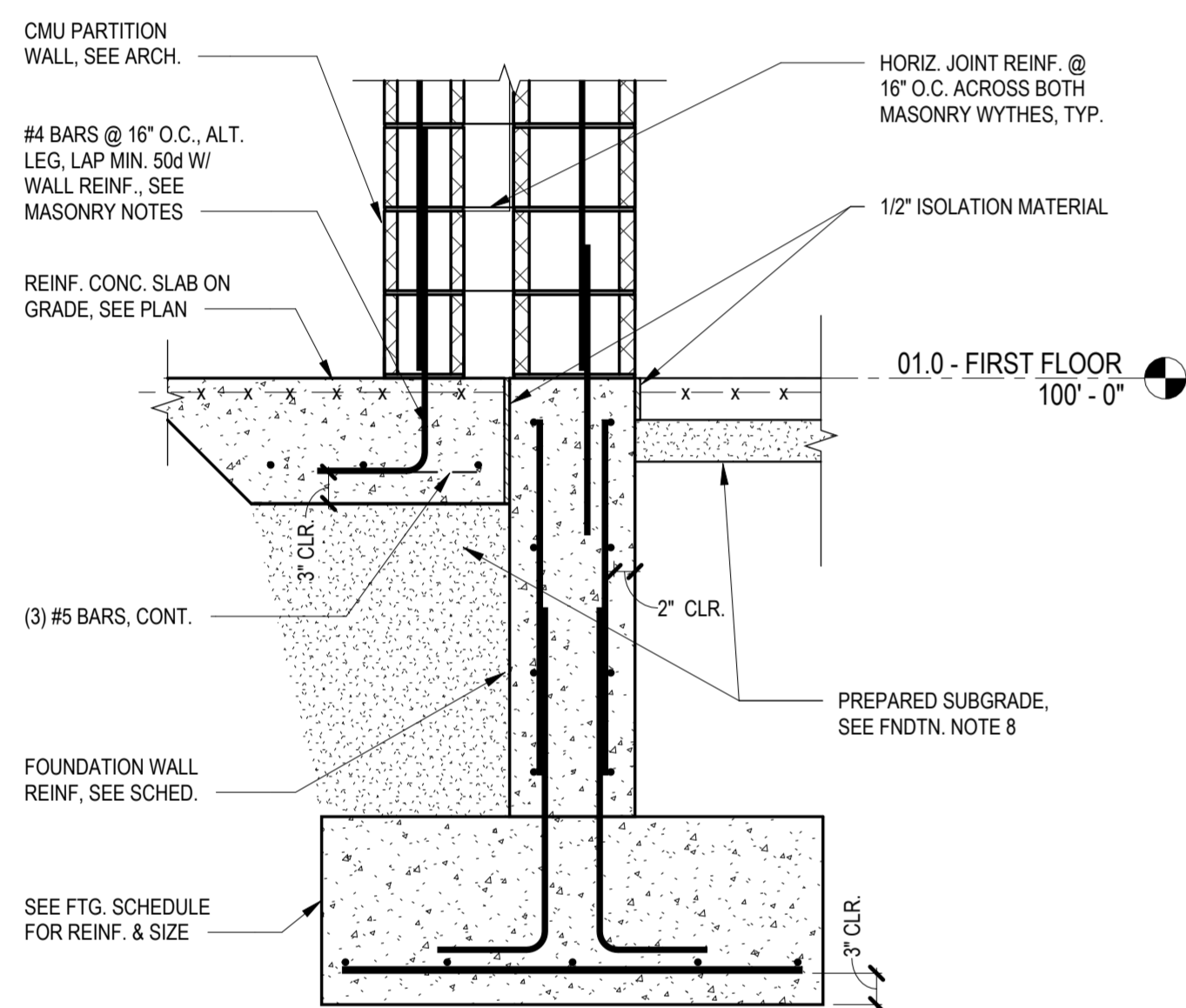




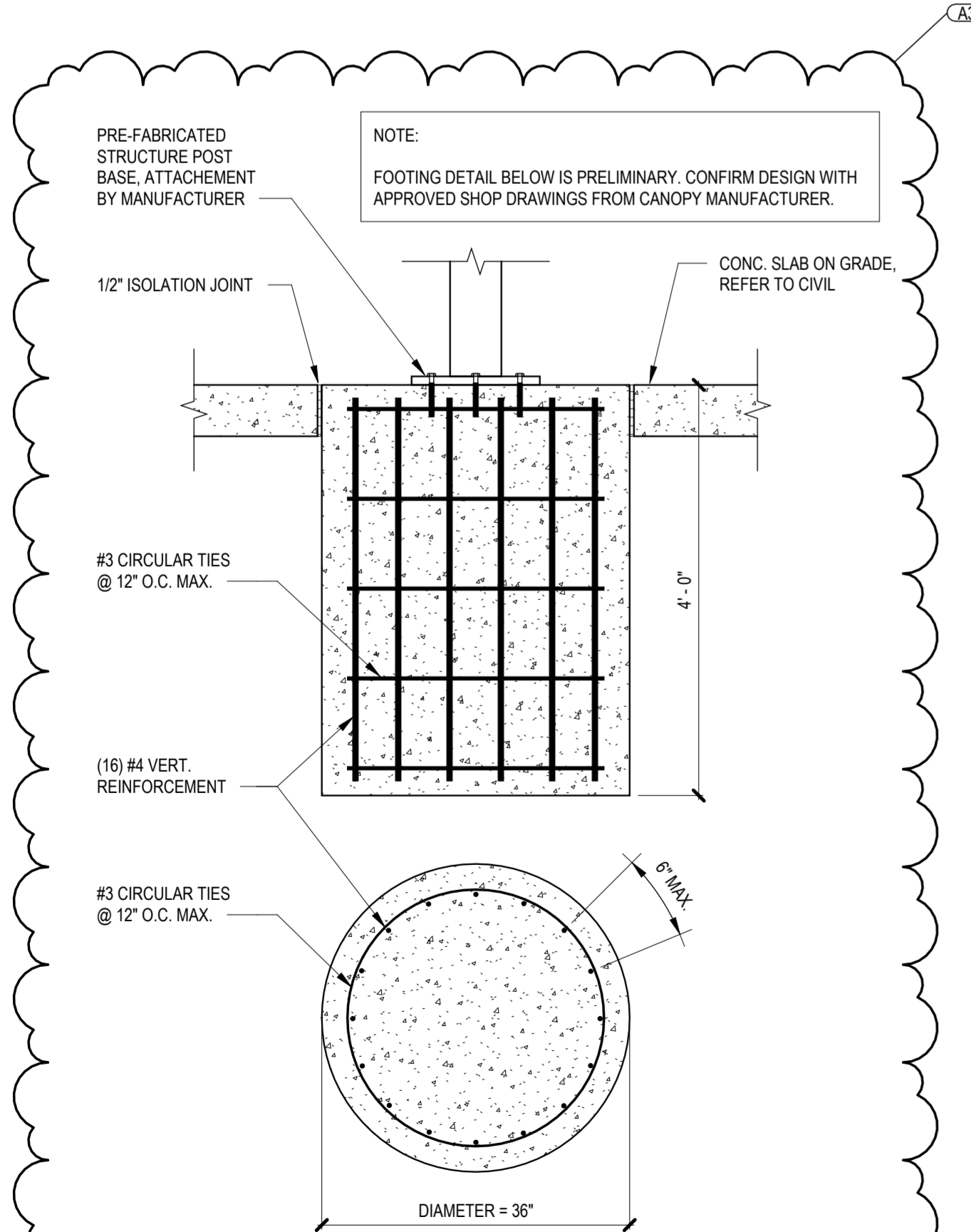
19 VOLLEYBALL SLEEVE DETAIL
3/4" = 1'-0"



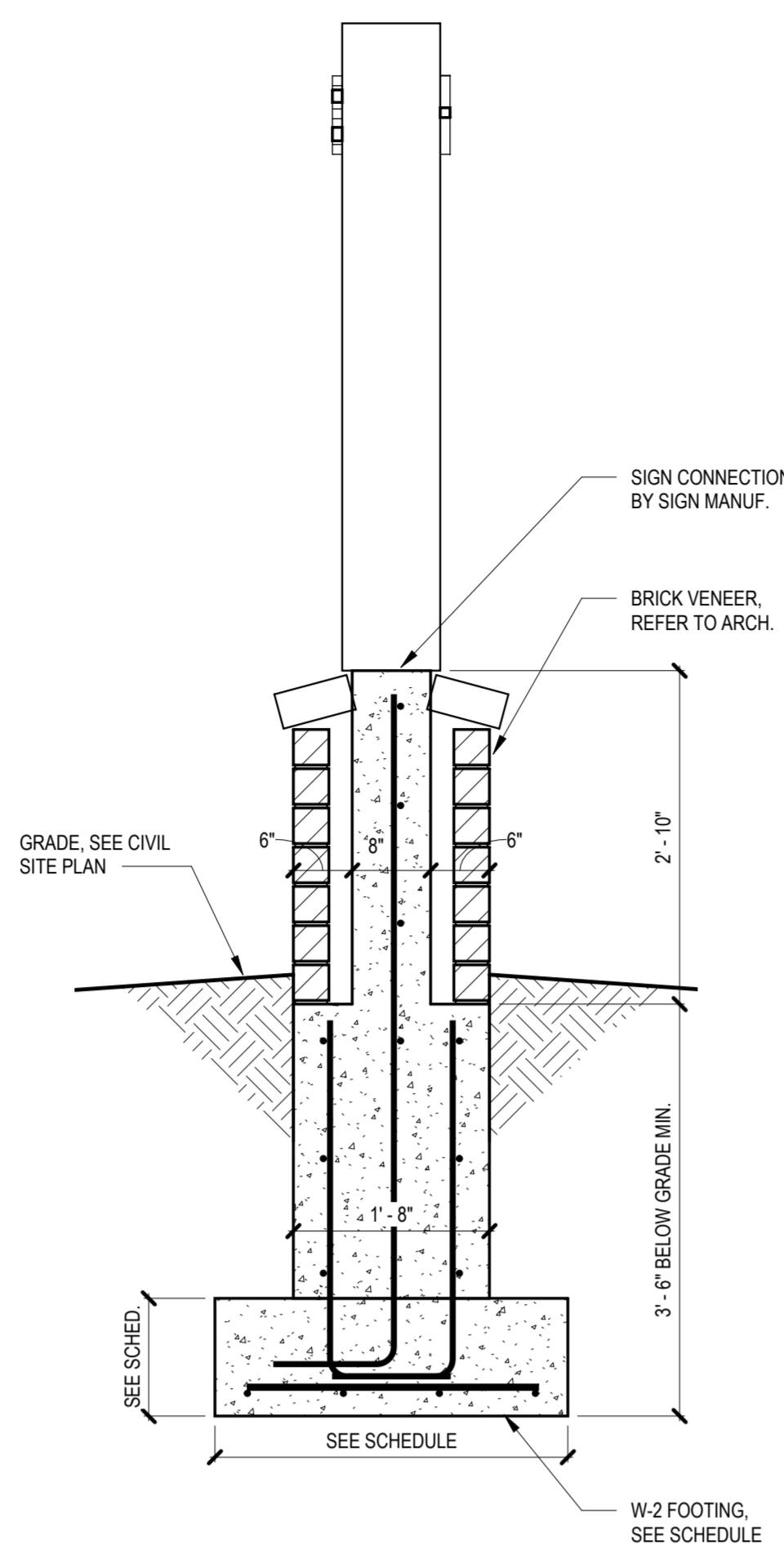
20 SLAB EDGE AT DOOR
3/4" = 1'-0"



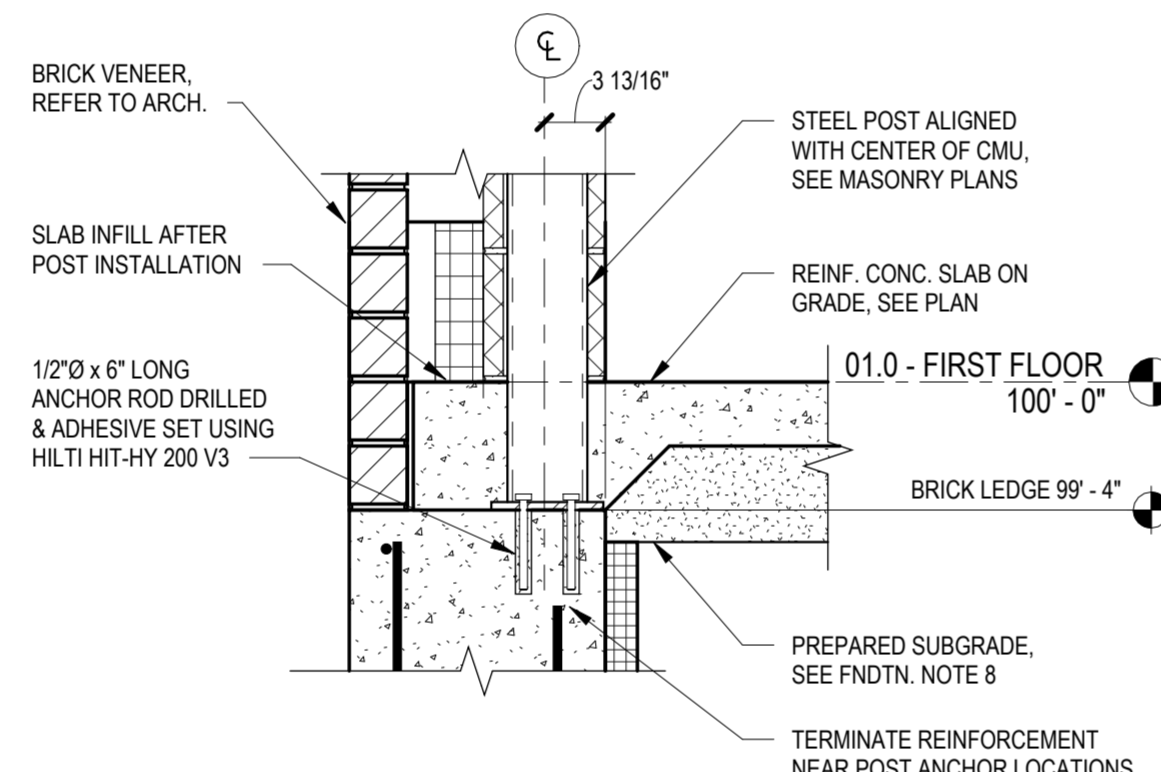
21 THICKENED SLAB AT DOUBLE CMU WALL
3/4" = 1'-0"



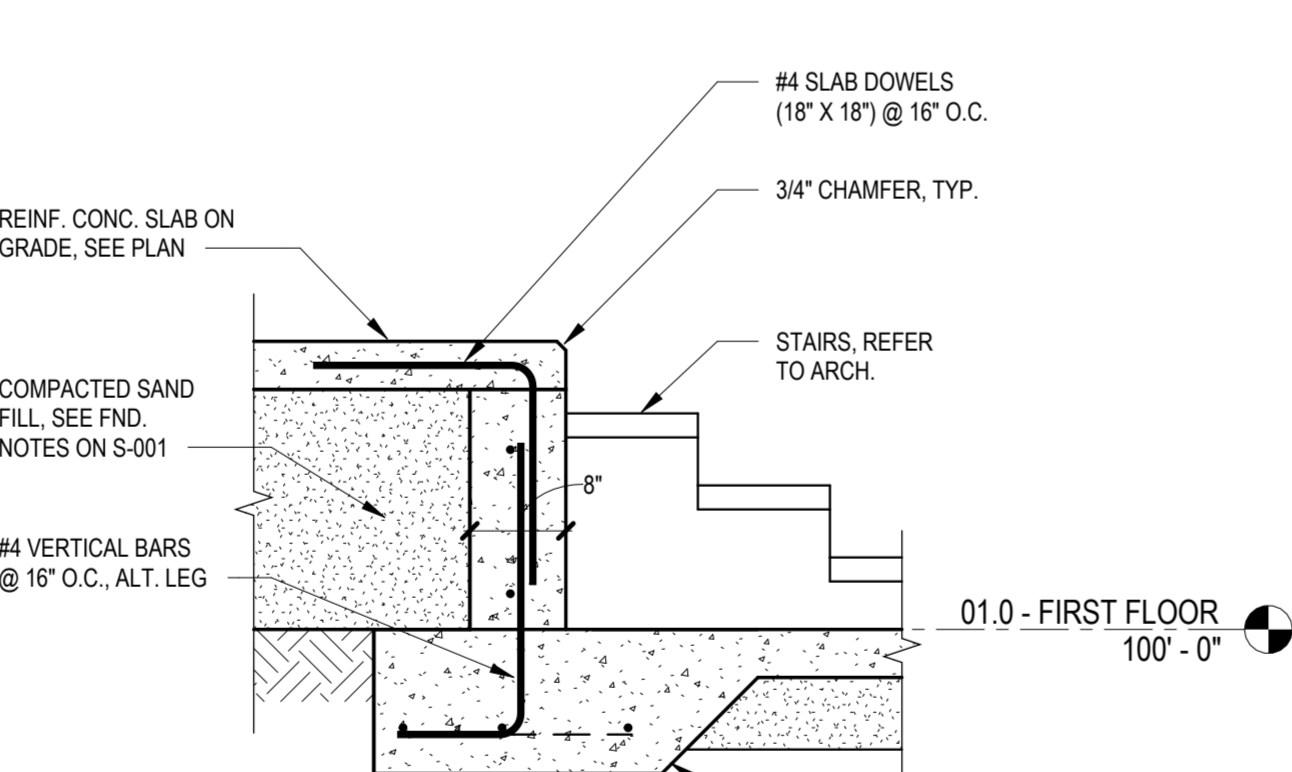
22 FOOTING DETAIL FOR OUTDOOR CLASSROOM
3/4" = 1'-0"



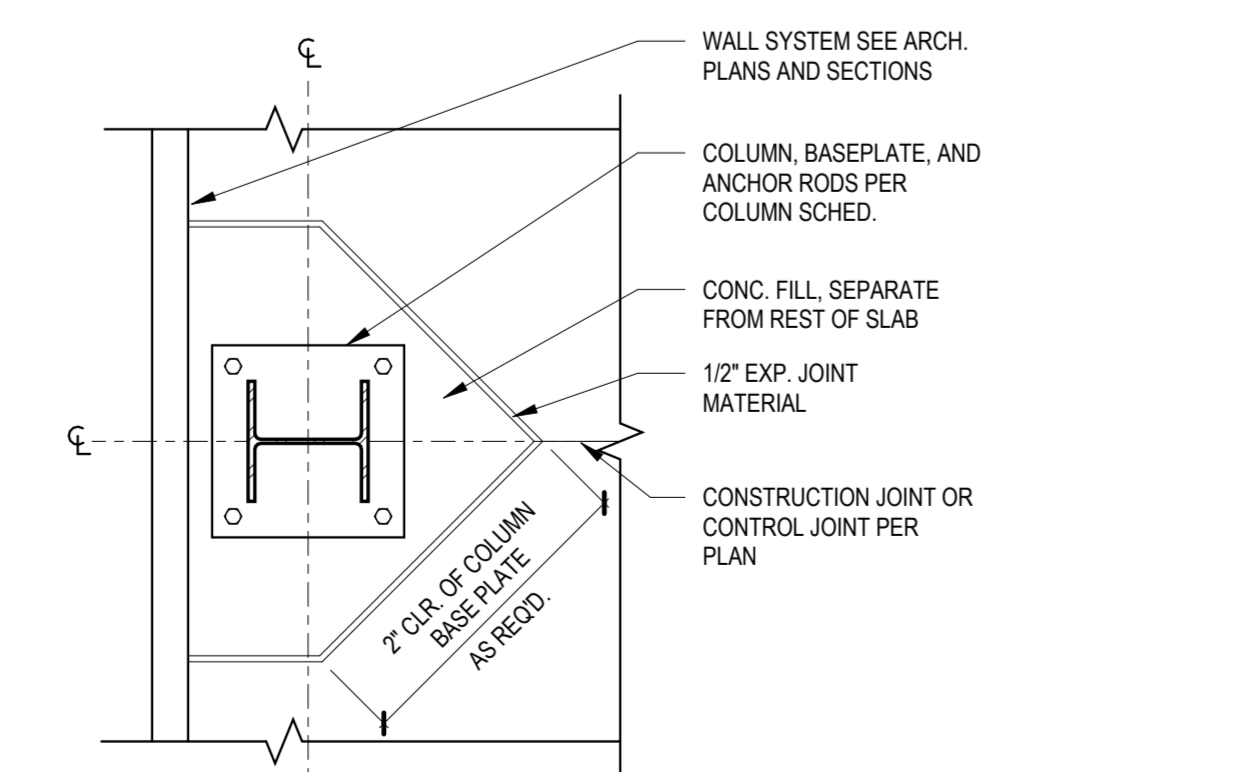
15 MONUMENT SIGN FOUNDATION
3/4" = 1'-0"



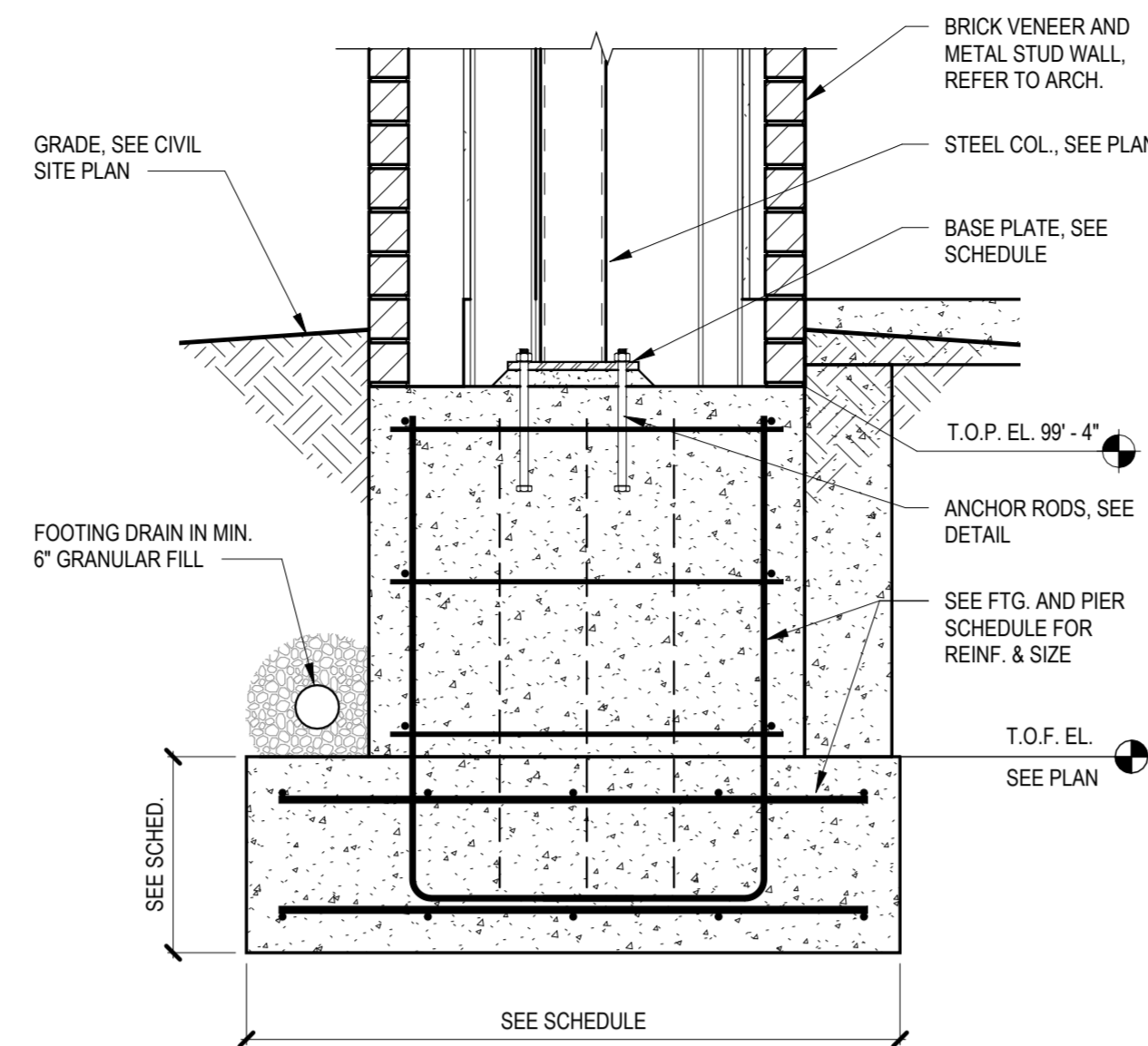
16 POST BASE AT FOUNDATION WALL
1" = 1'-0"



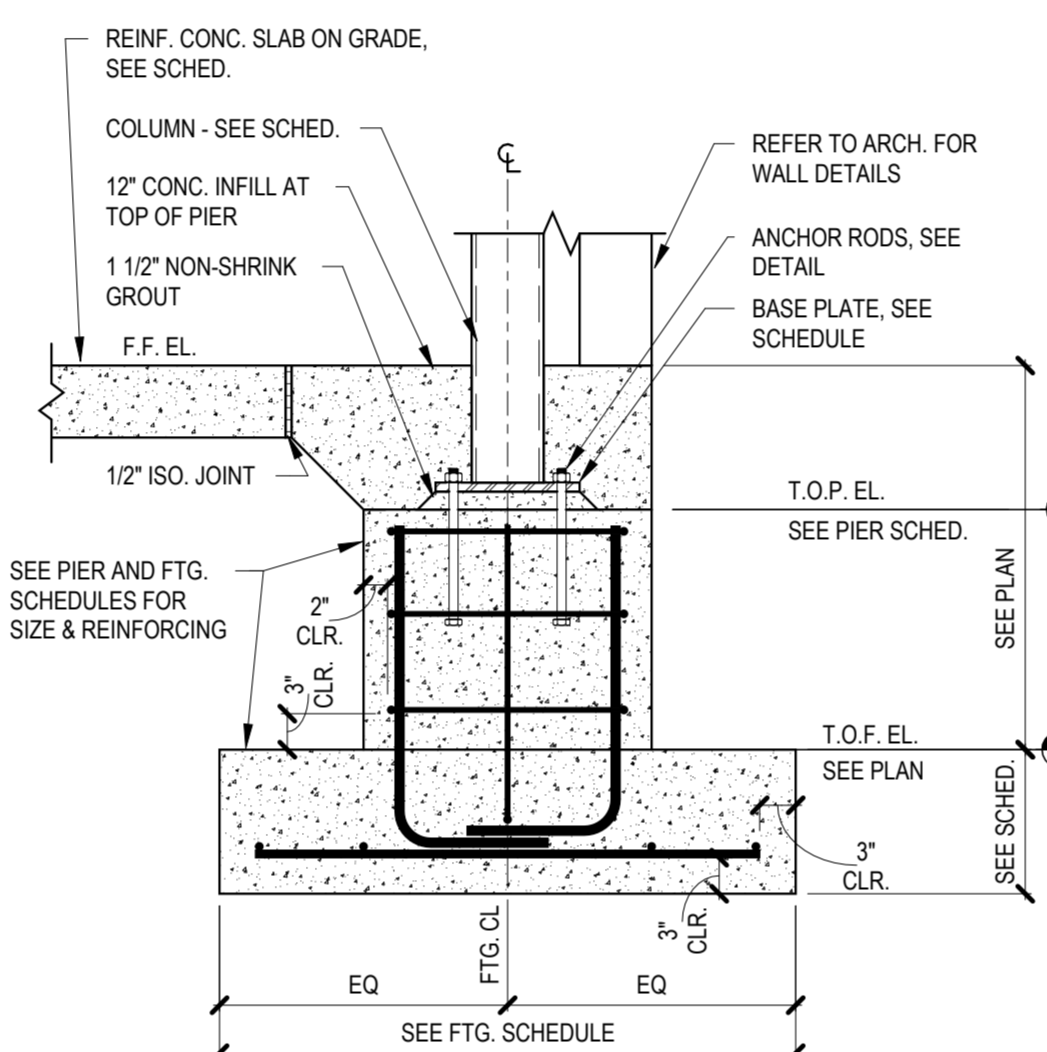
17 EDGE OF RAISED FLOOR
3/4" = 1'-0"



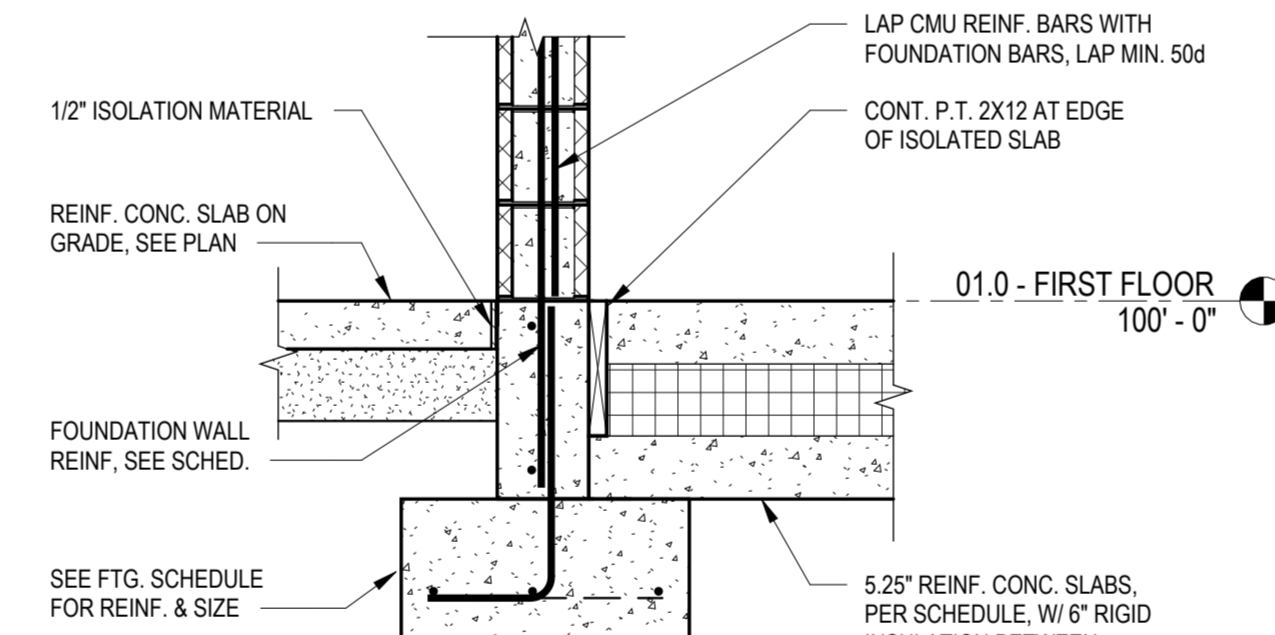
18 EXTERIOR ISOLATION JOINT DETAIL
NOT TO SCALE



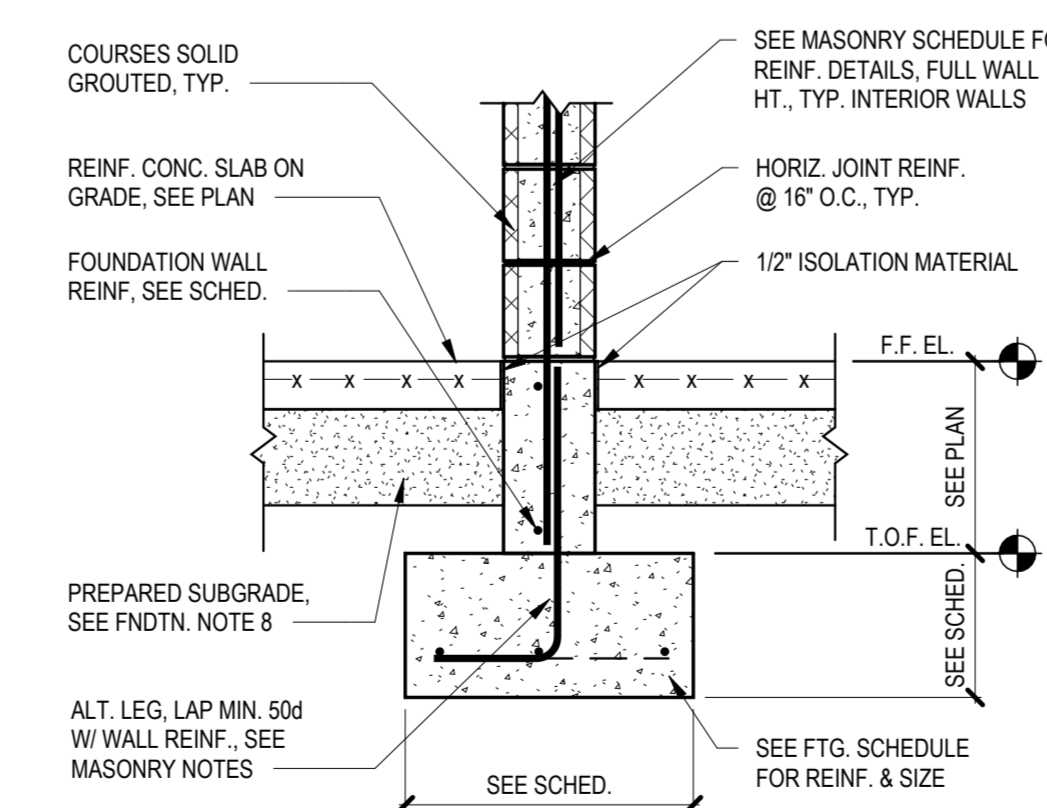
11 CANOPY FOUNDATION PIER - NORTH
3/4" = 1'-0"



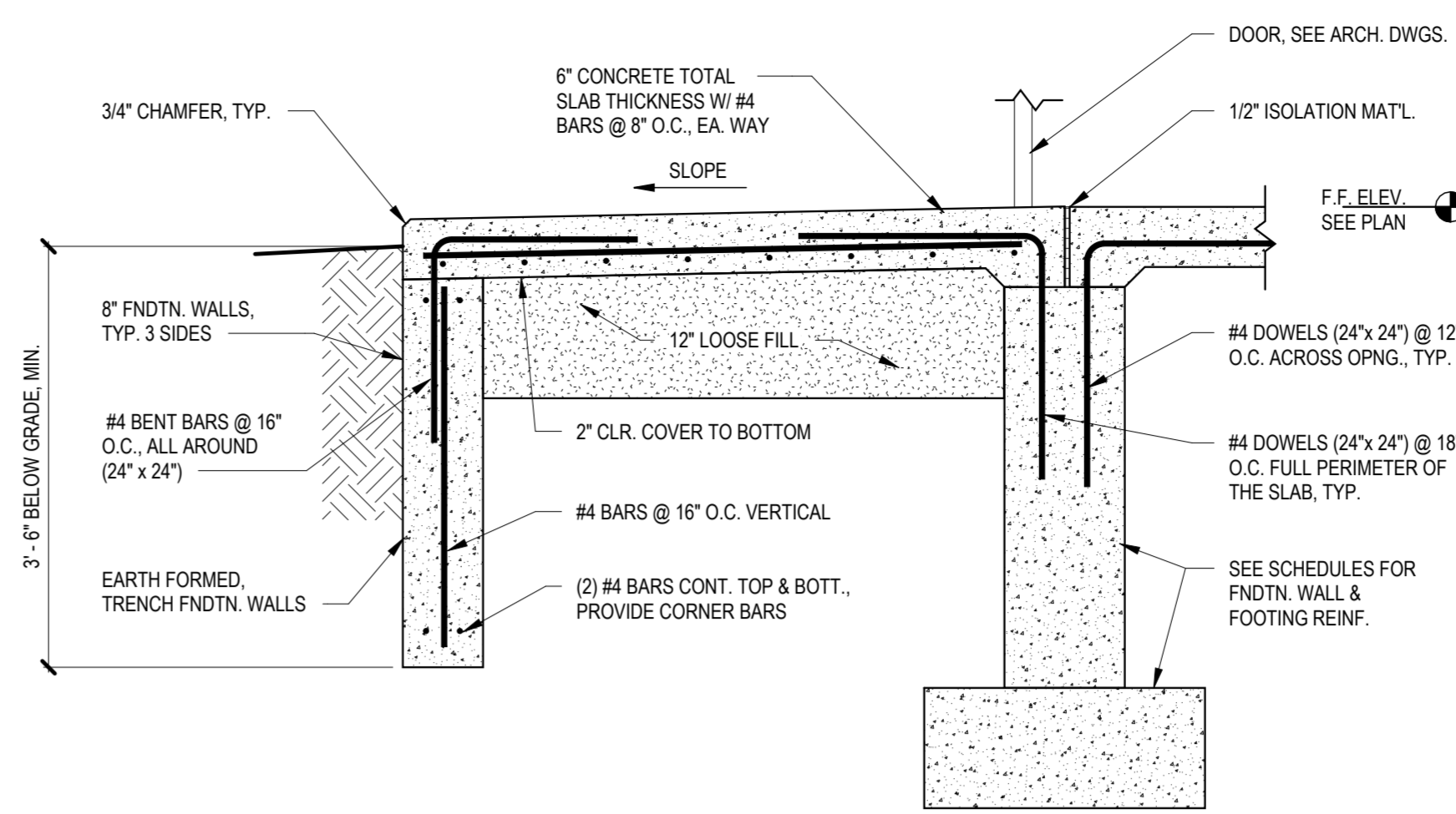
12 TYP. EXTERIOR CONCRETE FOOTING SECTION
3/4" = 1'-0"



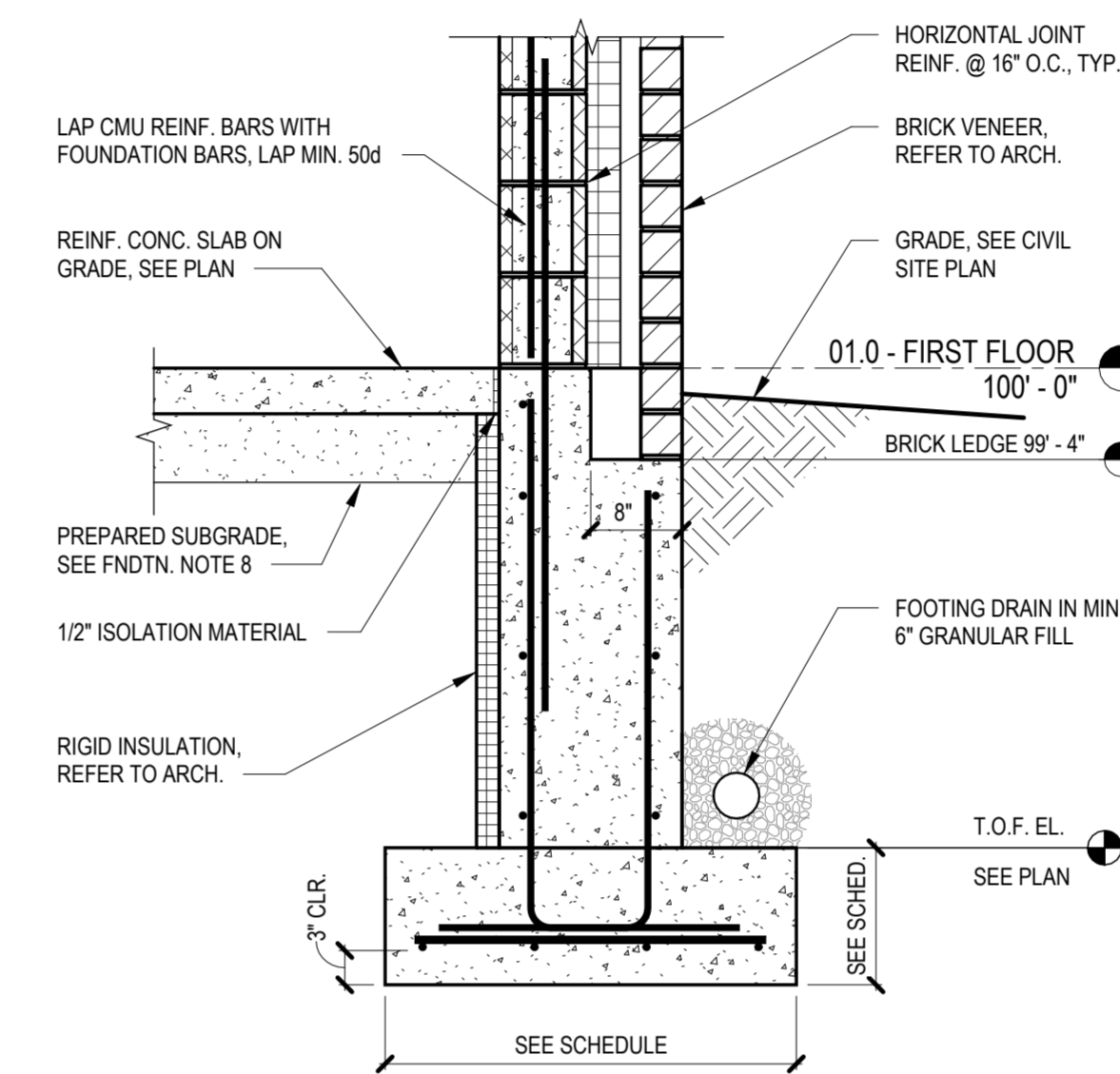
13 INSULATED SLAB EDGE
3/4" = 1'-0"



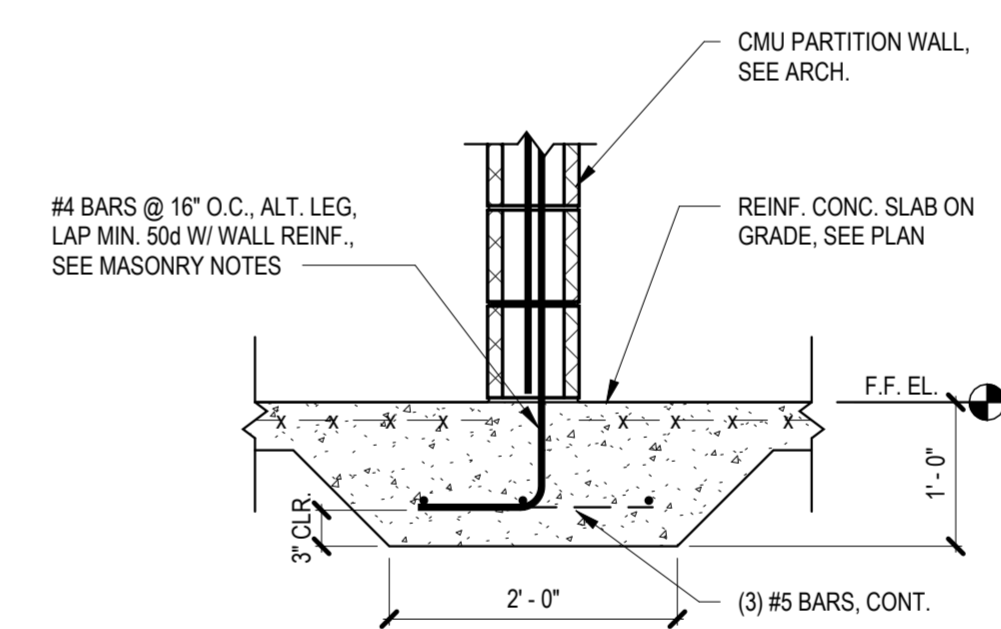
14 INTERIOR BEARING WALL FOOTING SECTION
3/4" = 1'-0"



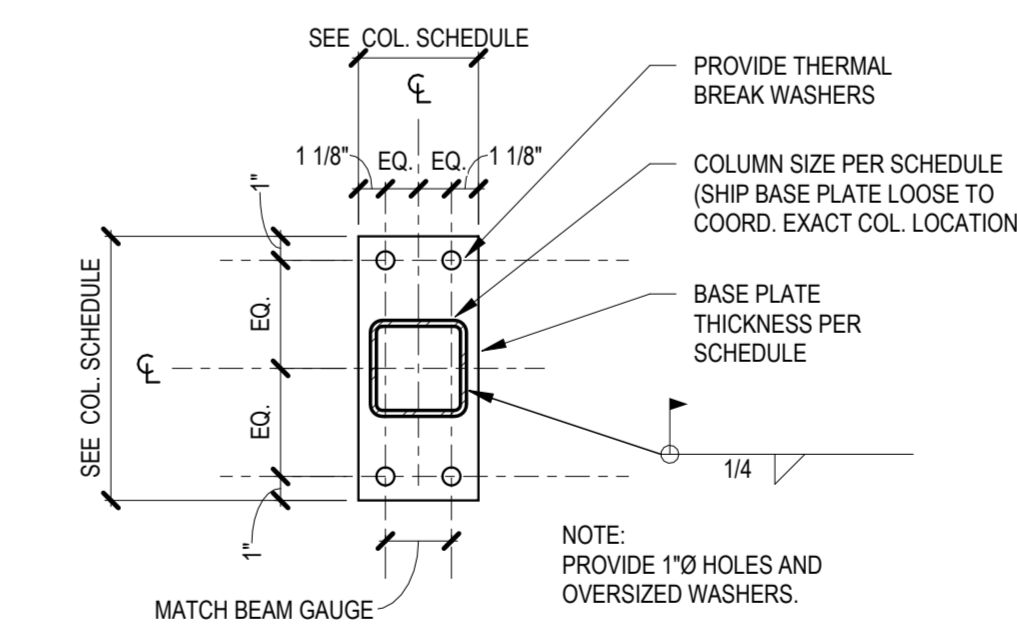
6 ENTRANCE SLAB SECTION
3/4" = 1'-0"



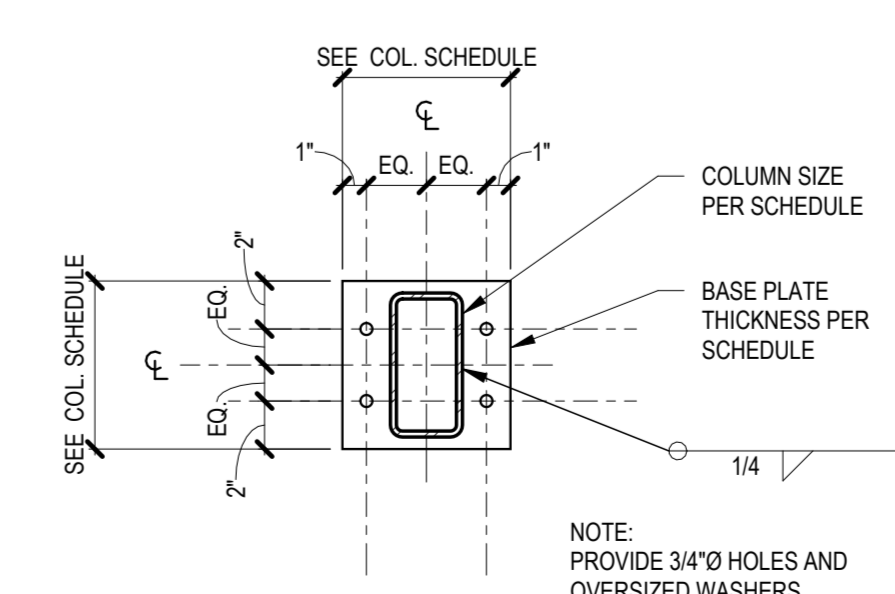
7 TYPICAL FOUNDATION WALL
3/4" = 1'-0"



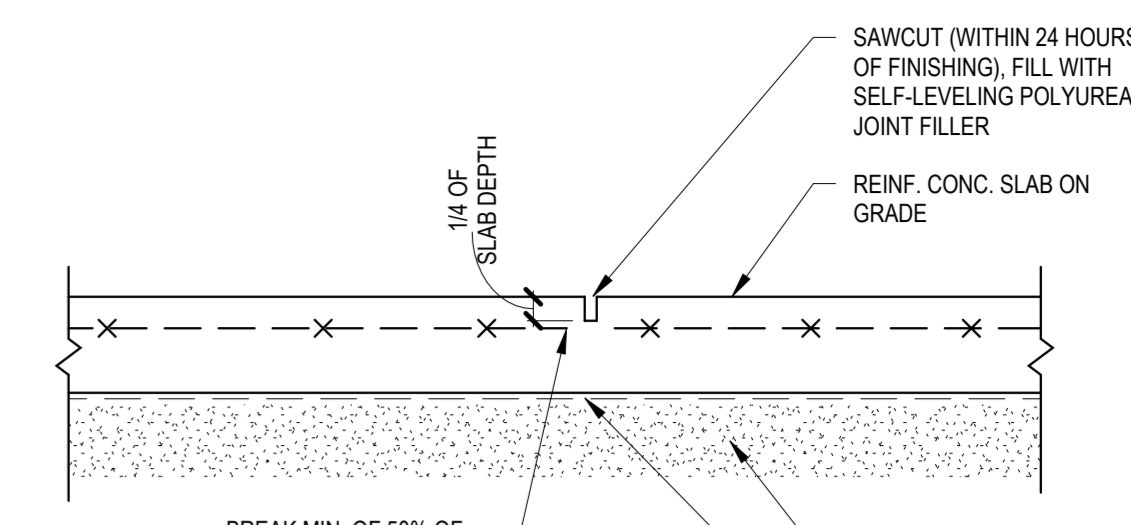
8 INTERIOR THICKENED SLAB SECTION
3/4" = 1'-0"



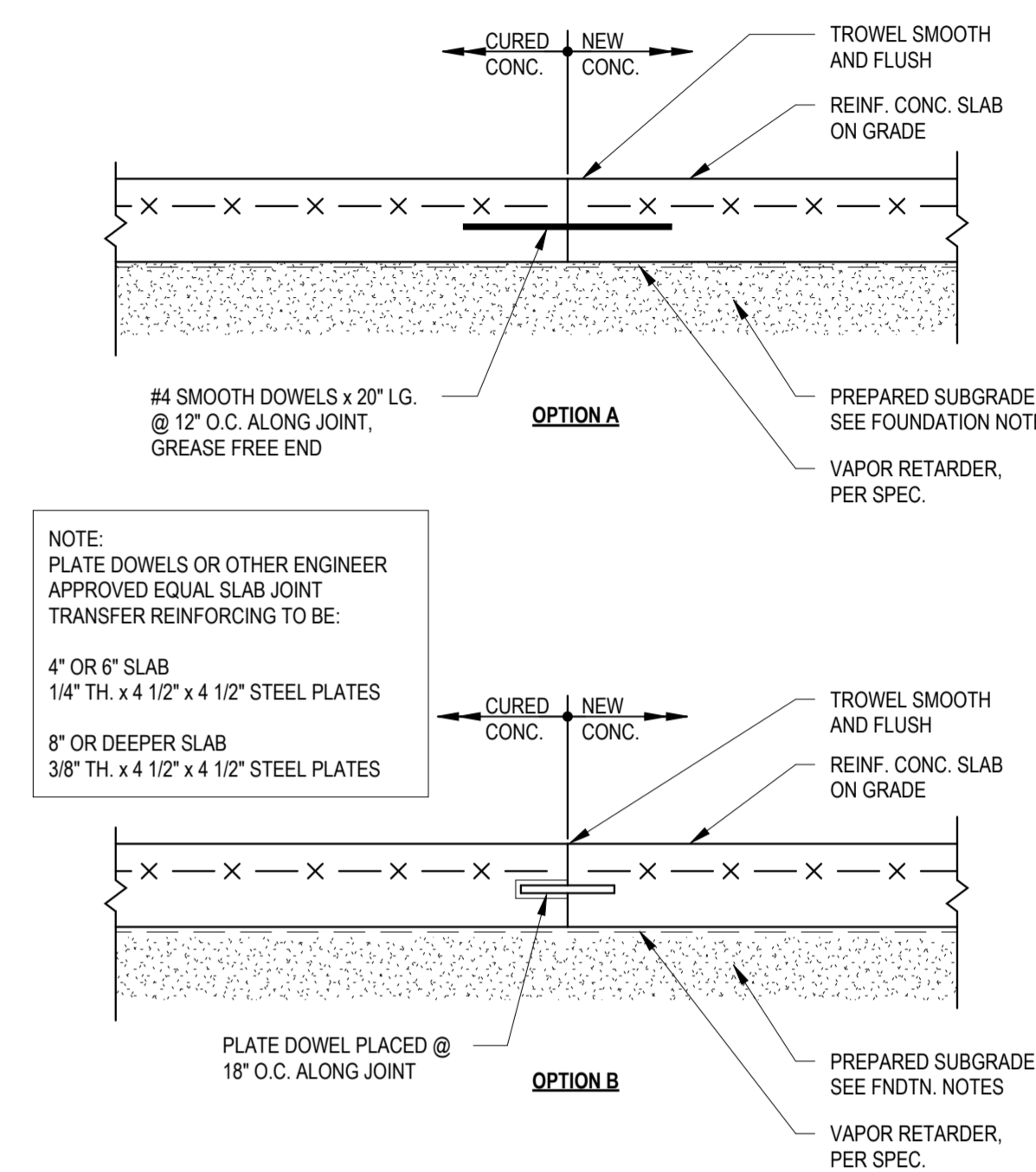
9 BASE PLATE BP-2
1 1/2" = 1'-0"



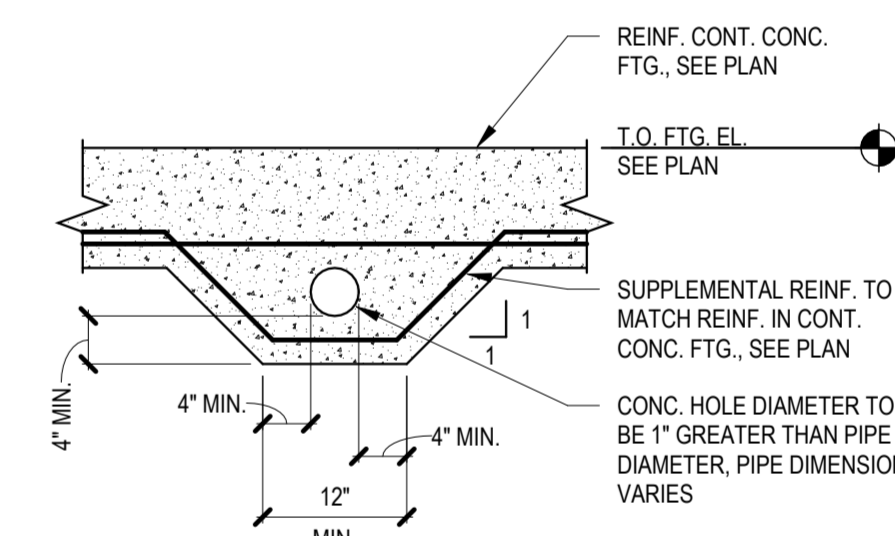
10 BASE PLATE BP-3
1 1/2" = 1'-0"



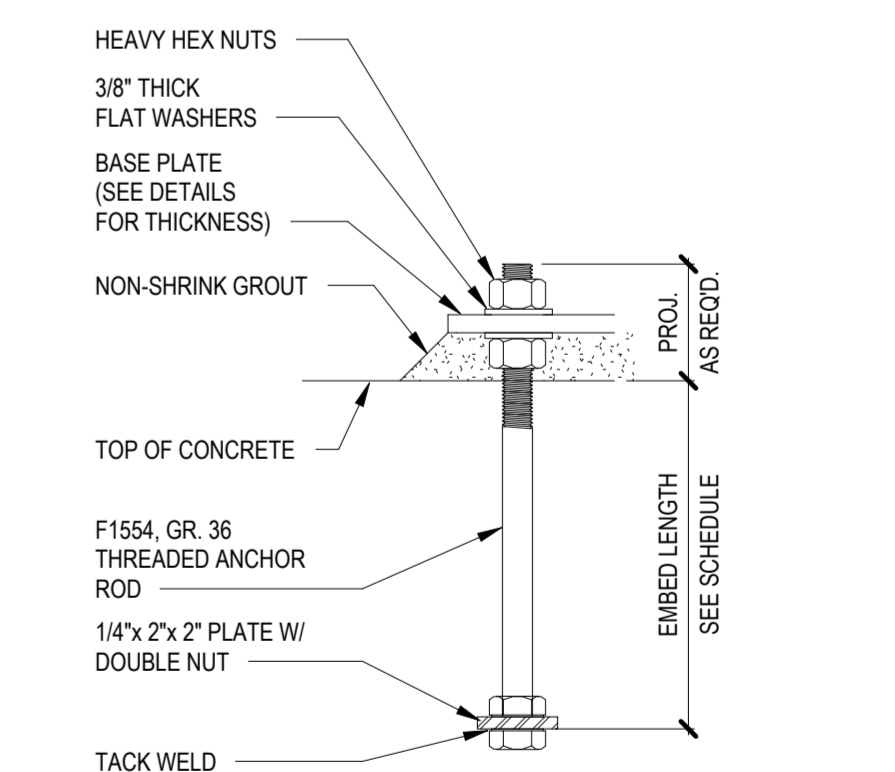
1 SLAB ON GRADE CONTROL JOINT DETAIL
3/4" = 1'-0"



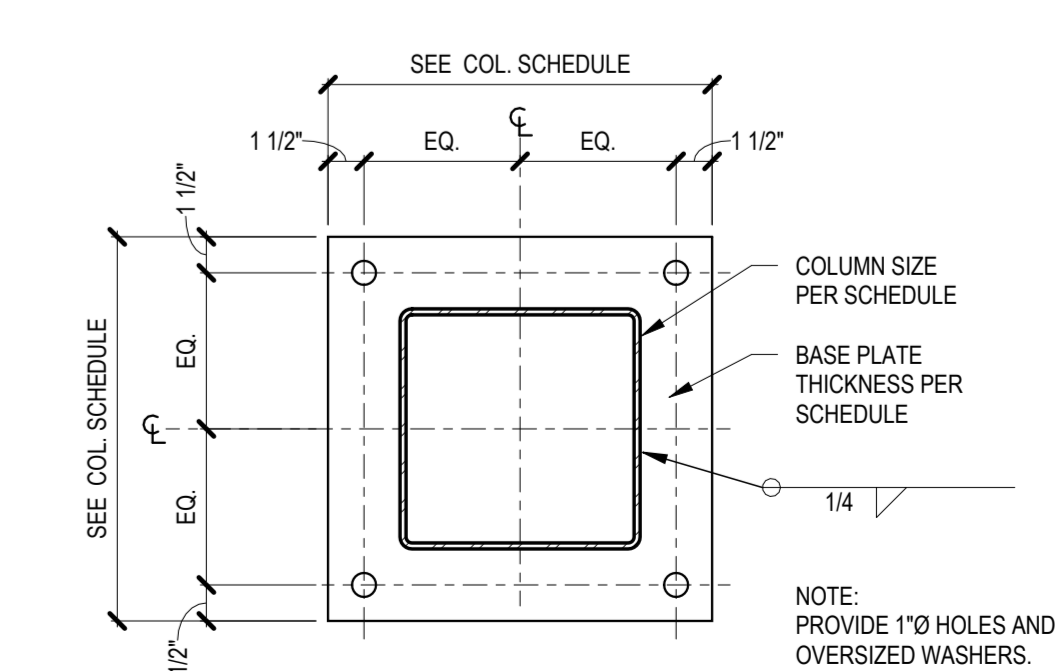
2 SLAB ON GRADE CONSTRUCTION JOINT DETAIL
3/4" = 1'-0"



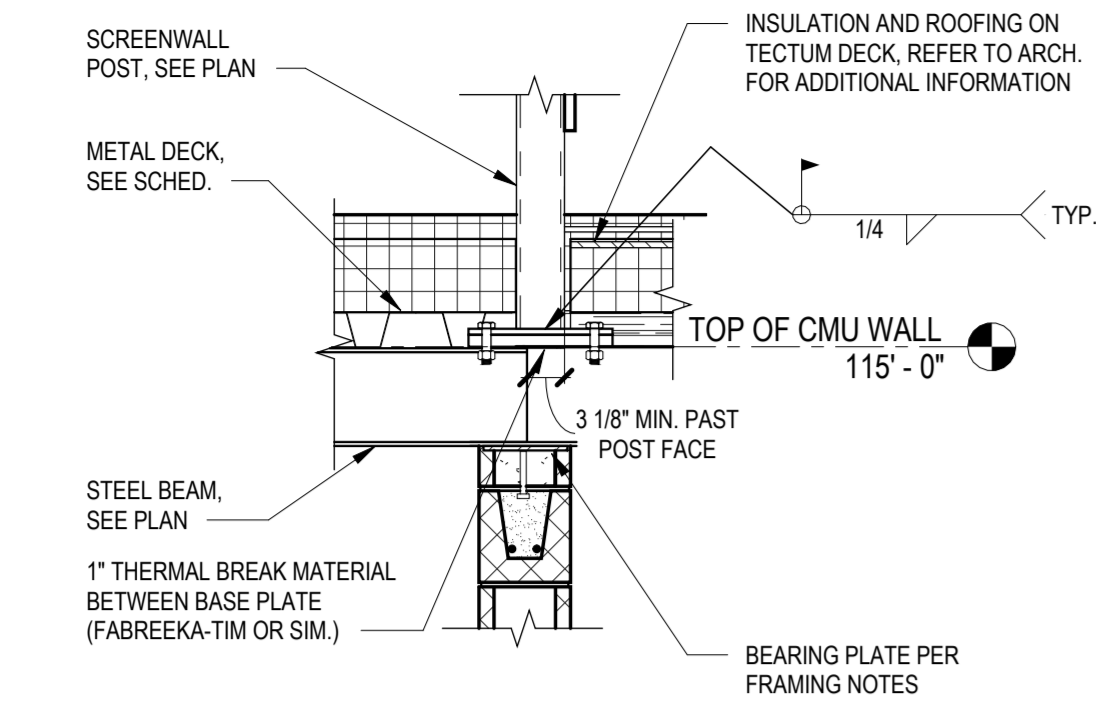
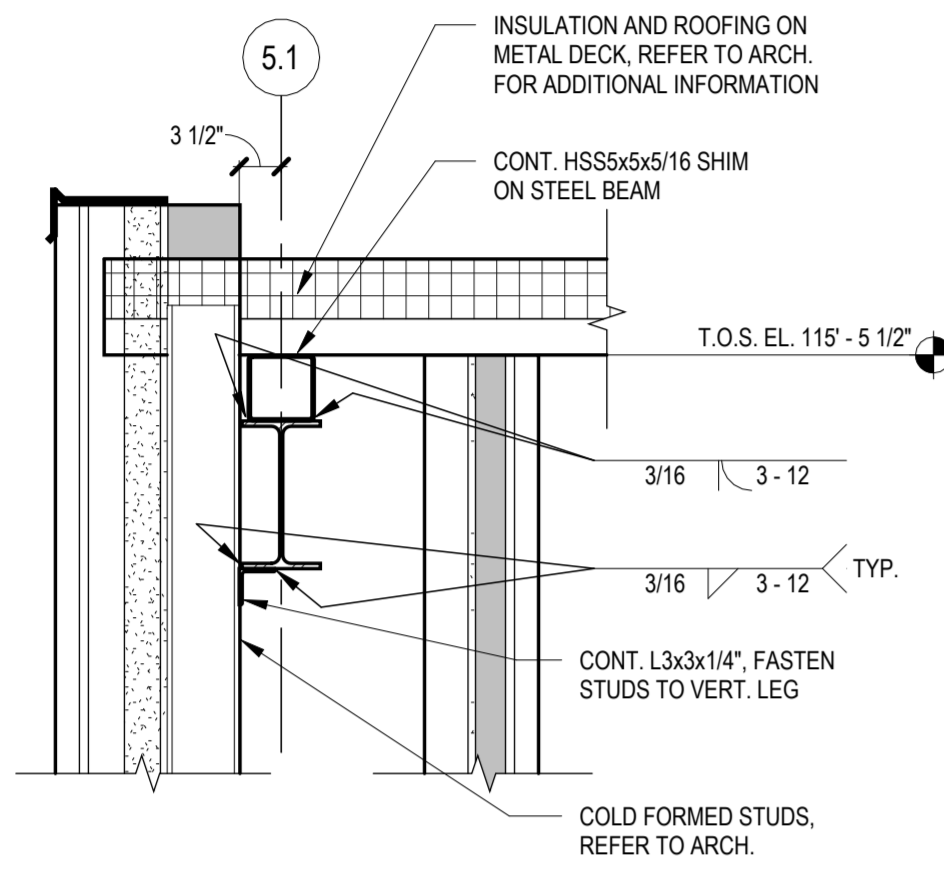
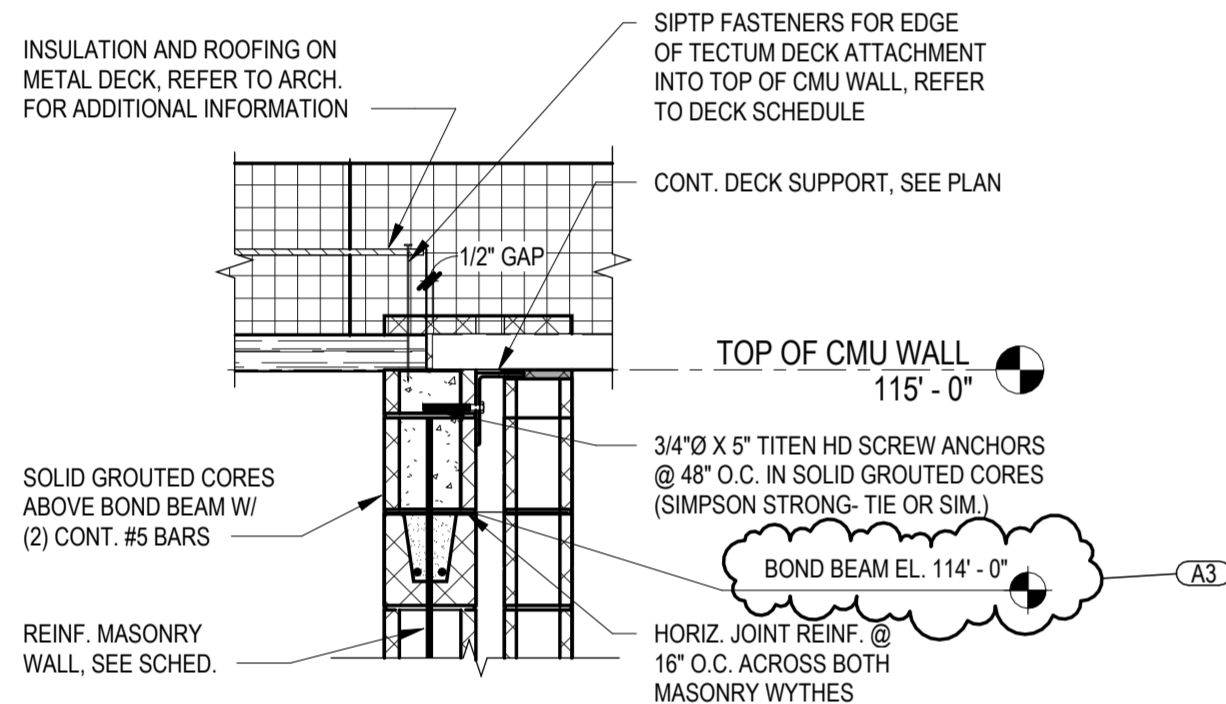
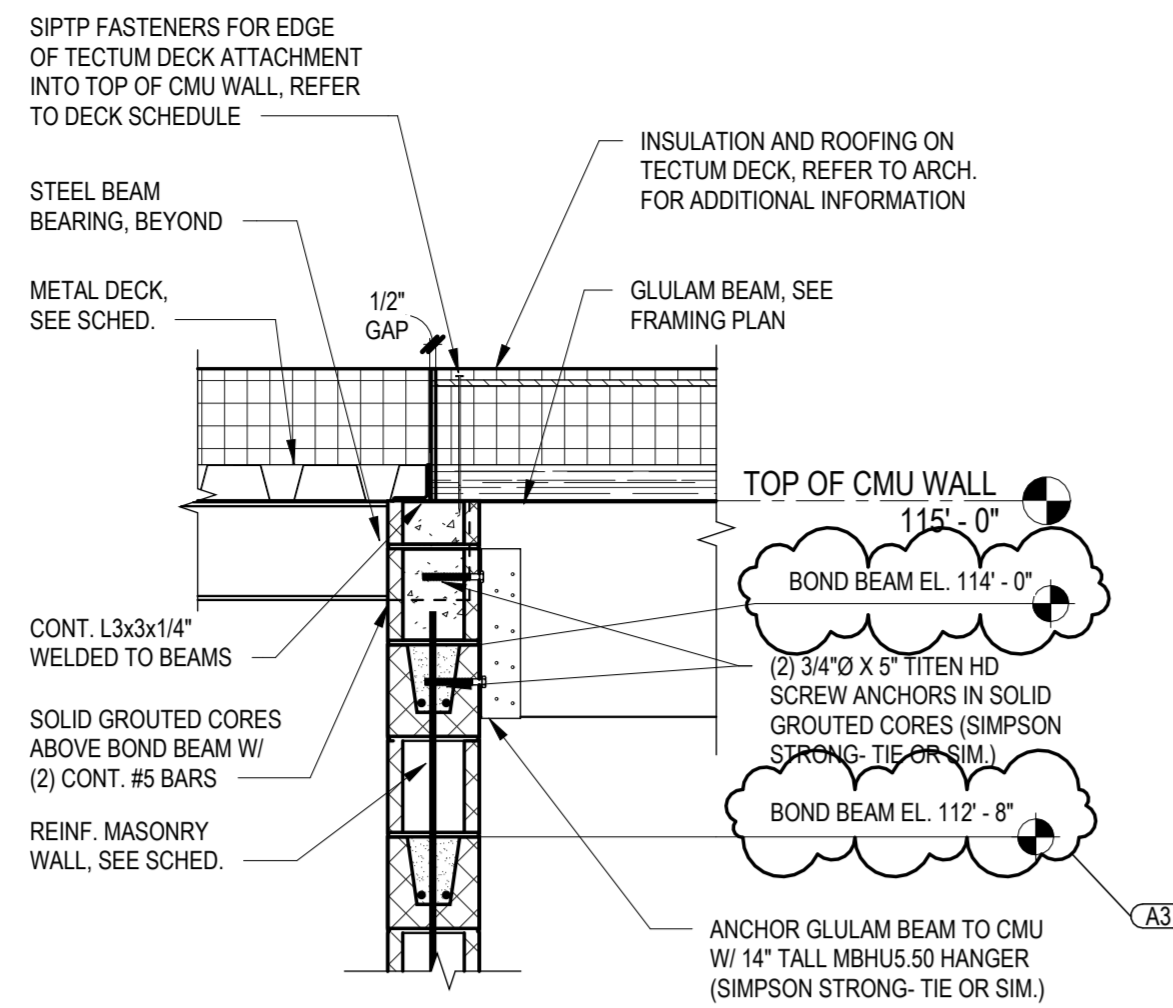
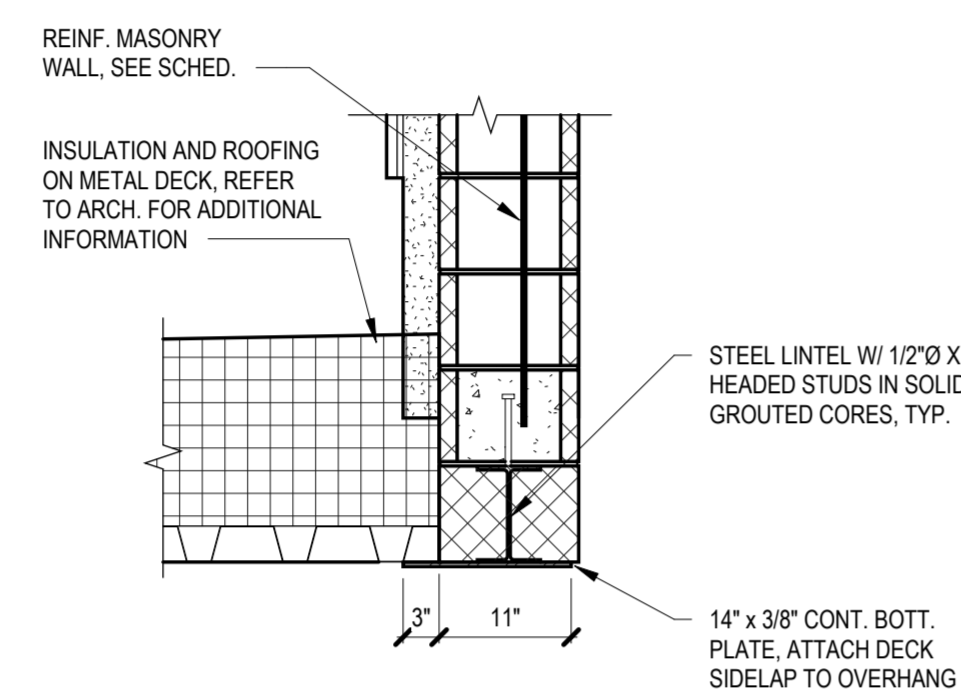
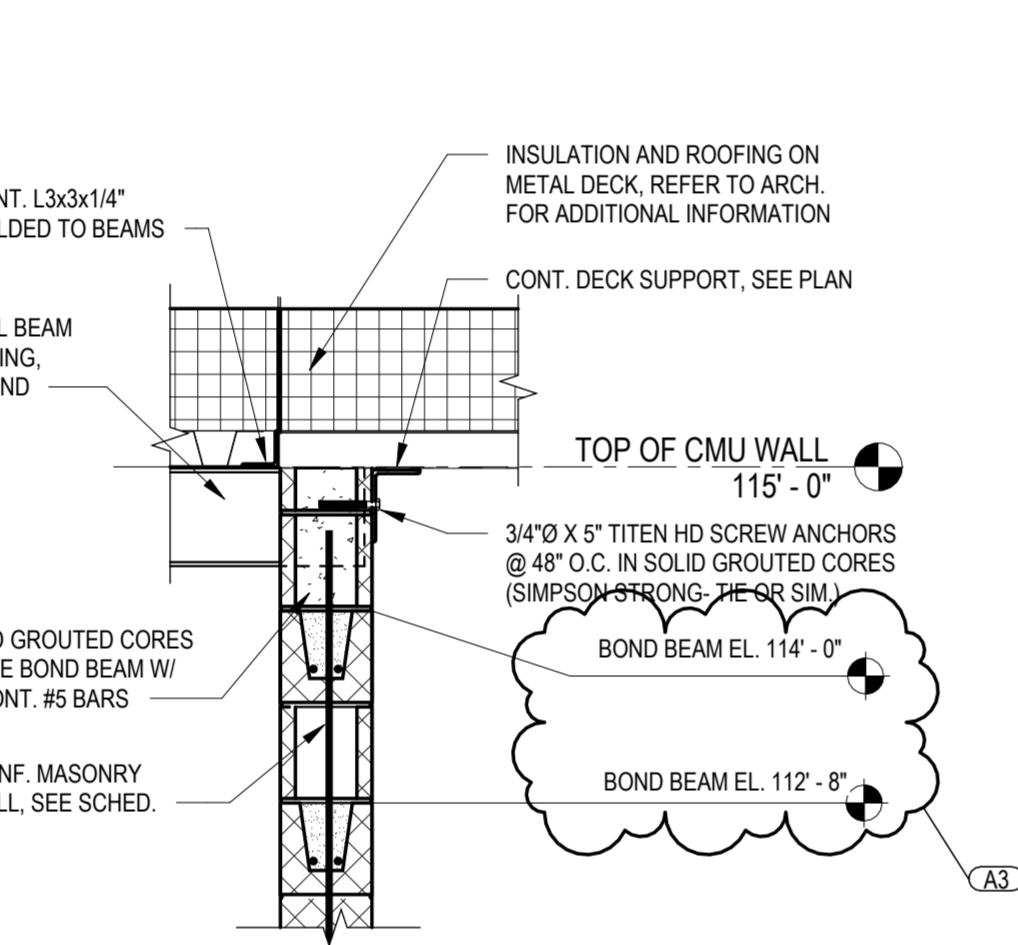
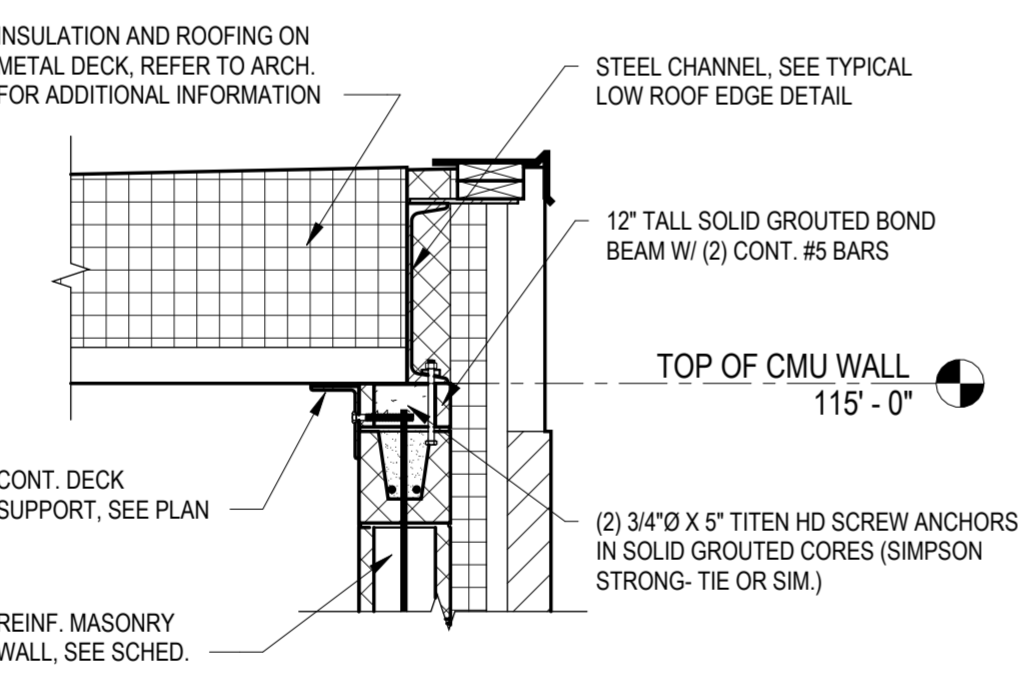
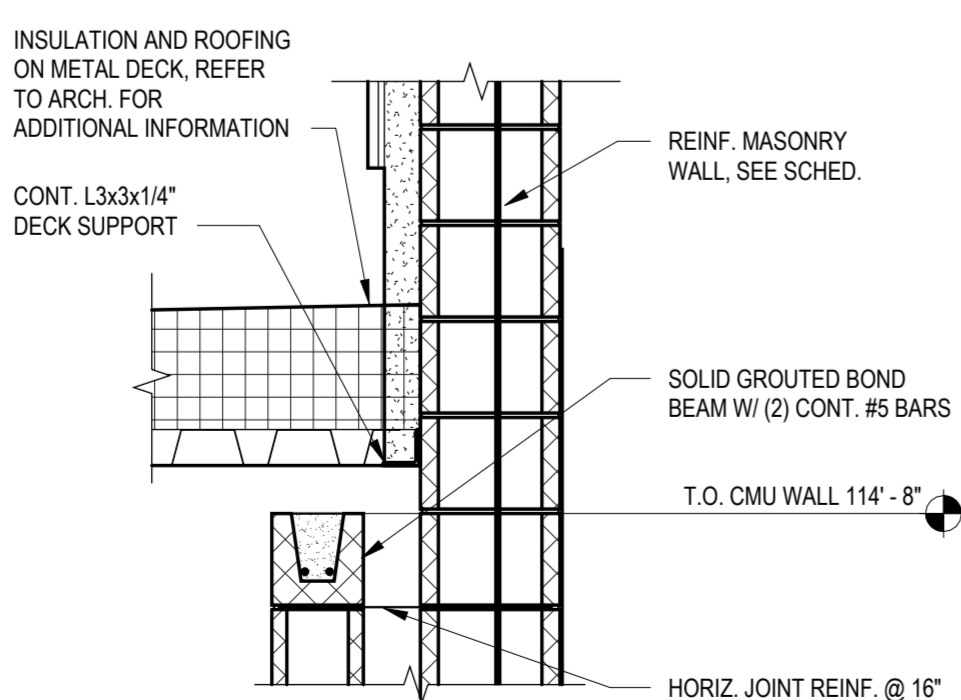
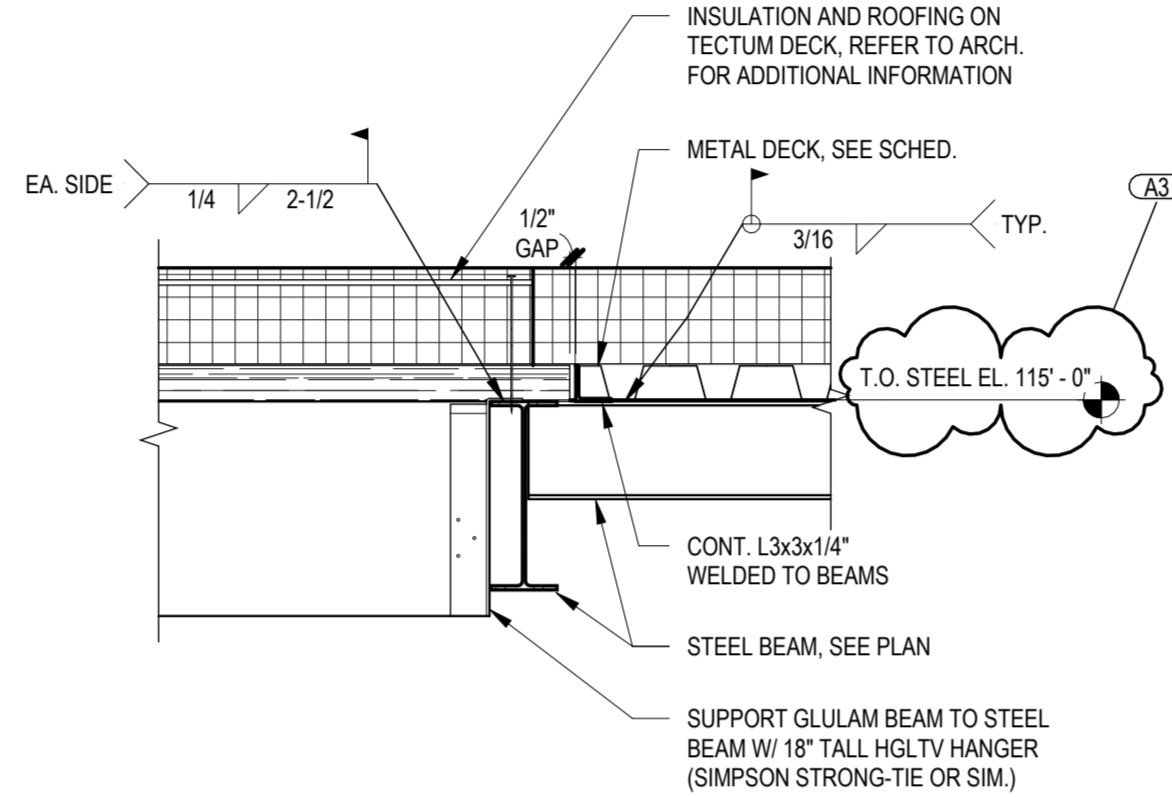
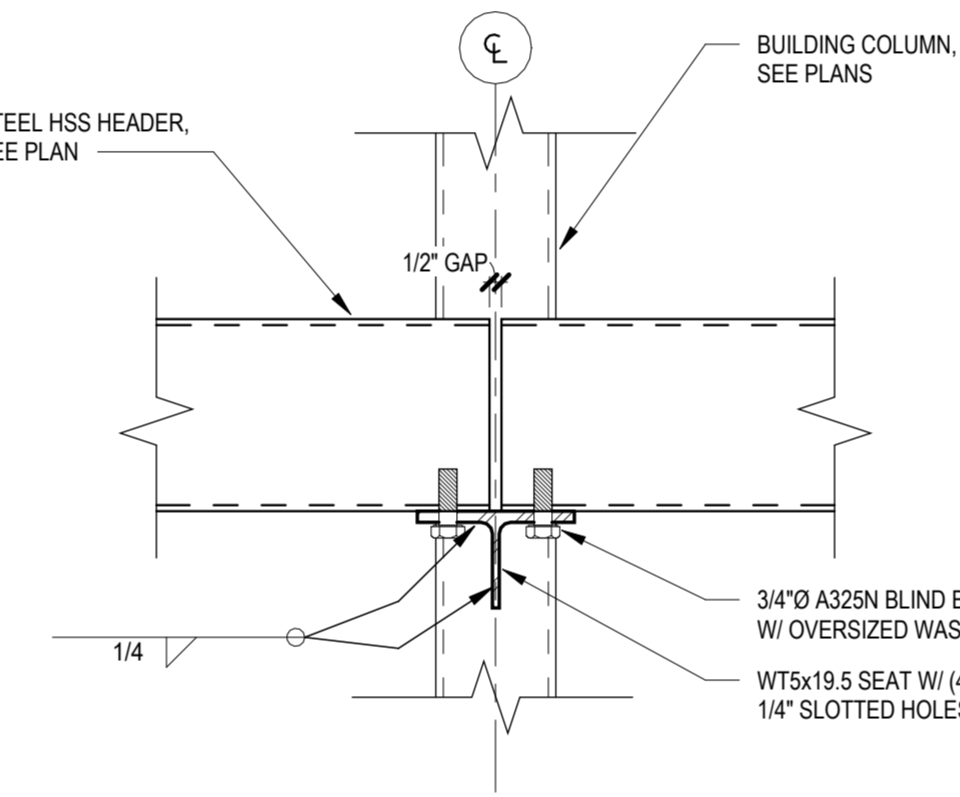
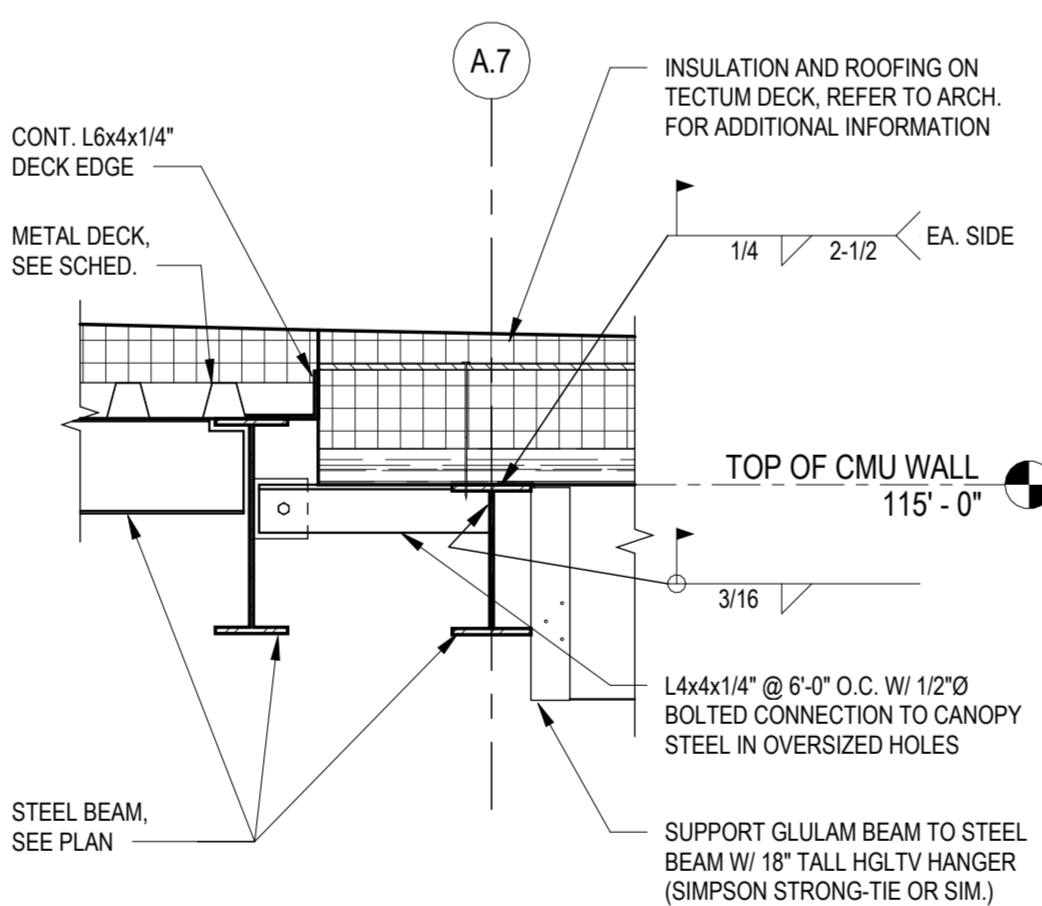
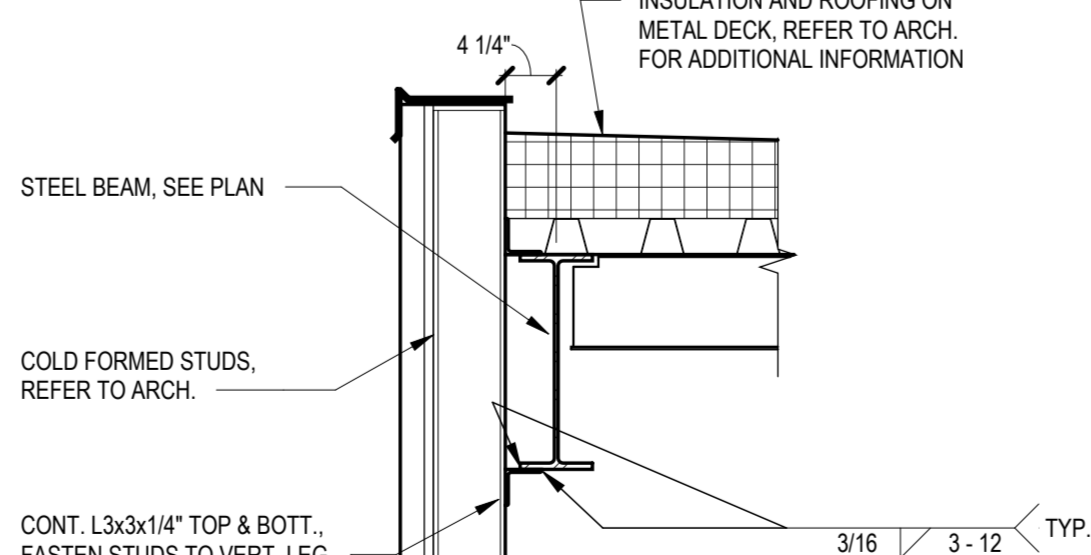
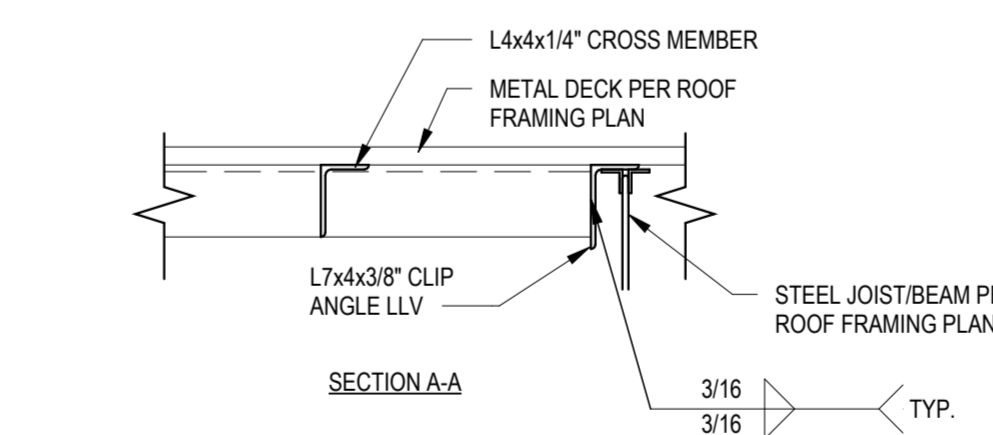
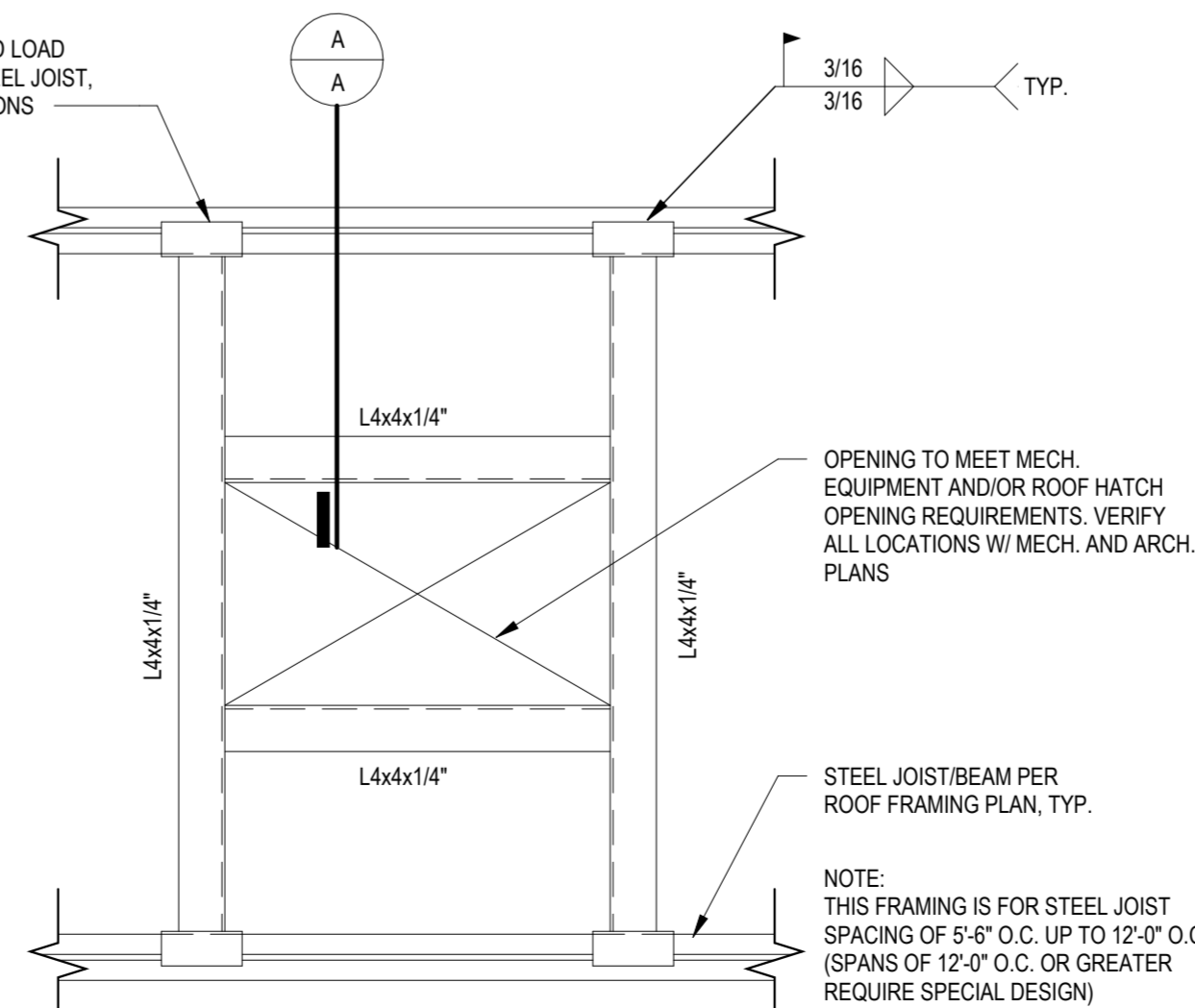
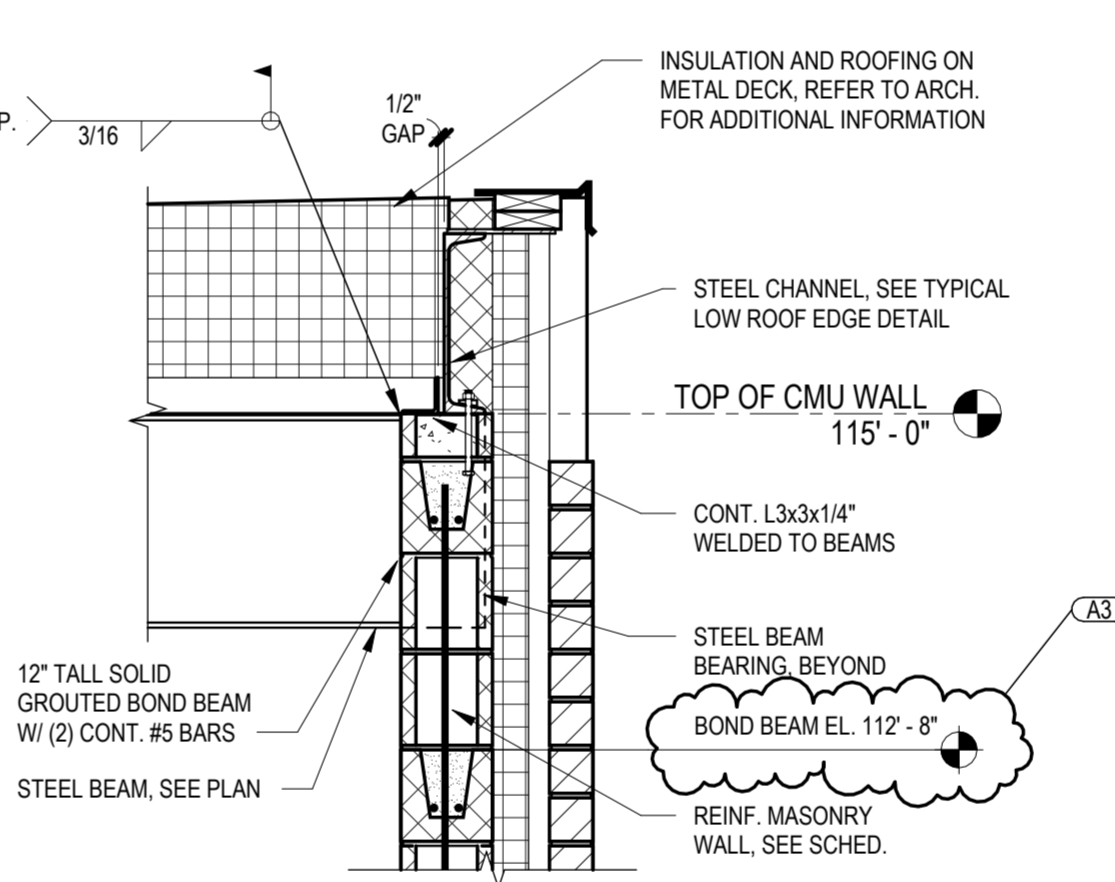
3 PIPE PENETRATION DETAIL
3/4" = 1'-0"



4 ANCHOR ROD DETAIL
1 1/2" = 1'-0"



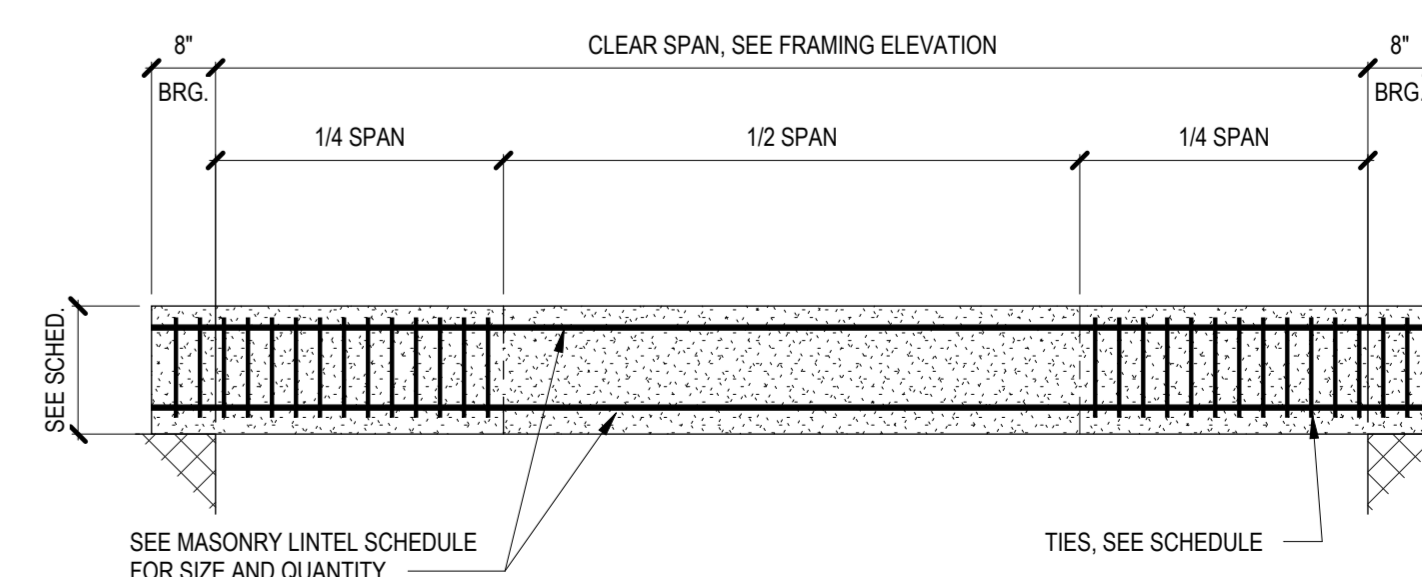
5 BASE PLATE BP-1
1 1/2" = 1'-0"

17 TYPICAL SCREENWALL POST SUPPORT
3/4" = 1'-0"18 CANOPY ROOF EDGE - NORTH
3/4" = 1'-0"19 TOP OF VESTIBULE WALL
3/4" = 1'-0"12 INTERIOR GLULAM FRAMING DETAIL
3/4" = 1'-0"13 LINTEL DETAIL AT CAFETERIA
3/4" = 1'-0"14 INTERIOR DECK BEARING ANGLE
3/4" = 1'-0"15 EXTERIOR EDGE OF METAL ROOF DECK
3/4" = 1'-0"16 WALL BRACING AT LOW ROOF
3/4" = 1'-0"7 ROOF FRAMING DETAIL
3/4" = 1'-0"8 GLULAM HANGER AT STEEL BEAM
3/4" = 1'-0"9 TYPICAL HEADER CLIP DETAIL
NOT TO SCALE10 ROOF TRANSITION AT CANOPY
3/4" = 1'-0"11 CANOPY ROOF EDGE - EAST
3/4" = 1'-0"5 ROOF BEAM END BEARING
3/4" = 1'-0"6 FRAMING @ ROOF OPENING
NOT TO SCALE7 TYP. STEEL LINTEL BEARING DETAIL
3/4" = 1'-0"4 GLULAM HANGER AT EXTERIOR WALL
3/4" = 1'-0"

MISCELLANEOUS MASONRY LINTEL SCHEDULE			
SPAN	CMU WIDTH	SIZE	REINFORCING
0 TO 4'-0"	8"	(1) BEAM 8" WIDE x 8" DEEP	(2) #5 BARS CONT.
	12"	(1) BEAM 12" WIDE x 8" DEEP	(3) #5 BARS CONT.
4'-1" TO 10'-0"	8"	(1) BEAM 8" WIDE x 16" DEEP	(2) #5 BARS CONT.
	12"	(1) BEAM 12" WIDE x 16" DEEP	(3) #5 BARS CONT.
10'-1" TO 14'-0"	8"	(1) BEAM 8" WIDE x 24" DEEP	(2) #5 BARS BOTTOM, CONT. (2) #5 BARS TOP, CONT. #4 TIES @ 8" O.C.
	12"	(1) BEAM 12" WIDE x 24" DEEP	(3) #5 BARS CONT.

NOTES:

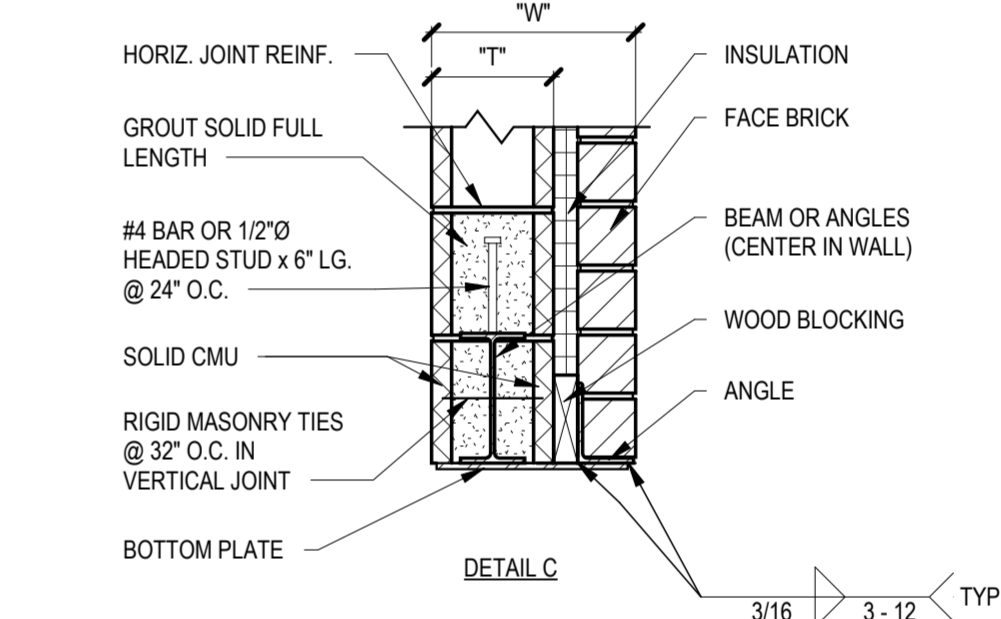
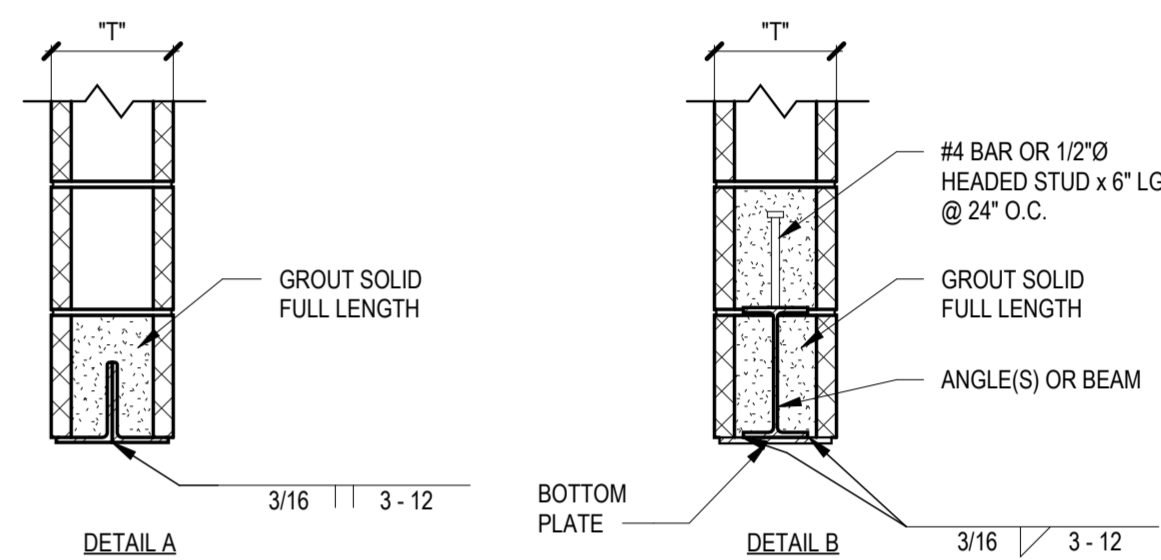
- BOND BEAMS TO EXTEND A MINIMUM OF 8" PAST MASONRY OPENINGS EXCEPT WHERE BEAM TERMINATES INTO PERPENDICULAR WALL. AT THESE LOCATIONS BOND BEAM (AND GROUTED COURSE IF APPLICABLE) TO EXTEND FULL DEPTH OF PERPENDICULAR WALL.
- DISTANCE FROM REINFORCING BARS TO BOTTOM OF BOND BEAM = 2 INCHES CLEAR.
- ON ALL BOND BEAMS THAT HAVE SOLID GROUTED COURSE ABOVE, PROVIDE #4 BENT VERTICAL BARS AT EACH END AND AT 16" O.C. MAXIMUM.
- ALL BOND BEAMS TO BE SHORED FOR A MINIMUM OF 7 DAYS.
- FOR OPENINGS 16 INCHES AND SMALLER, PROVIDE SOLID GROUTED BOND BEAM WITH (2) #5 BARS WITH 8" MIN. BEARING EACH SIDE OF OPENING.
- MAXIMUM UNIFORM LOAD NOT TO EXCEED 520LB/FT FOR 8" WIDE WALLS & 780LB/FT FOR 12" WALLS

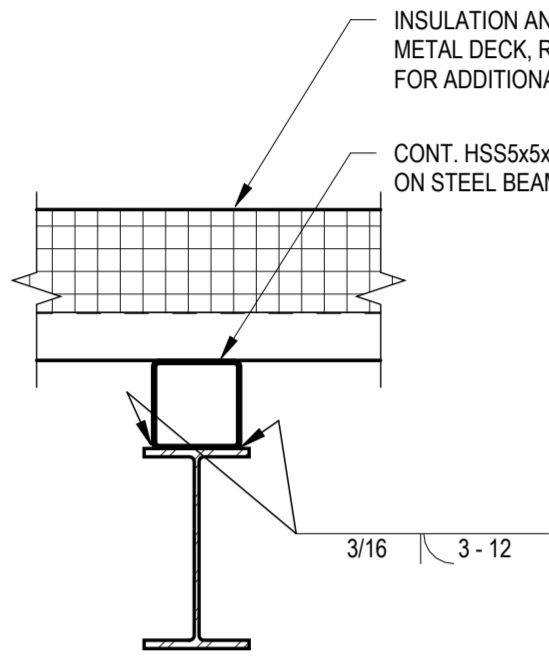
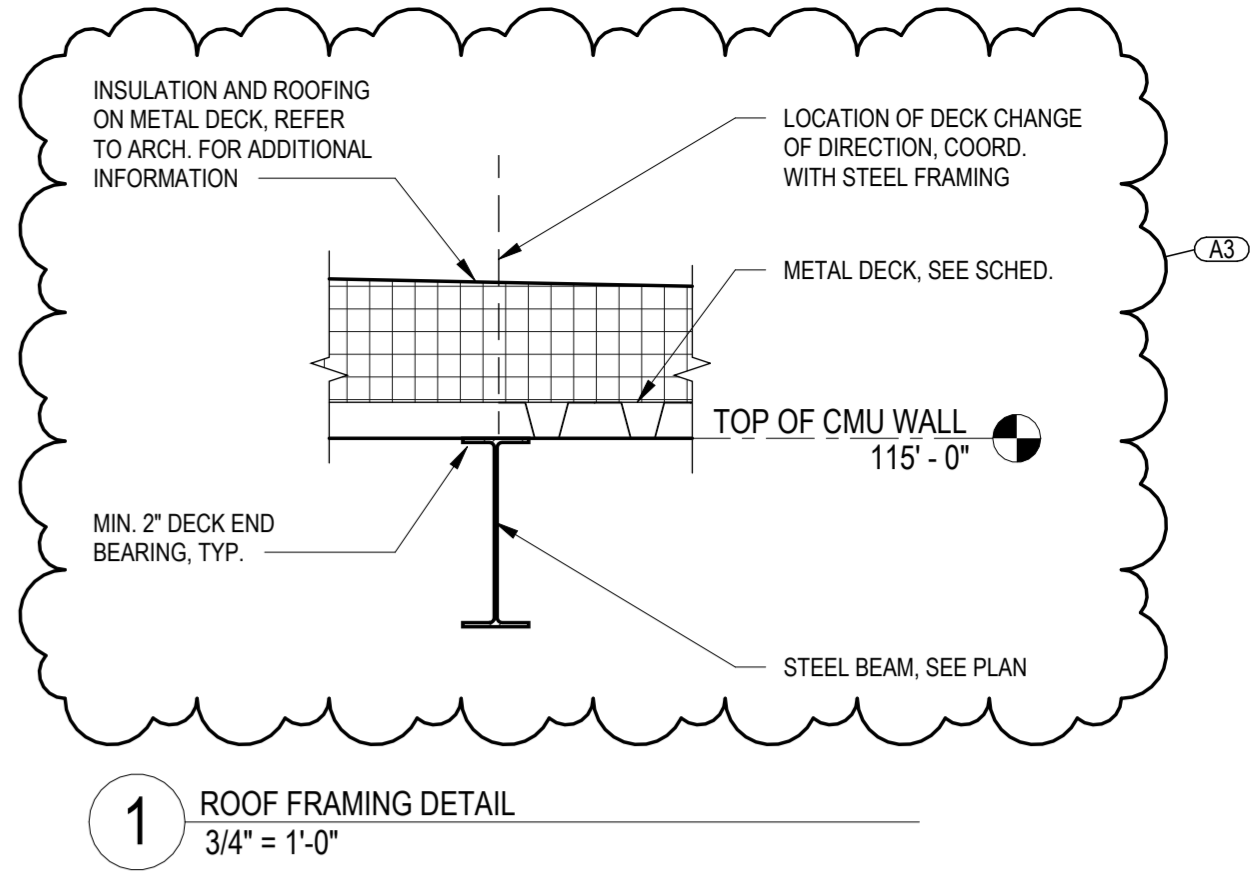
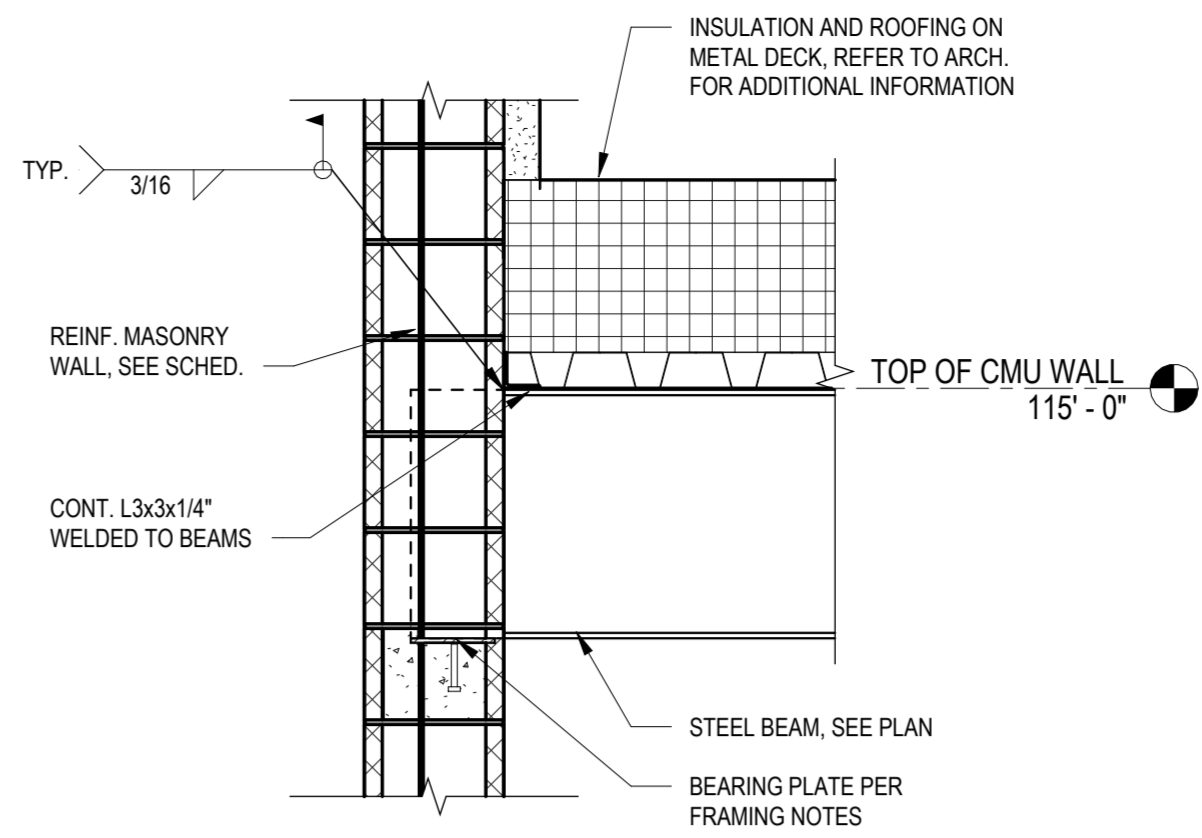
2 MASONRY LINTEL SCHEDULE
NOT TO SCALE

MISCELLANEOUS STEEL LINTEL SCHEDULE						
SPAN	WITHOUT FACE BRICK			WITH FACE BRICK		
	T	DESCRIPTION	DETAIL	T	DESCRIPTION	DETAIL
0 TO 6'-0"	6"	(2) L3 1/2 x 2 1/2 x 5/16" (LLV)	A	6"	(1) WT7x13 & L4 x 3 1/2 x 5/16" (LLV) WITH 3/8" x (W-1") PLATE	C
	8"	(2) L3 1/2 x 3 1/2 x 5/16"	A	8"	(3) L3 1/2 x 3 1/2 x 5/16" WITH 3/8" x (W-1") PLATE	C
	10"	L4 x 3 x 5/16 & L5 x 3 x 5/16" (SLV)	A	10"	(3) L4 x 4 x 5/16" WITH 3/8" x (W-1") PLATE	C
	12"	(2) L4 x 4 x 5/16" WITH 3/8" x 1" PLATE	B	12"	(3) L4 x 4 x 5/16" WITH 3/8" x (W-1") PLATE	C
6'-1" TO 8'-0"	6"	(1) WT7x13 (CENTERED)	A	6"	(1) WT7x13 & L4 x 3 1/2 x 5/16" (LLV) WITH 3/8" x (W-1") PLATE	C
	8"	(2) L5 x 3 1/2 x 5/16"	A	8"	(3) L5 x 3 1/2 x 5/16" (LLV) WITH 3/8" x (W-1") PLATE	C
	10"	L4 x 4 x 5/16" & L5 x 5 x 5/16"	A	10"	WBx10 & L4 x 3 1/2 x 5/16" (LLV) WITH 3/8" x (W-1") PLATE	C
	12"	WBx10 WITH 3/8" x 1" PLATE	B	12"	WBx10 & L4 x 3 1/2 x 5/16" (LLV) WITH 3/8" x (W-1") PLATE	C
8'-1" TO 10'-0"	6"	WT8x15.5 (CENTERED)	B			
	8"	WBx15 WITH 3/8" x 7" PLATE	A	8"	WBx15 & L5 x 3 1/2 x 5/16" (LLV) WITH 3/8" x (W-1") PLATE	C
	10"	WBx15 WITH 3/8" x 9" PLATE	B	10"	WBx15 & L5 x 3 1/2 x 5/16" (LLV) WITH 3/8" x (W-1") PLATE	C
	12"	WBx15 WITH 3/8" x 11" PLATE	B	12"	WBx15 & L5 x 3 1/2 x 5/16" (LLV) WITH 3/8" x (W-1") PLATE	C

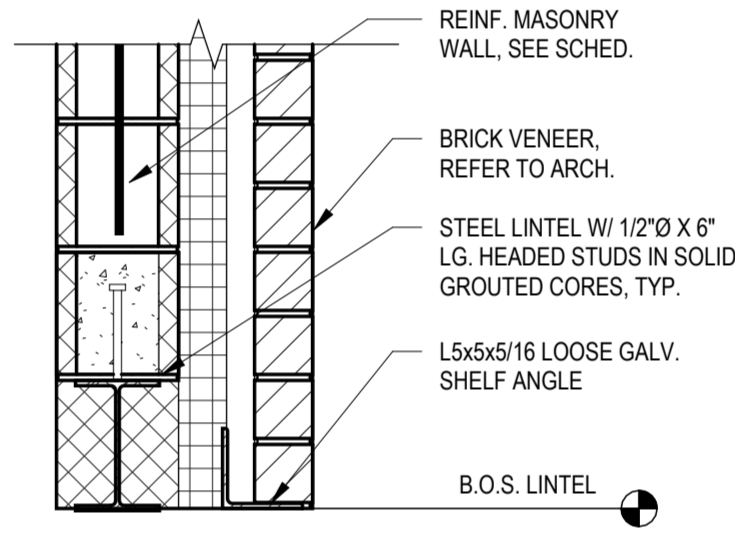
NOTES:

- DETAIL A & B LINTELS TO BEAR A MINIMUM OF 8" ON FULLY GROUTED COURSES OF SOLID MASONRY. LINTELS SPANNING 6'-0" OR MORE TO BEAR ON FULLY GROUTED CORES FULL HEIGHT OF JAMB.
- ALL LINTELS AT EXTERIOR LOCATIONS OR OTHERWISE SUBJECT TO WEATHER OR CORROSIVE ATMOSPHERE TO BE GALVANIZED. LINTELS CONSISTING OF A PLATE AND ROLLED BEAM W8 AND SMALLER TO HAVE BOTH PLATE AND BEAM GALVANIZED AFTER WELDING. LINTELS CONSISTING OF A PLATE AND ROLLED BEAM LARGER THAN W8 TO HAVE PLATE GALVANIZED AND BEAM PAINTED WITH SHOP PRIMER. ALL ANGLES TO BE GALVANIZED.
- LINTELS UTILIZING BOTTOM PLATES TO HAVE PLATE EXTEND FULL LENGTH OF MASONRY OPENING ONLY. BOTTOM PLATES ARE NOT TO EXTEND INTO JAMBS OF WALL OPENINGS.
- FOR OPENINGS 16 INCHES AND SMALLER, PROVIDE SOLID GROUTED BOND BEAM WITH (2) #5 BARS WITH 8" MIN. BEARING EACH SIDE OF OPENING.

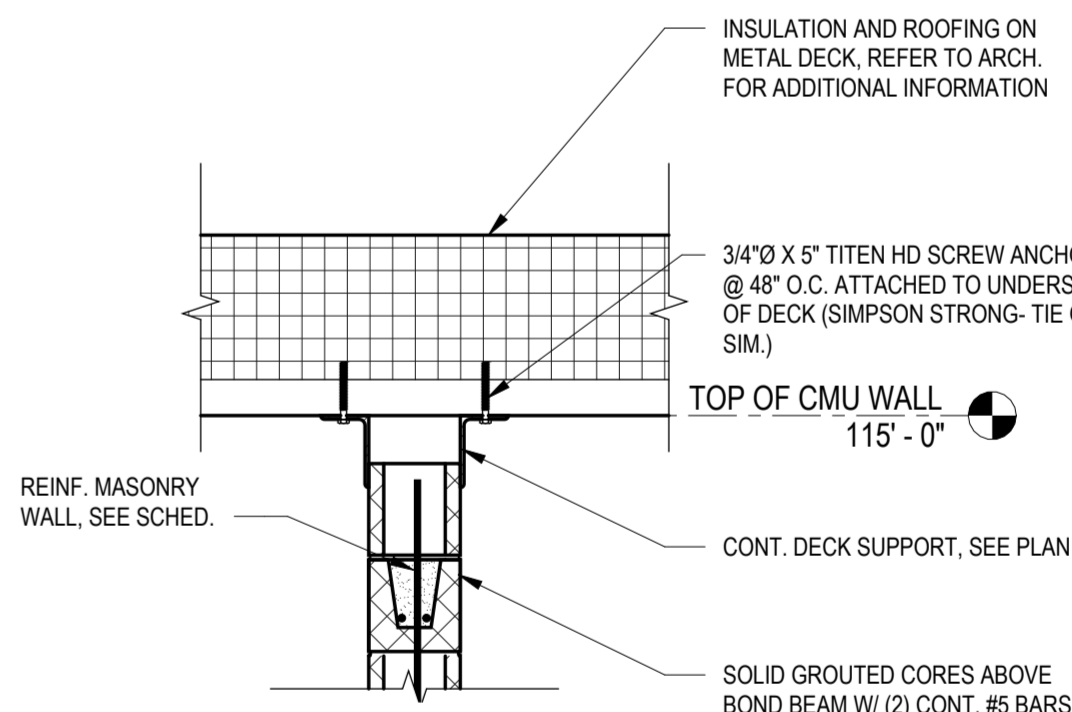




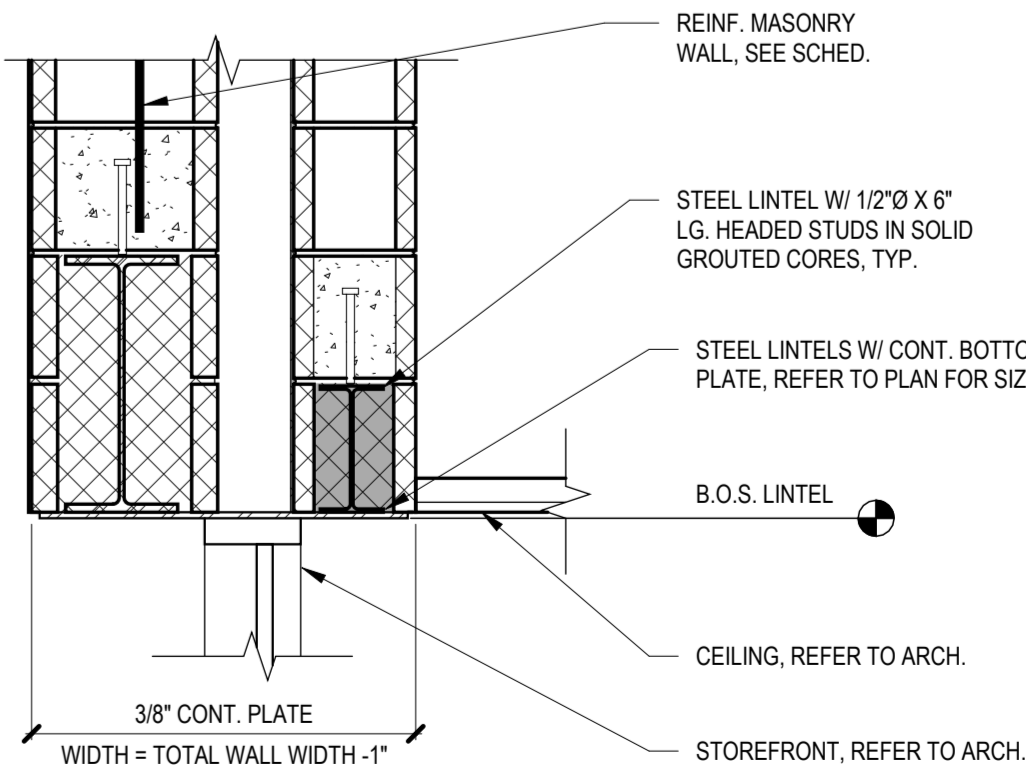
2 BUILT-UP CANOPY BEAM
1" = 1'-0"



3 LINTEL DETAIL - EXTERIOR WALL
1" = 1'-0"



4 CMU PARTITION WALL BRACING
3/4" = 1'-0"



5 STEEL LINTEL AT DOUBLE WALL
1" = 1'-0"

REVISIONS		
REV	DESCRIPTION	DATE
A1	ADDENDUM 1	21.01.2023
A2	ADDENDUM 2	20.03.2023

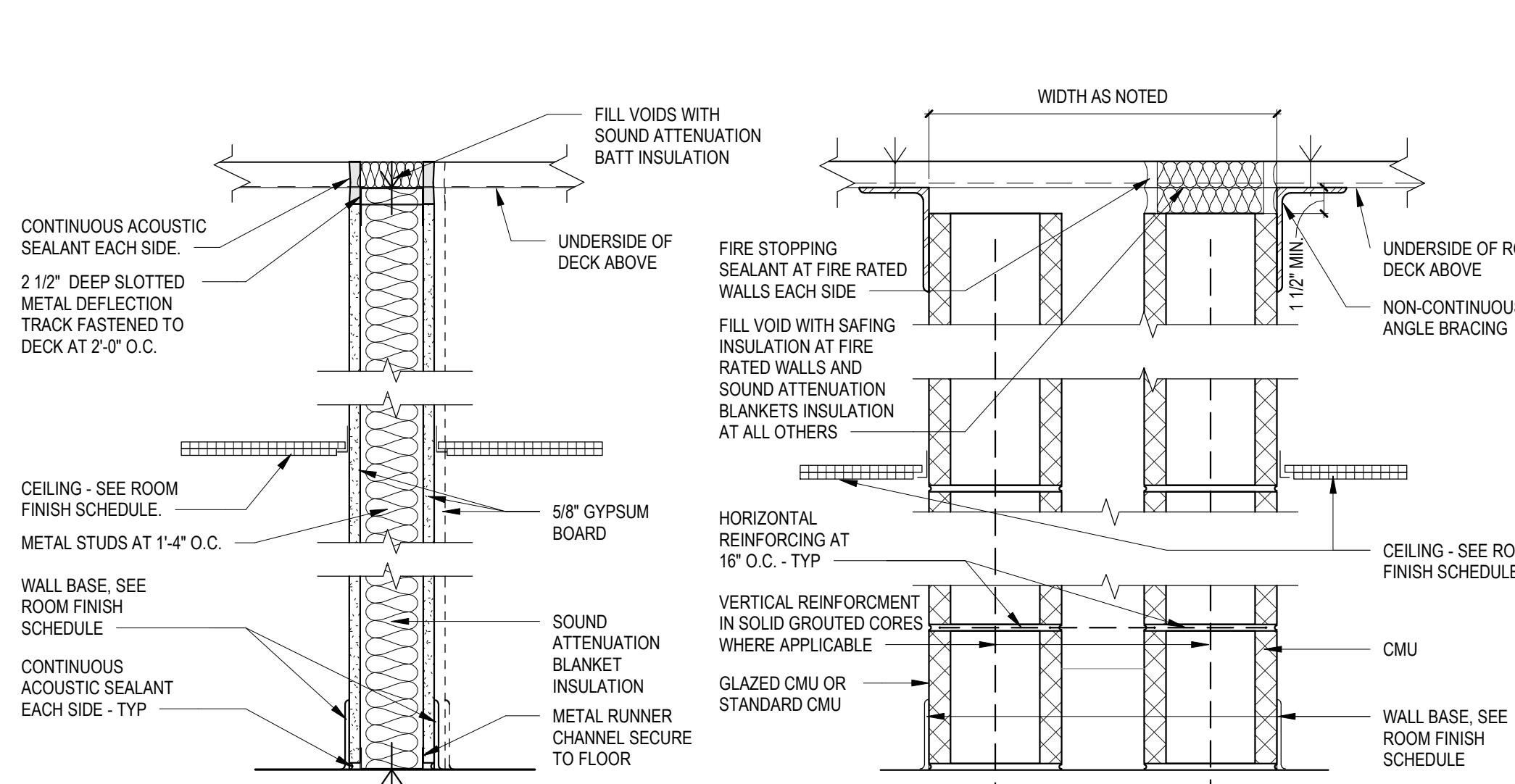
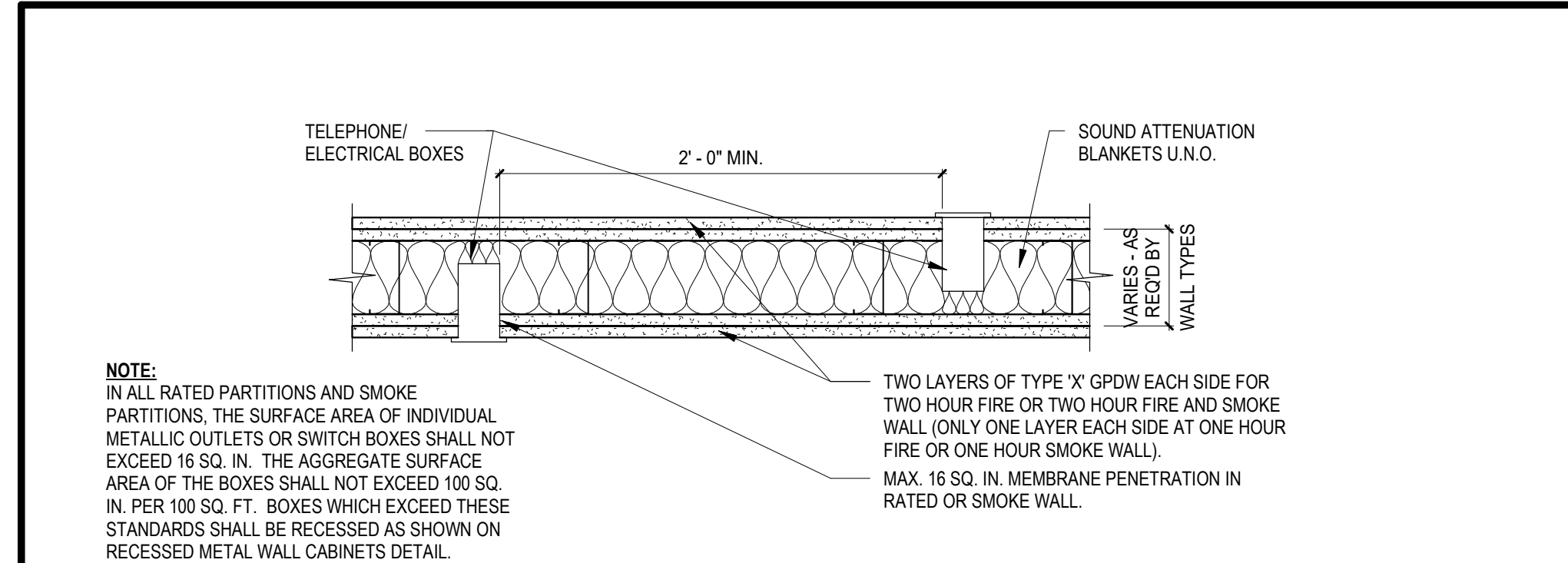
PROJ. #:	220116
DATE:	23-JUN-2023
SHEET	

S-503

Addendum #3

LANSING SCHOOL DISTRICT
Mt. Hope
1215 E Mt Hope Ave, Lansing, MI 48910

FRAMING DETAILS

**PARTITION TYPE 'S5A'**
(NON-RATED / 3 5/8" METAL STUDS)**PARTITION TYPE 'S5B'**
(NON-RATED / 6" METAL STUDS)**PARTITION TYPE 'S5C'**
(NON-RATED / SOUND-RATED / 6" METAL STUDS)
(2-LAYERS OF GYP. ON ONE SIDE)**PARTITION TYPE 'M4A'**
(NON-RATED / SMOKE TIGHT / 8" CMU WITH 6" CMU
(1/2" FULL WIDTH))**PARTITION TYPE 'M4B'**
(NON-RATED / SMOKE TIGHT / 12" CMU WITH 8" CMU
(2-4" FULL WIDTH))**PARTITION TYPE 'M4C'**
(NON-RATED / SMOKE TIGHT / 12" CMU WITH 6" BURNISHED BLOCK (ONE SIDED FACING CORRIDOR, U.N.O.)) (2-4" FULL WIDTH)**PARTITION TYPE 'M4D'**
(NON-RATED / SMOKE TIGHT / 8" CMU WITH 6" BURNISHED BLOCK (ONE SIDED FACING CORRIDOR, U.N.O.)) (1-6" FULL WIDTH)**PARTITION TYPE 'M4E'**
(NON-RATED / SMOKE TIGHT / 6" CMU WITH 4" BRICK A (RUNNING BOND))**PARTITION TYPE 'M2A'**
(NON-RATED / 4" BURNISHED BLOCK (ONE SIDED FACING CORRIDOR, U.N.O.))**PARTITION TYPE 'M2B'**
(NON-RATED / SMOKE TIGHT / 8" CMU)**PARTITION TYPE 'M2C'**
(NON-RATED / SMOKE TIGHT / 12" CMU)**PARTITION TYPE 'M2D'**
(NON-RATED / SMOKE TIGHT / 8" BURNISHED BLOCK (ONE SIDED FACING CORRIDOR, U.N.O.))**PARTITION TYPE 'M2E'**
(NON-RATED / 6" CMU)**PARTITION TYPE 'M2F'**
(NON-RATED / SMOKE TIGHT / 12" BURNISHED BLOCK (ONE SIDED FACING CORRIDOR, U.N.O.))**PARTITION TYPE 'M2G'**
(NON-RATED / 4" CMU)**PARTITION TYPE 'M2H'**
(NON-RATED / 6" BURNISHED BLOCK (ONE-SIDED FACING CORRIDOR, U.N.O.))**ELECTRICAL/TELEPHONE BOXES IN RATED AND/OR SMOKE WALLS**
NOT TO SCALE

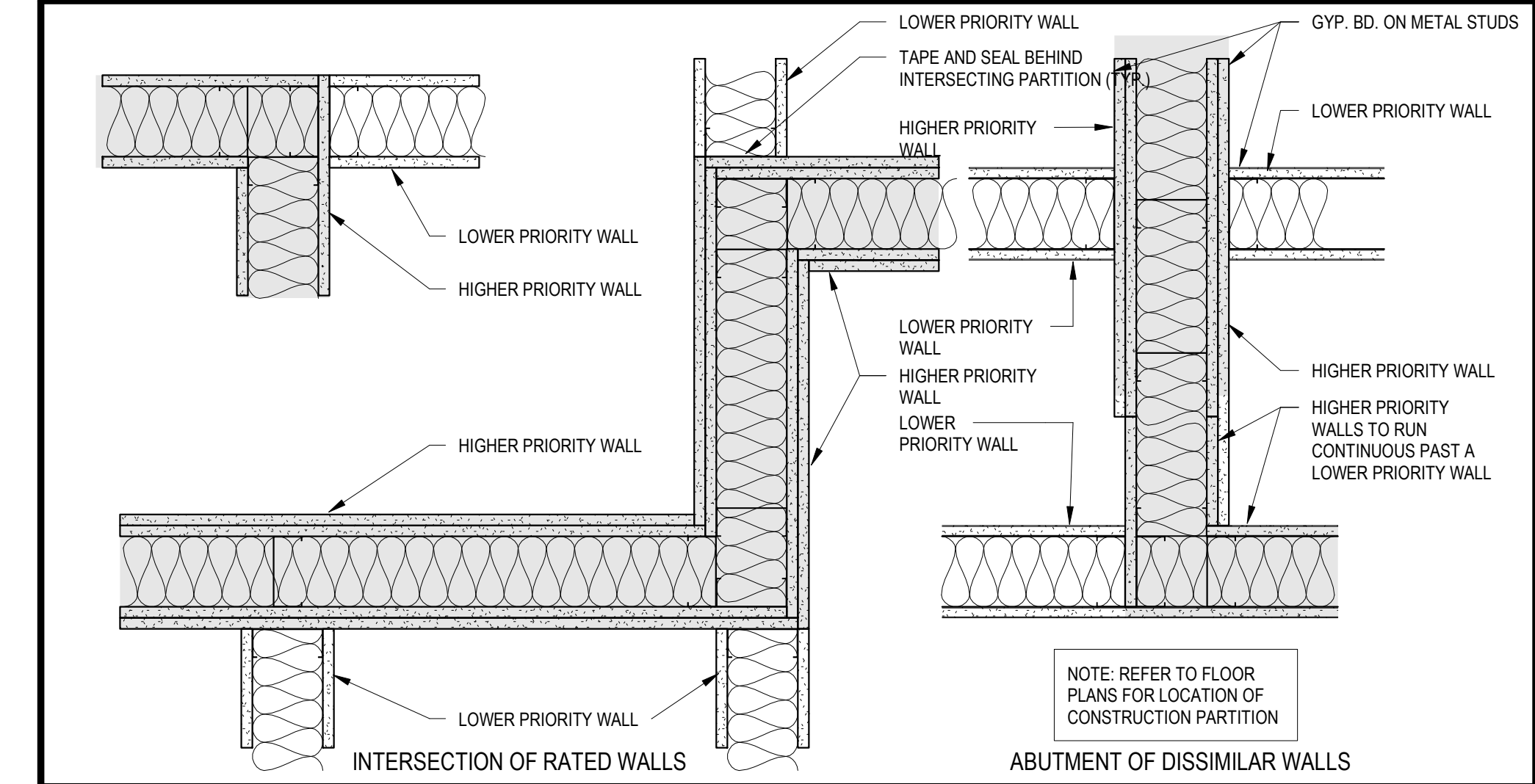
NOTE: REFER TO FLOOR PLANS FOR LOCATION OF CONSTRUCTION PARTITION

ABBREV.	FULL TEXT
AB	ANCHOR BOLT
ABI	ADDITIVE BID ITEM
AC	ACROUSTICAL
ACB	ACROUSTICAL CEILING BAFFLE
ACP	ACROUSTICAL CEILING SPRAY
ACS	ACROUSTICAL CEILING SPRAY
AD	AREA DRAIN
ADN	AREA DRAIN
AFF	ABOVE FINISHED FLOOR
AL	ALUMINUM
ALUM	ALUMINUM
AP	ACCESS DOORS
APPROX	APPROXIMATE
ARCH	ARCHITECTURAL
ASPH	ASPHALT
AWP	ACROUSTICAL WALL PANEL
BD	BOARD
BF	BARRIER FREE
BIT	BITUMINOUS
BL	BUILDING LINE
BLDG	BUILDING
BLUHD	BLUHD
BOTT	BOTTOM
BP	BASE PLATE
BR	BUMP RAIL
BS	BOTH SIDES
BUR	BUILT UP ROOFING
CAB	CABINET
CB	CATCH BASIN
CEM	CEMENT
CG	CORNER GUARD
CH	CHANNEL
CHKDPL	CHECKED PLATE
CL	CONTROL JOINT
CL	CENTERLINE
CL TO CL	CENTERLINE TO CENTERLINE
CLG	CEILING
CLK	CAULKING
CLR	CLEAR
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT
COB	COLUMN
COMP	COMPRESSIBLE
COMPO	COMPOSITION
CONC	CONCRETE
CONN	CONNECT, CONNECTION
CONST	CONSTRUCTION
CONST JT	CONSTRUCTION JOINT
CONT	CONTINUOUS
CONTR	CONTRACTOR
CPT	CARPET TILE
CS	CONCRETE SEALER
CTR	COUNTER
CTSK	COUNTERSINK
DEKS	DOUBLE EXTRA STRONG (STEEL PIPE)
DF	DRINKING FOUNTAIN
DI	DIAMETER
DIFF	DIFFUSER
DN	DOWN
DO	DOOR OPENING
DO	DOOR
DR	DRAPERY
DR	DOOR
DS	DOWN SPOUT
DT	DRAIN TILE
DTL	DETAIL
DWG	DRAWING
DWR	DRAWER
E	EAST
EA	EACH
EIFS	EXTERIOR INSULATION AND FINISH SYSTEMS
EJ	EXPANSION JOINT
EL	ELEVATION
ELECT	ELECTRICAL
ELEV	ELEVATOR OR ELEVATION
ENCL	ENCLOSURE
EP	EPOXY PAINT
EPS	EXTERIOR PAINT SYSTEM
EQ	EQUAL
EQUIP	EQUIPMENT
ES	EXPOSED STRUCTURE
EW	EACH WAY
EWIC	ELECTRICAL WATER COOLER

ABBREV.	FULL TEXT
EX	EXISTING
EXGR	EXISTING GRADE
EXP	EXPANSION
EXS	EXTRA STRONG (STEEL PIPE)
EXT	EXTERIOR
FA	FIRE ALARM
FAB	FABRIC/UPHOLSTERY
FD	FLOOR DRAIN
FDN	FOUNDATION
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FG	FROSTED GLASS
FHS	FIRE HOSE CABINET
FIN	FINISH
FL	FLOOR
FLL	FLOOR LINE
FLUOR	FLUORESCENT
FOC	FACE OF COLUMN
FOCONG	FACE OF CONCRETE
FR	FIBER REINFORCED CONCRETE
FRP	FIBER REINFORCED PANEL
FRFG	FIBER REINFORCED
FS	FULL SIZE
FT	FIRE TREATED
FTG	FOOTING
FUR	FUR
FV	FIELD VERIFY
G.B	GRAB BAR, GRADE BEAM
G.O.	GRILL OPENING
GA	GAUGE
GALV	GALVANIZED
GCT	GLAZED CERAMIC TILE
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GL	GLASS
GND	GROUND
GR	GRADE
GRGTG	GRATING
GSCFT	GLAZED STRUCTURAL CLAY FACING TILE
GT	GROUT
GYP. BD	GYPSUM BOARD
HC	HOLLOW CORE
HOWD	HOLLOW CORE WOOD
HDPB	HIGH DENSITY PARTICLEBOARD
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HP	HIGH POINT
HR	HOUR
HT	HEIGHT
HWD	HARDWARE
I.D. OR I.D	INSIDE DIAMETER
I.E	INVERT ELEVATION
IG	INSULATING GLASS
IN	INCHES
INCL	INCLUDING, INCLUSIVE
INSUL	INSULATION
INT	INTERIOR
IPS	INTERIOR PAINT SYSTEM
JA	JANITOR
JT	JOINT
KW	KILOWATTS
KWH	KILOWATT HOURS
LAD	LADDER
LAM	LAMINATED
LAV	LAVATORY
LF	LINEAR FEET
LGTH	LENGTH
LH	LEFT HAND
LKR	RIGHT HAND
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LO	LOUVER OPENING
LP	LIGHTING PANEL
LPS	LIQUID PETROLEUM GAS
LPS	LOW PRESSURE STEAM
LT	LIGHT
LWT	LEAVING WATER TEMPERATURE
MA	MEDICAL AIR
MANUF	MANUFACTURER
MAS	MASONRY
MATL	MATERIAL
MAX	MAXIMUM
MBH	THOUSAND BTU/HOUR
MS	SCHEDULE
MCA	MINIMUM CIRCUIT AMPACITY

ABBREV.	FULL TEXT
MCC	MULTI-COLOR COATING
MDO	MEDIUM DENSITY OVERLAY
MECH	MECHANICAL
MEMBWP	MEMBRANE WATERPROOFING
MET	METAL
MEZZ	MEZZANINE
MFR	MANUFACTURER
MS	MAXIMUM FUSE SIZE
MG	MEDICAL GAS
MH	MANHOLE
MHP	MOTOR HORSEPOWER
MIN	MINIMUM
MIR	MIRROR
MISC	MISCELLANEOUS
MM	MISCELLANEOUS METALS
MO	MASONRY OPENING
MOCP	MAXIMUM OVERCURRENT PROTECTION
MP	METAL PANEL
MPC	MICHIGAN PLUMBING CODE
MR	MANUFACTURER'S RECOMMENDATIONS
MRP	MARBLE TILE
MTD	MOUNTED
MUL	MULLION
N	NORTH
N.S	NEAR SIDE
NF	NO FINISH
NIC	NOT IN CONTRACT
NO	NUMBER
NPSH	NET POSITIVE SUCTION HEAD
NSNS	NON SHRINK NON STAIN GROUT
NTS	NOT TO SCALE
NTS	NOT TO SCALE
OC	ON CENTER
OBSGL	OBSCURE GLASS
OD	OUTSIDE DIAMETER
OHDR	SECTIONAL OVERHEAD DOOR
OPNG	OPENING
OPR	OPPOSITE
P	PAINT
PART	PARTITION
PC	PARTICLE BOARD
PB	PRECAST
PLBG	PLUMBING
PERM	PERMANENT
PL	PLATE
PL	PLASTIC LAMINATE
PLAS	PLASTER
PLG	PLUMBING
PLY	PLYWOOD
PT	PRESSURE TREATED
PT	PORCELAIN TILE
PTB	PORCELAIN TILE BASE
POL	POLISHED CONCRETE
QT	QUARRY TILE
QTB	QUARTZ TILE BASE
QZ	QUARTZ
R	RISER
RA	RETURN AIR
RB	RUBBER BASE
RC	ROOF CONDUCTOR
RD	ROOF DRAIN
RO	ROUND
RECNG	RECEIVING
REF	REFRIGERATOR
REINF	REINFORCED
REQD	REQUIRED
RF	RESILIENT FLOORING
RL	ROLLER SHADE
RL	ROOF LADDER
RM	ROOM
RO	ROUGH OPENING
RS	ROOF SUMP
RS	ROLLER SHADE
RSN	RESIN PANEL
RST	RUBBER STAIR TREAD
RWD	REDWOOD
RWM	RECESSED WALK OFF MAT
S	SOUTH
SA	SPANDREL GLASS
SAP	SUPPLY AIR
SAB	SOUND ATTENUATION BLANKETS
SC	SOLID CORE
SCH	SCHEDULE
SCONC	SEALED CONCRETE

ABBREV.	FULL TEXT
SCWD	SOLID CORE WOOD
SECT	SECTION
SER RECP	SERVICE RECEPTOR
SH	SHELF
SHT	SHEET
SHWR	SHOWER
SS	STAINLESS STEEL
SLV	SEALED CONCRETE
SPEC	SPECIFICATION
SQ	SQUARE
SQFT	SQUARE FOOT
SS	STAINLESS STEEL
SSK	SERVICE SINK
SSM	SOLID SURFACING MATERIAL
ST	SMOKE-TIGHT PER CODE TO RESIST THE PASSAGE OF SMOKE
ST	STONE
STD	STANDARD
STDW	STANDARD WEIGHT (STEEL PIPE)
STL	STEEL
STN	STAIN
STOR	STORAGE
STRL	STRUCTURAL
SUPP	SUPPORT
SUSP	SUSPENDED
SYM	SUSPENSION SYMMETRICAL
T	TREAD
T&G	TONGUE AND GROOVE
T.O.C. OR T.C	TOP OF CONCRETE
T.O.F. OR T.F	TOP OF FOOTING
T.O.M. OR T.M	TOP OF MASONRY
T.O.P. OR T.P	TOP OF PAVEMENT
T.O.S. OR T.S	TOP OF STEEL
T.O.W. OR T.W	TOP OF WALL
TI	TEMPER
TR	TRUSS BEARING
TG	TEMPERED GLASS
THK	THICK
THRESH	THRESHOLD
TLT	TOILET
TP	TOILET PARTITION
TR	TRANSITION TRIM
TYP	TYPICAL
TYP	TYPICAL
UNF	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
UR	URINAL
VCT	VINYL COMPOSITION TILE
VERT	VERTICAL
VEST	VESTIBULE
VF	VERIFY IN FIELD
W	WEST
W	WITH
WIO	WITHOUT
WC	WATER CLOSET
WC	WALLCOVERING
WCO	WALL CLEAN OUT
WD	WOOD
WP	WATERPROOFING
WP	WORKPOINT
WP	WALL PROTECTION
WSC	WAINSCOT
WT	WEIGHT
X-(MATERIAL)	DEMOTES EXISTING MATERIAL REFERENCED

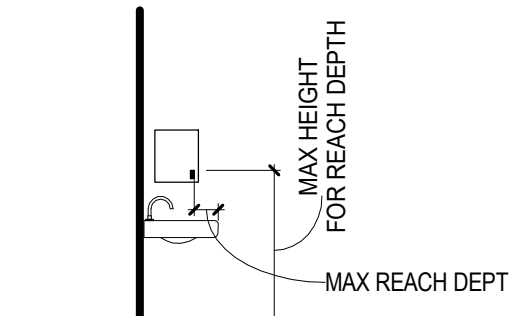
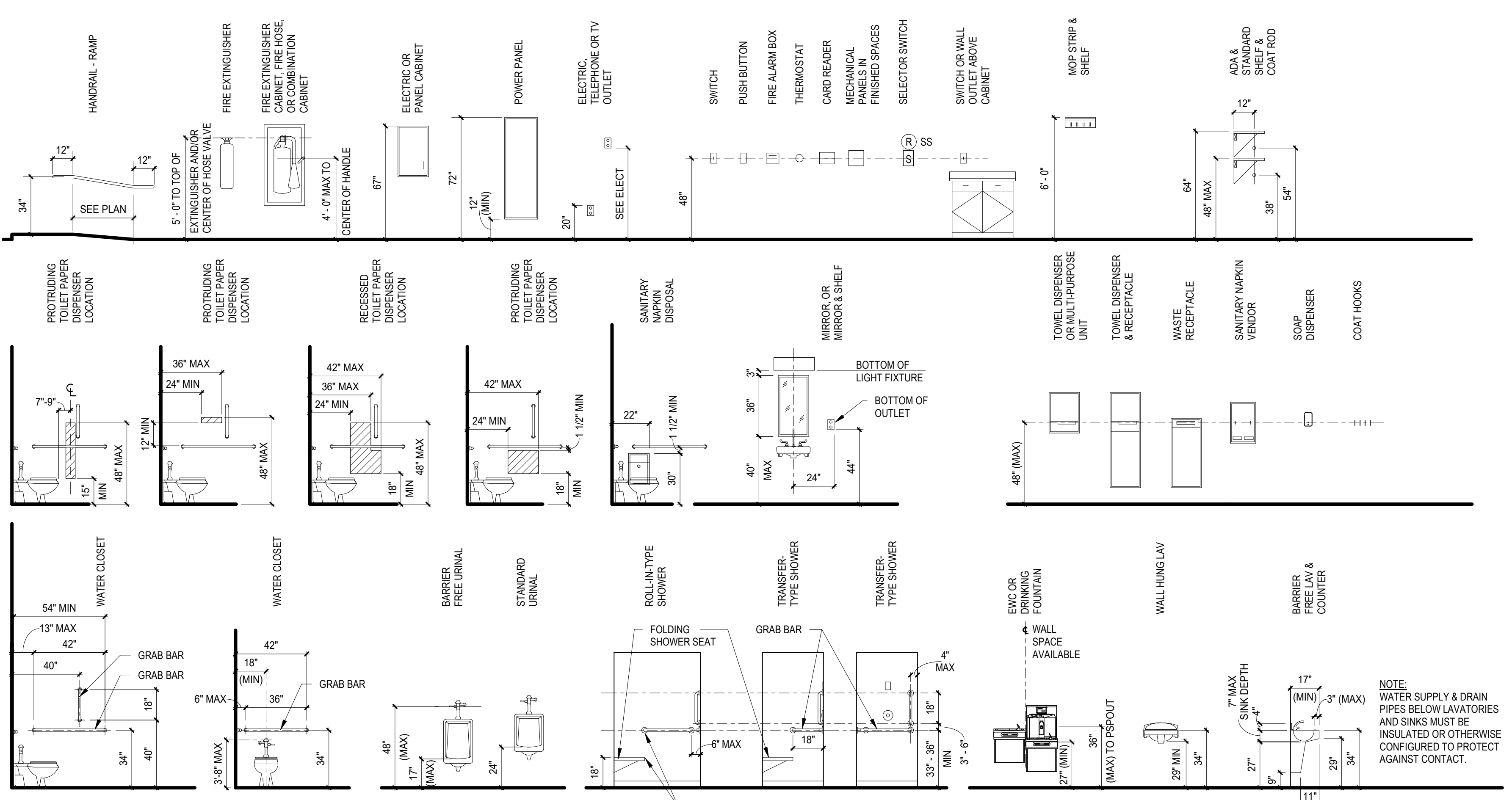
**PARTITION TYPE 'F1A'**
(NON-RATED / 2 1/2" MTL STUD)**PARTITION TYPE 'F1B'**
(NON-RATED / 3 5/8" MTL STUD)**PARTITION TYPE 'F1C'**
(NON-RATED / 3 5/8" MTL STUD WITH 3/4" VENEER PLYWOOD)**PARTITION TYPE 'F1D'**
(NON-RATED / 6" MTL STUD)**PARTITION TYPE 'F1D'**
(NON-RATED / 6" MTL STUD)**DRAWING REFERENCE SYMBOLS**

	ENLARGED PLAN OR DETAIL		ARCHITECTURAL KEYNOTE
	WALL SECTION		EQUIPMENT TAG
	BUILDING SECTION		WALL TAG
	EXTERIOR ELEVATIONS		DOOR TAG
	INTERIOR ELEVATIONS		ROOM NAME
	REVISION CLOUD AND TAG		ROOM TAG
	VIEW TITLE AND REFERENCE		WINDOW TAG
	DETAIL		CEILING SPOT ELEVATION
	EXISTING COLUMN LINE		FINISH TAG
	NEW COLUMN LINE		SPECIALITY EQUIPMENT TAG
	DEMO KEYNOTE		FURNITURE TAG
	LEVEL OR ELEVATION		
	DEMARICATION LINE		

MOUNTING HEIGHT COORDINATION

ARCHITECTURAL MECHANICAL & ELECTRICAL TRADES SHALL COORDINATE LOCATIONS OF WALL MOUNTED ITEMS TO ALIGN EITHER VERTICALLY OR HORIZONTALLY.

GENERAL MAXIMUM REACH DEPTH AND HEIGHT FOR HAND DRYERS / TOWEL DISPENSERS						
MAX REACH DEPTH	0.5'	2'	5'	6'	9'	11'
MAX REACH HEIGHT	48"	46"	42"	40"	36"	34"

**RECOMMENDED MOUNTING HEIGHTS (UNLESS OTHERWISE NOTED)****ARCHITECTURAL LEGENDS, SYMBOLS, AND ABBREVIATIONS**

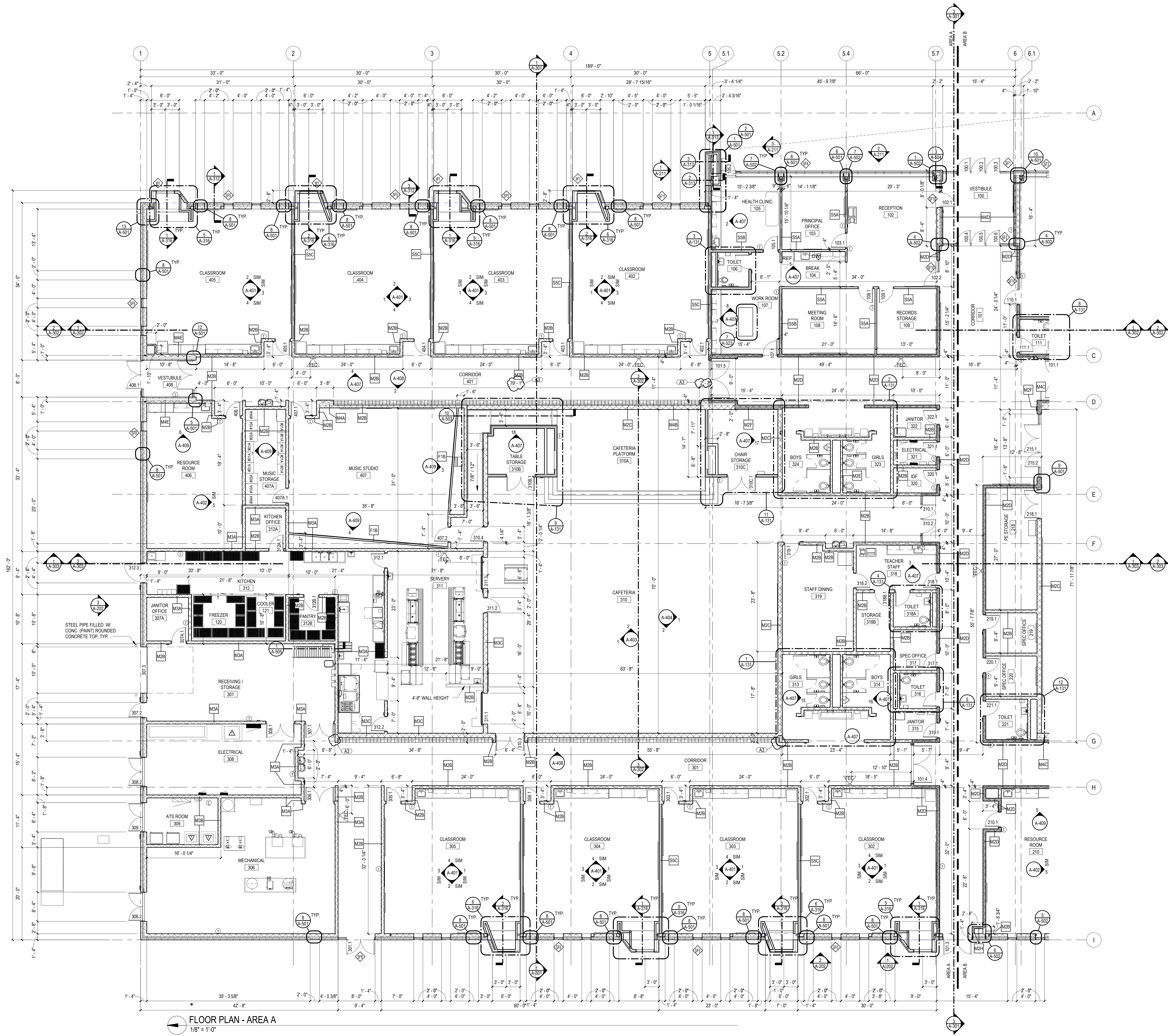
REV	DESCRIPTION	DATE
45	ADDENDUM 3	26 JUL 2023

PROJ. #:	220116
DATE:	23-JUN-2023
SHEET	

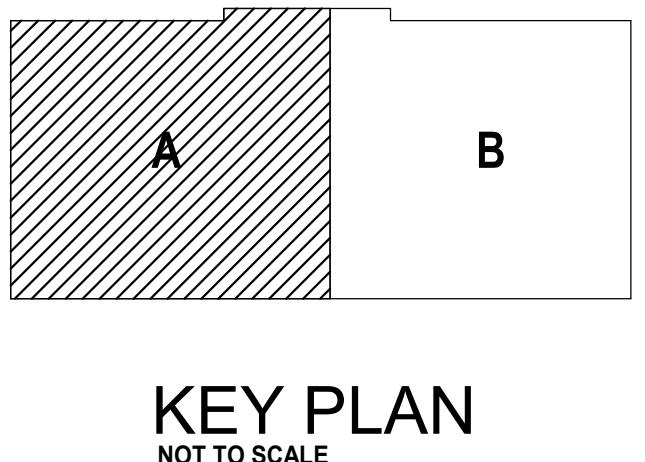
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Addendum #3

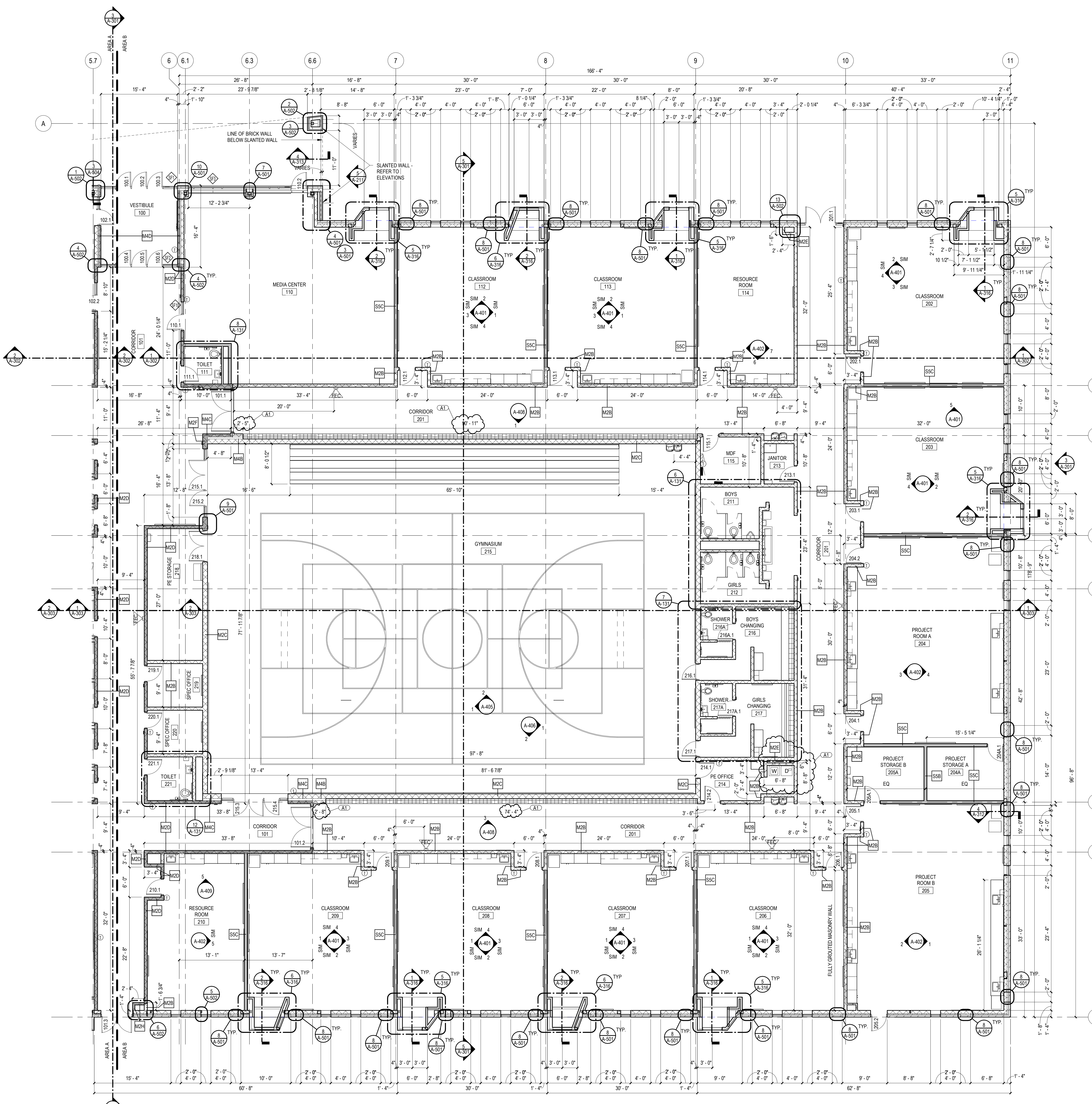
LANSING SCHOOL DISTRICT
Mt. Hope
1215 E Mt Hope Ave, Lansing, MI 48910**c2ae**
architecture + engineering
www.c2ae.com**Stantec**



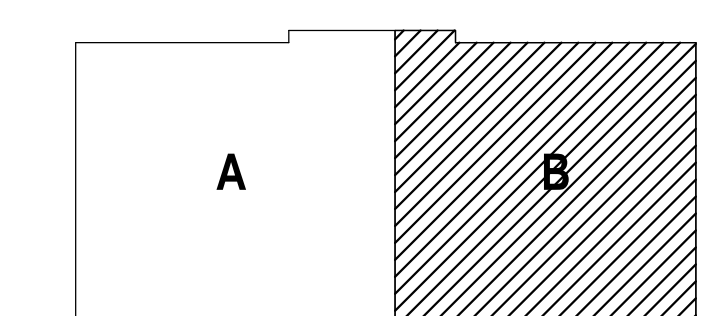
FLOOR PLAN - AREA A
1/8" = 1'-0"



- PARTITION TYPE GENERAL NOTES**
1. PROVIDE 1/2" IMPACT CEMENT BACKERBOARD AT ALL SHOWER WALLS, TYP.
 2. IF NOT SHOWN ON DRAWINGS, PROVIDE CONTROL JOINTS IN GYPSUM BOARD ASSEMBLIES AS DESCRIBED IN ASTM C 840-08 OR GA-216-2013.
- GENERAL NOTES:**
1. SUB-CONTRACTORS ARE TO COORDINATE WORK WITH ALL OTHER TRADES.
 2. CONFLICTS BETWEEN NOTES, DETAILS, SPECIFICATIONS, ETC., SHALL BE VERIFIED WITH THE OWNER'S REPRESENTATIVE OR THE MOST STRINGENT PROVISIONS SHALL GOVERN.
 3. DETAILS OF CONSTRUCTION NOT FULLY SHOWN SHALL BE OF THE SAME NATURE AS SHOWN FOR SIMILAR CONDITIONS. ANY UNCLEAR CONDITIONS SHALL BE VERIFIED WITH OWNER'S REPRESENTATIVE PRIOR TO CONSTRUCTION OF THAT AREA.
 4. DRAWINGS ARE NOT TO BE SCALED. ANY UNCLEAR DIMENSIONS OR DIMENSIONAL DISCREPANCIES SHALL BE VERIFIED WITH OWNER'S REPRESENTATIVE.
 5. ALL EXISTING CONDITIONS AND ALL RELATED DIMENSIONS INDICATED IN THE CONTRACT DOCUMENTS SHALL BE FIELD VERIFIED PRIOR TO FABRICATION, ERECTION, AND/OR CONSTRUCTION. ANY CONDITIONS THAT DIFFER FROM THAT INDICATED IN THE CONTRACT DOCUMENTS SHALL BE SUBMITTED TO THE OWNER'S REPRESENTATIVE FOR REVIEW PRIOR TO FABRICATION, ERECTION, AND/OR CONSTRUCTION.
 6. CONSTRUCTION MANAGER (CM) / GENERAL CONTRACTOR (GC) TO REVIEW ENTIRE SET OF CONSTRUCTION DOCUMENTS AND SHALL COORDINATE WORK BETWEEN ALL TRADES. IF CONFLICTS ARISE DUE TO COORDINATION OF TRADES, CM / GC IS TO VERIFY CONFLICT WITH OWNER'S REPRESENTATIVE PRIOR TO CONSTRUCTION / INSTALLATION OF CONFLICTING ITEMS.
 7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PREPARATIONS OF THE FLOORS, WALLS AND CEILINGS FOR NEW FINISHES.
 8. MAINTAIN FIRE RATING AT ALL ASSEMBLIES WHERE OPENINGS PENETRATIONS, EMBEDMENT, RECESSED EQUIPMENT, ACCESSORIES, ETC. DISRUPT THE CONTINUITY OF THE RATING.
 9. ALL DIMENSIONS ARE FROM FACE OF STUD. C.M.U. OR CONCRETE, U.N.O.
 10. PROVIDE ISOLATION MATERIAL BETWEEN DISSIMILAR MATERIALS THAT ARE IN CONTACT WITH ONE ANOTHER.
 11. PROVIDE SOLID, CONTINUOUS, NON COMBUSTIBLE BLOCKING AT LOCATIONS WHERE MILLWORK, PLUMBING FIXTURES, EQUIP., ETC. ATTACH TO WALL OR CEILING.

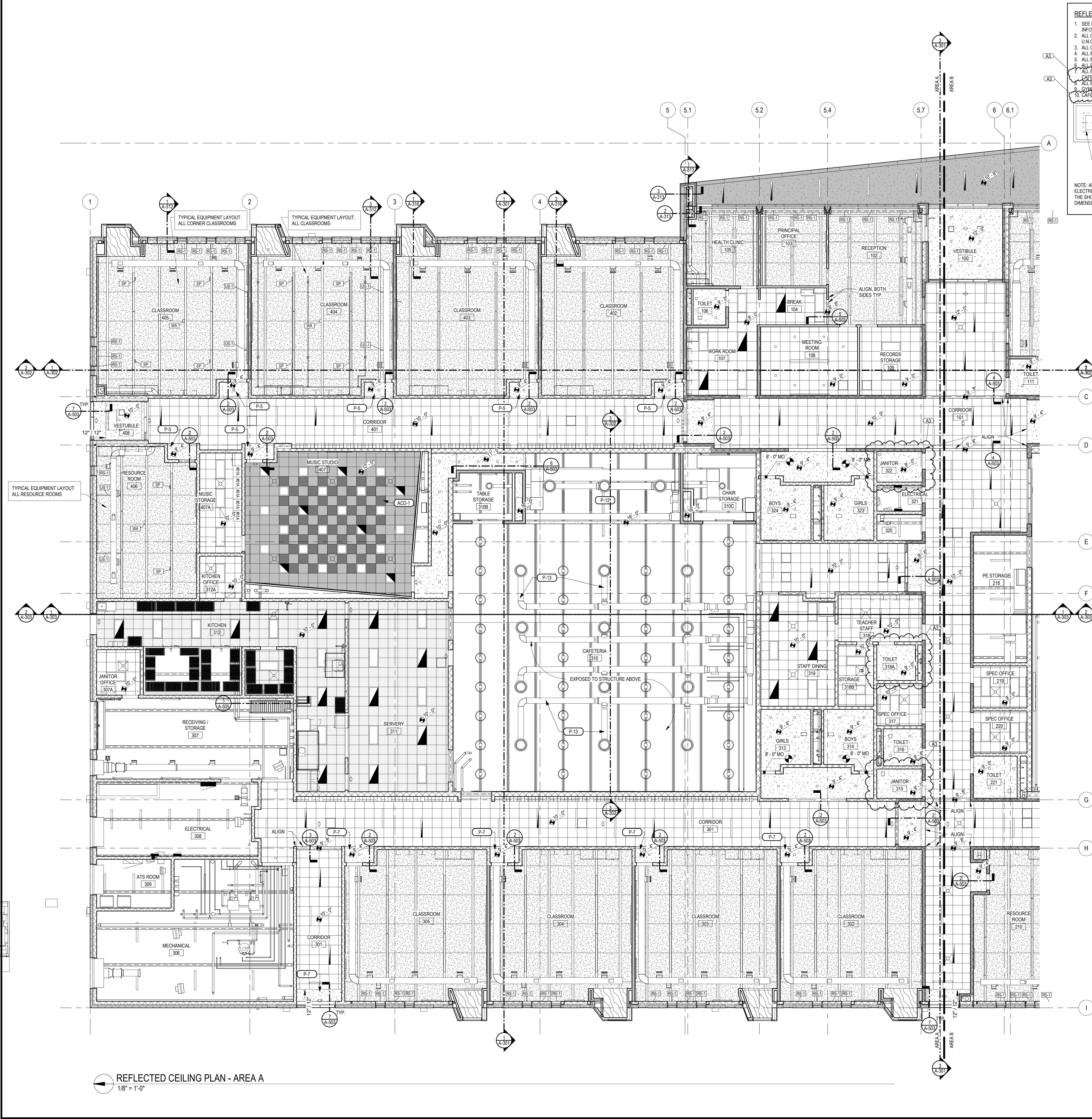


FLOOR PLAN - AREA B
1/8" = 1'-0"



KEY PLAN
NOT TO SCALE

- PARTITION TYPE GENERAL NOTES**
1. PROVIDE 1/2" IMPACT CEMENT BACKERBOARD AT ALL SHOWER WALLS, TYP.
 2. IF NOT SHOWN ON DRAWINGS, PROVIDE CONTROL JOINTS IN GYPSUM BOARD ASSEMBLIES AS DESCRIBED IN ASTM C 840-08 OR GA-216-2013.
- GENERAL NOTES**
1. SUB-CONTRACTORS ARE TO COORDINATE WORK WITH ALL OTHER TRADES.
 2. CONFLICTS BETWEEN NOTES, DETAILS, SPECIFICATIONS, ETC., SHALL BE VERIFIED WITH THE OWNER'S REPRESENTATIVE OR THE MOST STRINGENT PROVISIONS SHALL GOVERN.
 3. DETAILS OF CONSTRUCTION NOT FULLY SHOWN SHALL BE OF THE SAME NATURE AS SHOWN FOR SIMILAR CONDITIONS. ANY UNCLEAR CONDITIONS SHALL BE VERIFIED WITH OWNER'S REPRESENTATIVE PRIOR TO CONSTRUCTION OF THAT AREA.
 4. DRAWINGS ARE NOT TO BE SCALED. ANY UNCLEAR DIMENSIONS OR DIMENSIONAL DISCREPANCIES SHALL BE VERIFIED WITH OWNER'S REPRESENTATIVE.
 5. ALL EXISTING CONDITIONS AND ALL RELATED DIMENSIONS INDICATED IN THE CONTRACT DOCUMENTS SHALL BE FIELD VERIFIED PRIOR TO FABRICATION, ERECTION, AND/OR CONSTRUCTION. ANY CONDITIONS THAT DIFFER FROM THAT INDICATED IN THE CONTRACT DOCUMENTS SHALL BE SUBMITTED TO THE OWNER'S REPRESENTATIVE FOR REVIEW PRIOR TO FABRICATION, ERECTION, AND/OR CONSTRUCTION.
 6. CONSTRUCTION MANAGER (CM) / GENERAL CONTRACTOR (GC) TO REVIEW ENTIRE SET OF CONSTRUCTION DOCUMENTS AND SHALL COORDINATE WORK BETWEEN ALL TRADES. IF CONFLICTS ARISE DUE TO COORDINATION OF TRADES, CM / GC IS TO VERIFY CONFLICT WITH OWNER'S REPRESENTATIVE PRIOR TO CONSTRUCTION. INSTALLATION OF CONFLICTING ITEMS.
 7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PREPARATIONS OF THE FLOORS, WALLS, AND CEILINGS FOR NEW FINISHES.
 8. MAINTAIN FIRE RATING AT ALL ASSEMBLIES WHERE OPENINGS PENETRATIONS, EMBEDMENT, RECESSED EQUIPMENT, ACCESSORIES, ETC. DISRUPT THE CONTINUITY OF THE RATING.
 9. ALL DIMENSIONS ARE FROM FACE OF STUD, C.M.U. OR CONCRETE, U.N.O.
 10. PROVIDE ISOLATION MATERIAL BETWEEN DISSIMILAR MATERIALS THAT ARE IN CONTACT WITH ONE ANOTHER.
 11. PROVIDE SOLID, CONTINUOUS, NON COMBUSTIBLE BLOCKING AT LOCATIONS WHERE MILLWORK, PLUMBING FIXTURES, EQUIP., ETC. ATTACH TO WALL OR CEILING.



REFLECTED CEILING PLAN GENERAL NOTES:

1. SEE MECHANICAL & ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
2. ALL CEILING GRIDS TO BE CENTERED IN THE SPACE (BOTH DIRECTIONS), U.N.O.
3. ALL CEILING TO BE 10' - 0" U.N.O.
4. ALL BULKHEADS TO BE 9' - 8" U.N.O.
5. ALL EXPOSED FIRE SUPPRESSION TO BE PAINTED P-8.
6. ALL EXPOSED ELECTRICAL CONDUIT TO BE PAINTED P-8.
7. ALL EXPOSED HVAC TO BE PAINTED P-10 EXCEPT IN CLASSROOMS, CAFETERIA AND GYMNASIUM.
8. ALL EXPOSED WATER MAINS TO BE PAINTED P-11.
9. GYMNASIUM CEILING EXPOSED DUCTWORK TO BE PAINTED P-14.
10. CAFETERIA CEILING EXPOSED DUCTWORK TO BE PAINTED P-13.

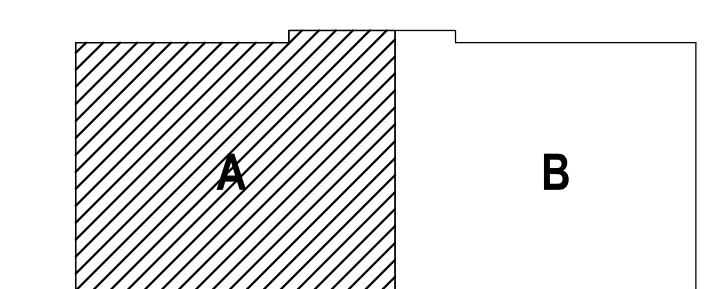
NOTE: ALL PENETRATIONS OF ACOUSTICAL CEILING PANELS, MECHANICAL, ELECTRICAL, OR FIRE SUPPRESSION COMPONENTS SHALL BE CENTERED IN THE SHORT DIMENSION AND BE CENTERED OR AT 1/4 POINTS IN THE LONG DIMENSION OF A PANEL AS INDICATED.

REFLECTED CEILING PLAN LEGEND:

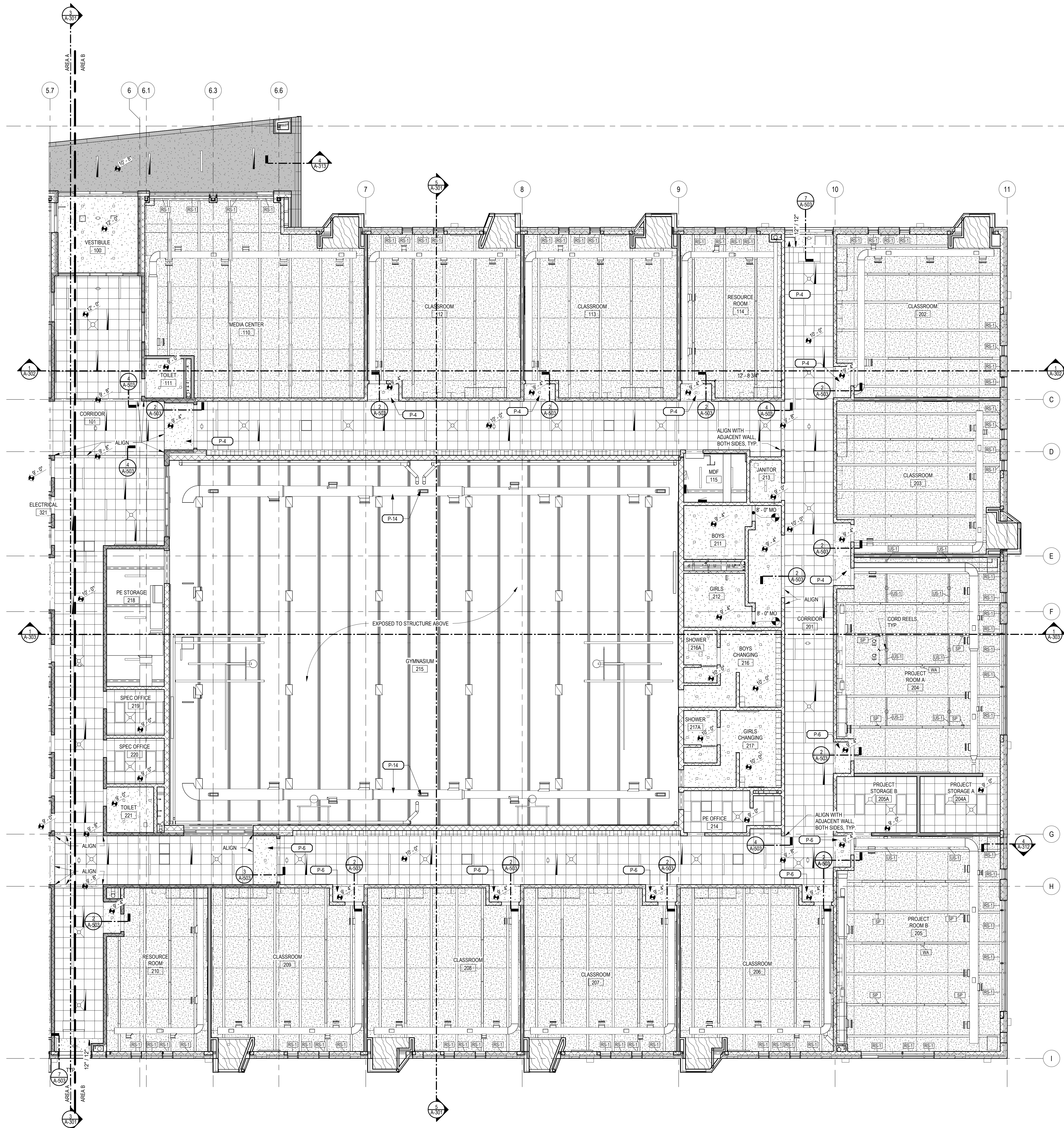
	EXPOSED (P-1, U.N.O.)
	GYPSUM BOARD (P-1, U.N.O.)
	2X2 ACOUSTIC CEILING PANEL (ACP-1)
	2X2 WASHABLE ACOUSTIC CEILING PANEL (ACP-2)
	2X2 HIGH NRC ACOUSTIC CEILING PANEL (ACP-3)
	3\" TECTUM DECK PAINTED P-15
	5/8\" EXTERIOR GYP SHEATHING
	WOOD VENEER
	CEILING HEIGHT - ABOVE FINISH FLOOR
	EX. CEILING HEIGHT - ABOVE FINISH FLOOR
	2X2 LIGHT FIXTURE
	2X4 LIGHT FIXTURE
	LINEAR LIGHT FIXTURE
	LINEAR PENDANT LIGHT FIXTURE
	2X4 RECESSED LIGHT FIXTURE
	CIRCULAR PENDANT LIGHT FIXTURE
	RECESSED ROUND/SQUARE LIGHT FIXTURE (EMERGENCY FIXTURES SHADED)
	SUPPLY DIFFUSER
	SUPPLY DIFFUSER
	LINEAR DIFFUSER
	TRANSFER GRILLE AND/OR EXHAUST FAN
	FIRE EXIT SIGN LOCATION
	SPEAKER LOCATION (SEE ELECTRICAL COMMUNICATIONS)
	CAMERA LOCATION (SEE ELECTRICAL COMMUNICATIONS)
	SPRINKLER LOCATION (SEE FIRE PROTECTION DRAWINGS)

EQUIPMENT SCHEDULE

	DESCRIPTION	MANUFACTURER	MODEL	SUPPLIED BY	INSTALLED BY	NOTES
BH-1	BASKETBALL BACKSTOP	DRAPER INC.	-	CONTRACTOR	CONTRACTOR	-
BH-2	SIDE FOLDING CEILING MOUNTED BASKETBALL BACKSTOP	DRAPER INC.	-	CONTRACTOR	CONTRACTOR	-
BKS	BASKETBALL BACKBOARD KEYSWITCH	DRAPER INC.	-	CONTRACTOR	CONTRACTOR	-
CAB-1	WENGER NARROW ACOUSTIC CABINET #01 - COMP GRILLE DOORS	WENGER CORPORATION	#01A	CONTRACTOR	CONTRACTOR	-
CAB-2	WENGER ACOUSTIC CABINET #03 - COMP GRILLE DOORS	WENGER CORPORATION	#03A	CONTRACTOR	CONTRACTOR	-
CAB-3	WENGER ACOUSTIC CABINET #04 - COMP GRILLE DOORS	WENGER CORPORATION	#04A	CONTRACTOR	CONTRACTOR	-
CAB-4	WENGER ACOUSTIC CABINET #10 - COMP GRILLE DOORS	WENGER CORPORATION	#10A	CONTRACTOR	CONTRACTOR	-
CB	CALL BUTTON / AUDIO AMPLIFIER	-	-	CONTRACTOR	CONTRACTOR	-
CM	COFFEE MAKER	-	-	OWNER	OWNER	-
DO	ADA DOOR OPERATOR PUSH BUTTON	CONTRACTOR	-	CONTRACTOR	CONTRACTOR	-
DRY	DRYER	CONTRACTOR	-	CONTRACTOR	CONTRACTOR	-
DW	DISHWASHER	CONTRACTOR	-	CONTRACTOR	CONTRACTOR	-
LC-1	LAPTOP CART	-	-	OWNER	OWNER	-
LK1-C	LOCKER 12' x 9' x 6'-0"	-	-	CONTRACTOR	CONTRACTOR	TO MATCH COLOR P-5
LK1-D	LOCKER 12' x 9' x 6'-0"	-	-	CONTRACTOR	CONTRACTOR	TO MATCH COLOR P-4
LK1-A	LOCKER 12' x 9' x 6'-0"	-	-	CONTRACTOR	CONTRACTOR	TO MATCH COLOR P-7
LK1-B	LOCKER 12' x 9' x 6'-0"	-	-	CONTRACTOR	CONTRACTOR	TO MATCH COLOR P-6
LK2	LOCKER 12' x 12' x 3'-0"	-	-	CONTRACTOR	CONTRACTOR	TO MATCH COLOR P-6
LK3	LOCKER 12' x 12' x 6'-0"	-	-	CONTRACTOR	CONTRACTOR	TO MATCH COLOR P-6
REF	REFRIGERATOR	CONTRACTOR	-	CONTRACTOR	CONTRACTOR	-
RS-1	ROLLER SHADE	DRAPER	-	CONTRACTOR	CONTRACTOR	-
SB-1	SCOREBOARD	-	-	CONTRACTOR	CONTRACTOR	-
SP	SPEAKER	-	-	CONTRACTOR	CONTRACTOR	-
TCB	TELESCOPIC BLEACHERS	INTERAL	MICHIGAN BLUE 95	CONTRACTOR	CONTRACTOR	-
TV-1	CLEVERTOUCH	-	-	CONTRACTOR	CONTRACTOR	-
TV-2	86" TELEVISION	-	-	CONTRACTOR	CONTRACTOR	-
TV-3	55" TELEVISION	-	-	CONTRACTOR	CONTRACTOR	-
US-1	UNISTRUT	-	-	CONTRACTOR	CONTRACTOR	TO MATCH CEILING COLOR
WA	WIRELESS ACCESS POINT	-	-	CONTRACTOR	CONTRACTOR	-
WP-1	GYMNASIUM WALL PAD	DRAPER INC.	NAVY BLUE	CONTRACTOR	CONTRACTOR	-
WSH	WASHER	-	-	CONTRACTOR	CONTRACTOR	-

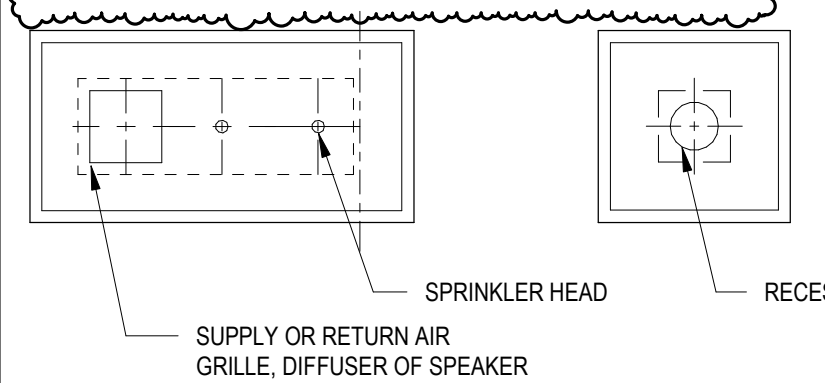


KEY PLAN
NOT TO SCALE

REFLECTED CEILING PLAN - AREA B
1/8" = 1'-0"

REFLECTED CEILING PLAN GENERAL NOTES:

1. SEE MECHANICAL & ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
2. ALL CEILING GRIDS TO BE CENTERED IN THE SPACE (BOTH DIRECTIONS), U.N.O.
3. ALL CEILING TO BE 10' - 0" U.N.O.
4. ALL BULKHEADS TO BE 9' - 8" U.N.O.
5. ALL EXPOSED FIRE SUPPRESSION TO BE PAINTED P-8.
6. ALL EXPOSED ELECTRICAL CONDUIT TO BE PAINTED P-8.
7. ALL EXPOSED HVAC TO BE PAINTED P-10 EXCEPT IN CLASSROOMS, CAFETERIA AND GYMNASIUM.
8. ALL EXPOSED INTERIUMS TO BE PAINTED P-11.
9. GYMNASIUM CEILING EXPOSED DUCTWORK TO BE PAINTED P-14.
10. CAFETERIA CEILING EXPOSED DUCTWORK TO BE PAINTED P-13.



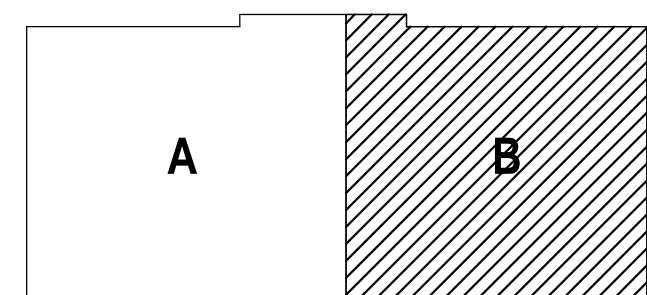
NOTE: ALL PENETRATIONS OF ACOUSTICAL CEILING PANELS, MECHANICAL, ELECTRICAL, OR FIRE SUPPRESSION COMPONENTS SHALL BE CENTERED IN THE SHORT DIMENSION AND BE CENTERED OR AT 1/4 POINTS IN THE LONG DIMENSION OF A PANEL AS INDICATED.

REFLECTED CEILING PLAN LEGEND:

- EXPOSED (P-1, U.N.O.)
- GYPSUM BOARD (P-1, U.N.O.)
- 2X2 ACOUSTIC CEILING PANEL (ACP-1)
- 2X2 WASHABLE ACOUSTIC CEILING PANEL (ACP-2)
- 2X2 HIGH NRC ACOUSTIC CEILING PANEL (ACP-3)
- 3" TECTUM DECK PAINTED P-15
- 5/8" EXTERIOR GYP SHEATHING
- WOOD VENEER
- CEILING HEIGHT - ABOVE FINISH FLOOR
- EX. CEILING HEIGHT - ABOVE FINISH FLOOR
- 2'x2' LIGHT FIXTURE
- 2'x4' LIGHT FIXTURE
- LINEAR LIGHT FIXTURE
- LINEAR PENDANT LIGHT FIXTURE
- 2'x4' RECESSED LIGHT FIXTURE
- CIRCULAR PENDANT LIGHT FIXTURE
- RECESSED ROUND/SQUARE LIGHT FIXTURE (EMERGENCY FIXTURES SHADED)
- SUPPLY DIFFUSER
- SUPPLY DIFFUSER
- LINEAR DIFFUSER
- TRANSFER GRILLE AND/OR EXHAUST FAN
- FIRE EXIT SIGN LOCATION
- SPEAKER LOCATION (SEE ELECTRICAL COMMUNICATIONS)
- CAMERA LOCATION (SEE ELECTRICAL COMMUNICATIONS)
- SPRINKLER LOCATION (SEE FIRE PROTECTION DRAWINGS)

EQUIPMENT SCHEDULE

	DESCRIPTION	MANUFACTURER	MODEL	SUPPLIED BY	BY	NOTES
BH-1	BASKETBALL BACKSTOP	DRAPER INC.	--	CONTRACTOR	CONTRACTOR	--
BH-2	SIDE FOLDING CEILING MOUNTED BASKETBALL BACKSTOP	DRAPER INC.	--	CONTRACTOR	CONTRACTOR	--
BKS	BASKETBALL BACKBOARD KEYSWITCH	DRAPER INC.	--	CONTRACTOR	CONTRACTOR	--
CAB-1	WENGER NARROW ACOUSTIC CABINET #01 - COMP GRILLE DOORS	WENGER CORPORATION	#01A	CONTRACTOR	CONTRACTOR	--
CAB-2	WENGER ACOUSTIC CABINET #03 - COMP GRILLE DOORS	WENGER CORPORATION	#03A	CONTRACTOR	CONTRACTOR	--
CAB-3	WENGER ACOUSTIC CABINET #04 - COMP GRILLE DOORS	WENGER CORPORATION	#04A	CONTRACTOR	CONTRACTOR	--
CAB-4	WENGER ACOUSTIC CABINET #10 - COMP GRILLE DOORS	WENGER CORPORATION	#10A	CONTRACTOR	CONTRACTOR	--
CB	CALL BUTTON / AUDIO AMPLIFIER	--	--	CONTRACTOR	CONTRACTOR	--
CM	COFFEE MAKER	--	--	OWNER	OWNER	--
DO	ADA DOOR OPERATOR PUSH BUTTON	--	--	CONTRACTOR	CONTRACTOR	--
DW	DRYER	--	--	CONTRACTOR	CONTRACTOR	--
DW	DISHWASHER	--	--	CONTRACTOR	CONTRACTOR	--
LC-1	LAPTOP CART	--	--	OWNER	OWNER	--
LK1-C	LOCKER 12" x 9" x 6'-0"	--	--	CONTRACTOR	CONTRACTOR	TO MATCH COLOR P-5
LK1-D	LOCKER 12" x 9" x 6'-0"	--	--	CONTRACTOR	CONTRACTOR	TO MATCH COLOR P-4
LK1-A	LOCKER 12" x 9" x 6'-0"	--	--	CONTRACTOR	CONTRACTOR	TO MATCH COLOR P-7
LK1-B	LOCKER 12" x 9" x 6'-0"	--	--	CONTRACTOR	CONTRACTOR	TO MATCH COLOR P-6
LK-2	LOCKER 12" x 12" x 3'-0"	--	--	CONTRACTOR	CONTRACTOR	TO MATCH COLOR P-6
LK-3	LOCKER 12" x 12" x 3'-0"	--	--	CONTRACTOR	CONTRACTOR	TO MATCH COLOR P-6
PTD	PAPER TOWEL DISPENSER	--	--	OWNER	CONTRACTOR	--
REF	REFRIGERATOR	--	--	CONTRACTOR	CONTRACTOR	--
RS-1	ROLLER SHADE	DRAPER	--	CONTRACTOR	CONTRACTOR	--
SB-1	SCOREBOARD	--	--	CONTRACTOR	CONTRACTOR	--
SP	SPEAKER	--	--	CONTRACTOR	CONTRACTOR	--
TCB	TELESCOPIC BLEACHERS	INTERKAL	MICHIGAN BLUE 25	CONTRACTOR	CONTRACTOR	--
TV-1	CLEVERTOUCH	--	--	CONTRACTOR	CONTRACTOR	--
TV-2	88" TELEVISION	--	--	CONTRACTOR	CONTRACTOR	--
TV-3	55" TELEVISION	--	--	CONTRACTOR	CONTRACTOR	--
US-1	UNISTRUT	--	--	CONTRACTOR	CONTRACTOR	TO MATCH CEILING COLOR
WA	WIRELESS ACCESS POINT	--	--	CONTRACTOR	CONTRACTOR	--
WP-1	GYMNASIUM WALL PAD	DRAPER INC.	NAVY BLUE	CONTRACTOR	CONTRACTOR	--
WSH	WASHER	--	--	CONTRACTOR	CONTRACTOR	--

KEY PLAN
NOT TO SCALE

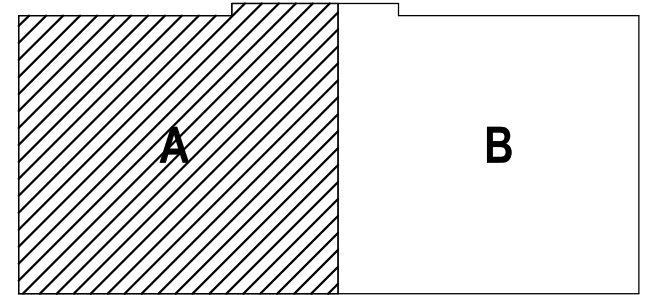


EQUIPMENT FLOOR PLAN - AREA A
1/8" = 1'-0"

EQUIPMENT SCHEDULE					
	DESCRIPTION	MANUFACTURER	MODEL	SUPPLIED BY	INSTALLED BY
BH-1	BASKETBALL BACKSTOP	DRAPER INC.	--	CONTRACTOR	CONTRACTOR
BH-2	SIDE FOLDING CEILING MOUNTED BASKETBALL BACKSTOP	DRAPER INC.	--	CONTRACTOR	CONTRACTOR
BKS	BASKETBALL BACKBOARD KEYSWITCH	DRAPER INC.	--	CONTRACTOR	CONTRACTOR
CAB-1	WENGER NARROW ACOUSTIC CABINET #01 - COMP GRILLE DOORS	WENGER CORPORATION	#01A	CONTRACTOR	CONTRACTOR
CAB-2	WENGER ACOUSTIC CABINET #03 - COMP GRILLE DOORS	WENGER CORPORATION	#03A	CONTRACTOR	CONTRACTOR
CAB-3	WENGER ACOUSTIC CABINET #04 - COMP GRILLE DOORS	WENGER CORPORATION	#04A	CONTRACTOR	CONTRACTOR
CAB-4	WENGER ACOUSTIC CABINET #10 - COMP GRILLE DOORS	WENGER CORPORATION	#10A	CONTRACTOR	CONTRACTOR
CB	CALL BUTTON / AUDIO AMPLIFIER	--	--	CONTRACTOR	CONTRACTOR
CM	COFFEE MAKER	--	--	OWNER	OWNER
DO	ADA DOOR OPERATOR FLUSH BUTTON	--	--	CONTRACTOR	CONTRACTOR
DY	DRYER	--	--	CONTRACTOR	CONTRACTOR
DW	DISHWASHER	--	--	CONTRACTOR	CONTRACTOR
LC-1	LAPTOP CART	--	--	OWNER	OWNER
LK-1C	LOCKER 12' X 6' 6"	--	--	CONTRACTOR	CONTRACTOR
LK-1D	LOCKER 12' X 6' 6"	--	--	CONTRACTOR	CONTRACTOR
LK-1A	LOCKER 12' X 6' 6" (AT)	--	--	CONTRACTOR	CONTRACTOR
LK-1B	LOCKER 12' X 6' 6"	--	--	CONTRACTOR	CONTRACTOR
LK-2	LOCKER 12' X 12' X 3' 0"	--	--	CONTRACTOR	CONTRACTOR
LK-3	LOCKER 12' X 12' X 6' 0"	--	--	CONTRACTOR	CONTRACTOR
PTD	PAPER TOWEL DISPENSER	--	--	OWNER	CONTRACTOR
REF	REFRIGERATOR	--	--	CONTRACTOR	CONTRACTOR
RS-1	ROLLER SHADE	DRAPER	--	CONTRACTOR	CONTRACTOR
SB-1	SCOREBOARD	--	--	CONTRACTOR	CONTRACTOR
SP	SPEAKER	--	--	CONTRACTOR	CONTRACTOR
TCB	TELESCOPIC BLEACHERS	INTERKAL	MICHIGAN BLUE 25	CONTRACTOR	CONTRACTOR
TV-1	CLEVERTOUCH	--	--	CONTRACTOR	CONTRACTOR
TV-2	80" TELEVISION	--	--	CONTRACTOR	CONTRACTOR
TV-3	80" TELEVISION	--	--	CONTRACTOR	CONTRACTOR
US-1	UNISTRUT	--	--	CONTRACTOR	CONTRACTOR
WA	WIRELESS ACCESS POINT	--	--	CONTRACTOR	CONTRACTOR
WB-1	COMMERCIAL WALL PAD	DRAPER INC.	NAVY BLUE	CONTRACTOR	CONTRACTOR
WSH	WASHER	--	--	CONTRACTOR	CONTRACTOR

ACCESSORY SCHEDULE					
TAG	DESCRIPTION	MANUFACTURER	MODEL	SUPPLIED BY	INSTALLED BY
GB1	36" GRAB BAR	BRADLEY	812-001-36	CONTRACTOR	CONTRACTOR
GB2	42" GRAB BAR	BRADLEY	812-001-42	CONTRACTOR	CONTRACTOR
GB3	18" GRAB BAR VERTICAL	BRADLEY	812-001-18	CONTRACTOR	CONTRACTOR
GB4	48" GRAB BAR	BRADLEY	812-001-48	CONTRACTOR	CONTRACTOR
GB5	18" GRAB BAR	BRADLEY	812-001-18	CONTRACTOR	CONTRACTOR
MB-1	MAGNETIC WHITE BOARD, 4' X 8'	--	--	CONTRACTOR	CONTRACTOR
MB-2	MAGNETIC WHITE BOARD, 4' X 4'	--	--	CONTRACTOR	CONTRACTOR
MB-3	MAGNETIC WHITE BOARD, 3' X 3'	--	--	CONTRACTOR	CONTRACTOR
MR-1	36" X 72" MIRROR	--	--	CONTRACTOR	CONTRACTOR
MR-2	24" X 36" MIRROR	--	--	CONTRACTOR	CONTRACTOR
PTD	PAPER TOWEL DISPENSER	--	--	OWNER	CONTRACTOR
SCR	SHOWER CURTAIN & ROD	--	--	CONTRACTOR	CONTRACTOR
SD	SOAP DISPENSER	--	--	OWNER	CONTRACTOR
SND	SANITARY NAPKIN DISPOSAL	BRADLEY	4722-15	CONTRACTOR	CONTRACTOR
SS-1	SHOWER SEAT	--	--	CONTRACTOR	CONTRACTOR
TB-1	4' X 4' TACK BOARD (REFER TO MATERIAL SCHEDULE)	--	--	CONTRACTOR	CONTRACTOR
TB-2	6' X 4' TACK BOARD (REFER TO MATERIAL SCHEDULE)	--	--	CONTRACTOR	CONTRACTOR
TB-3	4' X 8' BULLETIN BOARD CABINET (REFER TO MATERIAL SCHEDULE)	CLARIDGE	--	CONTRACTOR	CONTRACTOR
TB-5	4' X 3' TACK BOARD (REFER TO MATERIAL SCHEDULE)	--	--	CONTRACTOR	CONTRACTOR
TR	WASTE RECEPTACLE - SQUARE	--	--	OWNER	OWNER
TTD	TOILET TISSUE DISPENSER	--	--	OWNER	CONTRACTOR

NOTE:
• SEE RCP FOR WINDOW SHADES
• MANUFACTURERS AS LISTED ARE CONSIDERED BASIS OF DESIGN



KEY PLAN
NOT TO SCALE

REVISIONS		
REV	DESCRIPTION	DATE
A1	ADDENDUM 1	21 JUL 2023

PROJ. #: 220116
DATE: 23-JUN-2023
SHEET

A-121A

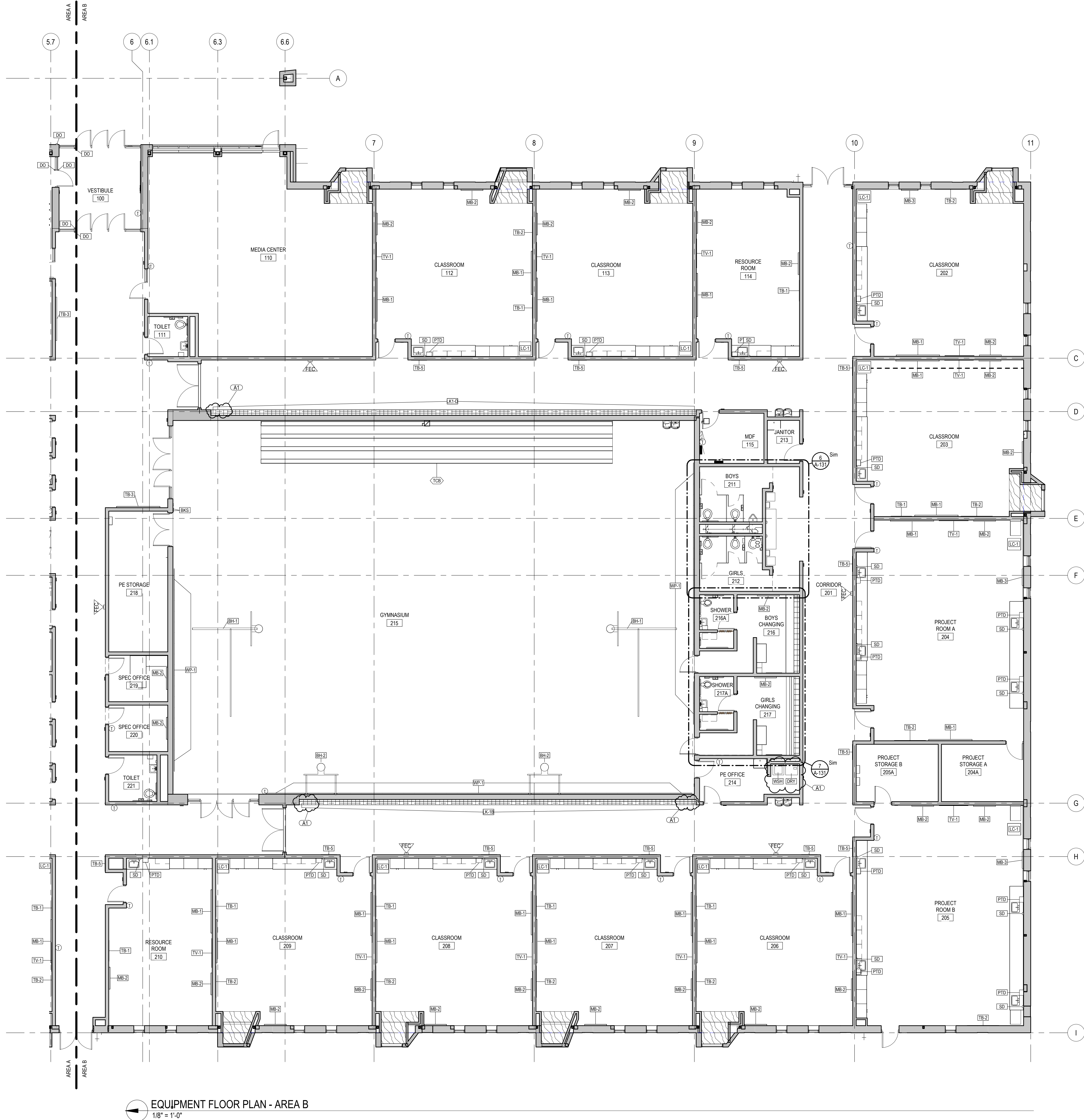
Addendum #3

LANSING SCHOOL DISTRICT
Mt. Hope
1215 E Mt Hope Ave, Lansing, MI 48910

EQUIPMENT PLAN - AREA A

Stantec

c2oe
architecture + engineering
www.c2oe.com

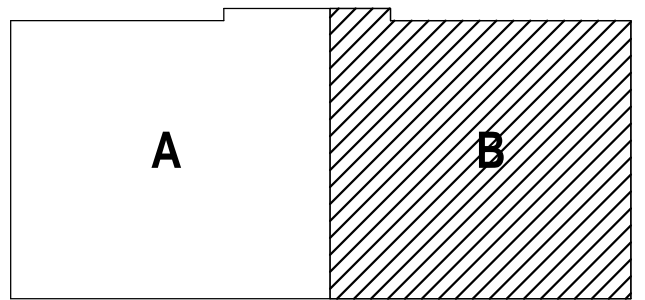


EQUIPMENT FLOOR PLAN - AREA B
1/8" = 1'-0"

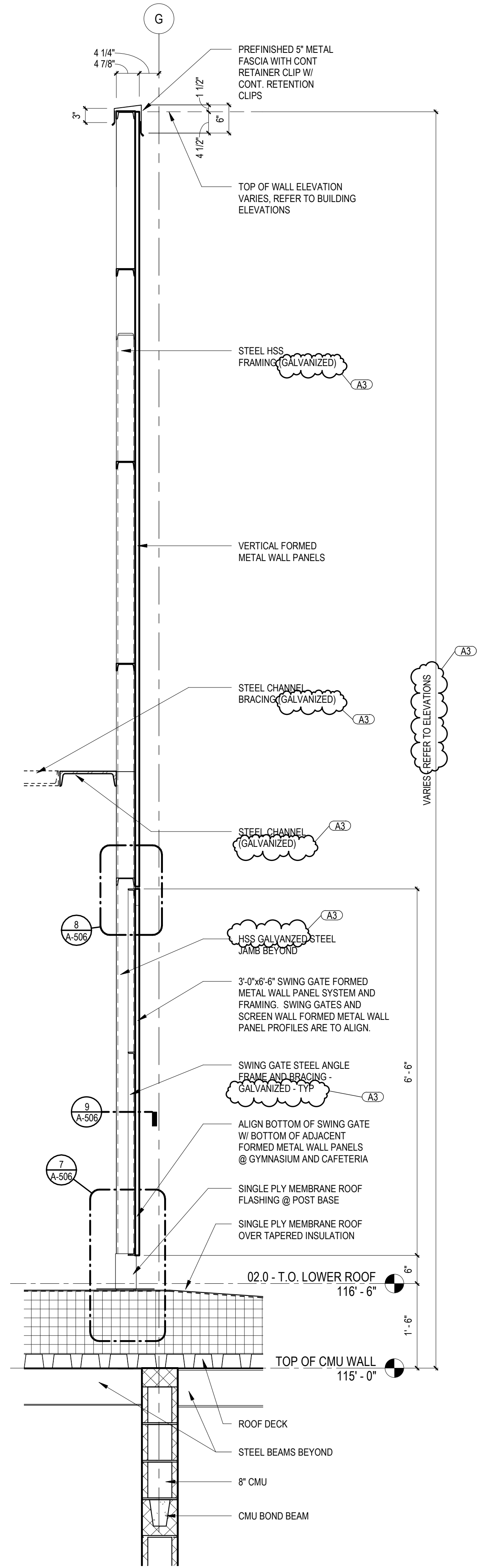
EQUIPMENT SCHEDULE					
	DESCRIPTION	MANUFACTURER	MODEL	SUPPLIED BY	NOTES
BH-1	BASKETBALL BACKSTOP	DRAPER INC.	--	CONTRACTOR	CONTRACTOR
BH-2	SIDE FOLDING CEILING MOUNTED BASKETBALL BACKSTOP	DRAPER INC.	--	CONTRACTOR	CONTRACTOR
BKS	BASKETBALL BACKBOARD KEYSWITCH	DRAPER INC.	--	CONTRACTOR	CONTRACTOR
CAB-1	WENGER NARROW ACOUSTIC CABINET #01 - COMP GRILLE DOORS	WENGER CORPORATION	#01A	CONTRACTOR	CONTRACTOR
CAB-2	WENGER ACOUSTIC CABINET #03 - COMP GRILLE DOORS	WENGER CORPORATION	#03A	CONTRACTOR	CONTRACTOR
CAB-3	WENGER ACOUSTIC CABINET #04 - COMP GRILLE DOORS	WENGER CORPORATION	#04A	CONTRACTOR	CONTRACTOR
CAB-4	WENGER ACOUSTIC CABINET #10 - COMP GRILLE DOORS	WENGER CORPORATION	#10A	CONTRACTOR	CONTRACTOR
DO	ADA DOOR OPERATOR PUSH BUTTON	--	--	CONTRACTOR	CONTRACTOR
DW	DISHWASHER	--	--	CONTRACTOR	CONTRACTOR
LC-1	LAPTOP CART	--	--	OWNER	OWNER
LK1-C	LOCKER 12" x 9" x 6" 4"	--	--	CONTRACTOR	CONTRACTOR
LK1-D	LOCKER 12" x 9" x 6" 4"	--	--	CONTRACTOR	TO MATCH COLOR P-5
LK-1A	LOCKER 12" x 9" x 6" 4" (A1)	--	--	CONTRACTOR	CONTRACTOR
LK-1B	LOCKER 12" x 9" x 6" 4"	--	--	CONTRACTOR	CONTRACTOR
LK-2	LOCKER 12" x 12" x 3" 4"	--	--	CONTRACTOR	CONTRACTOR
LK-3	LOCKER 12" x 12" x 3" 4"	--	--	CONTRACTOR	TO MATCH COLOR P-6
PTD	PAPER TOWEL DISPENSER	--	--	OWNER	CONTRACTOR
REF	REFRIGERATOR	--	--	CONTRACTOR	CONTRACTOR
RS-1	ROLLER SHADE	DRAPER	--	CONTRACTOR	CONTRACTOR
SB-1	SCOREBOARD	--	--	CONTRACTOR	CONTRACTOR
SP	SPEAKER	--	--	CONTRACTOR	CONTRACTOR
TB	TELESCOPIC BLEACHERS	INTERKAL	MICHIGAN BLUE 25	CONTRACTOR	CONTRACTOR
TV-1	CLEVERTOUCH	--	--	CONTRACTOR	CONTRACTOR
TV-2	86" TELEVISION	--	--	CONTRACTOR	CONTRACTOR
TV-3	55" TELEVISION	--	--	CONTRACTOR	CONTRACTOR
US-1	UNISTRUT	--	--	CONTRACTOR	CONTRACTOR
WAL	WALL MOUNTED ACCESS POINT	--	--	CONTRACTOR	CONTRACTOR
WP-1	GYMNASIUM WALL PAD	DRAPER INC.	NAVY BLUE	CONTRACTOR	CONTRACTOR
WSH	WASHER	--	--	CONTRACTOR	CONTRACTOR

ACCESSORY SCHEDULE					
TAG	DESCRIPTION	MANUFACTURER	MODEL	SUPPLIED BY	INSTALLED BY
GB1	36" GRAB BAR	BRADLEY	812-001-36	CONTRACTOR	CONTRACTOR
GB2	42" GRAB BAR	BRADLEY	812-001-42	CONTRACTOR	CONTRACTOR
GB3	18" GRAB BAR VERTICAL	BRADLEY	812-001-18	CONTRACTOR	CONTRACTOR
GB4	48" GRAB BAR	BRADLEY	812-001-48	CONTRACTOR	CONTRACTOR
GB5	18" GRAB BAR	BRADLEY	812-001-18	CONTRACTOR	CONTRACTOR
MB-1	MAGNETIC WHITE BOARD, 4' X 8'	--	--	CONTRACTOR	CONTRACTOR
MB-2	MAGNETIC WHITE BOARD, 4' X 4'	--	--	CONTRACTOR	CONTRACTOR
MB-3	MAGNETIC WHITE BOARD, 3' X 3'	--	--	CONTRACTOR	CONTRACTOR
MR-1	36" x 72" MIRROR	--	--	CONTRACTOR	CONTRACTOR
MR-2	24" X 36" MIRROR	--	--	CONTRACTOR	CONTRACTOR
PTD	PAPER TOWEL DISPENSER	--	--	OWNER	CONTRACTOR
SCR	SHOWER CURTAIN & ROD	--	--	CONTRACTOR	CONTRACTOR
SD	SOAP DISPENSER	--	--	OWNER	CONTRACTOR
SDN	SANITARY NAPKIN DISPOSAL	BRADLEY	4722-15	CONTRACTOR	CONTRACTOR
SS-1	SHOWER SEAT	--	--	CONTRACTOR	CONTRACTOR
TB-1	4' X 4' TACK BOARD (REFER TO MATERIAL SCHEDULE)	--	--	CONTRACTOR	CONTRACTOR
TB-2	6' X 4' TACK BOARD (REFER TO MATERIAL SCHEDULE)	--	--	CONTRACTOR	CONTRACTOR
TB-3	4' X 8' BULLETIN BOARD CABINET (REFER TO MATERIAL SCHEDULE)	CLARIDGE	--	CONTRACTOR	CONTRACTOR
TB-5	4' X 3' TACK BOARD (REFER TO MATERIAL SCHEDULE)	--	--	CONTRACTOR	CONTRACTOR
TR	WASTE RECEPTACLE - SQUARE	--	--	OWNER	OWNER
TTD	TOILET TISSUE DISPENSER	--	--	OWNER	CONTRACTOR

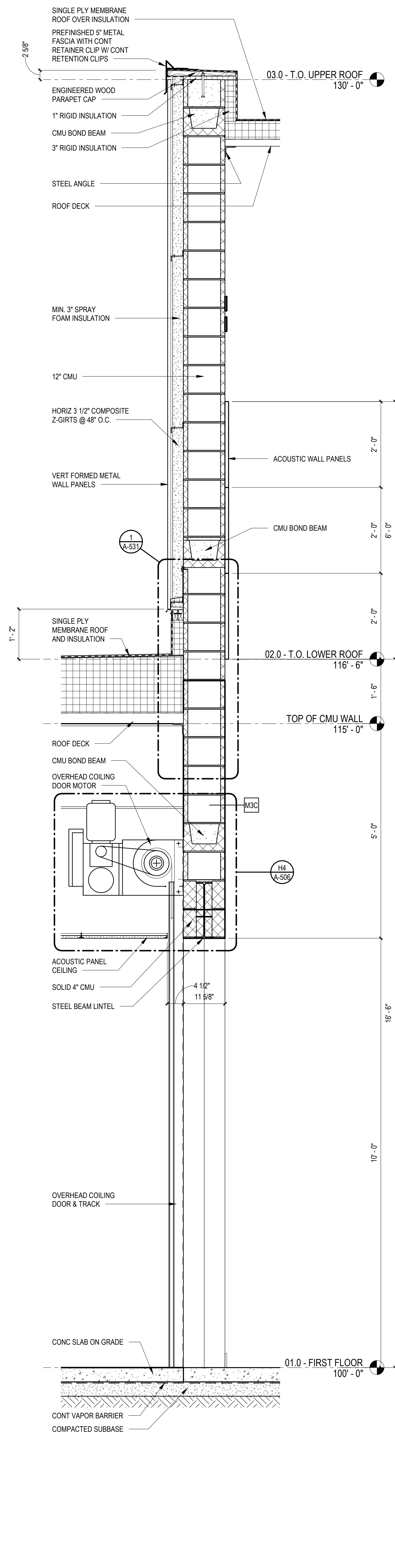
NOTE:
• SEE RCP FOR WINDOW SHADES
• MANUFACTURERS AS LISTED ARE CONSIDERED BASIS OF DESIGN



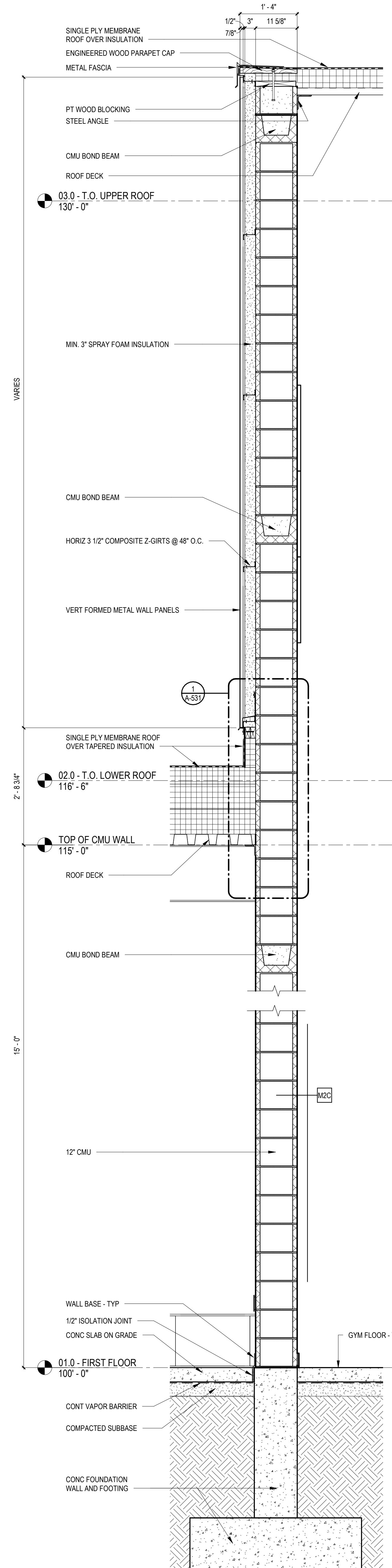
KEY PLAN
NOT TO SCALE



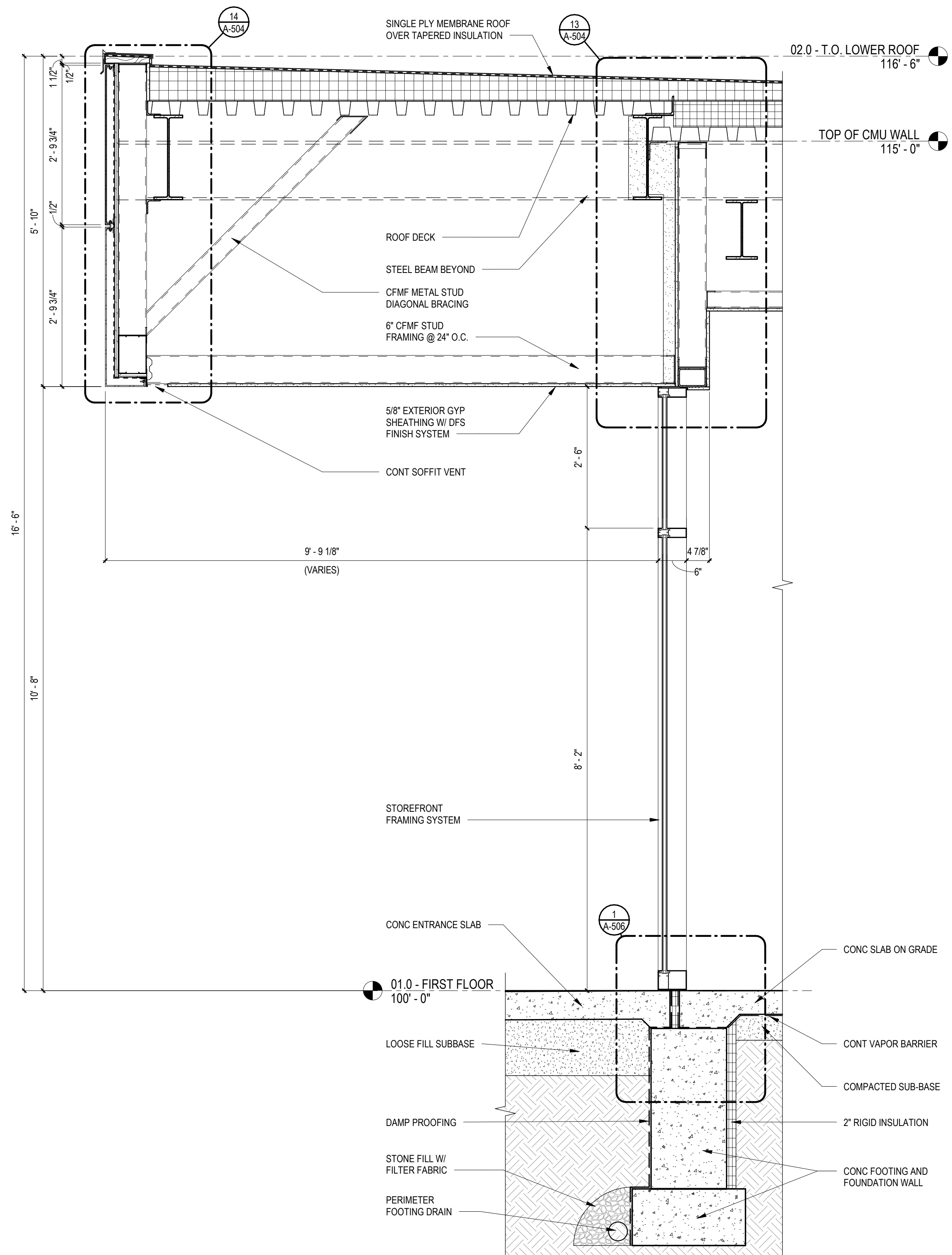
4 WALL SECTION - MECH SCREEN SOUTH OF GYM @ SWING GATE
A-1028 3/4" = 1'-0"



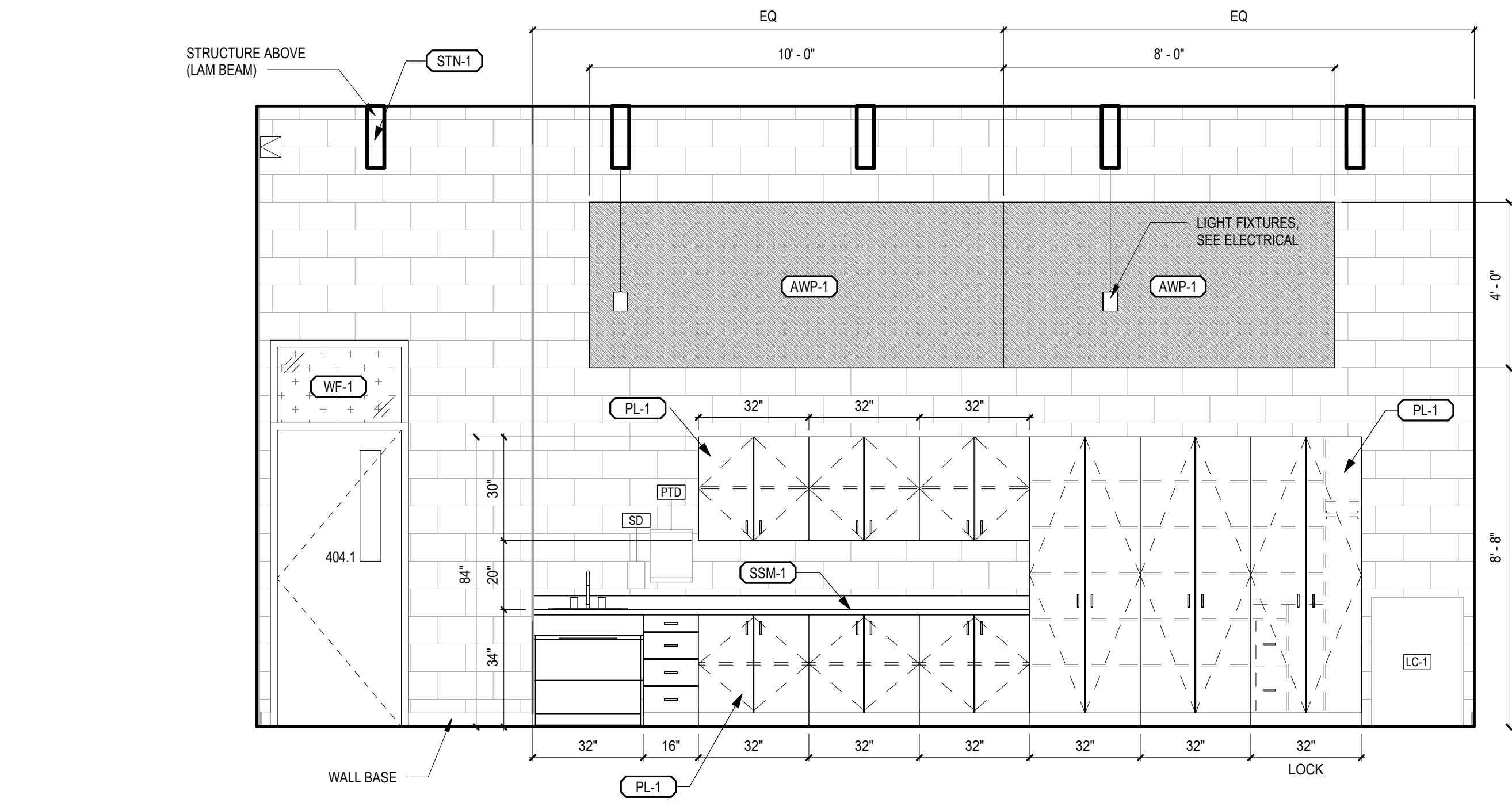
3 WALL SECTION - SOUTH CAFETERIA WALL
A-303 3/4" = 1'-0"



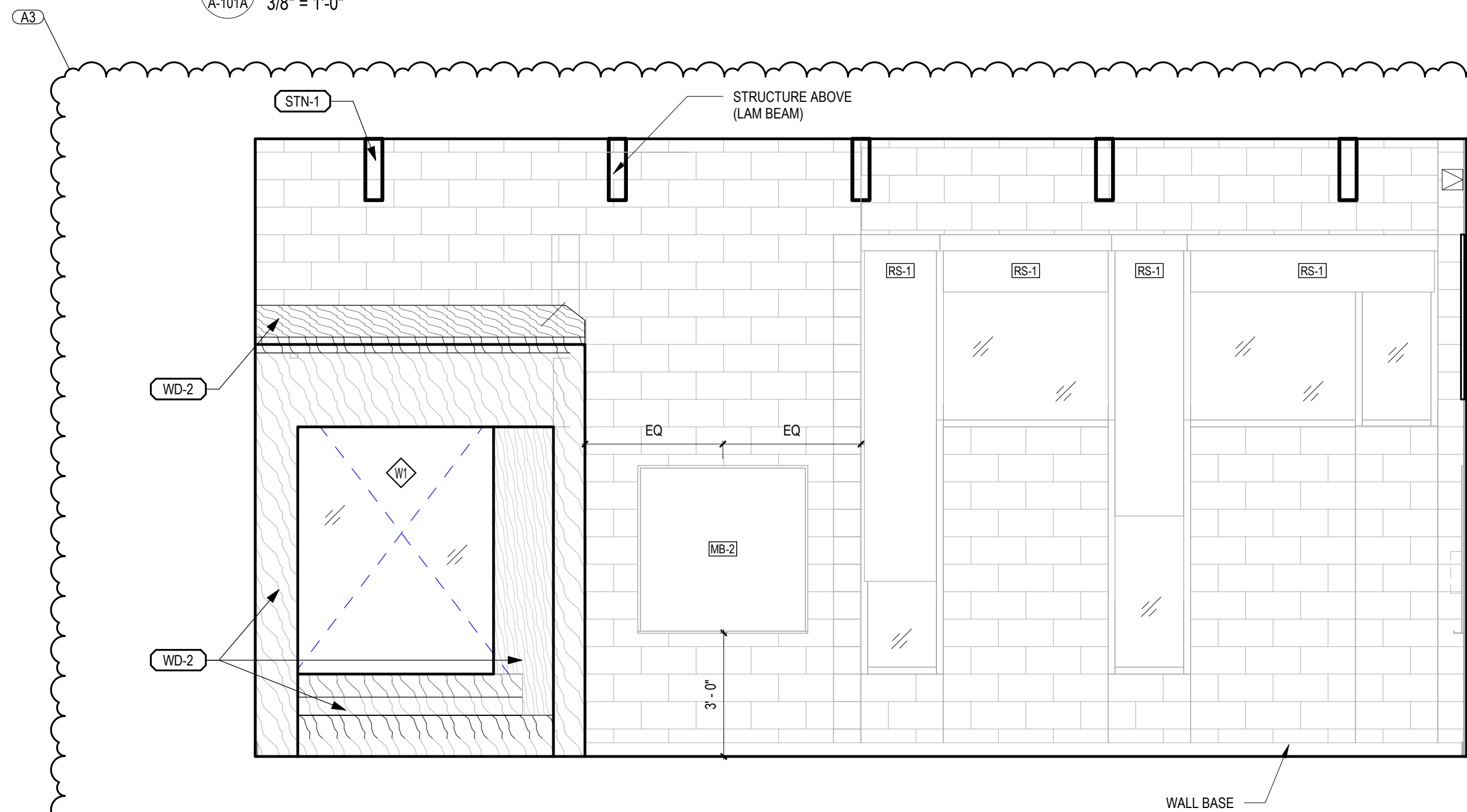
2 WALL SECTION - NORTH GYMNASIUM WALL
A-303 3/4" = 1'-0"



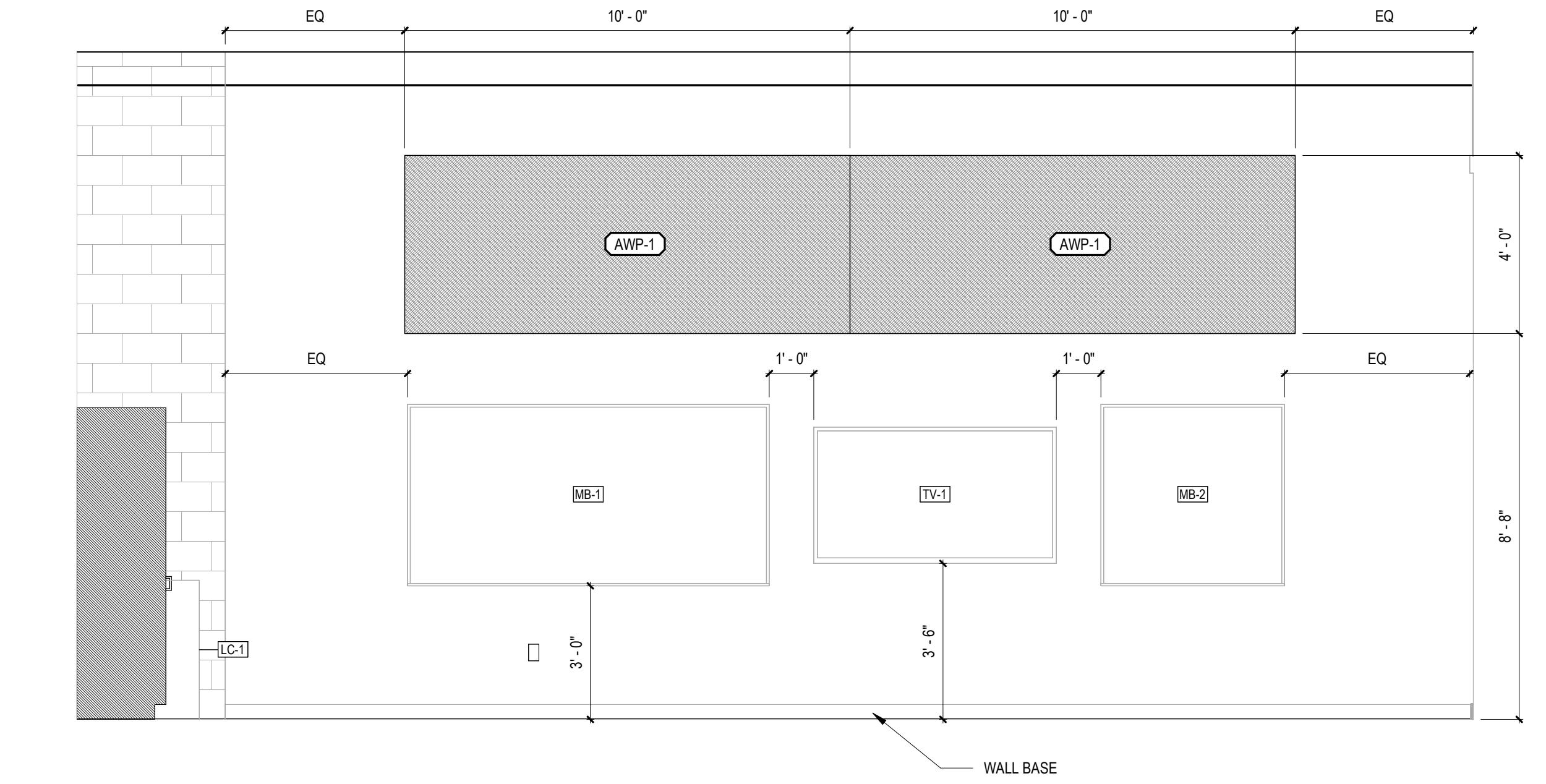
1 WALL SECTION - ENTRY CANOPY
A-301 3/4" = 1'-0"



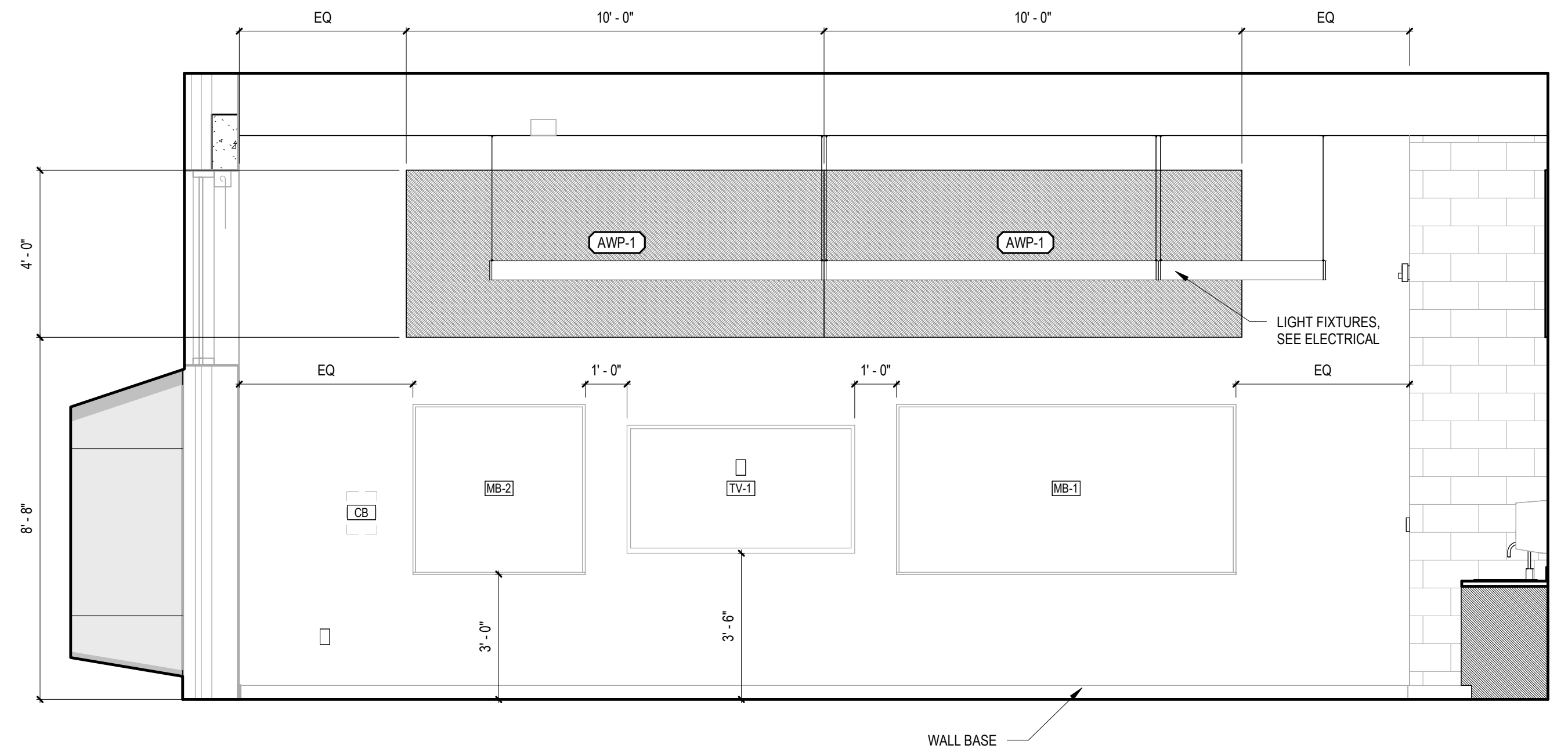
4 TYPICAL CLASSROOM- CASEWORK WALL
A-101A 3/8" = 1'-0"



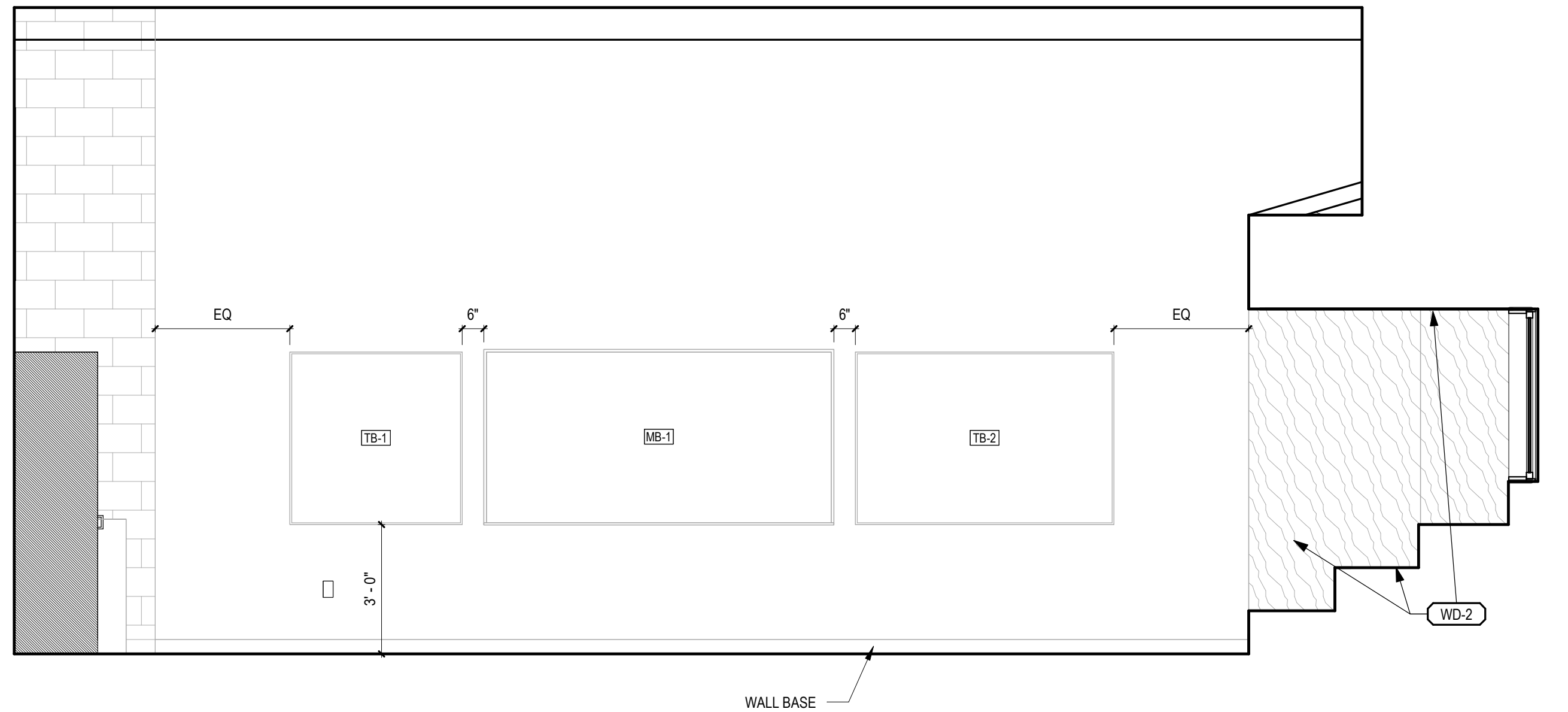
2 TYPICAL CLASSROOM- NOOK WALL
A-101A 3/8" = 1'-0"



5 CLASSROOM 203 TEACHING WALL
A-101B 3/8" = 1'-0"

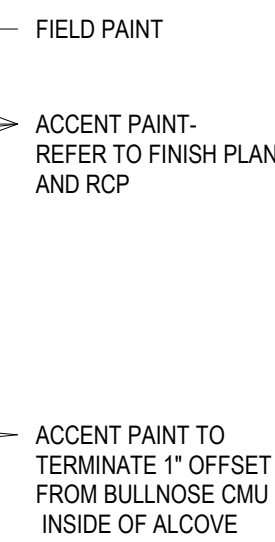


3 TYPICAL CLASSROOM- TEACHING WALL
A-101A 3/8" = 1'-0"

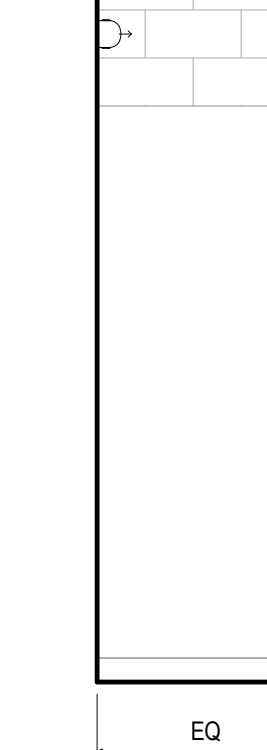


1 TYPICAL CLASSROOM- BACK WALL
A-101A 3/8" = 1'-0"

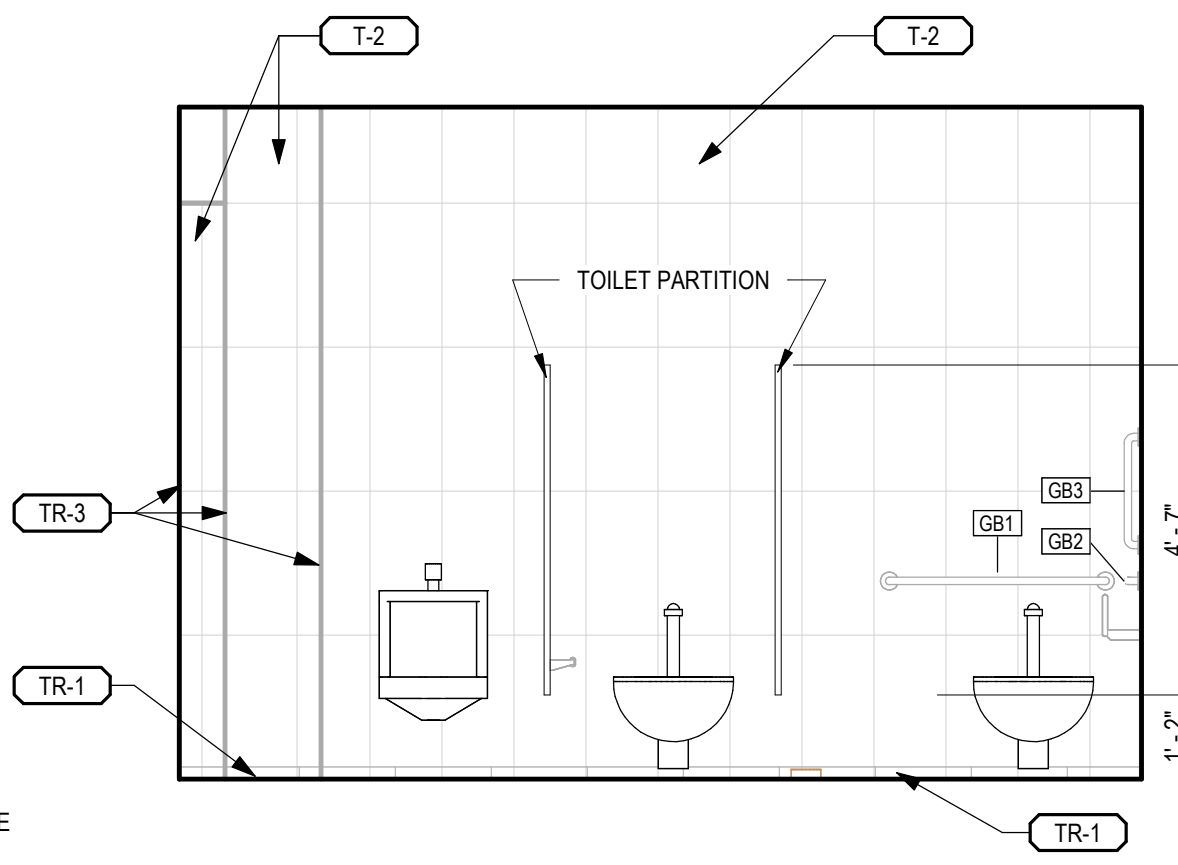
- MILLWORK GENERAL NOTES:**
1. CONTRACTOR SHALL FIELD VERIFY ALL FINISHED DIMENSIONS PRIOR TO ORDERING / INSTALLATION.
 2. ALL COUNTERTOP SUPPORTS SHALL BE SPACED 32" O.C. MAX. COORDINATE FINAL LOCATION W/ OWNER'S EQUIPMENT & FURNISHINGS PLACEMENT.
 3. ALL EXPOSED SURFACES OF CABINETS ARE TO BE FINISHED TO MATCH CABINET FINISH, U.N.O.
 4. GROMMETS SHALL BE SPACED 60" O.C. MAX. COORDINATE FINAL LOCATIONS WITH OWNER.
 5. PROVIDE FILLER PIECE AT ALL LOCATIONS BETWEEN CABINET AND ADJACENT WALL OR CEILING. FILLER PIECE TO BE FLUSH WITH FACE OF CABINET AND SHALL MATCH MATERIAL AND FINISH OF CABINETS.
 6. ALL COUNTERTOPS LOCATED ATOP BASE CABINETS TO HAVE 1" OVERHANG, U.N.O.
 7. ALL BASE CABINETS SHALL BE 24"D, U.N.O.
 8. ALL WALL CABINETS SHALL BE 12"D, U.N.O.
 9. PROVIDE SEALANT AT ALL EDGES WHERE COUNTERTOP, SIDESPLASH OR BACKSPLASH ABUT ADJACENT SURFACES.



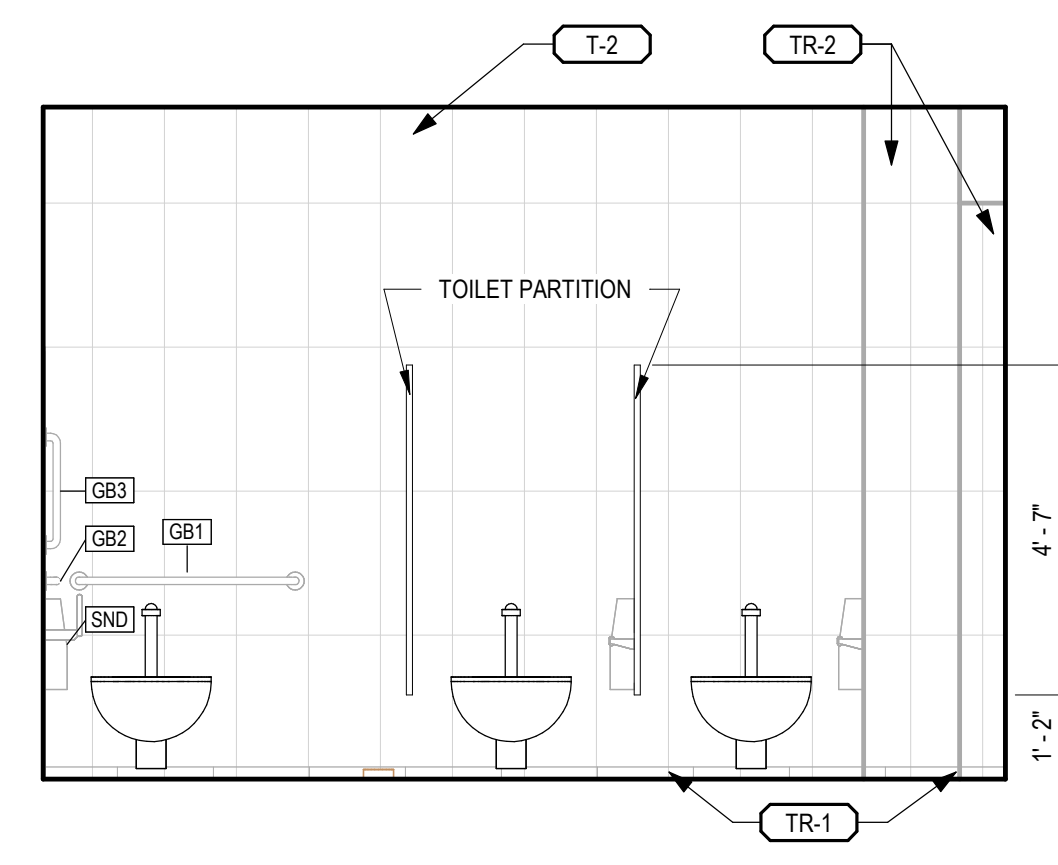
18 CAFETERIA TABLE STORAGE



17 CAFETERIA CHAIR STORAGE



16 BOYS GROUP TOILET ROOM

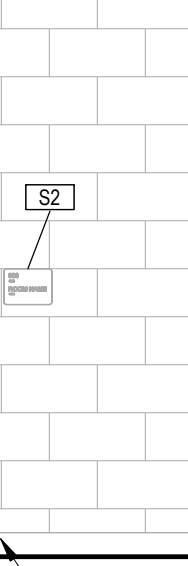


15 GIRLS GROUP TOILET ROOM

- ### MILLWORK GENERAL NOTES:
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 3. ALL EXPOSED SURFACES OF CABINETS ARE TO BE FINISHED TO MATCH CABIN FINISH. U.O.
 4. GROMMET'S SHALE BE SPACED 60" O.C. MAX. COORDINATE FINISH LOCATIONS WITH OWNER'S EQUIPMENT.
 5. PROVIDE FILLER PIECE AT ALL LOCATIONS BETWEEN CABINET AND ADJACENT WALL OR CEILING. FILLER PIECE TO BE FLUSH WITH FACE OF CABINET AND SHALL MATCH MATERIAL AND FINISH OF CABINETS.
 6. ALL COUNTERTOPS LOCATED ATOP BASE CABINETS TO HAVE "1" OVERHANG. U.O.
 7. ALL BASE CABINETS SHALL BE 24" U.O.
 8. ALL WALL CABINETS SHALL BE 12" U.O.
 9. PROVIDE SEALANT AT ALL JOINTS WHERE COUNTERTOP, DISPLAYSASH OR BACKSPLASH ADJ ADJACENT SURFACES



14 BOYS CHANGING- SOUTH WALL
A-131 3/8" = 1'-0"



13 BOYS CHANGING- NORTH WALL
A-131 3/8" = 1'-0"



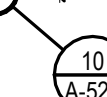
12 BOYS CHANGING SHOWER- NORTH
A-131 3/8" = 1'-0"



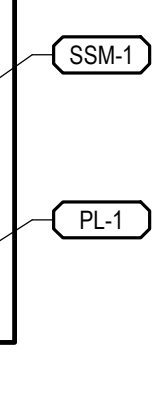
11 BOYS CHANGING SHOWER- WEST
A-131 $3/8" = 1'-0"$



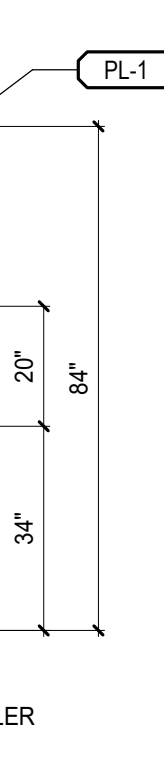
10 BOYS CHANGING TOILET
A-131 3/8" = 1'-0"



9 BOYS CHANGING- EAST WALL
A-131 3/8" = 1'-0"



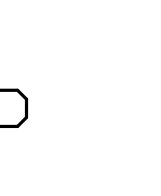
8 OFFICE WORK ROOM ISLAND
A-101A 3/8" = 1'-0"



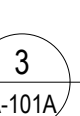
7 OFFICE WORK ROOM
A-101A 3/8" = 1'-0"



6 CORRIDOR GROUP TOILET SINK
A-131 3/8" = 1'-0"

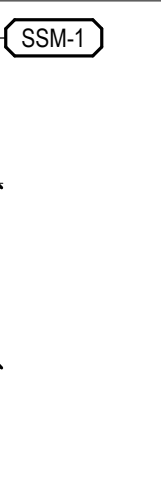


5 OFFICE BREAKROOM
A-101A 3/8" = 1'-0"



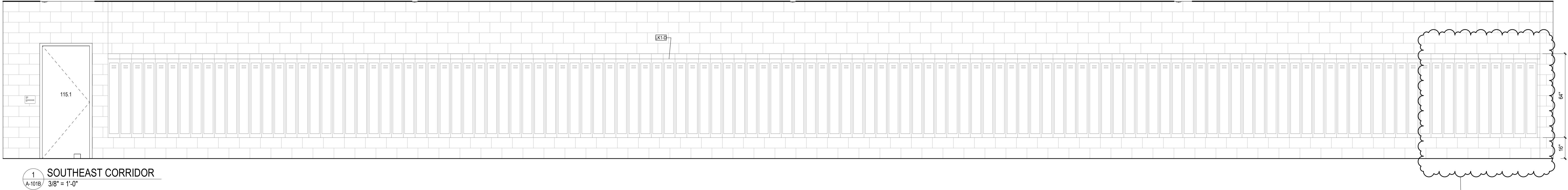
4 WOOD LOOK CORRIDOR TILE TYP.
A-101A 3/8" = 1'-0"

3 TEACHER WORK ROOM
A-101A $3/8" = 1'-0"$

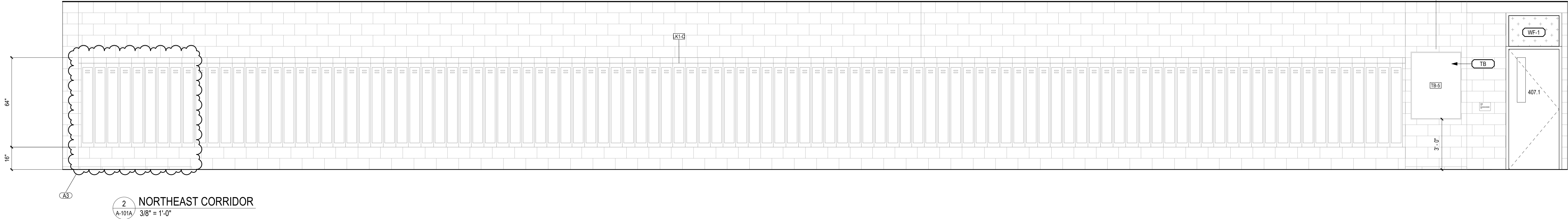


2 HEALTH CLINIC
A-101A 3/8" = 1'-0"

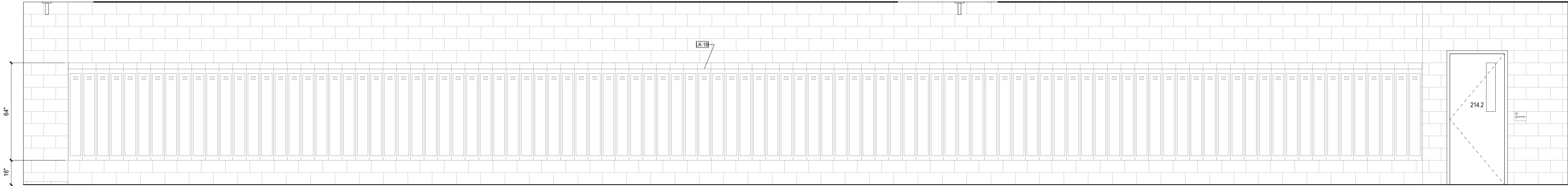
1 STAFF SINGLE RESTROOM
A-131 3/8" = 1'-0"



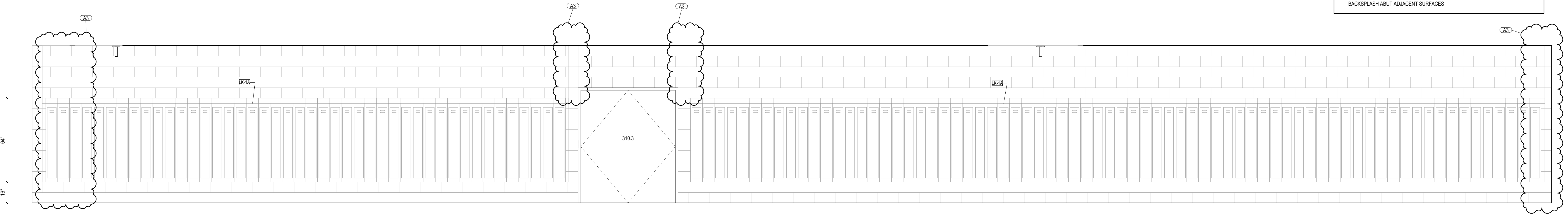
1 SOUTHEAST CORRIDOR
A-101B/ 3/8" = 1'-0"



2 NORTHEAST CORRIDOR
A-101A/ 3/8" = 1'-0"



3 SOUTHWEST CORRIDOR
A-101B/ 3/8" = 1'-0"



4 NORTHWEST CORRIDOR
A-101A/ 3/8" = 1'-0"

- MILLWORK GENERAL NOTES:**
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 7. ALL BASE CABINETS SHALL BE 24"D, U.N.O.
 8. ALL WALL CABINETS SHALL BE 12"D, U.N.O.
 9. PROVIDE SEALANT AT ALL EDGES WHERE COUNTERTOP, SIDESPLASH OR BACKSPLASH ABUT ADJACENT SURFACES.

REVISIONS		
REV	DESCRIPTION	DATE
03	ADDENDUM #3	26.01.2023

INTERIOR ELEVATIONS -
CORRIDORS

LANSING SCHOOL DISTRICT
Mt. Hope
1215 E Mt Hope Ave., Lansing, MI 48910

ROOM FINISH GENERAL NOTES:

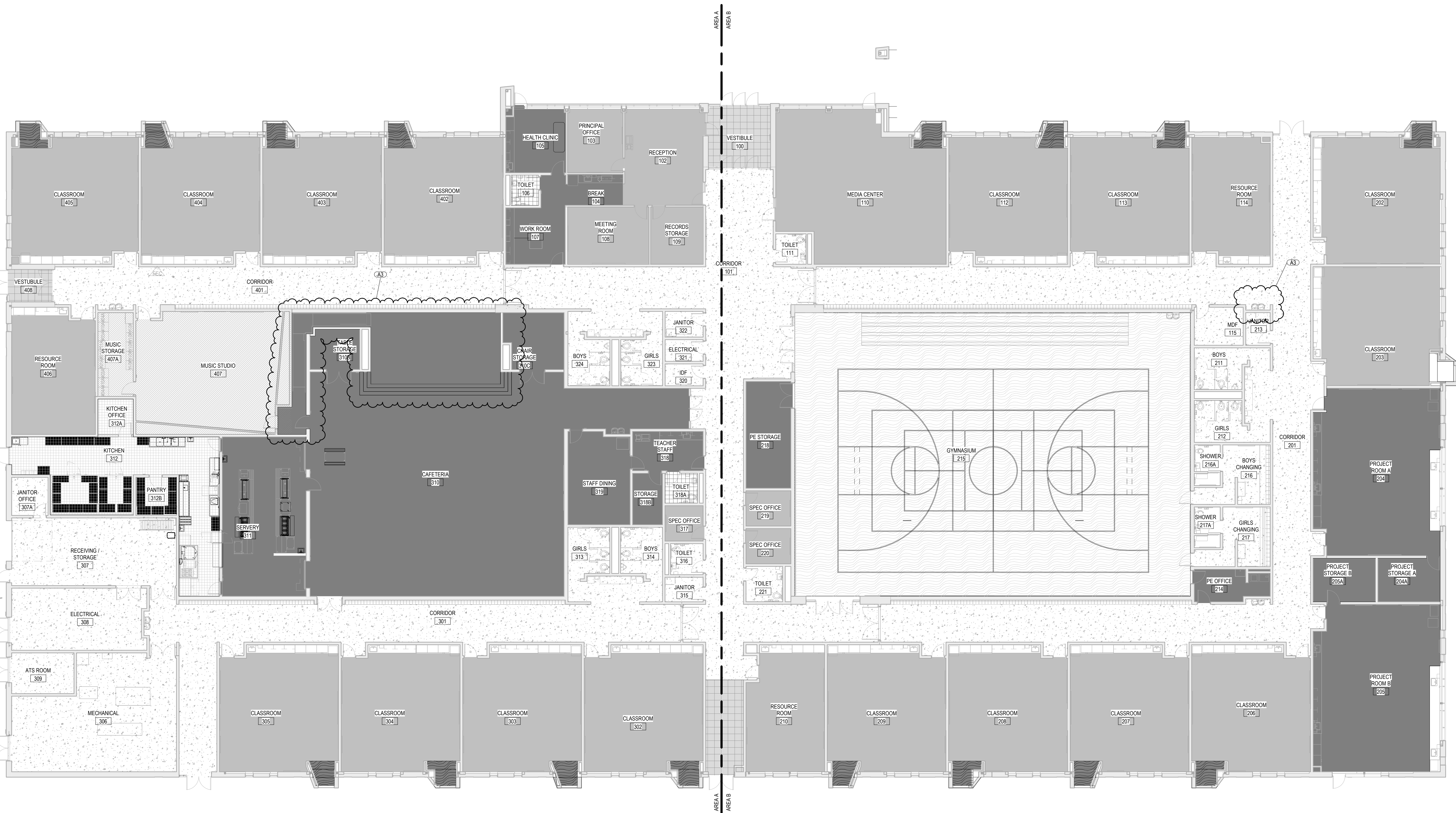
1. DOOR FRAME COLOR CHANGES SHALL OCCUR ON STOP AS IF DOOR IS IN CLOSED POSITION WITH THE DOOR AND FRAME SHOWING AS ONE COLOR.
2. FLOORING TRANSITIONS SHALL BE CENTERED UNDER DOOR WHILE IN CLOSED POSITION. PROVIDE TRANSITION STRIP BETWEEN ALL FLOORING MATERIAL TRANSITIONS.
3. ALL AREAS EXPOSED TO VIEW ABOVE THE CEILINGS ARE TO BE PAINTED. REFER TO INTERIORS DOCUMENTS FOR COLOR
4. ALL EXPOSED STRUCTURAL, PLUMBING, MECHANICAL & ELECTRICAL ELEMENTS ARE TO BE PAINTED. REFER TO INTERIORS DOCUMENTS FOR COLOR

INTERIORS ABBREVIATIONS

ABBREVIATION	FULL TEXT
ACD	ACOUSTICAL CEILING DIFFUSER
ACP	ACOUSTICAL CEILING PANEL
AWP	ACOUSTICAL WALL PANEL
CPT	CARPET TILE
EP	EPOXY PAINT
GT	GROUT
P	PAINT
PL	PLASTIC LAMINATE
POL	POLISHED CONCRETE
RB	RUBBER BASE
RF	RESILIENT FLOORING
RS	ROLLER SHADE
SLR	SEALED CONCRETE
STN	STAIN
T	TILE
TB	TACKBOARD
TP	TOILET PARTITION
TR	TRANSITION TRIM
WD	WOOD
WF	WINDOW FILM
WM	WALK OFF MAT

MATERIALS SCHEDULE

CODE	USE	MANUFACTURER	STYLE	PATTERN & COLOR	SIZE	INSTALLATION PATTERN	FINISH NOTES
ACD	ACOUSTICAL CEILING PANEL	KINETICS	RADIUS DIFFUSERS	WHITE DIFFUSER, WHITE GRID	24" X 24", 15/16" GRID	--	--
ACP-1	ACOUSTICAL CEILING PANEL- MUSIC ROOM	ARMSTRONG	SCHOOLZONE, FINE FISSURED, SQUARE EDGE	WHITE PANEL, WHITE GRID	24" X 24", 15/16" GRID	--	--
ACP-2	ACOUSTICAL CEILING PANEL	ARMSTRONG	SCHOOLZONE, FINE FISSURED, SQUARE EDGE	WHITE PANEL, WHITE GRID	24" X 24", 15/16" GRID	--	--
ACP-3	ACOUSTICAL CEILING PANEL	ARMSTRONG	OPTIMA	WHITE PANEL, WHITE GRID	24" X 24", 15/16" GRID	--	--
RB-1	RUBBER BASE	FLEXCO	RUBBER BASE, COVE	024 STONE	14H	--	--
TB	TILE BASE	VIRGINIA TILE, CROSSVILLE	COLOR BLOX 2.0	SLUNKY	6" X 12" COVE	--	--
CARPET							
CPT-1	CLASSROOM TEXTILE COMPOSITE FLOORING TILE	EF CONTRACT	KINETEX, IMPRINT	RAVEN IMP96	--	--	--
CPT-2	WALK OFF CARPET TILE	MILIKEN	OREX, OUTDRIFT	DTCS 27-173 GREY	20" X 20" MONOLITHIC	--	--
CPT-3	ADMINISTRATION OFFICES / OTHER OFFICES TEXTILE COMPOSITE FLOORING TILE	EF CONTRACT	KINETEX, IMPRINT	CADET IMP47	--	--	--
RF-1	CAFETERIA RESILIENT FLOORING	FORBO	MARMOLEUM, SHEET, REAL	DOVE GREY 2021	--	--	--
RF-2	CAFETERIA STAGE, PROJECT ROOM A/B, BAND ROOMS RESILIENT FLOORING	FORBO	MARMOLEUM, SHEET, CONCRETE	BLACK HOLE 3707	--	--	--
RF-3	RESILIENT KITCHEN FLOORING	PROTECT-ALL FLOORING	PROTECT-ALL FLOORING	DARK GRAY	--	--	INTEGRAL BASE
RF-4	GYMNASIUM FLOOR	GERFLOR	TARAFLEX SPORTS M PLUS	6375 OAK	--	--	--
RF-5	GYMNASIUM ACCENT FLOOR	GERFLOR	TARAFLEX SPORTS M PLUS	6430 BLUE	--	--	--
TILE							
T-1	SINK WET WALL & DRINKING FOUNTAIN NICHE TILE	VIRGINIA TILE, ISLA TILES	SHIBUSA	BEIGE	MOSAICO BACCHETTE RETT	INSTALLED IN VERTICAL ORIENTATION WITH 24" L RUNNING NORTH/SOUTH	--
T-2	TOILET WET WALL AND SIDE WALLS TILE	VIRGINIA TILE, ISLA TILES	SHIBUSA	BEIGE	24" L X 12" W	INSTALLED IN VERTICAL ORIENTATION WITH 24" L RUNNING NORTH / SOUTH	--
T-3	FIELD WALL TILE	VIRGINIA TILE COMPANY	MELROSE	WALL TILE, NAVY, GLOSSY	4" X 16"	VERTICAL STACK	--
T-4	ACCENT WALL TILE	VIRGINIA TILE COMPANY	MELROSE	CURVE DECORATIVE TILE, NAVY, MATT	4" X 16"	VERTICAL STACK	--
T-5	CORRIDOR TILE WIDE	VIRGINIA TILE, CAESAR CERAMICHE	LIFE	OAK	30 CM X 120 CM	VERTICAL STACK	--
T-6	CORRIDOR TILE MEDIUM	VIRGINIA TILE, CAESAR CERAMICHE	LIFE	OAK	20 CM X 120 CM	VERTICAL STACK	--
T-7	CORRIDOR TILE SMALL	VIRGINIA TILE, CAESAR CERAMICHE	LIFE	OAK	14.7 CM X 120 CM	VERTICAL STACK	--
T-8	SHOWER FLOOR TILE	VIRGINIA TILE, AMERICAN OLEAN	UNGLAZED MOSAICS	SNOW LEOPARD, STRAIGHT JOINT, 0468	1" X 1" MOSAIC	MONOLITHIC	--
T-9	SHOWER WALL TILE	VIRGINIA TILE, AMERICAN OLEAN	UNGLAZED MOSAICS	SALT & PEPPER, STRAIGHT JOINT, 0412	1" X 1" MOSAIC	MONOLITHIC	--
T-10	FLOOR TILE	VIRGINIA TILE, CROSSVILLE	COLOR BLOX 2.0	SLUNKY	12" X 12"	MONOLITHIC	--
PAINT							
P-1	GYPSUM BOARD / BULKHEAD CEILINGS - WHITE	SHERWIN-WILLIAMS	FLAT	SW 7004 SNOWBOUND	--	--	--
P-2	HOLLOW METAL DOOR AND WINDOW FRAME	SHERWIN-WILLIAMS	SEMI-GLOSS	SW 7019 GAUNTLET GRAY	--	--	--
P-3	FIELD NEUTRAL	SHERWIN-WILLIAMS	EGGSHELL	SW 7014 EIDER WHITE	--	--	--
P-4	ACCENT PAINT - GOLD	SHERWIN-WILLIAMS	EGGSHELL	SW 6361 AUTUMNAL	--	--	--
P-5	ACCENT PAINT - TEAL	SHERWIN-WILLIAMS	EGGSHELL	SW 7620 SEAWORTHY	--	--	--
P-6	ACCENT PAINT - BLUE	SHERWIN-WILLIAMS	EGGSHELL	SW 9178 IN THE NAVY	--	--	--
P-7	ACCENT PAINT - PURPLE	SHERWIN-WILLIAMS	EGGSHELL	SW 6286 MATURE GRAPE	--	--	--
P-8	INFRASTRUCTURE PAINT - FIRE SUPPRESSION	SHERWIN-WILLIAMS	EGGSHELL	SW 7600 BOLERO	--	--	--
P-9	INFRASTRUCTURE PAINT - ELECTRICAL CONDUIT	SHERWIN-WILLIAMS	EGGSHELL	SW 6286 MATURE GRAPE	--	--	--
P-10	INFRASTRUCTURE PAINT - HVAC	SHERWIN-WILLIAMS	EGGSHELL	SW 9047 AFTER THE RAIN	--	--	--
P-11	INFRASTRUCTURE PAINT - WATERLINE	SHERWIN-WILLIAMS	EGGSHELL	SW 6775 BRINY	--	--	--
P-12	GYPSUM BOARD / BULKHEAD CEILINGS - BLACK	SHERWIN-WILLIAMS	FLAT	SW 6258 TROICORN BLACK	--	--	--
P-13	CAFETERIA DUCTWORK ACCENT COLOR	SHERWIN-WILLIAMS	FLAT	SW 9059 SILKEN PEACOCK	--	--	--
P-14	GYMNASIUM DUCTWORK ACCENT COLOR	SHERWIN-WILLIAMS	FLAT	SW 6531 INDIGO	--	--	--
P-15	TECTUM ACOUSTIC WALL PANEL AND CEILING DECK COLOR	SHERWIN-WILLIAMS	FLAT	SW 9110 MALABAR	--	--	--
P-16	CHANGING ROOM CONCRETE BENCH PAINT	SHERWIN-WILLIAMS	EPOXY SEMI-GLOSS	SW7019 GAUNTLET GRAY	--	--	--
STN-1	STAIN FOR CLASSROOM LAM-BEAMS	MINWAX	SEMI-TRANSPARENT, SATIN	HABITAT 427	--	--	--
CASEWORK							
RL-1	WOODGRAIN PLASTIC LAMINATE	LAMINART	--	983 WG GOLDEN OAK	--	VERTICAL GRAIN	--
SSM-1	SOLID SURFACE COUNTERTOPS	WILSONART	SOLID SURFACE	AVAILANCHE MELANGE, 9175ML	--	--	--
MISCELLANEOUS							
AWP-1	ACOUSTIC WALL PANEL	MPS ACOUSTICS	POLYGO RECTANGLE FELT ACOUSTIC WALL PANEL	51 BIRCH BARK	48" x 120", 1" THICK		MOUNTING TO ACCOMMODATE 3/8" PFT ACOUSTIC ENHANCER TO BE PAINTED P-15 ON SITE
AWP-2	TECTUM ACOUSTIC WALL PANEL	ARMSTRONG TECTUM	DESIGNART SHAPES & LINES	90" SQUARE, BAND IN COLOR NATURAL	24" X 24"	--	TO BE PAINTED P-15 ON SITE
AWP-3	TECTUM ACOUSTIC WALL PANEL	ARMSTRONG TECTUM	DESIGNART SHAPES & LINES	90" SQUARE, RING IN COLOR NATURAL	24" X 24"	--	TO BE PAINTED P-15 ON SITE
AWP-4	TECTUM ACOUSTIC WALL PANEL	ARMSTRONG TECTUM	DESIGNART SHAPES & LINES	CIRCLE IN COLOR NATURAL	24" X 24"	--	TO BE PAINTED P-15 ON SITE
AWP-5	SOUND SEAL S-2100 WALL PANEL	SOUND SEAL	--	GUILFORD OF MAINE FR701 2100: SILVER NEUTRAL 406	2" THICK	--	EC-CLIP MOUNTED
AWP-6	SOUND SEAL S-2100 WALL PANEL	SOUND SEAL	--	GUILFORD OF MAINE FR701 2100: BALTIO 153	2" THICK	--	EC-CLIP MOUNTED
AWP-7	SOUND SEAL S-2100 WALL PANEL	SOUND SEAL	--	GUILFORD OF MAINE FR701 2100: TEAL 742	2" THICK	--	EC-CLIP MOUNTED
AWP-8	SOUND SEAL S-2100 WALL PANEL	SOUND SEAL	--	GUILFORD OF MAINE FR701 2100: CLEAR 206	2" THICK	--	EC-CLIP MOUNTED
FRP-1	FIBERGLASS REINFORCED PANEL	MARLITE FRP	--	PEBBLED MEDIUM GRAY	4' X 8'	INSTALLED IN VERTICAL ORIENTATION WITH 8" RUNNING NORTH/ SOUTH	--
POL-1	POLISHED CONCRETE	--	--	NATURAL	--	--	--
RS-1	WINDOW ROLLER SHADES	DRAPER	SHEERWEAVE BASIC	3% V22 CHARCOAL/GRAY WITH CLEAR ANODIZED VALANCE	VARIES, CONTRACTOR V.I.F.	--	--
SLR-1	SEALED CONCRETE	--	--	NATURAL	--	--	COORDINATE WITH STRUCTURAL
TB	TACKBOARD FINISH	FORBO	OUSTER SHELL	--	--	--	--
TP-1	TOILET PARTITIONS	SCRANTON PRODUCTS	NINEY HIDERS PARTITIONS	HAMMERED, NICKEL	--	--	--
WD-1	WOOD DOOR FINISH	--	WHITE OAK PLAIN SLICED	CLEAR STAIN	--	--	--
WD-2	NICHE WOOD	--	WHITE OAK VENEER PLYWOOD	CLEAR STAIN	--	--	ALL WOOD TRIM TO BE WHITE OAK STRIPES TO RUN VERTICAL
WM	WALK OFF MAT	SUE COOPER	ARK ADJUSTABLE WALK OFF MAT	PERFORATED POLYESTER CARPET, 1/2" CARPET, 1/2" CARPET, 1/2" CARPET	48" X 60", 1" CARPET	--	--
TRIM							
TR-1	SCHLUTER DILEX-AHKA FLOOR TRANSITION TRIM	SCHLUTER	--	SATIN ANODIZED	--	--	--
TR-2	SCHLUTER JOLY EDGE TRIM	SCHLUTER	--	SATIN ANODIZED	--	--	--
TR-3	SCHLUTER QUADECO CORNER TRIM	SCHLUTER	--	SATIN ANODIZED	--	--	--
TR-4	SCHLUTER RENO RAMP	SCHLUTER	--	SATIN ANODIZED	--	--	--
TR-5	CAFETERIA STAGE NOSING	TARKETT	STAIR NOSING SLIM NOSING	48 GREY	--	--	--
TR-6	TRANSITION CARPET TO CONCRETE	TARKETT	RUBBER EDGE GUARD	48 GREY	--	--	--
TR-7	TRANSITION RESILIENT TO CONCRETE	TARKETT	SLIM LINE	38 PEWTER	--	--	--

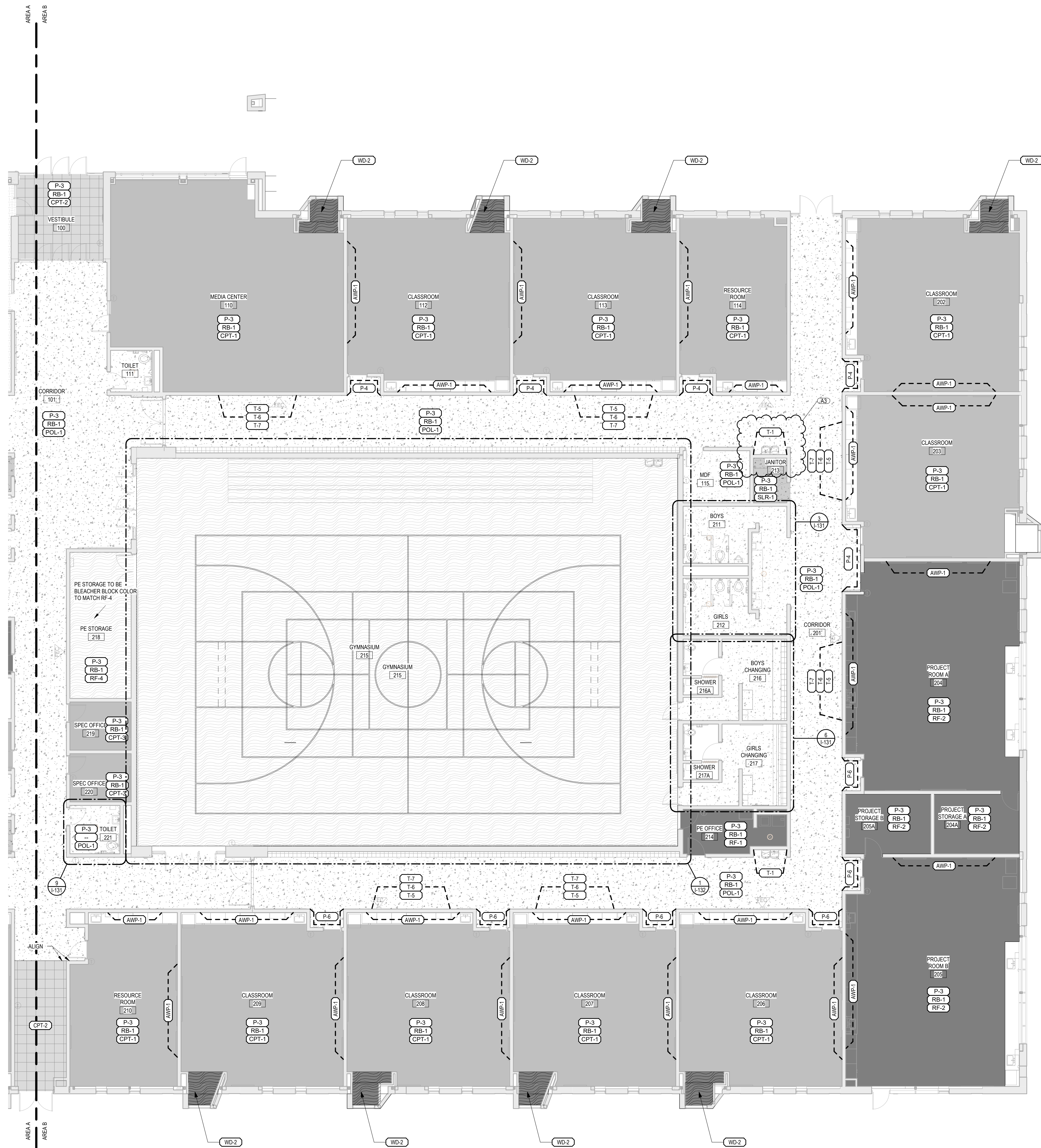


 FIRST FLOOR FINISH PLAN - OVERALL
3/32" = 1'-0"

MATERIALS LEGEND:

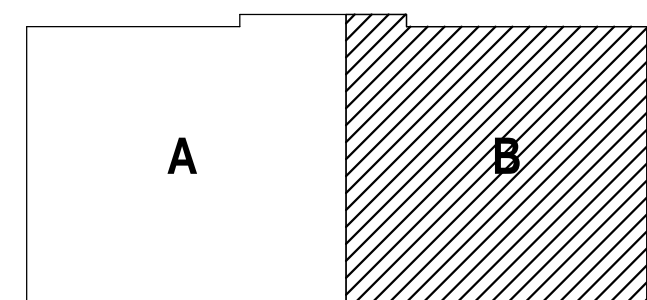
	POL-1		ACCENT FINISH
	SLR-1		FIELD WALL FINISH
	RF-1		FIELD BASE FINISH
	RF-2		FIELD FLOOR FINISH
	RF-3		
	RF-4		
	RF-5		
	CPT-1		
	CPT-2		
	CPT-3		

REVISIONS		
REV	DESCRIPTION	DATE
03	ADDENDUM 3	26.JUN.2023
PROJECT #:		
220116		
DATE:		
23-JUN-2023		
SHEET		



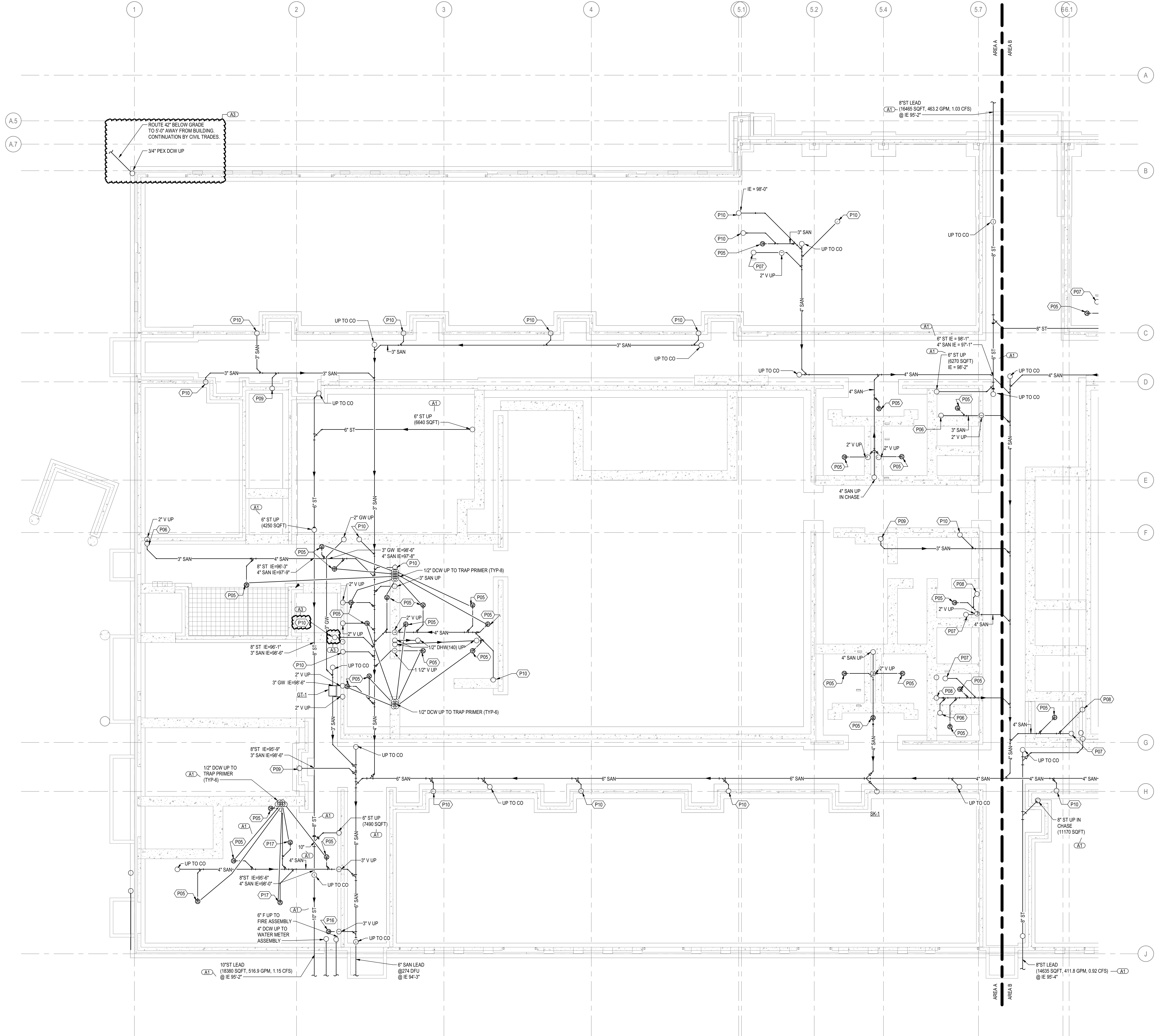
FIRST FLOOR FINISH PLAN - AREA B
1/8" = 1'-0"

MATERIALS LEGEND:	
POL-1	ACCENT FINISH
SLR-1	
RF-1	FIELD WALL FINISH
RF-2	FIELD BASE FINISH
RF-3	FIELD FLOOR FINISH
RF-4	
RF-5	
CPT-1	
CPT-2	
CPT-3	



KEY PLAN
NOT TO SCALE

REV	DESCRIPTION	DATE
01	ADDENDUM #3	26 JUL 2023



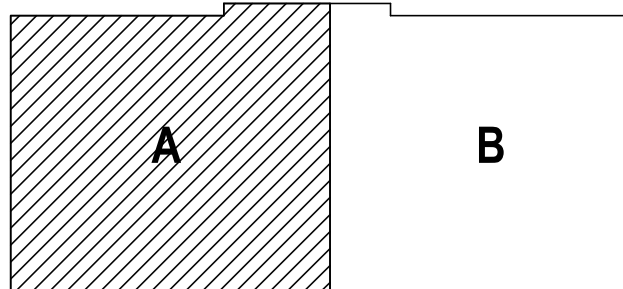
UNDERGROUND PLUMBING PLAN - AREA A
1/8" = 1'-0"

PLUMBING GENERAL NOTES

- THESE DRAWINGS INDICATE THE GENERAL EXTENT OF WORK BUT ARE NOT FABRICATION DRAWINGS. COORDINATE PLUMBING SYSTEMS WITH WORK OF ALL OTHER TRADES PRIOR TO ANY FABRICATION OR INSTALLATION. PROVIDE ALL FITTINGS, OFFSETS, TRANSITIONS, ETC. AS REQUIRED FOR A COMPLETE WORKABLE INSTALLATION.
- REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATION OF ALL NEW PLUMBING FIXTURES.
- ALL PLUMBING RELATED CORING THROUGH FLOORS SHALL BE BY PLUMBING CONTRACTOR.
- COORDINATE ALL NEW LOCATIONS, SIZES AND ELEVATIONS OF SLEEVES THROUGH WALLS, SLABS AND FOUNDATIONS WITH STRUCTURAL DRAWINGS AND FIELD CONDITIONS.
- COORDINATE ALL PIPE ROUTING WITH SITE CONDITIONS, EQUIPMENT MANUFACTURER'S RECOMMENDATIONS, AND ALL OTHER TRADES TO AVOID INTERFERENCES.
- PROVIDE ACCESS AROUND ALL NEW EQUIPMENT PER MANUFACTURER'S RECOMMENDATIONS.
- ALL OVERHEAD DOMESTIC WATER AND STORM PIPING SHALL BE INSULATED PER PLUMBING PIPING SYSTEM APPLICATION SCHEDULE AND LABELED IN ACCORDANCE WITH THE REQUIREMENTS OF THE PROJECT SPECIFICATIONS.
- ALL PIPING SHALL BE CONCEALED IN WALLS, CEILING SPACES OR ARCHITECTURAL SOFFITS UNLESS NOTED OTHERWISE.
- SEAL ALL PENETRATIONS THROUGH WALLS AND FLOORS AIR AND WATER TIGHT.
- COORDINATE LOCATIONS AND ELEVATIONS OF ALL NEW UNDERGROUND UTILITIES WITH CIVIL SITE PLANS PRIOR TO START OF CONSTRUCTION.
- CONTRACTOR SHALL MAINTAIN ADEQUATE CLEARANCES (PER THE LATEST EDITION OF THE NATIONAL ELECTRIC CODE) ABOVE AND AROUND ANY NEW ELECTRICAL PANELS, EQUIPMENT, AND TRANSFORMERS WHEN ROUTING OVERHEAD PIPING.
- RUN ALL SANITARY, VENT, AND STORM PIPING AT SLOPES COMPLYING WITH THE MICHIGAN PLUMBING CODE LATEST EDITION.
- PROVIDE WALL CLEANOUT AT THE BASE OF ALL VERTICAL STORM AND SANITARY CONDUCTORS.
- PROVIDE SHUT-OFF VALVES AT ALL PLUMBING FIXTURES. LOCATE ALL PLUMBING SHUT-OFF VALVES IN AN ACCESSIBLE LOCATION ABOVE AN ACCESS PANEL AND NO MORE THAN 24" ABOVE THE CEILING.
- FURNISH AND INSTALL BALANCING VALVES AT ALL BRANCHES OF HOT WATER RECIRCULATION PIPING SYSTEM. AT COMPLETION OF PIPING INSTALLATION, THE CONTRACTOR MUST BALANCE THE HOT WATER RECIRCULATING SYSTEM TO FLOW RATES INDICATED AND SUBMIT BALANCE RESULTS IN WRITING TO ARCHITECT/ENGINEER.
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- PROVIDE VENT PIPING THROUGH ROOF A MINIMUM OF 10' AWAY FROM PARAPET WALL AND A MINIMUM OF 10' CLEAR OR MORE FROM ANY OUTSIDE AIR INTAKES AS REQUIRED BY THE LATEST EDITION OF THE STATE LOCALLY ADOPTED PLUMBING CODE.
- SEE PLUMBING FIXTURE SCHEDULE ON P601 FOR BRANCH PIPING SIZES TO INDIVIDUAL PLUMBING FIXTURES.

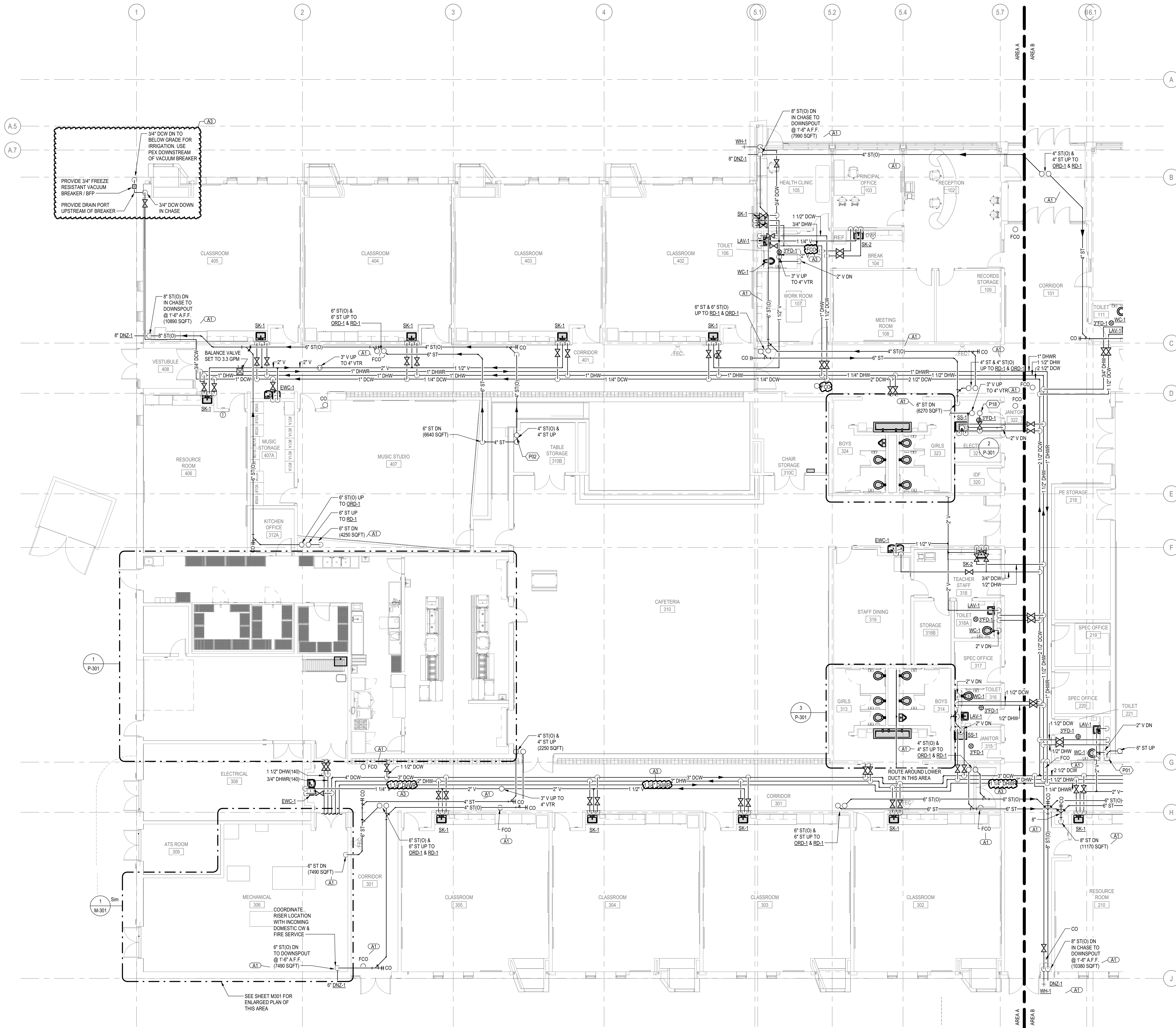
PLUMBING KEYNOTES

- (X)
- P05 ROUTE 3" SAN AND CONNECT TO FLOOR DRAIN.
 - P06 ROUTE 3" SAN UP TO SERVICE SINK/MOP BASIN.
 - P07 ROUTE 4" SAN UP TO FLOOR MOUNTED WATER CLOSET.
 - P08 ROUTE 2" SAN UP IN CHASE.
 - P09 ROUTE 2" SAN UP TO ELECTRIC WATER COOLER.
 - P10 ROUTE 2" SAN UP TO SINK.
 - P16 ROUTE 6" SAN AND CONNECT TO FLOOR DRAIN.
 - P17 ROUTE 4" SAN AND CONNECT TO FLOOR DRAIN.



KEY PLAN
NOT TO SCALE

REVISIONS		
REV	DESCRIPTION	DATE
A1	ADDENDUM 1	21-JUL-2023
A2	ADDENDUM 2	28-JUL-2023
A3	ADDENDUM 3	29-JUL-2023



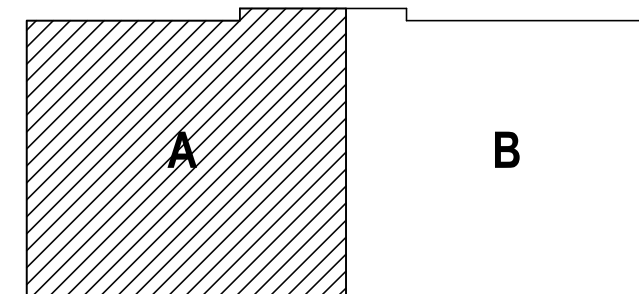
PLUMBING PLAN - AREA A
1/8" = 1'-0"

PLUMBING GENERAL NOTES

- THESE DRAWINGS INDICATE THE GENERAL EXTENT OF WORK BUT ARE NOT FABRICATION DRAWINGS. COORDINATE PLUMBING SYSTEMS WITH WORK OF ALL OTHER TRADES PRIOR TO ANY FABRICATION OR INSTALLATION. PROVIDE ALL FITTINGS, OFFSETS, TRANSITIONS, ETC. AS REQUIRED FOR A COMPLETE WORKABLE INSTALLATION.
- REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATION OF ALL NEW PLUMBING FIXTURES.
- ALL PLUMBING RELATED CORING THROUGH FLOORS SHALL BE BY PLUMBING CONTRACTOR.
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- CONTRACTOR SHALL MAINTAIN ADEQUATE CLEARANCES (PER THE LATEST EDITION OF THE NATIONAL ELECTRIC CODE) ABOVE AND AROUND ANY NEW ELECTRICAL PANELS, EQUIPMENT, AND TRANSFORMERS WHEN ROUTING OVERHEAD PIPING.
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- PROVIDE SHUT-OFF VALVES AT ALL PLUMBING FIXTURES. LOCATE ALL PLUMBING SHUT-OFF VALVES IN AN ACCESSIBLE LOCATION ABOVE AN ACCESS PANEL AND NO MORE THAN 24" ABOVE THE CEILING.
- FURNISH AND INSTALL BALANCING VALVES AT ALL BRANCHES OF HOT WATER RECIRCULATION PIPING SYSTEM. AT COMPLETION OF PIPING INSTALLATION, THE CONTRACTOR MUST BALANCE THE HOT WATER RECIRCULATING SYSTEM TO FLOW RATES INDICATED AND SUBMIT BALANCE RESULTS IN WRITING TO ARCHITECT/ENGINEER.
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- PROVIDE VENT PIPING THROUGH ROOF A MINIMUM OF 10' AWAY FROM PARAPET WALL AND A MINIMUM OF 10' CLEAR OR MORE FROM ANY OUTSIDE AIR INTAKES AS REQUIRED BY THE LATEST EDITION OF THE STATE LOCALLY ADOPTED PLUMBING CODE.
- SEE PLUMBING FIXTURE SCHEDULE ON P601 FOR BRANCH PIPING SIZES TO INDIVIDUAL PLUMBING FIXTURES.

PLUMBING KEYNOTES

- (X)
- P01 ROUTE RAIN CONDUCTOR DOWN IN CHASE. PROVIDE ACCESS FOR BASE OF STACK CLEAN OUT
- P02 ROUTE PRIMARY AND SECONDARY RAIN CONDUCTORS OVER SHEET METAL MAIN AND ROUTE DOWN WALL TO LOW ROOF.
- P18 ROUTE 3/4" DOW UP TO ROOF HYDRANT.



KEY PLAN
NOT TO SCALE

REVISIONS		
REV	DESCRIPTION	DATE
01	ADDENDUM 1	27-JUL-2023
02	ADDENDUM 2	28-JUL-2023
03	ADDENDUM 3	28-JUL-2023

PROJ. #: 220116

DATE: 23-JUN-2023

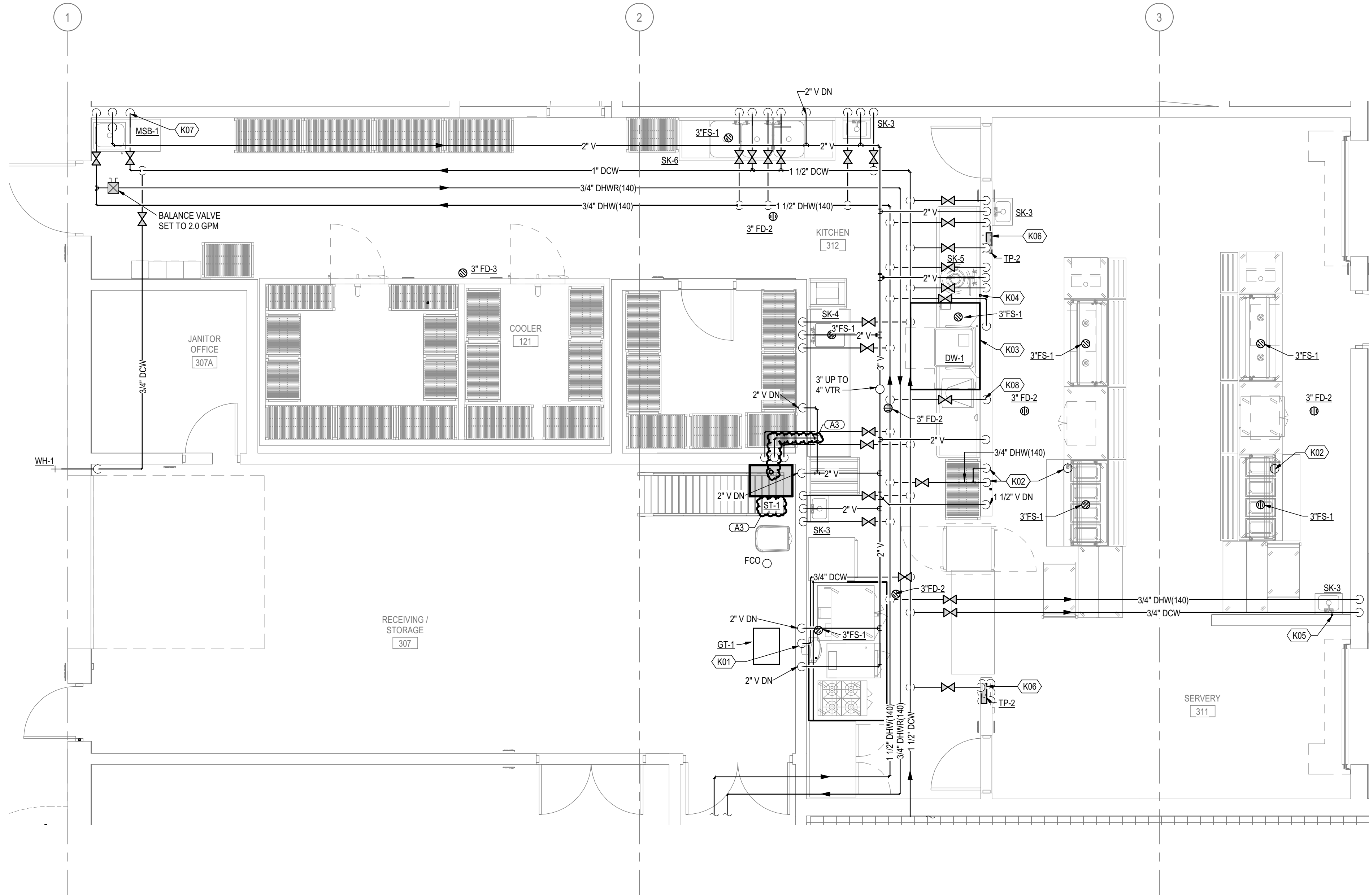
SHEET

P-111A

Addendum #3

KITCHEN PLUMBING KEYNOTES

- K01 PROVIDE 1/2" DCW DOWN IN WALL TO 96" A.F.F. AND STUB OUT TO REVERSE OSMOSIS SYSTEM. PROVIDE CONNECTION TO RO TANK AND CONNECTION BETWEEN RO TANK AND STEAMER. RO TANK AND STEAMER EQUIPMENT PROVIDED BY FSE TRADES. PROVIDE DCW CONNECTION TO DRAIN WATER TEMPERING KIT. COORDINATE WITH FSE TRADES.
- K02 PROVIDE 1/2" DHW DOWN IN WALL AND UNDER FLOOR TO HOT FOOD TABLE. COORDINATE WITH FSE TRADES FOR EXACT RISER LOCATION.
- K03 PROVIDE 3/4" DHW DOWN IN WALL AND STUB OUT AND CONNECT TO DISHWASHER / BOOSTER HEATER SYSTEM. (EQUIPMENT BY FSE TRADES). PROVIDE 1/2" DCW CONNECTION TO DRAIN WATER TEMPERING SYSTEM.
- K04 PROVIDE 3/4" DCW DOWN IN WALL AND STUB OUT AND CONNECT TO DISPOSAL SYSTEM. PROVIDE 1/2" DCW CONNECTION OFF 3/4" BRANCH TO CONNECT TO WATER SOFTENER AND FILTRATION SYSTEM (EQUIPMENT BY FSE TRADES).
- K05 HAND SINK LOCATED ON HALF-WALL. PROVIDE 1/2" DCW & DHW DOWN IN ADJACENT WALL. STUB OUT AND RUN SUPPLIES TIGHT TO WALL TO CONNECT TO HAND SINK. PROVIDE AAV VENT DOWNSTREAM OF TRAP BELOW SINK.
- K06 PROVIDE 3/4" DCW DOWN IN WALL TO TRAP PRIMER CABINET. PROVIDE PT-8 TYPE FOR 8 OUTLETS.
- K07 ROUTE 1/2" DCW, 1/2" DHW, AND 2" SAN TO MOP SINK.
- K08 ROUTE 1/2" HW DOWN IN WALL TO WATER SOFTENER. INDIRECT WASTE TO FLOOR SINK FROM SOFTENER.



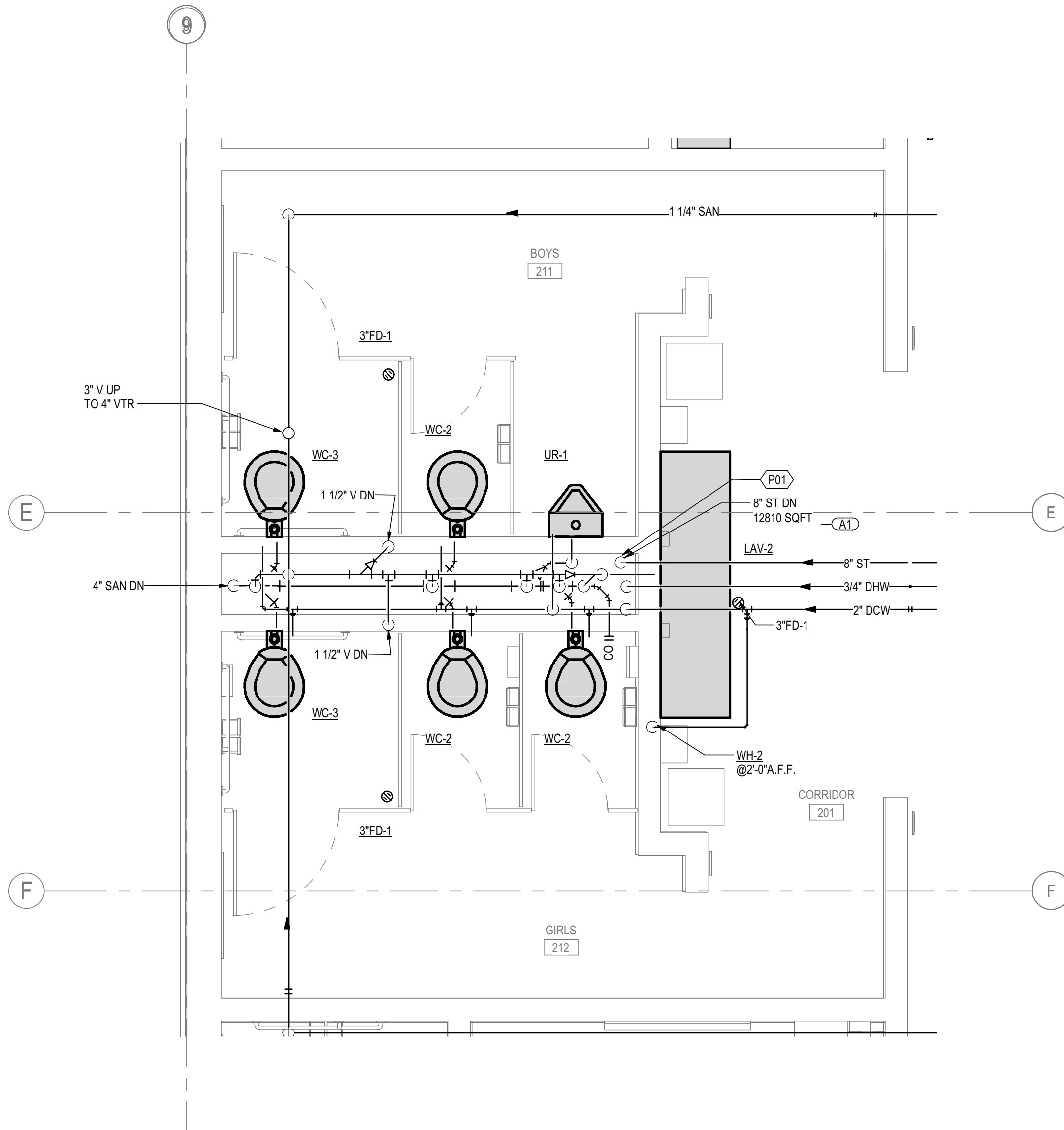
1 ENLARGED KITCHEN AREA PLUMBING PLAN
P-301 1/4" = 1'-0"

PLUMBING GENERAL NOTES

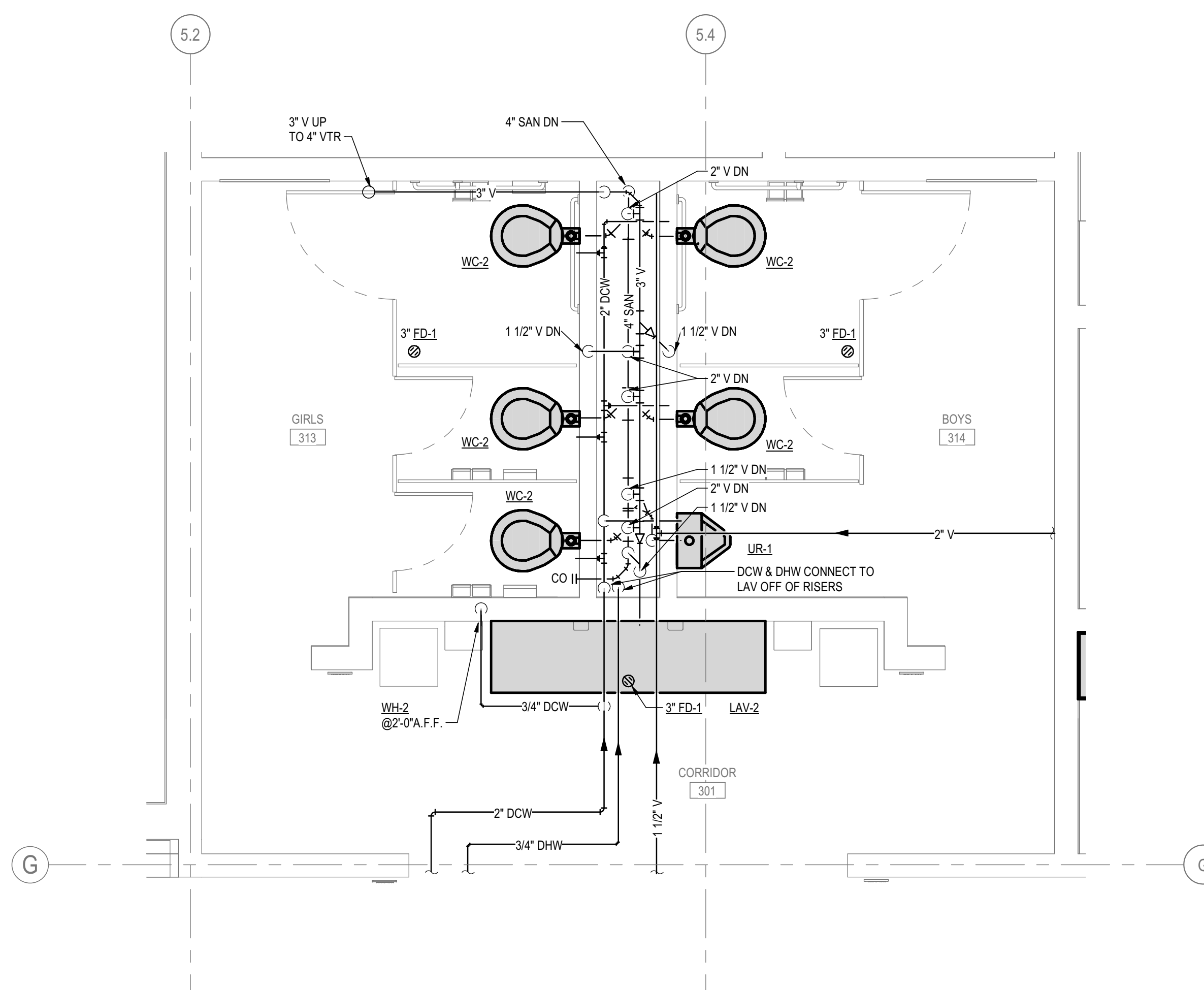
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- SEE PLUMBING FIXTURE SCHEDULE ON P801 FOR BRANCH PIPING SIZES TO INDIVIDUAL PLUMBING FIXTURES.

PLUMBING KEYNOTES

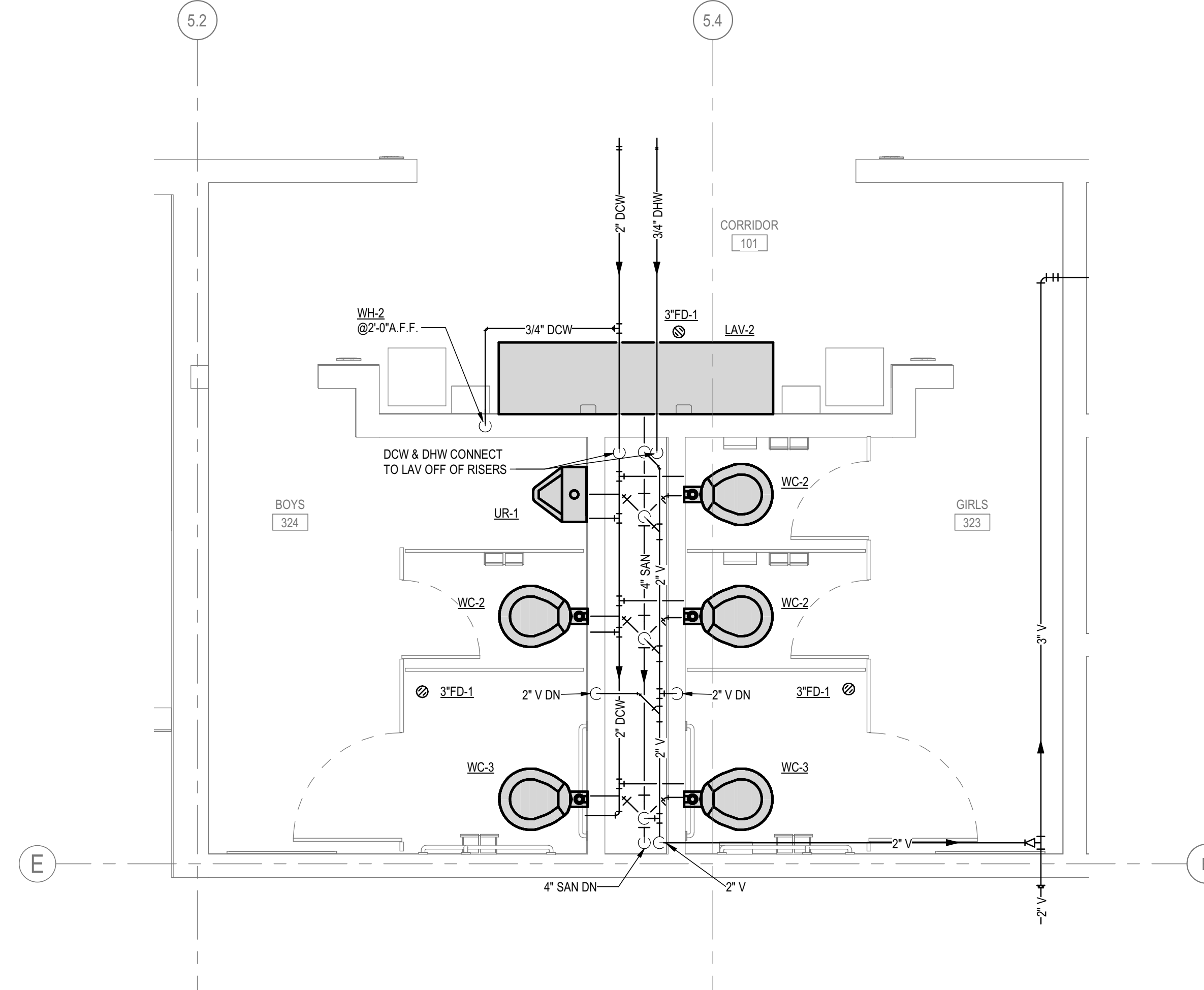
- P01 ROUTE RAIN CONDUCTOR DOWN IN CHASE. PROVIDE ACCESS FOR BASE OF STACK CLEAN OUT



4 ENLARGED TOILET ROOMS GIRLS 212 AND BOYS 211 PLUMBING PLAN
P-301 3/8" = 1'-0"



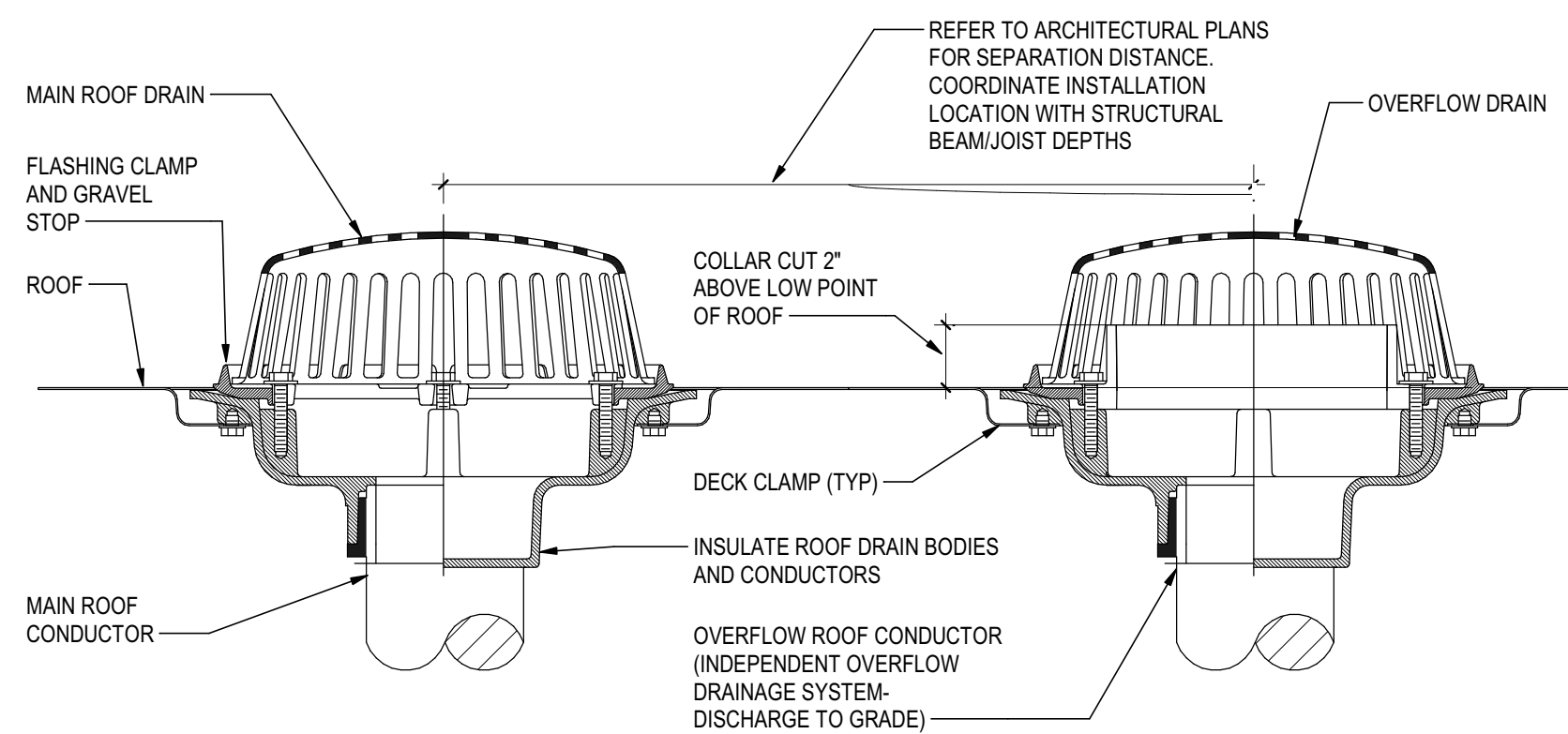
3 ENLARGED TOILET ROOMS GIRLS 313 AND BOYS 314 PLUMBING PLAN
P-301 3/8" = 1'-0"



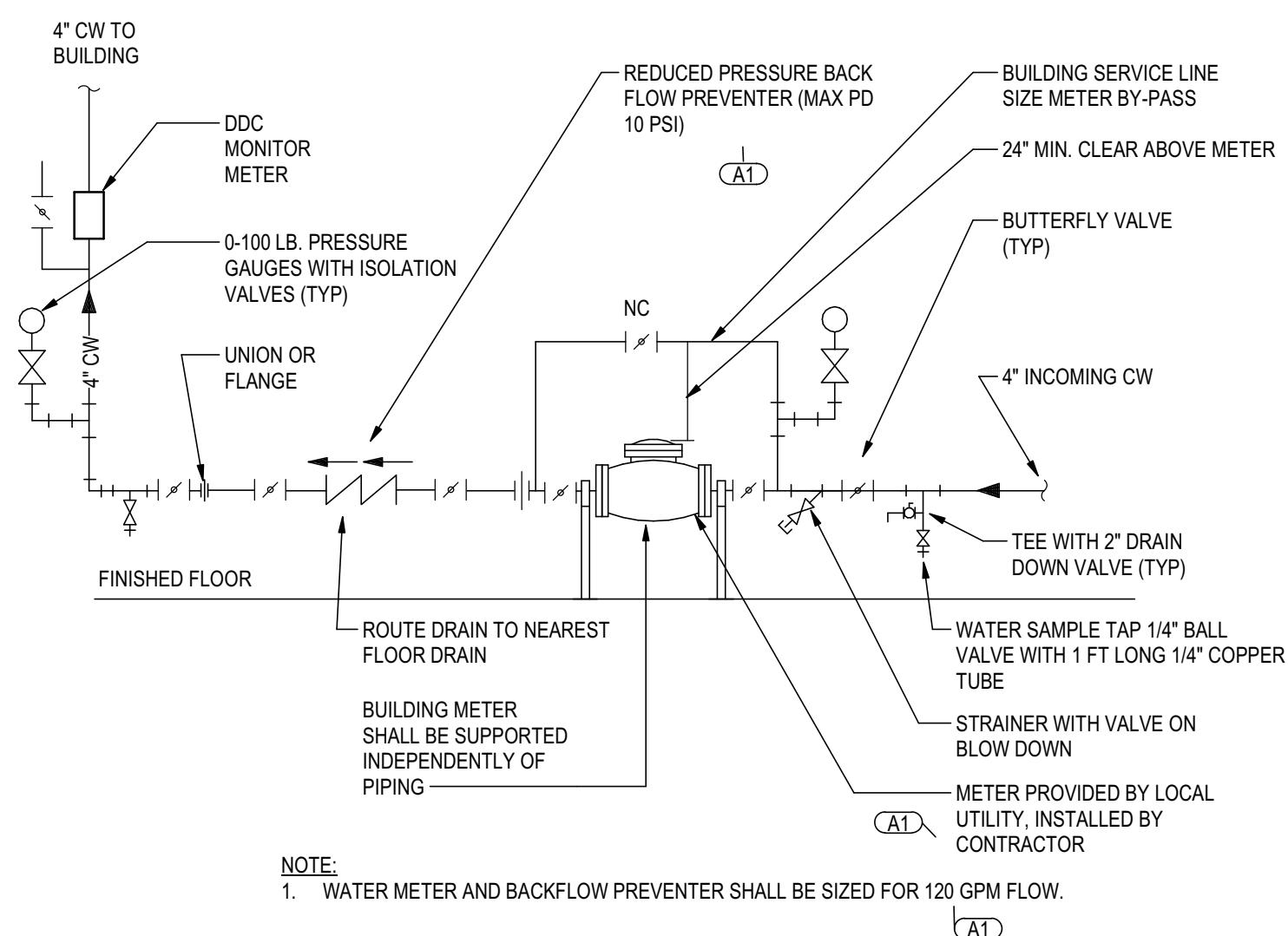
2 ENLARGED TOILET ROOMS GIRLS 323 AND BOYS 324 PLUMBING PLAN
P-301 3/8" = 1'-0"

REV	DESCRIPTION	DATE
A1	ADDENDUM 1	27-JUL-2023
A2	ADDENDUM 2	28-JUL-2023
A3	ADDENDUM 3	28-JUL-2023



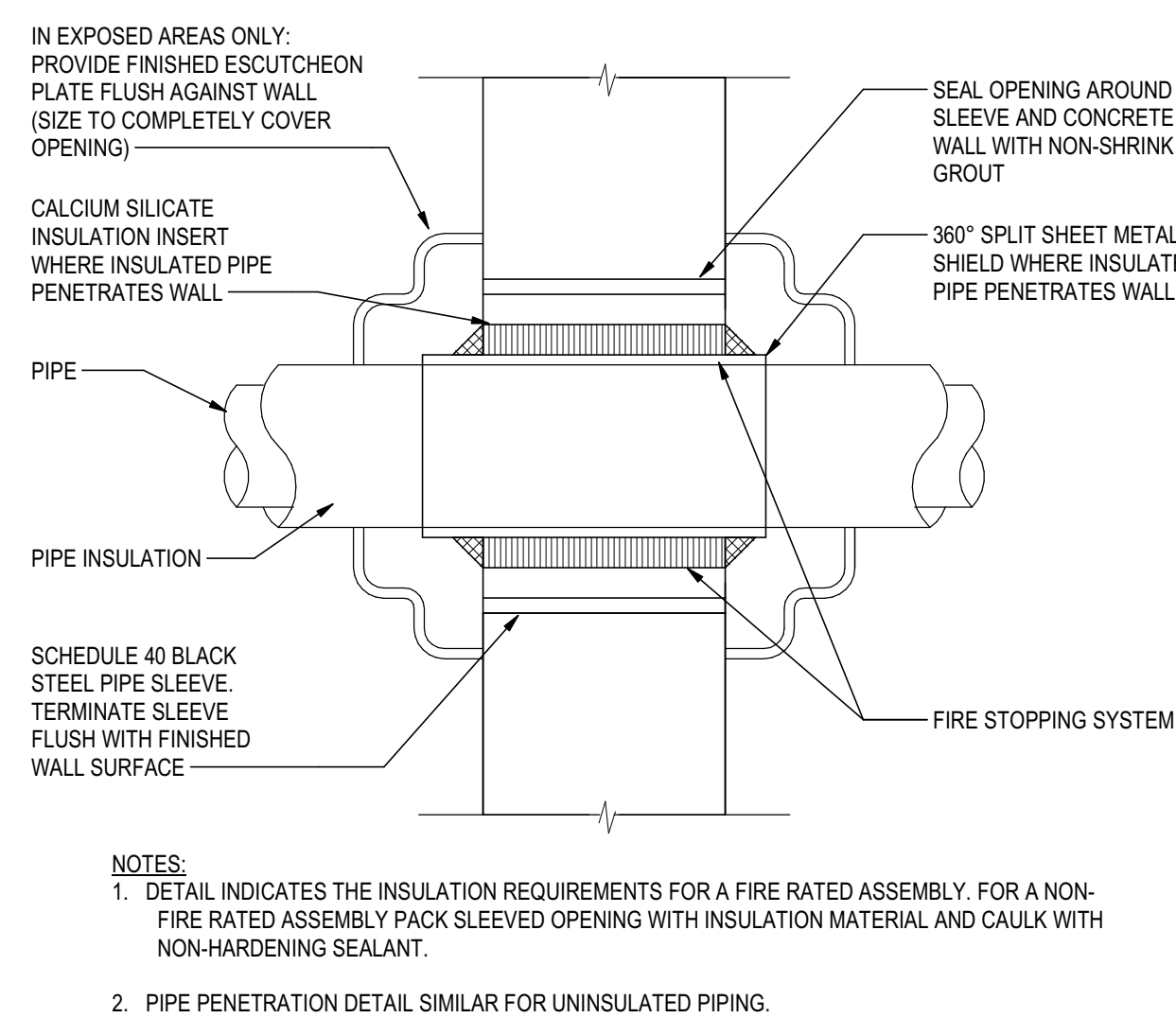


COMBINED ROOF DRAIN DETAIL
SCALE: NONE



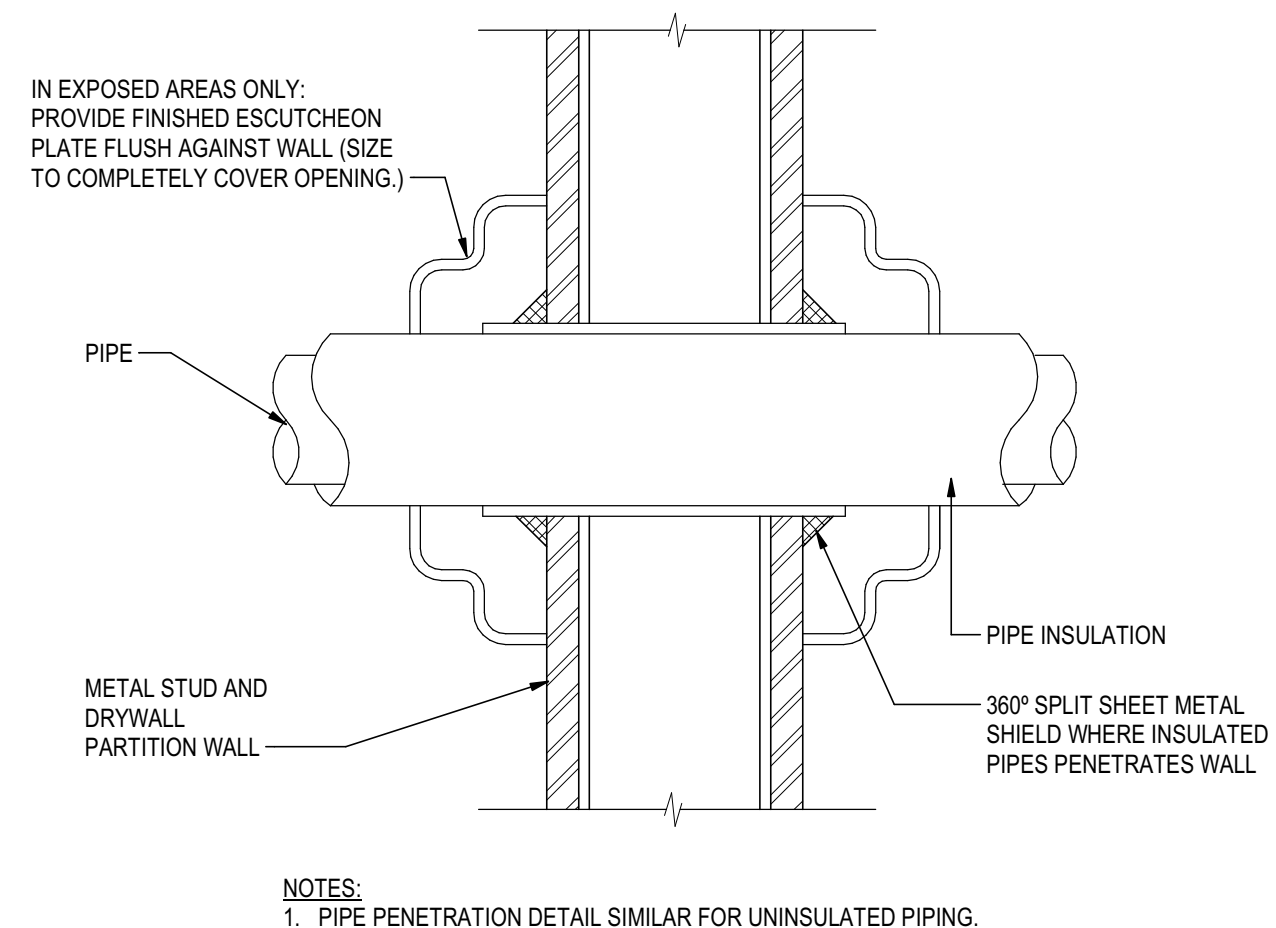
NOTE:
1. WATER METER AND BACKFLOW PREVENTER SHALL BE SIZED FOR 120 GPM FLOW.

WATER SERVICE PIPING DIAGRAM
SCALE: NONE



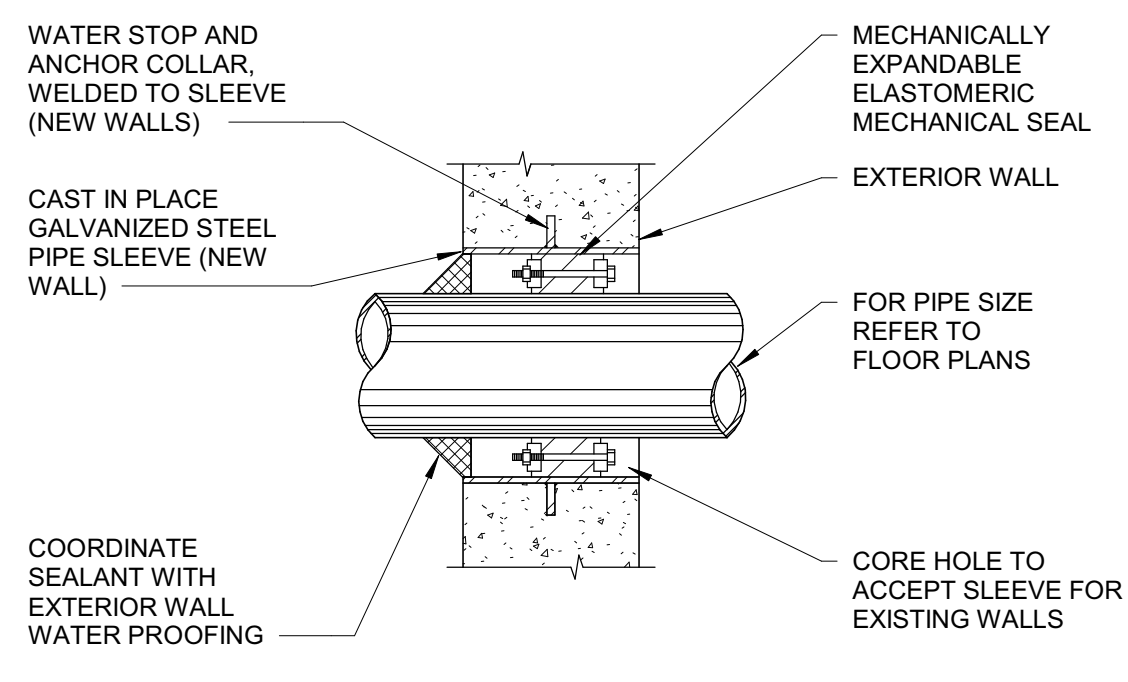
NOTES:
1. DETAIL INDICATES THE INSULATION REQUIREMENTS FOR A FIRE RATED ASSEMBLY FOR A NON-FIRE RATED ASSEMBLY PACK SLEEVED OPENING WITH INSULATION MATERIAL AND CALUL WITH NON-HARDENING SEALANT.
2. PIPE PENETRATION DETAIL SIMILAR FOR UNINSULATED PIPING.

FIRE RATED AND NON-FIRE RATED POURED CONCRETE OR BLOCK WALL PIPE PENETRATION DETAIL
SCALE: NONE

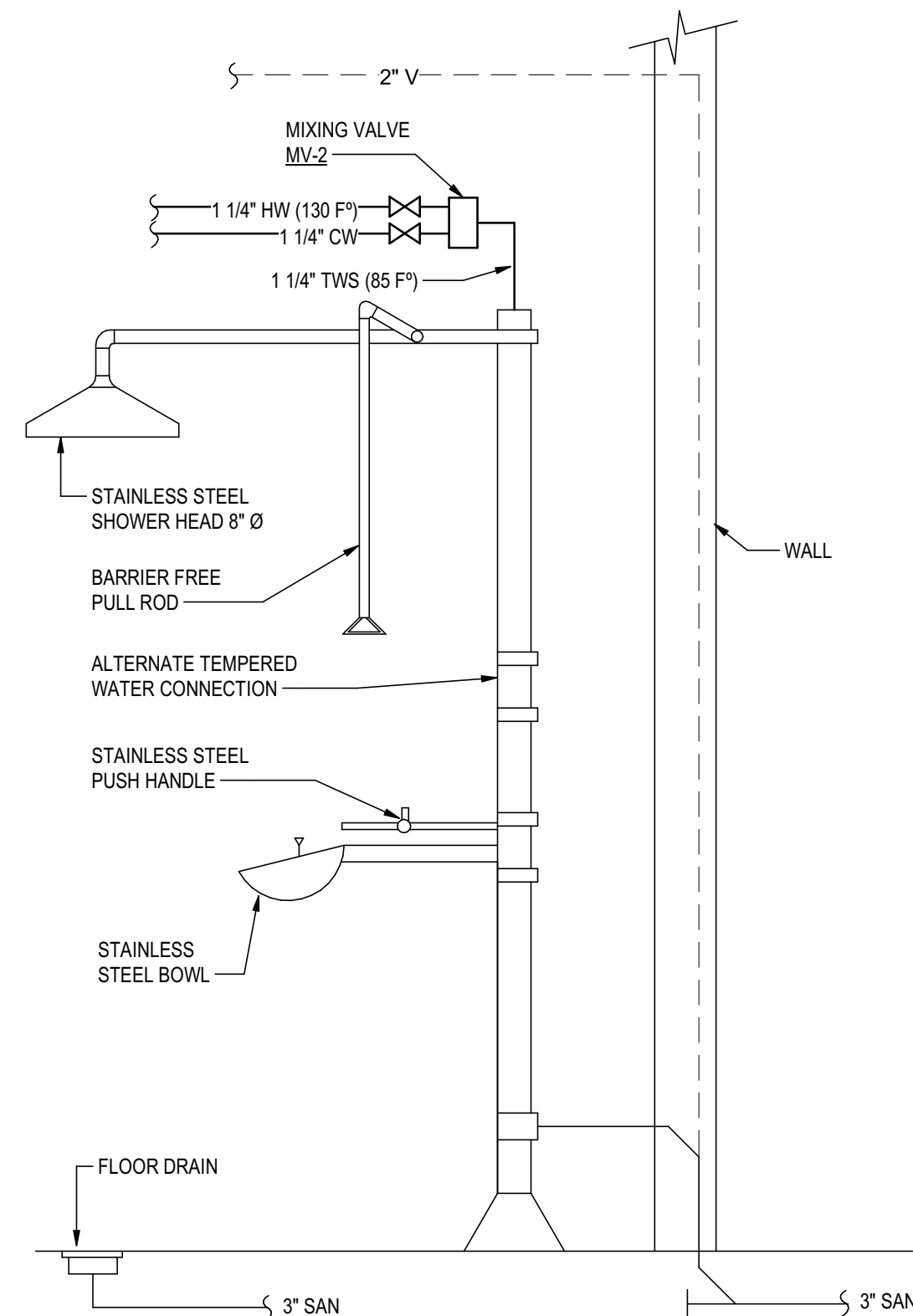


NOTES:
1. PIPE PENETRATION DETAIL SIMILAR FOR UNINSULATED PIPING.

NON-FIRE RATED STUD AND DRYWALL PARTITION WALL PIPE PENETRATION DETAIL
SCALE: NONE

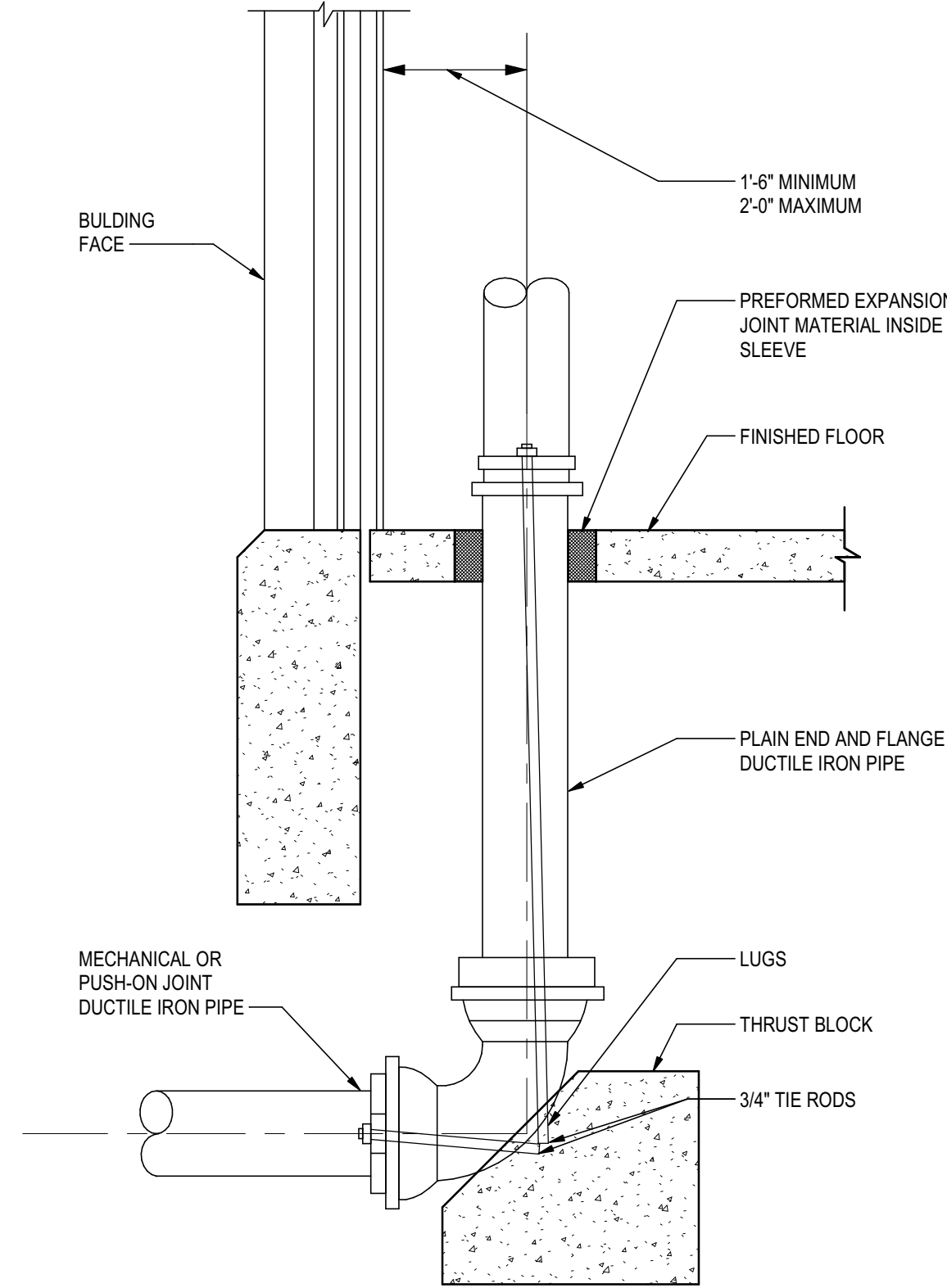


PIPE PENETRATION THROUGH EXTERIOR BELOW GRADE WALL DETAIL
SCALE: NONE



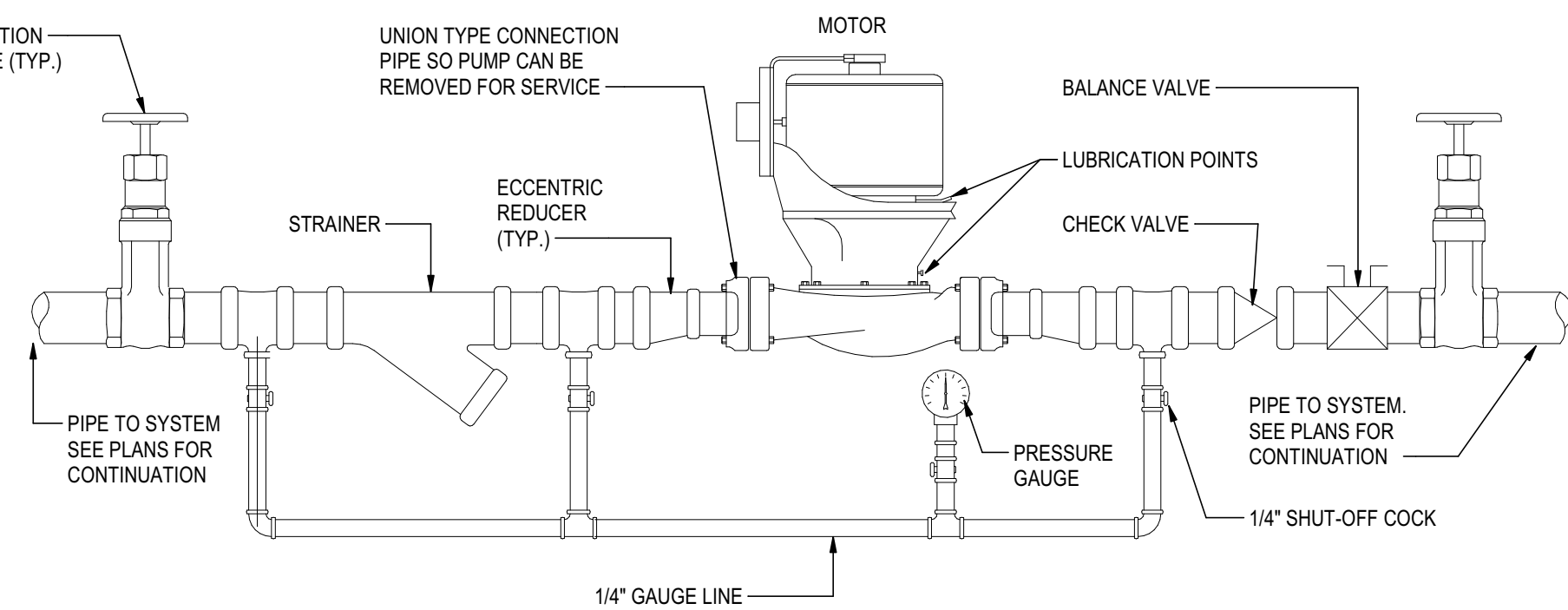
NOTES:
1. CONNECT TEMPERED WATER PIPING PER MANUFACTURER RECOMMENDATIONS.

EMERGENCY COMBINATION SHOWER/EYEWASH DETAIL
SCALE: NONE



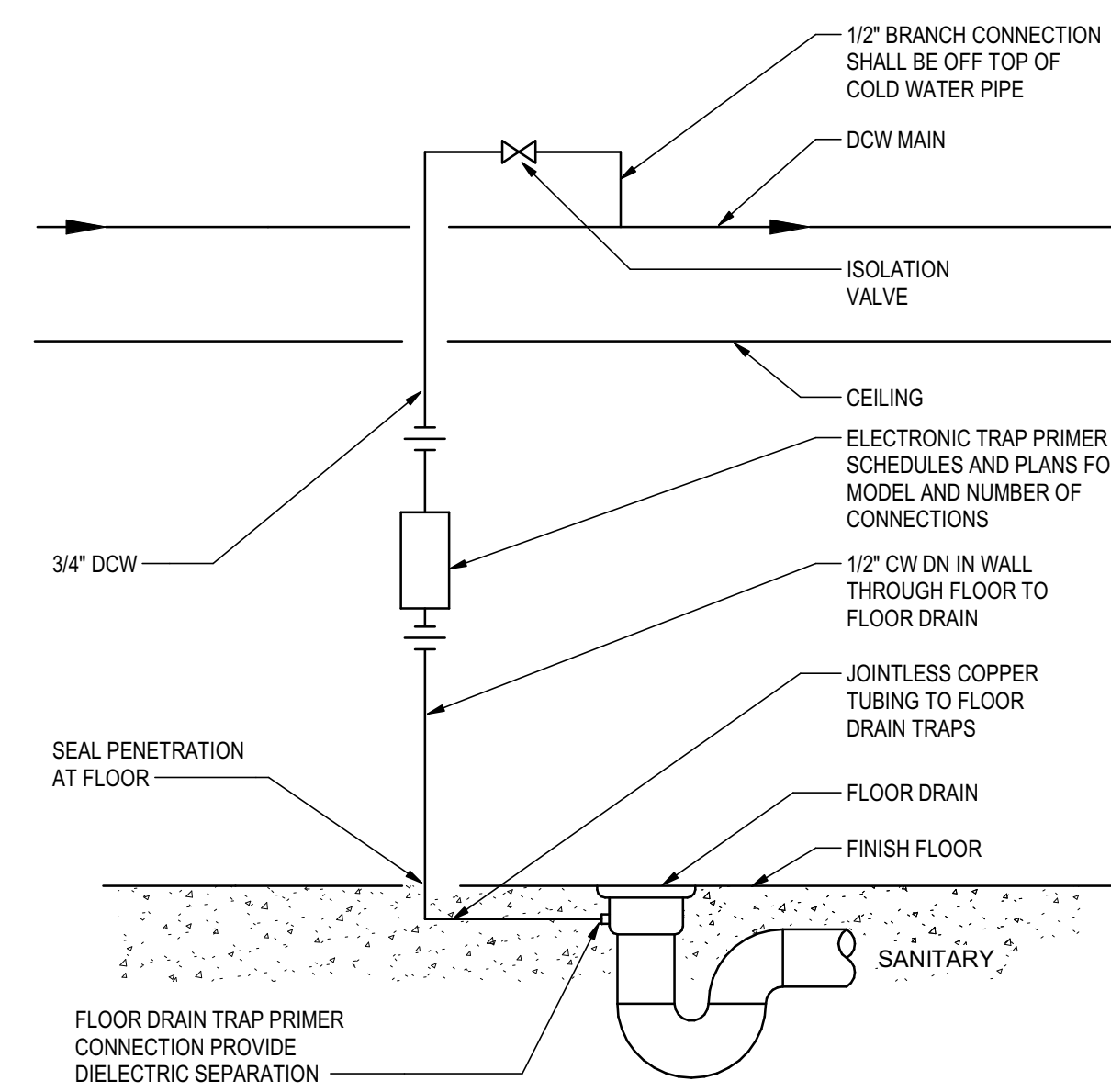
NOTE:
1. LOCATE FLANGE AT 12\"/>

WATER SERVICE LINE SCHEMATIC



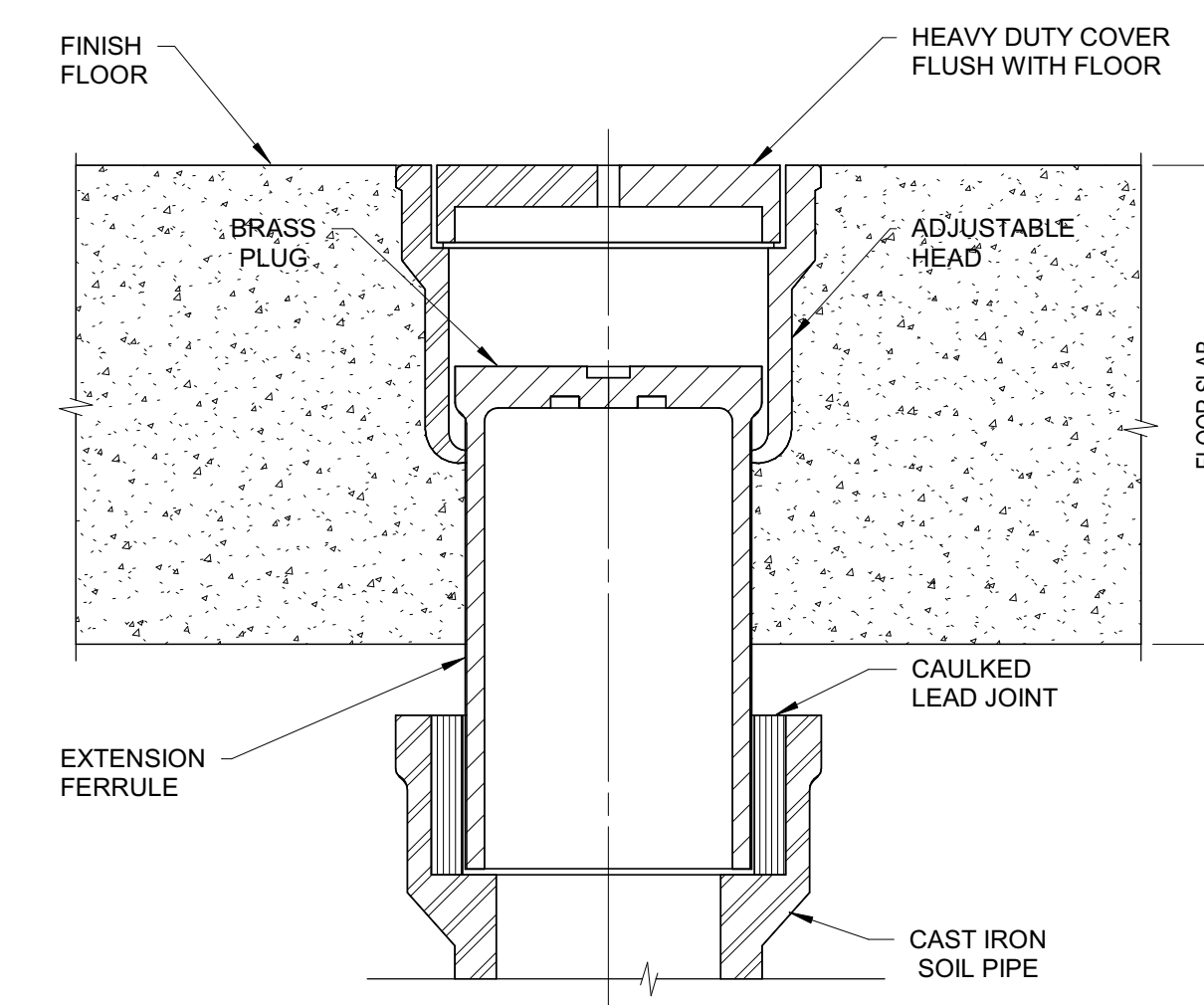
INSTALLATION NOTES:
1. THE PUMP SHALL BE INSTALLED DEAD LEVEL, AND SHALL NOT TOUCH OR REST ON ANY PART OF THE BUILDING STRUCTURE.
2. THE ELECTRICAL CONNECTION TO THE PUMP SHALL BE MADE THROUGH THE USE OF FLEXIBLE CONDUIT (GREENFIELD) AT LEAST 18\"/>

IN-LINE CIRCULATING PUMP PIPING DETAIL
SCALE: NONE

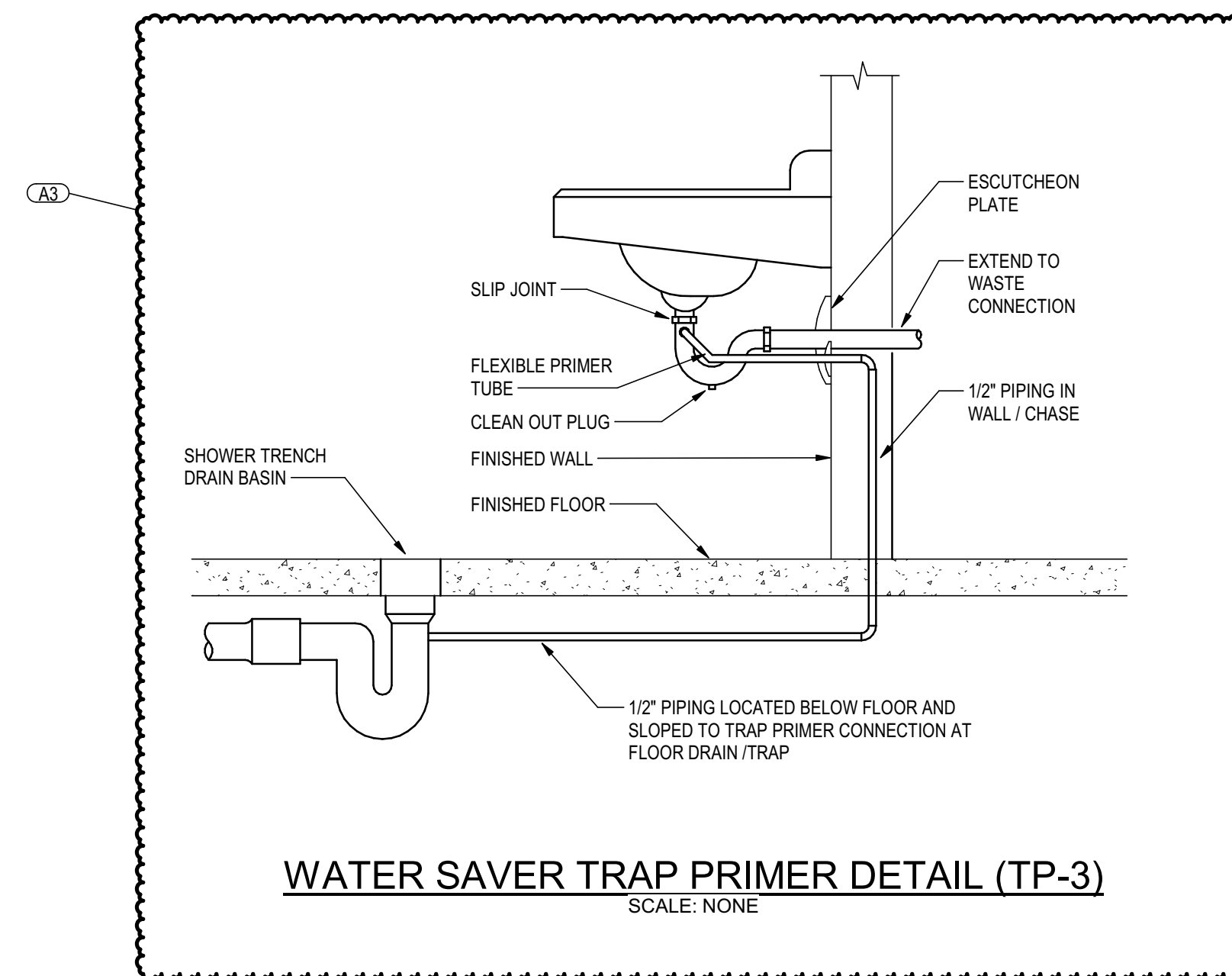


NOTES:
1. INSTALL TRAP PRIMER IN ACCESSIBLE LOCATION. COORDINATE ACCESS PANEL LOCATION WITH ARCHITECTURAL TRADES.
2. TUBING FROM TRAP PRIMER SHALL GRAVITY DRAIN TO FLOOR DRAIN TRAP PRIMER CONNECTION.

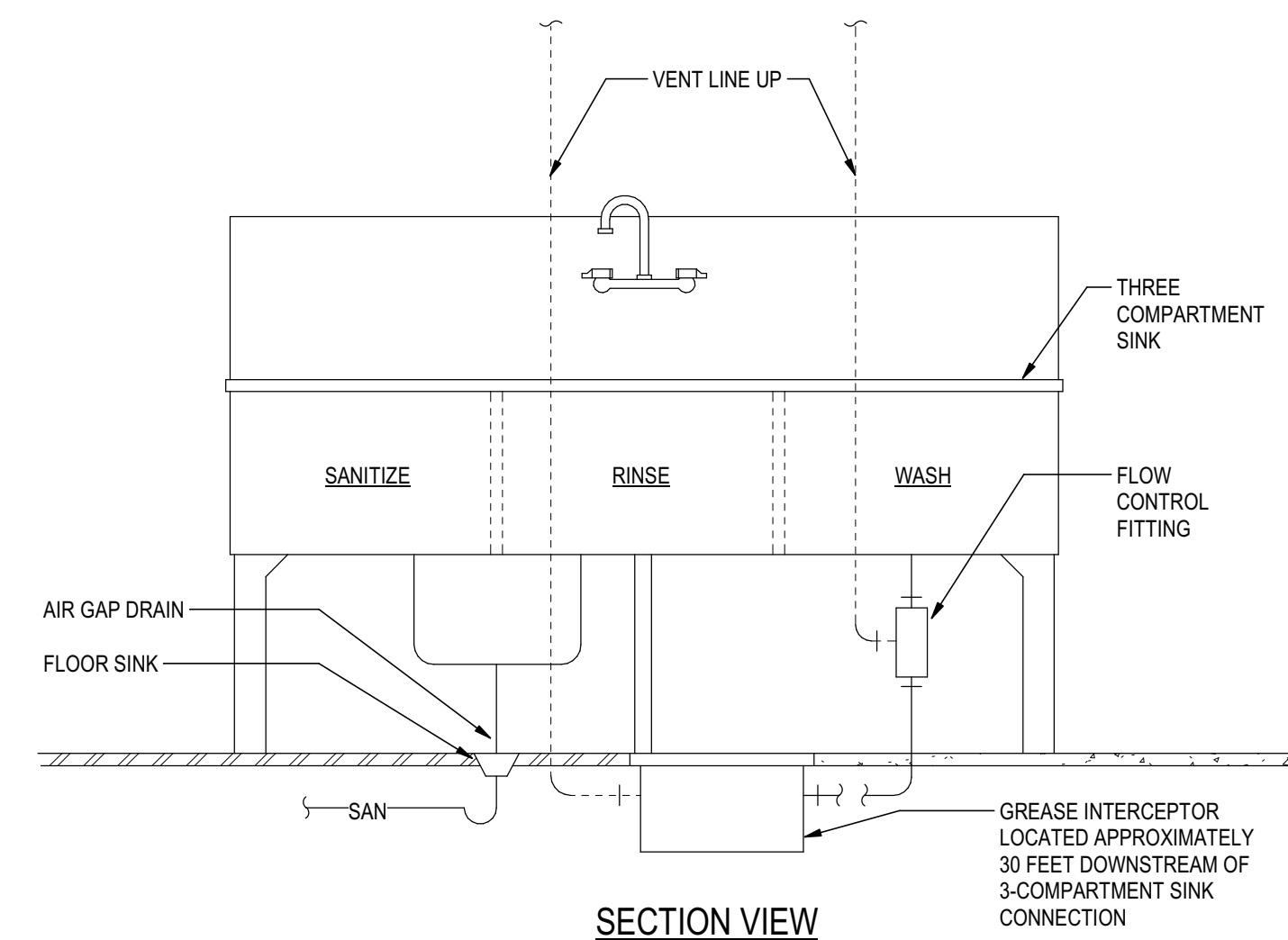
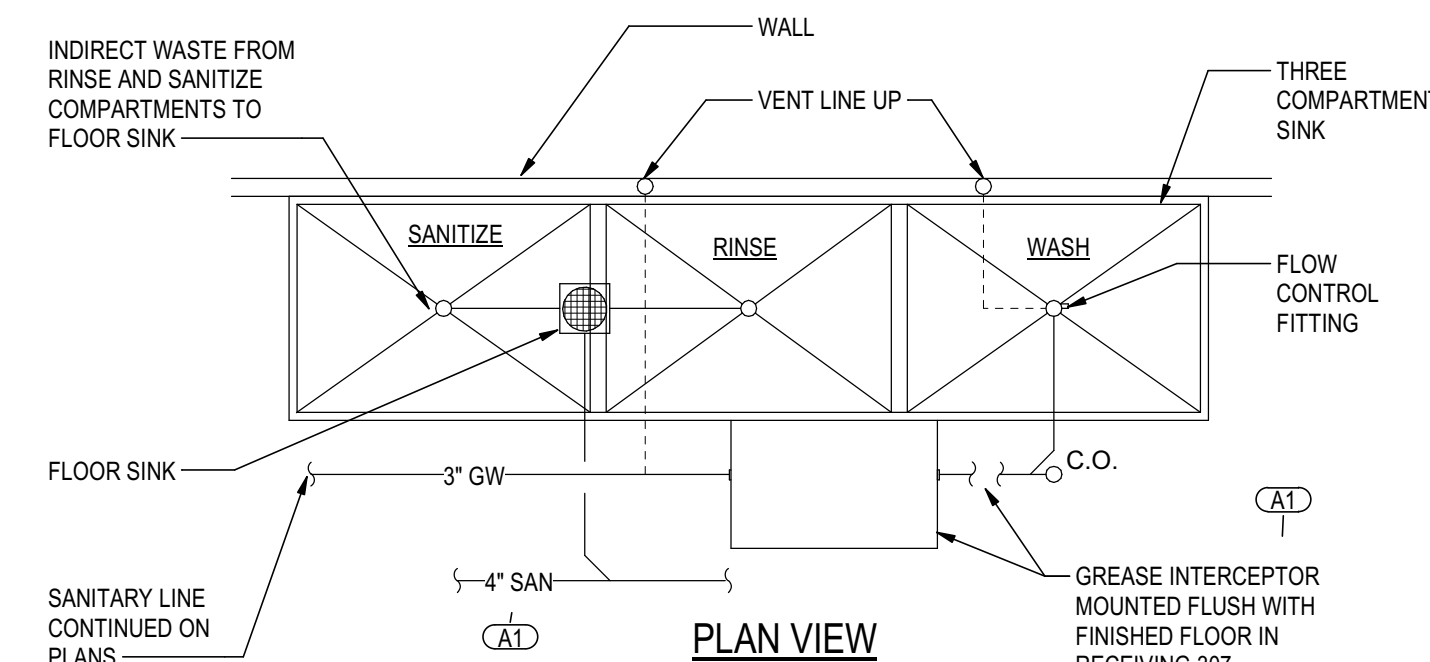
MULTIPLE TRAP PRIMER DETAIL (TP-2)
SCALE: NONE



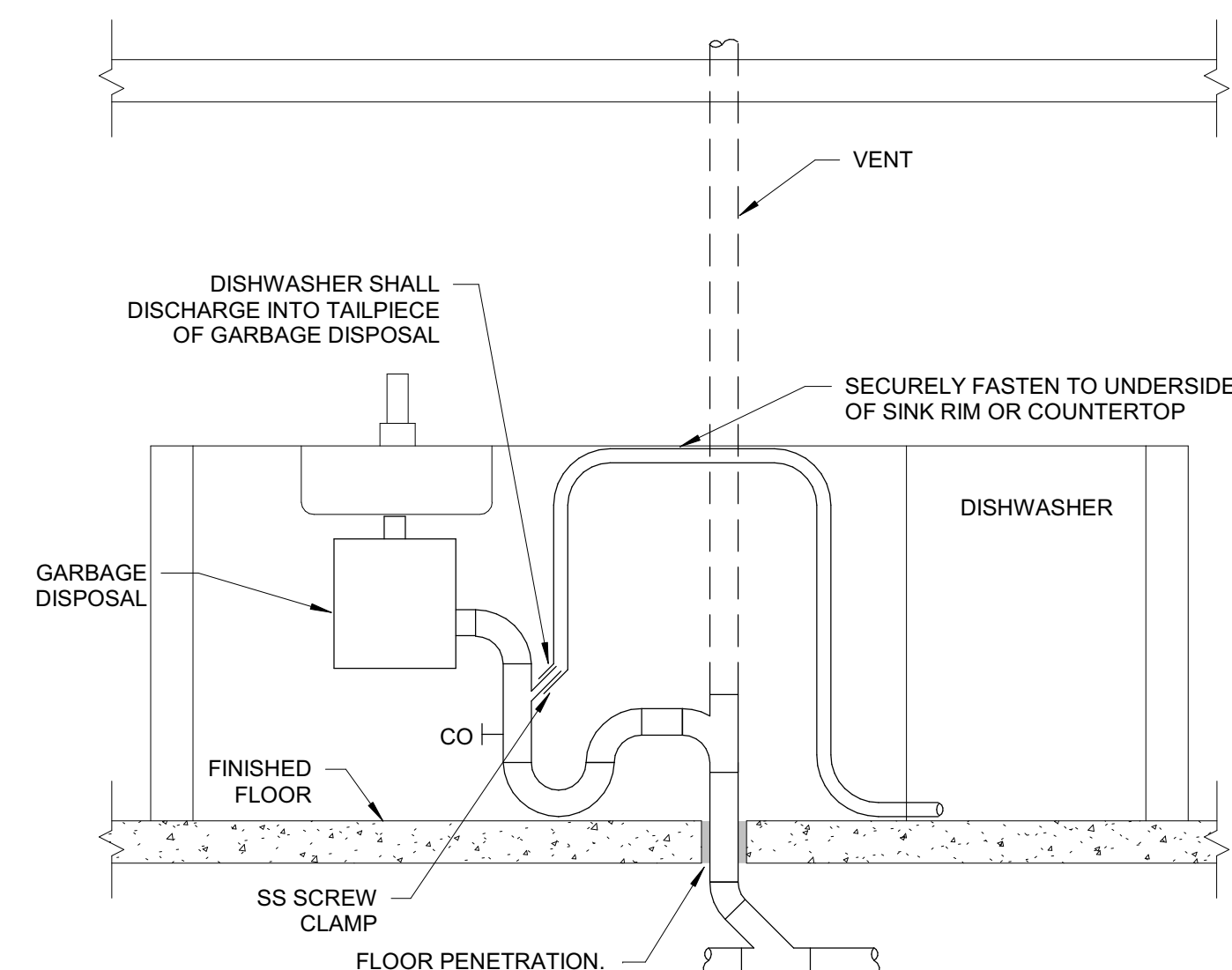
CLEAN OUT DETAIL
SCALE: NONE



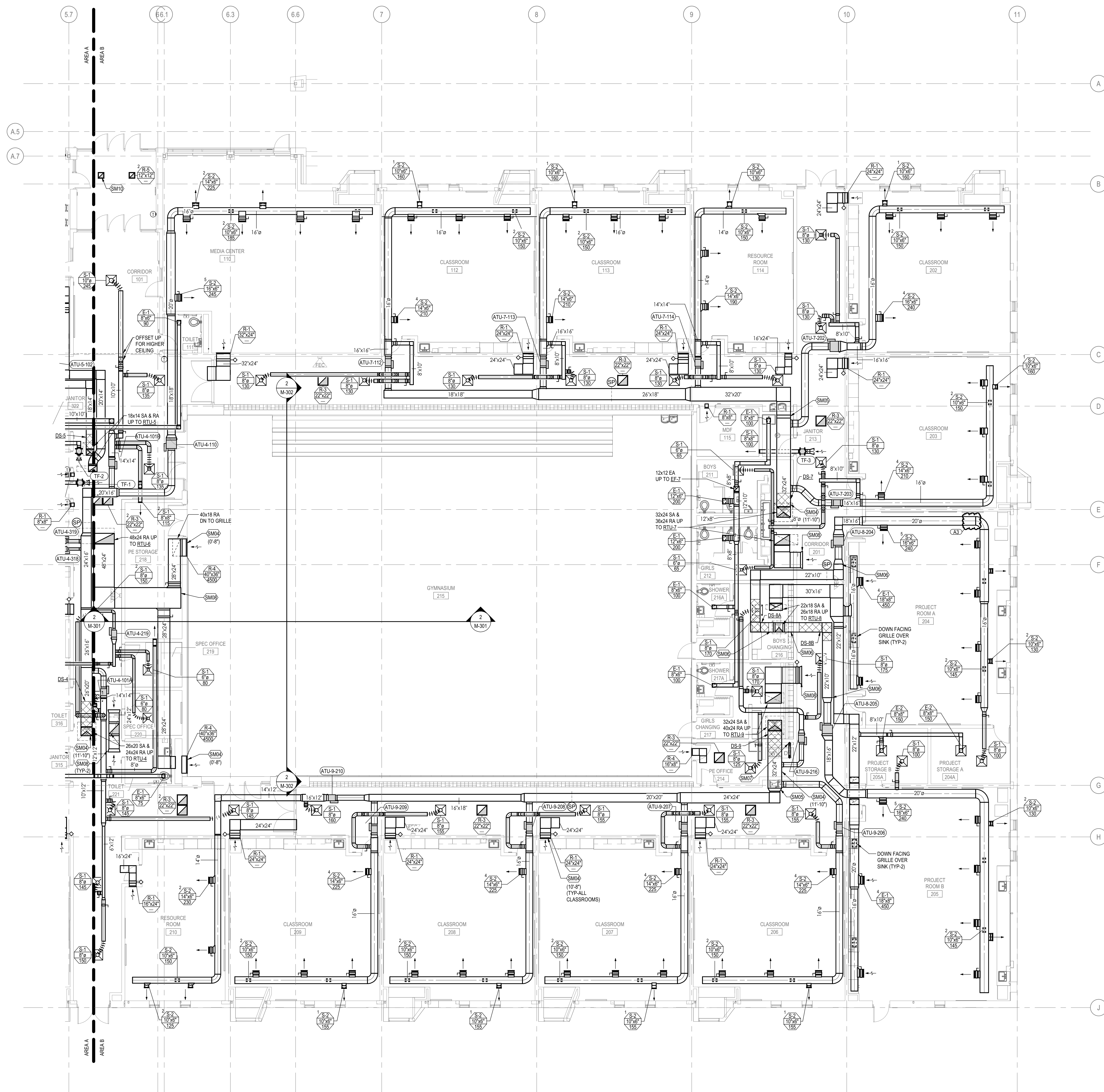
WATER SAVER TRAP PRIMER DETAIL (TP-3)
SCALE: NONE



GREASE INTERCEPTOR DETAIL
SCALE: NONE



BREAKROOM DISHWASHER DRAINAGE PIPING DETAIL
SCALE: NONE

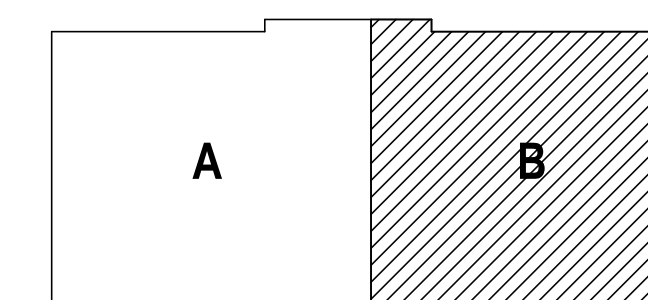


SHEET METAL GENERAL NOTES

- 1 COORDINATE NEW DUCTWORK WITH SITE CONDITIONS EQUIPMENT MANUFACTURER AND ALL OTHER TRADES TO AVOID INTERFERENCES.
- 2 PROVIDE ACCESS AROUND ALL NEW EQUIPMENT PER MANUFACTURERS RECOMMENDATIONS.
- 3 VAV BOXES AND VALVES SHALL BE LOCATED NO MORE THAN 24 INCHES ABOVE SUSPENDED CEILINGS FOR ACCESS.
- 4 ALL DUCTWORK SHALL BE ROUTED AS HIGH AS POSSIBLE, UNLESS OTHERWISE NOTED. COORDINATE ROUTING WITH OTHER TRADES TO AVOID INTERFERENCES.
- 5 BALANCE ALL AIR SYSTEMS TO INDICATED AIR FLOW RATES.
- 6 DUCT SIZES TO DIFFUSERS SHALL MATCH NECK SIZE OF EACH. REFER TO GRILLE, REGISTER & DIFFUSER SCHEDULE.
- 7 REFER TO DUCT SYSTEM APPLICATION SCHEDULE AND SPECIFICATIONS FOR DUCTWORK INSULATION REQUIREMENTS.
- 8 ALL DUCTWORK SHALL BE CONCEALED IN WALLS AND/OR CEILING SPACE, UNLESS OTHERWISE NOTED.
- 9 SEAL ALL PENETRATIONS THROUGH WALLS PER DETAILS AND SPECIFICATIONS.
- 10 COORDINATE EXACT LOCATIONS OF ALL DIFFUSERS AND RETURN GRILLES WITH ARCHITECTURAL REFLECTED CEILING AND LIGHTING PLANS.

SHEET METAL KEYNOTES

- SM04 LOCATE DUCT, GRILLE OR REGISTER AT INDICATED HEIGHT ABOVE FINISHED FLOOR.
- SM05 PROVIDE DOUBLE WALL DUCT FROM OUTLET OF UPSTREAM DUCT SILENCER TO THIS FITTING.
- SM06 PROVIDE DOUBLE WALL DUCT FROM OUTLET OF RETURN TO THIS FITTING.
- SM07 PROVIDE 2" RIGID ROUND GALVANIZED DRYER EXHAUST PIPE RISER WITHIN CHASE BEHIND DRYER. STUB THROUGH WALL FOR FUTURE FLEX DUCT DOWN TO DRYER. TO BE CONNECTED TO CHASE UP THROUGH ROOF WITH OFFSET AS SHOWN ON PLANS. TERMINATE WITH GOOSENECK (OPENING 2' 0" ABOVE ROOF SURFACE).
- SM08 PROVIDE 1" THICK INTERNAL ACOUSTICAL LINER ON RETURN DUCT FROM CONNECTOR TO THIS FITTING.
- SM10 TRANSFER AIR OPENINGS FOR TEMPERING AIR ABOVE VESTIBULE.



KEY PLAN
NOT TO SCALE

REVISIONS		
REV	DESCRIPTION	DATE
A1	ADDENDUM 1	21-JUL-20
A2	ADDENDUM 2	26-JUL-20
A3	ADDENDUM 3	28-JUL-20

GRILLE, REGISTER, DIFFUSER SCHEDULE											
UNIT IDENTIFICATION	DIFFUSER FACE SIZE (IN)	FLOW RANGE (CFM)	DIFFUSER NECK SIZE (IN)	FLOW PATTERN	BORDER TYPE	MOUNTING TYPE	COLOR	MATERIAL	ACCESSORY	MANUFACTURER	MODEL NUMBER
MARK	NUMBER										NOTES
S	1	24x24	SEE PLANS	SEE PLANS	4-WAY	31	LAY-IN	WHITE	STEEL	PRICE	SPO
S	2	24x24	SEE PLANS	SEE PLANS	22.5 DBL DEFL	N	DUCT MOUNT	WHITE	STEEL	PRICE	SOL
S	3	SEE PLANS	SEE PLANS	SEE PLANS	VERTICAL	-	DUCT END	WHITE	STEEL	PRICE	RPD
S	4	SEE PLANS	SEE PLANS	SEE PLANS	ADJ BLADE	-	SPIRAL DUCT FRAME	WHITE	STEEL	PRICE	HCD
S	5	SEE PLANS	SEE PLANS	SEE PLANS	STRAIGHT	-	SPIRAL DUCT FRAME	WHITE	STEEL	PRICE	HCD
R	1	SEE PLANS	SEE PLANS	SEE PLANS	-	F	SURFACE MOUNT	WHITE	STEEL	PRICE	S30
R	2	24x12	SEE PLANS	SEE PLANS	-	NF	LAY-IN	WHITE	STEEL	PRICE	80
R	3	24x24	SEE PLANS	SEE PLANS	-	NF	LAY-IN	WHITE	STEEL	PRICE	80
R	4	SEE PLANS	SEE PLANS	SEE PLANS	-	F	SURFACE MOUNT	WHITE	STEEL	PRICE	S3L
R	5	12x12	SEE PLANS	SEE PLANS	-	F	SURFACE MOUNT	WHITE	STEEL	PRICE	80
E	1	SEE PLANS	SEE PLANS	SEE PLANS	-	-	SURFACE MOUNT	WHITE	STEEL	PRICE	S30
E	2	24x24	SEE PLANS	SEE PLANS	-	-	LAY-IN	WHITE	STEEL	PRICE	PDOR
E	3	24x24	SEE PLANS	SEE PLANS	-	-	LAY-IN	WHITE	ALUMINUM	PRICE	APDOR

NOTES:
1. REFER TO REFLECTED CEILING PLANS EXACT LOCATION. PROVIDE ALL FRAMES AND ACCESSORIES AS REQUIRED FOR PROPER INSTALLATION.
2. FLEXIBLE DUCTWORK SHALL BE THE SAME SIZE AS THE DIFFUSER NECK OR AN EQUIVALENT RIGID. FLEXIBLE DUCTWORK SHALL BE SUPPORTED TO PREVENT KINKS OR BENDS.

VARIABLE FREQUENCY DRIVE SCHEDULE						
UNIT IDENTIFICATION	MARK	NUMBER	LOCATION	UNIT SERVED	MOTOR HP	MAX RATED HP
MARK	NUMBER					NOTES
VFD	HHWP-1	MECHANICAL - 306	HHWP-1	1.5	1.5	12
VFD	HHWP-2	MECHANICAL - 306	HHWP-2	1.5	1.5	12
VFD	HHWP-3	MECHANICAL - 306	HHWP-3	5	5	1
VFD	HHWP-4	MECHANICAL - 306	HHWP-4	5	5	1
VFD	RTU-1S	ROOF (IN RTU-1)	RTU-1	15	15	1
VFD	RTU-1E	ROOF (IN RTU-1)	RTU-1	-	-	4
VFD	RTU-2S	ROOF (IN RTU-2)	RTU-2	-	-	3
VFD	RTU-2E	ROOF (IN RTU-2)	RTU-2	-	-	4
VFD	RTU-3S	ROOF (IN RTU-3)	RTU-3	7.5	7.5	1
VFD	RTU-3E	ROOF (IN RTU-3)	RTU-3	-	-	4
VFD	RTU-4S	ROOF (IN RTU-4)	RTU-4	-	-	3
VFD	RTU-4E	ROOF (IN RTU-4)	RTU-4	-	-	4
VFD	RTU-5S	ROOF (IN RTU-5)	RTU-5	-	-	3
VFD	RTU-5E	ROOF (IN RTU-5)	RTU-5	-	-	4
VFD	RTU-6S	ROOF (IN RTU-6)	RTU-6	-	-	3
VFD	RTU-6E	ROOF (IN RTU-6)	RTU-6	-	-	4
VFD	RTU-7S	ROOF (IN RTU-7)	RTU-7	-	-	3
VFD	RTU-7E	ROOF (IN RTU-7)	RTU-7	-	-	4
VFD	RTU-8S	ROOF (IN RTU-8)	RTU-8	-	-	3
VFD	RTU-8E	ROOF (IN RTU-8)	RTU-8	-	-	4
VFD	RTU-9S	ROOF (IN RTU-9)	RTU-9	7.5	7.5	1
VFD	RTU-9E	ROOF (IN RTU-9)	RTU-9	-	-	1
VFD	EF-1	RECEIVING - 307	EF-1	14	14	1
VFD	EF-2	RECEIVING - 307	EF-2	14	14	1
VFD	EF-3	RECEIVING - 307	EF-3	14	14	1

NOTES:
1. PROVIDE VFD AND SHAFT GROUNDING RING FOR LOAD INDICATED.
2. VFD FOR CONSTANT OPERATION LOADS USED FOR BALANCING, SOFT START, AND RUNTIME/CONSUMPTION DATA.
3. BASIS OF DESIGN RTU-2,4,5,6,7,8 SUPPLY FANS ARE BEING CONTROLLED BY RTU CONTROLLER SIGNAL TO ECM MOTOR. PROVIDE VFD IF REQUIRED BY EQUIPMENT SELECTION.
4. BASIS OF DESIGN RTU-1,2,3,4,5,6,7,8 EXHAUST FANS ARE BEING CONTROLLED BY RTU CONTROLLER SIGNAL TO ECM MOTOR. PROVIDE VFD IF REQUIRED BY EQUIPMENT SELECTION.

DUCT SYSTEM APPLICATION SCHEDULE											
SYSTEM	APPLICATION	LOCATION	DESIGN CRITERIA	CONSTRUCTION	PRODUCT	MATERIAL	LINER	INSULATION	FACTORY JACKET	FIELD JACKET	NOTES
MARK	NUMBER		MAX VELOCITY (FPM)	MAX FRICTION (IN-WG/100')	DESIGN SYSTEM PRESSURE (IN-WG)	SEAL CLASS	MAX LEAKAGE RATE	SINGLE WALL	DOUBLE WALL UL LISTED	DOUBLE WALL PERF LINER	
SUPPLY AIR	LOW PRESSURE SINGLE ZONE (RTU-6, VF-1, VF-2, TF-1, TF-2, TF-3)	CONCEALED	1,200	0.08	2	B	6	X	-	X	
		EXPOSED	1,200	0.08	2	B	6	X	-	X	
		OUTSIDE/EXTERIOR	1,200	0.08	2	A	6	X	-	X	
		CONCEALED	1,000	0.08	2	C	6	X	-	X	
		EXPOSED ROUND	1,000	0.08	2	C	6	X	-	X	
		EXPOSED RECTANGULAR	1,000	0.08	2	C	6	X	-	X	
	MEDIUM PRESSURE (UPSTREAM OF ATU)	CONCEALED	1,500	0.20	6	B	6	X	-	X	
		EXPOSED ROUND	1,500	0.20	6	B	6	X	-	X	
		EXPOSED RECTANGULAR	1,500	0.20	6	B	6	X	-	X	
		OUTSIDE/EXTERIOR	1,500	0.20	6	A	6	X	-	X	
		CONCEALED	1,000	0.10	2	C	6	X	-	X	
		EXPOSED	1,000	0.10	2	B	6	X	-	X	
RETURN AIR	ALL	CONCEALED	1,000	0.10	2	C	6	X	-	X	
		EXPOSED	1,000	0.10	2	B	6	X	-	X	
GENERAL EXHAUST	ALL	CONCEALED	1,000	0.10	2	B	6	X	-	X	
		EXPOSED	1,000	0.10	2	B	6	X	-	X	
KITCHEN EXHAUST	LOW PRESSURE (CONSTANT VOLUME)	KITCHEN HOOD	1,200	0.10	6	B	6	X	-	X	
		DISHWASHER HOOD	1,200	0.10	2	B	6	X	-	X	
OUTSIDE AIR	ALL	ALL	1,500	0.10	2	A	6	X	-	X	
		ALL	1,500	0.10	2	A	6	X	-	X	

NOTES:
1. VERIFY MANUFACTURER CLEARANCE TO COMBUSTIBLES.
2. SEE PLANS AND DETAILS FOR LOCATION / EXTENT OF DUCTWORK WITH DOUBLE WALL PERFORATED LINER (OMIT EXTERNAL INSULATION ON DOUBLE WALL DUCT).
3. SEE PLANS AND DETAILS FOR LOCATION / EXTENT OF LINED DUCTWORK (OMIT EXTERNAL INSULATION ON LINED DUCTWORK).
4. SEE ARCHITECTURAL REFLECTED CEILING PLANS AND SECTIONS FOR EXPOSED / CONCEALED AREAS.

ROOF TOP UNIT SCHEDULE - PART A																										
UNIT IDENTIFICATION					AIRFLOW					PHYSICAL CHARACTERISTICS					INDIRECT GAS FIRED HEATING SECTION											
MARK	NUMBER	TYPE	LOCATION	AREA SERVED	MAX SUPPLY AIR (CFM)	MIN SUPPLY AIR (CFM)	MAX RETURN AIR (CFM)	MIN RETURN AIR (CFM)	MIN-MAX (DESIGN) OUTSIDE AIR (CFM)	MIN-MIN OUTSIDE AIR (CFM)	UNIT OPERATING WEIGHT (LBS)	MAXIMUM UNIT DIMENSIONS			FILTER											
												HEIGHT (IN)	WIDTH (IN)	LENGTH (IN)	FILTER TYPE	MERV RATING	MAX APD (IN-WG)	HEATING AIRFLOW (CFM)	EAT (F)	LAT (F)	INPUT RATING (MBH)	OUTPUT RATING (MBH)	NO OF STAGES	TURN DOWN RATIO	MAX APD (IN-WG)	
RTU	1	VAV-ERU	ROOF - A	NE CLASSROOMS	8,400	5,200	7,700	5,000	2,900	700	4,800	83	77	182	2" PRE 4" FINAL PLEATED	8/13	0.29	5,200	31.8	74.3	300.0	240.0	MODULATING	12:1	0.26	
RTU	2	VAV-ERU	ROOF - A	CAFETERIA / KITCH	9,600	6,100	7,950	2,100	4,000	1,750	8,500	78	97	317	2" PRE 4" FINAL PLEATED	8/13	0.15	6,150	25.0	74.0	400.0	324.0	MODULATING	10:1	0.06	
RTU	3	VAV	ROOF - A	NW CLASSROOMS	6,700	4,200	5,700	3,600	2,000	1,000	4,200	83	77	162	2" PRE 4" FINAL PLEATED	8/13	0.21	4,200	38.0	90.7	300.0	240.0	MODULATING	12:1	0.21	
RTU	4	VAV	ROOF - A	CENTER COMMONS	5,000	2,900	3,850	2,100	1,150	1,150	2,700	57	97	91	2" PRE 4" FINAL PLEATED	8/13	0.38	2,900	43.4	94.3	200.0	160.0	MODULATING	10:1	0.06	
RTU	5	VAV	ROOF - A	ADMIN AREA	2,300	1,350	1,850	900	350	200	2,300	57	97	91	2" PRE 4" FINAL PLEATED	8/13	0.17	1,350	53.3	153.3	200.0	160.0	MODULATING	10:1	0.12	
RTU	6	VAV SINGLE ZONE	ROOF - A	GYMNASIUM	11,000	6,100	9,050	5,600	3,000	1,950	8,100	78	97	309	2" PRE 4" FINAL PLEATED	8/13	0.18	11,000	52.0	93.0	600.0	480.0	MODULATING	10:1	0.10	
RTU	7	VAV	ROOF - B	SE CLASSROOMS	7,500	4,500	6,450	4,000	2,250	1,050	4,200	83	77	162	2" PRE 4" FINAL PLEATED	8/13	0.25	4,500	36.0	85.2	300.0	240.0	MODULATING	12:1	0.23	
RTU	8	VAV-ERU 100%OA	ROOF - B	ART/SCIENCE LABS	3,700	2,750	3,900	2,950	3,700	2,750	3,000	57	97	111	2" PRE 4" FINAL PLEATED	8/13	0.28	2,750	-10.0	74.0	300.0	240.0	MODULATING	10:1	0.21	
RTU	9	VAV	ROOF - B	SW CLASSROOMS	7,700	4,750	6,800	4,500	2,300	900	4,200	83	77	162	2" PRE 4" FINAL PLEATED	8/13	0.26	4,750	37.0	83.6	300.0	240.0	MODULATING	10:1	0.24	

ROOF TOP UNIT SCHEDULE - PART B																																						
UNIT IDENTIFICATION			COMPONENTS								CONDENSER SECTION				FANS				CAPACITY AND PERFORMANCE								ELECTRICAL					MOUNTING SUPPORT STYLE	MANUFACTURER	MODEL NUMBER	NOTES			
			DX COOLING COIL				HOT GAS REHEAT				COMPRESSORS		FANS		SUPPLY				EXHAUST				NOMINAL CAPACITY (TONS)		REFRIG TYPE		REFRIG CHARGE (LBS)		VOLTS		PHASE					MCA		MOP
MARK	NUMBER		TOTAL CAPACITY (MBH)	SENSIBLE CAPACITY (MBH)	EDB (F)	EWB (F)	LDB (F)	LWB (F)	MAX APD (IN-WG)	CAPACITY (MBH)	MAX APD (IN-WG)	NO. OF COMP.	NO. OF STAGES	TYPE OF COMP.	NO. OF FANS	ESP (IN-WG)	TSP (IN-WG)	BHP	HP	SPEED (RPM)	ESP (IN-WG)	TSP (IN-WG)	BHP	HP	SPEED (RPM)		EER	REFRIG TYPE	REFRIG CHARGE (LBS)									
RTU	1	315.7	236.2	76.9	64.0	51.2	51.1	0.46	171.8	0.08	2	MODULATING	INVERTER + FIXED	2	2.3	5.0	10.12	15	1,771	0.5	N/A	3.98	(2) 4	2,980	36.0	10.3	R410A	36	460	3	78.5	100	YES	24" CURB	DAIKIN APPLIED	DPS028A	1,2	
RTU	2	347.2	266.7	76.8	63.8	51.4	51.2	0.75	194.1	0.11	4	MODULATING	INVERTER	4	2.0	4.0	9.49	(2) 5.8	2,340	0.5	N/A	3.08	(2) 2.2	1,708	40.0	9.2	R410A	68	460	3	90.8	110	YES	24" CURB	DAIKIN APPLIED	DPSA034	1,2	
RTU	3	287.3	203.6	76.3	65.9	51.5	51.4	0.34	134.4	0.06	2	MODULATING	INVERTER + FIXED	2	1.5	3.0	4.88	7.5	1,389	0.5	N/A	2.47	8	2,108	25.0	11.0	R410A	36	460	3	69.4	90	YES	24" CURB	DAIKIN APPLIED	DPS025A	1,2	
RTU	4	172.8	134.3	76.3	65.2	53.7	53.7	0.01	88.2	0.10	2	MODULATING	INVERTER + FIXED	2	1.5	3.2	3.83	8	2,195	0.5	N/A	1.16	8	1,611	15.0	10.8	R410A	30	460	3	39.9	50	YES	24" CURB	DAIKIN APPLIED	DPS015A	1,2	
RTU	5	86.7	64.9	77.2	64.3	51.4	51.4	0.10	46.7	0.19	2	MODULATING	INVERTER + FIXED	2	1.5	2.5	1.38	4	2,371	0.5	N/A	0.43	4	1,705	7.0	12.1	R410A	18	460	3	21.5	25	YES	24" CURB	DAIKIN APPLIED	DPS007A	1,2	
RTU	6	444.0	323.3	76.9	65.6	52.0	52.0	0.56	214.5	0.08	4	MODULATING	INVERTER	4	1.5	3.0	8.90	(2) 5.8	1,754	0.5	N/A	3.36	(2) 2.2	1,815	40.0	9.7	R410A	106	460	3	95.3	110	YES	24" CURB	DAIKIN APPLIED	DPSA040	1,2	
RTU	7	293.2	215.8	76.3	65.9	53.0	52.9	0.39	138.5	0.07	2	MODULATING	INVERTER + FIXED	2	1.5	3.2	3.77	8	2,142	0.5	N/A	3.36	8	2,246	25.0	11.0	R410A	36	460	3	69.4	90	YES	24" CURB	DAIKIN APPLIED	DPS025A	1,2	
RTU	8	172.5	113.3	81.3	68.3	53.3	53.3	0.27	86.9	0.06	2	MODULATING	INVERTER + FIXED	2	1.5	3.0	3.65	8	2,128	0.5	N/A	1.14	8	1,477	13.0	10.8	R410A	30	460	3	39.3	50	YES	24" CURB	DAIKIN APPLIED	DPS015A	1,2	
RTU	9	294.6	218.9	79.3	65.9	53.3	53.2	0.41	139.4	0.07	2	MODULATING	INVERTER + FIXED	2	1.5	3.3	6.02	7.5	1,493	0.5	N/A	3.61	8	2,408	25.0	11.0	R410A	36	460	3	69.4	90	YES	24" CURB	DAIKIN APPLIED	DPS025A	1,2	
NOTES: 1. FILTERS ARE TO BE PROVIDED WITH PRE-FILTER. MAXIMUM PRESSURE DROP SHALL BE BASED ON TOTAL PRESSURE DROP ACROSS THE FILTER BANK WITH DRY FILTERS (PRESSURE DROP LISTED PLUS 0.50" ADDITIONAL DRY FILTER ALLOWANCE). 2. REFER TO MECHANICAL DETAILS FOR CURB FILLING MATERIAL REQUIREMENTS.																																						

SPLIT SYSTEM AIR CONDITIONING UNIT SCHEDULE																																	
UNIT IDENTIFICATION			PERFORMANCE				INDOOR UNIT													OUTDOOR UNIT										MANUFACTURER	NOTES		
MARK	NUMBER	ROOM(S) SERVED	EER	REFRIG TYPE	REFRIG CHARGE (LBS)	TOTAL CAPACITY (BTU/H)	SENSIBLE CAPACITY (BTU/H)	AIRFLOW RANGE (CFM)	EDB (F)	EWB (F)	LDB (F)	LWB (F)	FILTER RATING (MERV)	MOUNTING	CONDENSATE PUMP REQUIRED	ELECTRICAL				OPERATING WEIGHT (LBS.)	MODEL NUMBER	NO. OF COMP	COMP TYPE	AMBIENT DESIGN TEMP (F)	MINIMUM AMBIENT TEMP (F)	ELECTRICAL						OPERATING WEIGHT (LBS.)	MODEL NUMBER
																VOLTS	PHASE	MCA	MOP							VOLTS	PHASE	MCA	MOP				
ACU	1	107 - MDF	12.2	R410A	8	24,000.0	N/A	635 - 775	80.0	67.0	55.0	54.0	8	WALL	YES	208	1	1.0	15	60	PKA-A24KA7	1	INVERTER	95.0	-40.0	208	1	19.0	26	200	PUY-A24NH47	MTSUBISHI	1,2,3,4,5,6
NOTES: 1. PROVIDE ALL INTERCONNECTING WIRING BETWEEN THE INDOOR AND OUTDOOR UNITS. 2. PROVIDE PIPE PORTAL CURB FOR ROOF PIPING PENETRATIONS. 3. PROVIDE ROOF CURB RAILS FOR CONDENSING UNIT MOUNTING. 4. PROVIDE WITH DISCONNECT SWITCH. 5. PROVIDE WITH INSET OF LENGTH REQUIRED TO ACHIEVE INSTALLATION DISTANCE WITH MINIMAL EXTRA COILED PIPING. 6. PROVIDE WITH BAFFLES REQUIRED TO ACHIEVE LOW AMBIENT LISTED																																	

FUEL FIRED HOT WATER BOILER SCHEDULE																								
UNIT IDENTIFICATION			BURNER		FUEL				FLUID				PHYSICAL CHARACTERISTICS						ELECTRICAL			MANUFACTURER	MODEL NUMBER	NOTES
MARK	NUMBER	AREA SERVED	CONTROL	MIN TURN DOWN	TYPE	PRESSURE RANGE (IN-WG)	FIRING RATE INPUT (MBH)	FIRING RATE OUTPUT (MBH)	FLUID TYPE	MIN FLOW (GPM)	DESIGN FLOW (GPM)	EWT (F)	LWT (F)	MAX WPD (FT)	WEIGHT (LBS)	HEIGHT (IN)	WIDTH (IN)	DEPTH (IN)	VOLTS	PHASE	FLA			
B	1	BUILDING HEATING	MODULATING	20:1	NAT. GAS	4"-14"	1,000.0	900.0	WATER	12	60.0	110.0	140.0	5.0	900	78	28	25	120	1	13	AERCO	BMK-1000	
B	2	BUILDING HEATING	MODULATING	20:1	NAT. GAS	4"-14"	1,000.0	900.0	WATER	12	60.0	110.0	140.0	5.0	900	78	28	25	120	1	13	AERCO	BMK-1000	
NOTES:																								

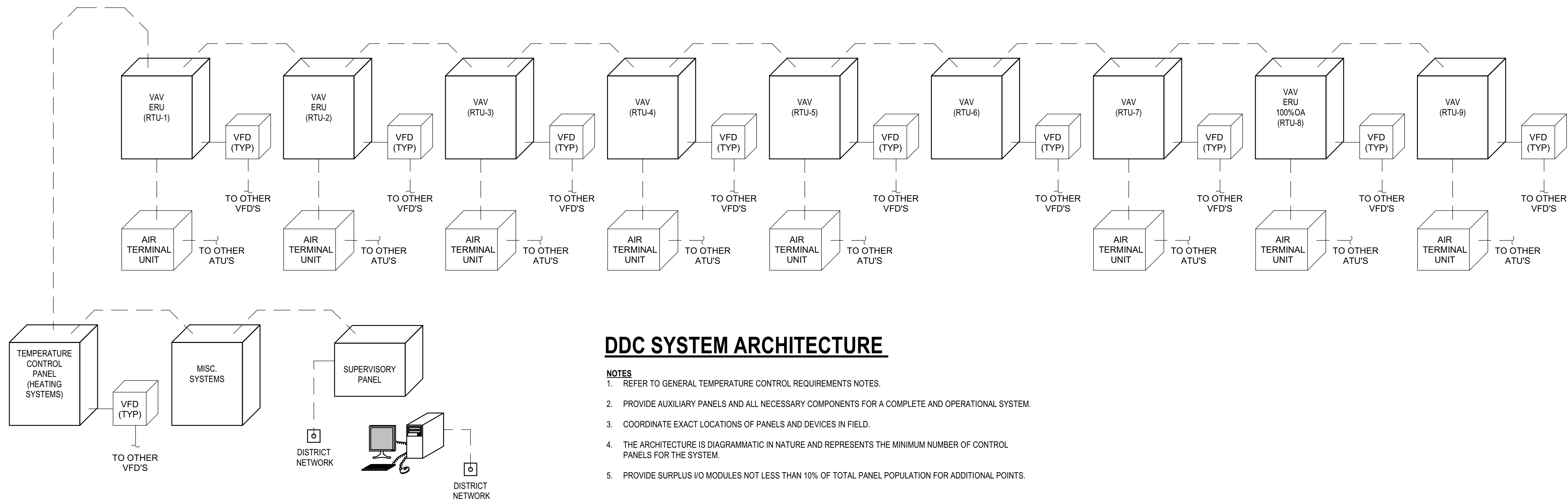
HVAC CIRCULATION PUMP SCHEDULE																					
UNIT IDENTIFICATION				PUMP TYPE	COUPLING TYPE	CONTROL	PERFORMANCE					PUMP MIN FLOW (GPM)	PUMP MOTOR			ELECTRICAL		MANUFACTURER	MODEL NUMBER	NOTES	
MARK	NUMBER	SYSTEM SERVED	REDUNDANT				FLUID TYPE	FLUID TEMP (F)	FLOW (GPM)	PUMP HEAD (FT)	MIN EFFICIENCY (%)		BHP	HP	SPEED (RPM)	VOLTS	PHASE				
HWHP	1	B-1	NO	INLINE	CLOSED	VFD	WATER	140	62.0	35	68	12	0.8	1.5	1,725	460	3	BELL & GOSSETT	E-90-2AB		
HWHP	2	B-2	NO	INLINE	CLOSED	VFD	WATER	140	62.0	35	68	12	0.8	1.5	1,725	460	3	BELL & GOSSETT	E-90-2AB		
HWHP	3	BUILDING LOOP	NO	BASE MOUNTED END SUCTION	CLOSED	VFD	WATER	140	105.0	60	68.1	21	2.3	5	1,750	460	3	BELL & GOSSETT	E-1510-2BD	1	
HWHP	4	BUILDING LOOP	YES	BASE MOUNTED END SUCTION	CLOSED	VFD	WATER	140	105.0	60	68.1	21	2.3	5	1,750	460	3	BELL & GOSSETT	E-1510-2BD	1	
HWHP	5	RWP LOOP	NO	INLINE	CLOSED	AUTO	WATER	140	2.5	20	N/A	-	N/A	1/8	3,300	120	1	BELL & GOSSETT	PL-45B		
NOTES: 1. PROVIDE WITH INERTIA BASE.																					
Ⓐ																					

HVAC EXPANSION TANK SCHEDULE																		
UNIT IDENTIFICATION			TANK								SYSTEM				MANUFACTURER	MODEL NUMBER	NOTES	
MARK	NUMBER	SYSTEM SERVED	TYPE	ASME CONSTRUCTION	TANK VOLUME (GAL)	ACCEPTANCE VOLUME (GAL)	DIAMETER (IN)	HEIGHT (IN)	OPERATING WEIGHT (LBS)	ESTIMATED SYSTEM VOLUME...	FLUID TYPE	OPERATING...		OPERATING PRESSURE				
												MIN TEMP (F)	MAX TEMP (F)	MIN PRESS (PSIG)				MAX PRESS (PSIG)
HET	1	BUILDING HEATING	BLADDER	YES	34.4	34.4	20	37	408	600	WATER	40	160	14.0	52.0	BELL & GOSSETT	B-130	
NOTES:																		

EXPANSION LOOP SCHEDULE												
UNIT IDENTIFICATION			PIPE SIZE (IN)	OPERATING...		APPROXIMATE EXPANSION (IN)	CONNECTION TYPE	CONFIGURATIO N	MANUFACTURER	MODEL NUMBER	NOTES	
MARK	NUMBER	SYSTEM SERVED		MIN TEMP (F)	MAX TEMP (F)							
EL	1	BUILDING HEATING LOOP	2-1/2"x2"	40	140	1.5	FLANGED / SOLDER	NESTED	METRAFLUX	MLS30200	1	
EL	2	BUILDING HEATING LOOP	2"x2-1/2"	40	140	1.5	SOLDER / FLANGED	NESTED	METRAFLUX	MLS30200	1	
NOTES: 1. REFER TO DRAWINGS AND FIELD CONDITIONS FOR SPECIFIC CONFIGURATION.												

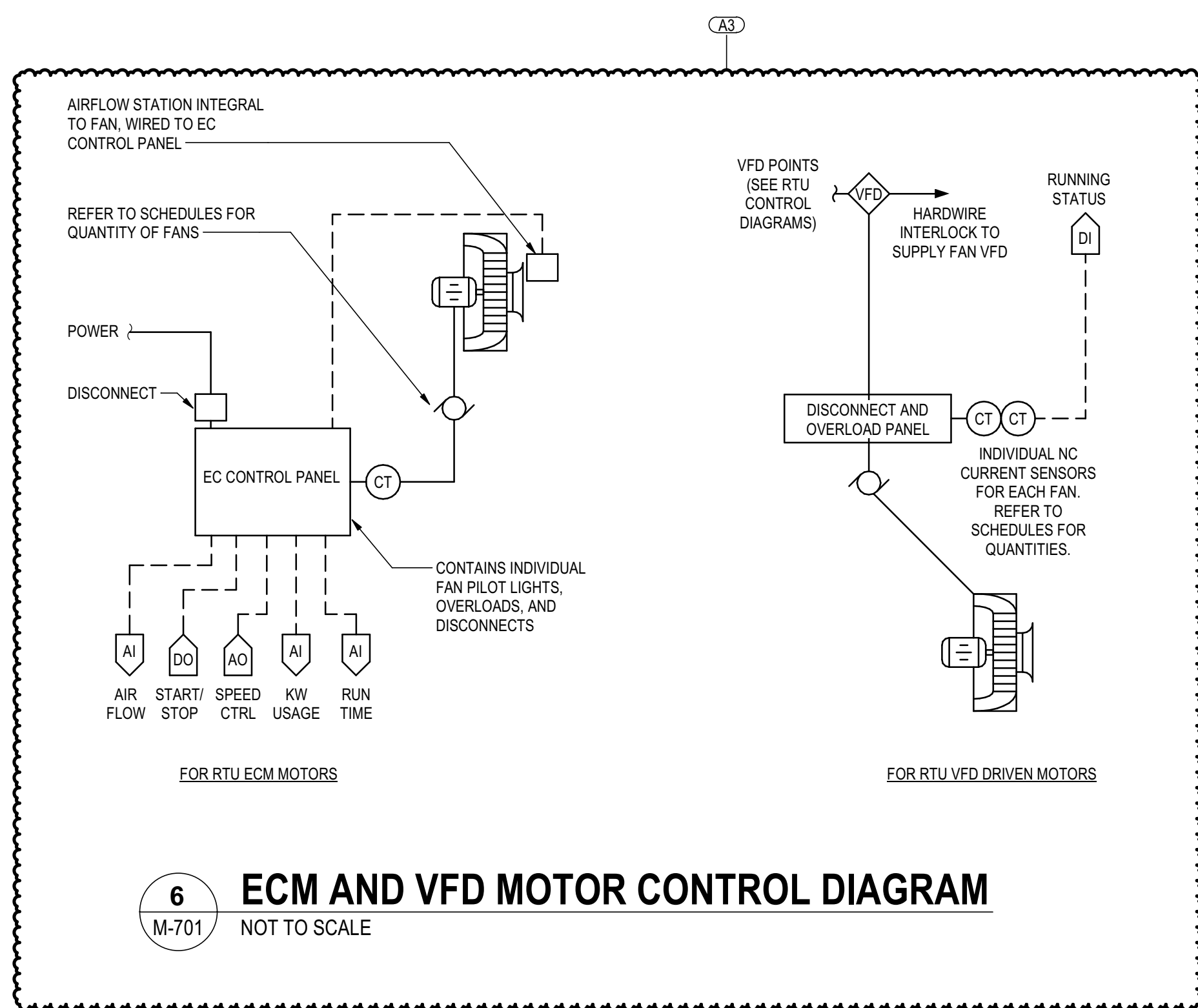
AIR AND DIRT SEPARATOR SCHEDULE												
UNIT IDENTIFICATION			TYPE	CONNECTIO N SIZE (IN)	DIAMETER (IN)	HEIGHT (IN)	WEIGHT (LBS)	FLOW (GPM)	MAX WPD (FT)	MANUFACTURER	MODEL NUMBER	NOTES
MARK	NUMBER	SYSTEM SERVED										
ADS	1	BUILDING HEAT LOOP	COALESCING	3	8.6	31.4	225	105.0	1.0	SPIROTHERM	VDSN300FA	
NOTES:												

PIPING SYSTEM APPLICATION SCHEDULE																																							
SYSTEM	PIPE SIZE (IN)	DESIGN		CONSTRUCTION				LOCATION	MATERIAL								JOINTS		INSULATION		FACTORY JACKET		FIELD JACKET			NOTES													
		MAX VELOCITY (FPS)	MAX FRICTION (FT/100')	OPERATING TEMP (F)	MIN WORKING PRESSURE (PSIG)	MIN TEMP RATING (F)	TEST PRESSURE (PSIG)		TES DURATION (HRS)	COPPER TYPE K	COPPER TYPE L	SCH 40 STEEL	SCH 80 STEEL	SCH 10 TYPE 316 STAINLESS STEEL	SCH 10 TYPE 304 STAINLESS STEEL	HDPE	PEXA	SOLDERED	BRAZED	THREADED	WELDED	PRESSURE FITTINGS	GROOVED	MINERAL FIBER PERFORMED	FLEXIBLE ELASTOMERIC		THICKNESS (IN)	ASJ	ASJ-SS	FSK	VINYL	PVC- ALL	PVC- FITTINGS	PVC- TO 10 FEET AFF	ALUMINUM	STAINLESS STEEL			
HOT WATER HEATING	1-1/4 AND LESS	4	4.0	110-140	125	200	125	2.5	CONCEALED	X							X	X					X	1		X				X	X			1					
	EXPOSED								X							X	X						X	X				X	1		X				X	X			1
	MECHANICAL ROOM								X							X	X						X	X				X	1		X				X	X			1
	UNDERGROUND								X							X	X						X	X				X	1		X								
	CONCEALED	X							X	X							X	X				X	1.5		X			X						1					
	1-1/2 & 2	(AS)	8	4.0	110-140	125	200	125	2.5	EXPOSED	X							X	X				X	1.5		X				X	X			1					
MECHANICAL ROOM	X														X	X						X	X				X	1.5		X				X	X			1	
CONCEALED	X	X													X	X						X	X				X	1.5		X				X					1
EXPOSED	X	X													X	X						X	X				X	1.5		X				X	X			1	
2-1/2 TO 3	(AS)	8	4.0	110-140	125	200	125	2.5	CONCEALED	X	X											X	1.5		X				X	X			1						
EXPOSED	X								X							X	X						X	X				X	1.5		X				X	X			1
MECHANICAL ROOM	X								X							X	X						X	X				X	1.5		X				X	X			1
CONCEALED	X								X							X	X						X	X				X	1.5		X				X	X			1
NOTES: 1. PIPE INSULATION THICKNESS BASED ON ASHRAE 90.1-2013. 2. PIPING CAN BE BRACKET COPPER OR WELDED STEEL.																																							

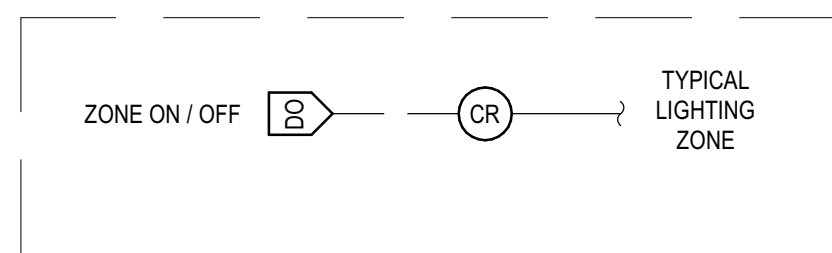


DDC SYSTEM ARCHITECTURE

- NOTES**
1. REFER TO GENERAL TEMPERATURE CONTROL REQUIREMENTS NOTES.
 2. PROVIDE AUXILIARY PANELS AND ALL NECESSARY COMPONENTS FOR A COMPLETE AND OPERATIONAL SYSTEM.
 3. COORDINATE EXACT LOCATIONS OF PANELS AND DEVICES IN FIELD.
 4. THE ARCHITECTURE IS DIAGRAMMATIC IN NATURE AND REPRESENTS THE MINIMUM NUMBER OF CONTROL PANELS FOR THE SYSTEM.
 5. PROVIDE SURPLUS I/O MODULES NOT LESS THAN 10% OF TOTAL PANEL POPULATION FOR ADDITIONAL POINTS.

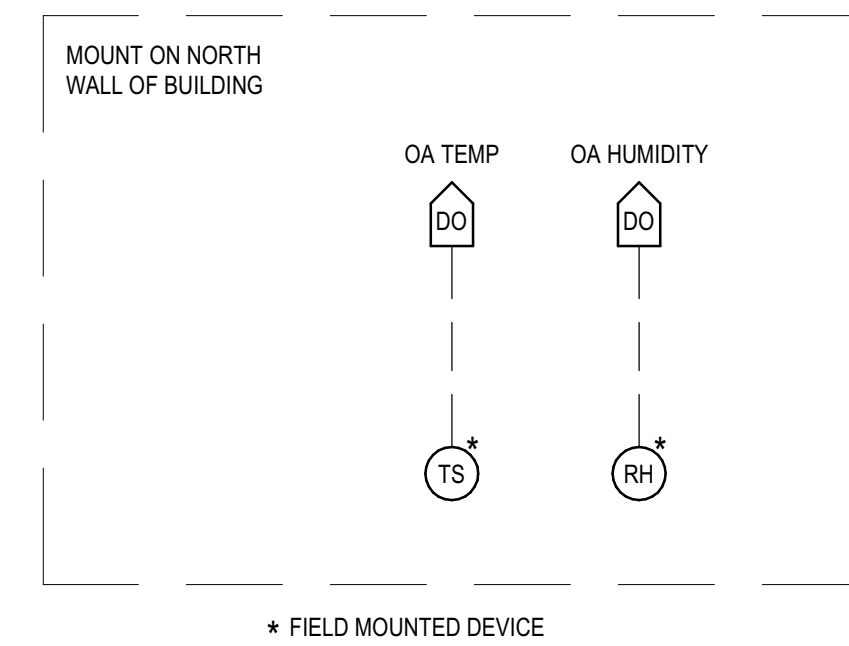


6 ECM AND VFD MOTOR CONTROL DIAGRAM
M-701 NOT TO SCALE



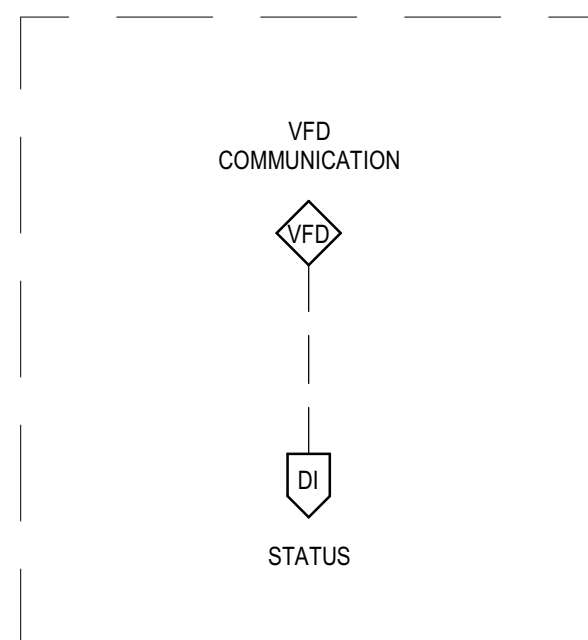
- SEQUENCE OF OPERATION GENERAL**
1. DDC SHALL HAVE TIME OF DAY SCHEDULING CAPABILITY OVER LIGHTING CIRCUITS THROUGH BMS CONTACTOR PROVIDED WITH LIGHTING CONTROL SYSTEM. REFER TO ELECTRICAL FLOOR PLANS FOR QUANTITY OF ZONES.
 2. REFER TO ELECTRICAL DRAWINGS FOR CONTACTOR LOCATIONS.

5 LIGHTING CONTROL
M-701 NOT TO SCALE



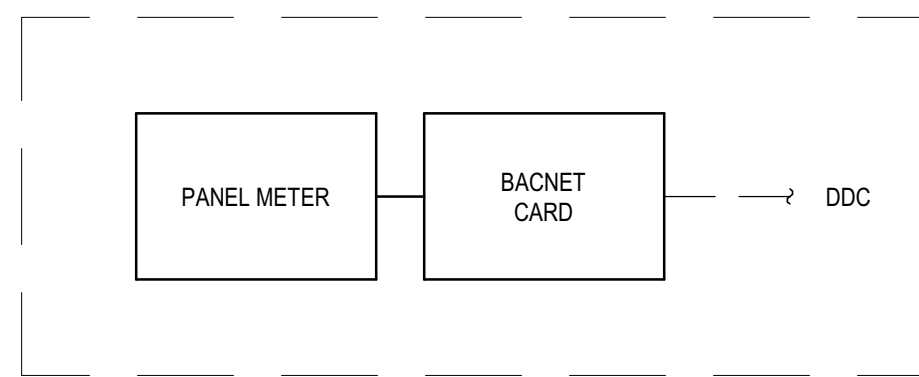
- SEQUENCE OF OPERATION GENERAL**
1. THE DDC MONITORS OUTSIDE AIR TEMPERATURE AND HUMIDITY AND MAKES THESE VALUES AVAILABLE TO ALL CONTROLLERS WHICH REQUIRE THEM.
 2. OUTSIDE AIR CONDITIONS ARE AVAILABLE ON THE GRAPHIC USER INTERFACE.
 3. OUTSIDE AIR CONDITIONS ARE TRENDED FOR DIAGNOSTIC PURPOSES AND FOR COMPARATIVE ENERGY USAGE.

4 OUTSIDE AIR TEMPERATURE AND HUMIDITY MONITORING
M-701 NOT TO SCALE



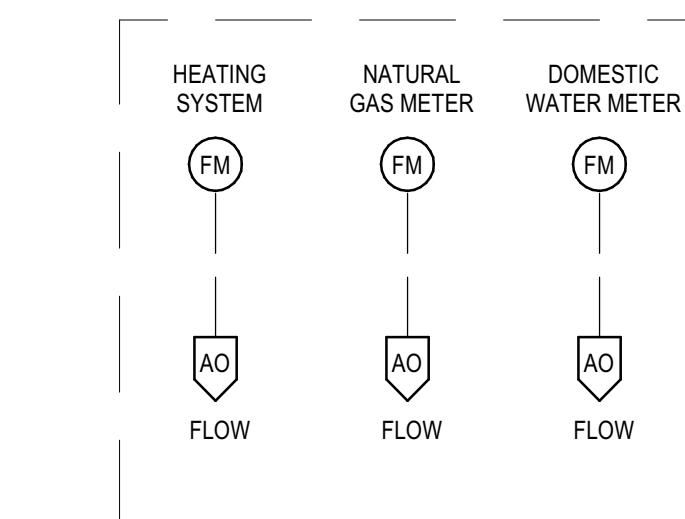
- SEQUENCE OF OPERATION GENERAL**
1. DDC SHALL MONITOR POWER USAGE FROM EACH PUMP AND FAN VFD.
 2. USAGE SHALL BE DISPLAYED ON GRAPHIC USER INTERFACE BY INDIVIDUAL DRIVE.
 - A. CURRENT
 - B. MONTHLY
 - C. YEAR TO DATE
 3. COMPARATIVE USAGE FROM PREVIOUS YEAR SHALL BE DISPLAYED ON GRAPHIC USER INTERFACE.

3 VFD POWER MONITORING
M-701 NOT TO SCALE



- SEQUENCE OF OPERATION GENERAL**
1. DDC SHALL MONITOR POWER USAGE.
 2. USAGE SHALL BE DISPLAYED ON GRAPHIC USER INTERFACE.
 - A. CURRENT
 - B. MONTHLY
 - C. YEAR TO DATE
 3. COMPARATIVE USAGE FROM PREVIOUS YEAR SHALL BE DISPLAYED ON GRAPHIC USER INTERFACE.

2 UTILITY MONITORING
M-701 NOT TO SCALE



- SEQUENCE OF OPERATION GENERAL**
1. DDC SHALL MONITOR USAGE.
 2. USAGE SHALL BE DISPLAYED ON GRAPHIC USER INTERFACE.
 - A. CURRENT
 - B. MONTHLY
 - C. YEAR TO DATE
 3. COMPARATIVE USAGE FROM PREVIOUS YEAR SHALL BE DISPLAYED ON GRAPHIC USER INTERFACE.

1 UTILITY MONITORING
M-701 NOT TO SCALE

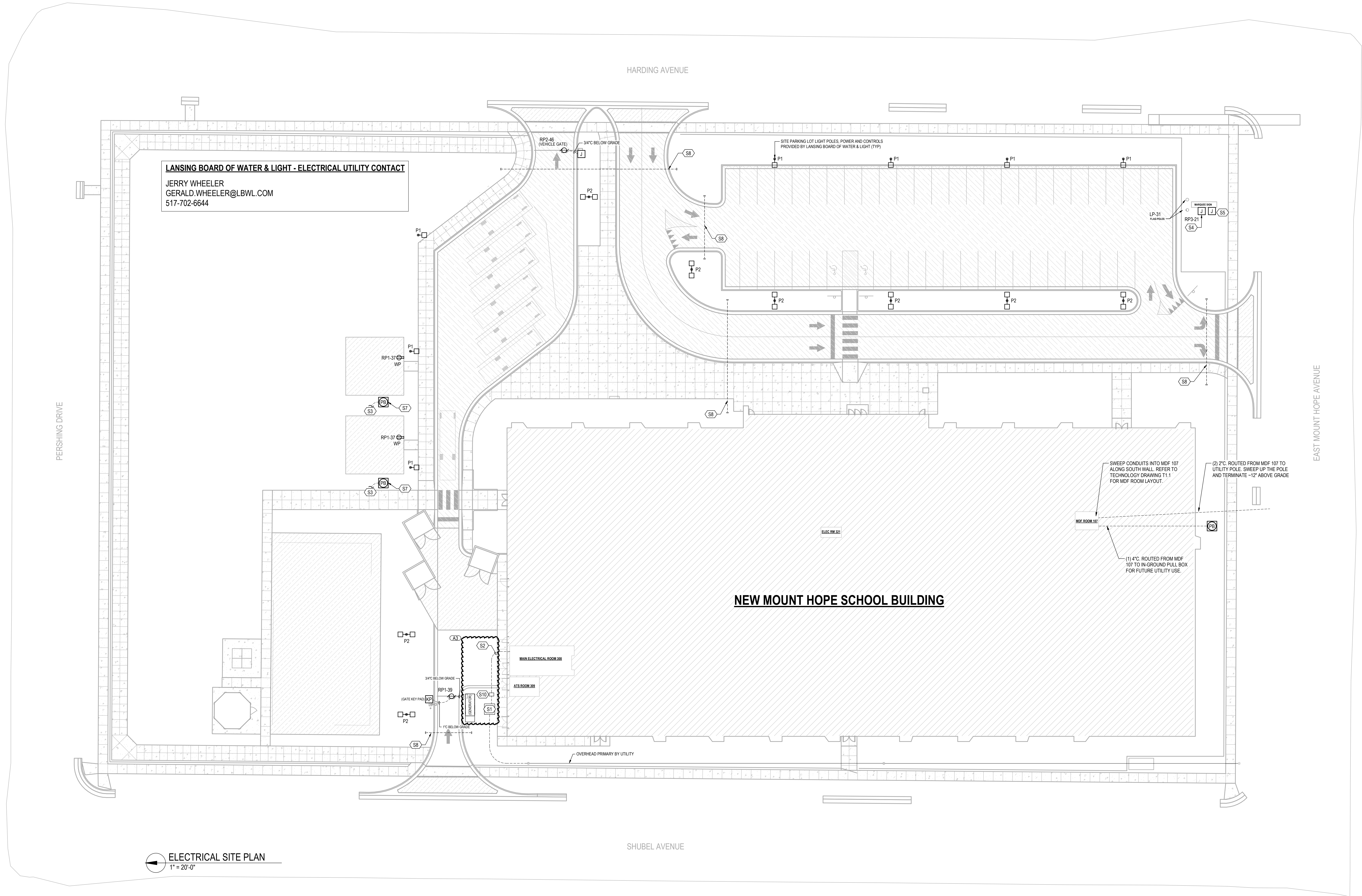
CONTROLS

- | | |
|-------|-----------------------------------|
| (PG) | AIR PRESSURE GAGE |
| (S) | AIR SAMPLING POINT |
| (CO2) | CARBON DIOXIDE SENSOR |
| (CO) | CARBON MONOXIDE SENSOR |
| (CT) | CURRENT TRANSMITTER |
| (CT) | CURRENT TRANSMITTER WITH LEAD |
| (D) | DEWPOINT SENSOR |
| (DPS) | DIFFERENTIAL PRESSURE SENSOR |
| (DPT) | DIFFERENTIAL PRESSURE TRANSMITTER |
| (FM) | FLOW METER |
| (FS) | FLOW SWITCH |
| (FT) | FLOW TRANSMITTER |
| (FZ) | FREEZE STAT |
| (HOA) | HAND SWITCH |
| (H) | HUMIDITY SENSOR |
| (LC) | LEVEL CONTROL |
| (LS) | LIMIT SWITCH |
| (LP) | LOOP POWERED INDICATOR |
| (O) | OCCUPANCY SENSOR |
| (PB) | PUSH BUTTON |
| (PI) | POSITION INDICATOR |
| (PS) | PRESSURE SENSOR |
| (RH) | RELATIVE HUMIDITY SENSOR |
| (R) | RELAY |
| (SP) | STATIC PRESSURE SENSOR |
| (T) | THERMOSTAT |
| (VB) | VIBRATION SENSOR |
| (AFS) | AIR FLOW SWITCH |
| (I/P) | CURRENT TO PRESSURE |
| (SCR) | SILICON CONTROLLED RECTIFIER |
| (TCP) | TEMPERATURE CONTROL PANEL |
| (TEC) | TERMINAL EQUIPMENT CONTROLLER |
| (S) | SENSOR WELL |
| (A) | ALARM HORN |
| (X) | ALARM BEACON |
| (AI) | ANALOG INPUT |
| (AO) | ANALOG OUTPUT |
| (DI) | DIGITAL INPUT |
| (DO) | DIGITAL OUTPUT |
| (EC) | ELECTRICALLY COMMUTED MOTOR |
| (STR) | STARTER |
| (HOA) | HAND OFF AUTO |
| (VFD) | VARIABLE FREQUENCY DRIVE |
| (X) | NON MOTORIZED VALVE |
| (M/X) | TWO WAY MOTORIZED VALVE |
| (M/X) | THREE WAY MOTORIZED VALVE |

CONTROLS

- | | |
|-----------|-----------------------------------|
| (S) | TWO WAY SOLENOID VALVE |
| (N) | THREE WAY SOLENOID VALVE |
| (N) | TWO WAY PNEUMATIC VALVE |
| (N) | THREE WAY PNEUMATIC VALVE |
| (P) | PUMP |
| (M) | MOTOR |
| (S) | DUCT SMOKE DETECTOR |
| (H) | HEAT DETECTOR |
| (L) | LABORATORY AIR VALVE |
| (X) | UNITARY HEATING COIL |
| (X) | UNITARY COOLING COIL |
| (F) | FILTER |
| (W) | ENERGY WHEEL |
| (M) | AIR FLOW MEASURING STATION |
| (P) | AIR FLOW PROBE |
| (D) | BACKRAFT DAMPER |
| (D) | MOTORIZED DAMPER - PARALLEL BLADE |
| (D) | MOTORIZED DAMPER - OPPOSED BLADE |
| (NC) | DAMPER ACTUATOR - ELECTRIC |
| (NC) | DAMPER ACTUATOR - PNEUMATIC |
| (F) | CENTRIFUGAL FAN |
| (P) | PROP FAN |
| (P) | PLENUM FAN |
| (H) | HUMIDIFIER |
| (E) | ETHERNET CONNECTION |
| (P) | PILOT LIGHT |
| (E) | ELECTRICAL CONNECTION |
| (C) | CONTACTOR |
| (C) | CONTACT |
| (DDC_XXX) | DDC PANEL |
| (C) | COMPUTER |

REVISIONS		
REV	DESCRIPTION	DATE
A1	ADDENDUM 1	27-JUL-2023
A2	ADDENDUM 2	28-JUL-2023
A3	ADDENDUM 3	28-JUL-2023



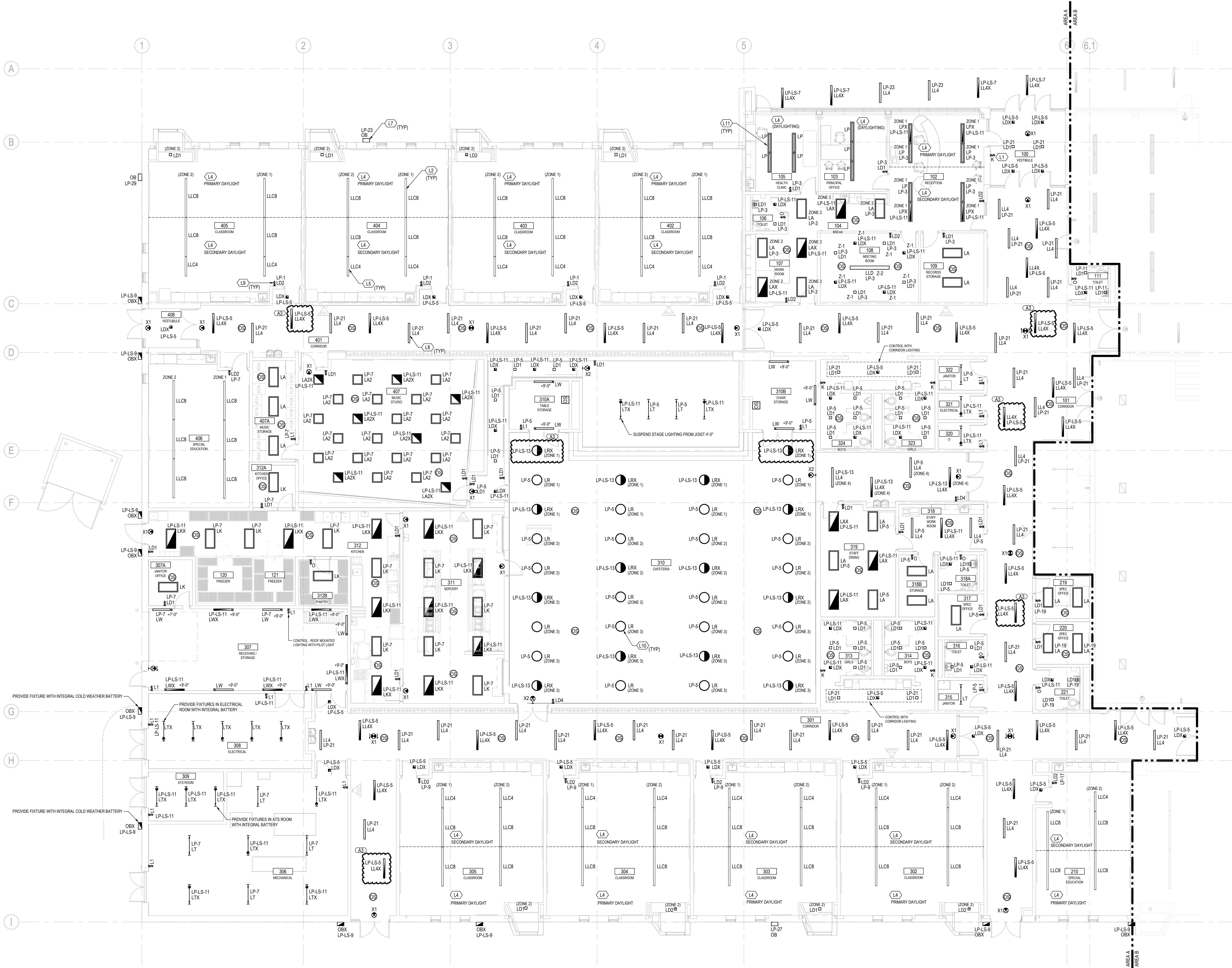
SITE PLAN KEYNOTES

- KEY NOTES**
- S1 NEW UTILITY TRANSFORMER FOR ELEMENTARY SCHOOL PROVIDED BY LANSING BOARD OF WATER & LIGHT (LBWL). CONCRETE PAD BY LBWL.
 - S2 UNDERGROUND SECONDARY ELECTRICAL SERVICE ENTRANCE FEEDERS FROM UTILITY TRANSFORMER TO MAIN SWITCHBOARD. PROVIDE LOCATOR WIRE AND WARNING TAPE COORDINATE ROUTING WITH OTHER TRADES TO AVOID CONFLICT WITH UNDERGROUND PIPING IN AREA. REFERENCE ONE-LINE DIAGRAM ON E401 FOR ADDITIONAL INFORMATION.
 - S3 PROVIDE (2) 3" CONDUITS WITH PULL STRING FOR POWER TO OUTDOOR LEARNING PAVILIONS. ROUTE CONDUIT FROM PULL BOX AND STUB UP AND CAP IN MAIN ELECTRICAL ROOM. REFERENCE DETAIL ON DRAWING E502.
 - S4 PROVIDE (2) 2" CONDUITS FROM MDF ROOM 107 TO MARQUEE SIGN FOR POWER AND LIGHTING. CAP AND MARK ONE CONDUIT AS SPARE. IN SECOND CONDUIT, CONNECT CIRCUITS IN PANEL RP-8 WITH 284, 8184G. COORDINATE FINAL REQUIREMENTS WITH SIGNAGE COMPANY/SHOP DRAWINGS AND OWNER PRIOR TO ROUGH-IN.
 - S5 PROVIDE (1) 2" EMPTY CONDUIT WITH PULL STRING FOR COMMUNICATION CABLEING FOR MARQUEE SIGN FROM MDF ROOM 107 TO MARQUEE SIGN.
 - S7 POWER AND COMMUNICATION PRECAST CONCRETE VAULT FOR OUTDOOR LEARNING PAVILION. COORDINATE EXACT LOCATION WITH OWNER.
 - S8 PROVIDE (2) 4" EMPTY CONDUIT SLEEVES (SCHEDULE 40) WITH PULL-STRING ROUTED BELOW GRADE FOR FUTURE USE. CAP BOTH ENDS BELOW GRADE.
 - A3 NEMA 3R 2000A CT CABINET

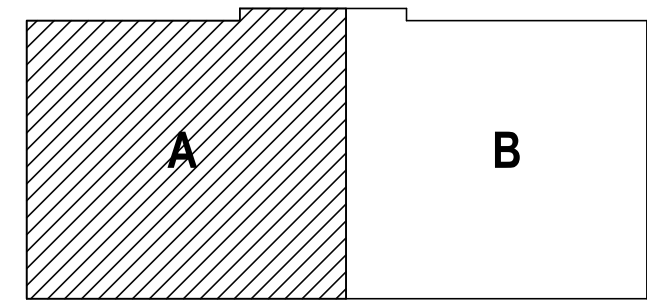
SITE PLAN GENERAL NOTES

- 1. REFER TO DRAWING E001 AND E002 FOR ELECTRICAL LEGEND AND ABBREVIATIONS.
- 2. ELECTRICAL CONTRACTOR SHALL VERIFY WITH CONSTRUCTION MANAGER, THAT A SURVEY HAS BEEN CONDUCTED AND ALL UNDERGROUND UTILITIES IDENTIFIED. CALL DIG TESS.
- 3. UTILITIES SHOWN ON THIS DRAWING ARE FOR REFERENCE ONLY. ELECTRICAL CONTRACTOR SHALL COORDINATE EXACT LOCATION OF ALL EXISTING UTILITIES AND ROUTING OF ALL NEW UNDERGROUND UTILITIES WITH RESPECTIVE TRADES (GENERAL, PLUMBING, CIVIL, ETC.). PRIOR TO DIGGING, MINIMIZE DIGGING BY SHARING TRENCHES WHENEVER POSSIBLE.
- 4. COORDINATE ANY DEMOLITION, TEMPORARY, AND PERMANENT (ELECTRICAL AND TELEPHONE) SERVICES TO THE SITE, WITH THE RESPECTIVE LOCAL UTILITY COMPANY REPRESENTATIVES, IN FIELD, PRIOR TO COMMENCEMENT OF WORK. ALL ASSOCIATED COSTS/FEE'S BY THE UTILITY COMPANY SHALL BE INCLUDED IN THE BID PRICE.
- 5. AT COMPLETION OF THE PROJECT, ELECTRICAL CONTRACTOR SHALL REMOVE ALL DE-ENERGIZED CONDUCTORS FROM SITE.
- 6. OUTDOOR SPARE CONDUITS SHALL INCLUDE PULL STRING AND SHALL BE TERMINATED WITH A CAP.
- 7. ELECTRICAL CONTRACTOR SHALL DIG OUT ENTIRE LENGTH OF TRENCH TO PROPERLY SET DUCT ELEVATIONS. BEFORE DIGGING, CALL DIG TESS.
- 8. PROVIDE LOCATOR WIRE AND WARNING TAPE FOR ALL UNDERGROUND CONDUITS AND FEEDERS.
- 9. ALL ELECTRICAL UTILITY WORK SHALL BE IN COMPLIANCE WITH LANSING BOARD OF WATER & LIGHT (LBWL) GUIDELINES AND DETAILS. COORDINATE WITH LBWL AS REQUIRED.
- 10. ALL CONDUIT DEPTHS SHALL BE COORDINATED WITH FINAL GRADES TO ALLOW FOR MINIMUM REQUIRED CONDUIT DEPTH. REFER TO CIVIL DRAWINGS FOR GRADING PLANS.

REVISIONS		
REV	DESCRIPTION	DATE
03	ADDENDUM 3	28 JUL 2023



FIRST LEVEL LIGHTING PLAN - AREA A
1/8" = 1'-0"



KEY PLAN
NOT TO SCALE

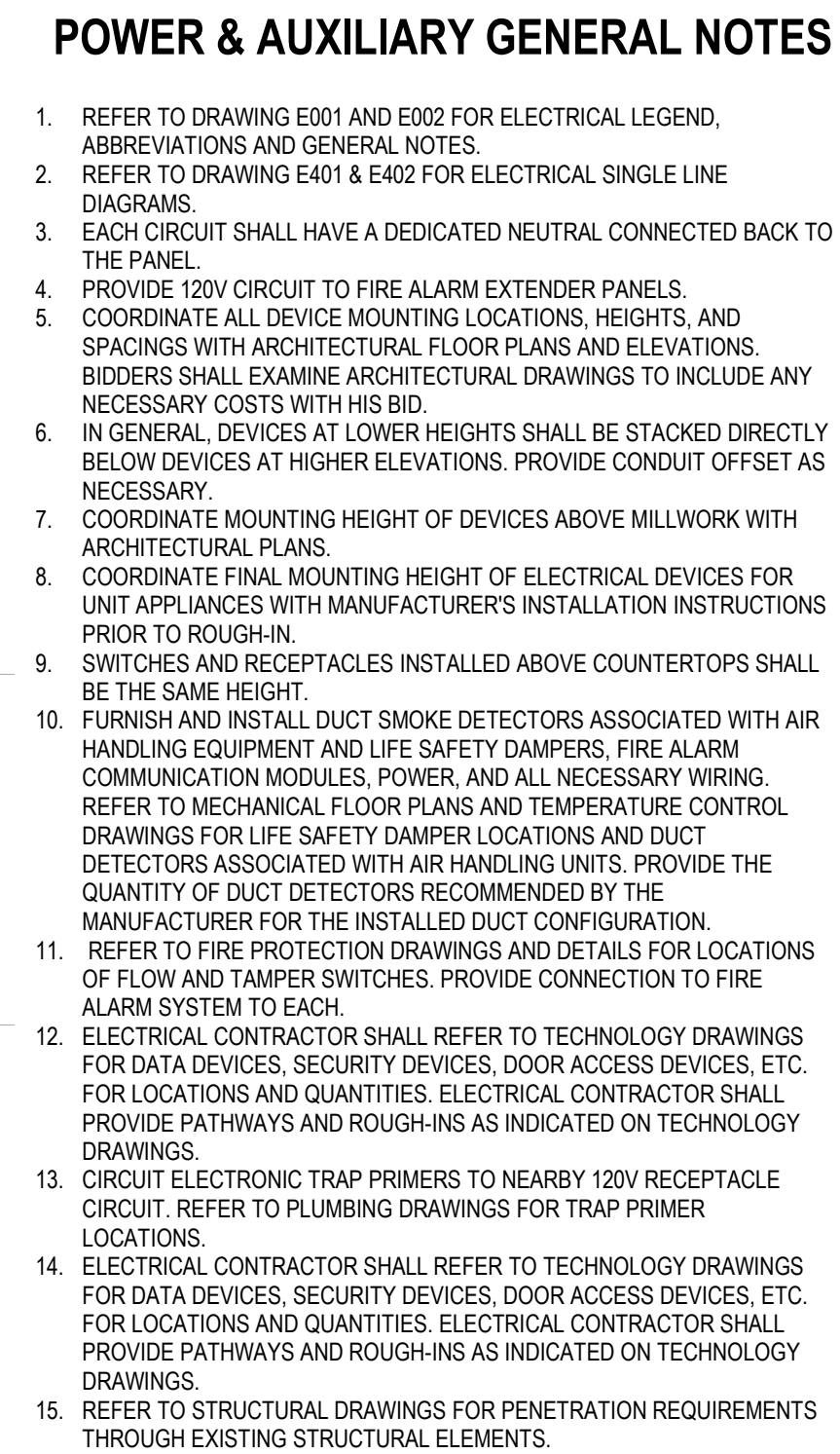
LIGHTING GENERAL NOTES

1. REFER TO DRAWING E001 AND E002 FOR ELECTRICAL LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. REFER TO DRAWING E001 AND E002 FOR LIGHTING FIXTURE SCHEDULE AND CONTROLS INFORMATION.
3. THE CONTRACTOR SHALL PROVIDE A HOT WIRE TIED AHEAD OF LOCAL SWITCHING AND THE LIGHTING CONTROL PANEL RELAYS FOR THE LEADS TO ALL NIGHT LIGHTS, EXIT LIGHTS, EMERGENCY BATTERY PACKS AND EMERGENCY UL924 RELAYS AND EXIT LIGHTS.
4. THE CONTRACTOR SHALL SUBMIT A FULL SET OF OCCUPANCY CONTROL LOCATION DRAWINGS SUBMITTALS TO THE A/E PRIOR TO PURCHASE OR INSTALLATION. OCCUPANCY CONTROL LOCATIONS AND QUANTITIES SHALL BE BASED ON THE MANUFACTURER'S RECOMMENDATIONS. THE LIGHTING PLANS SHOW DESIGN INTENT ONLY AND DO NOT REFLECT EVERY MANUFACTURER PERMUTATIONS.
5. OCCUPANCY CONTROLS SHALL BE WIRED SUCH THAT ALL GENERAL ROOM LIGHTING IS CONTROLLED.
6. PROVIDE A DESIGNATED NEUTRAL CONDUCTOR FOR EACH BRANCH CIRCUIT.
7. IN GENERAL, DEVICES AT LOWER HEIGHTS SHALL BE STACKED DIRECTLY BELOW DEVICES AT HIGHER ELEVATIONS. PROVIDE CONDUIT OFFSET AS NECESSARY.

LIGHTING KEYNOTES

- # KEYNOTES
- L1 LOW VOLTAGE MASTER OVERRIDE ON SWITCH FOR OVERRIDE OF INTERIOR LIGHTING ON LIGHTING CONTROL RELAY PANEL. SWITCH COVER SHALL BE ENGRAVED/EMBOSSED WITH DESCRIPTION. COORDINATE FINAL LOCATION WITH BUILDING OWNER.
 - L2 CLASSROOM LINEAR LIGHT FIXTURES SHALL BE EQUIPPED WITH INTEGRAL OCCUPANCY AND PHOTOCELL SENSORS.
 - L3 PROVIDE DAYLIGHT HARVESTING CONTROL IN THIS SPACE.
 - L4 SUSPEND CLASSROOM LINEAR FIXTURES FROM BOTTOM OF STRUCTURAL JOIST SUCH THAT BOTTOM OF FIXTURE IS 10'-0" AFF.
 - L5 SUSPEND CAFETERIA PENDANT FIXTURE SUCH THAT BOTTOM OF FIXTURE IS 12'-0" AFF.
 - L6 SUSPEND TYPE LP LIGHT FIXTURE SUCH THAT BOTTOM OF FIXTURE IS 10'-0" AFF.

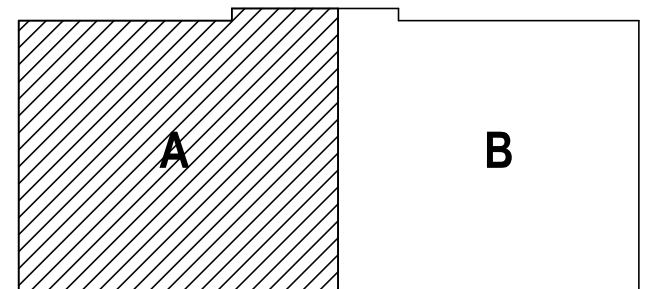
REVISIONS		
REV	DESCRIPTION	DATE
01	ADDENDUM 3	28 JUL 2023



KEY NOTES

- P1 PROVIDE GFCI BREAKER FOR EWC CIRCUIT. PROVIDE AN ADDITIONAL RECEPTACLE FOR BOTTLE FILLER COMPONENT. REFER TO EDC DATA SHEET FOR INSTALLATION INSTRUCTIONS AND LOCATE RECEPTABLES AS REQUIRED.
- P11 POWER FOR FORD COP MACHINE. NEMA 5-20R RECEPTACLE AND #10G 34FC. CAPAC DISCONNECTORS IN OUTLET BOX AND ELECTRICAL PANEL FOR FUTURE.
- P12 ADD GFCI BREAKER FOR REFRIGERATOR.
- P13 PROVIDE THE FOLLOWING "I" CONDUTITS AND ASSOCIATED CABLES/CONDUCTORS FROM THE GENERATOR
- P14 TO THE FIRE ALARM PANEL (1) TO THE FIRE ALARM PANEL (1) TO THE ATS ROOM FOR COMMUNICATION AND EPO FUNCTION (1) FOR POWER CIRCUITS FOR BATTERY CHARGER AND BLOCK HEATER (1) FOR POWER CIRCUITS FOR POSITIVE (1) TO ATS LS FOR DEDICATED START SIGNAL (1) TO ATS-SB FOR DEDICATED START SIGNAL (1)
- P16 MOTORIZED PROJECTION SCREEN AND ASSOCIATED CONTROL SWITCH. PROVIDE 3/4" CONDUIT WITH PULL STRING FROM CONTROL STATION TO SCREEN LOCATION
- P17 PROVIDE 1/2" CONDUIT FROM CONTROL STATION TO SCREEN LOCATION. (1) 1/4" BY CABLEING, MOUNT TO WALL WITH BOTTOM VERTICAL AT 14'-4" AFF. MODIFY RACEWAY IN FIELD TO FIT WALL LENGTH. PROVIDE ALL NECESSARY DISCONNECTORS, FUSES, ETC. FOR A COMPLETE FULLY FUNCTIONING SYSTEM.
- P18 J-BOX FOR POWER CONNECTION FOR SMOKE DAMPERS. PROVIDE TIGHTLY TYPED DISCONNECT SWITCH FOR EACH DAMPER. EXTEND WIRE FROM THE J-BOX TO EACH DAMPER. PROVIDE 1/2" CONDUIT APPROXIMATELY 6'-11" ON DAMPER. MINIMUM ONE CIRCUIT PER HVAC UNIT ON DAMPER.
- P19 PROVIDE GFCI BREAKER FOR AUTOMATIC FAULT CIRCUIT COORDINATE EXACT LOCATION AND REQUIREMENTS WITH SHOP DRAWINGS AND PLUMBING CONTRACTOR PRIOR TO ROUGH-IN.
- P20 TEACHER WORKSTATION. REFER TO DETAIL ON DRAWING E502.
- P21 PROVIDE DETAIL ON ADJACENT POWER AND DATA. REFER TO DETAIL ON DRAWING E502.
- P22 INTERACTIVE PLAT PANEL DISPLAY. REFER TO DETAIL ON DRAWING E502.
- P23 PROVIDE TWO VIDEO INTERFACE DISPLAY. REFER TO DETAIL ON DRAWING E502.
- P24 ADA DOR ACCESS CONTROL. PROVIDE 120V CIRCUIT AS SHOWN TO DOR POWER SUPPLY. PROVIDE PATHWAYS AS SHOWN ON ACCESS CONTROL DETAIL ON DRAWING E502. REFER TO TECHNOLOGY DRAWINGS FOR ADDITIONAL INFORMATION.
- P25 DOR PROVIDED WITH CARD ACCESS CONTROL. PROVIDE CARD ACCESS PATHWAYS AS SHOWN ON ACCESS CONTROL DETAIL ON DRAWING E502. REFER TO TECHNOLOGY DRAWINGS FOR COMMUNICATIONS REQUIREMENTS.
- P29 UNDERGROUND SECONDARY ELECTRICAL SERVICE ENTRANCE FROM MAIN UTILITY TO MAIN ELECTRICAL SERVICE ENTRANCE. PROVIDE LOCATOR WIRE AND WARNING TAPE. COORDINATE ROUTING WITH OTHER TRADES TO AVOID CONFLICT WITH UNDERGROUND PIPING.
- P33 GENERATOR PASS THRU DOORING STATION NEMA 3R ENCLOSEURE FOR QUICK CONNECTION TO PORTABLE GENERATOR DURING MAINTENANCE PREPARE OF PRIMARY GENERATOR IN COMPLIANCE WITH NEC 700.3(F).
- P34 NEMA 3R 200MA 2 CT CABINET

PROVIDE 18 INCH CABLE TRAY WITH 12 INCH MAXIMUM RUNG SPACING IN THE CORRIDORS FOR ALL LOW VOLTAGE CABLE MANAGEMENT. CABLE TRAY SHALL BE RATED FOR ALL REQUIRED CABLING WITH AN ADDITIONAL 10 LBS/FT FOR FUTURE CAPACITY.



KEY PLAN
NOT TO SCALE

NOTES



1. REFER TO DRAWING E001 AND E002 FOR ELECTRICAL LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. REFER TO DRAWING E401 & E402 FOR ELECTRICAL SINGLE LINE DIAGRAMS.
3. EACH CIRCUIT SHALL HAVE A DEDICATED NEUTRAL CONNECTED BACK TO THE MAINS.
4. PROVIDE 120V CIRCUIT TO FIRE ALARM EXTENDER PANELS.
5. COORDINATE ALL DEVICE MOUNTING LOCATIONS, HEIGHTS, AND SPACING WITH ARCHITECTURAL DRAWINGS. PROVIDE SUGGESTIONS. BIDDERS SHALL EXAMINE ARCHITECTURAL DRAWINGS TO INCLUDE ANY NECESSARY COSTS WITH HIS BID.
6. PROVIDE ALL DEVICES AT ALL HEIGHTS SHALL BE STACKED DIRECTLY BELOW DEVICES AT HIGHER LEVELS. PROVIDE CONDUIT OFFSET AS NECESSARY.
7. COORDINATE MOUNTING OF DEVICES ABOVE MILLWORK WITH ARCHITECTURAL PLANS.
8. COORDINATE FINAL MOUNTING HEIGHT OF ELECTRICAL DEVICES FOR ALL TRADES WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS PRIOR TO ROUGH-IN.
9. SWITCHES AND RECEPTABLES INSTALLED ABOVE COUNTERTOPS SHALL BE 48" HIGH.
10. FURNISH AND INSTALL DUCT SMOKE DETECTORS ASSOCIATED WITH AIR HANDLING EQUIPMENT AND LIFE SAFETY DAMPERS, FIRE ALARM CONTROL AND MODULAR EXHAUST FANS.
11. PROVIDE DETECTOR MOUNTING AND WIRING. DETECTOR MOUNTING SHALL REFER TO MECHANICAL FLOOR PLAN AND TEMPERATURE CONTROL DRAWINGS FOR LIFE SAFETY DAMPER LOCATIONS AND DUCT DETECTORS ASSOCIATED WITH AIR HANDLING SYSTEMS. PROVIDE THE QUALITY OF DUCT DETECTORS RECOMMENDED BY THE MANUFACTURER FOR THE INSTALLED DUCT CONFIGURATION.
12. REFER TO FIRE PROTECTION DRAWINGS AND DETECTOR SCHEDULE FOR LOCATION OF SMOKE DAMPERS AND DETECTORS. PROVIDE DUCT CONNECTION TO FIRE ALARM SYSTEM TO EACH.
13. ELECTRICAL CONTRACTOR SHALL REFER TO TECHNOLOGY DRAWINGS FOR DEVICES, SECURITY DEVICES, DOOR ACCESS DEVICES, ETC. FOR LOCATIONS AND QUANTITIES. ELECTRICAL CONTRACTOR SHALL PROVIDE PATHWAYS AND ROUGH-INS AS INDICATED ON TECHNOLOGY DRAWINGS.
14. CIRCUIT ELECTRONIC TRAP PRIMERS TO NEARBY 120V RECEPTACLE CIRCUIT. REFER TO PLUMBING DRAWINGS FOR TRAP PRIMER LOCATION.
15. ELECTRICAL CONTRACTOR SHALL REFER TO TECHNOLOGY DRAWINGS FOR DATA DEVICES, SECURITY DEVICES, DOOR ACCESS DEVICES, ETC. FOR LOCATIONS AND QUANTITIES. ELECTRICAL CONTRACTOR SHALL PROVIDE PATHWAYS AND ROUGH-INS AS INDICATED ON TECHNOLOGY DRAWINGS.
16. REFER TO STRUCTURAL DRAWINGS FOR PENETRATION REQUIREMENTS THROUGH EXISTING STRUCTURAL ELEMENTS.

KEY NOTES

- P1 PROVIDE GFCI BREAKER FOR EWC CIRCUIT. PROVIDE AN ADDITIONAL RECEPTACLE FOR BOTTLE FILLER COMPONENT. REFLECT TO EDCO SHEET FOR INSTALLATION INSTRUCTIONS AND LOCATE RECEPTABLES AS REQUIRED.
- P2 PROVIDE POWER FOR RETRACTABLE BACKBOARD GOLF AND HEIGHT ADJUST. EXTEND ONE 3/4" CONDUIT WITH PULL STRING FROM EACH JUNCTION BOX TO RESPECTIVE GOLF CONTROL SWITCH BACK. COORDINATE ADDITIONAL REQUIREMENTS WITH BACKBOARD MANUFACTURER AND PROVIDE TO THE INSTALLER. PROVIDE TO THE INSTALLER TO DETAIL ON DRAWING E502 FOR E4K+ POWER AND DATA REQUIREMENTS. COORDINATE LOCATION WITH ARCHITECTURAL ELEVATIONS AND EJECT POWER REQUIREMENTS WITH INSTALLER PROVIDED TO ROUGH-IN.
- P3 PROVIDE POWER AND JUNCTION BOX WITH 1" CONDUIT AND PULL STRING TO SCORES BOARD LOCATION. EXTEND 1" CONDUIT WITH PULL STRING TO SCORERS TABLE LOCATION AT FLOOR BOX. COORDINATE LOCATION WITH ARCHITECTURAL DRAWINGS AND EJECT POWER REQUIREMENTS WITH INSTALLER PROVIDED TO ROUGH-IN. REFERENCE DETAIL ON E502 FOR ADDITIONAL REQUIREMENTS.
- A3 PROVIDE RECEPTACLE AT EACH OF THE FOLLOWING:
 - COORDINATE REQUIREMENTS OF BLEACHER MOTORS WITH GENERAL CONTRACTOR AND BLEACHER INSTALLER PROVIDED TO ROUGH-IN OF THE FOLLOWING:
 - PROVIDE A 30A/250V DISCONNECT MOUNTED IN CENTER OF BLEACHER BANK 2" AFF FOR BLEACHER MOTOR MOTORS.
 - PROVIDE 3/4" CONDUIT FROM THE MOTOR CONTROL BOX TO EACH DRIVE BOX.
 - SWITCH CABINET FOR CONTROL OF BLEACHERS, GOLF HOSTS AND SCORERS (EJECT POWER, DATA, AND EJECT POWER, ETC.) ETC., AS REQUIRED FOR CONTROLS. COORDINATE REQUIREMENTS WITH INSTALLER PROVIDED TO ROUGH-IN TO ENSURE ALL REQUIREMENTS ARE MET FOR COMPLETE AND FULLY FUNCTIONAL SYSTEM.
 - POWER FOR COPY AND MACHINE LOCATIONS 400, 401 AND 4010, #100 3/4" CAP. SPARE CONDUITS IN HUBBLE BOX AND ELECTRICAL PANEL FOR FUTURE.
- P4 PROVIDE CORD AND REEL ASSEMBLY (OUTLET, HUBS, 120/230/220V) TO EACH JUNCTION BOX ALONG SIDE OF STRUCTURAL. JOIST WITH A QUAD GFCI NEMA 5-20 RECEPTACLE. REEL SHALL BE WHITE. PROVIDE 25 FT (DR. CONDUIT). CONTRACTOR IS RESPONSIBLE FOR MOUNTING AND SUPPORT FOR EACH REEL FOR COMPLETE AND FULLY FUNCTIONAL SYSTEM. PROVIDE SINGLE CHANNEL WIREMOLD 8000 SERIES RACEWAY FOR DATA, AV CABLEING. MOUNT TO WALL WITH BOTTOM ELEVATION AT 14'-4". PROVIDE RACEWAY IN WALL FOR EACH OF THE FOLLOWING. PROVIDE ALL REQUIRED CONDUITS, COVER PLATES ETC. FOR A COMPLETE AND FULLY FUNCTIONAL SYSTEM.
- P5 J-BOX FOR POWER CONNECTION FOR SMOKE DAMPERS. PROVIDE TO THE INSTALLER TO DETAIL DISCONNECT SWITCH FOR EACH DAMPER. RUN AN CONDUIT FROM THE J-BOX TO EACH UNIT AND CONNECT APPROXIMATELY 6-11 ON ONE CIRCUIT. MINIMUM ONE CIRCUIT PER DAMPER.
- P6 PROVIDE GFCI BREAKER FOR AUTOMATIC FAUCET CIRCUIT. COORDINATE EJECT LOCATION AND REQUIREMENTS WITH SHOP AND EJECT AND PUMPING CONTRACTOR. PROVIDE TO THE INSTALLER. PROVIDE TO THE INSTALLER TO DETAIL ON DRAWING E502.
- P7 WORKSTATION WITH ADJACENT POWER AND DATA. REFLECT TO DETAIL ON DRAWING E502.
- P8 INTERACTIVE FLAT PANEL DISPLAY. REFLECT TO DETAIL ON DRAWING

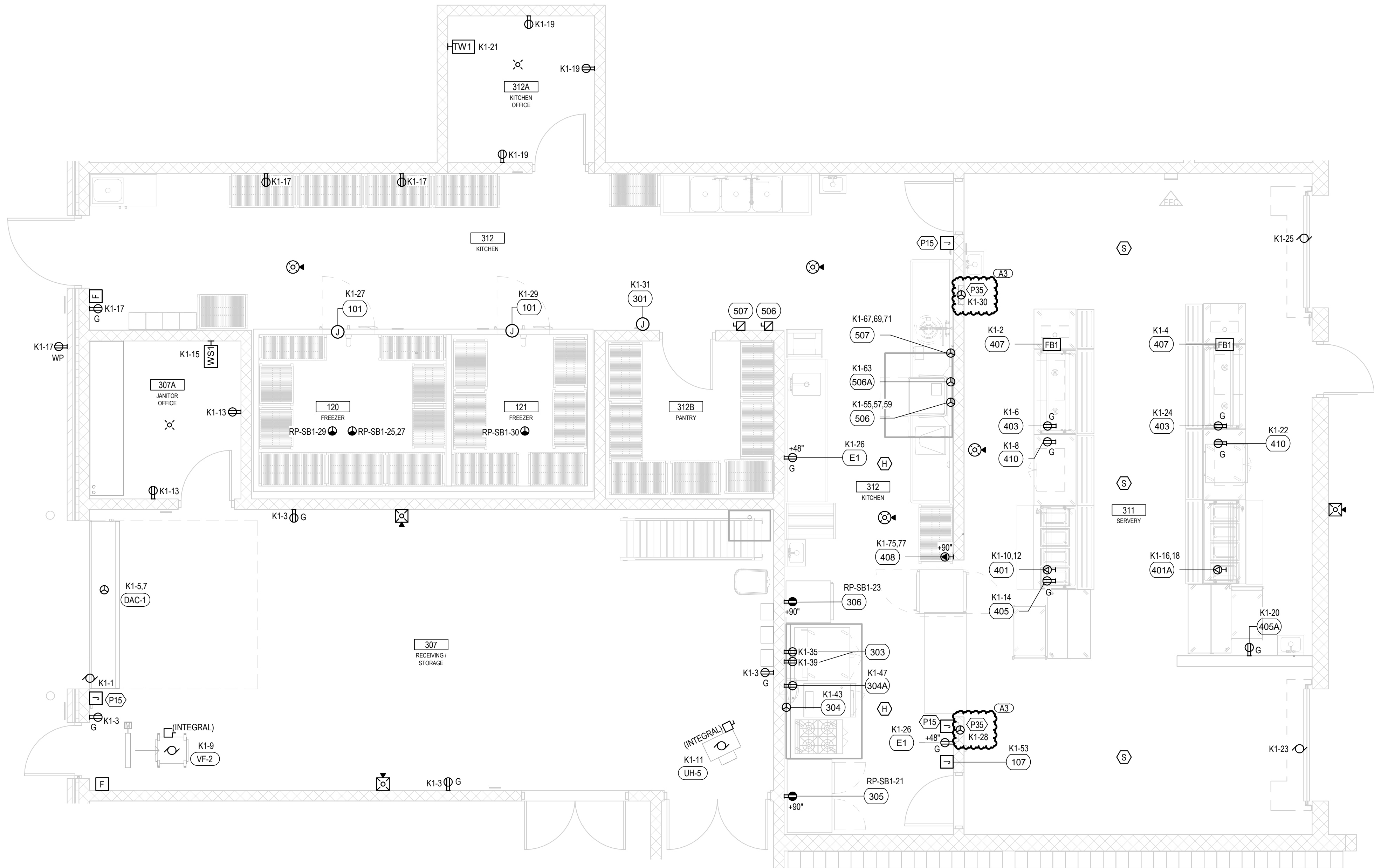
E211B

PROJ. #:	220116
DATE:	23-JUNE-2023

E211B

Addendum #3

ENLARGED KITCHEN PLAN
1/4" = 1'-0"



1. DOOR HEATERS, LIGHT SWITCHES AND PRESSURE RELIEF PORTS PRE-WIRED TO JUNCTION BOX AT TOP OF COLD STORAGE ASSEMBLY BY COOLER/FREEZER MANUFACTURER. ELECTRICAL CONTRACTOR SHALL MAKE ALL FINAL CONNECTIONS.
2. DISCONNECT PROVIDED BY EQUIPMENT PROVIDER. MAKE ALL CONNECTIONS AS REQUIRED TO DISCONNECT AND CONTROL PANEL.
3. REFER TO PEDESTAL MOUNTED RECEPTACLE DETAIL ON FOOD SERVICE DRAWING FSS-3 FOR INSTALLATION REQUIREMENTS.
4. PROVIDE (2) 3/4" CONDUIT (W/ PILE STRING) TO POINT OF SALE SYSTEM TO IDF ROOM FOR DATA CABLING. CONDUIT SHALL BE ROUTED BELOW SLAB TO THE NEAREST WALL.
5. PROVIDE CONCEALED CONDUIT FOR DISHWASHER VENT FAN CONTROL AT 64" AFF.
6. RECEPTACLE SHALL BE WATERPROOF RATED AND PROVIDED WITH HINGED COVER.
7. HOOD LIGHTS PROVIDED BY MANUFACTURER.
8. PROVIDE CIRCUIT TO LOAD CENTER FOR SERVING COUNTER. MAKE ALL CONNECTIONS AS REQUIRED.
9. REFER TO DOOR BELL WIRING SCHEMATIC DETAIL ON DRAWING ES02 FOR DOOR BELL SYSTEM REQUIREMENTS.
10. PROVIDE INTERCONNECTION AS REQUIRED TO COILING DOOR SWITCH. VERIFY LOCATION WITH ARCHITECT PRIOR TO ROUGH-IN.
GENERAL EQUIPMENT SCHEDULE NOTES
A. EQUIPMENT IDENTIFICATION VALUES BASED ON KITCHEN DRAWINGS. ALL NUMBERS ARE NOT USED.
B. VERIFY FINAL REQUIREMENTS WITH FINAL DIMENSIONED SHOP DRAWINGS AND EQUIPMENT PACKAGE.
C. AMPERAGES INDICATED IN BRACKETS [X] DESIGNATES CIRCUIT MINIMUM CIRCUIT AMPS AND NOT EQUIPMENT LOAD.

TAG	DESCRIPTION	AMPS	VOLTS	PHASE	CONNECTION			AFF (in)	COMMENTS
					ELECTRICAL CONNECTION	RECEPT CONFIG/SIZE	DISCONNECT		
101	WALK-IN COOLER/FREEZER	8.0	120	1	HARD-WIRED BY E.C.			ABOVE CEILING	
107	FIRE PROTECTION SYSTEM	10	120	1	HARD-WIRED BY E.C.			ABOVE CEILING	
301	HOOD	10	120	1	HARD-WIRED BY E.C.			ABOVE CEILING	NOTE 7
303	CONVECTION OVEN - DOUBLE CHECK	8.9	120	1	CORD & PLUG	NEMA 5-20R		24	
304	STEAMER	2	120	1	HARD-WIRED BY E.C.			24	
304A	REVERSE OSMOSIS SYSTEM	2.0	120	1	CORD & PLUG	NEMA 5-20R		24	
305	FREEZER	11.2	120	1	CORD & PLUG	NEMA 5-20R		90	
306	REFRIGERATOR	4.9	120/208	1	CORD & PLUG	NEMA 5-20R		90	
401	HOT FOOD TABLE	20.4	208	1	CORD & PLUG			5	NOTE 3
401A	HOT FOOD TABLE W/HEATED BASE	20.4	208	1	CORD & PLUG			5	NOTE 3
403	COLD FOOD TABLE	9.5	120	1	CORD & PLUG	NEMA 6-20R		5	NOTE 3
405	MILK COOLER	3	120	1	CORD & PLUG		100/3P/NF/4X	5	NOTE 3
405A	MILK COOLER	3	120	1	CORD & PLUG	NEMA 5-20R		16	
407	CASH REGISTER/POINT OF SALE SYSTEM	10	120	1	CORD & PLUG	NEMA 5-20R		5	NOTE 4
408	PASS THRU REFRIGERATOR/HEATED CABINET	11	120	1	CORD & PLUG	NEMA 5-20R		90	
410	UNDER COUNTER REFRIGERATOR	2	120	1	CORD & PLUG			5	NOTE 3
506	DISHWASHER & BOOSTER HEATER	45.4	208	3	HARD-WIRED BY E.C.		60A/3P/NF/4X	16	NOTE 5
506A	DRAIN WATER TEMPERING KIT	12	120	1	HARD-WIRED BY E.C.			16	NOTE 1
507	DISPOSAL	6.6	208	3	HARD-WIRED BY E.C.		30A/3P/NF/4X	16	NOTE 1
E-1	GENERAL PURPOSE DUPLEX	10	120	1				48	NOTE 8
E-2	GENERAL PURPOSE DUPLEX	10	120	1				16	NOTE 8

ADDITIONAL KITCHEN CIRCUITS									
	CONVENIENCE DUPLEX ELECTRICAL OUTLET	[20]	120	1				18" (U.N.O)	
	DEFROST HEATER/EVAPORATOR COIL	13.2	208	1				ABOVE CEILING	
	EVAPORATOR COIL FAN MOTOR	1.8	120	1				ABOVE CEILING	
	CONDENSATE DRAIN HEAT TAPE	[20]	120	1				VERIFY	NOTE 6
	TIME-CLOCK	[20]	120	1				VERIFY	NOTE 9
	DOOR BELL	[20]	120	1				VERIFY	NOTE 9
	OVERHEAD COILING DOOR	[20]	120	1	HARD-WIRED BY E.C.				NOTE 10

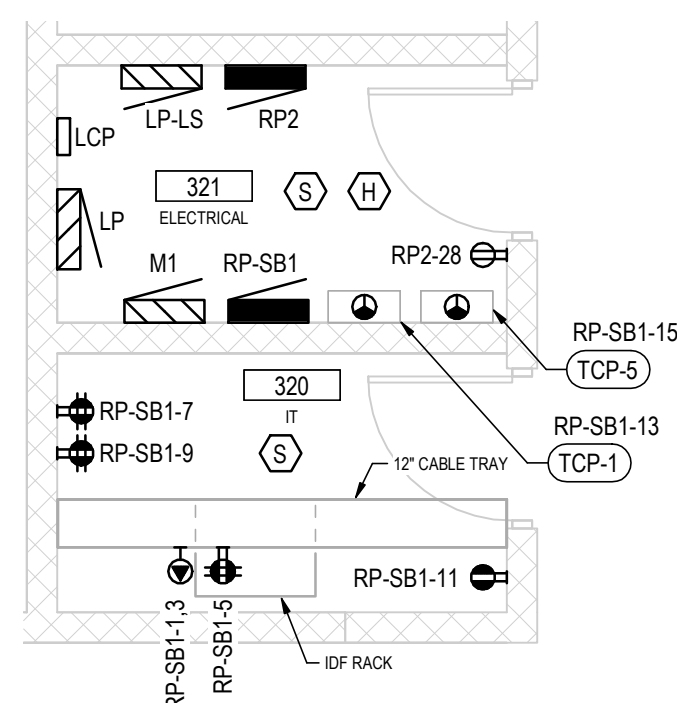
EQUIPMENT SCHEDULE NOTES

GENERAL KITCHEN NOTES

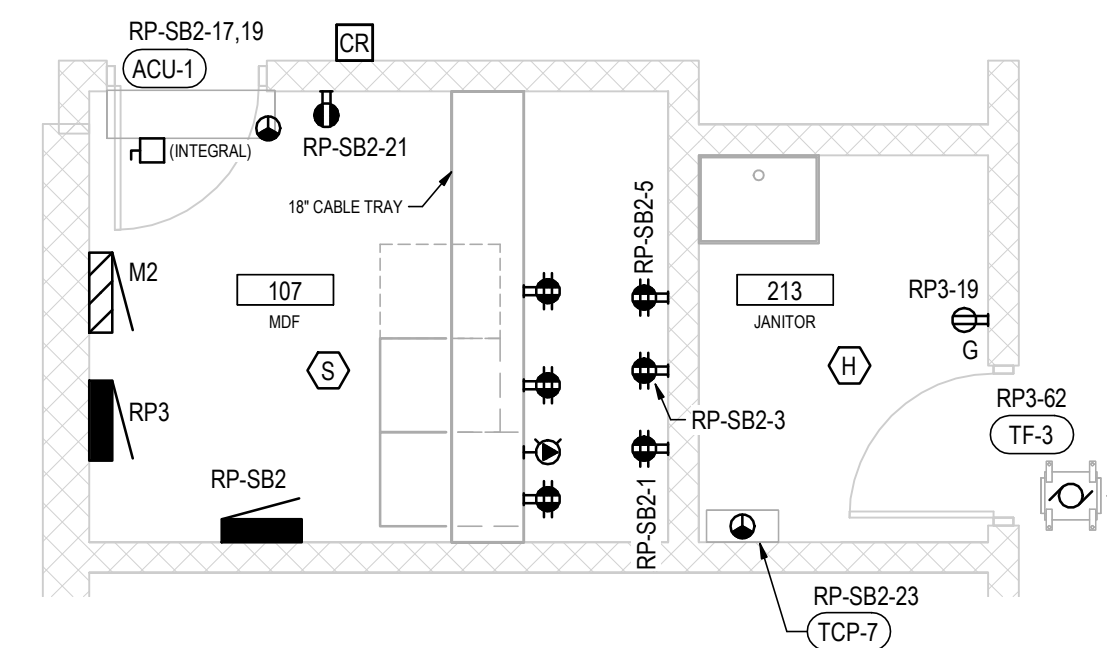
- PROVIDE GFCI PROTECTION FOR ALL 120 OR 208 VOLT, SINGLE PHASE RECEPTACLES RATED 50 AMPS OR LESS IN THE KITCHEN. PROVIDE GFCI PROTECTION FOR ALL 208 VOLT, THREE PHASE RECEPTACLES RATED 100 AMPS OR LESS IN THE KITCHEN, PER N.E.C. ARTICLE 210.8(B), UNLESS NOTED OTHERWISE. PROVIDE GFCI TYPE CIRCUIT BREAKERS.
- LOCATIONS SHOWN ARE APPROXIMATE CONNECTION POINTS ON EQUIPMENT. KITCHEN EQUIPMENT CONTRACTOR (KEC) SHALL PROVIDE FULLY DIMENSIONED ROUGH-IN PLANS. THE ELECTRICAL CONTRACTOR SHALL FIELD COORDINATE WITH THE KEC FOR EXACT EQUIPMENT LOCATIONS PRIOR TO INSTALLATION.
- CONTRACTOR SHALL PROVIDE APPROPRIATE RECEPTACLE FOR ALL EQUIPMENT NOTED AS CORD & PLUG CONNECTED. WHERE EQUIPMENT IS NOT FURNISHED WITH CORD/PLUG, THE CONTRACTOR SHALL PROVIDE APPROPRIATE CORD AND CORD CAP. CORD SHALL BE HARD USAGE SOW TYPE.
- ALL EXPOSED CONDUIT SHALL BE RUN TIGHT TO THE WALL. ELECTRICAL CONTRACTOR SHALL NOT ATTACH CONDUIT TO ANY LEGS OR SHELVING BRACING. CONDUIT MAY BE SECURED TO THE BOTTOM OF THE TABLES OR OTHER STEEL SURFACES. ALL FLEXIBLE CONDUIT SHALL BE "SEALTITE" OR EQUAL. FLEXIBLE METALLIC CONDUIT IS NOT ACCEPTABLE. ALL COVER PLATES SHALL BE STAINLESS STEEL.
- ALL KITCHEN DISCONNECTS SHALL BE MOUNTED IN A SAFE, EASILY ACCESSIBLE LOCATION, AND SHALL BE STAINLESS STEEL.
- REFER TO DIVISION 11400 GENERAL AND ITEM SPECIFICATIONS FOR ADDITIONAL INSTALLATION REQUIREMENTS.
- UTILITY REQUIREMENTS, DIMENSIONS, INTERCONNECTIONS AND SO ON ARE BASED ON THE FIRST NAME MANUFACTURER IN THE SPECIFICATIONS. THE FSEC IS RESPONSIBLE FOR ADVISING ANY DEVIATIONS WHICH MAY RESULT FROM THE USE OF MANUFACTURERS OTHER THAN THE FIRST NAMES.
- ALL COOKING EQUIPMENT MUST BE SHUT-OFF AUTOMATICALLY PER NFPA CODES. UTILIZING SHUNT TRIP BREAKERS OR CONTRACTORS, AS PROVIDED BY THE ELECTRICAL CONTRACTOR, OR GAS SUPPLY SHUT-OFF VALVES AS FURNISHED BY THE FSEC AND INSTALLED IN GAS SUPPLY LINE BY THE PLUMBING CONTRACTOR. CONNECT TO HOOD FIRE SUPPRESSION SYSTEM FOR AUTOMATIC SHUNT-TRIP UPON ALARM.
- REFER TO MECHANICAL PLANS FOR EXACT LOCATIONS OF HOOD EXHAUST FANS AND SUPPLY FANS. ELECTRICAL CONTRACTOR SHALL PROVIDE 4-HOUR TWIST TIMER TO CONTROL HOOD EXHAUST FANS. COORDINATE FAN CONTROLS WITH THE TEMPERATURE CONTROLS CONTRACTOR. FIELD COORDINATE LOCATIONS OF TWIST TIMERS.
- PROVIDE ALL INTERCONNECTING WIRING FOR WALK-IN COOLER AND WALK-IN FREEZER LIGHTS, DOOR HEATERS, COMPRESSORS, EVAPORATORS, ALARM SYSTEMS, HEATED PRESSURE RELIEF VENTS, TIME CLOCKS, INTERLOCKS, ECT. ARE NOT PRE-WIRED. ELECTRICAL CONTRACTOR SHALL WIRE PER MANUFACTURERS REQUIREMENTS. CONDUITS FOR LIGHTING SHALL BE RUN OVER TOP OF BOXES. INTERIOR CONDUIT RUNS ARE NOT ACCEPTABLE. CONDUIT PENETRATIONS INTO WALK-IN UNITS SHALL BE PVC AND TRANSITIONED TO EMT OUTSIDE OF THE UNITS.
- ALL WALK-IN CONDUIT PENETRATIONS SHALL BE SEALED BY THE ELECTRICAL CONTRACTOR WITH FOAM AND TO ENSURE THAT THERE ARE NO AIR LEAKS.
- ELECTRICAL CONTRACTOR SHALL INTERWIRE TIME CLOCK SERVING FREEZER/COOLER CONDENSING UNITS.
- VFD: VARIABLE FREQUENCY DRIVES (VFDs) SHALL BE FURNISHED BY MECHANICAL CONTRACTOR AND INSTALLED BY ELECTRICAL. CONTRACTOR SHALL MAKE ALL FINAL ELECTRICAL CONNECTIONS.
- REFER TO TECHNOLOGY DRAWINGS FOR ADDITIONAL BACK BOX LOCATIONS. COORDINATE INSTALLATION SUCH THAT DATA AND POWER BOXES ARE ADJACENT WHERE REQUIRED.

POWER & AUXILIARY KEYNOTES

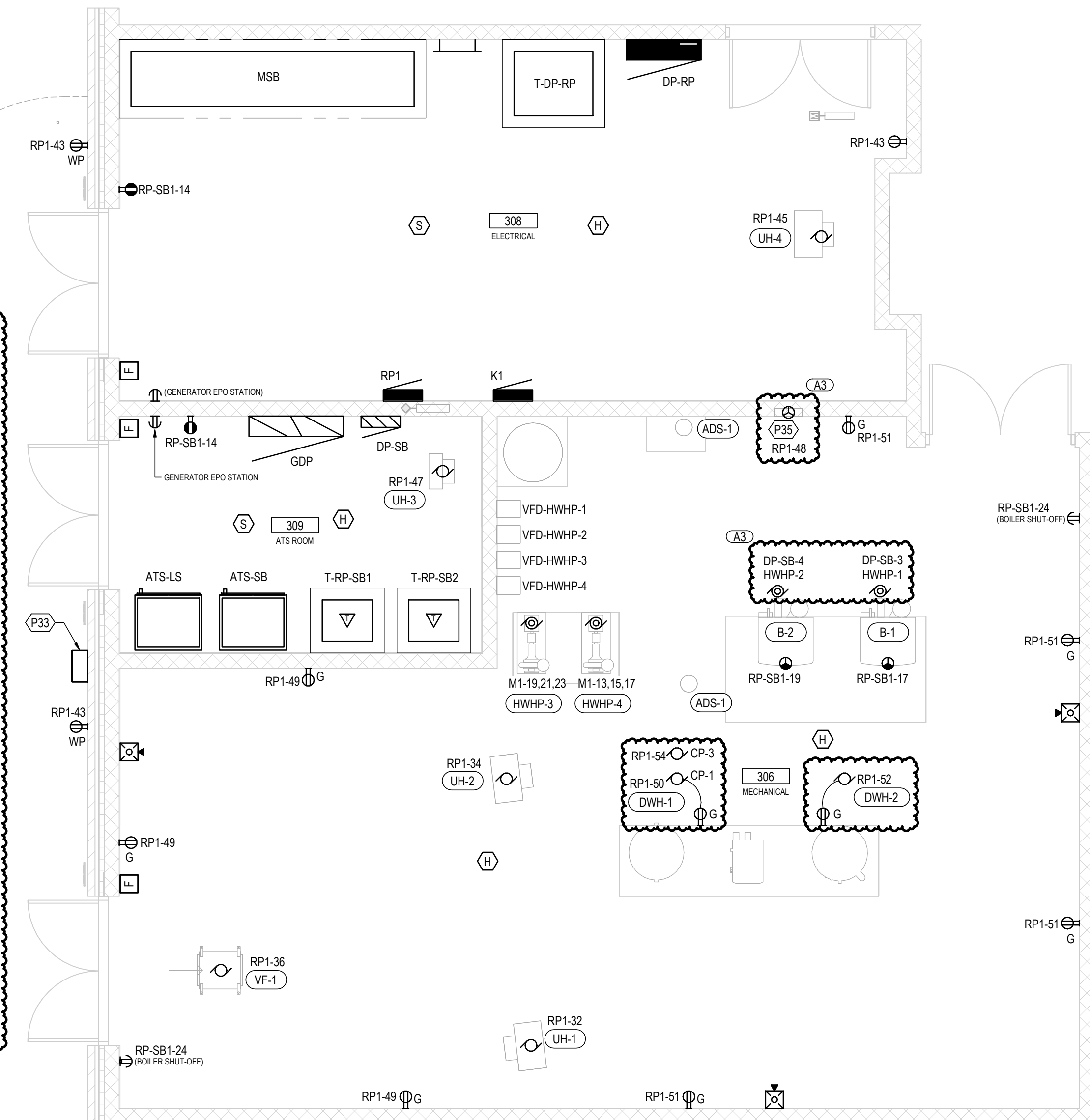
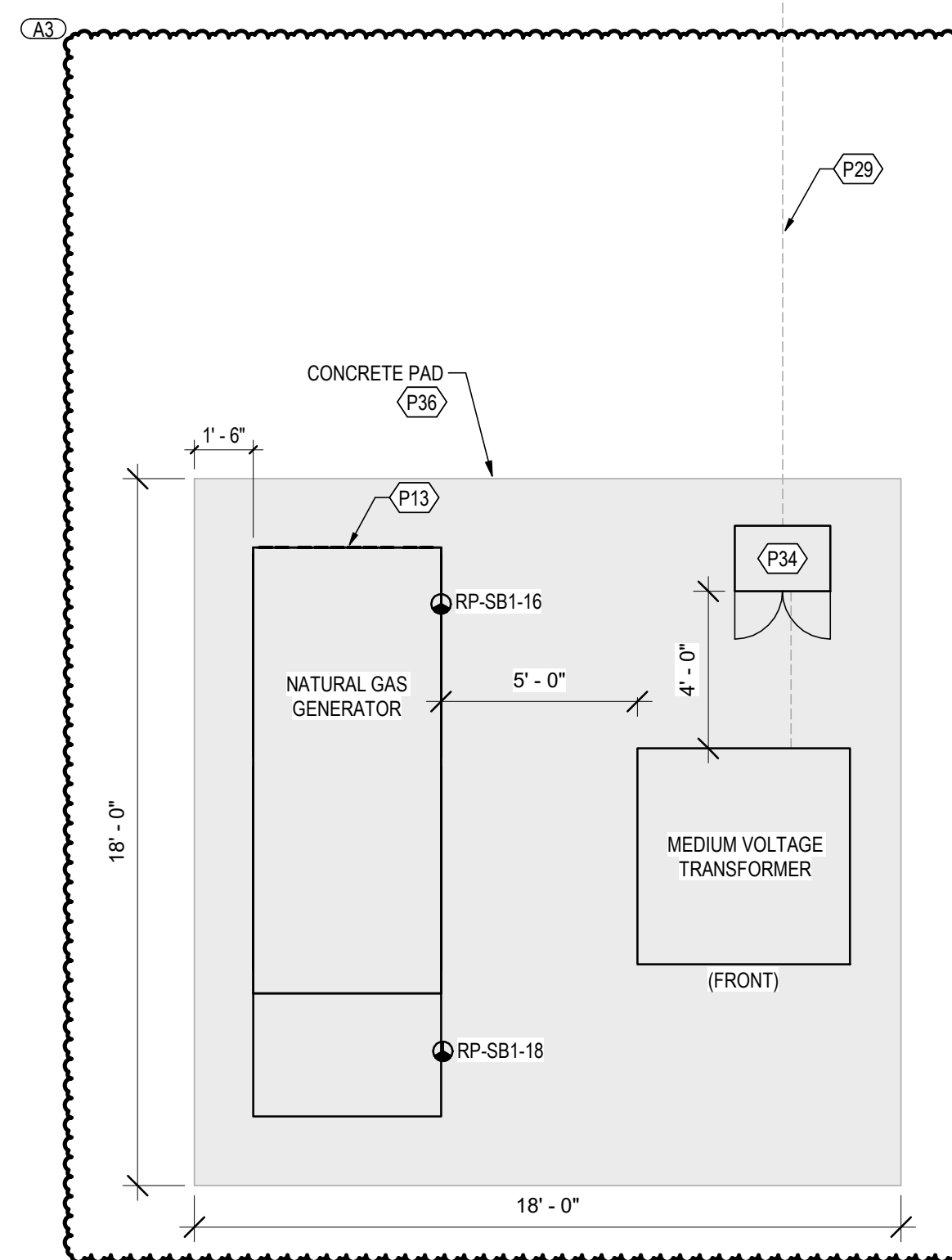
- KEY NOTES**
- P15 JUNCTION BOX INDICATED FOR MOTORIZED OVERHEAD DOOR. DOOR CONTROLS SHALL BE CONNECTED TO SECURITY AND FIRE ALARM SYSTEMS. OVERHEAD DOOR SHALL CLOSE UPON ACTIVATION OF SECURITY ALARM AND OPEN UPON ACTIVATION OF FIRE ALARM. VERIFY LOCATION AND REQUIREMENTS WITH DOOR SYSTEM INSTALLER PRIOR TO ROUGH-IN AND PROVIDE CONDUIT, JUNCTION BOX(ES), ETC. AS REQUIRED FOR A COMPLETE AND FULLY FUNCTIONAL SYSTEM.
- P15 PROVIDE CIRCUIT SHOWN FOR TRAP PRIMER POWER CONNECTION. REFER TO PLUMBING DRAWINGS FOR FINAL LOCATION AND QUANTITIES.



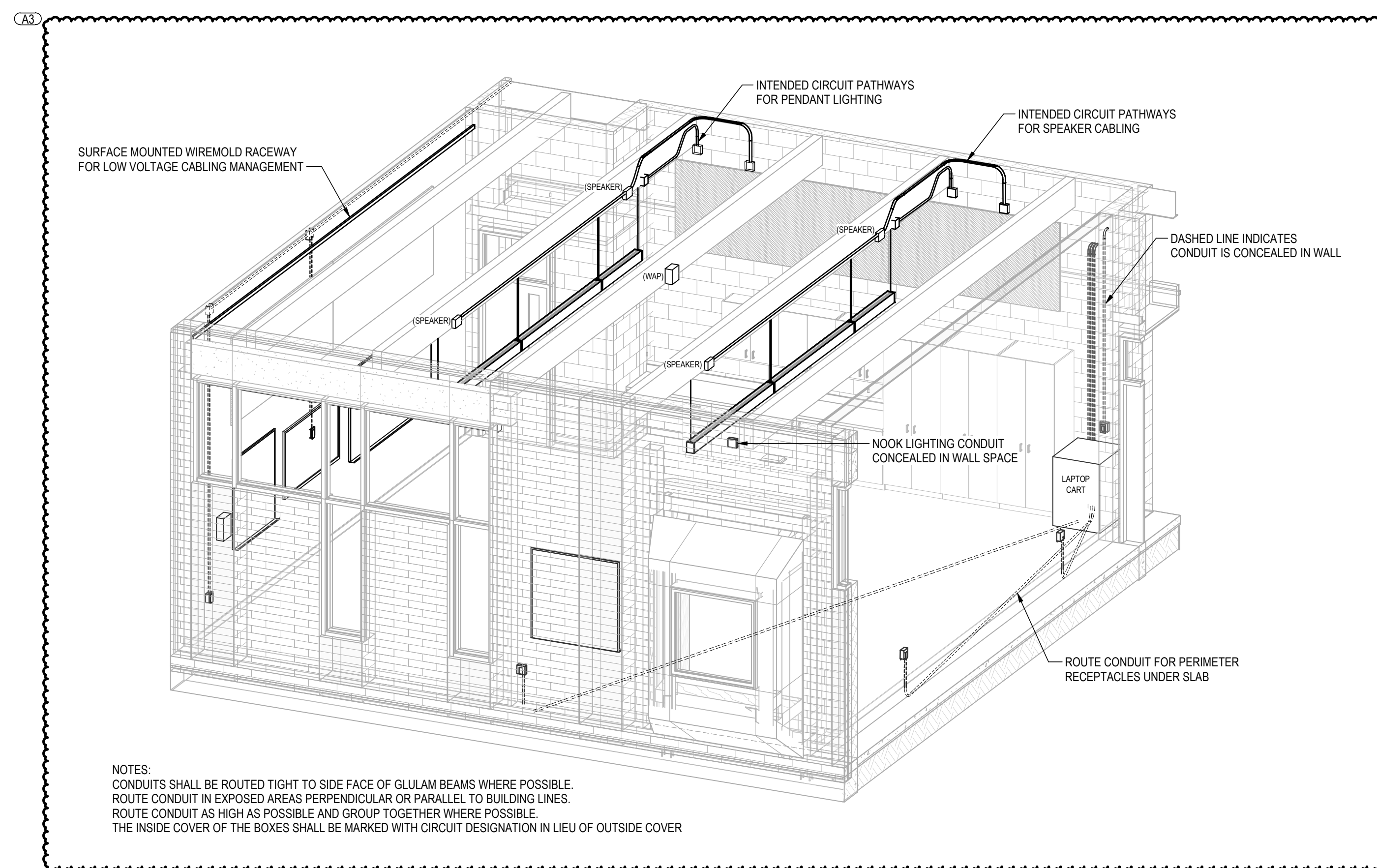
 ENLARGED ELECTRICAL/IDF ROOMS
1/4" = 1'-0"



ENLARGED MDF/JANITOR ROOM
1/4" = 1'-0"



ENLARGED MAIN ELECTRICAL AND BOILER ROOM
1/4" = 1'-0"



○ TYP CLASSROOM CONDUIT ROUTING

POWER & AUXILIARY GENERAL NOTES

2. REFER TO DRAWING E001 AND E002 FOR ELECTRICAL LEGEND, ABBREVIATIONS AND GENERAL NOTES.
3. REFER TO DRAWING E001 & E002 FOR ELECTRICAL SINGLE LINE DIAGRAMS.
3. EACH CIRCUIT SHALL HAVE A DEDICATED NEUTRAL CONNECTED BACK TO THE SERVICE.
4. PROVIDE 120V CIRCUIT TO FIRE ALARM EXTERIOR PANELS.
4. COORDINATE ALL DEVICE MOUNTING LOCATIONS, HEIGHTS, AND SPACINGS WITH ARCHITECTURAL DRAWINGS.
5. BIDDERS SHALL EXAMINE ARCHITECTURAL DRAWINGS TO INCLUDE ANY NECESSARY COSTS WITH HIS BID.
6. ALL ELECTRICAL DEVICES SHALL BE MOUNTED AT THE FOLLOWING HEIGHTS SHALL BE STACKED DIRECTLY BELOW DEVICES AT HIGHER LEVELS. PROVIDE CONDUIT OFFSET AS NECESSARY.
7. COORDINATE MOUNTING HEIGHT OF DEVICES ABOVE MILLWORK WITH ARCHITECTURAL PLANS.
8. COORDINATE FINAL MOUNTING HEIGHT OF ELECTRICAL DEVICES FOR CONFORMANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS PRIOR TO ROUGH-IN.
9. SWITCHES AND RECEPTABLES INSTALLED ABOVE COUNTERTOPS SHALL BE INSTALLED AT THE FOLLOWING HEIGHTS.
10. FURNISH AND INSTALL DUCT SMOKE DETECTORS ASSOCIATED WITH AIR HANDLING EQUIPMENT AND LIFE SAFETY DAMPERS. FIRE ALARM CONTROL PANELS AND MODELS SHALL BE INSTALLED AS SHOWN ON DRAWINGS.
11. REFER TO MECHANICAL FLOOR PLANS AND TEMPERATURE CONTROL DRAWINGS FOR LIFE SAFETY DAMPER LOCATIONS AND DUCT DETECTORS ASSOCIATED WITH AIR HANDLING UNITS. PROVIDE THE LOCATION OF EACH DUCT DETECTOR AND DAMPER AS REQUIRED BY THE MANUFACTURER FOR THE INSTALLED DUCT CONFIGURATION.
11. REFER TO FIRE PROTECTION DRAWINGS AND DETAILS FOR LOCATIONS FOR SMOKE DETECTOR, TAMPERS, SMOKE EXHAUST, PROVIDE CONNECTION TO FIRE ALARM SYSTEM AS NOTED.
12. ELECTRICAL CONTRACTOR SHALL REFER TO TECHNOLOGY DRAWINGS FOR DATA DEVICES, SECURITY DEVICES, DOOR ACCESS DEVICES, ETC. FOR LOCATIONS AND QUANTITIES. ELECTRICAL CONTRACTOR SHALL PROVIDE PATHWAYS AND ROUGH-INS AS INDICATED ON TECHNOLOGY DRAWINGS.
13. CIRCUIT ELECTRIC TRAP PRIMERS TO NEARBY 120V RECEPTACLE CIRCUIT. REFER TO PLUMBING DRAWINGS FOR TRAP PRIMER LOCATIONS.
14. ELECTRICAL CONTRACTOR SHALL REFER TO TECHNOLOGY DRAWINGS FOR DATA DEVICES, SECURITY DEVICES, DOOR ACCESS DEVICES, ETC. FOR LOCATIONS AND QUANTITIES. ELECTRICAL CONTRACTOR SHALL PROVIDE PATHWAYS AND ROUGH-INS AS INDICATED ON TECHNOLOGY DRAWINGS.
15. REFER TO STRUCTURAL DRAWINGS FOR PENETRATION REQUIREMENTS THROUGH EXISTING STRUCTURAL ELEMENTS.

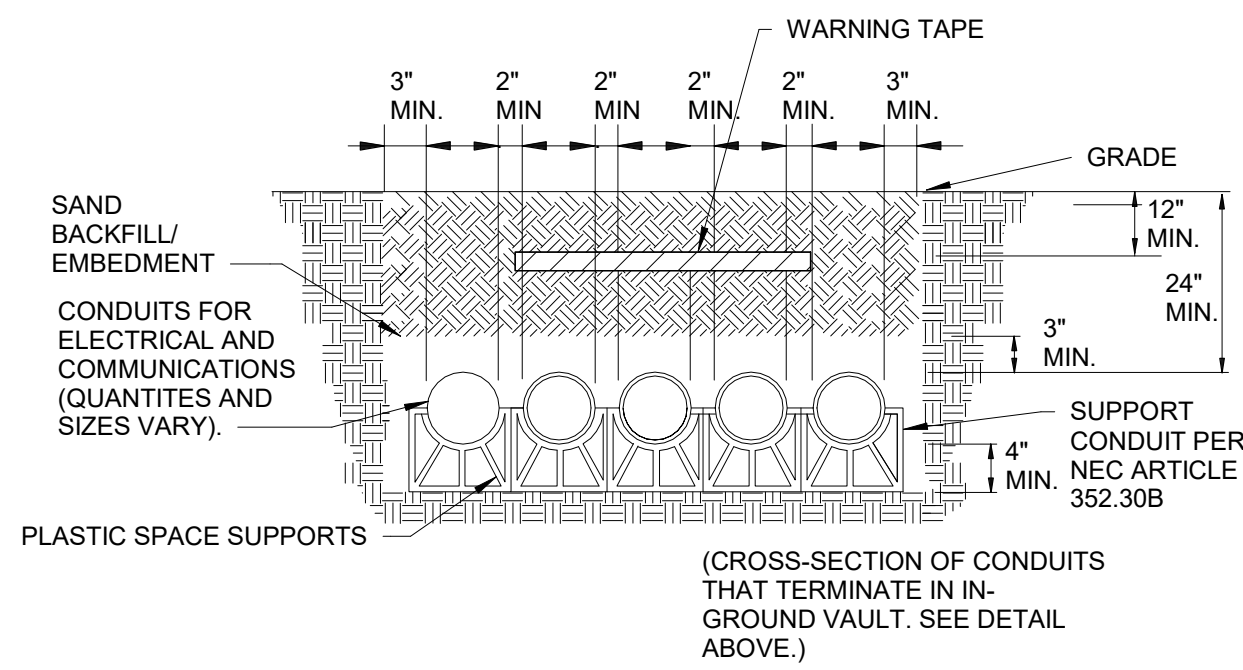
POWER & AUXILIARY KEYNOTES

 **KEY NOTES**

- P13 PROVIDE THE FOLLOWING 1" CONDUITS AND ASSOCIATED CABLES/CONDUCTORS FROM THE GENERATOR:
- (1) TO THE FIRE ALARM CONTROL PANEL
 - (1) TO THE ATS ROOM FOR COMMUNICATION AND EPS FUNCTION
 - (1) FOR POWER CIRCUITS FOR BATTERY CHARGER AND BLOCK HEATER POWER RESPECTIVELY
 - (1) TO ATS-S for DEDICATED START SIGNAL
 - (1) TO ATS-SB FOR DEDICATED START SIGNAL
 - (1) SPARE
- P29 UNDERGROUND SECONDARY ELECTRICAL SERVICE ENTRANCE FEEDERS FROM UTILITY TRANSFORMER TO MAIN SWITCHBOARD. PROVIDE CABLE TRAY, CABLES AND WAGGING TAPES COORDINATE ROUTING WITH OTHER TRADES TO AVOID CONFLICT WITH UNDERGROUND PIPING IN AREA.

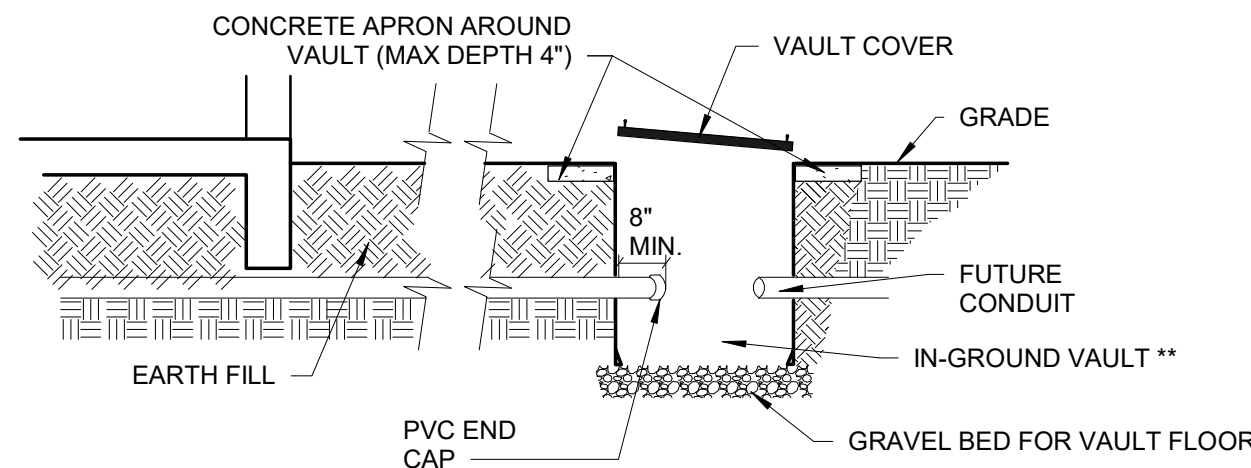
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| P33 | GENERATOR PASS THRU DUCKING STATION NEMA 3R ENCLOSURE FOR QUICK CONNECTION TO PORTABLE GENERATOR DURING MAINTENANCE/REPAIR OF PRIMARY GENERATOR IN COMPLIANCE WITH NEC 700.3(F). |
| P34 | NEMA 3R 2000A CT CABINET |
| P35 | PROVIDE CIRCUIT SHOWN FOR TRAP PRIMER POWER CONNECTION REFER TO PLUMBING DRAWINGS FOR FINAL LOCATION AND QUANTITIES |
| P36 | PROVIDE CONCRETE PAD USING 2500 PSI CONCRETE REINFORCED WITH 8 GAUGE WIRE MESH OR NUMBER 6 REINFORCING BARS ON 12 INCH CENTERS. EXTEND THE CONCRETE PAD BEYOND THE FRAME OF THE GENERATOR UNIT AT LEAST 18 INCHES AND ABOVE THE SURROUNDING SURFACE BY 3-8 INCHES. |

LANSING BWL ELECTRICAL CONSTRUCTION AND SUPPORT SERVICES T



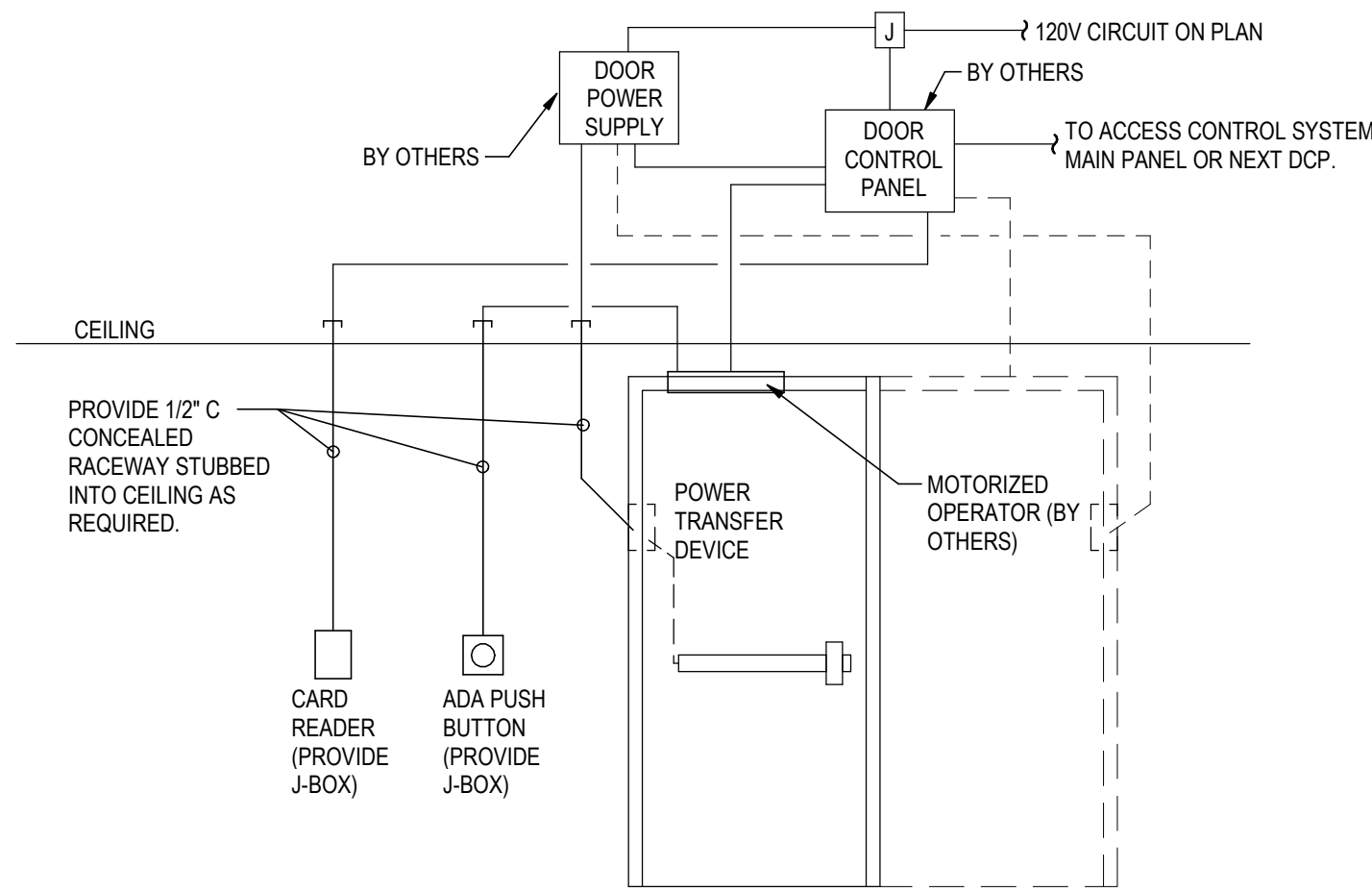
OUTDOOR PAVILION CONDUIT DETAIL

SCALE: NONE



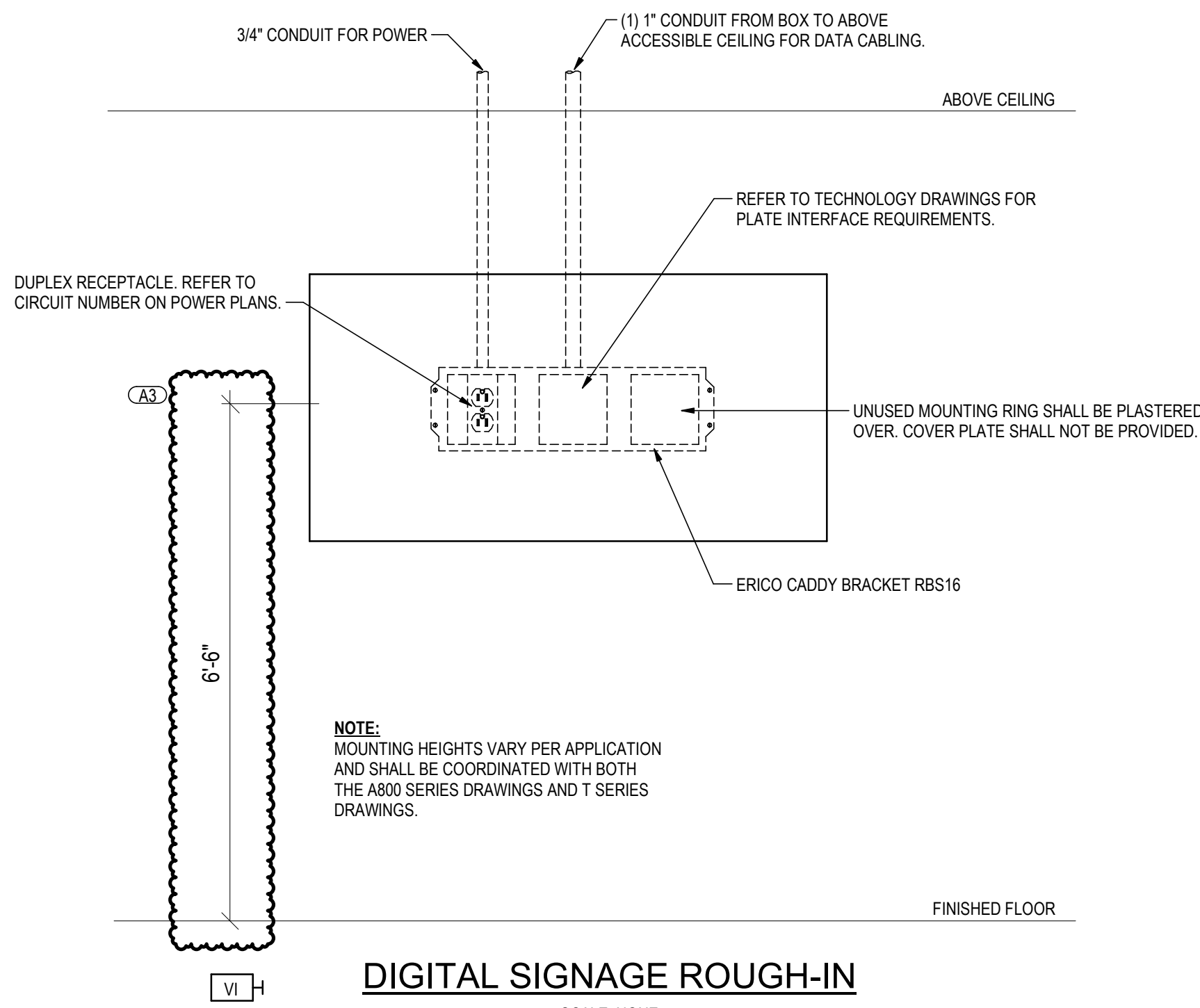
IN-GROUND VAULT DETAIL

SCALE: NONE



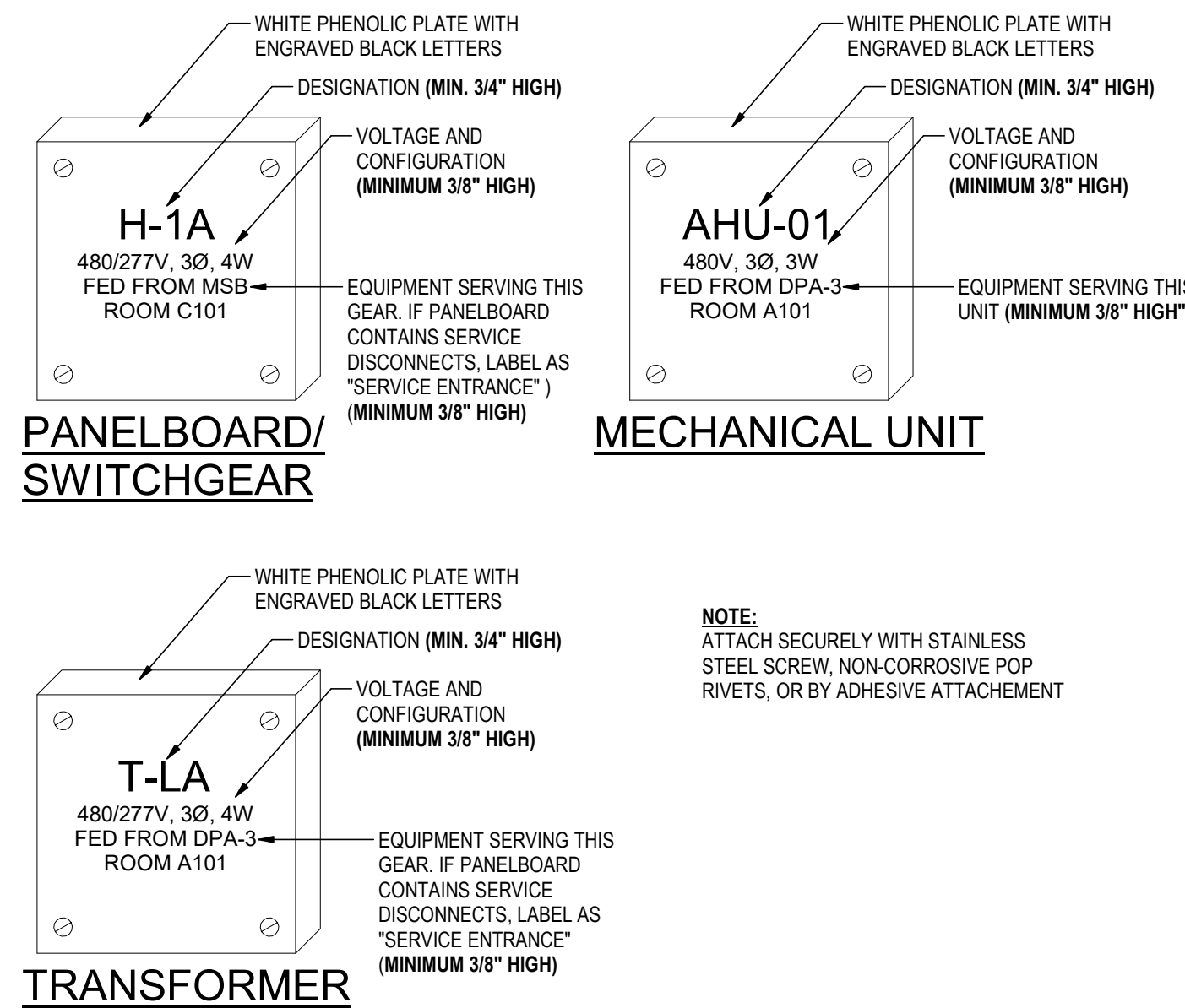
TYPICAL DOOR ACCESS CONTROL DETAIL

SCALE: NONE



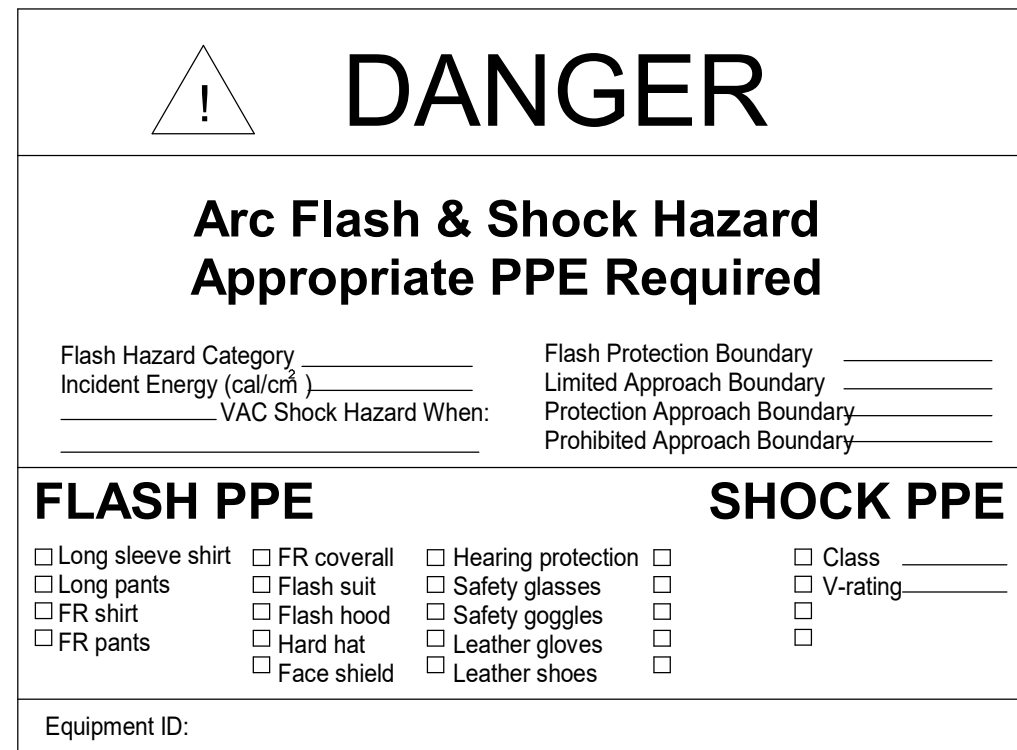
DIGITAL SIGNAGE ROUGH-IN

SCALE: NONE



EQUIPMENT IDENTIFICATION

SCALE: NONE

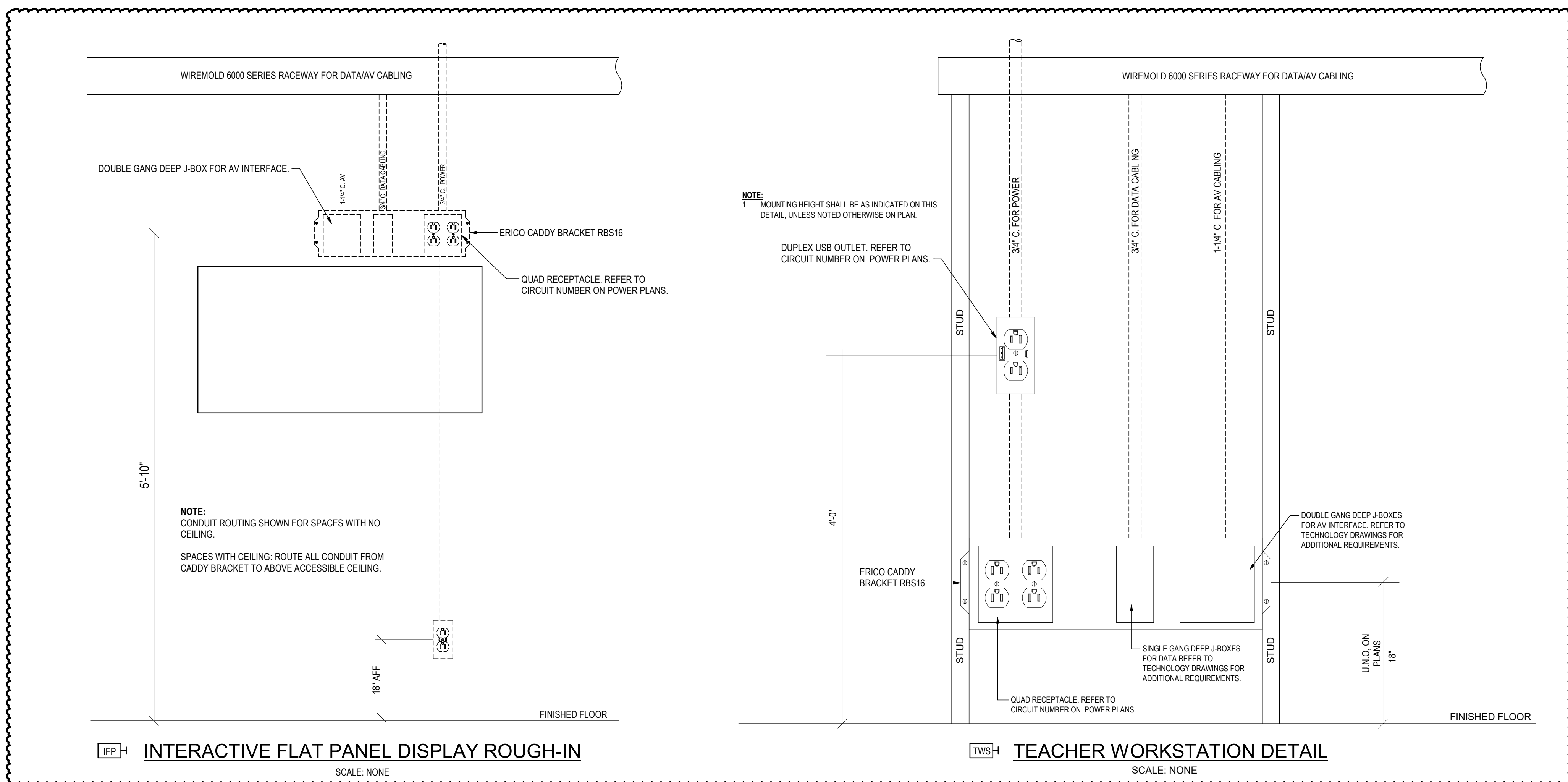
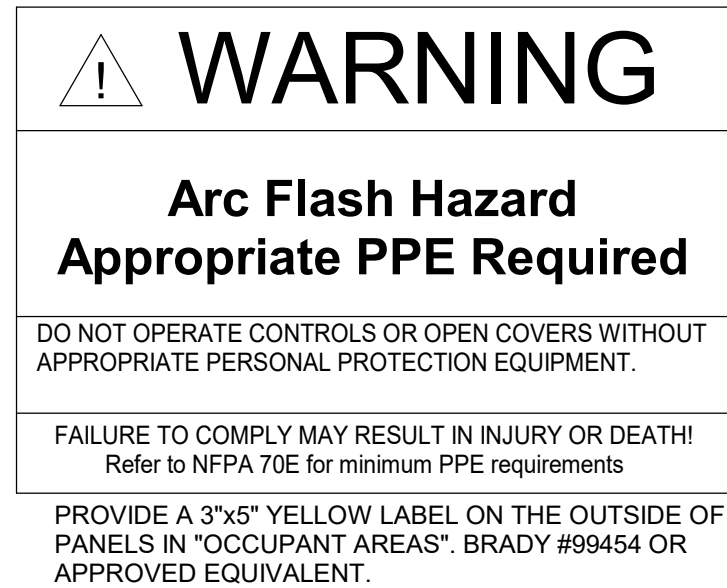


PROVIDE A 4\"/>

NOTE: LABELS SHALL BE COMPLIANT WITH 2020 VERSION OF NFPA 70E.

TYPICAL ARC FLASH WARNING LABELS

SCALE: NONE

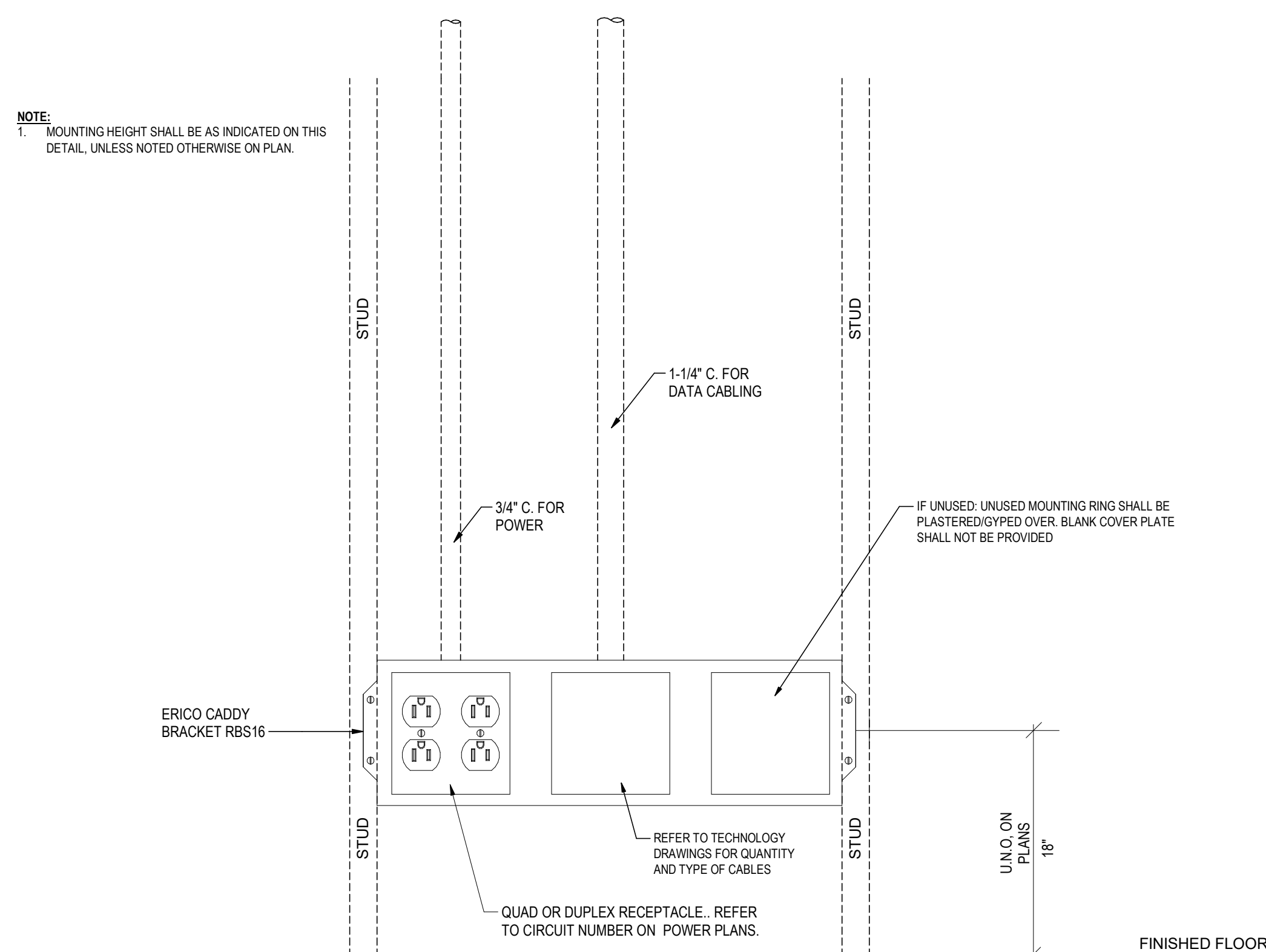


INTERACTIVE FLAT PANEL DISPLAY ROUGH-IN

SCALE: NONE

TEACHER WORKSTATION DETAIL

SCALE: NONE



RECEPTACLE / DATA COMBINATION OUTLET DETAIL

SCALE: NONE

FLOOR SERVICE FITTING AND POKE-THROUGH ASSEMBLY SCHEDULE							
(NOT ALL SERVICE FITTINGS AND POKE-THROUGH ARE USED IN THIS PROJECT)							
TYPE	DESCRIPTION	MANUFACTURER (SEE NOTE - 2)	DEVICE CONFIGURATION	FLANGE/COVER MATERIAL	SERVICE PLATE TYPE	MAXIMUM CONDUIT	MINIMUM DEPTH
FB1	MULTIFUNCTION EIGHT COMPARTMENT, MULTI-SERVICE, STAMPED STEEL WITH SPECIAL FINISH FOR SLAB ON GRADE APPLICATION, RECESSED FLOOR BOX, (2) DUPLEX RECEPTACLES, (2) TELECOMMUNICATION OUTLETS, (3) BLANK PLATES.	WIREMOLD EF88 CAST-N	4D/3T/BLANKS FOR REMAINING GANGS (NOTE 5)	SELECTED BY ARCHITECT	F	2"	6"
FB2	MULTIFUNCTION FOUR COMPARTMENT, MULTI-SERVICE, STAMPED STEEL WITH SPECIAL FINISH FOR SLAB ON GRADE APPLICATION, RECESSED FLOOR BOX, (2) DUPLEX RECEPTACLES, (1) TELECOMMUNICATION OUTLETS, (1) BLANK PLATES.	WIREMOLD EF84 CAST-N	4D/1T/BLANKS FOR REMAINING GANGS (NOTE 5)	SELECTED BY ARCHITECT	F	2"	6"

NOTES:

- UNLESS NOTED OTHERWISE ON AVI OR TECHNOLOGY DRAWINGS, PROVIDE 1 1/4" CONDUIT FROM EACH VOICE/DATA FLOOR BOX GANG COMPARTMENT TO ABOVE ACCESSIBLE CEILING SPACE. PROVIDE 1" CONDUIT FROM EACH BLANK FLOOR BOX AND WALL BOX GANG COMPARTMENT TO ACCESSIBLE CEILING SPACE. DO NOT DAILY CHANGE CONDUIT. CONTACT ENGINEER WHEN FIELD CONDITIONS DO NOT ALLOW FOR THIS.
- OTHER ACCEPTABLE MANUFACTURER'S ARE STEEL CITY OR HUBBELL-RACO. WATER EXCLUSION REQUIREMENT.
- ALL PRODUCTS IN THE SCHEDULE SHALL MEET AND EXCEED THE UL 508 RUB WATER EXCLUSION REQUIREMENT.
- PROVIDE ALL REQUIRED DEVICE BRACKETS AND TERMINATE ALL CABLES IN FLOOR BOX. LOOSE DANGLING CABLES INSIDE FLOOR BOX IS NOT ACCEPTABLE.
- REFER TO TECHNOLOGY/AV PLANS FOR QUANTITY OF DATA DROPS WITHIN DATA GANGS. WHERE TWO CIRCUITS ARE SHOWN ON PLANS, HALF OF THE OUTLETS ARE CONNECTED TO ONE CIRCUIT AND THE OTHER HALF TO ANOTHER CIRCUIT. WHERE THREE CIRCUITS ARE SHOWN ON PLANS, EACH OF THE OUTLETS ARE CONNECTED TO SINGLE CIRCUIT. WHERE NO DATA IS SHOWN ON TECHNOLOGY DRAWINGS, PROVIDE BLANK COVER PLATE OVER TWO GANGS.
- CONTRACTOR SHALL TRANSITION TO FLEXIBLE CONDUIT WITH SLACK AS NECESSARY TO SERVICE POKE THRU FROM ABOVE.

A = ALUMINUM
B = BRASS
BL = BLANK PLATE/GANG
D = DUPLEX RECEPTACLES
F = FLIP COVER
FR = FLIP LID (RECTANGULAR)
NA = NOT APPLICABLE
PF = PARTITION FEED
SL = SLIDES
T = VOICE/DATA OPENINGS

CONTRACTOR SHALL PROTECT INTERIOR FINISH OF ALL FLOOR BOX AND POKE-THRU FROM DIRT, DEBRIS, DAMAGE DURING CONSTRUCTION. INTERIOR FINISH SHALL LOOK LIKE NEW AT PROJECT CLOSEOUT. PROVIDE APPROPRIATE CONSTRUCTION COVER TO ENSURE BOX IS KEPT CLEAN -- NO EXCEPTIONS.

AS

LUMINAIRE SCHEDULE													
TYPE	DESCRIPTION	MOUNTING	MANUFACTURER #1 (COOPER LIGHTING)	MANUFACTURER #2 (GASSER BUSH)	LAMP					INPUT		COMMENTS/NOTES	
					TYPE	LUMENS	CRI	COLOR	FINISH	DISTRIBUTION/LENSING	WATTS		VOLTS
LA	2'X4' LED FLAT PANEL	RECESSED	COOPER: METALUX 24FP	LITHONIA:	LED	4800	85+	4000K	MATTE DIFFUSE	WIDE DISTRIBUTION	13	UNV	HIGH EFFICIENCY FIXTURE PROVIDE WITH WET LOCATION LISTING
LA2	2'X2' LED FLAT PANEL	RECESSED	COOPER: METALUX 24FP	LITHONIA:	LED	3000	85+	4000K	MATTE DIFFUSE	WIDE DISTRIBUTION	13	UNV	
LB	2'X4' LED ARCHITECTURAL VOLUMETRIC TROFFER	RECESSED	COOPER: 24RTC	LITHONIA: 2BLT4	LED	4800	85+	4000K		SMOOTH ACRYLIC CURVED LENS	34.5	UNV	
LD1	4" SQUARE DOWNLIGHT LED	RECESSED	COOPER: PORTFOLIO LDSQ4	GOTHAM: EVO SQ	LED	2000	85+	4000K		WIDE DISTRIBUTION	15	UNV	
LD2	4" SQUARE DOWNLIGHT LED ADJUSTABLE SLOPE	RECESSED	COOPER: PORTFOLIO LDSQ44A 4L	GOTHAM: INCITO ICD45QADJ	LED	2000		4000K		WIDE DISTRIBUTION			FIXTURE SHALL BE MOUNTED UNIFORMLY AT 24'-0" AFF. PROVIDE WITH INTEGRAL OCCUPANCY SENSOR LENS SHALL BE MINIMUM 0.125 INCH THICK TO PREVENT SAGGING. INVERT LENS IN FIXTURE IF THERE ARE TEXTURED PRISMS ON LENS TO ENSURE THAT THE SMOOTH FACE IS FACING THE SPACE.
LG	2'X2' HIGH BAY, HIGH EFFICACY LED	PENDANT	METALUX OHB	HOLOPHANE: PHZ	LED	23599	80	4000K		WIDE DISTRIBUTION	170	UNV	
LK	2'X4' GENERAL PURPOSE LENSED LED TROFFER	RECESSED	COOPER: 24GR LED	LITHONIA: 2TL4	LED	7200	85+	4000K		SATIN WHITE LENS	67	UNV	
LL4	4" WIDE, 4" LONG RECESSED LINEAR LOW LUMEN FIXTURE	RECESSED	COOPER: NEO-RAY DEFINE 4	PRUDENTIAL: P43	LED	4125	85+	4000K			4.5 W/FT	UNV	
LLC"x"	4" WIDE, CONTINUOUS LINEAR LED FIXTURE	PENDANT	AXIS LIGHTING: BEAM 4	FOCAL POINT: SEEM 4	LED	600M/FT UP/1200LM/FT DOWN	85+	4000K		WIDE DISTRIBUTION		UNV	PROVIDE WITH INTEGRAL OCCUPANCY AND DAYLIGHT SENSORS; "x" DICTATES LINEAR LENGTH OF FIXTURE
LLD	CURVED WAVESTREAM DIRECT / INDIRECT	PENDANT	NEO-RAY CONVERGE		LED	4300		4000K					PROVIDE WITH INTEGRAL OCCUPANCY AND DAYLIGHT SENSORS
LP	LED SUSPENDED DIRECT / INDIRECT	PENDANT	CORELITE JAYLUM - J3		LED	5963	85+	4000K	WHITE				
LR	PENDANT RING LED	PENDANT	COOPER: SHAPER SENSE CIRCLE	LITHONIA: EQUAL	LED	8992	85+	4000K		SATIN ROUND LENS	41	UNV	
LT	GENERAL PURPOSE 4" LENSED LED STRIPLIGHT	PENDANT	COOPER: METALUX 45NLED	LITHONIA: ZL1D	LED	5800	85+	4000K		SATIN ROUND LENS	41	UNV	
LW	GENERAL PURPOSE 4" LENSED LED STRIPLIGHT	WALL MOUNTED	METALUX SWLED	LITHONIA: EQUAL	LED	4015	85+	4000K			7 W/FT	UNV	PROVIDE WITH INTEGRAL OCCUPANCY SENSOR. REFER TO FLOOR PLANS FOR MOUNTING HEIGHT
OB	EXTERIOR TRAPEZOIDAL LED WALL PACK	WALL MOUNTED	COOPER: IST	LITHONIA: WST	LED	3000	85+	4000K		WIDE DISTRIBUTION	25	UNV	WET LOCATION LISTED. MOUNT FIXTURE AT 12' 9" ABOVE GRADE UNLESS OTHERWISE NOTED.
X1	EDGE-LIT LED ACRYLIC EMERGENCY EXIT SIGN	CEILING MOUNTED	COOPER: SURE-LITES EUX	LITHONIA: EDG-EDGR	GREEN LED	N/A	85+	N/A		ACRYLIC EMERGENCY EXIT SIGN	3	UNV	BOTH SINGLE AND DOUBLE FACED EXIT SIGNS ARE REQUIRED ON THE PROJECT. THE CONTRACTOR SHALL REFERENCE THE LIGHTING SYMBOL LEGEND ON E001 AND UTILIZE THE LEGEND AND FLOOR PLANS TO DETERMINE THE EXACT NUMBER OF SINGLE AND DOUBLE FACED SIGNS REQUIRED.
X2	EDGE-LIT LED ACRYLIC EMERGENCY EXIT SIGN	WALL MOUNTED - FACE	COOPER: SURE-LITES EUX	LITHONIA: EDG-EDGR	GREEN LED	N/A	85+	N/A		ACRYLIC EMERGENCY EXIT SIGN	3	UNV	BOTH SINGLE AND DOUBLE FACED EXIT SIGNS ARE REQUIRED ON THE PROJECT. THE CONTRACTOR SHALL REFERENCE THE LIGHTING SYMBOL LEGEND ON E001 AND UTILIZE THE LEGEND AND FLOOR PLANS TO DETERMINE THE EXACT NUMBER OF SINGLE AND DOUBLE FACED SIGNS REQUIRED.
X3	EDGE-LIT LED ACRYLIC EMERGENCY EXIT SIGN	WALL MOUNTED - SIDEWALL	COOPER: SURE-LITES EUX	LITHONIA: EDG-EDGR	GREEN LED	N/A	85+	N/A		ACRYLIC EMERGENCY EXIT SIGN	3	UNV	BOTH SINGLE AND DOUBLE FACED EXIT SIGNS ARE REQUIRED ON THE PROJECT. THE CONTRACTOR SHALL REFERENCE THE LIGHTING SYMBOL LEGEND ON E001 AND UTILIZE THE LEGEND AND FLOOR PLANS TO DETERMINE THE EXACT NUMBER OF SINGLE AND DOUBLE FACED SIGNS REQUIRED.
LIGHTING LUMINAIRE SCHEDULE NOTES													
GENERAL NOTES													
1. FIXTURE FINISH WILL BE SELECTED IN SUBMITTAL PHASE UNLESS OTHERWISE SPECIFIED.													
2. VERIFY MOUNTING AND PROVIDE REQUIRED CHEVRON(S) AS SHOWN ON ELECTRICAL PLANS.													
3. PROVIDE ALL LED FIXTURES WITH A MAXIMUM CCT OF 3500 DEGREES KELVIN AND A MINIMUM CRI OF 85 UNLESS OTHERWISE SPECIFIED.													
4. CONTRACTOR TO VERIFY SPECIFIED FIXTURE MOUNTING IS COMPATIBLE WITH CEILING TYPE BEFORE ORDERING.													
5. CONTRACTOR TO VERIFY MOUNTING HEIGHT WITH ARCHITECT BEFORE INSTALLING.													
6. CONTRACTOR TO FIELD VERIFY OVERALL LENGTH BEFORE ORDERING.													
7. PROVIDE FIXTURES WITH DIMMING BALLASTS WHERE SHOWN CIRCUITED TO DIMMING CONTROLS. DIMMING BALLASTS TO BE COMPATIBLE WITH OVERALL DIMMING CONTROL SYSTEM.													
8. PROVIDE FACTORY CONNECTED ROW-MOUNTED FIXTURE WHERE APPLICABLE.													

LIGHTING CONTROL NARRATIVE

- ALL LOW VOLTAGE WIRING SHALL BE PLENUM RATED IN ENTIRE PROJECT.
- ALL LOW VOLTAGE WIRING TERMINATIONS SHALL BE MADE WITHIN A JUNCTION BOX. NO EXPOSED SPLICING PERMITTED.
- ALL LIGHTING CONTROLS SHALL COMPLY WITH 2015 ASHRAE 90.1.
- BASIS OF DESIGN IS ACUTY NLIGHT.

SEQUENCE OF OPERATION:

- RAISE/LOWER = 0-10V DIMMING AND REQUIRES 0-10V WIRING.
- OCCUPANCY SENSORS ARE ALL DUAL TECHNOLOGY TYPE SET TO 20 MINUTES AUTO OFF/MANUAL ON, EXCEPT WHERE NOTED OTHERWISE BELOW.
- COORDINATE WITH MECHANICAL SDO AND CONTROLS DIAGRAMS. BAS CONTRACTOR SHALL PROVIDE GRAPHIC INTERFACE WITHIN THE BAS SYSTEM AND MAP ALL LIGHTING CONTROL PANEL CONTROL POINTS TO EASILY ALLOW OWNER TO REVISE SCHEDULING, OCCUPANCY SENSOR ADJUSTMENTS, ETC. THROUGH BAS INTERFACE. PROVIDE ALL REQUIRED LIGHTING CONTROL SYSTEM COMPONENTS TO ALL FOR THIS INTERCONNECTION VIA BACnet COMMUNICATION.
- LIGHTING WITHIN BUILDING SHALL BE NETWORKED.
- UPON ACTIVATION OF FIRE ALARM SYSTEM OR SECURITY ALARM SYSTEM, ALL NETWORKED INTERIOR AND EXTERIOR LIGHTING SHALL TURN ON.
- PROVIDE PHOTOCELL ON ROOF AND AIM NORTH FOR CONTROL OF ALL EXTERIOR LUMINAIRES TIE IN TO RELAY PANEL FOR ACCESS TO NETWORKED CONTROL.
- PROVIDE OCCUPANCY SENSORS WITH AUXILIARY CONTACT FOR ALL BUILDING SPACES FOR BUILDING AUTOMATION SYSTEM (BAS) TO MONITOR STATUS AND SET BACK HVAC SYSTEM WHEN NOT OCCUPIED.

OFFICES / CONFERENCE:

- MANUAL: ON/OFF/RAISE/LOWER LIGHTING CONTROLS FOR EACH RESPECTIVE ZONE.
- AUTOMATIC: OCCUPANCY SENSOR SET TO AUTO OFF/MANUAL ON.

CLASSROOMS:

- MANUAL: ON/OFF/RAISE/LOWER LIGHTING CONTROLS FOR EACH RESPECTIVE ZONE.
- AUTOMATIC: INTEGRAL OCCUPANCY SENSOR SET TO AUTO OFF/MANUAL ON.
- DAYLIGHT HARVESTING: AS INDICATED ON FLOOR PLANS FOR DAYLIGHT ZONES.

LARGE VOLUME SPACE (CAFETERIA, MEDIA CENTER, GYM)

- MANUAL: ON/OFF/RAISE/LOWER LIGHTING CONTROLS FOR EACH RESPECTIVE ZONE.
- AUTOMATIC: OCCUPANCY SENSORS WITH 50% DIMMING WHEN NOT OCCUPIED. MANUAL ON.
- DAYLIGHT HARVESTING: AS INDICATED ON FLOOR PLANS FOR DAYLIGHT ZONES.

CORRIDORS / VESTIBULES:

- MANUAL: ON/OFF LOW VOLTAGE CONTROL STATION LOCATED IN CORRIDOR NEAR MAIN ENTRY AS INDICATED ON FLOOR PLAN. STATION SHALL HAVE PILOT LIGHT.
- DURING BUILDING OPERATION, CONTROL BY TIME SCHEDULE WITH LIGHTING CONTROL PANELS. OCCUPANCY SENSORS WITH 50% DIMMING WHEN NOT OCCUPIED.
- AFTER HOURS: OCCUPANCY SENSORS SET TO AUTO 50% ON/AUTO OFF. BE ZONED BY CORRIDOR SECTION WITH MAXIMUMS AS DEFINED BY IECC.
- COORDINATE WITH MECHANICAL SEQUENCE OF OPERATIONS AND CONTROLS DIAGRAMS. BAS CONTRACTOR SHALL PROVIDE GRAPHIC INTERFACE WITHIN THE BAS SYSTEM AND MAP ALL LIGHTING CONTROL PANEL CONTROL POINTS TO EASILY ALLOW OWNER TO REVISE SCHEDULING, OCCUPANCY SENSOR ADJUSTMENTS, ETC. THROUGH BAS INTERFACE. PROVIDE ALL REQUIRED LIGHTING CONTROL SYSTEM COMPONENTS TO ALL FOR THIS INTERCONNECTION VIA BACnet COMMUNICATION. LIGHTING SHALL BE CAPABLE OF BEING OVERRIDDEN TO TURN ON LIGHTING DURING OFF HOURS VIA OVERRIDE CONTROL STATION LOCATED NEAR SCHOOL ENTRY.

LARGE RESTROOMS / TOILET ROOMS:

- MANUAL: KEY OPERATED LOW VOLTAGE MOMENTARY SWITCH.
- AUTOMATIC: DUAL SENSING OCCUPANCY SENSORS WITH FULL COVERAGE TO AVOID LIGHTS SHUTTING OFF WHILE SPACES ARE OCCUPIED. SET TO AUTO ON WITH EITHER SENSING METHOD / AUTO OFF WITH MAX TIMER SETTING AND VACANCY FOR BOTH SENSING METHODS.
- DAYLIGHT HARVESTING: NONE.

SMALL TOILET ROOMS:

- WALL MOUNTED OCCUPANCY SENSOR SWITCH SET TO AUTO ON / AUTO OFF.
- SENSOR SHALL BE LOW VOLTAGE WITH SEPARATE POWER PACKS FOR LIGHTING AND FAN CONTROL WHERE APPLICABLE. REFER TO MECHANICAL SCHEDULES M800 SERIES.

MDF / IDF:

- WALL MOUNTED TOGGLE ON / OFF SWITCH.

ELECTRICAL / MECHANICAL:

- WALL MOUNTED TOGGLE ON / OFF SWITCH.

STORAGE / JANITOR CLOSETS:

- WALL MOUNTED OCCUPANCY SENSOR SWITCH SET TO AUTO ON / AUTO OFF.

LOUNGE / BREAK ROOM/ WORK ROOM:

- MANUAL: ON/OFF/RAISE/LOWER LIGHTING CONTROLS FOR EACH RESPECTIVE ZONE.
- AUTOMATIC: OCCUPANCY SENSOR SET TO AUTO OFF / MANUAL ON.

FOOD PREP & KITCHEN AREA:

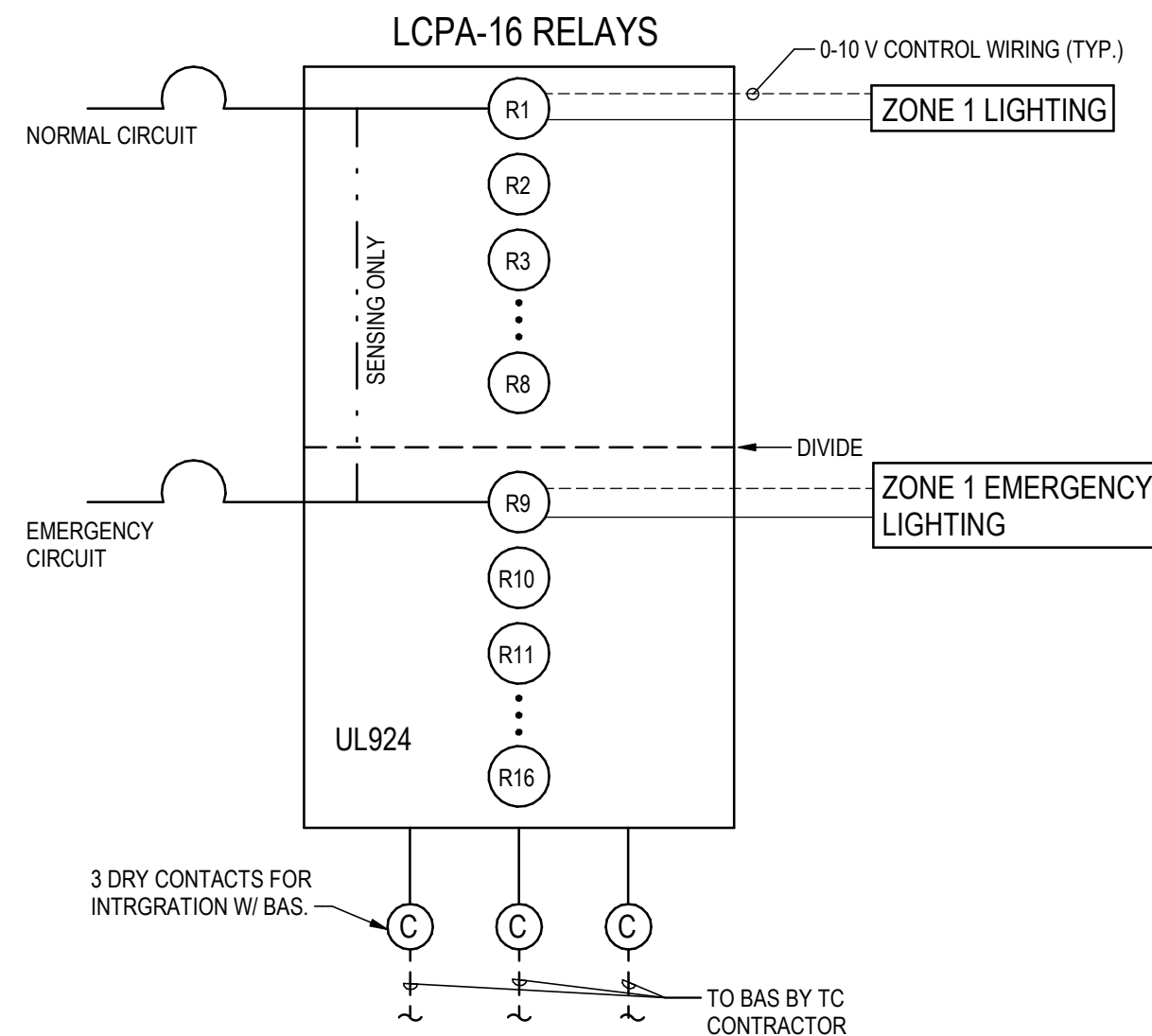
- MANUAL: ON/OFF/RAISE/LOWER LIGHTING CONTROLS FOR EACH RESPECTIVE ZONE.
- AUTOMATIC: OCCUPANCY SENSOR SET TO AUTO OFF / AUTO ON.

EXTERIOR BUILDING LIGHTING:

- MANUAL: OVERRIDE STATION LOCATED IN ELECTRICAL ROOM ADJACENT TO RESPECTIVE LIGHTING CONTROL PANEL.
- AUTOMATIC: CONTROLLED VIA LIGHTING CONTROL RELAYS.
- COORDINATE WITH MECHANICAL SDO AND CONTROLS DIAGRAMS. BAS CONTRACTOR SHALL PROVIDE GRAPHIC INTERFACE WITHIN THE BAS SYSTEM AND MAP ALL LIGHTING CONTROL PANEL CONTROL POINTS TO EASILY ALLOW OWNER TO REVISE SCHEDULING, OCCUPANCY SENSOR ADJUSTMENTS, ETC. THROUGH BAS INTERFACE. PROVIDE ALL REQUIRED LIGHTING CONTROL SYSTEM COMPONENTS TO ALL FOR THIS INTERCONNECTION VIA BACnet COMMUNICATION. LIGHTING SHALL BE CAPABLE OF BEING OVERRIDDEN VIA OVERRIDE CONTROL STATION LOCATED ADJACENT TO LIGHTING CONTROL PANEL.

FLAG POLE LIGHTING

- MANUAL: OVERRIDE STATION LOCATED IN ELECTRICAL ROOM ADJACENT TO LIGHTING CONTROL PANEL.
- AUTOMATIC: PHOTOCELL ON AND TIME-CLOCK OFF.
- COORDINATE WITH MECHANICAL SDO AND CONTROLS DIAGRAMS. BAS CONTRACTOR SHALL PROVIDE GRAPHIC INTERFACE WITHIN THE BAS SYSTEM AND MAP ALL LIGHTING CONTROL PANEL CONTROL POINTS TO EASILY ALLOW OWNER TO REVISE SCHEDULING, OCCUPANCY SENSOR ADJUSTMENTS, ETC. THROUGH BAS INTERFACE. PROVIDE ALL REQUIRED LIGHTING CONTROL SYSTEM COMPONENTS TO ALL FOR THIS INTERCONNECTION VIA BACnet COMMUNICATION. LIGHTING SHALL BE CAPABLE OF BEING OVERRIDDEN AND CONTROLLED VIA OVERRIDE CONTROL STATION ADJACENT TO LIGHTING CONTROL PANEL.



NOTES:

- REFER TO SPECIFICATION 26.09.43 FOR ADDITIONAL REQUIREMENTS.

CORRIDOR LIGHTING CONTROL PANEL

SCALE: NONE

LIGHTING CONTROL PANEL (LCP) - RELAY SCHEDULE

SOURCE CIRCUIT	RELAY #	RELAY TYPE	UL924 (YES/NO)	VOLTAGE	ZONE DESCRIPTION
LP-21	1	DIMMING	NO	277	CORRIDOR LIGHTING
LP-23	2	DIMMING	NO	277	FRONT BUILDING & SOFFIT LIGHTING
LP-25	3	DIMMING	NO	277	SOUTH BUILDING LIGHTING
LP-27	4	DIMMING	NO	277	WEST BUILDING LIGHTING
LP-29	5	DIMMING	NO	277	NORTH BUILDING LIGHTING
LP-31	6	DIMMING	NO	277	FLAG POLE LIGHTING
RPS-21	7	DIMMING	---	120	MARQUEE SIGN LTG
---	8	DIMMING	---	277	SPARE
---	9	DIMMING	---	277	SPARE
LP-L5-5	10	DIMMING	YES	277	CORRIDOR LIGHTING
LP-L5-7	11	DIMMING	YES	277	FRONT BUILDING & SOFFIT EGRESS...
LP-L5-9	12	DIMMING	YES	277	WEST AND NORTH EGRESS BUILDING...
---	13	DIMMING	YES	277	SPARE
---	14	DIMMING	YES	277	SPARE
---	15	DIMMING	YES	277	SPARE
---	16	DIMMING	---	277	SPARE

SCHEDULE NOTES:

- REFER TO SEQUENCE OF OPERATION FOR RELAY CONTROLS REQUIREMENTS.
- PROVIDE A DIMMING RELAY WHERE INDICATED. EXTEND PHOTOSENSOR TO LIGHTING CONTROLS PANEL (IF APPLICABLE FOR DAYLIGHT HARVESTING) AND ALL 0-10V WIRING TO LED LIGHT FIXTURES FOR DIMMING CONTROLS.
- EXTEND ALL OCCUPANCY SENSOR WIRING ONLY FROM SPACES CONTROLLED BY RELAY PANEL BACK TO RELAY PANEL FOR OCCUPANCY SENSOR INTERFACE PER MANUFACTURER'S REQUIREMENTS.
- PROVIDE 3 DRY CONTACTS AND INTERCONNECT TO BAS FOR OVERRIDE OF LIGHTING THRU BAS. REFER TO SEQUENCE OF OPERATIONS ON THIS SHEET.
- WHERE ONE CIRCUIT FEEDS MULTIPLE RELAYS, CIRCUIT SHALL BE ROUTED THROUGH RELAY FOR THAT PARTICULAR ZONE/GROUP.
- PROVIDE A 4 BUTTON LOW VOLTAGE CONTROLS STATION ADJACENT TO RELAY PANEL IN ELECTRICAL ROOM. EACH BUTTON SHALL BE PROGRAMMED FOR OVERRIDE ON/OFF OF RELAY GROUPING AS DIRECTED BY OWNER DURING STARTUP. LABEL EACH BUTTON BY GROUPING.

Work Category No. 02 – Earthwork and Site Utilities

Work Included:

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

Reference Work Category Index

Work Category Notes:

1. Demolition and clearing/grubbing of the entire site, including, but not limited to, the removal of trees, tree roots, stumps, topsoil removal, vegetation and deleterious materials as shown or specified, hard surfaces, fences, handrails, retaining walls, posts, gates, signs, etc. Includes all labor, material, accessories, and equipment for a complete installation.
2. Provide all utility demolition as shown or specified including, but not limited to water lines, fire lines, concrete pipe, hydrants, backflow preventors, sewer and storm cleanouts, pipe, and manholes, irrigation pumps, monitoring wells, access ports, etc.
3. Provide all necessary items for complete construction and relocation of the water systems to within 5' of the building as shown or specified including all associated structures, manholes, pressure testing, bacteria testing, flushing, drain basins, meters, backflow preventors, wet taps, temporary piping, valving and capping in existing piping for permanent and final connections, demolition and re-working of existing (as called out per the plans), concrete thrust blocks and restraints, inspections, testing and certifications, and all agency fees and agency work as required.
4. Furnish and install all piping, structures and accessories required for the performance of the storm and sanitary work to within 5' of the building as shown or specified including all associated structures, as required. Clean the systems upon completion of the work and prior to acceptance by the Owner. Include final adjustment of structures to match final grades. Include underground basin.
5. Provide all mass excavation, grading, compaction, backfill, berms and off-site borrowed fill to final subgrade elevations as shown or specified, including backfill required around the building foundations, foundation walls, retaining walls, sidewalks, curb and gutters, drives, asphalt paving, etc. This is to include all rough and final grading to +/- 0.1'. All unsuitable soils and materials shall not be permitted to be stockpiled and must be removed on a daily basis.
6. Coordinate and develop soil erosion plan with the Construction Manager for submission to appropriate jurisdiction. Furnish and install soil erosion control measures as shown and/or specified. Maintain soil erosion control measures during the course of this project. Remove erosion control and clean all catch basins and/or pipe as required at completion of project. All inspection logs to be copied directly to the Construction Manager and copies shall be kept within a soil erosion control manual, located within the Construction Manager's trailer.
7. Provide all cutting, patching and repairs by a qualified person as required of existing roadways, landscape areas, paving, hardscape, etc. disturbed by this scope of work.
8. Provide all required tree protection, sedimentation and water pollution control shown, specified or necessary to perform the work in this package or the work of others, including maintenance and removal upon completion and acceptance of work by the governing agency.

9. Provide all dewatering (ground and rain water) as necessary until final grade and complete and operational storm system is available. All ground water will be diverted so as not to interfere with construction or public traffic flow and the operations of the existing facility. All drainage inlets shall be protected as specified. Maintenance of dewatering system to be considered a 24 hour/7 day week assignment.
10. This subcontractor shall participate in all coordination meetings (internal and meetings with local agencies and those having jurisdiction) concerning the relocation of existing utilities so as not to impact the existing facility operations. Include temporary utilities and provisions as necessary to allow relocation of existing utilities without interruption of service to existing facilities. This contractor to provide for temporary support and protections for any existing utility or other piping encountered during performance of this work. Include verification of existing utility locations prior to excavations, and monitoring during excavation and backfill.
11. Provide all right-of way permits/bonds, etc. as required by city, county, and state agencies relative to the work within this package.
12. Prior to any imported soils entering project site, provide material analytical soils reports and documentation that material is free of contaminants/hazardous materials.
13. Clean roads and staging areas of any tracking dirt or debris generated during site clearing, excavation, earth retention, foundations/slab-on-grade and caisson activities as necessary or as directed by the Construction Manager. Dust control and street cleaning on a regular basis as job conditions require.
14. Furnish and install all under-drain/foundation/footing drainage systems as shown and specified.
15. Strip and stockpile topsoil for re-use. Re-spread topsoil to within specified tolerances, upon completion of rough grading. Large clumps of dirt and stones shall be removed from topsoil. **Provide and install any additional topsoil needed to bring grades to within +/- 0.1'.**
16. Where existing asphalt paving is removed for new utilities, place compacted aggregate base to bottom of asphalt for asphalt patch by others. If asphalt cannot be patched immediately, place aggregate to top of adjacent asphalt. Remove additional aggregate at such time when asphalt can be placed.
17. Final tie-ins of all water/storm/sanitary sewer mains will be the responsibility of this Work Category. Hydro excavating is required at tie in points to utilities.

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. Some SESC measures will already be in place from building demolition contractor. This WC to maintain existing SESC measures already in place. Provide and install any additional SESC measures needed including any new permits needed.
 - A. C-101 calls for new silt fence to be provided and installed behind existing curb prior to removal and construction of perimeter sidewalk.
2. Getting the SE parking lot installed as soon as possible is a high priority as this will be used for trailers, laydown, and parking. Intent is to install subbase and use that for temporary parking lot/laydown. The WC will need to come back before asphalt is installed to replace, regrade and add any additional subbase needed as a result of the temporary parking/laydown. Reference logistics plan.
3. Protect existing utility structures, underground utilities and property corners as shown.
4. Sidewalk demo around the perimeter of the site along with road, curbs, etc. demo will be outside the

construction fencing. This WC responsible to provide barricading as needed to perform this demo and will leave barricading in place until installation is complete.

5. Provide and install drain tile and gravel fill at freezer and cooler slabs.
6. Provide and install barrier gates including but not limited to operator, concrete footing, gate, controller, vehicle detector, etc. for a complete installation.
7. Provide and install subgrade base under asphalt and concrete including but not limited to aggregate, 21AA crushed limestone, class II sand, granular backfill, etc.
8. Provide and install chain link fence including all accessories needed for a complete installation. Multiple mobilizations will be needed as posts are to be installed prior to maintenance strip and fencing installed after. Concrete footings for fencing by WC 05.
9. Provide excavation and backfill for mockup wall foundation/footing (roughly 10-15' long). This WC is responsible for demoing the mockup foundation/footing at end of the project.
10. Provide and install temporary crane pads and drives. Remove drive and crane pad when directed by Construction Manager and restore grades to their original grades or as shown on drawings. The crane pad shall be constructed and maintained as a flat level work platform suitable for heavy cranes. Confirm size, length and location with trades utilizing cranes. **To be funded from this WC's allowance.**
11. This subcontractor will establish a concrete wash out area, maintain, remove and properly dispose of concrete washout materials offsite periodically or as directed by the Construction Manager.
12. Provide and install yard hydrant vault, hydrant, supply line, drain, and hose for a complete installation (Detail 33/C-503).
13. **Provide and install ¾ DCW line added in Addendum 3 beyond 5' from the footprint of the building. WC 27 responsible for installation and tie within 5' of the building footprint.**

Related Work by Others:

1. Landscaping by WC 08.
2. Synthetic turf, sand infill, aquaflo backing, aggregate base and nailer board per detail 10/L-500 by WC 08. This WC (02) responsible for "natural soil surface".
3. Boulder retainage walls including perforated pvc and aggregate base by WC 08.
4. Refer to Sections 00210 and 01019 for testing requirements and responsibilities.
5. ~~Imported topsoil to be furnished and placed by WC 08. Topsoil will be raked by WC 08 as required. This WC (02) is responsible for getting topsoil grading to +/- 0.1' before WC 08 takes over.~~
6. Final connection of utilities (sewer, water and gas) from 5' outside of building and all work inside of the building by W.C. 26, 27, and 28.
7. Mechanical and electrical contractors will perform excavation, backfill, compaction and removal of spoils within the building, as needed.

Allowances:

This Contractor shall include in their Base Bid a Construction Manager's allowance **of \$80,000**. Reference Section 01020 for specific instructions on allowances. Intent of this allowance is to relocate existing SESC measures as needed and replacing unsuitable soils if necessary.

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. 02

Work Category No. 20 – General Trades**Work Included:**

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

Reference Work Category Index

Work Category Notes:

1. Complete all exterior and interior Carpentry/Millwork (rough and finish) and various General Trades Work as noted within this Work Category, including all labor, materials and equipment required for a complete installation.
2. All exterior and interior rough and finish carpentry including counters, cabinets, trim, nailers, blocking and plywood sheathing.
3. Furnish and install all roof nailers, plywood sheathing and blocking. Furnish and install rigid insulation in concealed locations created by Subcontractor.
4. Furnish all embedded anchors and bolts for rough carpentry to masonry and concrete to be installed by others.
5. Furnish and install wood blocking, FRT, sheets, boards, plywood, etc. for required materials that are to be installed by this work category.
6. 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, wall mounted toilet partitions, visual display surfaces, metal lockers, fire extinguisher cabinets, misc. accessories, etc., Subcontractor to furnish and install blocking for a complete installation.
7. Provide non-combustible wood blocking in walls for wall mounted accessories and equipment installed by Owner/others shown or specified.
8. Furnish and install doors, frames, and hardware.
 - Provide and install automatic door operators at doors provided by this WC.
 - 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.
 - Where wood doors are installed in Aluminum Frames, provide and install wood doors and door hardware. Aluminum Frames furnished and installed by WC 18. Coordinate with WC 18 to ensure doors and door frames are prepared appropriately.
9. Include grouting of hollow metal door frames in gypsum wall. Hollow metal door frames in masonry walls to be installed as the wall is installed so WC 11 can grout the frames.
10. Manufacturer's rep is to review, approve and sign off on the installation of all door hardware before acceptance by TCC and the Owner.
11. All interior finish carpentry, architectural woodwork, casework, countertops, 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.

12. Furnish and install formed metal countertops and shelving.
13. Furnish and install wall protection systems.
14. Furnished and installed all window sills.
15. Furnish and install all solid-surface materials and grommets as indicated.
16. Furnish and install all wall protection, handrail, corner guards, and crash rail.
17. All architectural hardware for cabinets supplied by this Work Category.
18. Include all stainless steel required and associated with millwork.
19. Install all custom casework fabricated and furnished by others including cabinets, p-lam coat shelves, p-lam and solid surface vanity tops, and solid surface windowsills.
20. All fabricated materials are to be shop assembled to the greatest extent possible before shipping to the job site.
21. Furnish and install handrails, display case, wood counter top, transaction counters, crash rails, corner guards, wall hooks, adjustable shelves, wall protection, stainless steel shelves and projection screens.
22. Furnish and installation of specialties including but not limited to: lockers, benches, towel bars, shower curtain rods, stainless steel shelves, curtain tracks, specimen pass through boxes, coat rods, coat racks, mop holders, robe hooks, shelving, wall and corner guards, impact rails, fire extinguishers, fire extinguisher cabinets, impact resistant wall protection, brackets, associated signage, coat/clothes hooks, shelving, bulletin boards, broom / mop hooks, hand sanitizer & disposal, coat rods, visual display boards, marker boards, tackboards, window roller shades, tack strips, overhead coiling doors, etc., as well as all items mentioned in the above referenced spec sections.
23. Equipment items designated as Owner-Furnished/Contractor-Installed are a part of this scope of work. Owner furnished equipment isolated to an electrical connection "only" will be handled by the electrical subcontractor. Equipment requiring water, ducting, etc. will be handled by the mechanical subcontractor. All equipment that does not have any mechanical and/or electrical connection is the responsibility of this work category to receive, unload, distribute, and install.
24. Furnish and install sealants for all materials installed by this contractor such as cabinets, counters, sills, etc.
25. 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.

- I. A mockup of the reading nook Style A will be constructed prior to installation (see schedule). Once approved, this may be disassembled to be used for final construction if wanted.
 - A. Provide and install wood and all accessories at reading nooks.
 - B. This WC responsible to build, maintain, and remove temporary shelter over the reading nook mock up to prevent it from getting precipitation on it.

2. Provide and install glulam beams including all accessories for a complete installation. This WC will need to work closely with WC 14 Roofing to minimize the amount of time the glulam beams are exposed to exterior elements. This WC is responsible to protect glulam beams until roofing is installed.
3. Provide and install all signage and plaque(s) including all accessories for a complete installation.
4. Furnish and install all athletic equipment including but not limited to telescopic stands/bleachers, basketball equipment, volleyball equipment, scoreboards, **Gaga-Ball Pit**, and gymnasium safety wall pads, including all accessories for a complete installation.
5. Provide and install the monument sign including but not limited to LED screen, aluminum panels, and lettering/numbering.
6. Provide and install the dumpster enclosure gates including but not limited to trex boards, framing, hardware, steel, and all associated accessories. This WC responsible for the pipe sleeve in the concrete for the barn gate stop.
7. Provide, install, and maintain temporary plywood wall, double doors, and hardware at the main entrance to be used for the duration of the project. WC 20 to remove this at the end of the project when WC 18 will install the main entrance storefront system.
7A. Provide, install, and maintain temporary plywood protection for wall penetrations/openings required to be covered for security, weather, climate, or misc. requirements. To be funded by this WC allowance, not to include the installation and maintenance of the temporary plywood wall referenced in note #7.
8. Provide and install temporary fire extinguishers (during construction) within a freestanding wood cabinet painted in red, labeled "fire extinguisher" as located by the Construction Manager. Removal following use included. Quantity for each area to match minimum required by MIOSHA.
9. Provide and install flag poles including but not limited to excavation, backfill, concrete, wedges, fill, foundation tube, lightning ground spike, etc for a complete installation.
10. Provide and install bike racks. Concrete footing by WC 05.
- ~~11. At time glulam beams are set, masonry walls will be built and concrete slab on grade will not be installed. Please note this when determining installation methods.~~
12. Provide and install steel shade structures (outdoor classrooms).
13. Provide and install exterior movable bleachers (detail 11/L-500).
14. Install flexible flashing where blocking gets wrapped with it (example is detail 5/A-101A). WC 13 to provide flexible flashing.
15. Furnish and install plywood backer at all electrical equipment indicated to receive plywood backer.
16. Furnish and install Washer & Dryer as indicated on A-121A Equipment Schedule.

Related Work by Others:

1. Dumpsters
2. Temporary water and electrical
3. Benchmarks and column lines (one in each direction) by Construction Manager.
4. Concrete benches by WC 10.
5. Roof access doors, expansion joints and accessories by WC 14

6. Roof insulation by WC 14.
7. Plywood sheathing and shims at cafeteria platform steps by WC 21
8. Independent testing and inspections by Owner.
9. Roof mechanical equipment curbs by WC 27, installed by WC 14.
10. Temporary heat by Construction Manager.
11. Roof accessories furnished and installed by WC 14.
12. All aluminum door hardware provided by WC 18 and keyed by same.
13. All structural framing by WC 12 and WC 21.
14. Sectional doors by WC 18.
15. Acoustical wall panels by WC 21.
16. Bathroom accessories (toilet partitions, grab bars, mirrors, soap dispensers, sanitary napkin disposals, shower seats, and waste receptacles. Receive and install owner provided toilet tissue dispensers) by WC 27.

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. 27 – Mechanical and Plumbing Systems

Work Included:

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

Reference Work Category Index

Work Category Notes:

1. Furnish and install all mechanical and plumbing systems, including domestic water, sanitary and vent, hydronic piping, water heaters, boilers, unit heaters, unit ventilators, air handling units, chillers, cooling towers, VAV boxes, mechanical louvers, radiant heat systems, humidifiers, condensate, heat exchangers, air conditioners, air curtain, ductwork, insulation, plumbing fixtures, trench 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. Furnish all hoisting, lifting, scaffolding and handling of all materials required to complete this work category.
8. 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.
9. Provide and install mechanical equipment tags, pipe identification and other required identification of

signage related to his work.

10. Run the various building piping systems out five (5) feet from the building walls and make the final connections to underground systems.
11. The mechanical contractor will provide assistance during concrete pours to guarantee the proper elevation of drains is maintained during the concrete pour. Accommodate floor finishes when calculating elevations.
12. 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.
13. 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.
14. Caulking and sealants for this trade's work. Include all required penetrations, and sealing of same, including but not limited to ceiling deck, walls, floors, etc.

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. Unistrut installation in exposed ceiling locations needs to be closely coordinated and approved by The Christman Company. All contractors will do a mock up for all Unistrut, fasteners, clips, etc. that will be installed in the ceiling space of a typical classroom. This mock up needs to be approved before overhead MEP installation can start.
 - a. All unistrut, clips, hangers, etc. that are to be installed in exposed ceilings spaces will be handed over to WC 24 to paint before installation. The tectum deck and glulam beams do not get painted but the exposed MEP items do (expect ductwork).
2. Owner is providing a commissioning agent. This WC to work with the commissioning agent as much as needed per contract documents.
3. Furnish and install heat trace. Coordinate with WC 28 for single point power connection locations.
4. Variable Frequency Drives (VFDs) shall be furnished by WC 27 and installed by WC 28.
5. All excavation and backfill related to Work including suitable backfill, compaction, & restoration and removal (from site) of all unsatisfactory fill in accordance with the documents.
6. This WC to carry SC Tech as controls subcontractor for base bid. Please provide voluntary alternates for any other controls subcontractors.
7. Provide and install roof support blocks, mats, etc. for all roof piping. Piping to be run in a professional manner with straight runs and 90 degree turns.
8. Furnish and install bathroom accessories including but not limited to toilet partitions, grab bars, mirrors, soap dispensers, sanitary napkin disposals, shower seats, and waste receptacles. Receive and install owner provided toilet tissue dispensers.
9. Provide and install roof hydrant(s).
10. Provide and install wireguard in the gym for all items installed by this WC as indicated.

11. Provide and install 3/4" DCW as noted in Addendum 3 drawing. This WC responsible to install 5' outside the building footprint.

Related Work by Others:

1. Concrete equipment pads by W.C. 10.
2. Roof vents flashing and counter flashing by W.C. 14.
3. Fire protection system and risers by W.C. 26.
4. Site and footing drainage systems by W.C. 02.
5. Power supply to mechanical equipment by W.C. 28.
6. Installation of access panels/doors by W.C. 11 & 21.
7. Site utilities beyond 5' from building perimeter by WC 02 or Utility Company.
8. Counter tops to be cut by WC 20.

Allowances:

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

Unit Prices:

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

End of Work Category No. 27

The Christman Company

RFI LOG

#	Subject	Status	Responsible Contractor	Received From	Assignee	Date Initiated	RFI Manager	Due Date	Closed Date	Ball In Court	Location	Schedule Impact	Cost Code	Cost Impact
54	SUBSTITUTION REQUEST - Platinum Visual Systems Inc	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/28/2023	Austin Brown	08/01/2023	07/31/23					
<p>Austin Brown Sent Fri Jul 28, 2023 at 11:23 am EDT We are requesting review and consideration to be listed as equal manufacturer to bid the above mentioned project and scopes of work. Attached please find our Substitution Request forms, cross reference sheet, applicable color charts, Product data and our full architectural catalog. We are requesting review and if approved to be forwarded to C2AE for approval. Thank you in advance for your consideration. We look forward to the opportunity.</p> <p>Q: Mt Hope Elementary School Cross Reference Sheet Platinum Visual Systems.xlsx UNEEK_N1_1MR.pdf Bulletin Board Cabinet Platinum Detail.pdf BTS Trim System.pdf Forbo Colored Cork Color Chart.pdf Mt Hope Elementary School Requests for Substitution 101100 and 101200.pdf Platinum Architectural Catalog.pdf</p> <p>A: Steve Jurczuk (C2AE) Responded Fri Jul 28, 2023 at 11:39 am EDT Rejected. Received too late.</p>														
53	SUBSTITUTION REQUEST - Duro-Tuff	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/26/2023	Austin Brown	07/30/2023	07/27/23					
<p>Austin Brown Sent Wed Jul 26, 2023 at 02:02 pm EDT Attached substitution request for roofing membrane to Duro Tuff 60 Mil Membrane DT60_Membrane - White.pdf</p> <p>A: Steve Jurczuk (C2AE) Responded Thu Jul 27, 2023 at 08:13 am EDT Still rejected. Not the owner's preferred material for roofs. Not enough information to confirm the installation method.</p> <p>A: Steve Jurczuk (C2AE) Responded Thu Jul 27, 2023 at 07:46 am EDT REjected. No substitution request form.</p>														
52	Earthwork/Site work Questions	Closed		None	Dobbs, Andrew (Th... Baisch, Kristy (C... Jurczuk, Steve (C...	07/26/2023	Austin Brown	07/30/2023	07/31/23					
<p>Austin Brown Sent Wed Jul 26, 2023 at 11:57 am EDT</p> <p>Q:</p> <ol style="list-style-type: none"> Is there an existing, scaled site drawing with grades? Is the fence in the fence contractors bid category? What elevation is the demo contractor bringing sand up to after building demo? 														

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#	Subject	Status	Responsible Contractor	Received From	Assignee	Date Initiated	RFI Manager	Due Date	Closed Date	Ball In Court	Location	Schedule Impact	Cost Code	Cost Impact
	Structural Concrete:													
	1. I do not see any concrete benches (Note 10 of specific notes)													
	Who is responsible for the concrete maintenance strip?													
	RFI #1.docx													
	Steve Jurczuk (C2AE) Responded Fri Jul 28, 2023 at 10:22 am EDT													
	1. See Bid package 1 for proposed grades after demo.													
	A: 3. See answer above													
	1. See locker rooms.													
	Andrew Dobbs (The Christman Company (LAN)) Responded Thu Jul 27, 2023 at 08:35 am EDT													
	Answers in red.													
	1. Is there an existing, scaled site drawing with grades?													
	2. Is the fence in the fence contractors bid category? There is no fencing bid category. Fencing is in WC 02.													
	3. What elevation is the demo contractor bringing sand up to after building demo?													
	A:													
	Structural Concrete:													
	1. I do not see any concrete benches (Note 10 of specific notes)													
	Who is responsible for the concrete maintenance strip? WC 05 to provide and install maintenance strips.													
51	Sch 40 Steel to Copper Mech Piping	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/26/2023	Austin Brown	07/30/2023	07/28/23					
	Austin Brown Sent Wed Jul 26, 2023 at 11:55 am EDT													
	All hydronic piping 2 ½" through 4" is to be welded sch 40 steel. I'm requesting you allow brazing copper 2 ½" through 4" and the use of mechanically formed tees with the T-drill. This would eliminate a lot of joints and potential for leaks and decreases the weight of the pipe exponentially while also reducing the risk of injury. Attached is the submittals for these mechanically formed tees.													
	Q: RFI 51.pdf TEE FORMING_SUBMITTAL_SPECIFICATION .pdf													
	Kristy Baisch (C2AE) Responded Fri Jul 28, 2023 at 10:34 am EDT													
	Per Scott Roberts, Stantec:													
	Piping system application schedule will be revised:													
	- largest hydronic pipe size on the project is 3", range will be 2 1/2" - 3".													
	A: - 2 1/2" - 3" will have brazed copper added as an option for that size range in addition to welded steel.													
	See forthcoming addendum 3.													
	Not acceptable: t-drill mechanically formed tees.													
	Any expansion loops, hangers, anchors, and guides shall be provided to match the provided system material.													
50	Roofing insulation r-value from 56 to 30	Closed		None	Baisch, Kristy	07/26/2023	Austin	07/30/2023	07/27/23					

The Christman Company

#	Subject	Status	Responsible Contractor	Received From	Assignee	Date Initiated	RFI Manager	Due Date	Closed Date	Ball In Court	Location	Schedule Impact	Cost Code	Cost Impact
					(C... Jurczuk, Steve (C...		Brown							
	<p>Austin Brown Sent Wed Jul 26, 2023 at 11:51 am EDT</p> <p>Q: Can we get clarification on the roof insulation. Is there to be a 2.6 inch base with taper and a 2.6 upper layer on the entire lower roof area? This would give the roof an average r-value of approximately 56. Michigan requires R-30. Can we provide an average R-Value of 30? This will save a significant amount of labor and materials.</p> <p>RFI 50.pdf</p> <p>Steve Jurczuk (C2AE) Responded Thu Jul 27, 2023 at 07:48 am EDT</p> <p>A: The intent is to meet the energy code and provide positive drainage. Tectum deck meets code as specified. On the steel deck, there are two layers of 2.6" thick insulation. On top of both is tapered insulation to provide positive drainage.</p>													
49	SUBSTITUTION REQUEST - Gymnasium Equipment Manufacturer	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/26/2023	Austin Brown	07/30/2023	07/31/23					
	<p>Austin Brown Sent Wed Jul 26, 2023 at 11:17 am EDT</p> <p>We are requesting to bid our Gared/Performance Sports Systems gym equipment as equal to the approved manufacturers listed in Specification Section 116623 - Gymnasium Equipment. I have attached the Request For Substitution form along with product data on the equipment we intend to bid.</p> <p>Q: C & M Associates has been in business for over 35 years providing quality sales and installation of gym equipment across the entire state of Michigan. We have partnered with Gared/Performance Sports Systems for the past 20 years and have completed numerous projects with The Christman Company including our most recent project together at Fowler High School.</p> <p>We are hopeful to be approved to bid and look forward to working with The Christman Company on this project. If you have any questions, please do not hesitate to email or call.</p> <p>MtHope_116623_GymEquip_SubstitutionRequest_C&M.pdf</p> <p>A: Steve Jurczuk (C2AE) Responded Fri Jul 28, 2023 at 07:50 am EDT</p> <p>Recieved too late and with out request form.</p>													
48	Multiple Flooring/Tile RFI's	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/26/2023	Austin Brown	07/30/2023	07/31/23					
	<p>Austin Brown Sent Wed Jul 26, 2023 at 11:10 am EDT</p> <p>1. Cafeteria 310A Platform shows on drawing I-101A to install RB-2 wall base. There is no RB-2 wall base on the material schedule. Please advise as to what RB-2 wall base is.</p> <p>2. The ceramic specifications show Schluter Ditra and Schluter Kerdi for the waterproofing/ Crack Isolation. Is this to be installed in the showers Only? Or are they wanting this in the Toilet Rooms also? See attached spec.</p> <p>3. Details 10, 11 & 12/A407 shows the elevations for the ceramic in the showers. The elevations show 2 shower stall walls and one wet wall behind the toilet to receive T-9 Ceramic Tile. What is being installed on the other walls?</p> <p>Q: Do all the walls in the Shower/Toilet receive wall tile T-9? See attached A407 & A131.</p> <p>A407 Elevations.pdf</p> <p>Enlarged Floor Plans.pdf</p> <p>Finish Plans.pdf</p> <p>093013 Ceramic Tiling.pdf</p> <p>A: Steve Jurczuk (C2AE) Responded Fri Jul 28, 2023 at 08:52 am EDT</p> <p>3. See 6/I-101B. Walls are tiles</p> <p>Steve Jurczuk (C2AE) Responded Fri Jul 28, 2023 at 07:49 am EDT</p> <p>A: 1. See upcoming addendum.</p> <p>2. Kerdi is for shower application only. Ditra shouldbe used for all other floor ceramic tile applciations.</p>													

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#	Subject	Status	Responsible Contractor	Received From	Assignee	Date Initiated	RFI Manager	Due Date	Closed Date	Ball In Court	Location	Schedule Impact	Cost Code	Cost Impact
47	ACM Panel Extent	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/26/2023	Austin Brown	07/30/2023	07/31/23					
<p>Austin Brown Sent Wed Jul 26, 2023 at 11:05 am EDT</p> <p>Q: Drawing A-211 - Yellow highlighted area within the storefront framing system. (ATTACHED "RFI 47 (1)") Drawing A-202 - Yellow highlighted area within the storefront framing system. (ATTACHED "RFI (2)") RFI 47 (1).png RFI (2).png</p> <p>A: Steve Jurczuk (C2AE) Responded Fri Jul 28, 2023 at 08:05 am EDT That is spandrel glass.</p>														
46	Multiple Site & Structural Concrete Questions	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/26/2023	Austin Brown	07/30/2023	07/31/23					
<p>Austin Brown Sent Wed Jul 26, 2023 at 07:05 am EDT Received 4:15PM 7/25/2023</p> <p>I have a few RFI questions for WC No. 05 Site Concrete and WC No. 10 Structural Concrete.</p> <p>WC No. 05 Site Concrete</p> <p>Q:</p> <ul style="list-style-type: none"> Civil C-103 Site Plan does not match ES01 Electrical Site Plan Is WC No. 05 responsible for transformer and generator pads? Who is responsible for furnishing the site furnishings? Can you please provide more information, locations, and details for benches, lights, fences, concrete planters, concrete stairs, and retaining walls in the concrete scope? Or could you please remove it from the scope if not part of the project anymore? Please provide detail for shade structures footings Is the electrical area around the northwest entrance area concrete or asphalt? <p>WC No. 10 Structural Concrete.</p> <ul style="list-style-type: none"> Is WC No. 02 responsible for all excavation and backfill of interior and exterior footings? <p>Andrew Dobbs (The Christman Company (LAN)) Responded Mon Jul 31, 2023 at 02:37 pm EDT</p> <p>A:</p> <ol style="list-style-type: none"> See addendum. Concrete equipment pads by WC 10. Spec Section 323300 Site Furnishings is by WC 20. See site drawings for amenities. See addendum. Per sheet C103, it is concrete. Yes WC 02 is responsible for all excavation and backfill of interior and exterior footings. <p>Steve Jurczuk (C2AE) Responded Fri Jul 28, 2023 at 03:05 pm EDT</p> <p>A:</p> <ol style="list-style-type: none"> See addendum. 														

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#	Subject	Status	Responsible Contractor	Received From	Assignee	Date Initiated	RFI Manager	Due Date	Closed Date	Ball In Court	Location	Schedule Impact	Cost Code	Cost Impact
	2. CM to respond 3. CM to respond 4. See site drawings for amenities. CM to clarify further. 5. See addendum. 6. Per sheet C103, it is concrete 7.													
45	ACP quantity	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/25/2023	Austin Brown	07/29/2023	07/31/23					
	Austin Brown Sent Tue Jul 25, 2023 at 03:43 pm EDT Q: 1. RCP's legend A-111A & B identify 2x2 High NRC Acoustic Ceiling Panel (ACP-3), however Materials Schedule I-001 does not show ACP-3. Please clarify and add details for ACP-3 to Materials Schedule.													
	A: Steve Jurczuk (C2AE) Responded Fri Jul 28, 2023 at 08:16 am EDT See upcoming addendum.													
44	WC 02 & 08 Earthwork Stockpile	Closed		None	Dobbs, Andrew (Th...	07/25/2023	Austin Brown	07/29/2023	07/27/23					
	Austin Brown Sent Tue Jul 25, 2023 at 03:41 pm EDT Q: Scope item #15 in WC02 states Earthwork is responsible to strip, stockpile and re-spread including removal of clumps and stones. Both WC02 and 08 scopes state that topsoil will be furnished, installed and graded by WC08. It also states that initial placement to within +/- 1" is by WC02 which is conflicting. Is the intent to have 02 strip, stockpile and re-spread existing soils and then have 08 furnish and install any additional topsoil qty that may be required?													
	A: Andrew Dobbs (The Christman Company (LAN)) Responded Thu Jul 27, 2023 at 08:20 am EDT The WCs will be adjusted. WC 02 to provide and install any additional topsoil needed to bring grade to within +/- 0.1' after respreading existing topsoil.													
43	Multiple Masonry Questions	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/25/2023	Austin Brown	07/29/2023	07/31/23					
	Austin Brown Sent Tue Jul 25, 2023 at 03:38 pm EDT RFI CJ- See attached. Please confirm that the masons are responsible for all additional adds/Cost associated with this detail. The seismic clips are unnecessary(Michigan is a low risk seismic zone) and if required are placed in the wrong spot on this detail- Please advise RFI Floor Plan-See Attached- The Floor Plan Tags calls out 4" Burnished CMU, when scaled they show 8" Burnished CMU- which is correct? Please advise													
	<ul style="list-style-type: none"> S503-5 is in the same spot referenced on the floor plan and shows 8" CMU here, not 4" 													
	Q: RFI Floor Plan- The wall that divides Classroom 205/206 has a callout for "fully grouted masonry wall" (highlighted in green)- Is this for all walls in this corridor or just this section? Please advise S101 A/B- Note 3: Typical Top of Bond Beam Elevation 12'8", Top of 12" Tall Bond Beam at Exterior wall + 15"													
	<ul style="list-style-type: none"> For 8" interior walls, Most TOW framing cuts in structural drawings show 8" bond beam at 13'4" and 14'- is a second bond beam requires at 12'8" for all locations throughout? S103 A/B note 4 says to place Bond Beam at locations shown on details- which is correct? Please advise 													
	S103 A/B- Rebar Schedule. M2 has rebar spacing #4 60" OC- this won't work well and will require additional labor cost. Spacing should be 56" or 64" OC- which is acceptable? Please advise													

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#	Subject	Status	Responsible Contractor	Received From	Assignee	Date Initiated	RFI Manager	Due Date	Closed Date	Ball In Court	Location	Schedule Impact	Cost Code	Cost Impact
	<p>Is an updated schedule going to be released? The current schedule has no mention of dates for spray foam/brick veneer Installation. Load bearing and non-load bearing masonry walls are called out but have a 4-month gap between dates(4-3-24 to 8-15-24). Please advise</p> <p>Are Normal Weight CMU an acceptable alternate? These would be more cost efficient, especially for the burnished CMU which I am informed by the vendors are very costly to produce. Please advise</p> <p>RFI CJ.pdf</p> <p>RFI Floor Plan.pdf</p>													
	<p>Steve Jurczuk (C2AE) Responded Fri Jul 28, 2023 at 03:03 pm EDT</p> <p>Reinforcing shown is diagramatic only</p> <p>See addendum for burnished block clarification</p> <p>A: That wall is grouted for acoustic reasons.</p> <p>See addendum for bond beam clarifications</p> <p>Rebar spacing will change in addendum.</p> <p>Normal weight block is acceptable.</p>													
	<p>Andrew Dobbs (The Christman Company (LAN)) Responded Thu Jul 27, 2023 at 08:07 am EDT</p> <p>A: Masonry Schedule - A more detailed schedule will be developed with the awarded bidders after contracts have been awarded. The guideline schedule is for a starting reference but does not contain all of the details. The intent was for the spray foam and brick veneer to be included in the load bearing masonry wall schedule item. The reason for the gap between the load bearing and non-load bearing masonry walls is that the non-load bearing masonry walls are installed on top of thickened slabs. The thickened slabs will not be poured until after the load bearing masonry walls are complete.</p>													
42	SUBSTITUTION REQUEST - Premier Panel Systems	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/25/2023	Austin Brown	07/29/2023	07/27/23					
	<p>Austin Brown Sent Tue Jul 25, 2023 at 03:37 pm EDT</p> <p>Attached is a substitution request for the Mt Hope School.</p> <p>Q: Premier Panel Systems is a local fabricator located in Howell Michigan. We have used Premier at Waterford Schools, Romeo Schools, Roseville Schools, Avondale Schools etc.</p> <p>https://premierpanelsystems.com/</p>													
	<p>A: Kristy Baisch (C2AE) Responded Thu Jul 27, 2023 at 07:30 am EDT</p> <p>Per Steve Jurczuk: Substitution request accepted.</p> <p>PremierPanelSystems_SubstitutionRequestSigned.pdf</p>													
41	Cable Tray	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/25/2023	Austin Brown	07/29/2023	07/31/23					
	<p>Q: Austin Brown Sent Tue Jul 25, 2023 at 03:34 pm EDT</p> <p>From the pre-bid meeting, when should we expect the addendum regarding the cable tray specifications? The suppliers are asking what to quote.</p>													
	<p>A: Steve Jurczuk (C2AE) Responded Fri Jul 28, 2023 at 02:59 pm EDT</p> <p>See upcoming addendum.</p>													
40	Suburban Fab - Bonding	Closed		None	Dobbs, Andrew (Th...	07/25/2023	Austin Brown	07/29/2023	07/27/23					
	<p>Q: Austin Brown Sent Tue Jul 25, 2023 at 03:34 pm EDT</p>													

The Christman Company

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	<p>Suburban Fab would love to quote this project, but we currently do not have the bonding capacity for it. We only have around \$600k available, just by the looks of it, the joist and deck package would eat most of that up. If we can bond our portion, and exclude the bond amount for the joist and deck, let me know. In the past, we have had the owner write a joint check to our joist and deck supplier.</p> <p>If any of this possible, let me know.</p> <p>Thanks,</p> <p>Bill Graham Suburban Fabrication</p>													
	<p>A: Andrew Dobbs (The Christman Company (LAN)) Responded Thu Jul 27, 2023 at 07:54 am EDT At this time, this request is denied.</p>													
39	SUBSTITUTION REQUEST - Control Solutions Inc	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/25/2023	Austin Brown	07/29/2023	07/27/23					
	<p>Q: Austin Brown Sent Tue Jul 25, 2023 at 03:33 pm EDT Please see attached substitution request to add Control Solutions as an approved controls contractor. Substitution Request - Control Solutions.pdf</p>													
	<p>A: Andrew Dobbs (The Christman Company (LAN)) Responded Thu Jul 27, 2023 at 07:50 am EDT SC Tech needs to be carried as the base bid controls contractor. All other controls contractors should be presented as a voluntary alternate on the bid form.</p>													
38	Tectum Decking WC	Closed		None	Dobbs, Andrew (Th...	07/25/2023	Austin Brown	07/29/2023	07/27/23					
	<p>Austin Brown Sent Tue Jul 25, 2023 at 03:31 pm EDT I was notified by my Armstrong Tectum rep in regard to the Mt. Hope Elementary Project out for bid. Pioneer is an <i>authorized</i> Tectum Roof Deck installer based in Grand Rapids. We have an incredibly experience install crew and have worked around the entire state of MI. We are currently installing a Tectum auditorium roof this week near Flint.</p> <p>I noticed that our scope of work is to be contracted under the Roofing Bid Category, is that correct? In most cases, we almost always bid directly (furnish & installed Tectum) to the Construction Manager. We've had difficulties being contracted under Roofers historically, and have had much more success working directly thru the CM. That way we can manage shop drawings and coordinate schedule dates directly with the CM more efficiently. Please let me know if this change can be made.</p> <p>Q:</p> <p>Armstrong has our full endorsement on this one, we'd love the opportunity to work with you!</p> <p>Thank you,</p> <p>Brian Johnson <i>Project Estimator - Tectum Roof Deck</i></p>													
	<p>A: Andrew Dobbs (The Christman Company (LAN)) Responded Thu Jul 27, 2023 at 07:48 am EDT The tectum deck scope of work will remain under WC 12 - Roofing. The main reason for this is that tapered insulation needs to be installed on top of the tectum deck and then membrane every day so the tectum deck is not left exposed to the elements. This will require close coordination between the tectum deck installers and the roofers which is why I have lumped them together.</p>													
37	Multiple Earthwork Questions	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/25/2023	Austin Brown	07/29/2023	07/28/23					
	<p>Q: Austin Brown Sent Tue Jul 25, 2023 at 03:25 pm EDT</p>													

The Christman Company

#	Subject	Status	Responsible Contractor	Received From	Assignee	Date Initiated	RFI Manager	Due Date	Closed Date	Ball In Court	Location	Schedule Impact	Cost Code	Cost Impact
	<ol style="list-style-type: none"> 1. Please provide a detail for concrete footings/foundations that are required for the shade structure/outdoor classroom. 2. Please provide a detail for the bike rack concrete footings. 3. WC 02, Specific Notes & Details Item 8 has the concrete footings for the fence installed by WC 05? This typical is included with the fence contractor's work. Please clarify or remove this from WC 05 responsibility. 4. S-501 detail 6 Entrance Slab section has a 2" clear cover to bottom? Please clarify what this 2" clear cover is? 5. Please provide a detail for the natural gas generator. 													
	A: Austin Brown (The Christman Company (LAN)) Responded Fri Jul 28, 2023 at 10:58 am EDT 3. No fencing work category is included in this project, WC 02 is to provide as required in the project manual.													
	Steve Jurczuk (C2AE) Responded Fri Jul 28, 2023 at 10:34 am EDT 1. See upcoming addendum A: 2. Follow manufacturer's recommendations for foundations. 3. CM to respond 4. 2" is in reference to cover between bott. of slab and rebar. 5. See upcoming addendum.													
36	Multiple painting RFI's	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/25/2023	Austin Brown	07/29/2023	07/31/23					
	Austin Brown Sent Tue Jul 25, 2023 at 03:22 pm EDT 1.) Christman general requirements item #39 Sealant Schedule notes work category 24 is to caulk exposed structural steel. Can you please clarify what specific locations of structural steel need to be caulked by 24? 2.) Is any other caulking required by WC #24 than hollow metal frames and structural steel referenced in the christman sealant schedule? 3.) What paint color is the ductwork to be painted in the cafeteria? The reflected ceiling plan appears to have a note pointing to the ductwork to be P-13, but the reflected ceiling plan general note 7 says all duct to be painted P-10 except classrooms. Which is correct P-13 or P-10? 4.) Reflected ceiling plan legend notes tectum ceilings are to be painted P-15, but Christman scope of work category 24 specific note 1 says tectum deck "does not" get painted. Which is correct? Q: 5.) Do gluelam beams require field staining and varnishing? Spec section 099300 references that they do, but just want to verify. 6.) Does the wood laminate at the classroom reading nooks require field finishing by work category 24? 7.) Do the reflected ceiling plan general notes 5, 6 & 8 regarding color coding fire suppression, electrical conduit, and water lines apply to all rooms with exposed ceilings or are there specific rooms that these notes apply to? 8.) Regarding the reflected ceiling plan general note 6 stating to paint all electrical conduit color P-9, does this apply to conduit that is attached directly to exposed ceiling deck that would be painted a different color? Is there a drawing showing the conduit that would need painted to be able to quantify this scope of work in the bid? 9.) Interior paint specification 099124, 3.6B.2 references alkyd dryfall, this product is not available in Michigan due to the new VOC regulations, is an acrylic dryfall acceptable for exposed ceilings? 10.) Interior paint specification 099124, CMU substrate finish is listing a finish of MPI gloss level 3 which is an eg-shel finish. Is the correct that they want an eg-shel finish in lieu of semi-gloss on CMU walls on the project?													
	Kristy Baisch (C2AE) Responded Thu Jul 27, 2023 at 11:42 am EDT Per Steve Jurczuk/Katie Winters: Item 3: P-13 is the correct paint color. Further clarification will be in Addendum #3. A: Item 4: Tectum deck to be painted. Item 5: Yes, stain and varnish.													

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#	Subject	Status	Responsible Contractor	Received From	Assignee	Date Initiated	RFI Manager	Due Date	Closed Date	Ball In Court	Location	Schedule Impact	Cost Code	Cost Impact
	Item 6: Veneer plywood and trim that is installed around and within the nooks needs be finishes.													
	Item 7: Intent is all public and student occupied rooms.													
	Item 8: This applied to all conduit, even that applied to deck.													
	Item 9: Yes, this is acceptable.													
	Item 10: This is correct; Eggshell is a district standard.													
35	Multiple Flooring Questions	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/25/2023	Austin Brown	07/29/2023	07/31/23					
	Austin Brown Sent Tue Jul 25, 2023 at 03:16 pm EDT													
	Q:													
	<ul style="list-style-type: none"> Do you want T-1 behind drinking Fountains in Corridor 201 East side of Janitor 213 Page A-407 Shows wood look Corridor tile Being 12'9" wide on Hallway, on the finish pages 1-101A & 1-101B Shows 14'2" wide. Could you clarify please. All Classrooms call for a Little area to receive hard wood flooring, is this correct? If so, the specs just say Niche Wood, White Oak. Could you please clarify? We would also need a transition strip clarification. Steps in the café Platform 310A, are we figuring RF-1 or RF-2 Can we also bid the Polish Concrete or does it have to run with the concrete bid category. 													
	Kristy Baisch (C2AE) Responded Thu Jul 27, 2023 at 07:38 am EDT Per Katie Winters:													
	A:													
	<ul style="list-style-type: none"> Bullet one: Yes, T-1 to be applied to the drinking fountain wall. This will be in Addendum #3. Bullet two: Sheet A-407 elevation 4 is correct with the 12'-9" dimension. Sheets I-101A and I-101B reference for locations, not specific dimensions. Additional dimensions to be reflected in Addendum #3. Bullet three: WD-2 is for the niche area only. This is not for classroom flooring. Reference Sheet A-401 elevations 1 and 2. Bullet four: This is addressed on a previous RFI and will be in Addendum #3. 													
34	Fiber installation	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/25/2023	Austin Brown	07/29/2023	07/27/23					
	Austin Brown Sent Tue Jul 25, 2023 at 03:15 pm EDT													
	Q:													
	<ol style="list-style-type: none"> Does the RFP include the fiber installation for the outside fiber connection to the district's existing fiber? If so, what count fiber cable is needed? 													
	Kristy Baisch (C2AE) Responded Wed Jul 26, 2023 at 04:06 pm EDT Per Paul Twigg, Baron Malow: MetroNet, the district's internet provider, will install the fiber into the building. The electrical contractor is to install the conduit between the utility pole and MDF and coordinate with MetroNet.													
33	Decorative Film WF-1 - Unavailable in US	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/25/2023	Austin Brown	07/29/2023	07/31/23					

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	<p>Austin Brown Sent Tue Jul 25, 2023 at 03:14 pm EDT Per attached email, specified WF-1 is not available in the US and is Europe exclusive, please review. RE_Bid Invite from Clark for _Project Name_.msg</p> <p>Kristy Baisch (C2AE) Responded Thu Jul 27, 2023 at 07:31 am EDT Per Katie Winters: Window film WF-1 alternate will be on Addendum #3.</p>													
32	Exposed ductwork insulation vs painting	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/25/2023	Austin Brown	07/29/2023	07/31/23					
	<p>Austin Brown Sent Tue Jul 25, 2023 at 03:11 pm EDT I have a question about the ductwork insulation work for this project.</p> <p>Q: Please clarify: The specs. Say to insulate the Exposed ductwork. Typically we don't do that, they would paint the ductwork (classrooms, gym, and cafeteria). Let me know.</p> <p>RFI #1.doc</p> <p>Kristy Baisch (C2AE) Responded Fri Jul 28, 2023 at 10:23 am EDT Per Scott Roberts, Stantec: We will revise the duct application schedule on m601 to:</p> <ul style="list-style-type: none"> - Indicate that all exposed round duct will be uninsulated (classrooms, most of gym and cafeteria). - Exposed rectangular single wall (upper cafe, utility areas will still be insulated but change to ASJ jacket). <p>A:</p> <ul style="list-style-type: none"> - While it does indicate for paint grip to be provided on all exposed ductwork per 2331 13-2.1B, a column will be added to the duct application schedule for further clarity. (Note: any actual painting (if required) would not be by mechanical trades.) <p>Additional clarifications/changes will be made to the duct application schedule beyond what is listed here.</p> <p>See forthcoming addendum 3.</p>													
31	SUBSTITUTION REQUEST - Wolverine Enclosures / AAP Approved Fabricator spec 07 42 13.23	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/25/2023	Austin Brown	07/29/2023	07/27/23					
	<p>Austin Brown Sent Tue Jul 25, 2023 at 11:22 am EDT Substitution Request Reviewer,</p> <p>Wolverine Enclosures, Inc. is very interested in bidding the metal wall panel portion of work for this project. The design features you have incorporated into the wall panels for this project fit very well with our capabilities to perform unique and challenging installations. Wolverine is a single source provider of engineered MCM panel systems, furnished and installed. Our fabrication division, Advanced Architectural Products, operates under agreement of major MCM suppliers including Alcoa Reynobond, Mitsubishi / Alpolc and Alucobond.</p> <p>Wolverine Enclosures successfully completed a major project for LSD / Christman / Stantec in 2022, the Everett High School additions. Some photos of our MCM installed on this project are attached.</p>													

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	<p>I am enclosing data on AAP DS-9500 dry joint pressure equalized rainscreen system and a few other photos of our work. We request that you review the information and consider adding Wolverine Enclosures / AAP as an approved fabricator for Section 07 4213.23 of this project. We are confident that we can offer a knowledgeable and competitive quote.</p> <p>Received from larry.k@panels.com DS-9500 Air and Water 20 Psf.pdf DS-9500 Structural 30 and 50 Psf.pdf intro letter.pdf JCC Letter.pdf 20221014_101656.jpg 20221014_092316.jpg major projects.pdf JCC ext.JPG 20221014_101529.jpg SECTION 07 42 43 v.1.pdf IMG_2858.JPG</p> <hr/> <p>Kristy Baisch (C2AE) Responded Tue Jul 25, 2023 at 01:46 pm EDT</p> <p>A: Per Steve Jurczuk: Denied. Substitution request form was not included with submission.</p>													
30	Exterior Classroom Area Base, and clarifications	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/24/2023	Austin Brown	07/28/2023	07/31/23					
	<p>Austin Brown Sent Mon Jul 24, 2023 at 12:27 pm EDT What is required at the outdoor classroom areas? I can't find if it requires gravel or just dirt.</p> <p>Q: Section 31 sheet C504 shows a fence (NIC) and possible a conc strip in between the two walks.</p> <p>Landscaping L-100 has synthetic turf between the two walks.</p> <p>Please clarify.</p> <hr/> <p>Steve Jurczuk (C2AE) Responded Fri Jul 28, 2023 at 08:44 am EDT</p> <p>A: 1. to be answered in upcoming addendum 2. Fence is NIC, synthetic turf is located between two walks.</p>													
29	Exterior Site Plan Questions	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/24/2023	Austin Brown	07/28/2023	07/27/23					
	<p>Austin Brown Sent Mon Jul 24, 2023 at 12:26 pm EDT Regarding the barrier gates at the east side: Is there an entry gate and exit gate or is it just one barrier gate? Are there two barrier gates at the entry off of Harding?</p> <p>Q: C-504 shows all fence NIC, also it calls out AMERISTAR, spec just talks about chain link.</p> <p>Can you provide a fence layout? And details.</p>													

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	<p>Can you do something other than trex for the gates at the dumpster, possibly go to a steel frame with treated wood, would this be acceptable?</p> <p>Kristy Baisch (C2AE) Responded Tue Jul 25, 2023 at 01:50 pm EDT Per Mark Adams: There is one barrier gate on the east side (Harding Avenue). The gate is an exit only for the bus parking lot (this is shown on the plans at only one location). The perimeter fence is Not in Contract (NIC), the Lansing School District plans on installing a "AMERISTAR" fence in the future, but not in this contract. (no additional action is required, clarification only)</p> <p>A: The fence required for this project is shown, there is chain link fence required at the west end of the basketball court. (this is shown on the plans).</p> <p>Provide base bid as shown; can provide a voluntary alternate for another way.</p>													
28	Finish Floor Plan - Cafeteria and surrounding area flooring type	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/24/2023	Austin Brown	07/28/2023	07/27/23					
	<p>Q: Austin Brown Sent Mon Jul 24, 2023 at 12:25 pm EDT Please verify the cafeteria and surround areas flooring. The Cafeteria Platform and stairs show RF-2 to be installed. The corridor/stair that flows off of the cafeteria platform receives RF-2, is this also correct? Please see attached. RFI Finish Plan - Area A.pdf</p> <p>A: Kristy Baisch (C2AE) Responded Tue Jul 25, 2023 at 11:49 am EDT Per Katie Winters: See upcoming addendum</p>													
27	Waterproofing Shower WC Responsibility	Closed		None	Dobbs, Andrew (Th...	07/24/2023	Austin Brown	07/28/2023	07/27/23					
	<p>Austin Brown Sent Mon Jul 24, 2023 at 11:56 am EDT</p> <p>Q: 1. Confirming that Water proofing in the two Shower Areas are by WC13 not WC22Per The Christman Company Project Manual pg 79?</p> <p>A: Andrew Dobbs (The Christman Company (LAN)) Responded Thu Jul 27, 2023 at 07:20 am EDT Confirmed that waterproofing at the shower areas is by WC 13.</p>													
26	Synthetic Turf Curbing	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/21/2023	Austin Brown	07/25/2023	07/24/23					
	<p>Q: Austin Brown Sent Fri Jul 21, 2023 at 11:40 am EDT Detail 10/L-500 for synthetic turf shows conc curbing. Per sheet L-100 synthetic turf is mostly bordered by bldg. wall, conc. walk and/or conc. mow strip. Please confirm whether curbing is required in this case.</p> <p>A: Steve Jurczuk (C2AE) Responded Mon Jul 24, 2023 at 09:24 am EDT Per L-100, the synthetic turf is only located between the two sidewalks on the north and northeast portions of the site. The concrete walks will serve as the curb.</p>													
25	Detail 31 C-504	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/21/2023	Austin Brown	07/25/2023	07/24/23					
	<p>Q: Austin Brown Sent Fri Jul 21, 2023 at 10:45 am EDT Cross Section 31 on C-504 details 8" 21aa and 12" sand under the 6" concrete paving as opposed to 6" sand under remaining 6" concrete paving. Is the section correct?</p>													

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	<p>Kristy Baisch (C2AE) Responded Fri Jul 21, 2023 at 01:17 pm EDT</p> <p>A: Per Mark Adams: The pavement structural section for the basketball court should be: 4" concrete over 6" sand, 6 x 6 WWF1.4 x 1.4. This will be clarified in the Addendum.</p>													
24	Architectural RFI's - Locker Width, Bench Finish	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/20/2023	Austin Brown	07/24/2023	07/21/23					
	<p>Austin Brown Sent Thu Jul 20, 2023 at 10:17 am EDT</p> <p>Q1) According to images for the corridor lockers on page A-408 and the equipment schedule on page A-131, you are asking for a locker that is 8" in width. However, none of the manufacturer's listed provides an 8" locker. PLEASE ADVISE.</p> <p>Q: (The nearest options appear to be 9" wide OR a "two-person" locker at 15" That would include two separate cubby doors on top. There are also "duplex" lockers that are 15" wide but they have to be a minimum 15" depth, OR perhaps you know of a manufacturer that is not listed that offers the size you are asking for? Not sure which direction to go here. PLEASE ADVISE)</p> <p>Q2) The spec section mentions wooden locker benches. PLEASE ADVISE where on the job these are if anywhere, because according to Bench details 9 and 10 on page A-523 the changing room benches are going to be concrete. Thank you.</p>													
	<p>Steve Jurczuk (C2AE) Responded Fri Jul 21, 2023 at 10:46 am EDT</p> <p>A: Q1: We will clarify this by future addendum Q2: Eliminated. We will clarify by future addendum.</p>													
23	Plastic Laminate Color Selection	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/20/2023	Austin Brown	07/24/2023	07/21/23					
	<p>Austin Brown Sent Thu Jul 20, 2023 at 10:24 am EDT</p> <p>Q: Specification 123216 and color schedule refers to PL-1 being a "Plastic Laminate", but the Laminart color selection listed is a wood veneer product which manufacturer's listed in 123216 won't use in manufacturing.</p> <p>Please advised an alternate Plastic Laminate finish selection for the Casework.</p>													
	<p>Steve Jurczuk (C2AE) Responded Fri Jul 21, 2023 at 10:27 am EDT</p> <p>A: Plesae clarify concern of the use of this product for casework. Manufacturer supports use for this application. See attached product data sheet. LaminArt_Product Sheet.pdf</p>													
22	Roller Window Shade Color/Finish Quantity	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/20/2023	Austin Brown	07/24/2023	07/21/23					
	<p>Austin Brown Sent Thu Jul 20, 2023 at 10:31 am EDT</p> <p>Q: Elevations A201, A202 contain a material legend upper right hand corner. The shades of color appear that ACM A and ACM C are the same color/finish, and that ACM B and ACM D are the same color/finish.</p> <p>Can you confirm this? Or are there 5 totally different colors/finishes for the ACM?</p>													
	<p>Steve Jurczuk (C2AE) Responded Fri Jul 21, 2023 at 10:29 am EDT</p> <p>A: This will be clarified in upcoming addendum.</p>													
21	SUBSTITUTION REQUEST - Acoustic Tack Panel	Closed		None	Baisch, Kristy (C... Jurczuk,	07/20/2023	Austin Brown	07/24/2023	07/21/23					

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					Steve (C...									
	<p>Q: Austin Brown Sent Thu Jul 20, 2023 at 10:43 am EDT We are submitting the attached substitution request for the Mt. Hope School project. Please contact us should you have any questions. AWP5-8 2000 Series Acoustic Tack Panel Specifications.pdf AWP5-8 c2ae Substitution Request Form.pdf</p> <p>A: Steve Jurczuk (C2AE) Responded Fri Jul 21, 2023 at 10:28 am EDT Rejected. 220116_RFS-1.pdf</p>													
20	SUBSTITUTION REQUEST - Pressure Water Cooler	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/20/2023	Austin Brown	07/24/2023	07/21/23					
	<p>Q: Austin Brown Sent Thu Jul 20, 2023 at 10:41 am EDT In Section 2.1 Pressure Water Cooler I was hoping you would consider allowing Murdock Mfg. Model# A172108F-BF12-BCD-WF1EZ as an Approved Equivalent to other Manufacturers Listed. We have put Murdock Coolers in many of your existing Lansing Schools in the past couple of years. Please see the Specification Sheet attached. Thank you for your consideration on this Project. A172108F-BF12-BCD-WF1EZ.pdf</p> <p>A: Steve Jurczuk (C2AE) Responded Thu Jul 20, 2023 at 03:37 pm EDT Substitution Form.</p> <p>A: Steve Jurczuk (C2AE) Responded Thu Jul 20, 2023 at 03:35 pm EDT Denied. No substitution request for as part of submission. It is preferred if a contractor makes these submittals for substitutions rather than manufacturer's reps. This gives credence that someone really wants to use the product.</p>													
19	Movable Bleachers Specification	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/20/2023	Austin Brown	07/24/2023	07/21/23					
	<p>Q: Austin Brown Sent Mon Jul 17, 2023 at 08:57 am EDT Please provide specifications and approved mfg for "moveable bleachers" as identified in WC-20 scope item #13</p> <p>A: Steve Jurczuk (C2AE) Responded Fri Jul 21, 2023 at 09:58 am EDT See detail 11/L-500 for product specifics.</p>													
18	Steel Shade Structure Specification	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/20/2023	Austin Brown	07/24/2023	07/21/23					
	<p>Q: Austin Brown Sent Mon Jul 17, 2023 at 08:57 am EDT Please provide specifications and approved mfg for "steel shade sturctures (outdoor classrooms)" as identified in WC-20 scope item #12</p> <p>A: Steve Jurczuk (C2AE) Responded Thu Jul 20, 2023 at 03:38 pm EDT The spec is on 7/L-500</p>													
17	SUBSTITUTION REQUEST - Roller Window Shades	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	07/20/2023	Austin Brown	07/24/2023	07/21/23					

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	<p>Austin Brown Sent Mon Jul 17, 2023 at 08:58 am EDT Requesting a substitution for OpenLight roller shades in lieu of the specified roller shade manufacturers listed in the specifications for Lansing Schools – New Mount Hope Elementary in, Lansing , Michigan. Attached is a product data sheet about OpenLight manual and motorized shades submittal, along with a brochure about OpenLight and Commercial Brochure. OpenLight is made locally in Ann Arbor, Michigan and is able to provide an equivalent quality product as the specified manufacturers. OPENLIGHT BROCHURE.pdf OpenLight-Manual-Submittal.pdf</p> <p>Q:</p> <p>Steve Jurczuk (C2AE) Responded Thu Jul 20, 2023 at 03:36 pm EDT A: Denied. No substitution request form as part of submission. It is preferred if a contractor makes these submittals for substitutions rather than manufacturer's reps. This gives credence that someone really wants to use the product.</p>													
16	Door 102.2 & 110.1 - WC Requirements	Closed		None	Dobbs, Andrew (Th...	07/14/2023	Austin Brown	07/18/2023	07/26/23					
	<p>Austin Brown Sent Fri Jul 14, 2023 at 07:54 am EDT Doors Numbers 102.2 and 110.1 have Aluminum door frames with wood doors.</p> <p>Q:</p> <p>Please confirm that WC 18 would have the Aluminum door frames and WC 20 would have the wood doors and hardware for these two openings.</p> <p>A: Andrew Dobbs (The Christman Company (LAN)) Responded Wed Jul 26, 2023 at 01:30 pm EDT WC 18 to provide and install aluminum door frames. WC 20 to provide and install wood doors and hardware.</p>													
15	C105 - ST Pipe Type	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/12/2023	Austin Brown	07/16/2023	07/21/23					
	<p>Q: Austin Brown Sent Wed Jul 12, 2023 at 02:25 pm EDT On sheet C105 Site utility plan, one run of pipe is labeled to be 12" Concrete pipe. All of the other pipe is just labeled "ST", I could not find what the desired pipe type is if the run is labeled "ST".</p> <p>Kristy Baisch (C2AE) Responded Tue Jul 18, 2023 at 03:03 pm EDT Per Mark Adams: Specification Section 334200 Stormwater Conveyance states the following materials can be used: 1. Corrugated-steel pipe and fittings. 2. Corrugated-aluminum pipe and fittings. 3. ABS pipe and fittings. 4. PE pipe and fittings. 5. PVC pipe and fittings and, 6. Concrete pipe and fittings. The storm sewer run on Sheet C-105 labeled "12" Concrete pipe" does not have to be concrete.</p> <p>A:</p>													
14	Temporary Road and Crane Pad Material	Closed		None	Jurczuk, Steve (C... Baisch, Kristy (C...	07/12/2023	Austin Brown	07/16/2023	07/26/23					
	<p>Q: Austin Brown Sent Wed Jul 12, 2023 at 02:24 pm EDT Can a detail for the temporary road and crane pad be provided. Material type, depth, etc.</p> <p>A: Andrew Dobbs (The Christman Company (LAN)) Responded Wed Jul 26, 2023 at 12:46 pm EDT The temporary crane pads will be funded from WC02's allowance. The design of the crane pads will be the responsibility of WC 02 once the crane sizes, weights, etc. can be coordinated with the WC's needing the cranes.</p>													
13	Zonolite Insulation	Closed		None	Dobbs,	11/04/2022	Andrew	11/08/2022	11/10/22		Demolition			

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					Andrew (Th...		Dobbs							
	<p>Q: Andrew Dobbs Sent Fri Nov 4, 2022 at 08:32 am EDT The existing drawings show the possibility of zonolite insulation being in the CMU. Has it been confirmed if this zonolite exists and has it been tested for asbestos?</p> <p>A: Andrew Dobbs (The Christman Company (LAN)) Responded Thu Nov 10, 2022 at 02:45 pm EST ERG did not find any zonolite within the CMU. They did find foam insulation which was tested and negative for asbestos.</p>													
12	Gray Glass Block Mortar	Closed		None	Dobbs, Andrew (Th...	11/04/2022	Andrew Dobbs	11/08/2022	11/10/22		Demolition			
	<p>Q: Andrew Dobbs Sent Fri Nov 4, 2022 at 08:28 am EDT At the end of the pre-bid meeting it was discussed that there might be some gray glass block mortar that was not tested in the original ERG Haz-Mat survey. Has that been tested yet and what were the results?</p> <p>A: Andrew Dobbs (The Christman Company (LAN)) Responded Thu Nov 10, 2022 at 02:51 pm EST ERG found a dark gray/brown cement caulk on the exterior block windows. This was found to be positive for asbestos (it is on the brick edge of the windows). It is estimated that there are approximately 50 square feet of this material. WC 01A to include abatement of 50sf of this dark gray/brown cement caulk in their base bid and provide unit pricing shall any more need to be abated. ERG also found lead chinking strips on the window ledges and on the roof that is believed to be the same material as asbestos containing. There is estimated to be approximately 210sf of this material. WC 01A to include abatement of 210sf of this lead chinking strips in their base bid and provide unit pricing shall any more need to be abated.</p>													
11	Depth of Demo & Backfill	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	11/04/2022	Andrew Dobbs	11/08/2022	11/10/22		Demolition			
	<p>Q: Andrew Dobbs Sent Fri Nov 4, 2022 at 08:25 am EDT Is it possible to only demo the existing structure down to a certain depth in lieu of removal of it all? This could possibly save money and running into hidden unknowns. Also do we need to backfill the entire basement and to what elevation? If future excavating contractor is going to dig down for footings/foundations, might make since to leave the backfill down for now.</p> <p>A: Kristy Baisch (C2AE) Responded Wed Nov 9, 2022 at 11:03 am EST The basement must be completely removed where below the proposed building. Preliminary design indicates the new building location will require complete removal.</p>													
10	Slab on Grade & Basement	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	11/04/2022	Andrew Dobbs	11/08/2022	11/10/22		Demolition			
	<p>Q: Andrew Dobbs Sent Fri Nov 4, 2022 at 08:19 am EDT Is this school slab on grade with the exception of above the basement? There was mention at the prebid that there is a crawl space under the whole school.</p> <p>A: Kristy Baisch (C2AE) Responded Wed Nov 9, 2022 at 11:02 am EST The construction manager has the existing drawings. There is a combination of basement, tunnels, and horizontal ventilation shafts. Contractor shall visit the site AND review the existing documentation.</p>													
9	Driveway Approches	Closed		None	Dobbs, Andrew (Th...	11/04/2022	Andrew Dobbs	11/08/2022	11/10/22		Demolition			
	<p>Q: Andrew Dobbs Sent Fri Nov 4, 2022 at 08:17 am EDT Since there are current driveway approaches and hard surfaces is the Demolition Contractor responsible for a construction entrance mud mat per the SESC Plan or is that the responsibility of the future site work contractor?</p> <p>A: Andrew Dobbs (The Christman Company (LAN)) Responded Thu Nov 10, 2022 at 02:55 pm EST WC 01B (Demolition contractor) is responsible for construction entrance mud mat per the SESC plan.</p>													

The Christman Company

#	Subject	Status	Responsible Contractor	Received From	Assignee	Date Initiated	RFI Manager	Due Date	Closed Date	Ball In Court	Location	Schedule Impact	Cost Code	Cost Impact
8	Electric Transformers	Closed		None	Dobbs, Andrew (Th...	11/04/2022	Andrew Dobbs	11/08/2022	11/10/22		Demolition			
Q: Andrew Dobbs Sent Fri Nov 4, 2022 at 08:17 am EDT There are three electric transformers in the basement area of the building. Who owns them? Who is responsible to remove them?														
A: Andrew Dobbs (The Christman Company (LAN)) Responded Thu Nov 10, 2022 at 02:56 pm EST These are Lansing School District owned equipment. WC 01B is responsible to remove them.														
7	Sewer Removal Location	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	11/04/2022	Andrew Dobbs	11/08/2022	11/10/22		Demolition			
Q: Andrew Dobbs Sent Fri Nov 4, 2022 at 08:16 am EDT The Demolition Plan drawing does not have the location of the entire sewer proposed to be removed. Please revise the drawing with the sewer located from the street to the building.														
A: Kristy Baisch (C2AE) Responded Wed Nov 9, 2022 at 11:01 am EST See upcoming addendum.														
6	Plywood Over Openings	Closed		None	Dobbs, Andrew (Th...	11/04/2022	Andrew Dobbs	11/08/2022	11/10/22		Demolition			
Q: Andrew Dobbs Sent Fri Nov 4, 2022 at 08:11 am EDT You mentioned that we have to put plywood over all the window and door openings, ground floor only, this is an extremely expensive item when there is going to be safety construction fencing all the way around the facility before this takes place. Demolition will follow within 30 days of asbestos removal. Can the plywood sheeting be removed?														
A: Andrew Dobbs (The Christman Company (LAN)) Responded Thu Nov 10, 2022 at 03:03 pm EST This was discussed and decided to leave plywood sheeting in WC 01A's scope as outlined in the project manual.														
5	Stripping Topsoil	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	11/04/2022	Andrew Dobbs	11/08/2022	11/10/22		Demolition			
Q: Andrew Dobbs Sent Fri Nov 4, 2022 at 08:06 am EDT 1. Note on drawing C-102 says contractor responsible for stripping 6" of top soil for "all disturbed areas" Does that include the parking lots and sidewalks?														
A: Kristy Baisch (C2AE) Responded Wed Nov 9, 2022 at 10:59 am EST Per specifications, this includes parking lots and sidewalks.														
4	Condition of Site After Demolition	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	11/04/2022	Andrew Dobbs	11/08/2022	11/10/22		Demolition			
Q: Andrew Dobbs Sent Fri Nov 4, 2022 at 08:05 am EDT 1. What condition is the demolition contractor supposed to leave the site in? Are we responsible for the items listed in section 312000 - Earth Moving? Or are we just supposed to strip off 6" of top soil, store on site, backfill the basements with Class II sand and compact to 95%? We aren't placing or installing any subbase courses, drainage courses bedding courses etc. correct?														
A: Kristy Baisch (C2AE) Responded Wed Nov 9, 2022 at 10:58 am EST														

The Christman Company

#	Subject	Status	Responsible Contractor	Received From	Assignee	Date Initiated	RFI Manager	Due Date	Closed Date	Ball In Court	Location	Schedule Impact	Cost Code	Cost Impact
	Demolition contractor shall strip 6" of top soil and store on site (coordinate storage area with Construction Manager), back fill basements with Class II and compact to 95%. Do not install any additional courses.													
3	Subbase Removal	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	11/04/2022	Andrew Dobbs	11/08/2022	11/10/22		Demolition			
	Andrew Dobbs Sent Fri Nov 4, 2022 at 08:04 am EDT													
	Q: 1. Is the subbase material being removed from the asphalt parking lot?													
	A: Kristy Baisch (C2AE) Responded Wed Nov 9, 2022 at 10:57 am EST See upcoming addendum.													
2	Demolition Note 9	Closed		None	Baisch, Kristy (C... Jurczuk, Steve (C...	11/04/2022	Andrew Dobbs	11/08/2022	11/10/22		Demolition			
	Andrew Dobbs Sent Fri Nov 4, 2022 at 08:04 am EDT													
	Q: 1. Demolition Note 9 says that "established lawn areas disturbed by the contractor operations shall be seeded and mulched" what about the basketball courts and playground area?													
	A: Kristy Baisch (C2AE) Responded Wed Nov 9, 2022 at 10:56 am EST Per sheet C-101, basketball court and playground areas shall be seeded.													
1	Boiler's Weight	Closed		None	Dobbs, Andrew (Th...	11/04/2022	Andrew Dobbs	11/08/2022	11/11/22		Demolition			
	Andrew Dobbs Sent Fri Nov 4, 2022 at 08:02 am EDT													
	Q: Do we know the weights of the boilers that are to be salvaged?													
	A: Andrew Dobbs (The Christman Company (LAN)) Responded Fri Nov 11, 2022 at 07:00 am EST We do not know the weight of the boilers. Attached are photos of the identification plates to hopefully help the bidder. IMG_6650.JPEG IMG_6645.JPEG													
(None)	Reading Nook Stair Material WC Responsibility	Closed		None	Dobbs, Andrew (Th...		Austin Brown		07/31/23					
	Austin Brown Sent Mon Jul 24, 2023 at 08:25 am EDT													
	Q: Who is responsible for the reading nook material that is being installed on 3 stair/ bench in the classrooms (WD 2)? Please see attached. Is this the carpenter? Or the flooring? Wood Floor - Reading Nook Sections and Elevations.pdf I-101A---MEMO 01 - Finish Plan - Area A.pdf													
	A: Andrew Dobbs (The Christman Company (LAN)) Responded Mon Jul 31, 2023 at 02:29 pm EDT WC 20 is to provide and install all wood at the reading nooks, including WD2.													
(None)	WC & Specification Clarification - WC 21 & 11600	Closed		None	Dobbs, Andrew (Th...		Austin Brown		07/31/23					
	Q: Austin Brown Sent Thu Jul 20, 2023 at 10:35 am EDT													

The Christman Company

#	Subject	Status	Responsible Contractor	Received From	Assignee	Date Initiated	RFI Manager	Due Date	Closed Date	Ball In Court	Location	Schedule Impact	Cost Code	Cost Impact
	<ul style="list-style-type: none"> Specification section 11600 was included. Was that in error? Special Note No. 3 calls for installation of plywood at the cafeteria steps. Should that be by General Trades? 													
	A: Andrew Dobbs (The Christman Company (LAN)) Responded Mon Jul 31, 2023 at 02:30 pm EDT Spec section 11600 was removed from WC 21's scope in addendum 2. Plywood at the cafeteria steps only is in WC 21's scope.													
(None)	Exterior Sheathing WC Responsibility	Closed		None	Dobbs, Andrew (Th...		Austin Brown		07/31/23					
	Q: Austin Brown Sent Mon Jul 17, 2023 at 08:56 am EDT During the pre-bid meeting the CM briefly went over scope clarification diagrams. There appears to be various discrepancies with regard to which package is responsible for sheathing. For example typical nook CMU head detail shows ¾" exterior gyp sheathing by WC-20. Should this not be WC-21 is gyp sheathing is correct? Please review and confirm intent and/or revise scope clarification diagrams accordingly													
	A: Andrew Dobbs (The Christman Company (LAN)) Responded Mon Jul 31, 2023 at 02:31 pm EDT Gypsum sheathing is by WC 21, plywood sheathing is by WC 20.													

Trade Contract Proposal Pre-Submission Checklist

- ☐ Trade Contract Proposal Form completely filled out?
- ☐ Form signed by authorized officer of firm?
- ☐ Costs for Performance and Labor & Material Bond costs excluded in base bid proposal sum but amount included in break out?
- ☐ All taxes included in base proposal sum?
- ☐ Bid security (bond or certified check or money order) of at least 5% of base proposal sum included?
- ☐ Requested alternates & unit prices quoted?
- ☐ Sworn & Notarized Familial Affidavit for Lansing School District included?
- ☐ Sworn & Notarized Familial Affidavit for C2AE & Christman included?
- ☐ Non-Discrimination Certification included in your proposal?
- ☐ Iran Sanctions Certificate and Act Certificate included?
- ☐ Affidavit of Bidder – Non-Collusion included with your proposal?
- ☐ Legal Status of Bidder Certificate included in your proposal?
- ☐ All information (proposal, bond, etc.) Submitted in duplicate?
- ☐ Proposal submitted in sealed envelope per specifications?

TRADE CONTRACT PROPOSAL FORM

WORK CATEGORY NO. 00 and _____

Date: _____

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

Re: Mt. Hope School

Ladies and Gentlemen:

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

BASE PROPOSAL SUM:

_____ (\$ _____)

PERFORMANCE & PAYMENT BOND: The Trade Contractor may be required to furnish a Co-Obligee Labor & Material Payment & Performance Bonds for the full contract amount.

The name of the Bonding Company is: _____.

The sum of (\$ _____) to cover cost of furnishing these bonds is **added to** the base bid.

EXPERIENCE MODIFICATION RATING (EMR):

List the EMR for your firm as determined by your insurance carrier for the past three (3) years.

2022 _____ 2021 _____ 2020 _____

ADDENDA: The following Addenda have been received, are hereby acknowledged, and their execution is included in Bid Sums listed herein.

No _____ Dated _____ No _____ Dated _____ No. _____ Dated _____

TIME AND MATERIAL RATES:

Labor rates listed below include the following:

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

TRADE CONTRACT PROPOSAL FORM

WORK CATEGORY NO. 00 and _____

Date: _____

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

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

MANDATORY ALTERNATES:

Reference Specification Section 01100 for alternate descriptions.

Alternate #1 – Public Address System
Alternate #2 – Five vs. Three Year Warranty
Alternate #3 – Surveillance Camera Type
Alternate #4 – Wired Glass Break Sensors

Add/Deduct \$ _____
Add/Deduct \$ _____
Add/Deduct \$ _____
Add/Deduct \$ _____

UNIT PRICES:

WC 02 – Snow Removal (parking lots, drives, laydown area, & walk to main entrance)\$ _____/Event
WC 02 – Street Sweeping \$ _____/Event
WC 02 – Excavation & Removal of Unsuitable Soils (Off-Site) \$ _____/cy (truck)
WC 02 – Engineered Fill (Sand) Compacted in Place \$ _____/cy (truck)
WC 02 – Engineered Fill (21AA) Compacted in Place \$ _____/cy (truck)
WC 02 – Amount Included for temporary crane pads and drives \$ _____
WC 05 – Typical Curb & Gutter \$ _____/sf
WC 05 – Typical 4" Sidewalk \$ _____/sf
WC 05 – Heavy Duty Concrete Pavement \$ _____/sf
WC 05 – Level 2 Finish to Level 3 Finish \$ _____/sf
WC 06 – Standard Duty Asphalt \$ _____/sf
WC 10 – Amount to add Barrier One style admixture to slabs \$ _____/sf
WC 10 – Amount included for concrete survey for specified tolerances \$ _____
WC 11 – Amount included for winter protection measures \$ _____
WC 12 – Increase amount if cranes could only use the drives and not crane pads \$ _____

TRADE CONTRACT PROPOSAL FORM

WORK CATEGORY NO. 00 and _____

Date: _____

WC 14 – Increase amount if cranes could only use the drives and not crane pads	\$ _____
WC 20 – Increase amount if cranes could only use the drives and not crane pads	\$ _____
WC 23 – Amount to add vapor barrier at all flooring not passing moisture tests	\$ _____/sf
WC 27 – Increase amount if cranes could only use the drives and not crane pads	\$ _____
WC 28 – Amount carried for connecting and disconnecting power to TCC Trailer	\$ _____

VOLUNTARY ALTERNATIVES (Variations From Materials Specified):

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

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

SCHEDULE:

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

BIDDER'S CERTIFICATE:

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

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

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

An individual doing business as _____

Signature:

Title:

Address:

Phone:

Fax:

Email: