



**THOMPSON
& LITTON** EST.
1956

ENGINEERS ARCHITECTS SURVEYORS



ADDENDUM NO. 002

TO: All Plan Holders

RE: Montgomery County Magistrate and Court Services Building
Montgomery County Board of Supervisors
T&L Project No. 16910

DATE: November 17, 2023

BIDS RECEIVED DATE: December 7, 2023

This Addendum forms a part of the Contract Documents and modifies the original Bidding Documents dated July 9, 2023, as noted below. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject Bidder to disqualification.

This Addendum consists of **85** pages.

CLARIFICATIONS AND ANSWERS TO PRE-BID QUESTIONS:

1. Clarification: Bid Form Item 5 should read, "Bidder agrees that the Work will be substantially completed within Four Hundred Eighty (480) consecutive calendar days after Notice to Proceed..." Bid form is not reissued as part of this addendum.

CHANGES TO THE SPECIFICATIONS:

1. Section 01 9113:
 - a. **DELETE** Paragraph 1.2.C
2. Section 07 2500:
 - a. **DELETE** Paragraph 3.4.A.1
 - b. **DELETE** Paragraph 3.4.A.3
 - c. **DELETE** Paragraph 3.4.A.4
 - d. **DELETE** Paragraph 3.4.B
3. Section 08 7100:
 - a. General Comment: Removable cores by Best, delete references to Sargent. No substitutions.
4. Section 22 3000:
 - a. **REPLACE** Section 22 3000 in its entirety.



5. Section 23 0900:
 - a. **REPLACE** Section 23 0900 in its entirety.
6. Section 23 0910:
 - a. **REPLACE** Section 23 0910 in its entirety.

CHANGES TO DRAWINGS:

1. Sheet G002:
 - a. **ADD** the following:
 - i. Reference Code: 2018 Virginia Energy Conservation Code (VECC)
 - ii. C402.5 Air Leakage
 - iii. C402.5.1 Air Barriers
2. Sheet G004:
 - a. **REPLACE** Sheet G004 in its entirety.
3. Sheet C300:
 - a. **REPLACE** Sheet C300 in its entirety.
4. Sheet C301:
 - a. **REPLACE** Sheet C301 in its entirety.
5. Sheet C302:
 - a. **REPLACE** Sheet C302 in its entirety.
6. Sheet C400:
 - a. **REPLACE** Sheet C400 in its entirety.
7. Sheet C500:
 - a. **REPLACE** Sheet C500 in its entirety.
8. Sheet C501:
 - a. **REPLACE** Sheet C501 in its entirety.
9. Sheet C601:
 - a. **REPLACE** Sheet C601 in its entirety.
10. Sheet A002:
 - a. **REPLACE** Sheet A002 in its entirety.
11. Sheet A101:
 - a. **REPLACE** Sheet A101 in its entirety.
12. Sheet A201:
 - a. **REPLACE** Sheet A201 in its entirety.



13. Sheet A311:
 - a. **REPLACE** Sheet A311 in its entirety.
14. Sheet A701:
 - a. **REFER** to the Finish Schedule. All references to "PT-1" shall be **REVISED** to read "PNT-1".
15. Sheet A712:
 - a. **REPLACE** Sheet A712 in its entirety.
16. Sheet S100:
 - a. **REPLACE** Sheet S100 in its entirety.
17. Sheet P001:
 - a. **REPLACE** Sheet P001 in its entirety.
18. Sheet P101:
 - a. **REPLACE** Sheet P101 in its entirety.
19. Sheet P102:
 - a. **REPLACE** Sheet P102 in its entirety.
20. Sheet P103:
 - a. **REPLACE** Sheet P103 in its entirety.
21. Sheet P104:
 - a. **REPLACE** Sheet P104 in its entirety.
22. Sheet P106:
 - a. **REPLACE** Sheet P106 in its entirety.
23. Sheet M103:
 - a. **REPLACE** Sheet M103 in its entirety.
24. Sheet M104:
 - a. **REPLACE** Sheet M104 in its entirety.
25. Sheet E101:
 - a. **REPLACE** Sheet E101 in its entirety.
26. Sheet E201:
 - a. **REPLACE** Sheet E201 in its entirety.
27. Sheet E301:
 - a. **REPLACE** Sheet E301 in its entirety.



Enclosures: Specification Sections:
 Section 22 3000
 Section 23 0900
 Section 23 0910
 Sheets:
 G004, C300, C301, C302, C400, C500, C501, C601, A002, A101, A201, A311, A712, S100,
 P001, P101, P102, P103, P104, P106, M103, M104, E101, E201, E301.

SECTION 22 3000 - PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Water Heaters:
 - 1. Tankless electric.
- B. In-line circulator pumps.

1.2 SUBMITTALS

- A. Product Data:
 - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
 - 2. Indicate pump type, capacity, power requirements.
 - 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
 - 4. Provide electrical characteristics and connection requirements.

1.3 QUALITY ASSURANCE

- A. Certifications:
 - 1. Water Heaters: NSF approved.
- B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

PART 2 PRODUCTS

2.1 WATER HEATERS

- A. Tankless Electric:
 - 1. Type: Automatic, electric.
 - 2. Accessories:
 - a. Water Connections: Brass.
 - b. Dip Tube: Brass.
 - c. Drain valve.
 - d. Anode: Magnesium.
 - e. Temperature and Pressure Relief Valve: ASME labeled.

2.2 IN-LINE CIRCULATOR PUMPS

- A. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.
- B. Impeller: Bronze.
- C. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- D. Seal: Carbon rotating against a stationary ceramic seat.
- E. Drive: Flexible coupling.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.

END OF SECTION

SECTION 230900 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 GENERAL

2.1 SECTION INCLUDES

- A. BUILDING AUTOMATION SYSTEM - GENERAL DESCRIPTION
- B. APPROVED CONTROL SYSTEM MANUFACTURES
- C. QUALITY ASSURANCE
- D. CODES AND STANDARDS
- E. SYSTEM PERFORMANCE
- F. SUBMITTAL REQUIREMENTS
- G. WARRANTY REQUIREMENTS
- H. SYSTEM MAINTENANCE AND REMOTE ANALYSIS
- I. OWNERSHIP OF PROPRIETARY MATERIAL
- J. DEFINITIONS

BUILDING AUTOMATION SYSTEM - GENERAL DESCRIPTION

- A. Provide a new Building Automation System (BAS) to integrate and control all mechanical equipment associated with this project. System shall also communicate with the existing county-wide Trane Connect System.
 - 1. The Building Automation System shall be as indicated on the drawings and described in these specifications. System must be fully integrated and coordinated with mechanical equipment DDC controllers furnished and installed in the equipment manufacturer's factory as specified in those sections. The intent of the BAS is to integrate all mechanical equipment into one system for global monitoring, control, and alarming associated with the building. It is the BAS manufacturer's responsibility to provide all the design, engineering, and field coordination required to ensure all equipment sequence of operations are met as specified and the designated BAS operators have the capability of managing the building mechanical system to ensure occupant comfort while maintaining energy efficiency.
 - 2. The BAS shall meet open standard protocol communication standards (As defined in System Communications Section) to ensure the system maintains "interoperability" to avoid proprietary arrangements that will make it difficult for the Owner to consider other BAS manufacturers in future projects.

3. Direct Digital Control (DDC) technology shall be used to provide the functions necessary for control of mechanical systems and terminal devices on this project.
4. The BAS shall accommodate simultaneous multiple user operation. Access to the control system data should be limited only by the security permissions of the operator role. Multiple users shall have access to all valid system data. An operator shall be able to log onto any workstation on the control system and have access to all appropriate data.

APPROVED CONTROL SYSTEM MANUFACTURES

- A. Approved BAS Manufacturers
 1. Trane Tracer®. No substitutions

QUALITY ASSURANCE

- A. BAS Manufacturer Qualifications
 1. The BAS manufacturer shall have an established business office within 50.00 miles of the project site and must provide 24 hours/day, 7 days/week response in the event of a customer warranty or service call.
 2. The BAS Manufacturer shall have factory trained and certified personnel providing all engineering, service, startup, and field labor for the project from their local office location. BAS manufacturer shall be able to provide training certifications for all local office personnel upon request.
 3. The BAS shall be provided by a single manufacturer and this manufacturer's equipment must consist of operator workstation software, Web-based hardware/software, Open Standard Protocol hardware/software, Custom application Programming Language, Graphical Programming Language, Building Controllers, Custom Application Controllers, and Application Specific Controllers. All other products specified herein (i.e., sensors, valves, dampers, actuators, etc.) need not be manufactured by the BAS manufacturer listed in this specification.
 4. Independent representatives of BAS manufacturers are not acceptable. BAS vendor must be corporate owned entity of BAS manufacturer.

CODES AND STANDARDS

- A. Codes and Standards: Meet requirements of all applicable standards and codes, except when more detailed or stringent requirements are indicated by the Contract Documents, including requirements of this Section.
 1. Underwriters Laboratories: Products shall be UL-916-PAZX listed.
 2. National Electrical Code -- NFPA 70.
 3. Federal Communications Commission -- Part J.

4. ASHRAE/ANSI 135-2012 (BACnet) - (System Level Devices) - Building Controllers shall conform to the listed version of the BACnet specification in order to improve interoperability with various building system manufacturers' control systems and devices.
5. ASHRAE/ANSI 135-2012 (BACnet) - (Unit Level Devices) - Unit Controllers shall conform to the listed version of the BACnet specification in order to improve interoperability with various building system manufacturers' control systems and devices.

SYSTEM PERFORMANCE

- A. Performance Standards. The BAS system shall conform to the following:
 1. Graphic Display. The system shall display a graphic with a minimum of 20 dynamic points. All current data shall be displayed within 10 seconds of the operator's request.
 2. Graphic Refresh. The system shall update all dynamic points with current data within 10 seconds.
 3. Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be 5 seconds. Analog objects shall start to adjust within 5 seconds.
 4. Object Scan. All changes of state and change of analog values shall be transmitted over the high-speed network such that any data used or displayed at a controller or workstation will be current within the prior 10 seconds.
 5. Alarm Response Time. The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed 10 seconds.
 6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.
 7. Programmable Controllers shall be able to execute DDC PID control loops at a selectable frequency from at least once every 5 seconds. The controller shall scan and update the process value and output generated by this calculation at this same frequency.
 8. Multiple Alarm Annunciations. All workstations on the network shall receive alarms within 5 seconds of each other.
 9. Reporting Accuracy. Table 1 lists minimum acceptable reporting accuracies for all values reported by the specified system.

SUBMITTAL REQUIREMENTS

- A. BAS manufacturer shall provide shop drawings and manufacturers' standard specification data sheets on all hardware and software being provided for this project. No work may begin on any segment of this project until the Engineer and Owner have reviewed submittals for conformity with the plan and specifications.

1. Provide three (3) printed copies of submittal package for review and approval.
- B. Quantities of items submitted shall be reviewed by the Engineer and Owner. Such review shall not relieve the BAS manufacturer of furnishing quantities required based upon contract documents.
- C. Provide the Engineer and Owner, any additional information or data which is deemed necessary to determine compliance with the specifications or which is deemed valuable in documenting and understanding the system to be installed.
- D. All shop drawings shall be provided to the Owner electronically as .dwg or .dxf file formats once they have been approved and as-built drawings have been completed.
- E. Submit the following within 90 days of contract award:
 1. A complete bill of materials of equipment to be used indicating quantities, manufacturers and model numbers.
 2. A schedule of all control valves including the valve size, pressure drop, model number (including pattern and connections), flow, CV, body pressure rating, and location.
 3. A schedule of all control dampers including damper size, pressure drop, manufacturer, and model number.
 4. Provide all manufacturers' technical cut sheets for major system components. When technical cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Include:
 - a. Building Controllers
 - b. Custom Application Controllers
 - c. Application Specific Controllers
 - d. Operator Workstations
 - e. Portable Operator Terminals
 - f. Auxiliary Control Devices
 5. Provide proposed Building Automation System architectural diagram depicting various controller types, workstations, device locations, addresses, and communication cable requirements
 6. Provide detailed termination drawings showing all required field and factory terminations, as well as terminal tie-ins to DDC controls provided by mechanical equipment manufacturers. Terminal numbers shall be clearly labeled.
 7. Provide a sequence of operation for each controlled mechanical system and terminal end devices.

8. Provide a BACnet Protocol Implementation Conformance Statement (PICS) for each BACnet system level device (i.e. Building Controller & Operator Workstations) type. This defines the points list for proper coordination of interoperability with other building systems if applicable for this project.
- F. Project Record Documents: Upon completion of installation, submit three (3) copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and include:
1. Project Record Drawings - These shall be as-built versions of the submittal shop drawings. One set of electronic media including CAD .dwg and .pdf drawing files shall be provided.
 2. Testing and Reports and Checklists signed off by trained factory (equipment manufacturers) and field (BAS) personnel.
 3. Operating and Maintenance (O & M) Manuals - These shall be as-built versions of the submittal product data. In addition to the information required for the submittals, Operating & Maintenance manual shall include:
 - a. Procedures for operating the BAS including logging on/off, alarm management, generation of reports, trends, overrides of computer control, modification of setpoints, and other interactive system requirements.
 - b. Explanation of how to design and install new points, new DDC controllers, and other BAS hardware.
 - c. Documentation, installation, and maintenance information for all third party hardware/software products provided including personal computers, printers, hubs, sensors, valves, etc.
 - d. Original issue media for all software provided, including operating systems, programming language, operator workstation software, and graphics software.
 - e. Licenses, Guarantee, and Warranty documents for all equipment and systems.
- G. Training Manuals: The BAS manufacturer shall provide a course outline and copies of training manuals at least two weeks prior to the start of any corporate training class to be attended by the Owner.

WARRANTY REQUIREMENTS

- A. Warrant all work as follows:
1. BAS system labor and materials shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. BAS failures during the warranty period shall be adjusted, repaired, or replaced at no charge to the Owner. The BAS manufacturer shall respond to the Owner's request for warranty service within 24 hours of the initiated call and will occur during normal business hours (8AM-5PM).

2. At the end of the final start-up/testing, if equipment and systems are operating satisfactorily to the Owner and Engineer, the Owner shall sign certificates certifying that the BAS is operational, and has been tested and accepted in accordance with the terms of this specification. The date of Owner's acceptance shall be the start of the warranty period.
3. To ensure that the owner will have the most current operating system provided by the manufacturer, the BAS manufacturer shall include licensing and labor costs to facilitate software/firmware updates throughout the warranty period at no charge to the owner. These updates shall include upgrades for functional enhancements associated with the following: operator workstation software, project specific software, graphics, database, firmware updates, and all security related service packs. Written authorization by the Owner must be granted prior to the installation of these updates.
4. The BAS manufacturer shall provide a web-accessible Users Network for the proposed System and give the Owner free access to question/answer forum, user tips, upgrades, and training schedules for a one year period of time correlating with the warranty period.

SYSTEM MAINTENANCE AND REMOTE ANALYSIS

- A. The BAS Manufacture shall provide Building Automation System remote support and system analysis for a period of 1 year (beginning the date of substantial completion).
- B. The BAS manufacturer shall setup a secure remote connection for data collection, analytics and remote technical support for the HVAC systems included in this contract.
 1. Provide technician support during the warranty period to diagnose issues remotely through the secure remote connection.
 2. The building owner is responsible for providing adequate internet access.
- C. Connectivity / Remote Access / Network Security
 1. Provide and maintain secure remote access to the facilities Building Automation System (BAS) or other building systems. Users accessing service through this connection shall not have access to the building owners network. Secure remote access to the BAS shall not require ANY inbound ports on a firewall to be "exposed" or "forwarded".
 2. Secure remote access to the BAS shall be available anywhere, anytime, using a compatible client device (PC/tablet/phone)
 3. The Owner will provide up to Three (3) IP drops and IP addresses on the owners network to gain access to the internet. The BAS manufacture shall coordinate with the Owners IT team, verify the proposed system shall meet all network security requirements and any other network configuration information necessary to each control contractor for the purpose of configuring each Area Controller on the network. It shall be the responsibility of the BAS manufacture to coordinate with the owner for network connectivity.
- D. The BAS Manufacture shall provide a professional analysis for the facility HVAC systems.

1. The analysis shall consist of an evaluation of HVAC systems including charts and graphs which indicate both current building performance and opportunities for building and HVAC system performance improvement.
- E. The following shall be provided after substantial completion of the project:
1. Orientation meeting with the building owner's representative to identify the HVAC systems that will be evaluated.
 2. System setup for data collection and analytics. BAS Manufacture to setup a secure remote data collection and analytics for identified systems.
 3. Assessment analysis shall be performed by trained personnel with relevant professional credentials in HVAC systems, energy management and building optimization methodologies.
 4. Consultation meeting with owner to review performance reports and improvement opportunities.
- F. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of owner.

OWNERSHIP OF PROPRIETARY MATERIAL

- A. Project specific software and documentation shall become the owner's property upon project completion. This includes the following:
1. Operator Graphic files
 2. As-built hardware design drawings
 3. Operating & Maintenance Manuals
 4. BAS System software database

DEFINITIONS

- A. DDC: Direct digital control
- B. I/O: Input/output.
- C. MS/TP: Manager Subordinate / Token Passing.
- D. POT: Portable Operator's Terminal.
- E. PID: Proportional plus integral plus derivative.
- F. RTD: Resistance temperature detector.
- G. BAS/ATC: Building Automation System/Automatic Temperature Controls.

PART 2 PRODUCTS

13.1 SECTION INCLUDES

- A. MATERIALS:
- B. SYSTEM COMMUNICATION
- C. OPERATOR INTERFACE
- D. BUILDING CONTROLLER SOFTWARE
- E. BUILDING / SYSTEM CONTROLLERS
- F. ADVANCED APPLICATION CONTROLLERS:
- G. APPLICATION SPECIFIC CONTROLLERS:
- H. APPLICATION CONTROLLER for Packaged Rooftop Units
- I. VARIABLE AIR VOLUME TERMINAL UNIT CONTROLLERS
- J. INPUT/OUTPUT INTERFACE:
- K. POWER SUPPLIES:
- L. AUXILIARY CONTROL DEVICES:
- M. WIRING AND RACEWAYS:

MATERIALS:

- A. Use new products that the manufacturer is currently manufacturing and that have been installed in a minimum of 25 installations. Do not use this installation as a product test site unless explicitly approved in writing by the owner or the owner's representative. Spare parts shall be available for at least five years after completion of this contract.

SYSTEM COMMUNICATION

- A. System Communications
 - 1. Each workstation, building controller, and equipment controller communication interface shall utilize the BACnet™ protocol with an Ethernet (IEEE 802.3), Wi-Fi (IEEE 802.11), RS485 (EIA-485), or Zigbee® (802.15.4) physical interface and an appropriate data link technology as defined in ANSI®/ASHRAE® Standard 135-2012. (e.g. BACnet over IP, BACnet over IPv6, BACnet SC, BACnet over MS/TP, BACnet Zigbee).
 - 2. All system controllers shall be BTL listed as a BACnet Building Controller (B-BC) as defined in ANSI®/ASHRAE® Standard 135-2012.
 - 3. All documented status and control points, schedule, alarm, and data-log services or objects shall be available as standard object types as defined in ANSI®/ASHRAE® Standard 135-2012.

4. Each System Controller shall communicate with a network of Custom Application and Application Specific Controllers utilizing one or more of the interfaces documented within Field Bus Communications below.
5. All Operator Workstations (B-OWS, B-AWS) and Building Controllers (B-BC) shall support BACnet Secure Connect (BACnet SC), a secure and encrypted datalink layer specifically designed for those networks.

B. Field Bus Communications

1. BACnet™
 - a. All equipment and plant controllers shall be BTL listed as a BACnet Application Specific Controller (B-ASC) or a BACnet Advanced Application Controller (B-AAC) as defined in ANSI®/ASHRAE® Standard 135-2012.
 - b. All communication shall conform to ANSI®/ASHRAE® Standard 135-2012.
 - c. System Controller shall function as a BACnet router to each unit controller providing a globally unique BACnet Device ID for all BACnet controllers within the system.
 - d. BACnet Zigbee®
 - 1) Communication between System Controller and equipment/plant controllers shall utilize BACnet Zigbee as defined in ANSI®/ASHRAE® Standard 135-2012.
 - 2) Each equipment controller wireless communication interface shall self-heal to maintain operation in the event of network communication failure.
 - 3) Each zone sensor wireless communication interface shall be capable of many-to-one sensors per controller to support averaging, monitoring, and multiple zone applications. Sensing options shall include temperature, relative humidity, CO2, and occupancy.
 - e. BACnet MS/TP
 - 1) Communication between System Controller and equipment/plant controllers shall utilize BACnet MS/TP as defined in ANSI®/ASHRAE® Standard 135-2012.

C. Variable Refrigerant Flow (VRF) Communications

1. The VRF system shall communicate with the BAS using one of the following communications methods.
 - a. The VRF system and the BAS shall utilize ANSI®/ASHRAE® Standard 135 (BACnet) protocol revision 12 or greater.
 - b. Recognizing that VRF manufacturers utilize proprietary protocols to pass information between VRF equipment components. A gateway device is an accepted method to convert proprietary data to BACnet data. BACnet data shall conform to BACnet protocol revision 12 or greater.

- c. When a device is capable of data exchange with the BACnet protocol across non-IP network segments, the BACnet protocol shall be used to exchange data. If a device does not support the BACnet protocol an alternative protocol may be used. Data exchanged using the alternative protocol shall be converted to the BACnet protocol to allow integration to the BAS.
- 2. To promote BAS interoperability, each instance of the following VRF system components shall be visible to the BAS network as a virtual BACnet device.
 - a. Indoor equipment
 - b. Outdoor equipment
 - c. Refrigerant manifold devices
 - d. Outdoor air ventilation systems
- 3. Virtual BACnet device functionality shall conform to BACnet protocol revision 12 or greater and meet the minimum functionality defined by BACnet device profile B-ASC.
- 4. The VRF indoor equipment shall support wireless zone sensors. Sensing options shall include temperature, relative humidity, CO2, and occupancy. Each zone sensor wireless communication interface shall be capable of many-to-one sensors per controller to support averaging, monitoring, and multiple zone applications.

OPERATOR INTERFACE

- A. Provide Building Operator Web Interface
 - 1. Manufacturer shall provide a user interface with time-of-day schedules, data collection, dashboards, reports and building summary, system applications, and self-expiring timed overrides. Manufacturer shall provide a published user and applications guide(s) that detail the system application operation, configuration, setup and troubleshooting.
 - 2. The building operator web interface shall be accessible via a web browser without requiring any "plug-ins" (i.e. JAVA Runtime Environment (JRE), Adobe Flash).
 - 3. User Roles
 - a. The system shall include pre-defined "roles" that allow a system administrator to quickly assign permissions to a user.
 - b. User logon/logoff attempts shall be recorded.
 - c. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user definable.
 - 4. On-Line Help and Training
 - a. Provide a context sensitive, on line help system to assist the operator in operation and configuration of the system.

- b. On-line help shall be available for all system functions and shall provide the relevant data for each particular screen.
5. Equipment and Application Pages
- a. The building operator web interface shall include standard pages for all equipment and applications. These pages shall allow an operator to obtain information relevant to the operation of the equipment and/or application, including:
 - 1) Animated Equipment Graphics for each major piece of equipment and floor plan in the System. This includes:
 - (a) Each Chiller, Air Handler, VAV Terminal, Fan Coil, Boiler, and Cooling Tower. These graphics shall show all points dynamically as specified in the points list.
 - (b) Animation capabilities shall include the ability to show a sequence of images reflecting the position of analog outputs, such as valve or damper positions. Graphics shall be capable of launching other web pages.
 - 2) Alarms relevant to the equipment or application without requiring a user to navigate to an alarm page and perform a filter.
 - 3) Historical Data (As defined in Trend Logs section of CONTROLLER SOFTWARE) for the equipment or application without requiring a user to navigate to a Data Log page and perform a filter.
 - b. VAV Air System. An operator shall be able to view and control (where applicable) the following parameters via the building operator web interface:
 - 1) System Mode
 - 2) System Occupancy
 - 3) Ventilation (Outdoor air flow) setpoint
 - 4) Ventilation (Outdoor air flow) status
 - 5) Air Handler Static pressure setpoint
 - 6) Air Handler Static pressure status
 - 7) Air Handler occupancy status
 - 8) Air Handler Supply air cooling and heating set points
 - 9) Air Handler minimum, maximum and nominal static pressure setpoints
 - 10) VAV box minimum and maximum flow
 - 11) VAV box drive open and close overrides

- 12) VAV box occupancy status
 - 13) VAV box Airflow to space
 - 14) Average space temperature
 - 15) Minimum space temperature
 - 16) Maximum space temperature
6. System Graphics. Building operator web interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using colors to represent zone temperature relative to zone set point.
- a. Graphic imagery – graphics shall use 3D images for all standard and custom graphics. The only allowable exceptions will be photo images, maps, schematic drawings, and selected floor plans.
 - b. Animation. Graphics shall be able to animate by displaying different Image lies for changed object status.
 - c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.
7. Graphics Library. Furnish a library of standard HVAC equipment such as chillers, air handlers, terminals, fan coils, unit ventilators, rooftop units, and VAV boxes, in 3-dimensional graphic depictions. The library shall be furnished in a file format compatible with the graphics generation package program.
8. Manual Control and Override
- a. Point Control. Provide a method for a user to view, override, and edit if applicable, the status of any object and property in the system. The point status shall be available by menu, on graphics or through custom programs.
 - b. Temporary Overrides. The user shall be able to perform a temporary override wherever an override is allowed, automatically removing the override after a specified period of time.
 - c. Override Owners. The system shall convey to the user the owner of each override for all priorities that an override exists.
 - d. Provide a specific icon to show timed override or operator override, when a point, unit controller or application has been overridden manually.
9. Scheduling. - The scheduling application shall provide graphical representation of the day, week, month and exception events.
10. Alarm/Event Notification

- a. Alarm/Event Log. The operator shall be able to view all logged system alarms/events from any building operator web interface.
 - 1) The operator shall be able to sort and filter alarms from events. Alarms shall be sorted in a minimum of 4 categories based on severity.
 - 2) The operator shall be able to acknowledge and add comments to alarms
 - 3) Alarm/event messages shall use full language, easily recognized descriptors.
 - b. Alarm Suppression. Alarms shall be able to be suppressed based on load/source relationships to present the likely root cause to the building operator as described in ASHRAE Guideline 36. Load/Source relationships shall be configurable by the user through a web interface.
11. Reports and Logs.
- a. The building operator web interface shall provide a reporting package that allows the operator to select reports.
 - b. The building operator web interface shall provide the ability to schedule reports to run at specified intervals of time.
 - c. The following standard reports shall be available without requiring a user to manually configure the report:
 - 1) All Points in Alarm Report: Provide an on demand report showing all current alarms.
 - 2) All Points in Override Report: Provide an on demand report showing all overrides in effect.
 - 3) Field Report: Provide a one-time report that lists all equipment with the unit configuration and present operation.
 - 4) Points report: Provide a report that lists the current value of all points
 - d. The controls vendor shall provide a hardening report that summarizes the port configuration details to ensure sites have not been exposed to the Internet in alignment with Cyber Security best practices.

B. Provide Mobile App Interface

- 1. Provide mobile (smart phone or tablet) interfaces to the building automation system, compatible with iOS and Android™ operating systems.
- 2. Controls manufacturer shall provide a phone/tablet interface with the ability to view/override status and setpoints, view/change schedules, view/acknowledge/comment on alarms, and view graphics for all spaces and equipment.

3. This phone/tablet interface shall resize itself appropriately for the size of the interface (i.e. no "pinching and zooming" required).
4. This phone/tablet interface shall function remotely from the facility while following IT security best practices (e.g. no ports exposed to the internet).
5. The operator interface shall support system access on a mobile device via a mobile app to:
 - a. Alarm log
 - b. System Status
 - c. Equipment status
 - d. Space Status
 - e. Standard Equipment graphics
 - f. Override set points
 - g. Override occupancy
 - h. Acknowledge Alarms
 - i. Add Comment(s) to Alarms

BUILDING CONTROLLER SOFTWARE

- A. Manufacturer shall provide standard applications to deliver HVAC system control. Standard applications include Time of Day Scheduling with Optimal Start/Stop, VAV Air Systems Control, Chiller Plant Control, Historical Trend Logs and Trim and Respond. Manufacturer shall provide system optimization strategies for functions such as fan pressure optimization and ventilation optimization.
- B. Furnish the following applications software for building and energy management. All software applications shall reside and run in the system controllers. Editing of applications shall occur at the building operator interface.
 1. VAV Air Systems Applications
 - a. The BAS shall provide air system applications that coordinate air handlers (AHU)/rooftop units (RTU) and Variable Air Volume Terminal equipment.
 - b. The air system applications shall perform the following functions:
 - 1) Startup and shutdown the air handler safely. Ensure the VAV boxes are open sufficiently when the air handler is running, to prevent damage to the ductwork and VAV boxes due to high air pressure.

- 2) Fan Pressure Optimization (ASHRAE 90.1, Guideline 36) - Minimize energy usage by controlling system static pressure to the lowest level while maintaining zone airflow requirements. Trim and respond reset logic shall reset setpoint within the range of min and max values based on zone requests.
 - 3) The controls contractor shall confirm the performance of Fan Pressure Optimization by conducting a field functional test that demonstrates critical zone reset with the engineer/owner present.
 - 4) Ventilation Optimization (ASHRAE 62) – properly ventilate all spaces while minimizing operating energy costs, using measured outdoor air flow. Dynamically calculate the system outdoor air requirement based on “real time” conditions in the spaces (i.e., number of occupants, CO2 levels, etc.) minimizing the amount of unconditioned outdoor air that must be brought into the building.
 - 5) Demand Controlled Ventilation – the active ventilation setpoint shall modulate between the occupied ventilation and occupied standby ventilation setpoint; Resetting the setpoint based on CO2 levels in the space.
 - 6) Discharge Air Temperature Reset (ASHRAE 90.1, Guideline 36) - Minimize energy usage by controlling discharge air temperature in response to building loads and outdoor air temperature. Trim and respond reset logic shall reset setpoint within the range of min and max values based on zone requests.
- c. The Air Systems application shall provide a user interface that includes status of current system operation with real time data of key operating parameters. Key operating parameters for Guideline 36 include:
- 1) Duct Static Pressure
 - 2) Duct Static Optimization Setpoint
 - 3) Outdoor Airflow
 - 4) Ventilation Optimization Setpoint
 - 5) Duct Static Optimization Maximum VAV Damper/Source VAV Box
 - 6) Ventilation Optimization Maximum VAV Vent Ratio/Source VAV box
 - 7) Discharge Air Temperature
 - 8) Discharge Air Temperature Optimization Setpoint
 - 9) Duct Static Optimization System Requests
 - 10) Discharge Air Temperature Optimization System Requests
- d. The air system application status screens shall explain what optimization calculations are occurring, critical parameters, and source equipment members. The

optimization status, inputs, and results shall be displayed for VAV Ventilation Optimization (calculating proper outside air intake), VAV Discharge Air Temperature Optimization (calculating proper discharge air temperature) and VAV Duct Static Pressure Optimization (calculating proper fan static pressure).

- e. The air systems applications shall provide a user interface that enables configuration changes made by swipe and type fields, selection list, and check box entry for feature definition:
 - 1) VAV Auxiliary Night Heat
 - 2) VAV Source Temperature Distribution
 - 3) Changeover System control
 - 4) Start/Stop Delay operation
 - 5) Enable/Disable Optimization Strategies (Duct Static Optimization, Discharge Air Temperature Optimization and Ventilation Optimization)
- f. The operation of VAV Terminal equipment members of the VAV Air System shall be selected by check box to optionally participate in the following functions when for Guideline 36 applications:
 - 1) System calculations (min, max, average)
 - 2) Duct Pressure Optimization
 - 3) Ventilation Optimization
 - 4) Drive to Maximum Override
 - 5) Common Source Temperature
 - 6) Common Space
 - 7) Discharge Air Temperature Optimization
 - 8) Hot Water Temperature Optimization
 - 9) Chilled Water Temperature Optimization
- g. The air system application vendor shall provide a published applications guide that details the air system application operation, configuration, setup, and troubleshooting. The applications guide documentation shall be maintained under version control, and updated by the manufacture to reflect most recent feature updates as made available. Contents of the guide shall include:
 - 1) Description of System Operation
 - 2) Required Components

- 3) Sequences of Operation
 - 4) Installation
 - 5) Controller Setup
 - 6) Required Programming
 - 7) Optimization Strategies
 - 8) Special Applications
 - 9) Troubleshooting
- h. The air system application shall present in plain user language the current operation with source zone information and reset events.
2. Trend Logs
- a. The system shall harvest trend logs for defined key measurements for each controlled HVAC device and HVAC application. Trend logs shall be captured for a minimum of 5 key operating points for each piece of HVAC equipment and HVAC application and stored for no less than 1 year at 15-minute intervals. Data Logs shall be capable of being configured on an interval or change of value basis.
- 1) Fan Coil
 - (a) Discharge Air Temperature
 - (b) Space Temperature Active
 - (c) Space Temperature Setpoint Active
 - (d) Air Flow Setpoint Active
 - (e) Discharge Air Flow
 - 2) Water Source Heat Pump
 - (a) Discharge Air Temperature
 - (b) Space Temperature Active
 - (c) Space Temperature Setpoint Active
 - (d) Air Flow Setpoint Active
 - (e) Discharge Air Flow
 - 3) Air Handling Unit/Rooftop (VAV)
 - (a) Discharge Air Temperature

- (b) Discharge Air Temperature Setpoint Active
 - (c) Space Temperature Active
 - (d) Cooling Capacity Status
 - (e) Discharge Air Flow
- 4) Air Handling Unit/Rooftop (CV)
 - (a) Discharge Air Temperature
 - (b) Space Temperature Active
 - (c) Space Temperature Setpoint Active
 - (d) Cooling Capacity Status
 - (e) Heating Capacity Primary Status
 - (f) Outdoor Air Damper Position
- 5) VAV Box
 - (a) Discharge Air Temperature
 - (b) Space Temperature Active
 - (c) Space Temperature Setpoint Active
 - (d) Air Flow Setpoint Active
 - (e) Discharge Air Flow
- 3. Trim and Respond
 - a. The BAS shall provide a setpoint reset application program based on 'trim and respond' functionality as outlined in ASHRAE Guideline 36.

BUILDING / SYSTEM CONTROLLERS

- A. There shall be one or more independent, standalone microprocessor based System Controllers to manage the global strategies described in CONTROLLER SOFTWARE section.
 - 1. The controller shall provide a USB communications port for connection to a PC.
 - 2. The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
 - 3. All System Controllers shall have a real time clock and shall be able to accept a BACnet time synchronization command for automatic time synchronization.

4. Data shall be shared between networked System Controllers.
 5. Serviceability – The System Controller shall have a display on the main board that indicates the current operating mode of the controller.
- B. Controls manufacturer shall provide secure remote access to the Building Automation System (BAS). Secure remote access shall not require IP ports to be "exposed" (i.e. port-forwarded or external public IP addresses) to the Internet. Controls manufacturer shall update secure remote access software as necessary to follow cyber security best practices and respond to cyber security events.

ADVANCED APPLICATION CONTROLLERS:

- A. Advance Application Controllers shall be used to control all equipment or applications of medium and high complexity, including but not limited to Air Handlers, Boiler Plants and Chiller Plants.
- B. The Advanced Application Controller shall be capable of operating as a stand-alone controller or as a member of a Building Automation System (BAS).
- C. When the Advanced Application Controller is operating as a member of a Building Automation System (BAS), the application controller shall operate as follows:
1. Application Controller will receive operation mode commands from the BAS network controller. The BAS commands shall include but not be limited to the follow: Occupied Heat/Cool, Unoccupied Heat/Cool, Morning Warm-up, / Pre-cool, Occupied Bypass).
 2. Application Controller will provide equipment status parameters to the BAS through BACnet communication.
 3. Application Controller will operate as a stand-alone controller in the event of communication failure with the BAS.
 4. In case of communications failure, stand-alone operation shall use default values or last known values for remote sensors read over the network such as outdoor air temperature.
- D. For Stand-Alone Operation of Advanced Application Controllers:
1. Shall operate a schedule in a standalone application using a Real Time Clock with a 7 day power backup.
 - a. The Controller shall have a built in schedule (assessable with or without a display)
 - b. Support will be for at least 3 schedules with up to 10 events for each day of the week.
 - c. Each of the 3 schedules can be Analog, Binary or Multi-State
 - d. The controller shall support a minimum of 25 exceptions each with up to 10 events.

- E. For ease of troubleshooting, the Controller shall support data trend logging.
 - 1. With a minimum of 20,000 trending points total on a controller
 - 2. Trends shall be capable of being collected at a minimum sample rate of once every second
 - 3. Shall be capable of trending all BACnet points used by controller
 - 4. Trends shall be capable of being scheduled or triggered.
- F. To meet the sequence of operation for each application, the Controller shall use library programs provided by the controller manufacturer that are either factory loaded or downloaded with service tool to the controller.
- G. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.
 - 1. Operating conditions:
 - a. Temperature: -40°F to 158°F (-40°C to 70°C)
 - b. Relative Humidity: 5% to 100% RH (non-condensing)
 - 2. Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.
 - 3. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° F to 158° F [-40° C to 70° C].
- H. Input/Output: The Controller shall have on board or through expansion module all I/O capable of performing all functionality needed for the application. Controls provided by the equipment manufacture must supply the required I/O for the equipment. In addition other controls must meet the following requirements:
 - 1. Shall support flexibility in valve type, the controllers shall be capable of supporting the following valve control types: 0-10VDC, 0-5VDC, 4-20mA, 24VAC - 2 position.
 - 2. Shall support flexibility in sensor type, the Controller shall be capable of reading sensor input ranges of 0 to10V, 0 to 20mA, 50ms or longer pulses, 200 to 20Kohm and RTD input.
 - 3. Shall support flexibility in sensor type, all Analog Outputs shall have the additional capability of being programmed to operate as Universal Inputs or Pulse Width Modulation Outputs.
 - 4. Shall support flexibility in sensor type, the Controller and/or expansion modules shall support dry and wetted (24VAC) binary inputs.
 - 5. The controller shall support pulse accumulator for connecting devices like energy meters.

6. In order to support a wide range of devices, the Controller's binary output shall be able to drive at least 10VA each.
7. For future needs, any unused I/O that is not needed for the functionality of the equipment shall be available to be used by custom programs on the Controller and by any other controller on the network.
8. The Controller shall provide 24VAC and 24VDC power terminals sensors and other devices required.
9. The Controller shall provide a dedicated static pressure input.
- I. Input/Output Expandability – The Controller shall provide the following functionality in order to meet current and future application needs:
 1. For the application flexibility, the Controller shall be capable of expanding to a total of at least 100 hardware I/O terminations.
 2. Expansion I/O can be mounted up to 650 ft. (200m) from control.
 3. For optimized system operation, expansion I/O must communicate via an internal controller communication bus (point expansion via the BACnet MS/TP network is not allowed).
- J. Serviceability – The Controller shall provide the following in order to improve serviceability of the Controller.
 1. Diagnostic LEDs for power/normal operation/status, BACnet communications, sensor bus communications, and binary outputs. All wiring connections shall be clearly labeled and made to be field removable.
 2. Binary and analog inputs and outputs shall use removable connectors or be connected to terminal strip external to the control box.
 3. Software service tool connection through the following methods: direct cable connection to the Controller, connection through another controller on BACnet link
 4. For safety purposes, the controller shall be capable of being powered by a portable computer's USB port for the purposes of configuration, programming and testing programs so that this work can be accomplished with the power off to the associated equipment.
 5. The Controller software tool service port shall utilize standard off-the-shelf USB printer cable.
 6. Capabilities to temporarily override the BACnet point values with built-in time expiration in the Controller.
 7. To aid in service replacement, the Controller shall easily attached to standard DIN rail mounting.

8. For future expansion, the Controller shall be capable of adding sequence of operation programming utilizing service tools software with a graphical programming interface (editing or programming in line code is not permissible).
 9. To aid in service replacement, the Controller shall allow for setting its BACnet address via controller mounted rotary switches that correspond to the numerical value of the address. (DIP switch methodologies are not allowed). Setting of the address shall be accomplished without the need of a service tool or power applied to the controller.
 10. Controller data shall be maintained through a power failure.
- K. Software Retention: All Controller operating parameters, setpoints, BIOS, and sequence of operation code must be stored in non-volatile memory in order to maintain such information for months without power.
- L. Controller must meet the following Agency Compliance:
1. UL916 PAZX, Open Energy Management Equipment
 2. UL94-5V, Flammability
 3. FCC Part 15, Subpart B, Class B Limit
 4. BACnet Testing Laboratory (BTL) listed as BACnet Advanced Application Controller (B-AAC)

APPLICATION SPECIFIC CONTROLLERS:

- A. General Description
1. Application Specific Controllers (ASC) shall be microprocessor-based DDC controllers which, through hardware or firmware design, control specified equipment. They are not user programmable, but are customized for operation within the confines of the equipment they are designed to serve.
 2. Zone Controllers are controllers that operate equipment that control the space temperature of single zone. Examples are controllers for VAV, Fan coil, Blower Coils, Unit Ventilators, Heat Pumps, and Water Source Heat Pumps.
- B. The Application Specific Controller shall be capable of operating as a stand-alone controller or as a member of a Building Automation System (BAS).
- C. When the Application Specific Controller is operating as a member of a Building Automation System (BAS), the application controller shall operate as follows:
1. Application Controller will receive operation mode commands from the BAS network controller. The BAS commands shall include but not be limited to the follow: Occupied Heat/Cool, Unoccupied Heat/Cool, Morning Warm-up, / Pre-cool, Occupied Bypass).
 2. Application Controller will provide equipment status parameters to the BAS through BACnet communication.

3. Application Controller will operate as a stand-alone controller in the event of communication failure with the BAS.
 4. In case of communications failure stand-alone operation shall use default values or last known values for remote sensors read over the network such as outdoor air temperature.
- D. Stand-Alone Operation: Each piece of equipment specified in section "A" shall be controlled by a single controller and provide stand-alone control in the event that a BAS is not present.
- E. Software
1. To meet the sequence of operation for each zone control, the controller shall use programs developed and tested by the controller manufacturer that are either factory loaded or downloaded with service tool to the controller.
 2. For controlling ancillary devices and for flexibility to change the sequence of operation in the future, the controller shall be capable running custom programs written in a graphical programming language.
- F. Environment: Controller hardware shall be suitable for the anticipated ambient conditions.
1. Storage: -55° to 203° F (-48° to 95° C) and 5 to 95% Rh, non-condensing.
 2. Operating: -40° to 158° F (-40 to 70° C) and 5 to 95% Rh, non-condensing.
 3. Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.
 4. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° to 158° F [-40° to 70° C].
- G. Input/Output:
1. For flexibility in selection and replacement of valves, the controllers shall be capable of supporting all of the following valve control types 0-10VDC, 0-5VDC, 4-20mA, 24VAC floating point, 24VAC - 2 position (Normally Open or Normally Closed).
 2. For flexibility in selection and replacement of sensors, the controllers shall be capable of reading sensor input ranges of 0 to 10V, 0 to 20mA, pulse counts, and 200 to 20Kohm.
 3. For flexibility in selection and replacement of binary devices, the controller shall support dry and wetted (24VAC) binary inputs.
 4. For flexibility in selection and replacement devices, the controller's shall have binary output which are able to drive at least 12VA each.
 5. For flexibility in selection and replacement of motors, the controller shall be capable of outputting 24VAC (binary output), DC voltage (0 to 10VDC minimum range) and PWM (in the 80 to 100 Hz range).

6. For future needs, any I/O that is unused by functionality of equipment control shall be available to be used by custom program on the controller and by another controller on the network.
 7. For future expansion and flexibility, the controller shall have either on board or through expansion, 20 hardware input/output points. Expansion points must communicate with the controller via an internal communications bus. Expansion points must be capable of being mounted up to 650ft. (200 m) from the controller. Expansion points that require the BACnet network for communication with the controller are not allowed.
- H. Serviceability – The controller shall provide the following in order to improve serviceability of the controller.
1. Diagnostic LEDs shall indicate correct operation or failures/faults for all of the following: power, sensors, BACnet communications, and I/O communications bus.
 2. All binary output shall have LED's indicating the output state.
 3. All wiring connectors shall removable without the use of a tool.
 4. Software service tool connection through all of the following methods: direct cable connection to the controller, connection through another controller on BACnet link
 5. For safety purposes, the controller shall be capable of being powered by a portable computer for the purposes of configuration, programming, and testing programs so that this work can be accomplished with the power off to the equipment.
 6. Capabilities to temporarily override of BACnet point values with built-in time expiration in the controller.
 7. BACnet MAC Address shall be set using decimal (0-9) based rotary switches.
 - a. Configuration change shall not be made in a programming environment, but rather by a configuration page utilizing dropdown list, check boxes, and numeric boxes.
 8. For ease of troubleshooting, the Controller shall support BACnet data trend logging.
 - a. With a minimum of 20,000 trending points total on controller
 - b. Trends shall be capable of being collected at a minimum sample rate of once every second.
 - c. Shall be capable of trending all BACnet points used by controller
 - d. Trends shall be capable of being scheduled or triggered
- I. Software Retention: All Zone Controller operating parameters, setpoints, BIOS, and sequence of operation code must be stored in non-volatile memory in order to maintain such information for months without power.
- J. Application controller shall meet the following Agency Compliance:

1. UL916 PAZX, Open Energy Management Equipment
2. UL94-5V, Flammability
3. FCC Part 15, Subpart B, Class B Limit
4. BACnet Testing Laboratory (BTL) listed as BACnet Application Specific Controller (B-ASC)

APPLICATION CONTROLLER FOR PACKAGED ROOFTOP UNITS

- A. The Rooftop Unit (RTU) Application Controller shall be a microprocessor-based DDC controller which, through hardware or firmware design, controls specified equipment. The controller is not user programmable, but is customized for operation within the confines of the equipment it is designed to serve.
- B. The Application Controller shall be capable of operating as a stand-alone controller or as a member of a Building Automation System (BAS).
- C. When the Application Controller is operating as a member of a Building Automation System (BAS), the application controller shall operate as follows:
 1. Application Controller will receive operation mode commands from the BAS network controller. The BAS commands shall include but not be limited to the follow: Occupied Heat/Cool, Unoccupied Heat/Cool, Morning Warm-up, / Pre-cool, Occupied Bypass).
 2. Application Controller will provide equipment status parameters to the BAS through BACnet communication.
 3. Application Controller will operate as a stand-alone controller in the event of communication failure with the BAS.
 4. In case of communications failure stand-alone operation shall use default values or last known values for remote sensors read over the network such as outdoor air temperature.
- D. Software
 1. To meet the sequence of operation for each zone control, the controller shall use programs developed and tested by the controller manufacturer that are either factory loaded or customized with use of service tool native to the controller.
- E. Environment: Controller hardware shall be suitable for the anticipated ambient conditions.
 1. Storage: -55° to 203° F (-48° to 95° C) and 5 to 95% Rh, non-condensing.
 2. Operating: -40° to 158° F (-40 to 70° C) and 5 to 95% Rh, non-condensing.
 3. Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.
 4. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° to 158° F [-40° to 70° C].

- F. Controller Input/Output: The controller shall have on board capable of performing all functionality needed for the application. Controls provided by the equipment manufacture must supply the required I/O for the equipment.
 - 1. For flexibility in selection and replacement of valves, the controllers shall be capable of supporting all of the following output types; 0-10VDC, 0-5VDC, 4-20mA, Binary.
 - 2. For flexibility in selection and replacement of sensors, the controllers shall be capable of reading sensor input ranges of 0 to10V, 0 to 20mA, Pulse counts, and 200 to 20Kohm.
- G. Serviceability – The controller shall provide the following in order to improve serviceability of the controller.
 - 1. Diagnostic LEDs shall indicate correct operation or failures/faults for all of the following: power, sensors, BACnet communications, and I/O communications bus.
 - 2. All binary output shall have LED's indicating the output state.
 - 3. All wiring connectors shall removable without the use of a tool.
 - 4. Software service tool connection through the following methods: direct cable connection to the controller, connection through another controller on BACnet link.
- H. Software Retention: All Zone Controller operating parameters, setpoints, BIOS, and sequence of operation code must be stored in non-volatile memory in order to maintain such information for months without power.
- I. Controller shall meet the following Agency Compliance:
 - 1. UL916 PAZX, Open Energy Management Equipment
 - 2. UL94-5V, Flammability
 - 3. FCC Part 15, Subpart B, Class B Limit
 - 4. BACnet Testing Laboratory (BTL) listed

VARAIBLE AIR VOLUME TERMINAL UNIT CONTROLLERS

- A. General Description
 - 1. Variable Air Volume (VAV) controllers shall be microprocessor-based DDC controllers which, through hardware or firmware design, control specified equipment. They are typically not user programmable, but are configurable for operation of VAV terminal units.
 - 2. Variable Air Volume (VAV) controllers are controllers that operate equipment that control the space temperature of single zone.
- B. The VAV controller shall be capable of operating as a stand-alone controller or as a member of a Building Automation System (BAS).

- C. When the VAV controller is operating as a member of a Building Automation System (BAS), the application controller shall operate as follows:
1. The VAV controller will receive operation mode commands from the BAS network controller. The BAS commands shall include but not be limited to the following: Occupied Heat/Cool, Unoccupied Heat/Cool, Morning Warm-up, / Pre-cool, Occupied Bypass).
 2. The VAV controller will provide equipment status parameters to the BAS through BACnet communication.
 3. The VAV controller will operate as a stand-alone controller in the event of communication failure with the BAS.
 4. In case of communications failure stand-alone operation shall use default values or last known values for remote sensors read over the network such as outdoor air temperature.
- D. Stand-Alone Operation: Each VAV Terminal Unit shall be controlled by a single controller and provide stand-alone control in the event that a BAS is not present.
- E. The VAV controller shall communicate to the building automation system via one of the following protocols: BACnet™ MS/TP or BACnet™ Zigbee defined in ANSI®/ASHRAE® Standard 135-2020
1. BACnet™ MS/TP
 - a. To allow maximum communications speed and co-existence with other controllers, the controller shall support at a minimum the following BACnet MS/TP manager baud rates: 9600, 19200, 38400, 76800.
 2. BACnet™ Zigbee
 - a. VAV controller wireless communication interface shall self-form and self-heal to maintain operation in the event of network communication failure.
 - b. IEEE 802.15.4 radios to minimize risk of interference, reliability, and range.
 - c. Operating range shall be a minimum of 200 feet; open range shall be 2,500 ft. (762 m) with less than 2% packet error rate.
 - d. To protect against harmful interference, certifications shall include Energy Management Equipment FCC CFR47, Section 15.247 & subpart E, Digital Modulation Transmission with no SAR (FCC ID: TPF-251701)
- F. Each VAV terminal unit shall use a space zone sensor(s) to measure the space condition it is serving.
1. The VAV controller shall use a wired or wireless communication interface to connect to its space zone sensor.

2. Each zone sensor communication interface shall be capable of many-to-one sensors per controller to support averaging, monitoring, and multiple zone applications. Sensing options shall include temperature, relative humidity, CO₂, and occupancy.
3. Wireless zone sensors
 - a. To check for proper operation, wireless zone temperature sensors shall include a signal strength and battery condition indicators on the zone sensor.
 - b. The wireless zone sensor battery life shall provide at least 15 years life under normal operating conditions and must be readily available Lithium size AA, 1.5V.
 - c. The wireless zone sensor and receiver addresses shall be held in non-volatile memory to ensure operation through system voltage disturbances and to minimize the risk of incorrect association.
 - d. To ensure proper system performance, the wireless zone sensor shall automatically determine when the space temperature is rapidly changing. When the space temperature is readily changing, the space temperature shall be transmitted at least once each 30 seconds. The maximum time between transmissions shall be 15 minutes.
 - e. Zone temperature sensing accuracy shall be +/- 0.5F (+/- 0.28C).

G. Software

1. To meet the sequence of operation for each zone control, the controller shall use programs developed and tested by the controller manufacturer that are either factory loaded or downloaded with service tool to the controller.
2. For controlling ancillary devices and for flexibility to change the sequence of operation in the future, the controller shall be capable running custom programs written in a graphical programming language.

H. Environment: Controller hardware shall be suitable for the anticipated ambient conditions.

1. Storage: -55° to 203° F (-48° to 95° C) and 5 to 95% Rh, non-condensing.
2. Operating: -40° to 158° F (-40 to 70° C) and 5 to 95% Rh, non-condensing.
3. Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.
4. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° to 158° F [-40° to 70° C].

I. Input/Output:

1. For flexibility in selection and replacement of valves, the controllers shall be capable of supporting all of the following valve control types 0-10VDC, 0-5VDC, 4-20mA, 24VAC floating point, 24VAC - 2 position (Normally Open or Normally Closed).

2. For flexibility in selection and replacement of sensors, the controllers shall be capable of reading sensor input ranges of 0 to 10V, 0 to 20mA, and 200 to 20Kohm.
 3. For flexibility in selection and replacement of binary devices, the controller shall support dry and wetted (24VAC) binary inputs.
 4. For flexibility in selection and replacement devices, the controller shall have binary output which are able to drive at least 12VA each.
 5. For flexibility in selection and replacement of motors, the controller shall be capable of outputting 24VAC (binary output), DC voltage (0 to 10VDC minimum range) and PWM (in the 80 to 100 Hz range).
- J. Serviceability – The controller shall provide the following in order to improve serviceability of the controller.
1. Diagnostic LEDs shall indicate correct operation or failures/faults for all of the following: power, sensors, BACnet communications, and I/O communications bus.
 2. All binary output shall have LED's indicating the output state.
 3. All wiring connectors shall removable without the use of a tool.
 4. Software service tool connection through all of the following methods: direct cable connection to the controller, connection through another controller on BACnet link and through the controller's zone sensor.
 5. For safety purposes, the controller shall be capable of being powered by a portable computer for the purposes of configuration, programming, and testing programs so that this work can be accomplished with the power off to the equipment.
 6. Capabilities to temporarily override of BACnet point values with built-in time expiration in the controller.
 7. BACnet MAC Address shall be set using decimal (0-9) based rotary switches.
 - a. Configuration change shall not be made in a programming environment, but rather by a configuration page utilizing dropdown list, check boxes, and numeric boxes.
 8. For ease of troubleshooting, the Controller shall support BACnet data trend logging.
 - a. Trends shall be capable of being collected at a minimum sample rate of once every second.
 - b. Shall be capable of trending all BACnet points used by controller
 - c. Trends shall be capable of being scheduled or triggered
- K. Software Retention: All Zone Controller operating parameters, setpoints, BIOS, and sequence of operation code must be stored in non-volatile memory in order to maintain such information for months without power.

- L. Controller shall meet the following Agency Compliance:
1. UL916 PAZX, Open Energy Management Equipment
 2. UL94-5V, Flammability
 3. FCC Part 15, Subpart B, Class B Limit
 4. AS/NZS CISPR 32:2016
 5. VCCI-CSPR 32:2016
 6. CAN ICES-003(B)/NMB-003(B)
 7. To ensure integration to the building automation system the controller must be BTL (BACnet Testing Lab) listed. The following BACnet profiles are in order of most functionality (B-BC) to least functionality (B-ASC).
 - a. BACnet Building Controller (B-BC)
 - b. BACnet Advance Applications Controller (B-AAC)
 - c. BACnet Application Specific Controller (B-ASC)

INPUT/OUTPUT INTERFACE:

- A. Hardwired inputs and outputs may tie into the system through building, custom application, or ASCs.
- B. All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24V of any duration, such that contact with this voltage will cause no damage to the controller.
- C. Binary inputs shall allow the monitoring of on/off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against the effects of contact bounce and noise. Binary inputs shall sense "dry contact" closure without external power (other than that provided by the controller) being applied.
- D. Pulse accumulation input objects. This type of object shall conform to all the requirements of binary input objects and also accept up to 10 pulses per second for pulse accumulation.
- E. Analog inputs shall allow the monitoring of low voltage (0 to 10 VDC), current (4 to 20 mA), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with and field configurable to commonly available sensing devices.
- F. Binary outputs shall provide for on/off operation or a pulsed low-voltage signal for pulse width modulation control. Binary outputs on building and custom application controllers shall have status lights. Outputs shall be selectable for either normally open or normally closed operation.

- G. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0 to 10VDC or a 4 to 20 mA signal as required to provide proper control of the output device. Analog outputs shall not exhibit a drift of greater than 0.4% of range per year.
- H. Tri-State Outputs. Provide tri-state outputs (two coordinated binary outputs) for control of three-point floating type electronic actuators without feedback. Use of three-point floating devices shall be limited to zone control and terminal unit control applications (VAV terminal units, duct-mounted heating coils, zone dampers, radiation, etc.). Control algorithms shall run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.
- I. System Object Capacity. The system size shall be expandable to at least twice the number of input/ output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system.

POWER SUPPLIES:

- A. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish overcurrent protection in both primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.
 - 1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in overvoltage and overcurrent protection and shall be able to withstand a 150% current overload for at least three seconds without trip-out or failure.
 - a. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MIL-STD 810C for shock and vibration.
 - b. Line voltage units shall be UL recognized and CSA approved.

AUXILIARY CONTROL DEVICES:

- A. Motorized dampers, unless otherwise specified elsewhere, shall be as follows:
 - 1. Damper frames shall be 16 gauge galvanized sheet metal or 1/8" extruded aluminum with reinforced corner bracing.
 - 2. Damper blades shall not exceed 8" in width or 48" in length. Blades are to be suitable for medium velocity performance (2,000 fpm). Blades shall be not less than 16 gauge.
 - 3. Damper shaft bearings shall be as recommended by manufacturer for application.
 - 4. All blade edges and top and bottom of the frame shall be provided with compressible seals. Side seals shall be compressible stainless steel. The blade seals shall provide for a maximum leakage rate of 10 CFM per square foot at 2.5" w.c. differential pressure.

5. All leakage testing and pressure ratings will be based on AMCA Publication 500.
 6. Individual damper sections shall not be larger than 48" x 60". Provide a minimum of one damper actuator per section.
- B. Control dampers shall be parallel or opposed blade types as scheduled on drawings.
- C. Electric damper/valve actuators
1. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.
 2. Where shown, for power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing.
 3. All rotary spring return actuators shall be capable of both clockwise or counter clockwise spring return operation. Linear actuators shall spring return to the retracted position.
 4. Proportional actuators shall accept a 0-10 VDC or 0-20 ma control signal and provide a 2-10 VDC or 4-20 ma operating range.
 5. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb. torque capacity shall have a manual crank for this purpose.
 6. Actuators shall be provided with a conduit fitting and a minimum 1m electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.
 7. Actuators shall be Underwriters Laboratories Standard 873 listed.
 8. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque.
- D. Control Valves
1. Control valves shall be two-way or three-way type for two-position or modulating service as scheduled or shown.
 2. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:
 - a. Water Valves:
 - 1) Two-way: 150% of total system (pump) head.
 - 2) Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.
 - b. Steam Valves: 150% of operating (inlet) pressure.

E. Water Valves

1. Body and trim style and materials shall be in accordance with manufacturer's recommendations for design conditions and service shown, with equal percentage ports for modulating service.
2. Sizing Criteria:
 - a. Two-position service: Line size.
 - b. Two-way modulating service: Pressure drop shall be equal to twice the pressure drop through heat exchanger (load), 50% of the pressure difference between supply and return mains, or 34.5 kPa (5 psi), whichever is greater.
 - c. Three-way modulating service: Pressure drop equal to twice the pressure drop through the coil exchanger (load), 34.5 kPa (5 psi) maximum.
 - d. Valves DN 15 (1/2 in.) through DN 50 (2 in.) shall be bronze body or cast brass ANSI Class 250, spring-loaded, PTFE packing, quick opening for two-position service. Two-way valves to have replaceable composition disc or stainless steel ball.
 - e. Valves DN 65 (2 1/2 in.) and larger shall be cast iron ANSI Class 125 with guided plug and PTFE packing.
3. Water valves shall fail normally open or closed, as scheduled on plans, or as follows:
 - a. Water zone valves—normally open preferred
 - b. Heating coils in air handlers - normally open
 - c. Chilled-water control valves - normally closed
 - d. Other applications—as scheduled or as required by sequences of operation
4. Zone valves shall be sized to meet the control application and they shall maintain their last position in the event of a power failure.

F. Steam Valves

1. Body and trim materials shall be in accordance with manufacturer's recommendations for design conditions and service with linear ports for modulating service.
2. Sizing Criteria:
 - a. Two-position service: pressure drop 10% to 20% of inlet psig
 - b. Modulating service: 100 kPa (15 psig) or less; pressure drop 80% of inlet psig
 - c. Modulating service: 101 to 350 kPa (16 to 50 psig); pressure drop 50% of inlet psig
 - d. Modulating service: over 350 kPa (50 psig); pressure drop as scheduled on plans

G. Binary Temperature Devices

1. Low-voltage space thermostat shall be 24 V, bimetal-operated, mercury-switch type, with either adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C to 30°C (55°F to 85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.
2. Line-voltage space thermostat shall be bimetal-actuated, open contact type, or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listed for electrical rating, concealed setpoint adjustment, 13°C to 30°C (55°F to 85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.
3. Low-limit thermostats. Low-limit airstream thermostats shall be UL listed, vapor pressure type, with an element of 6 m (20 ft) minimum length. Element shall respond to the lowest temperature sensed by any 30 cm (1 ft) section. The low-limit thermostat shall be manual reset only.

H. Wired Temperature Sensors

1. Temperature sensors shall be RTD or thermistor.
2. Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m² (10 ft²) of duct cross section.
3. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed. The well must withstand the flow velocities in the pipe.
4. Space sensors shall be equipped with setpoint adjustment, override switch, display, and/or communication port as shown on plans.
5. Provide matched temperature sensors for differential temperature measurement.

I. Wired Humidity Sensors

1. Duct and room sensors shall have a sensing range of 20% to 80%.
2. Duct sensors shall be provided with a sampling chamber.

J. Static Pressure Sensors

1. Sensor shall have linear output signal. Zero and span shall be field-adjustable.
2. Sensor sensing elements shall withstand continuous operating conditions plus or minus 50% greater than calibrated span without damage.
3. Water pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Sensor shall be complete with 4-20 ma output, required mounting brackets, and block and bleed valves. Mount in location accessible for service.

4. Water differential pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (DP) and maximum static pressure shall be 3,000 psi. Transmitter shall be complete with 4-20 ma output, required mounting brackets, and five-valve manifold. Mount in a location accessible for service.

K. Low Limit Thermostats

1. Safety low limit thermostats shall be vapor pressure type with an element 6m [20 ft] minimum length. Element shall respond to the lowest temperature sensed by any one foot section.
2. Low limit shall be manual reset only.

WIRING AND RACEWAYS:

- A. General: Provide copper wiring, plenum cable, and raceways as specified in the applicable sections of this specification.
- B. All insulated wire to be copper conductors, UL labeled for 90°C (194°F) minimum service.
- C. Fiber Optic Cable. Optical cables shall be duplex 900 mm tight-buffer construction designed for intra-building environments. The sheath shall be UL Listed OFNP in accordance with NEC Article 770. The optical fiber shall meet the requirements of FDDI, ANSI X3T9.5 PMD for 62.5/125 µm.

PART 3 EXECUTION

27.1 SECTION INCLUDES

- A. EXAMINATION:
- B. PROTECTION:
- C. COORDINATION:
- D. GENERAL WORKMANSHIP:
- E. FIELD QUALITY CONTROL:
- F. COMMUNICATION WIRING:
- G. FIBER OPTIC CABLE:
- H. INSTALLATION OF SENSORS:
- I. FLOW SWITCH INSTALLATION:
- J. WARNING LABELS:
- K. IDENTIFICATION OF HARDWARE AND WIRING:
- L. CONTROLLERS:

M. PROGRAMMING:

N. CONTROL SYSTEM CHECKOUT AND TESTING:

O. CLEANING:

P. TRAINING:

EXAMINATION:

- A. The Contract Documents shall be thoroughly examined for coordination of control devices, their installation, and wiring. Coordinate and review mechanical equipment specifications, locations, and identify any discrepancies, conflicts, or omissions that shall be reported to the Architect/Engineer for resolution before rough-in work is started.
- B. The BAS manufacturer shall inspect the jobsite in order to verify that control equipment can be installed as required, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

PROTECTION:

- A. The BAS installation contractor shall protect all work and material from damage by their work or personnel, and shall be liable for all damage thus caused.
- B. The BAS manufacturer shall be responsible for their work and equipment until final inspection, testing, and acceptance. The BAS installing contractor shall protect their work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

COORDINATION:

- A. Site
 - 1. Where the mechanical work will be installed in close proximity to, or will interfere with, work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment. If the contractor installs his/her work before coordinating with other trades, so as to cause any interference with work of other trades, the contractor shall make the necessary changes in his/her work to correct the condition without extra charge.
 - 2. Coordinate and schedule work with all other work in the same area, or with work that is dependent upon other work, to facilitate mutual progress.
- B. Submittals. Refer to the "Submittals," section of this specification for requirements.
- C. Test and Balance
 - 1. The contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.

2. The contractor shall provide training in the use of these tools. This training will be planned for a duration of 4 hours.
3. In addition, the contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.
4. The tools used during the test and balance process shall be returned to the contractor at the completion of the testing and balancing.

D. Life Safety

1. Duct smoke detectors required for air handler shutdown shall be supplied under Section 26100 of this specification. The contractor shall interlock smoke detectors to air handlers for shutdown as described in the Sequences of Operation for this project.
2. Smoke dampers and actuators required for duct smoke isolation are provided under Section 26100. The contractor shall interlock these dampers to the air handlers as described in the Sequences of Operation for this project as applicable.
3. Fire/smoke dampers and actuators required for fire rated walls are provided under another Section 26100. Control of these dampers shall be by 26100

E. Coordination with Controls Specified in Other Sections or Divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:

1. All communication media and equipment shall be provided as specified in the "Communication" section of this specification.
2. Each supplier of a controls product is responsible for the configuration, programming, start-up, and testing of that product to meet the sequences of operation described in this section.
3. The Contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this section and those provided under other sections or divisions of this specification.

GENERAL WORKMANSHIP:

- A. Install equipment, piping, wiring/conduit, parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- C. Install all equipment in readily accessible locations as defined by National Electric Code (NEC). Control panels shall be attached to structural walls or properly supported in a free-standing configuration, unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.

- D. Verify integrity of all control wiring to ensure continuity and freedom from shorts and grounds prior to commencing the startup procedures.
- E. All control device installation and wiring shall comply with Contract Documents, acceptable industry specifications, and industry standards for performance, reliability, and compatibility. Installation and wiring shall be executed in strict adherence to local codes and standard practices referenced in Contract Documents.

FIELD QUALITY CONTROL:

- A. All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Contract Documents.
- B. BAS manufacturer shall continually monitor the field installation for building code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.
- C. BAS installing Contractor(s) shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

COMMUNICATION WIRING:

- A. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.
- B. Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.
- C. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer shall not be exceeded during installation.
- D. Contractor shall verify the integrity of the entire network following cable installation. Use appropriate test measures for each particular cable.
- E. When a cable enters or exits a building, a lightning arrestor must be installed between the line and ground.
- F. All runs of communication wiring shall be unspliced length when the length is commercially available.
- G. All communication wiring shall be labeled to indicate origin and destination.

FIBER OPTIC CABLE:

- A. All cabling shall be installed in a neat and workmanlike manner. Minimum cable and unjacketed fiber bend radii as specified by cable manufacturer shall be maintained.
- B. Maximum pulling tensions as specified by the cable manufacturer shall not be exceeded during installation. Post installation residual cable tension shall be within cable manufacturer's specifications.

- C. Fiber optic cabinets, hardware, and cable entering the cabinet shall be installed in accordance with manufacturers' instructions. Minimum cable and unjacketed fiber bend radii as specified by cable manufacturer shall be maintained.

INSTALLATION OF SENSORS:

- A. Sensors required for mechanical equipment operation shall be factory installed and wired as specified in mechanical equipment specifications. BAS manufacturer shall be responsible for coordinating these control devices and ensuring the sequence of operations will be met. Installation and wiring shall be in accordance with the BAS manufacturer's recommendations.
- B. Sensors that require field mounting shall meet the BAS manufacturer's recommendations and be coordinated with the mechanical equipment they will be associated.
- C. Mount sensors rigidly and adequately for the environment the sensor will operate.
- D. Room temperature sensors shall be installed on concealed junction boxes properly supported by the block wall framing. For installation in dry wall ceilings, the low voltage sensor wiring can be installed exposed and must meet applicable National and Local Electrical Codes.
- E. All wires attached to wall mounted sensors shall be sealed off to prevent air from transmitting in the associated conduit and affecting the room sensor readings.
- F. Install duct static pressure tap with tube end facing directly down-stream of air flow.
- G. Install space static pressure sensor with static sensing probe applicable for space installation where applicable.
- H. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.
- I. All pipe mounted temperature sensors shall be installed in matched thermowells. Install all liquid temperature sensors with heat conducting fluid in thermal wells for adequate thermal conductance.
- J. Wiring for space sensors shall be concealed in building drywall. EMT conduit is acceptable within mechanical equipment and service rooms.
- K. Install outdoor air temperature sensors on north wall complete with sun shield at manufacturer's recommended location and coordinated with Engineer.

FLOW SWITCH INSTALLATION:

- A. Coordinate installation of flow switch with Mechanical Contractor who will be responsible for installing a thread o let in steel piping applications. Copper pipe applications will require the use CxCxF Tee, and no pipe extensions or substitutions will be allowed.
- B. Mount a minimum of 5 pipe diameters upstream and 5 pipe diameters downstream, or two feet, whichever is greater, from pipe fittings and other inline potential obstructions.

- C. Install in accordance with manufacturers' instructions, which will require proper flow direction, horizontal alignment with flow switch mounting on the top of pipe.

WARNING LABELS:

- A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the BAS system.
- B. Permanent warning labels shall be affixed to all motor starters and all control panels that are connected to multiple power sources utilizing separate disconnects.

IDENTIFICATION OF HARDWARE AND WIRING:

- A. All field wiring and cabling, including that within factory mounted, and wired control panels and devices for mechanical equipment, shall be labeled at each end within 2" of termination with a cable identifier and other descriptive information for troubleshooting, maintenance, and service purposes. BAS manufacturer to coordinate this labeling requirement with mechanical equipment manufacturer as it relates to controls.
- B. Permanently label or code each point of field terminal strips to show the instrument or item served and correlate them to the BAS design drawings.
- C. Identify control panels with minimum 1-cm letters on laminated plastic nameplates.
- D. Identifiers shall match record documents. All plug-in components shall be labeled such that removal of the component does not remove the label.

CONTROLLERS:

- A. Provide a separate DDC Controller for individual HVAC mechanical equipment. BAS manufacturer shall furnish and coordinate DDC controllers and control devices and ensure that installation and wiring adhere to BAS manufacturer's design recommendations. For those mechanical equipment units that do not have factory installed controls specified, the BAS manufacturer shall field mount controls and coordinate all installation and termination information to ensure the specified sequence of operations are met.
- B. Building Controllers and Custom Application Controllers shall be selected to provide a minimum of 15% spare I/O point capacity for each point type (analog or digital) found at each location. If input points are not universal, 15% of each type is required. If outputs are not universal, 15% of each type is required. A minimum of one spare is required for each type of point used in each controller.
 - 1. Future use of spare I/O point capacity shall require providing the field instrument and control device, field wiring, engineering, and programming. No additional Controller boards or point modules shall be required to implement use of these spare points.

PROGRAMMING:

- A. Provide sufficient internal memory for all controllers to ensure specified sequence of operations, alarming, trending, and reporting requirements are achieved. BAS manufacturer

shall provide a minimum of 25% spare memory capacity for future use.

- B. Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index.
- C. Software Programming
 - 1. Provide programming for individual mechanical systems to achieve all aspects of the sequence of operation specified. It is the BAS manufacturer's responsibility to ensure all mechanical equipment functions and operates as specified in sequence of operations. Provide sufficient programming comments in controller application software to clearly describe each section of the program. The comment statements shall reflect the language used in the sequence of operations.
- D. BAS Operator's Interface
 - 1. When Operator Workstation is specified, provide color graphics for each piece of mechanical equipment depicting sufficient I/O to monitor and troubleshoot operation. Operator color graphics shall include Chiller Plant, Cooling Tower System, Boiler Plant, Air Handling Units, Rooftop Units, VAV Terminal Boxes, Fan Coil Units, Unit Ventilators, Heat Exchangers, Exhaust Fans, etc. These standard graphics shall depict all points dynamically as specified in the points list and/or indicated in sequence of operation.
 - 2. The BAS manufacturer shall provide all the labor necessary to install, initialize, start up, and trouble-shoot all operator interface software and their functions as described in this section. This includes any operating system software, the operator interface data base, and any third party software installation and integration required for successful operation of the operator interface.
 - 3. As part of this execution phase, the BAS manufacturer shall perform a complete test of the operator interface.

CONTROL SYSTEM CHECKOUT AND TESTING:

- A. Start-up testing. All testing in this section shall be performed by the contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the owner's representative is notified of the system demonstration.
 - 1. The contractor shall furnish all labor and test apparatus required to calibrate and prepare for service all of the instruments, controls, and accessory equipment furnished under this specification.
 - 2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
 - 3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to manufacturer's recommendations.
 - 4. Verify all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starter, etc.) operate properly and normal positions are correct.

5. Verify all analog output devices (I/Ps, actuators, etc) are functional, that start and span are correct, and that direction and normal positions are correct. The contractor shall check all control valves and automatic dampers to ensure proper action and closure. The contractor shall make any necessary adjustments to valve stem and damper blade travel.
6. Verify the system operation adheres to the sequences of operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops and optimal start/stop routines.
7. Alarms and Interlocks
 - a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
 - b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
 - c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

CLEANING:

- A. The BAS manufacturer's installing contractor(s) shall clean up all debris resulting from their installation activities on a daily basis. The installation contractors shall remove all cartons, containers, crates, etc. under his control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Owner, Construction Manager, General Contractor, and/or Mechanical Contractor.
- B. At the completion of work in any area, the installation contractor shall clean all of their work, equipment, etc., making it free from dust, dirt and debris.
- C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage. Any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

TRAINING:

- A. Provide minimum of (4) hours of operator training throughout the contract period. The training will be provided for personnel designated by the Owner.
- B. These objectives will be divided into logical groupings; participants may attend one or more of these, depending on level of knowledge required:
 1. Day-to-day BAS Operators
 2. BAS Troubleshooting & Maintenance

END OF SECTION

SECTION 23 0910 - EXISTING BAS INTEGRATION

BUILDING AUTOMATION SYSTEM - GENERAL DESCRIPTION

PROVIDE AN EXTENSION OF THE EXISTING BUILDING AUTOMATION SYSTEM (BAS) TO INTEGRATE AND CONTROL ALL MECHANICAL EQUIPMENT ASSOCIATED WITH THIS PROJECT. ALL NEW BUILDING CONTROLLERS, AND EQUIPMENT/PLANT CONTROLLERS, SHALL BE INTEGRATED INTO THE EXISTING COUNTY-WIDE TRANE CONNECT SYSTEM.

- 2.1 THE EXISTING BUILDING BAS IS TRANE TRACER.**
- 2.2 THE BUILDING AUTOMATION SYSTEM SHALL BE AS INDICATED ON THE DRAWINGS AND DESCRIBED IN THESE SPECIFICATIONS. SYSTEM MUST BE FULLY INTEGRATED AND COORDINATED WITH MECHANICAL EQUIPMENT DDC CONTROLLERS FURNISHED AND INSTALLED IN THE EQUIPMENT MANUFACTURER'S FACTORY AS SPECIFIED IN THOSE SECTIONS. THE INTENT OF THE BAS IS TO INTEGRATE ALL MECHANICAL EQUIPMENT INTO ONE SYSTEM FOR GLOBAL MONITORING, CONTROL, AND ALARMING ASSOCIATED WITH THE BUILDING. IT IS THE BAS MANUFACTURER'S RESPONSIBILITY TO PROVIDE ALL THE DESIGN, ENGINEERING, AND FIELD COORDINATION REQUIRED TO ENSURE ALL EQUIPMENT SEQUENCE OF OPERATIONS ARE MET AS SPECIFIED AND THE DESIGNATED BAS OPERATORS HAVE THE CAPABILITY OF MANAGING THE BUILDING MECHANICAL SYSTEM TO ENSURE OCCUPANT COMFORT WHILE MAINTAINING ENERGY EFFICIENCY.**
- 2.3 THE BAS SHALL MEET OPEN STANDARD PROTOCOL COMMUNICATION STANDARDS (AS DEFINED IN SYSTEM COMMUNICATIONS SECTION) TO ENSURE THE SYSTEM MAINTAINS "INTEROPERABILITY" TO AVOID PROPRIETARY ARRANGEMENTS THAT WILL MAKE IT DIFFICULT FOR THE OWNER TO CONSIDER OTHER BAS MANUFACTURERS IN FUTURE PROJECTS.**
- 2.4 DIRECT DIGITAL CONTROL (DDC) TECHNOLOGY SHALL BE USED TO PROVIDE THE FUNCTIONS NECESSARY FOR CONTROL OF MECHANICAL SYSTEMS AND TERMINAL DEVICES ON THIS PROJECT.**
- 2.5 THE BAS SHALL ACCOMMODATE SIMULTANEOUS MULTIPLE USER OPERATION. ACCESS TO THE CONTROL SYSTEM DATA SHOULD BE LIMITED ONLY BY THE SECURITY PERMISSIONS OF THE OPERATOR ROLE. MULTIPLE USERS SHALL HAVE ACCESS TO ALL VALID SYSTEM DATA. AN OPERATOR SHALL BE ABLE TO LOG ONTO ANY WORKSTATION ON THE CONTROL SYSTEM AND HAVE ACCESS TO ALL APPROPRIATE DATA.**

APPROVED CONTROL SYSTEM MANUFACTURERS

APPROVED BAS MANUFACTURERS:

- 4.1 TRANE TRACER®— NO SUBSTITUTIONS**

SYSTEM COMMUNICATION

SYSTEM COMMUNICATIONS

- 6.1 EACH WORKSTATION, BUILDING CONTROLLER, AND EQUIPMENT CONTROLLER COMMUNICATION INTERFACE SHALL UTILIZE THE BACNET™ PROTOCOL WITH AN ETHERNET (IEEE 802.3), WI-FI (IEEE 802.11), RS485 (EIA-485), OR ZIGBEE® (802.15.4) PHYSICAL INTERFACE**

AND AN APPROPRIATE DATA LINK TECHNOLOGY AS DEFINED IN ANSI®/ASHRAE® STANDARD 135-2012. (E.G. BACNET OVER IP, BACNET OVER IPV6, BACNET SC, BACNET OVER MS/TP, BACNET ZIGBEE).

- 6.2 ALL SYSTEM CONTROLLERS SHALL BE BTL LISTED AS A BACNET BUILDING CONTROLLER (B-BC) AS DEFINED IN ANSI®/ASHRAE® STANDARD 135-2012.**
- 6.3 ALL DOCUMENTED STATUS AND CONTROL POINTS, SCHEDULE, ALARM, AND DATA-LOG SERVICES OR OBJECTS SHALL BE AVAILABLE AS STANDARD OBJECT TYPES AS DEFINED IN ANSI®/ASHRAE® STANDARD 135-2012.**
- 6.4 EACH SYSTEM CONTROLLER SHALL COMMUNICATE WITH A NETWORK OF CUSTOM APPLICATION AND APPLICATION SPECIFIC CONTROLLERS UTILIZING ONE OR MORE OF THE INTERFACES DOCUMENTED WITHIN FIELD BUS COMMUNICATIONS BELOW.**
- 6.5 ALL OPERATOR WORKSTATIONS (B-OWS, B-AWS) AND BUILDING CONTROLLERS (B-BC) SHALL SUPPORT BACNET SECURE CONNECT (BACNET SC), A SECURE AND ENCRYPTED DATALINK LAYER SPECIFICALLY DESIGNED FOR THOSE NETWORKS.**

FIELD BUS COMMUNICATIONS

7.1 BACNET™

- A. All equipment and plant controllers shall be BTL listed as a BACnet Application Specific Controller (B-ASC) or a BACnet Advanced Application Controller (B-AAC) as defined in ANSI®/ASHRAE® Standard 135-2012.
- B. All communication shall conform to ANSI®/ASHRAE® Standard 135-2012.
- C. System Controller shall function as a BACnet router to each unit controller providing a globally unique BACnet Device ID for all BACnet controllers within the system.
- D. BACnet Zigbee®
 - 1. Communication between System Controller and equipment/plant controllers shall utilize BACnet Zigbee as defined in ANSI®/ASHRAE® Standard 135-2012.
 - 2. Each equipment controller wireless communication interface shall self-heal to maintain operation in the event of network communication failure.
 - 3. Each zone sensor wireless communication interface shall be capable of many-to-one sensors per controller to support averaging, monitoring, and multiple zone applications. Sensing options shall include temperature, relative humidity, CO2, and occupancy.
- E. BACnet MS/TP
 - 1. Communication between System Controller and equipment/plant controllers shall utilize BACnet MS/TP as defined in ANSI®/ASHRAE® Standard 135-2012.

OPERATOR INTERFACE

PROVIDE BUILDING OPERATOR WEB INTERFACE

9.1 MANUFACTURER SHALL PROVIDE A USER INTERFACE WITH TIME-OF-DAY SCHEDULES, DATA COLLECTION, DASHBOARDS, REPORTS AND BUILDING SUMMARY, SYSTEM APPLICATIONS, AND SELF-EXPIRING TIMED OVERRIDES. MANUFACTURER SHALL PROVIDE A PUBLISHED USER AND APPLICATIONS GUIDE(S) THAT DETAIL THE SYSTEM APPLICATION OPERATION, CONFIGURATION, SETUP AND TROUBLESHOOTING.

9.2 THE BUILDING OPERATOR WEB INTERFACE SHALL BE ACCESSIBLE VIA A WEB BROWSER WITHOUT REQUIRING ANY “PLUG-INS” (I.E. JAVA RUNTIME ENVIRONMENT (JRE), ADOBE FLASH).

9.3 USER ROLES

- A. The system shall include pre-defined “roles” that allow a system administrator to quickly assign permissions to a user.
- B. User logon/logoff attempts shall be recorded.
- C. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user definable.

9.4 ON-LINE HELP AND TRAINING

- A. Provide a context sensitive, on line help system to assist the operator in operation and configuration of the system.
- B. On-line help shall be available for all system functions and shall provide the relevant data for each particular screen.

9.5 EQUIPMENT AND APPLICATION PAGES

- A. The building operator web interface shall include standard pages for all equipment and applications. These pages shall allow an operator to obtain information relevant to the operation of the equipment and/or application, including:
 - 1. Animated Equipment Graphics for each major piece of equipment and floor plan in the System. This includes:
 - a. Each Chiller, Air Handler, VAV Terminal, Fan Coil, Boiler, and Cooling Tower. These graphics shall show all points dynamically as specified in the points list.
 - b. Animation capabilities shall include the ability to show a sequence of images reflecting the position of analog outputs, such as valve or damper positions. Graphics shall be capable of launching other web pages.
 - 2. Alarms relevant to the equipment or application without requiring a user to navigate to an alarm page and perform a filter.
 - 3. Historical Data (As defined in Trend Logs section of CONTROLLER SOFTWARE) for the equipment or application without requiring a user to navigate to a Data Log page and perform a filter.

B. VAV Air System. An operator shall be able to view and control (where applicable) the following parameters via the building operator web interface:

1. System Mode
2. System Occupancy
3. Ventilation (Outdoor air flow) setpoint
4. Ventilation (Outdoor air flow) status
5. Air Handler Static pressure setpoint
6. Air Handler Static pressure status
7. Air Handler occupancy status
8. Air Handler Supply air cooling and heating set points
9. Air Handler minimum, maximum and nominal static pressure setpoints
10. VAV box minimum and maximum flow
11. VAV box drive open and close overrides
12. VAV box occupancy status
13. VAV box Airflow to space
14. Average space temperature
15. Minimum space temperature
16. Maximum space temperature

9.6 SYSTEM GRAPHICS. BUILDING OPERATOR WEB INTERFACE SHALL BE GRAPHICALLY BASED AND SHALL INCLUDE AT LEAST ONE GRAPHIC PER PIECE OF EQUIPMENT OR OCCUPIED ZONE, GRAPHICS FOR EACH CHILLED WATER AND HOT WATER SYSTEM, AND GRAPHICS THAT SUMMARIZE CONDITIONS ON EACH FLOOR OF EACH BUILDING INCLUDED IN THIS CONTRACT. INDICATE THERMAL COMFORT ON FLOOR PLAN SUMMARY GRAPHICS USING COLORS TO REPRESENT ZONE TEMPERATURE RELATIVE TO ZONE SET POINT.

- A. Graphic imagery – graphics shall use 3D images for all standard and custom graphics. The only allowable exceptions will be photo images, maps, schematic drawings, and selected floor plans.
- B. Animation. Graphics shall be able to animate by displaying different Image lies for changed object status.
- C. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.

9.7 GRAPHICS LIBRARY. FURNISH A LIBRARY OF STANDARD HVAC EQUIPMENT SUCH AS CHILLERS, AIR HANDLERS, TERMINALS, FAN COILS, UNIT VENTILATORS, ROOFTOP UNITS, AND VAV BOXES, IN 3-DIMENSIONAL GRAPHIC DEPICTIONS. THE LIBRARY SHALL BE FURNISHED IN A FILE FORMAT COMPATIBLE WITH THE GRAPHICS GENERATION PACKAGE PROGRAM.

9.8 MANUAL CONTROL AND OVERRIDE

- A. Point Control. Provide a method for a user to view, override, and edit if applicable, the status of any object and property in the system. The point status shall be available by menu, on graphics or through custom programs.
- B. Temporary Overrides. The user shall be able to perform a temporary override wherever an override is allowed, automatically removing the override after a specified period of time.
- C. Override Owners. The system shall convey to the user the owner of each override for all priorities that an override exists.
- D. Provide a specific icon to show timed override or operator override, when a point, unit controller or application has been overridden manually.

9.9 SCHEDULING. - THE SCHEDULING APPLICATION SHALL PROVIDE GRAPHICAL REPRESENTATION OF THE DAY, WEEK, MONTH AND EXCEPTION EVENTS.

9.10 ALARM/EVENT NOTIFICATION

- A. Alarm/Event Log. The operator shall be able to view all logged system alarms/events from any building operator web interface.
 - 1. The operator shall be able to sort and filter alarms from events. Alarms shall be sorted in a minimum of 4 categories based on severity.
 - 2. The operator shall be able to acknowledge and add comments to alarms
 - 3. Alarm/event messages shall use full language, easily recognized descriptors.
- B. Alarm Suppression. Alarms shall be able to be suppressed based on load/source relationships to present the likely root cause to the building operator as described in ASHRAE Guideline 36. Load/Source relationships shall be configurable by the user through a web interface.

9.11 REPORTS AND LOGS.

- A. The building operator web interface shall provide a reporting package that allows the operator to select reports.
- B. The building operator web interface shall provide the ability to schedule reports to run at specified intervals of time.
- C. The following standard reports shall be available without requiring a user to manually configure the report:
 - 1. All Points in Alarm Report: Provide an on demand report showing all current alarms.

2. All Points in Override Report: Provide an on demand report showing all overrides in effect.
 3. Field Report: Provide a one-time report that lists all equipment with the unit configuration and present operation.
 4. Points report: Provide a report that lists the current value of all points
- D. The controls vendor shall provide a hardening report that summarizes the port configuration details to ensure sites have not been exposed to the Internet in alignment with Cyber Security best practices.

PROVIDE MOBILE APP INTERFACE

10.1 PROVIDE MOBILE (SMART PHONE OR TABLET) INTERFACES TO THE BUILDING AUTOMATION SYSTEM, COMPATIBLE WITH IOS AND ANDROID™ OPERATING SYSTEMS.

10.2 CONTROLS MANUFACTURER SHALL PROVIDE A PHONE/TABLET INTERFACE WITH THE ABILITY TO VIEW/OVERRIDE STATUS AND SETPOINTS, VIEW/CHANGE SCHEDULES, VIEW/ACKNOWLEDGE/COMMENT ON ALARMS, AND VIEW GRAPHICS FOR ALL SPACES AND EQUIPMENT.

10.3 THIS PHONE/TABLET INTERFACE SHALL RESIZE ITSELF APPROPRIATELY FOR THE SIZE OF THE INTERFACE (I.E. NO "PINCHING AND ZOOMING" REQUIRED).

10.4 THIS PHONE/TABLET INTERFACE SHALL FUNCTION REMOTELY FROM THE FACILITY WHILE FOLLOWING IT SECURITY BEST PRACTICES (E.G. NO PORTS EXPOSED TO THE INTERNET).

10.5 THE OPERATOR INTERFACE SHALL SUPPORT SYSTEM ACCESS ON A MOBILE DEVICE VIA A MOBILE APP TO:

- A. Alarm log
- B. System Status
- C. Equipment status
- D. Space Status
- E. Standard Equipment graphics
- F. Override set points
- G. Override occupancy
- H. Acknowledge Alarms
- I. Add Comment(s) to Alarms

BUILDING / SYSTEM CONTROLLERS

THERE SHALL BE ONE OR MORE INDEPENDENT, STANDALONE MICROPROCESSOR BASED SYSTEM CONTROLLERS TO MANAGE THE GLOBAL STRATEGIES DESCRIBED IN CONTROLLER SOFTWARE SECTION.

12.1 THE CONTROLLER SHALL PROVIDE A USB COMMUNICATIONS PORT FOR CONNECTION TO A PC.

12.2 THE OPERATING SYSTEM OF THE CONTROLLER SHALL MANAGE THE INPUT AND OUTPUT COMMUNICATIONS SIGNALS TO ALLOW DISTRIBUTED CONTROLLERS TO SHARE REAL AND VIRTUAL POINT INFORMATION AND ALLOW CENTRAL MONITORING AND ALARMS.

12.3 ALL SYSTEM CONTROLLERS SHALL HAVE A REAL TIME CLOCK AND SHALL BE ABLE TO ACCEPT A BACNET TIME SYNCHRONIZATION COMMAND FOR AUTOMATIC TIME SYNCHRONIZATION.

12.4 DATA SHALL BE SHARED BETWEEN NETWORKED SYSTEM CONTROLLERS.

12.5 SERVICEABILITY – THE SYSTEM CONTROLLER SHALL HAVE A DISPLAY ON THE MAIN BOARD THAT INDICATES THE CURRENT OPERATING MODE OF THE CONTROLLER.

CONTROLS MANUFACTURER SHALL PROVIDE SECURE REMOTE ACCESS TO THE BUILDING AUTOMATION SYSTEM (BAS). SECURE REMOTE ACCESS SHALL NOT REQUIRE IP PORTS TO BE "EXPOSED" (I.E. PORT-FORWARDED OR EXTERNAL PUBLIC IP ADDRESSES) TO THE INTERNET. CONTROLS MANUFACTURER SHALL UPDATE SECURE REMOTE ACCESS SOFTWARE AS NECESSARY TO FOLLOW CYBER SECURITY BEST PRACTICES AND RESPOND TO CYBER SECURITY EVENTS.

BUILDING CONTROLLER SOFTWARE

MANUFACTURER SHALL PROVIDE STANDARD APPLICATIONS TO DELIVER HVAC SYSTEM CONTROL. STANDARD APPLICATIONS INCLUDE TIME OF DAY SCHEDULING WITH OPTIMAL START/STOP, VAV AIR SYSTEMS CONTROL, CHILLER PLANT CONTROL, HISTORICAL TREND LOGS AND TRIM AND RESPOND. MANUFACTURER SHALL PROVIDE SYSTEM OPTIMIZATION STRATEGIES FOR FUNCTIONS SUCH AS FAN PRESSURE OPTIMIZATION AND VENTILATION OPTIMIZATION.

FURNISH THE FOLLOWING APPLICATIONS SOFTWARE FOR BUILDING AND ENERGY MANAGEMENT. ALL SOFTWARE APPLICATIONS SHALL RESIDE AND RUN IN THE SYSTEM CONTROLLERS. EDITING OF APPLICATIONS SHALL OCCUR AT THE BUILDING OPERATOR INTERFACE.

16.1 VAV AIR SYSTEMS APPLICATIONS

- A. The BAS shall provide air system applications that coordinate air handlers (AHU)/rooftop units (RTU) and Variable Air Volume Terminal equipment.
- B. The air system applications shall perform the following functions:
 - 1. Startup and shutdown the air handler safely. Ensure the VAV boxes are open sufficiently when the air handler is running, to prevent damage to the ductwork and VAV boxes due to high air pressure.
 - 2. Fan Pressure Optimization (ASHRAE 90.1, Guideline 36) - Minimize energy usage by controlling system static pressure to the lowest level while maintaining zone airflow requirements. Trim and respond reset logic shall reset setpoint within the range of min and max values based on zone requests.

3. The controls contractor shall confirm the performance of Fan Pressure Optimization by conducting a field functional test that demonstrates critical zone reset with the engineer/owner present.
 4. Ventilation Optimization (ASHRAE 62) – properly ventilate all spaces while minimizing operating energy costs, using measured outdoor air flow. Dynamically calculate the system outdoor air requirement based on “real time” conditions in the spaces (i.e., number of occupants, CO2 levels, etc.) minimizing the amount of unconditioned outdoor air that must be brought into the building.
 5. Demand Controlled Ventilation – the active ventilation setpoint shall modulate between the occupied ventilation and occupied standby ventilation setpoint; Resetting the setpoint based on CO2 levels in the space.
 6. Discharge Air Temperature Reset (ASHRAE 90.1, Guideline 36) - Minimize energy usage by controlling discharge air temperature in response to building loads and outdoor air temperature. Trim and respond reset logic shall reset setpoint within the range of min and max values based on zone requests.
- C. The Air Systems application shall provide a user interface that includes status of current system operation with real time data of key operating parameters. Key operating parameters for Guideline 36 include:
1. Duct Static Pressure
 2. Duct Static Optimization Setpoint
 3. Outdoor Airflow
 4. Ventilation Optimization Setpoint
 5. Duct Static Optimization Maximum VAV Damper/Source VAV Box
 6. Ventilation Optimization Maximum VAV Vent Ratio/Source VAV box
 7. Discharge Air Temperature
 8. Discharge Air Temperature Optimization Setpoint
 9. Duct Static Optimization System Requests
 10. Discharge Air Temperature Optimization System Requests
- D. The air system application status screens shall explain what optimization calculations are occurring, critical parameters, and source equipment members. The optimization status, inputs, and results shall be displayed for VAV Ventilation Optimization (calculating proper outside air intake), VAV Discharge Air Temperature Optimization (calculating proper discharge air temperature) and VAV Duct Static Pressure Optimization (calculating proper fan static pressure).

- E. The air systems applications shall provide a user interface that enables configuration changes made by swipe and type fields, selection list, and check box entry for feature definition:
 - 1. VAV Auxiliary Night Heat
 - 2. VAV Source Temperature Distribution
 - 3. Changeover System control
 - 4. Start/Stop Delay operation
 - 5. Enable/Disable Optimization Strategies (Duct Static Optimization, Discharge Air Temperature Optimization and Ventilation Optimization)
- F. The operation of VAV Terminal equipment members of the VAV Air System shall be selected by check box to optionally participate in the following functions when for Guideline 36 applications:
 - 1. System calculations (min, max, average)
 - 2. Duct Pressure Optimization
 - 3. Ventilation Optimization
 - 4. Drive to Maximum Override
 - 5. Common Source Temperature
 - 6. Common Space
 - 7. Discharge Air Temperature Optimization
 - 8. Hot Water Temperature Optimization
 - 9. Chilled Water Temperature Optimization
- G. The air system application vendor shall provide a published applications guide that details the air system application operation, configuration, setup, and troubleshooting. The applications guide documentation shall be maintained under version control, and updated by the manufacture to reflect most recent feature updates as made available. Contents of the guide shall include:
 - 1. Description of System Operation
 - 2. Required Components
 - 3. Sequences of Operation
 - 4. Installation
 - 5. Controller Setup
 - 6. Required Programming

- 7. Optimization Strategies
- 8. Special Applications
- 9. Troubleshooting
- H. The air system application shall present in plain user language the current operation with source zone information and reset events.

16.2 TREND LOGS

- A. The system shall harvest trend logs for defined key measurements for each controlled HVAC device and HVAC application. Trend logs shall be captured for a minimum of 5 key operating points for each piece of HVAC equipment and HVAC application and stored for no less than 1 year at 15-minute intervals. Data Logs shall be capable of being configured on an interval or change of value basis.
 - 1. Fan Coil
 - a. Discharge Air Temperature
 - b. Space Temperature Active
 - c. Space Temperature Setpoint Active
 - d. Air Flow Setpoint Active
 - e. Discharge Air Flow
 - 2. Water Source Heat Pump
 - a. Discharge Air Temperature
 - b. Space Temperature Active
 - c. Space Temperature Setpoint Active
 - d. Air Flow Setpoint Active
 - e. Discharge Air Flow
 - 3. Air Handling Unit/Rooftop (VAV)
 - a. Discharge Air Temperature
 - b. Discharge Air Temperature Setpoint Active
 - c. Space Temperature Active
 - d. Cooling Capacity Status
 - e. Discharge Air Flow

4. Air Handling Unit/Rooftop (CV)
 - a. Discharge Air Temperature
 - b. Space Temperature Active
 - c. Space Temperature Setpoint Active
 - d. Cooling Capacity Status
 - e. Heating Capacity Primary Status
 - f. Outdoor Air Damper Position
5. VAV Box
 - a. Discharge Air Temperature
 - b. Space Temperature Active
 - c. Space Temperature Setpoint Active
 - d. Air Flow Setpoint Active
 - e. Discharge Air Flow

16.3 TRIM AND RESPOND

- A. The BAS shall provide a setpoint reset application program based on 'trim and respond' functionality as outlined in ASHRAE Guideline 36.

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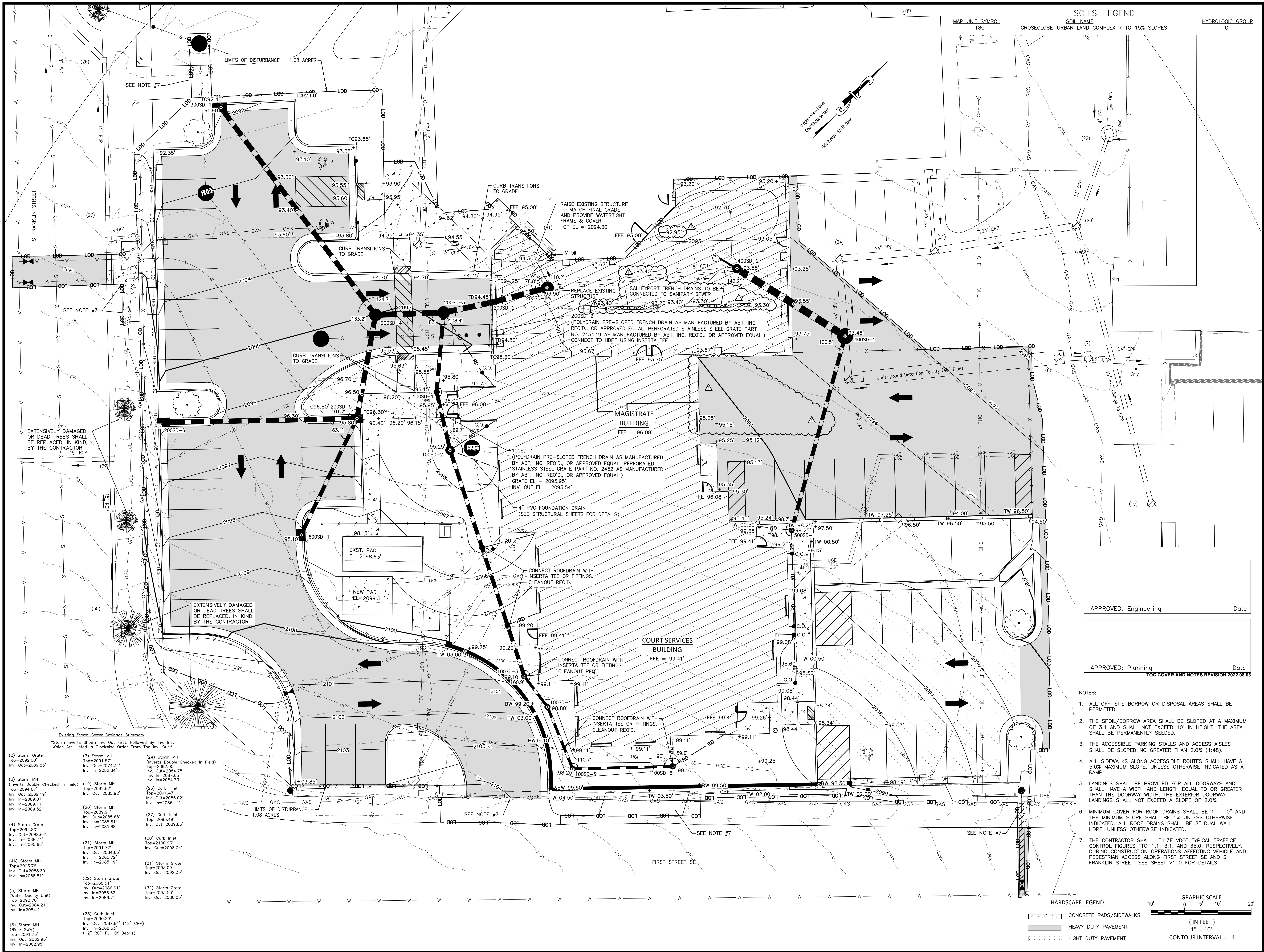
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| MAP UNIT SYMBOL | SOILS LEGEND | HYDROLOGIC GROUP |
|-----------------|--|------------------|
| 18C | SOIL NAME GROSECLOSE-URBAN LAND COMPLEX 7 TO 15% SLOPES | C |

Seal

Montgomery County

Professional Engineer

M. Andrew Monk

Lic. No. 050716

10/11/2023

MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES BUILDING

GRADING PLAN

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APPROVED: Engineering
Date

APPROVED: Planning
Date

TOC COVER AND NOTES REVISION 2022.08.03

NOTES:

1. ALL OFF-SITE BORROW OR DISPOSAL AREAS SHALL BE PERMITTED.

2. THE SPOIL/BORROW AREA SHALL BE SLOPED AT A MAXIMUM OF 3:1 AND SHALL NOT EXCEED 10' IN HEIGHT. THE AREA SHALL BE PERMANENTLY SEEDED.

3. THE ACCESSIBLE PARKING STALLS AND ACCESS AISLES SHALL BE SLOPED NO GREATER THAN 2.0% (1:48).

4. ALL SIDEWALKS ALONG ACCESSIBLE ROUTES SHALL HAVE A 5.0% MAXIMUM SLOPE, UNLESS OTHERWISE INDICATED AS A RAMP.

5. LANDINGS SHALL BE PROVIDED FOR ALL DOORWAYS AND SHALL HAVE A WIDTH AND LENGTH EQUAL TO OR GREATER THAN THE DOORWAY WIDTH. THE EXTERIOR DOORWAY LANDINGS SHALL NOT EXCEED A SLOPE OF 2.0%.

6. MINIMUM COVER FOR ROOF DRAINS SHALL BE 1' - 0" AND THE MINIMUM SLOPE SHALL BE 1% UNLESS OTHERWISE INDICATED. ALL ROOF DRAINS SHALL BE 8" DUAL WALL HDPE, UNLESS OTHERWISE INDICATED.

7. THE CONTRACTOR SHALL UTILIZE VDOT TYPICAL TRAFFIC CONTROL FIGURES TTC-1.1, 3.1, AND 35.0, RESPECTIVELY, DURING CONSTRUCTION OPERATIONS AFFECTING VEHICLE AND PEDESTRIAN ACCESS ALONG FIRST STREET SE AND S FRANKLIN STREET. SEE SHEET 'V100' FOR DETAILS.

CONCRETE PADS/SIDEWALKS

HEAVY DUTY PAVEMENT

LIGHT DUTY PAVEMENT

GRAPHIC SCALE

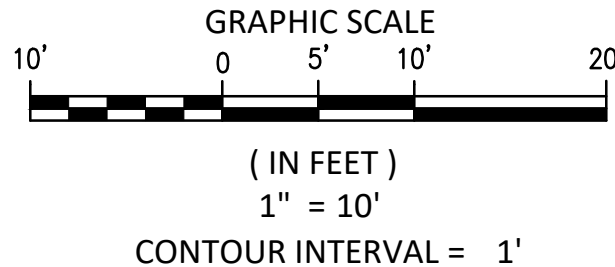
(IN FEET)

1" = 10'

CONTOUR INTERVAL = 1'



- GREENSPACE LEGEND**
- FRONTAGE
 - REMAINING
- HARDSCAPE LEGEND**
- CONCRETE PADS/SIDEWALKS
 - HEAVY-DUTY ASPHALT PAVEMENT
 - LIGHT-DUTY ASPHALT PAVEMENT



APPROVED: Engineering _____ Date _____

APPROVED: Planning _____ Date _____

TOC COVER AND NOTES REVISION 2022.08.03

Seal
MONTGOMERY COUNTY
M. ANDREW MONK
Lic. No. 050716
10/11/23
PROFESSIONAL LANDSCAPE ARCHITECT

MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES
BUILDING

GREENSPACE REQUIREMENTS

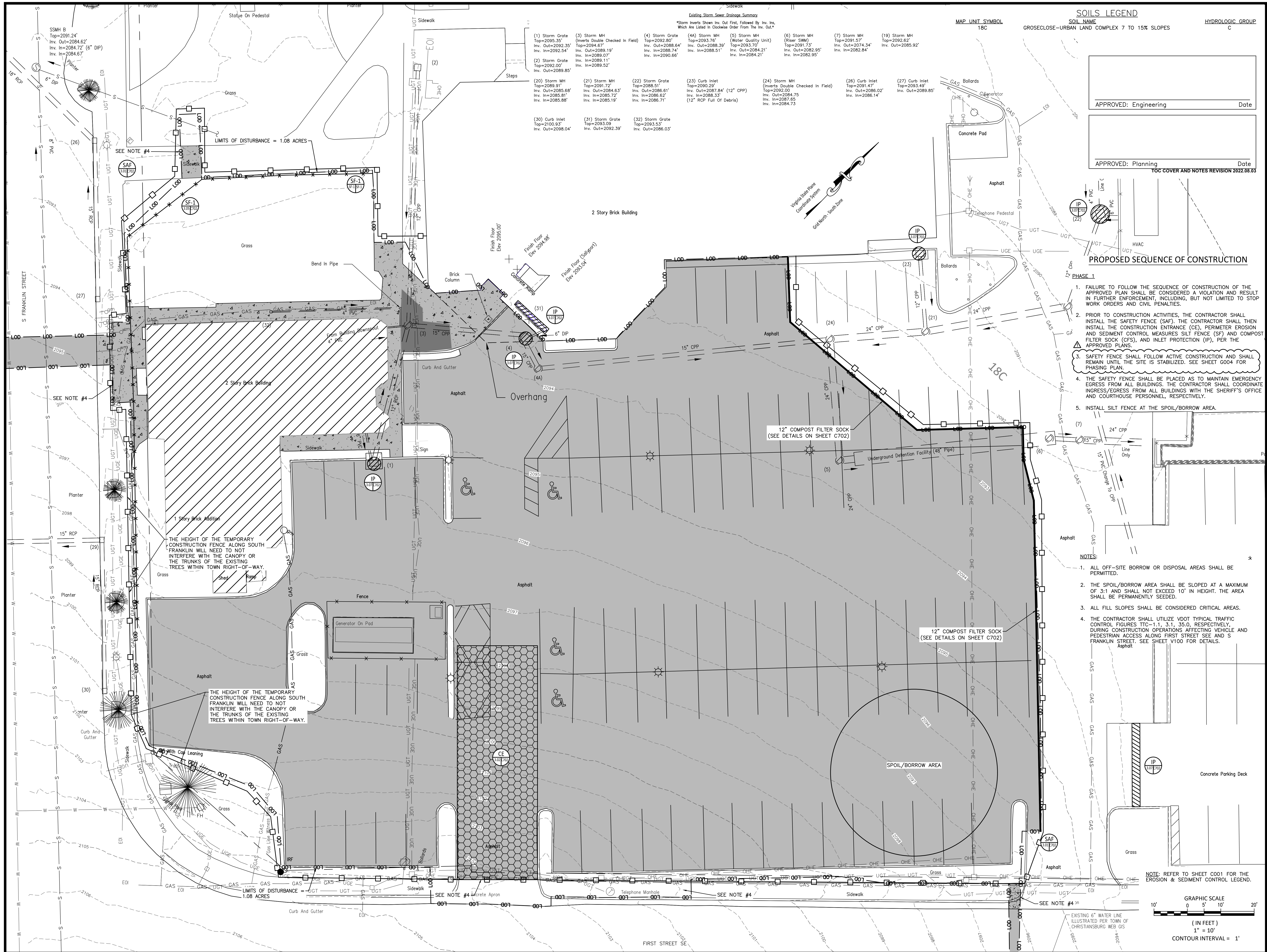
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Project No.
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THOMPSON & LITTON

Sheet No.
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Seal of the Commonwealth of Virginia
M. ANDREW MONK
Lic. No. 050716
Professional Engineer

MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES BUILDING

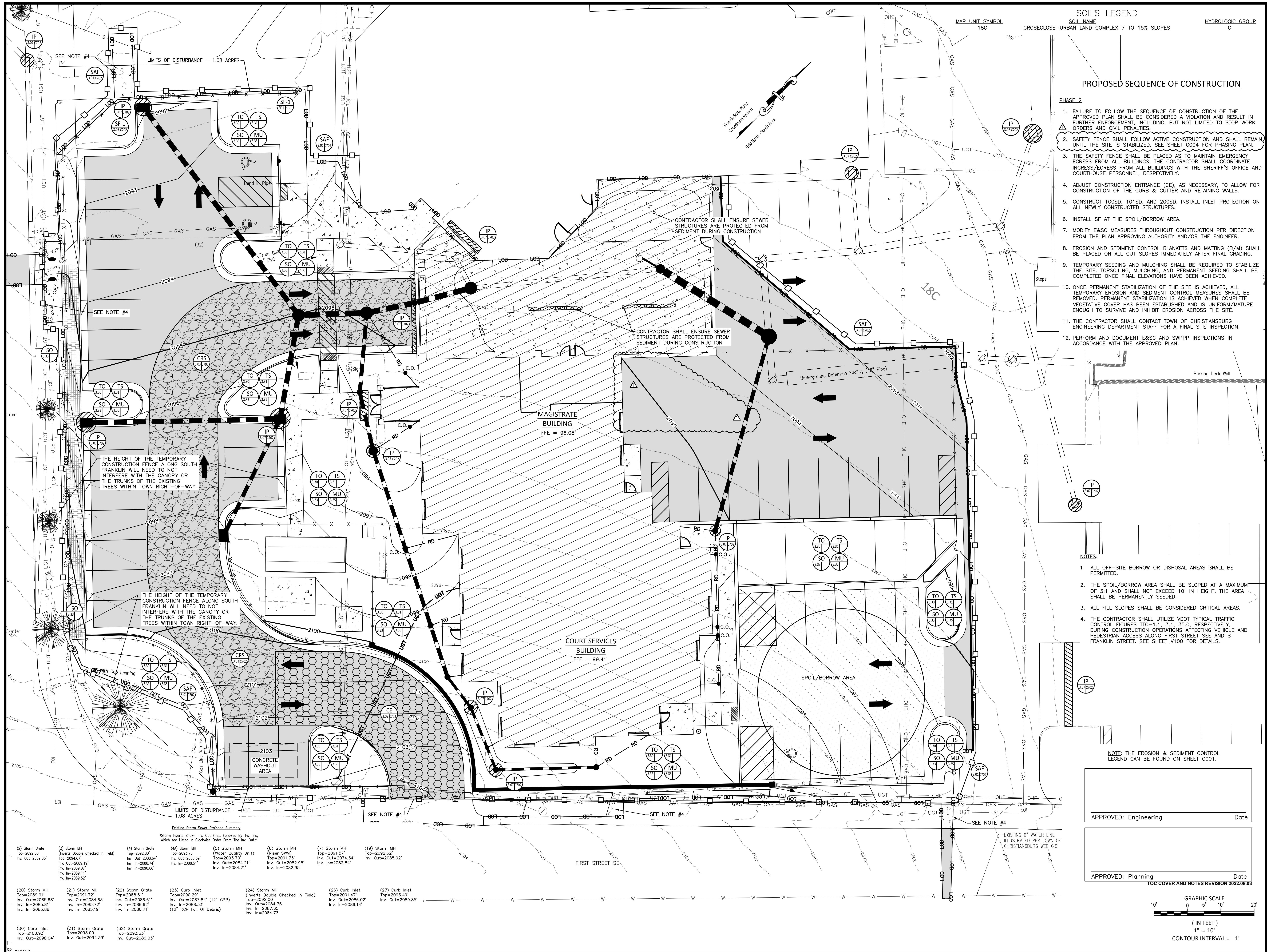
EROSION AND SEDIMENT CONTROL PLAN - PHASE 1

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THOMPSON & LITTON

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Seal

Montgomery County

Professional Engineer

M. Andrew Monk

Lic. No. 050716

10/11/2023

Montgomery County Magistrate and Court Services Building

Erosion and Sediment Control Plan - Phase 2

Designed: TCR

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Checked: MAM

Date: 10/11/2023

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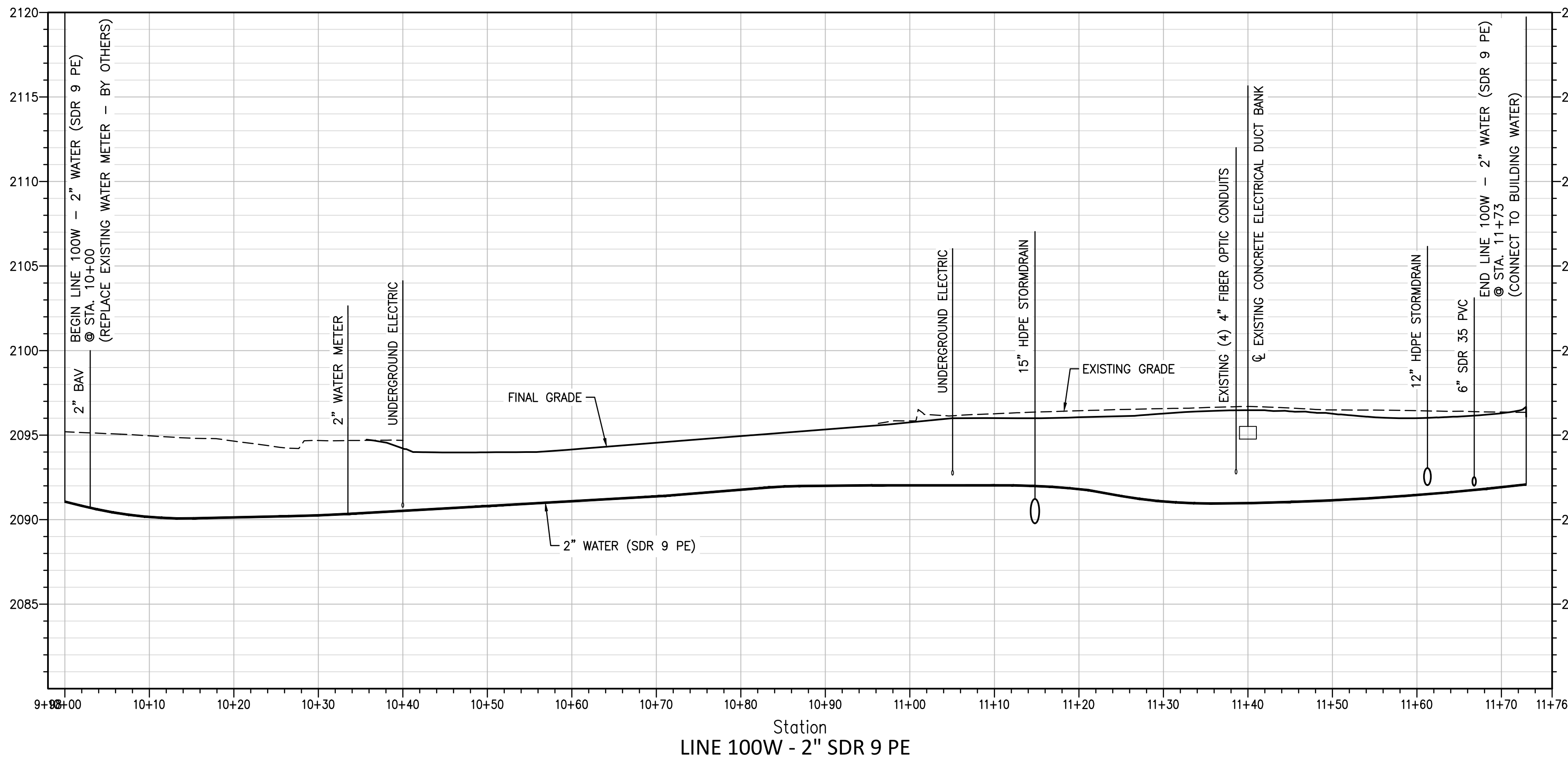
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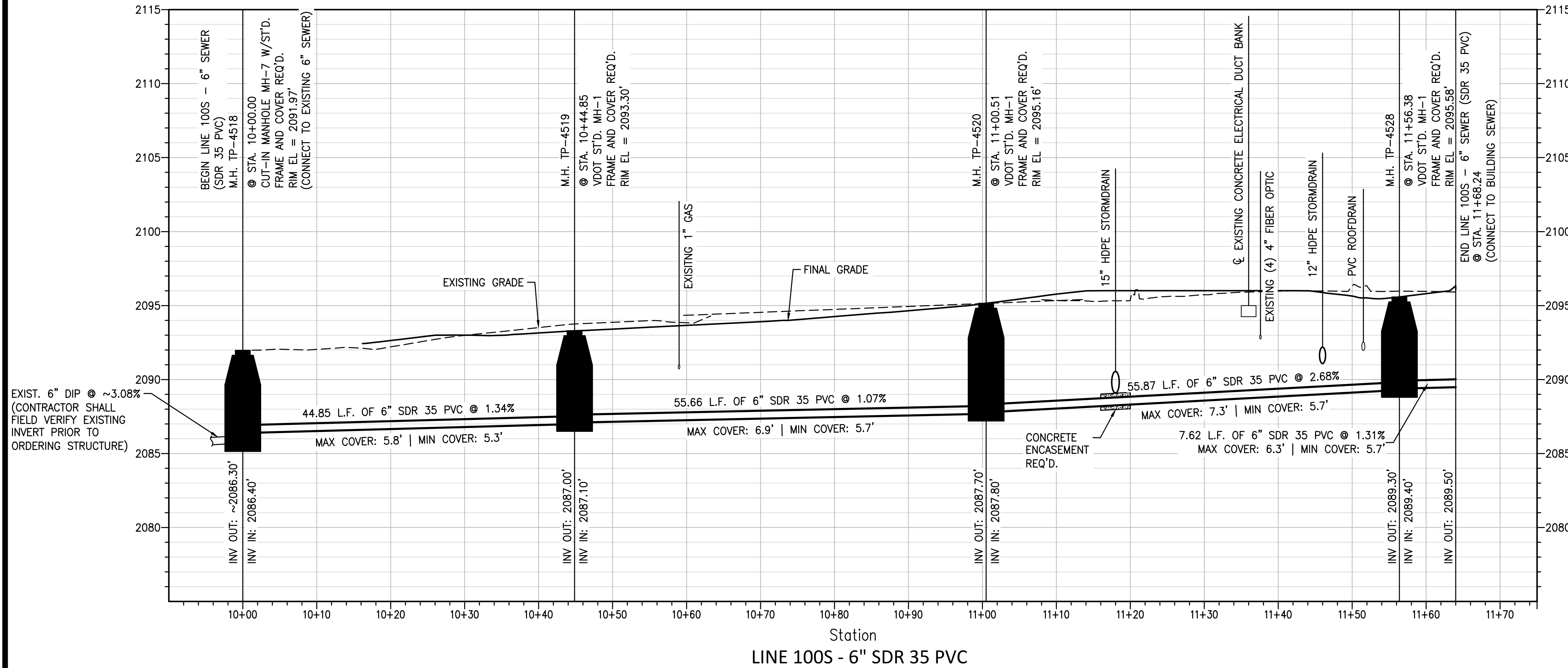
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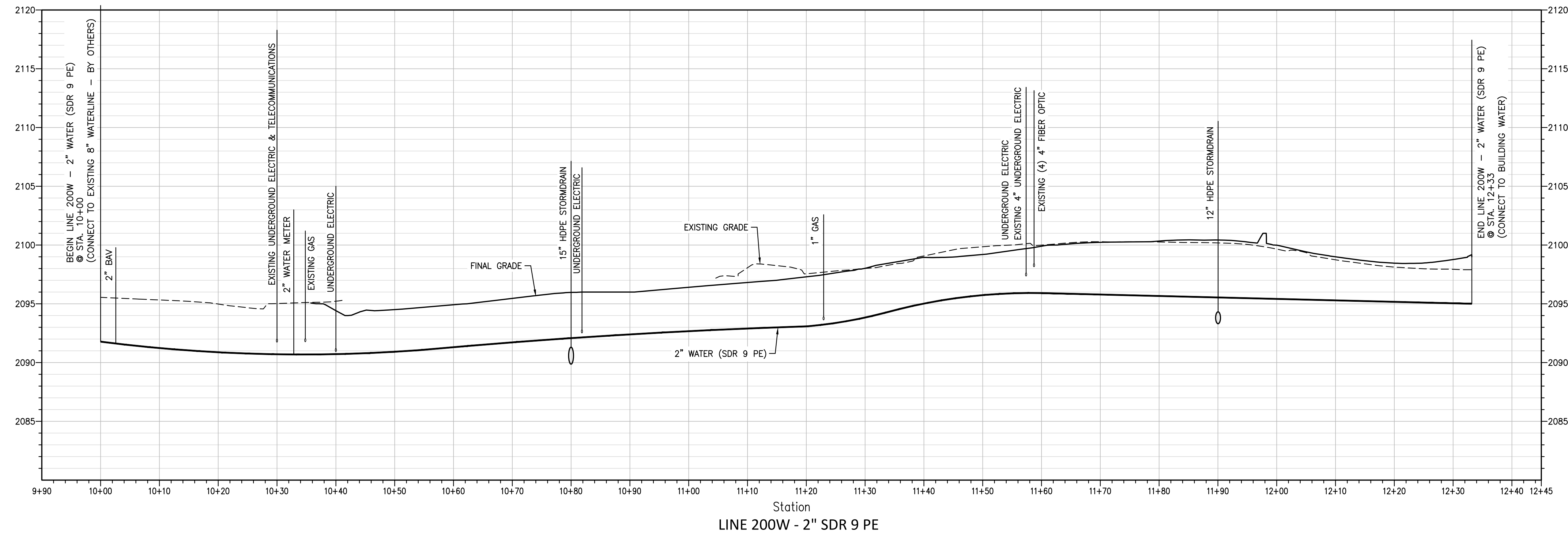
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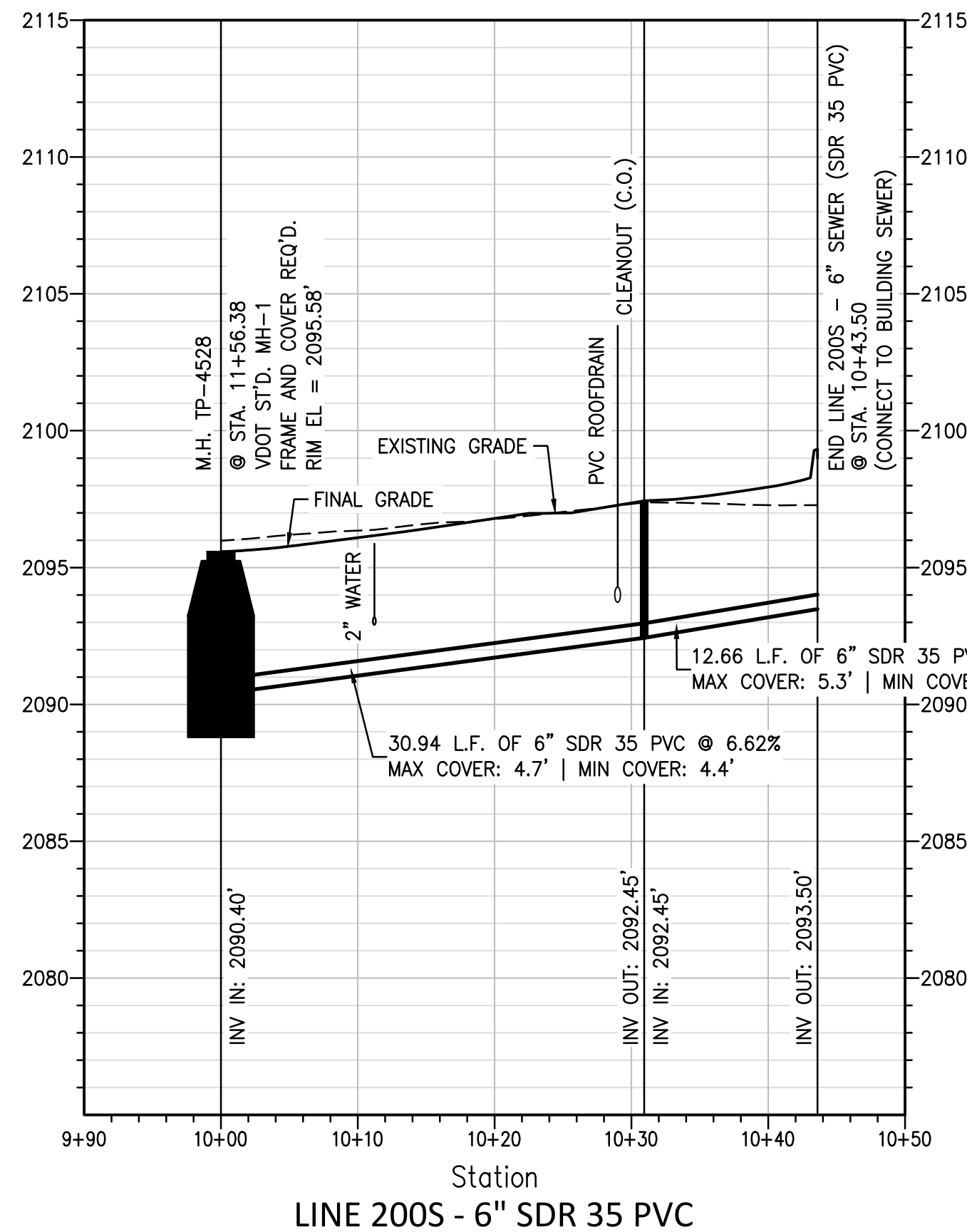
LINE 100W - 2" SDR 9 PE



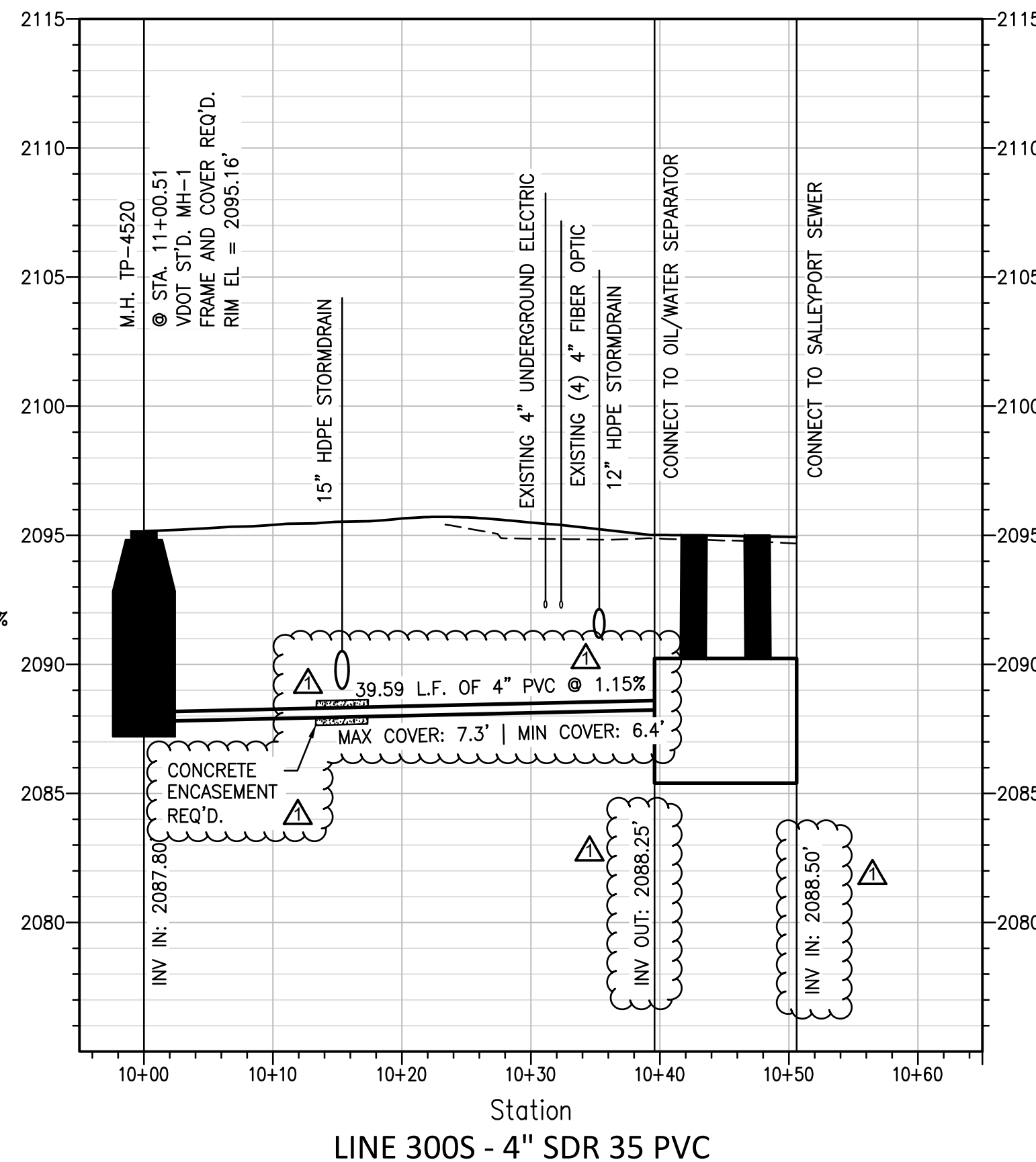
LINE 100S - 6" SDR 35 PVC



LINE 200W - 2" SDR 9 PE



LINE 200S - 6" SDR 35 PVC



LINE 300S - 4" SDR 35 PVC

NOTES:

- SANITARY SEWER LINES CONSTRUCTED PARALLEL TO WATER LINES SHALL BE CONSTRUCTED AT LEAST 10 FEET HORIZONTALLY FROM THE WATER LINE WHENEVER POSSIBLE.
- WHEN LOCAL CONDITIONS PREVENT A HORIZONTAL SEPARATION OF AT LEAST 10 FEET, THE WATER LINE MAY BE LAID CLOSER TO A SANITARY SEWER LINE OR SANITARY SEWER MANHOLE PROVIDED THAT:
 - THE BOTTOM OF THE WATER LINE IS AT LEAST 18 INCHES ABOVE THE CROWN OF THE SANITARY SEWER.
 - WHERE THIS VERTICAL SEPARATION CANNOT BE OBTAINED, THE SANITARY SEWER SHALL BE CONSTRUCTED OF AWWA-APPROVED WATER PIPE PRESSURE TESTED IN PLACE TO 50 PSI, WITHOUT LEAKAGE, PRIOR TO BACKFILLING.
 - THE SANITARY SEWER MANHOLE SHALL BE OF WATERTIGHT CONSTRUCTION AND TESTED IN PLACE.
- WATER LINES CROSSING SANITARY SEWER LINES SHALL BE LAID TO PROVIDE A SEPARATION OF AT LEAST 18 INCHES BETWEEN THE BOTTOM OF THE WATER LINE AND THE TOP OF THE SANITARY SEWER WHENEVER POSSIBLE.

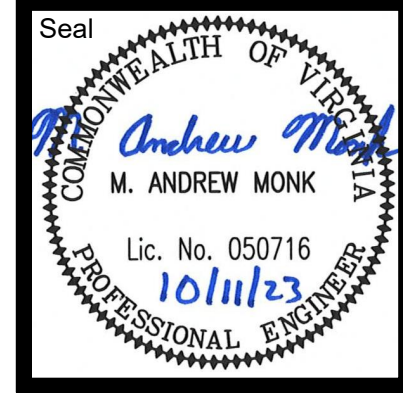
- WHEN LOCAL CONDITIONS PREVENT A VERTICAL SEPARATION OF AT LEAST 18 INCHES BETWEEN THE BOTTOM OF THE WATER LINE AND THE TOP OF SANITARY SEWER LINE, THE FOLLOWING CONSTRUCTION SHALL BE USED:
 - SANITARY SEWERS PASSING OVER OR UNDER WATER LINES SHALL BE CONSTRUCTED AS DESCRIBED IN SECTION 2 ABOVE.
 - SANITARY SEWERS PASSING OVER WATER LINES SHALL BE LAID TO PROVIDE:
 - VERTICAL SEPARATION OF AT LEAST 18 INCHES BETWEEN THE BOTTOM OF THE SANITARY SEWER AND TOP OF WATER LINE.
 - ADEQUATE STRUCTURAL SUPPORTS FOR THE SANITARY SEWER TO PREVENT EXCESSIVE DEFLECTION OF THE JOINTS AND SETTLING ON AND BREAKING THE WATER LINE.
 - MAXIMUM SEPARATION OF WATER LINE JOINTS FROM THE SANITARY SEWER LINE.

SCALE: 1" = 10' HORIZONTAL
1" = 5' VERTICAL

APPROVED: Engineering Date

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TGC COVER AND NOTES REVISION 2022.05.03



MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES
BUILDING

PROFILES - WATER AND SANITARY SEWER

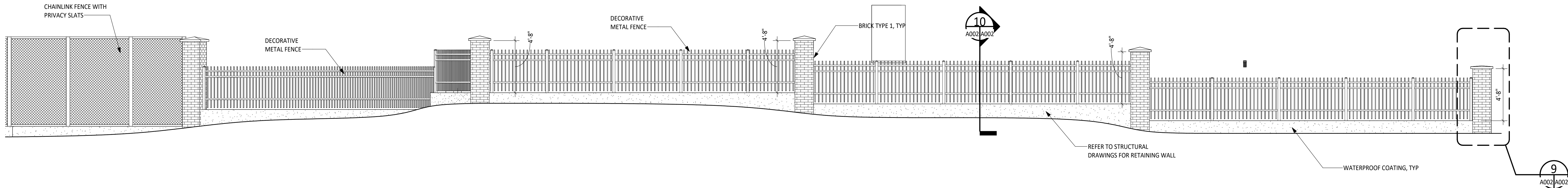
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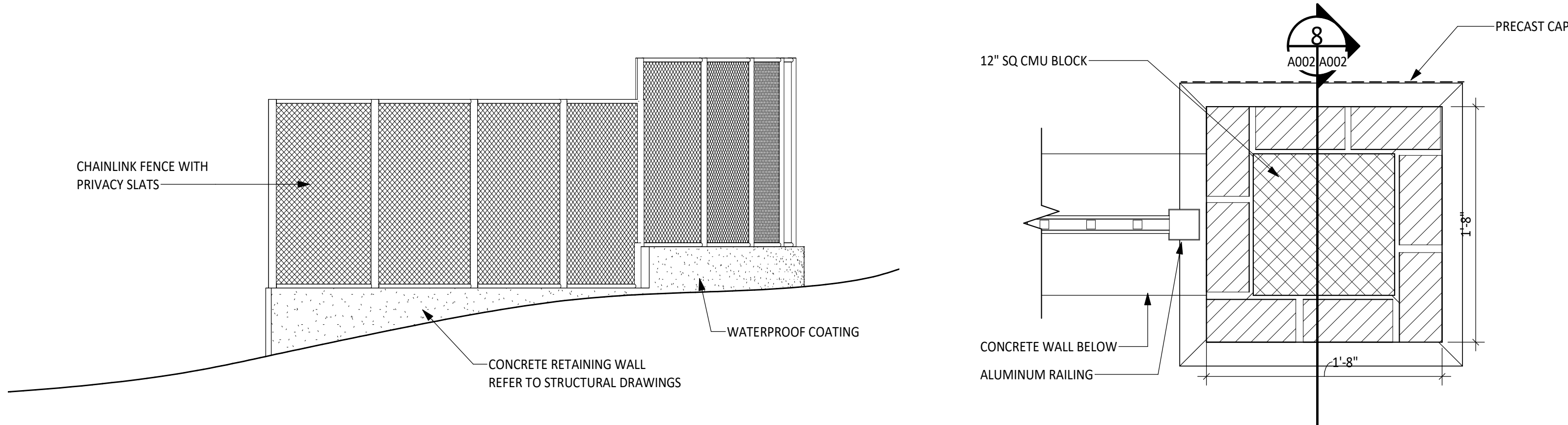
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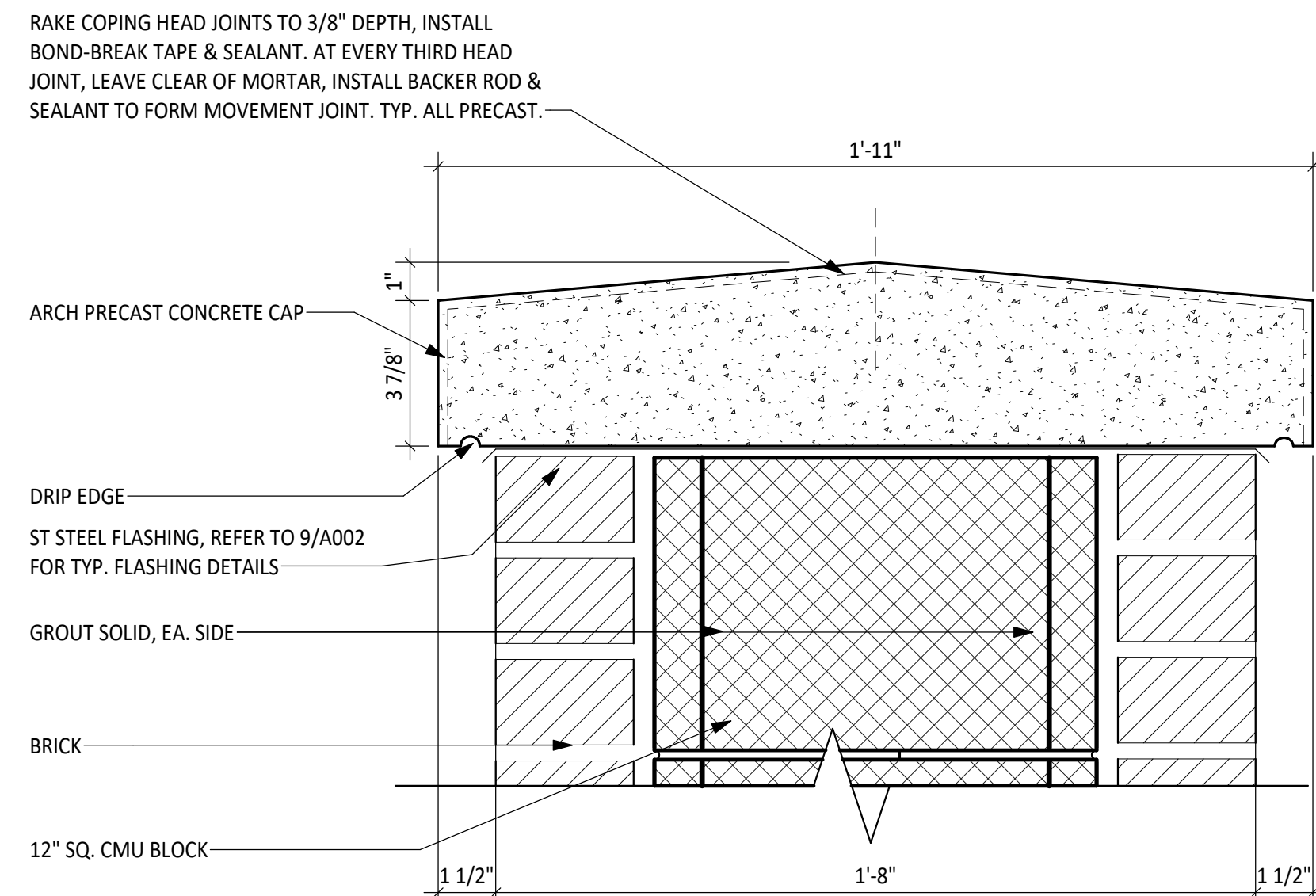


1 ELEVATION
SCALE: 1/4" = 1'-0"

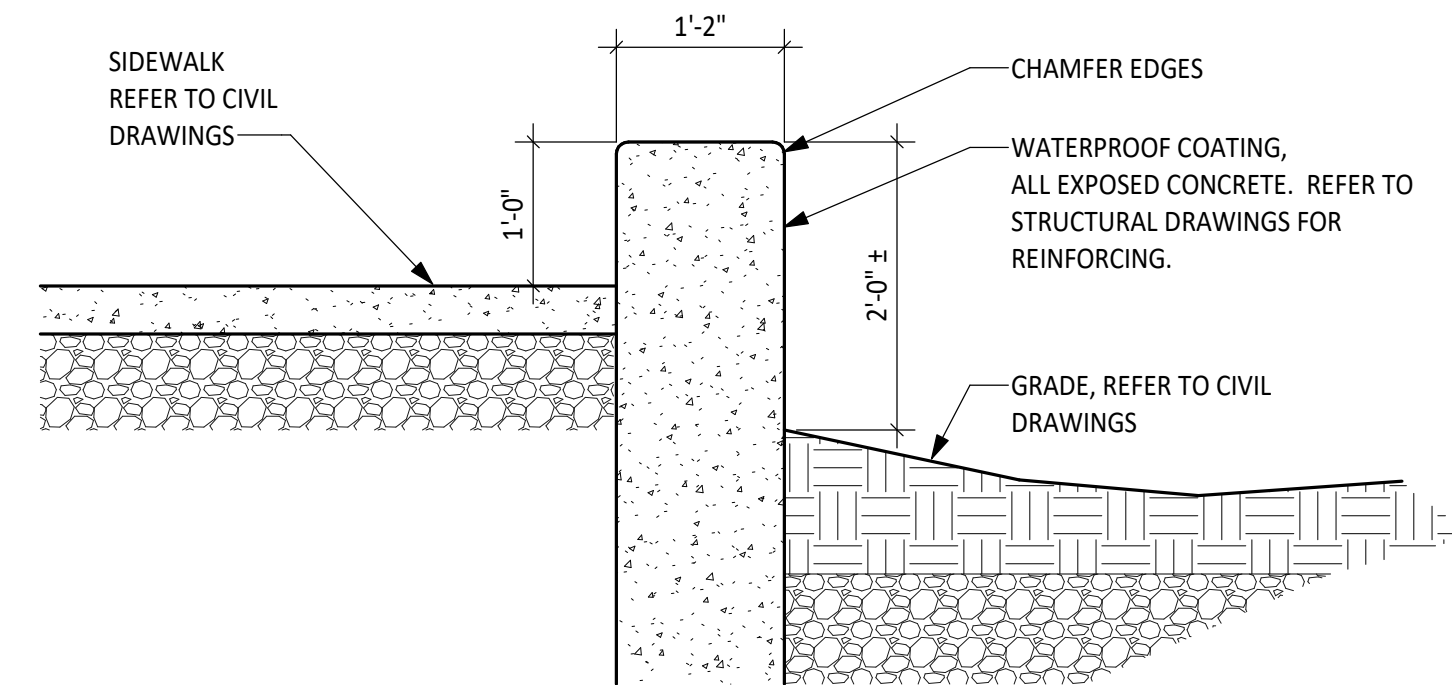


2 ELEVATION
SCALE: 1/4" = 1'-0"

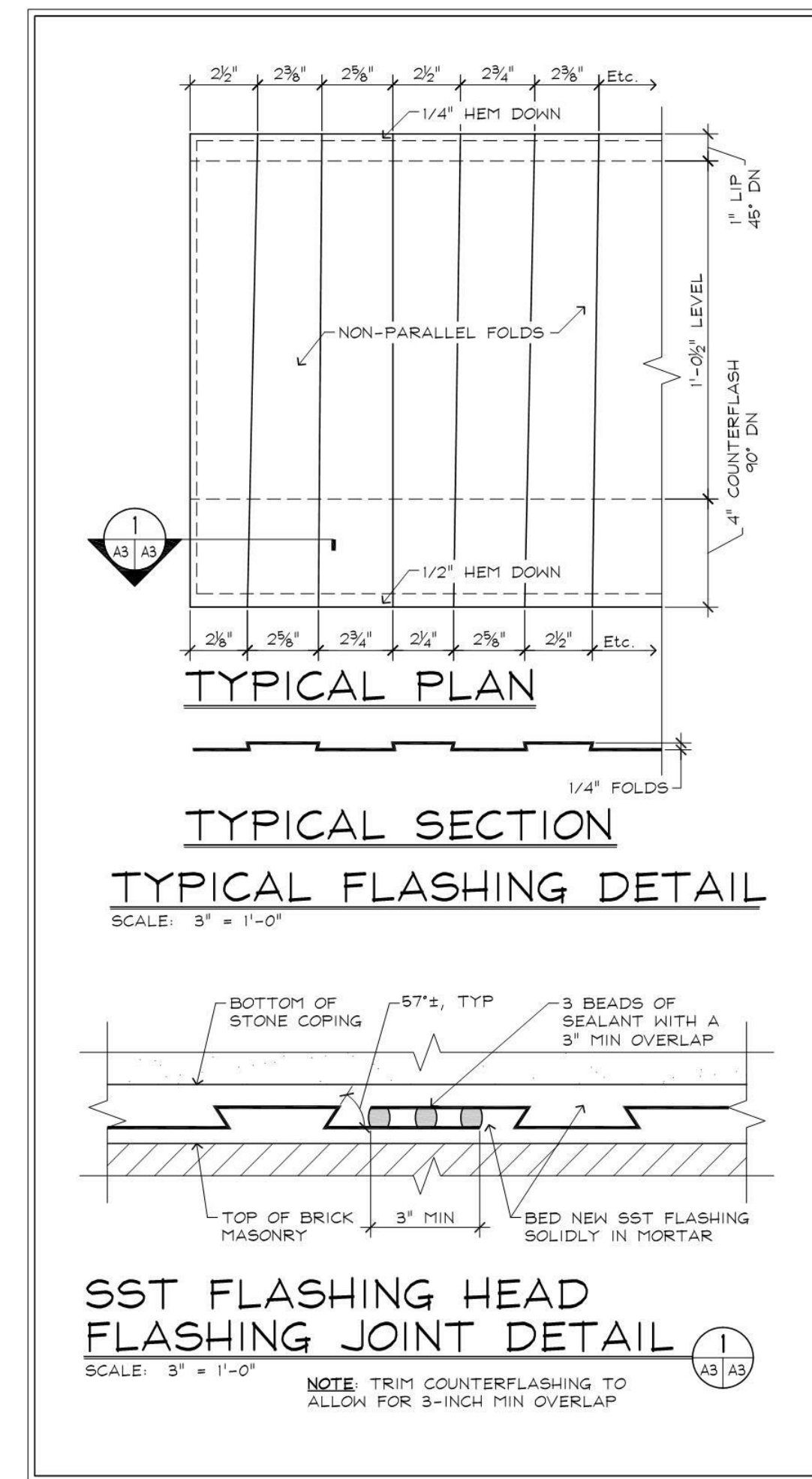
3 PLAN DETAIL
SCALE: 1 1/2" = 1'-0"



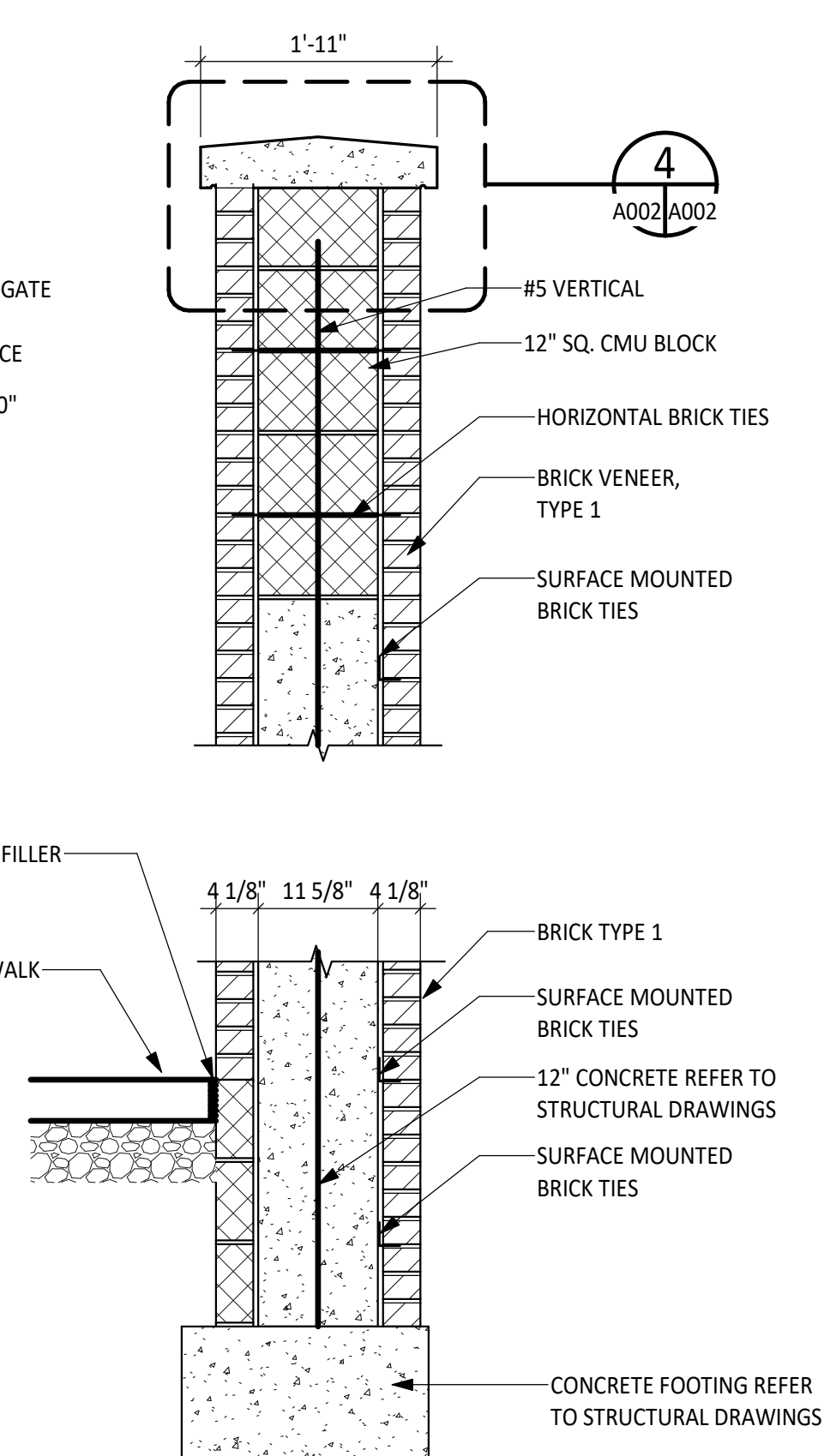
4 PRECAST CAP DETAIL
SCALE: 3" = 1'-0"



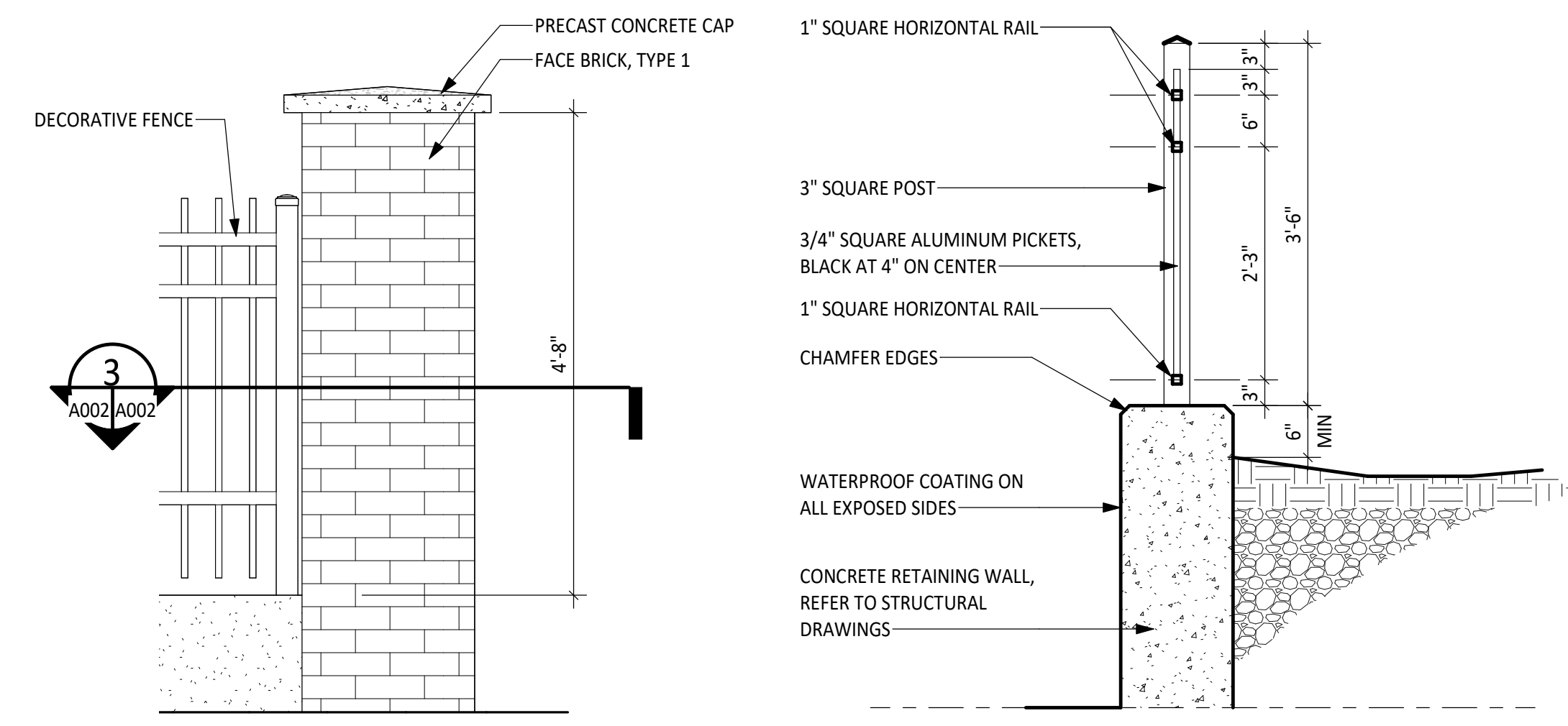
5 SIDEWALK RETAINING WALL DETAIL
SCALE: 3/4" = 1'-0"



6 TYP ST STEEL FLASHING UNDER PRECAST CAPS
SCALE: 3" = 1'-0"

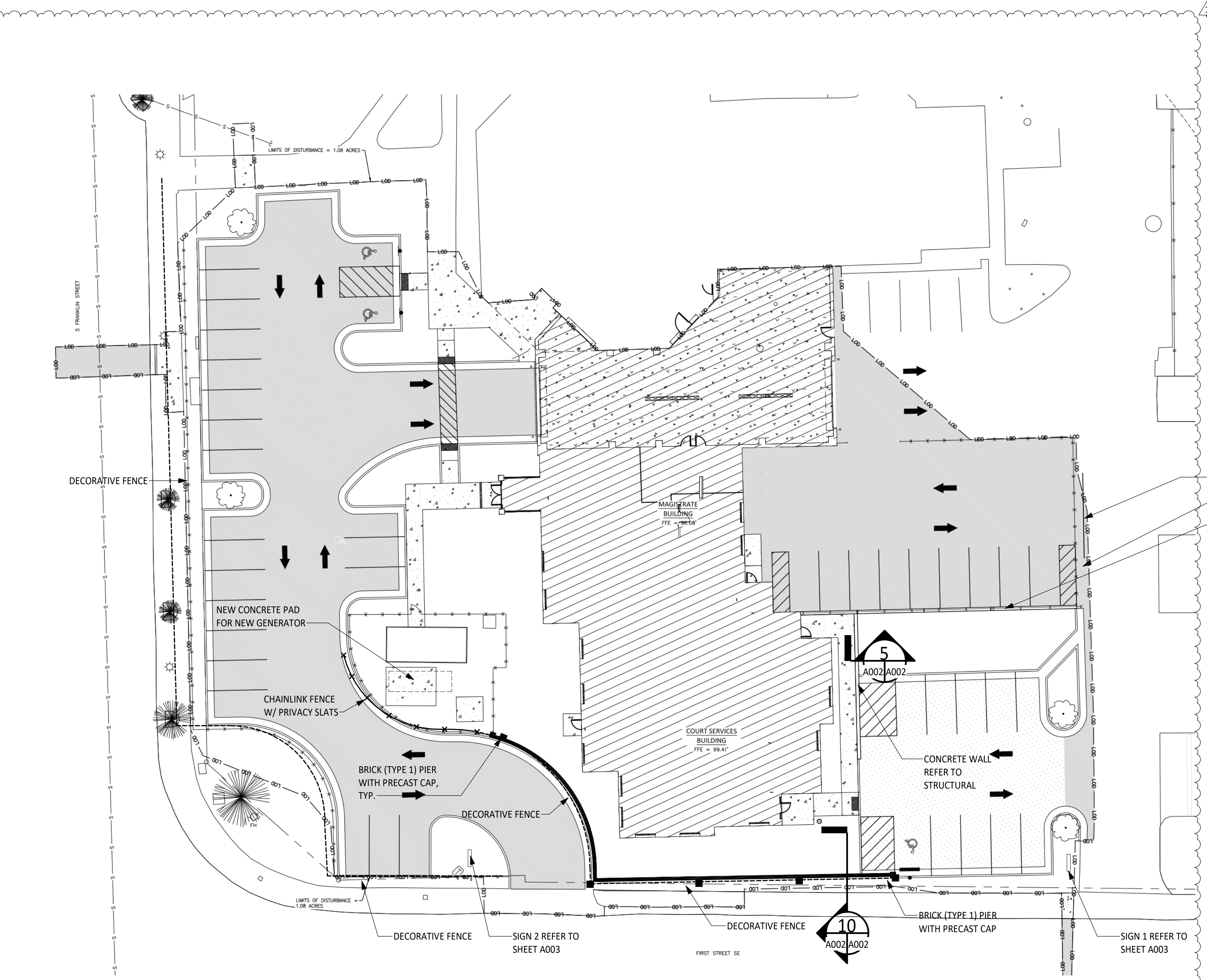


8 MASONRY PIER SECTION
SCALE: 3/4" = 1'-0"

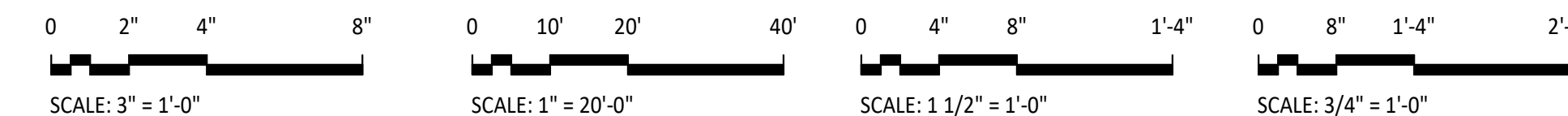


9 PIER ELEVATION
SCALE: 3/4" = 1'-0"

10 RAILING SECTION
SCALE: 3/4" = 1'-0"

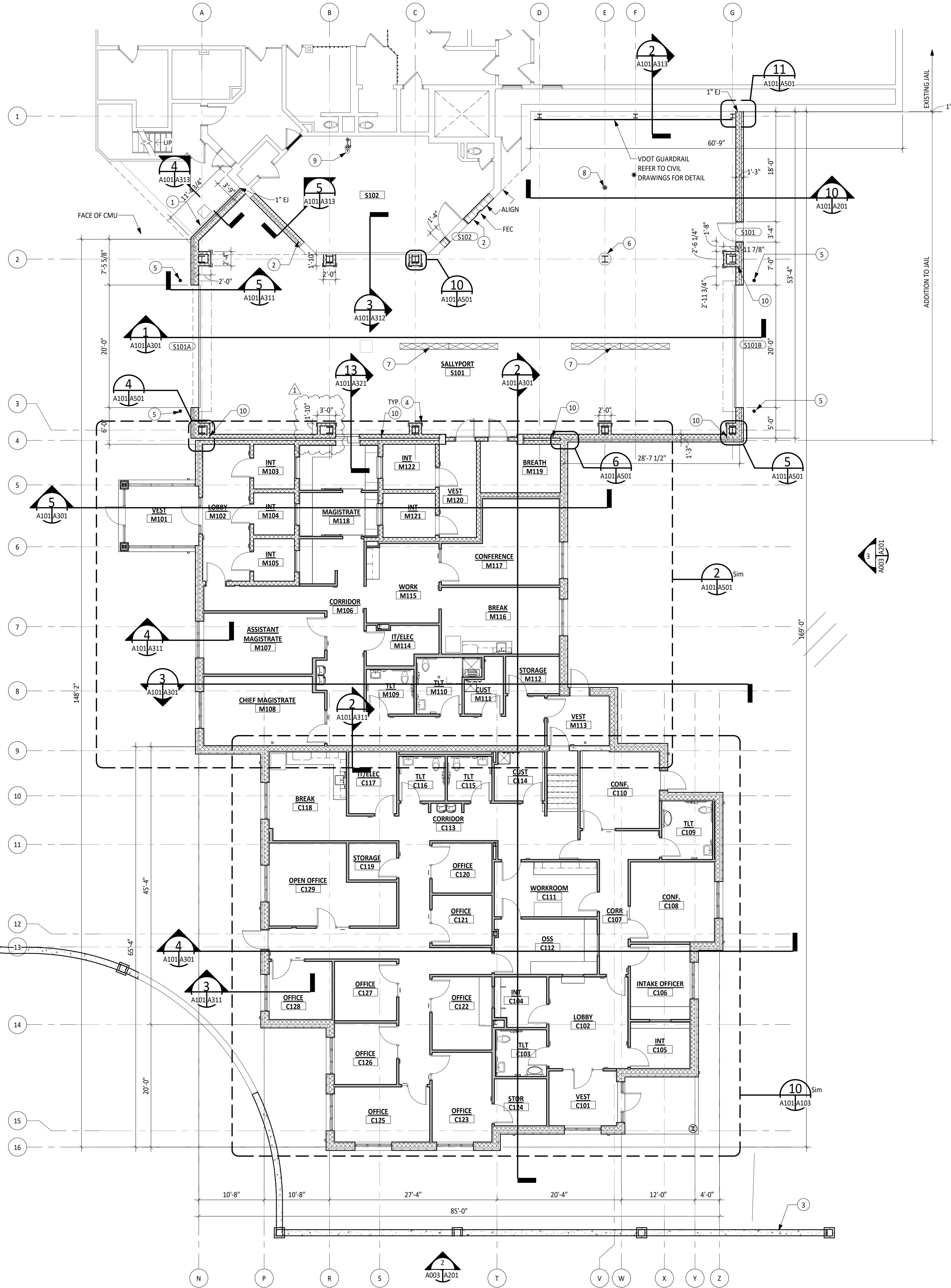


7 ARCHITECTURAL SITE PLAN
SCALE: 1" = 20'-0"



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FLOOR PLAN - OVERALL
1/8" = 1'-0"
PLAN NORTH



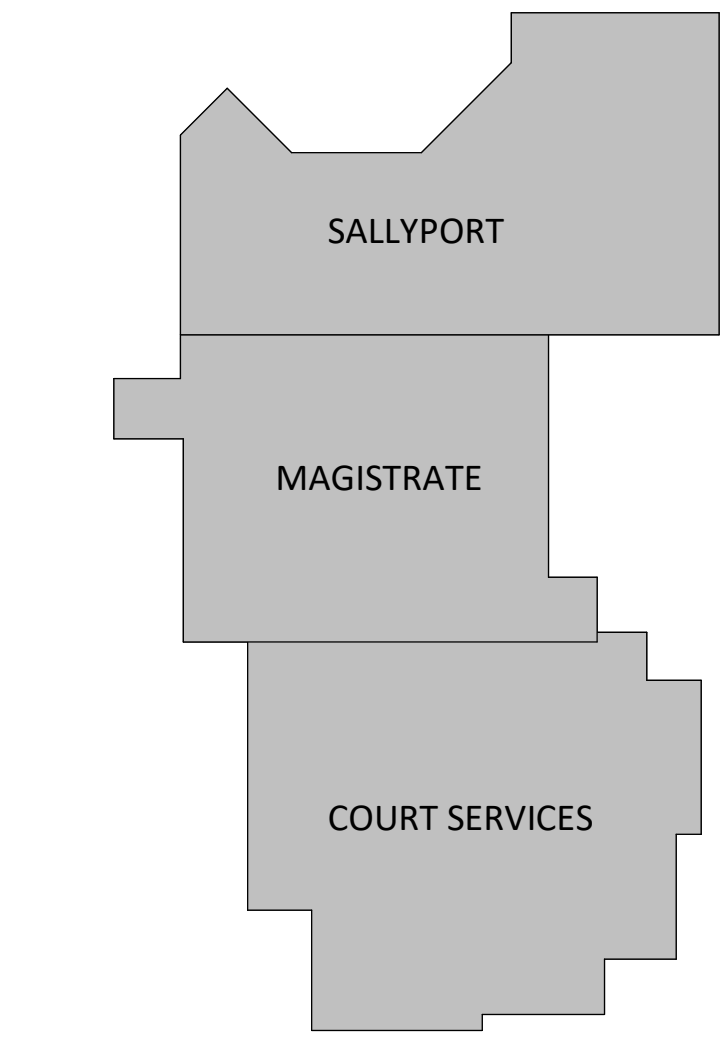
GENERAL CONSTRUCTION NOTES:

- ALL WORK SHALL BE PERFORMED IN OBSERVANCE OF LOCAL, STATE, AND FEDERAL CODES AND REGULATIONS.
- EXISTING CONDITIONS SHOWN HEREIN WERE TAKEN FROM SITE OBSERVATIONS AND COMPLETE OR PARTIAL SETS OF ORIGINAL DESIGN DRAWINGS WHEN MADE AVAILABLE. ANY DISCREPANCIES BETWEEN THE DRAWINGS AND ACTUAL BUILT CONDITIONS ARE TO BE REPORTED TO THE ARCHITECT PRIOR TO COMMENCEMENT OF WORK.
- LOOSE FURNISHINGS, APPLIANCES, AND EQUIPMENT ARE NOT INCLUDED WITHIN THIS PROJECT'S SCOPE (NIC), UNLESS OTHERWISE NOTED.
- DO NOT "SCALE" DRAWINGS. USE DIMENSIONAL INFORMATION PROVIDED ONLY. FOR DIMENSIONS NOT SHOWN OR IN QUESTION, CONTRACTOR SHALL REQUEST CLARIFICATION FROM ARCHITECT PRIOR TO PROCEEDINGS.
- ALL INTERIOR PARTITIONS ARE PARTITION TYPE 'A1' (UON).
- ALL DIMENSIONS NOTED AS "CLEAR," ARE FROM FACE OF FINISH TO FACE OF FINISH.
- PROVIDE CONCEALED WOOD BLOCKING AT LOCATIONS OF WALL-MOUNTED EQUIPMENT, CASEWORK, SHELVING, AND TOILET ACCESSORIES.
- ALL SIDEWALKS LOCATED ALONG ACCESSIBLE ROUTE SHALL HAVE A 5% MAXIMUM SLOPE UNLESS OTHERWISE INDICATED AS A RAMP.
- REFER TO ENLARGED FLOOR PLANS FOR PARTITION TYPES, DIMENSIONS, AND RELEVANT CONSTRUCTION RELATED FEATURES AND EQUIPMENT IN THOSE AREAS.
- REFER TO LIFE SAFETY DRAWINGS FOR LOCATIONS OF FIRE-RATED CONSTRUCTION AND FIRE EXTINGUISHER LOCATIONS.
- ALL DOORS LOCATED IN STUD PARTITIONS ARE TO BE LOCATED 4" FROM AN ADJACENT WALL TO THE BACK OF THE FRAME OR CENTERED BETWEEN 2 ADJACENT WALLS UNLESS OTHERWISE NOTED.
- ALL DOORS LOCATED IN MASONRY CONSTRUCTION ARE TO BE LOCATED 8" FROM AN ADJACENT WALL OR CENTERED BETWEEN 2 ADJACENT WALLS UNLESS OTHERWISE NOTED.
- PROVIDE MINIMUM 1'-6" CLEAR ON PULL SIDE OF DOORS BETWEEN JAMB AND INTERSECTING WALL ON LATCH SIDE OF DOOR. PROVIDE 1'-0" CLEAR ON PUSH SIDE OF DOOR BETWEEN JAMB AND INTERSECTING WALL ON LATCH SIDE OF DOOR FOR ALL DOORS WITH BOTH A LATCH AND A CLOSER.
- PROVIDE CONCRETE EQUIPMENT PADS FOR ALL EQUIPMENT INDICATED TO BE MOUNTED OR OTHERWISE REQUIRED TO BE MOUNTED TO THE FLOOR. REFER TO STRUCTURAL DRAWINGS FOR EQUIPMENT PAD CONSTRUCTION REQUIREMENTS.

CONSTRUCTION NOTES: (THIS SHEET ONLY)

OCCURS WHERE (B) ARE INDICATED ON DRAWINGS.

- EDGE OF EXISTING CONCRETE LANDING.
- REMOVE EXISTING OVERHEAD DOOR, ASSOCIATED HARDWARE AND JAMBS. INFILL OPENING WITH NEW BRICK TO MATCH EXISTING (TYPE 2) AND CMU BACK UP TO MATCH EXISTING WALL THICKNESS.
- REFER TO SHEET A002 FOR SITE WALL.
- PROVIDE 4x4x1/4 STEEL ANGLE, 8'-0" HIGH. START 4" ABOVE FLOOR. INSTALL WITH 1/4" CONCRETE SCREW AT 16" ON CENTER WITH 1" MINIMUM EMBEDMENT, 3 1/2" FROM CORNER AT EACH CMU PER CORNER IN SALLYPORT.
- 6" BOLLARD. REFER TO CIVIL DRAWINGS FOR DETAILS C703. TOTAL OF FOUR (4).
- PROVIDE WATERPROOF COATING ON ALL EXPOSED CONCRETE COLUMNS.
- TRENCH DRAIN. REFER TO PLUMBING DRAWINGS.
- FLOOR DRAIN. REFER TO PLUMBING DRAWINGS.
- EMERGENCY SHOWER/EYEWASH. REFER TO PLUMBING DRAWINGS.
- CMU CONTROL JOINT. REFER TO A001 FOR CONTROL JOINT DETAILS.



KEY PLAN

0 4' 8' 16'
SCALE: 1/8" = 1'-0"



MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES BUILDING

OVERALL FLOOR PLAN

No. 1 Date: 11/17/2023 Purpose of Document Issue: ADDENDUM NO. 2

Designed: EFS
Drawn: TWMM
Checked: EFS
Date: 10/11/2023

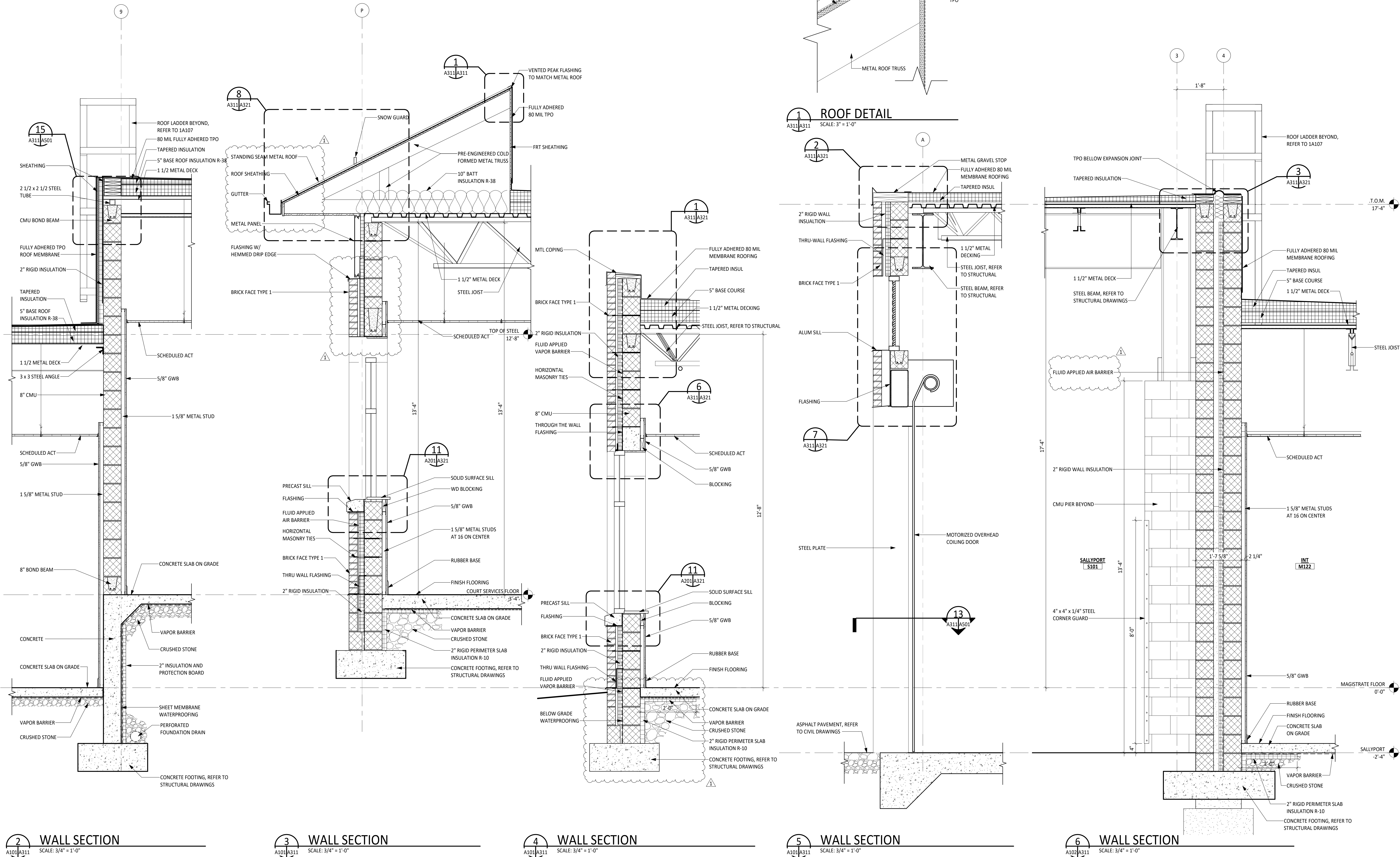
Project No. 16910



Sheet No.

A101

File Name: C:\Users\kathryn_foster\Documents\16910 MC Magistrate Court Services_v22_kfoster\W098B.rvt Date/Time: 11/17/2023 3:59:47 PM



MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES BUILDING

WALL SECTIONS

Project No. 16910
Date 11/17/2023
Checked EFS
Designed EFS
Purpose of Document Issue
ADDENDUM NO. 2

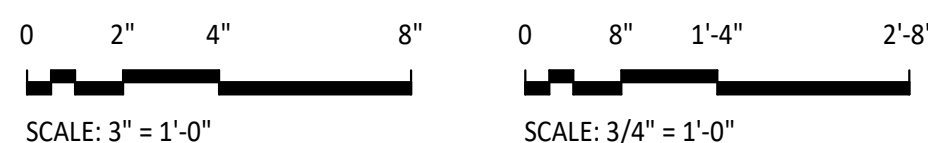
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Drawn TWMM
Checked EFS
Date 10/11/2023

Project No. 16910

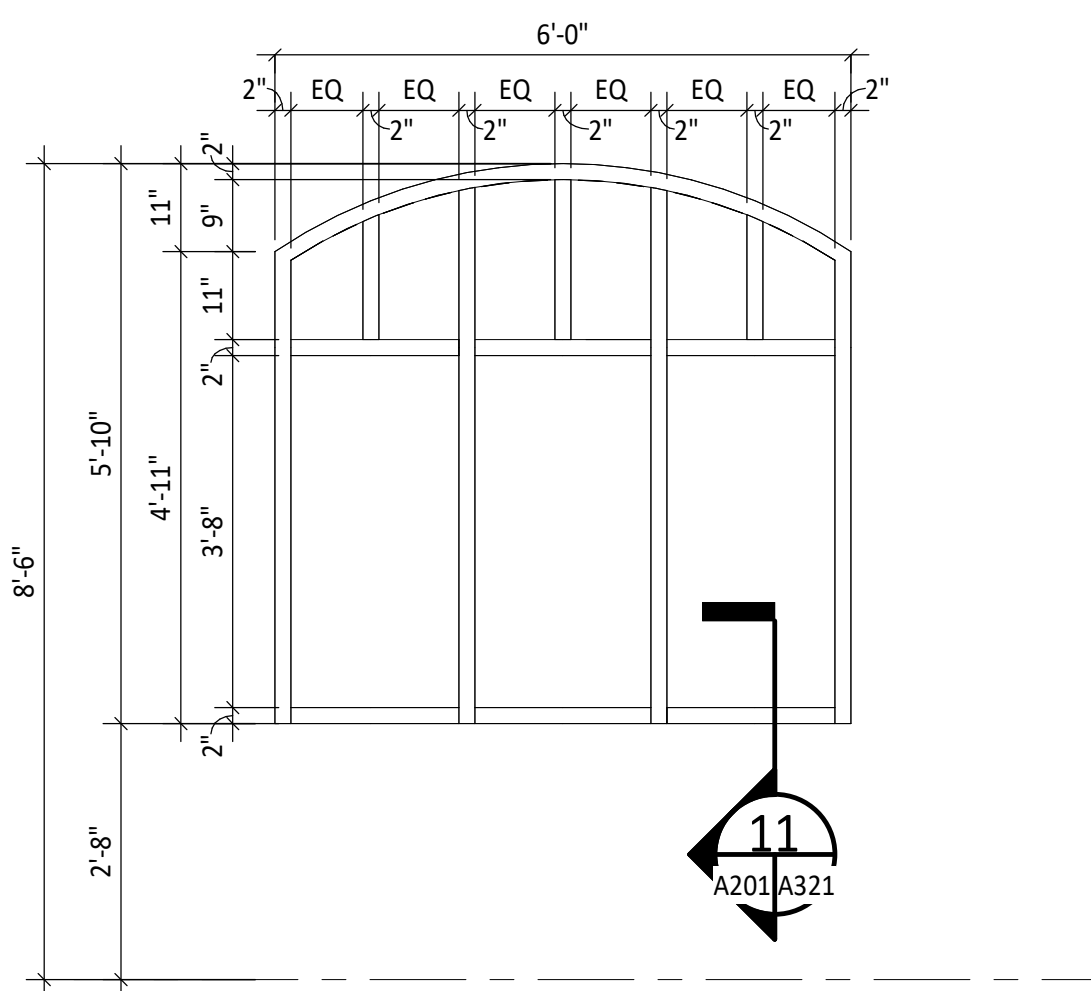


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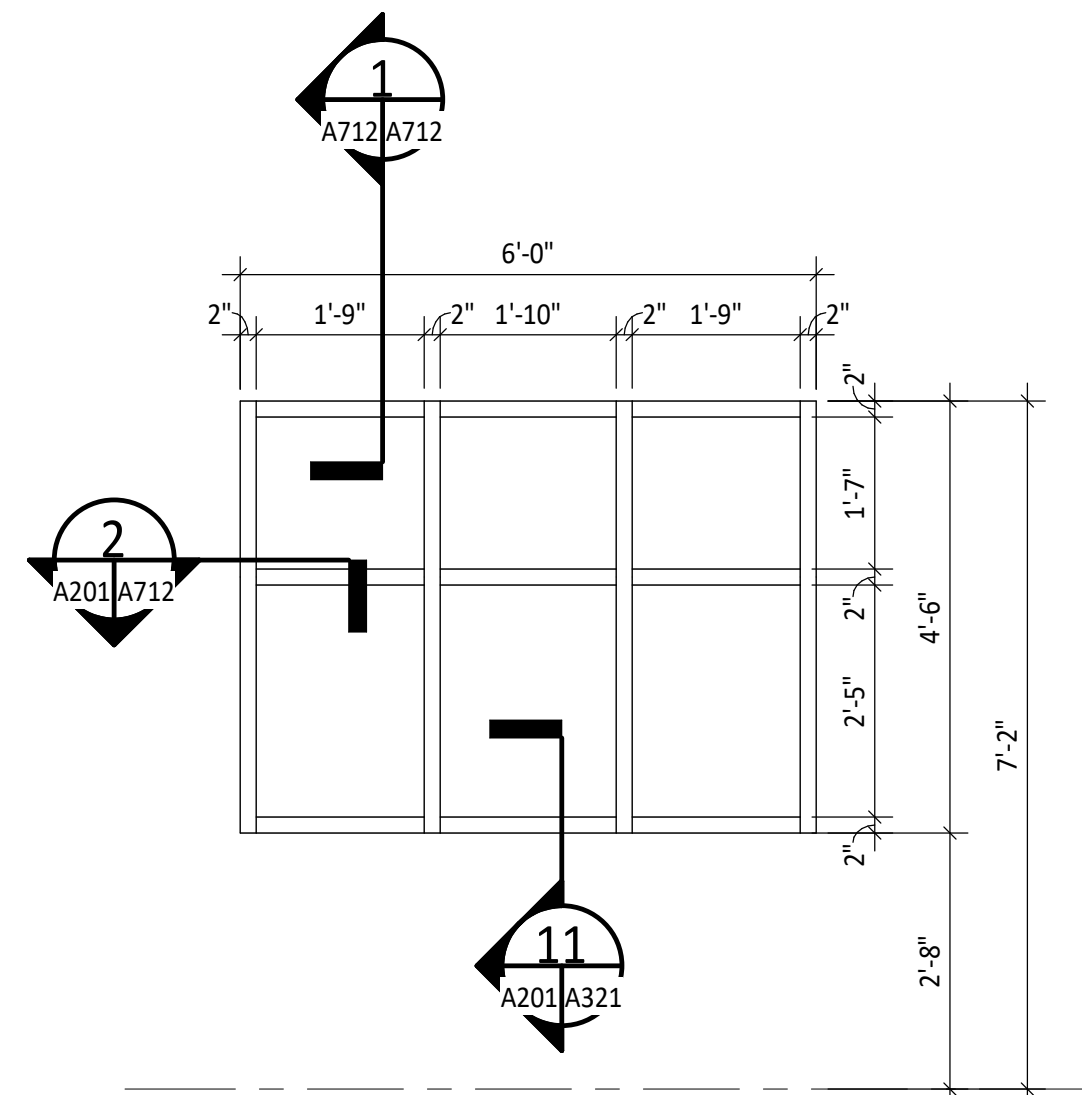
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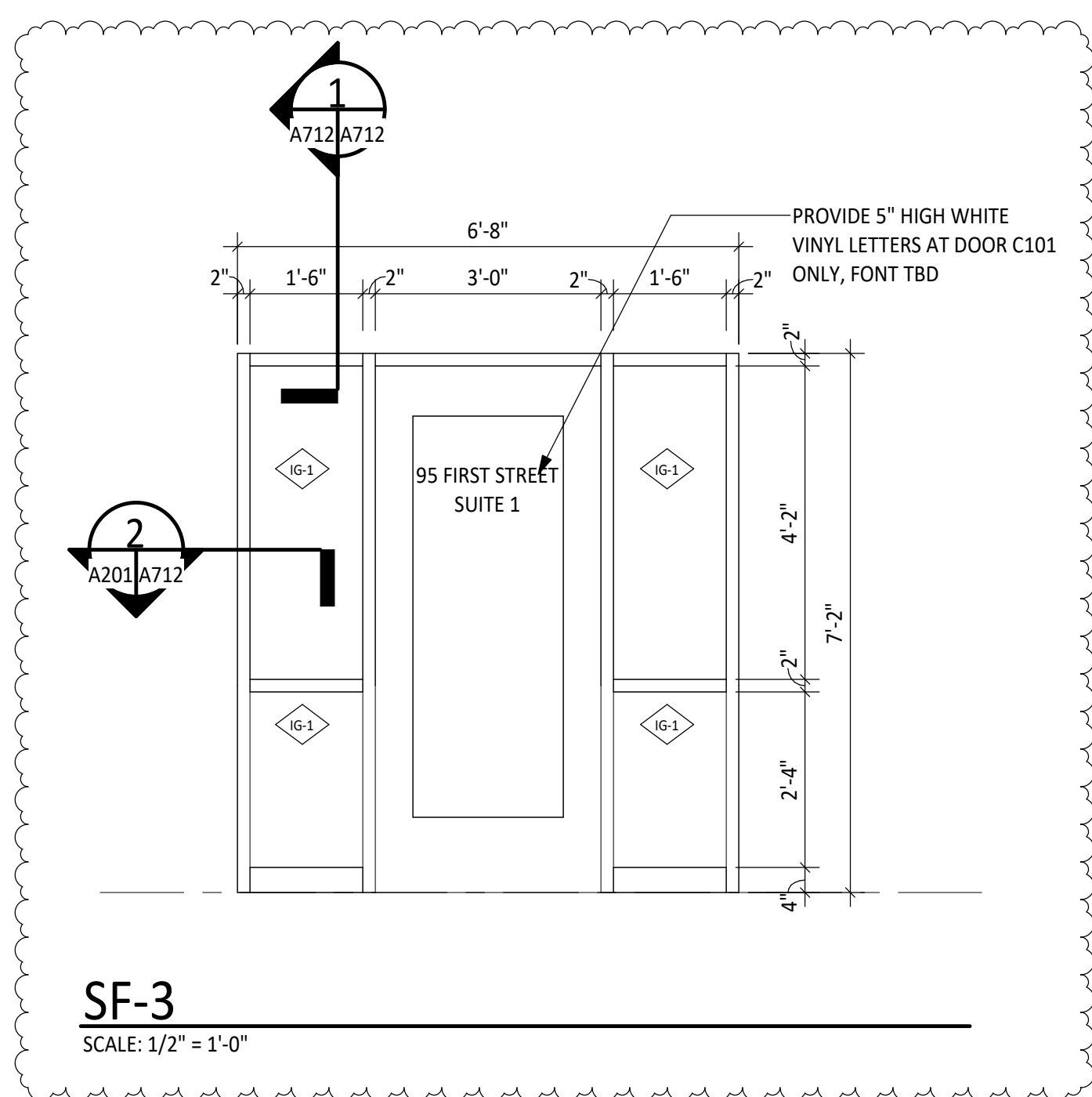
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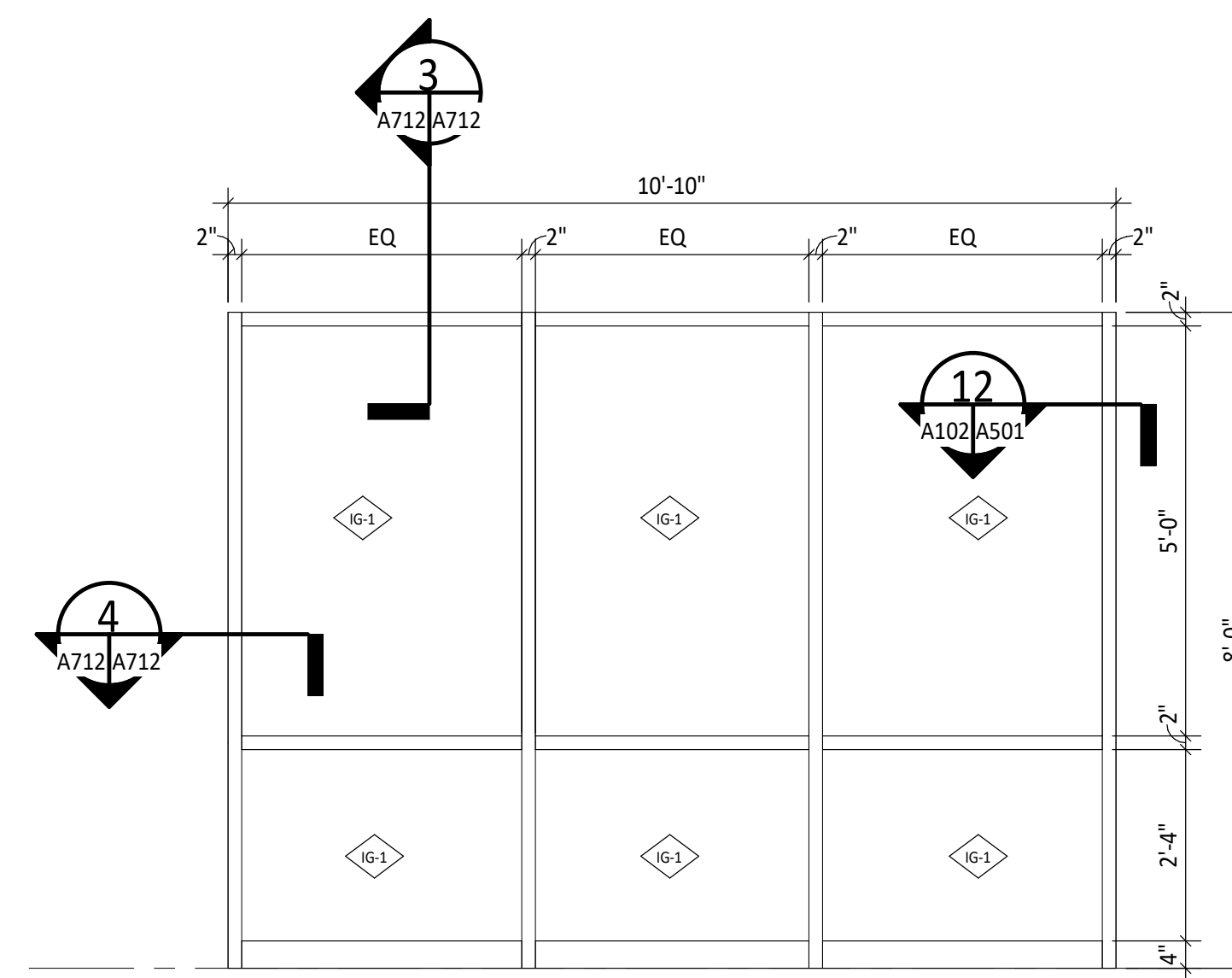
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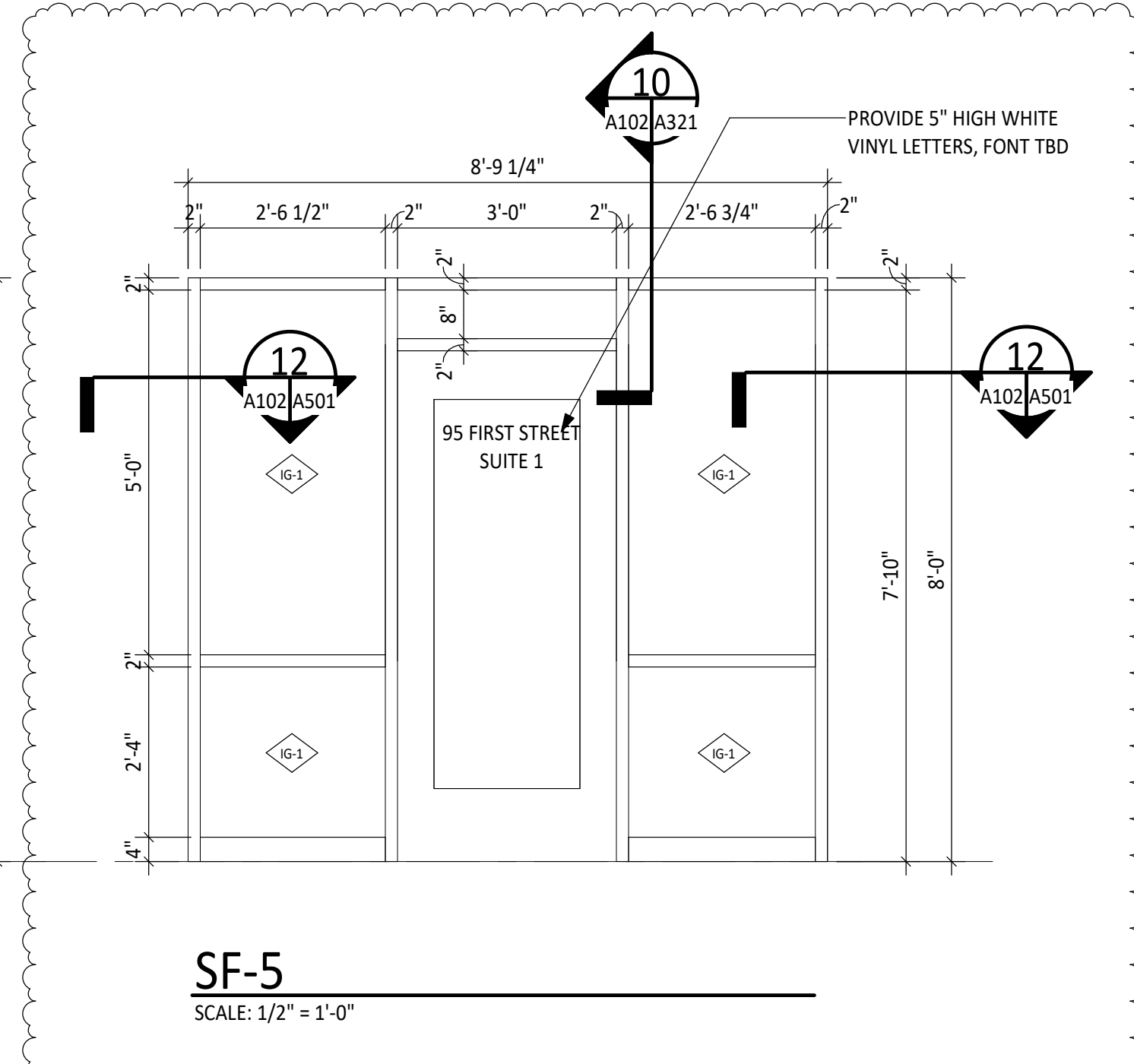
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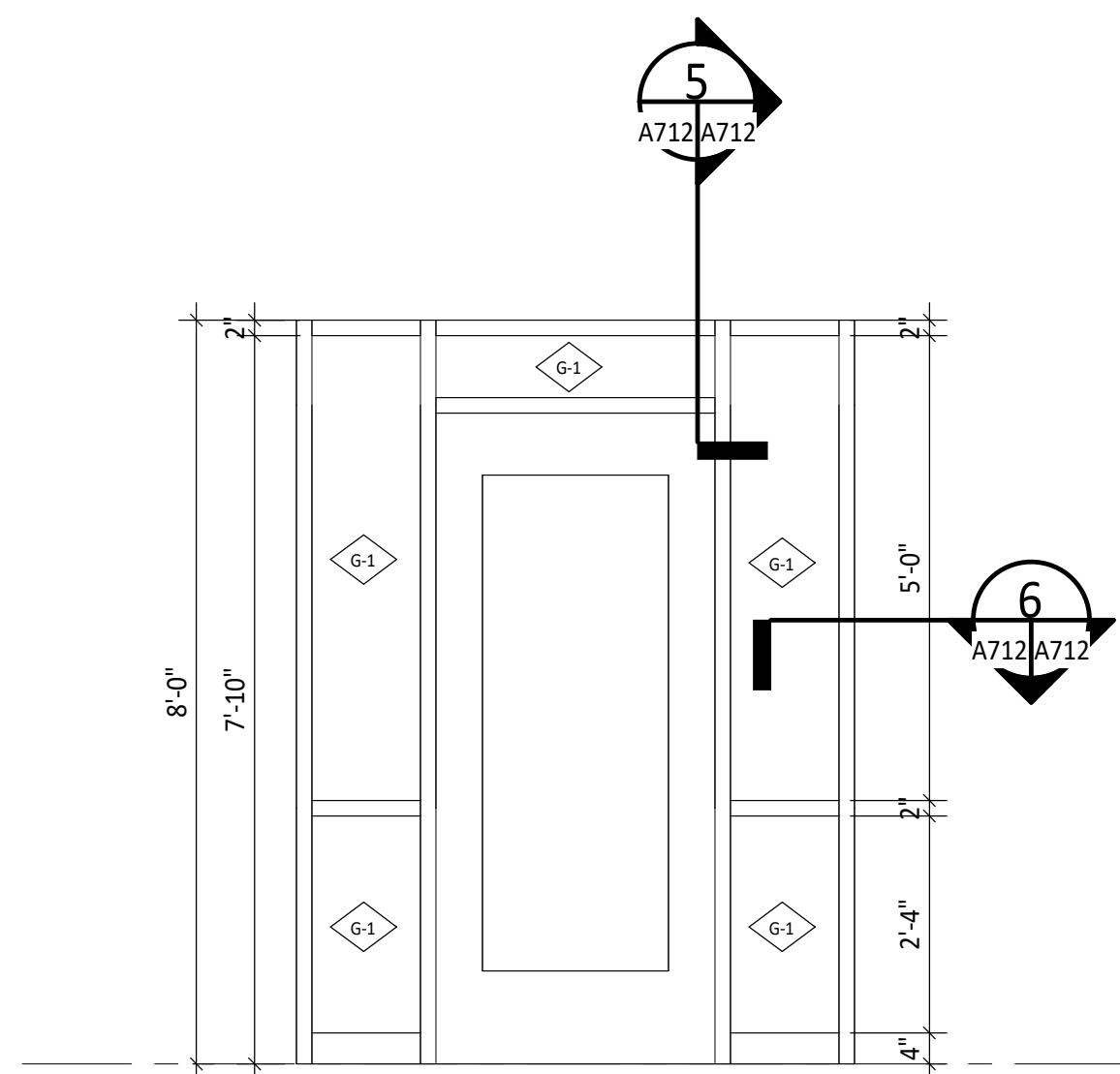
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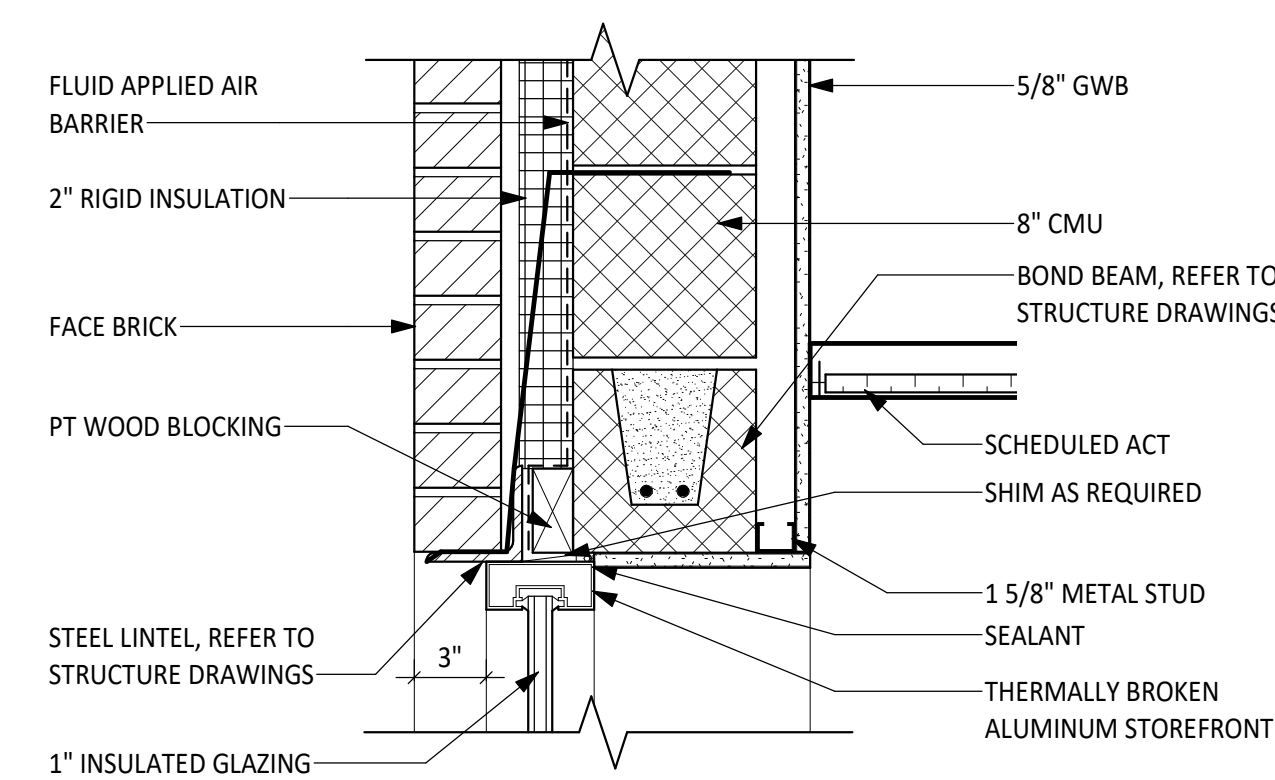
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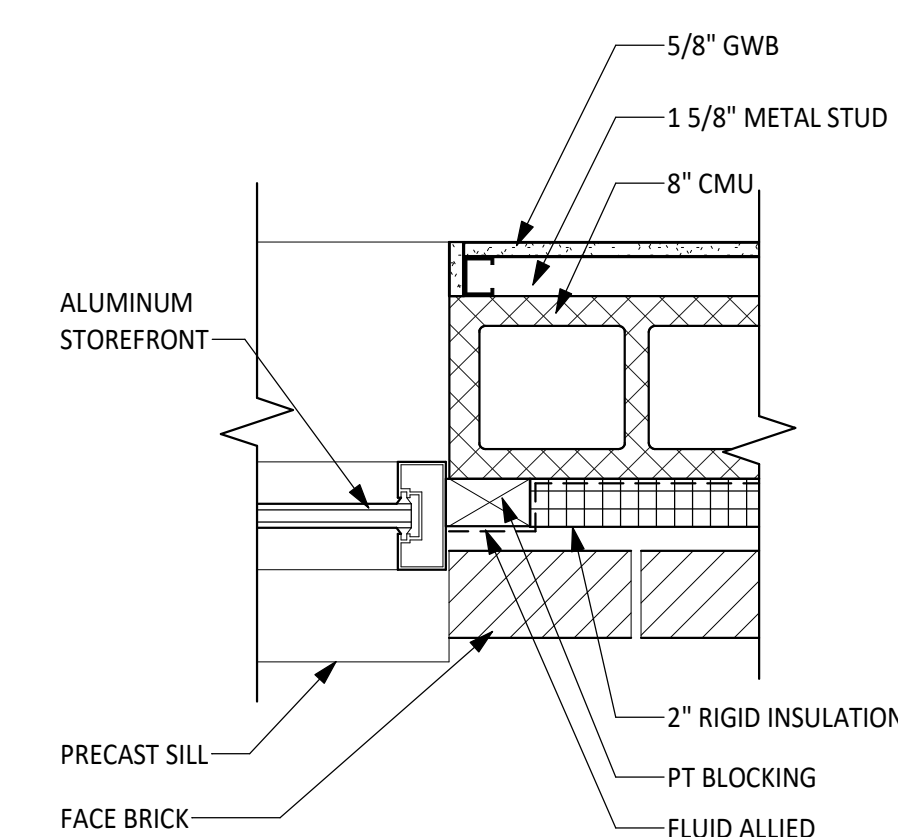
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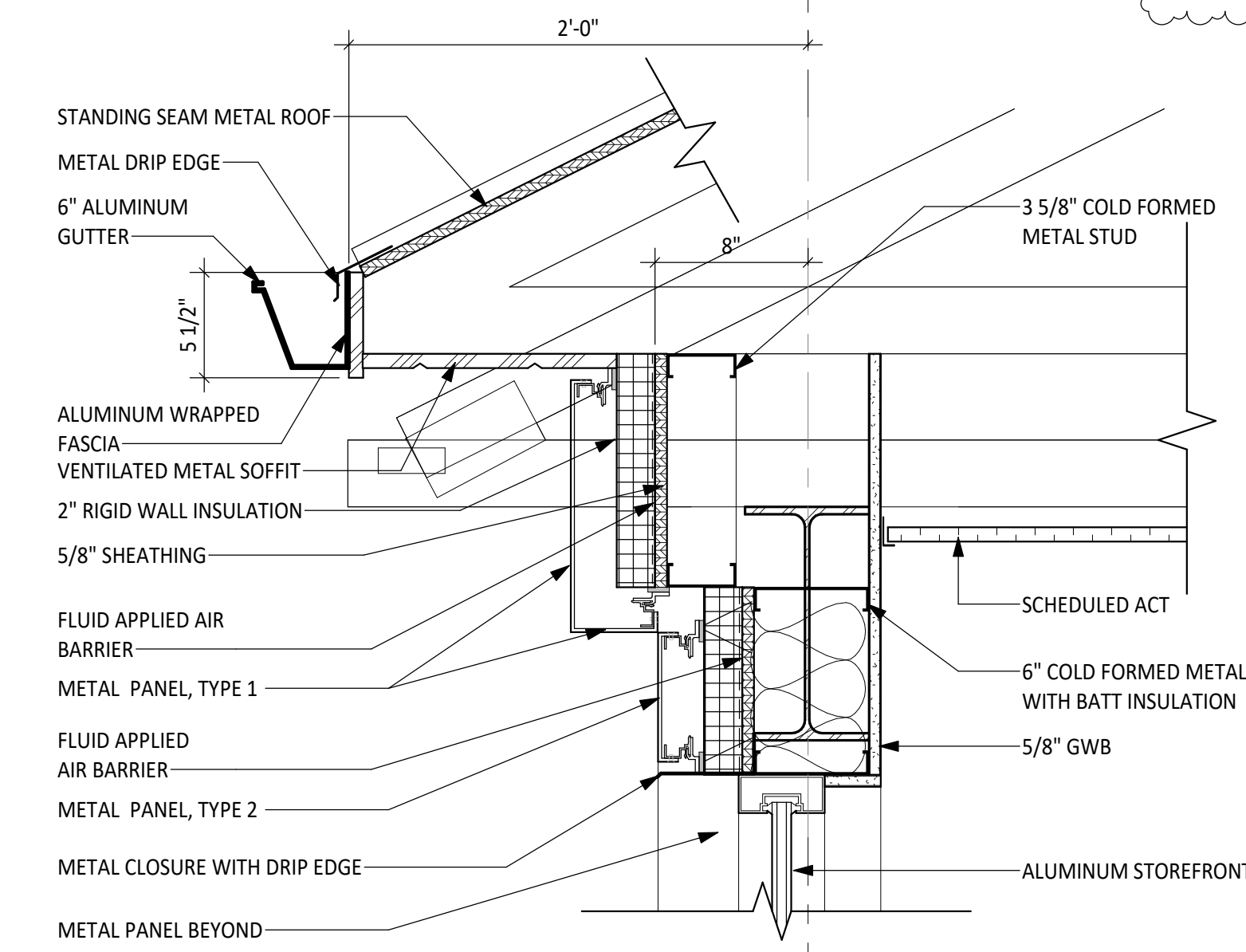
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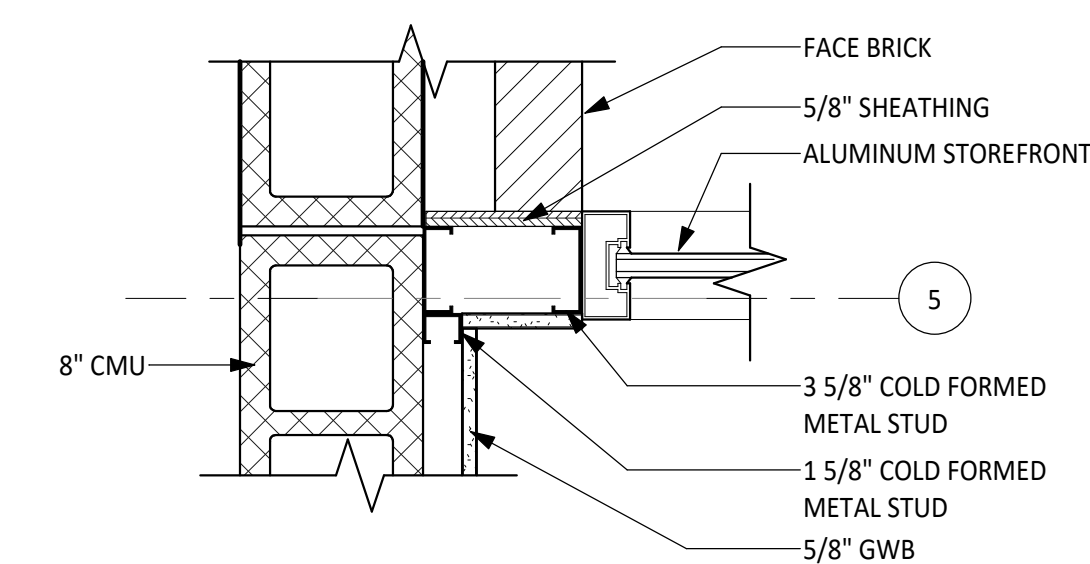
1 HEAD DETAIL
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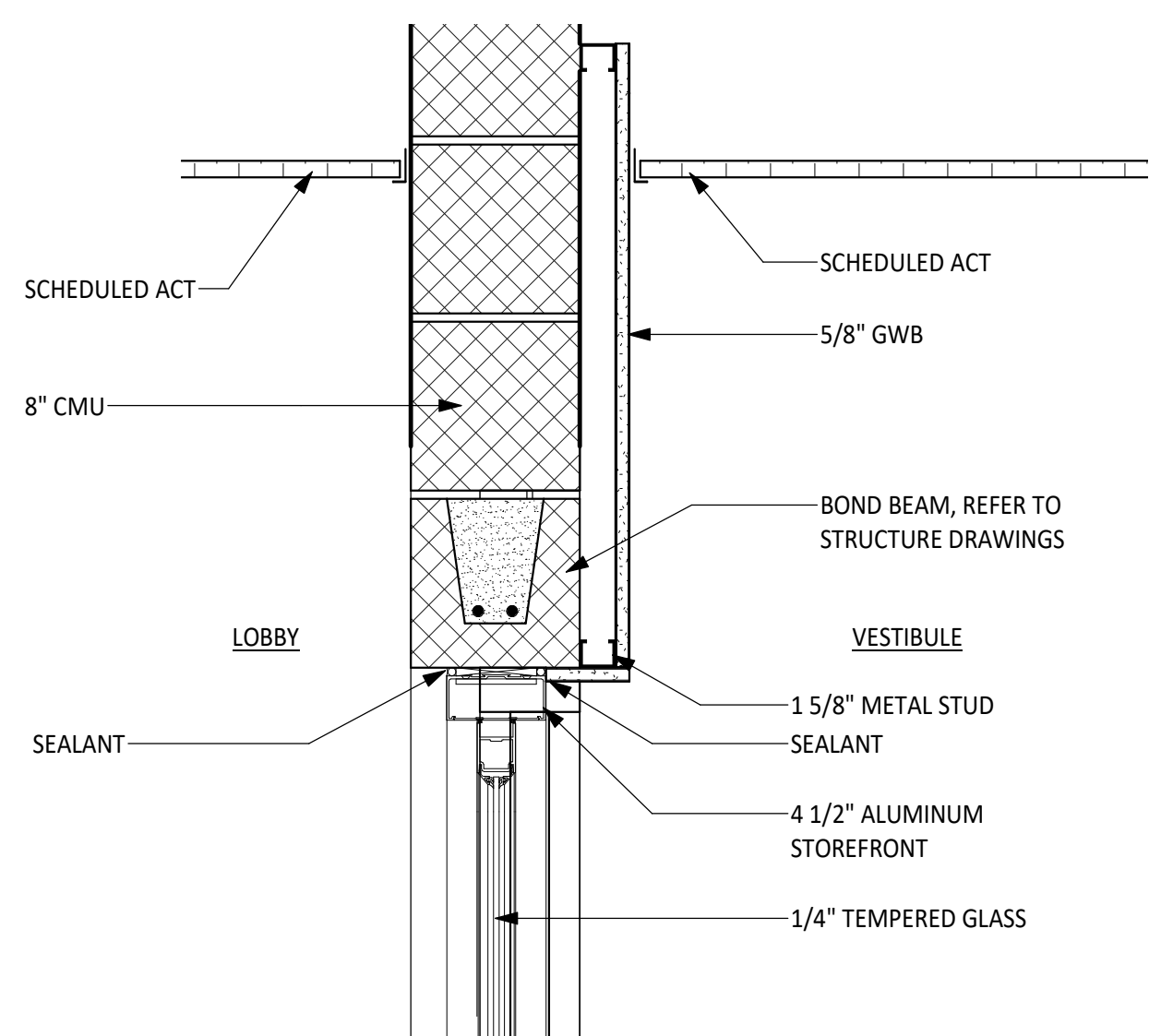
2 JAMB DETAIL
SCALE: 1 1/2" = 1'-0"



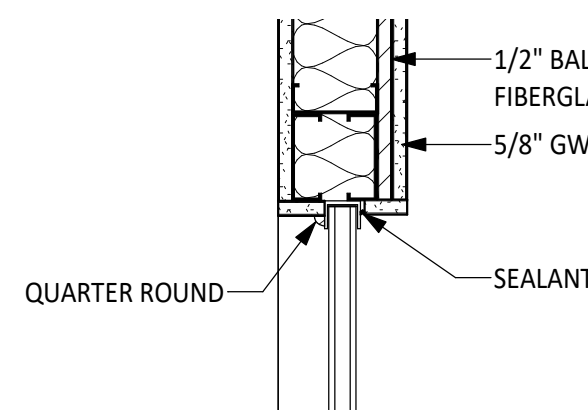
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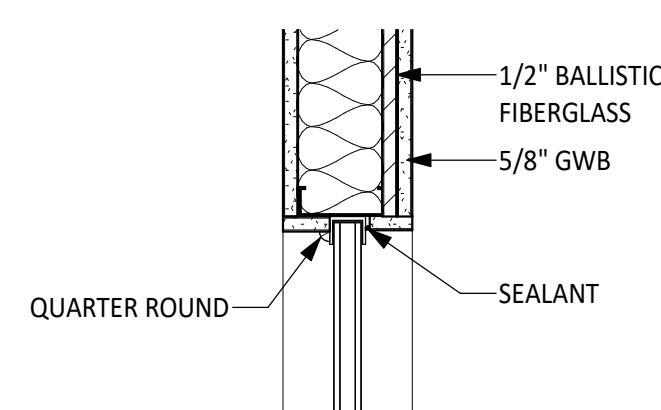
4 JAMB DETAIL
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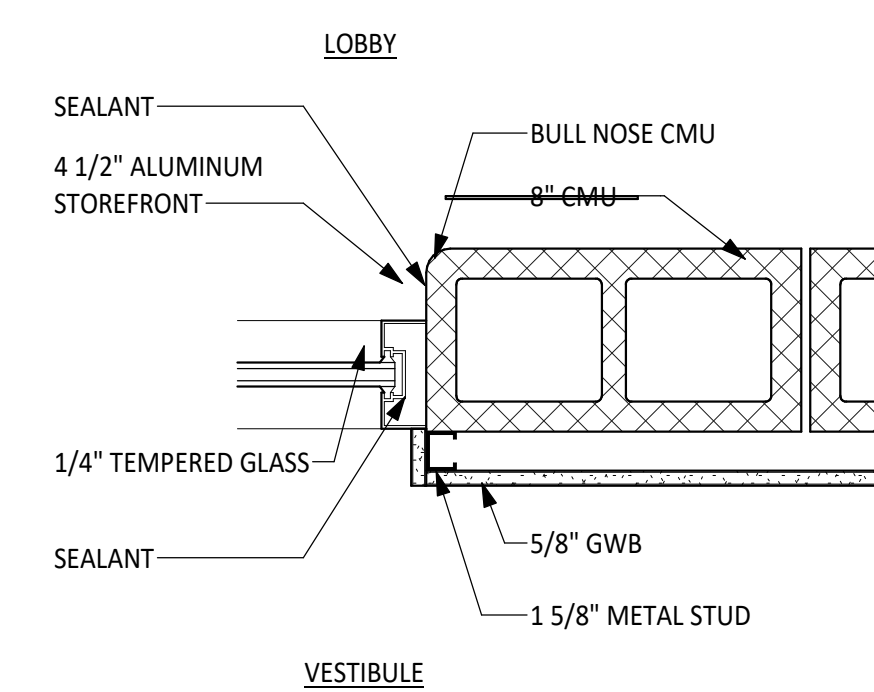
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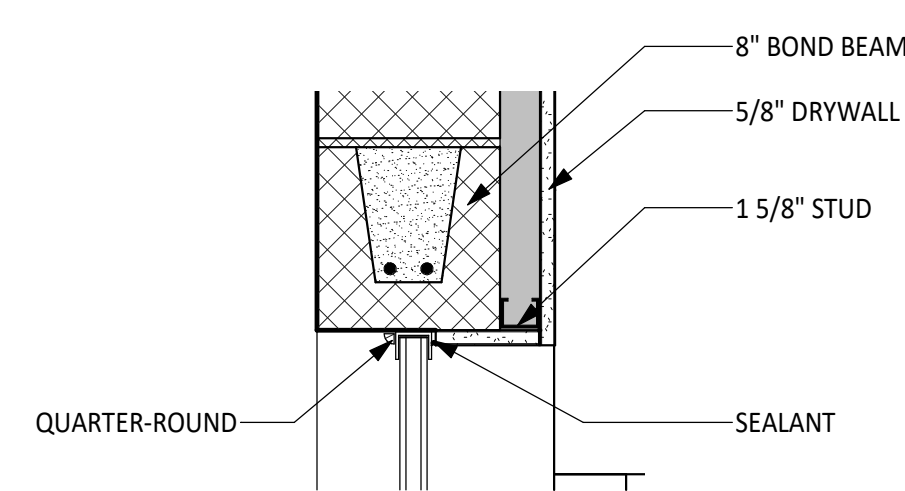
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SCALE: 1 1/2" = 1'-0"



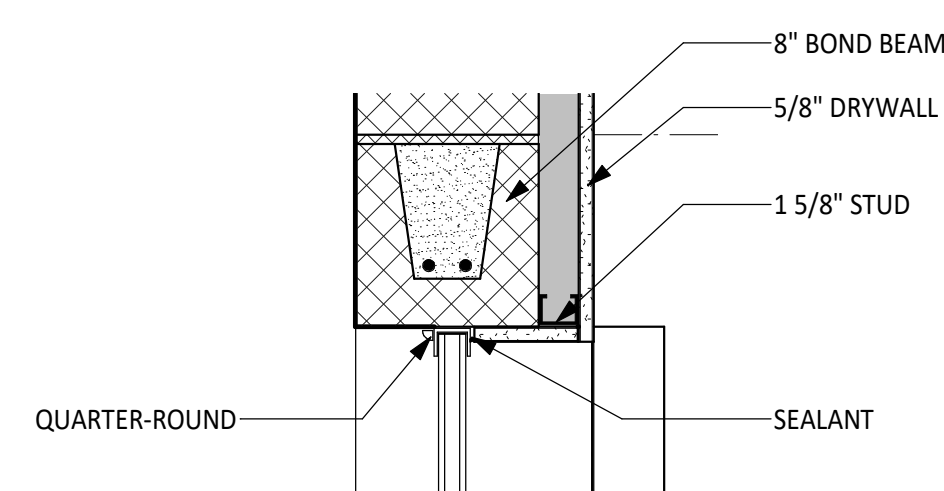
9 JAMB DETAIL
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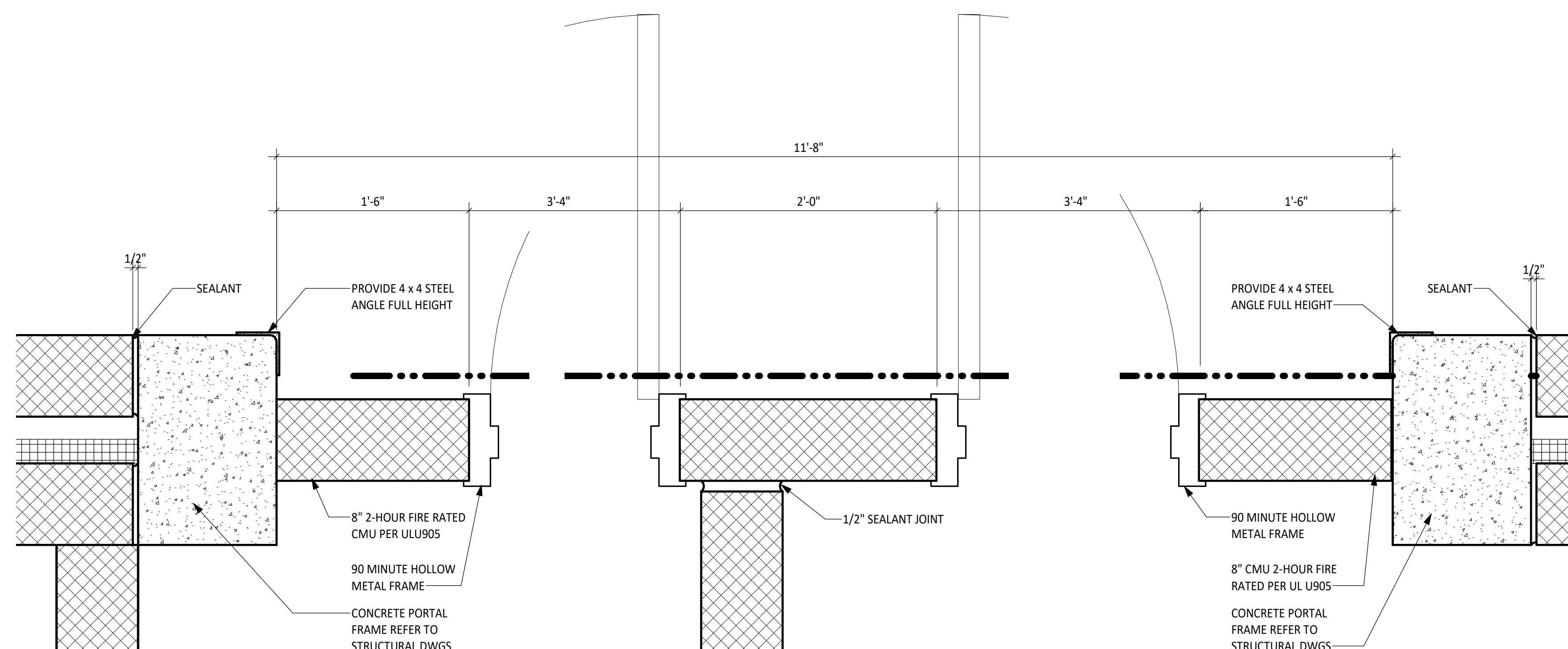
6 JAMB DETAIL
SCALE: 1 1/2" = 1'-0"



8 HEAD DETAIL
SCALE: 1 1/2" = 1'-0"



10 JAMB DETAIL
SCALE: 1 1/2" = 1'-0"



11 DOORS M120 AND M119 JAMB DETAIL
SCALE: 1 1/2" = 1'-0"



MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES BUILDING

STOREFRONT DETAILS

Drawn: 11/17/2023
Checked: 11/17/2023
Date: 11/17/2023

Designed: EFS
Drawn: TWMM
Checked: EFS
Date: 10/11/2023

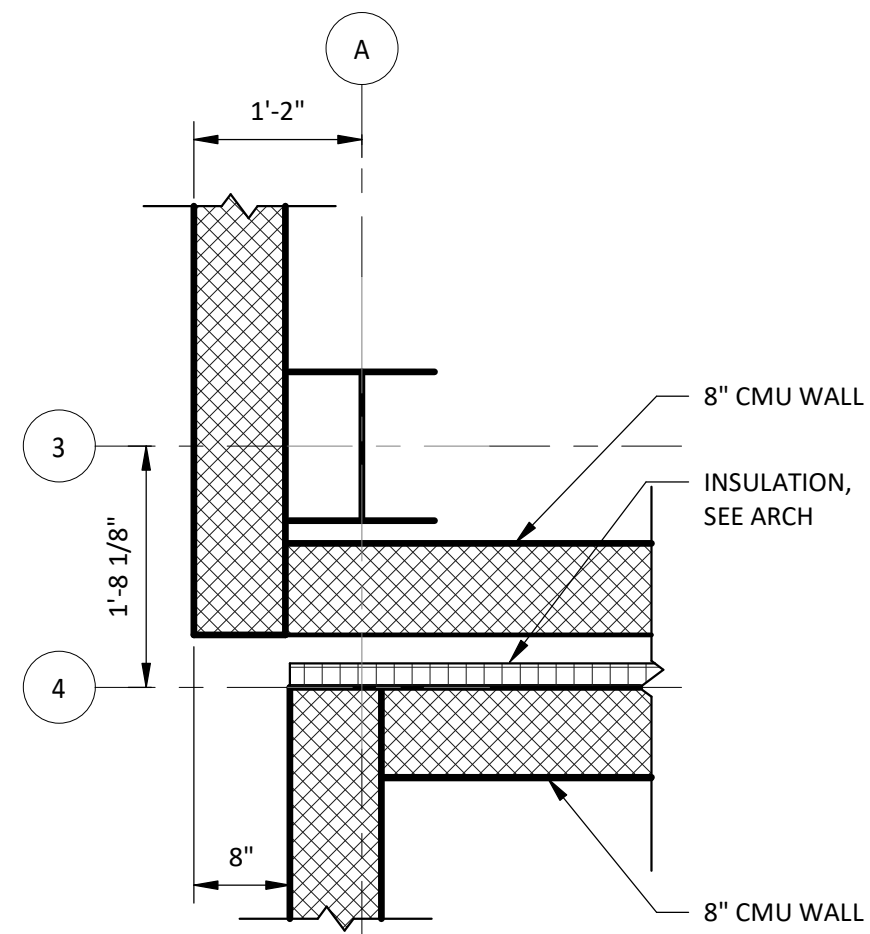
Project No.
16910



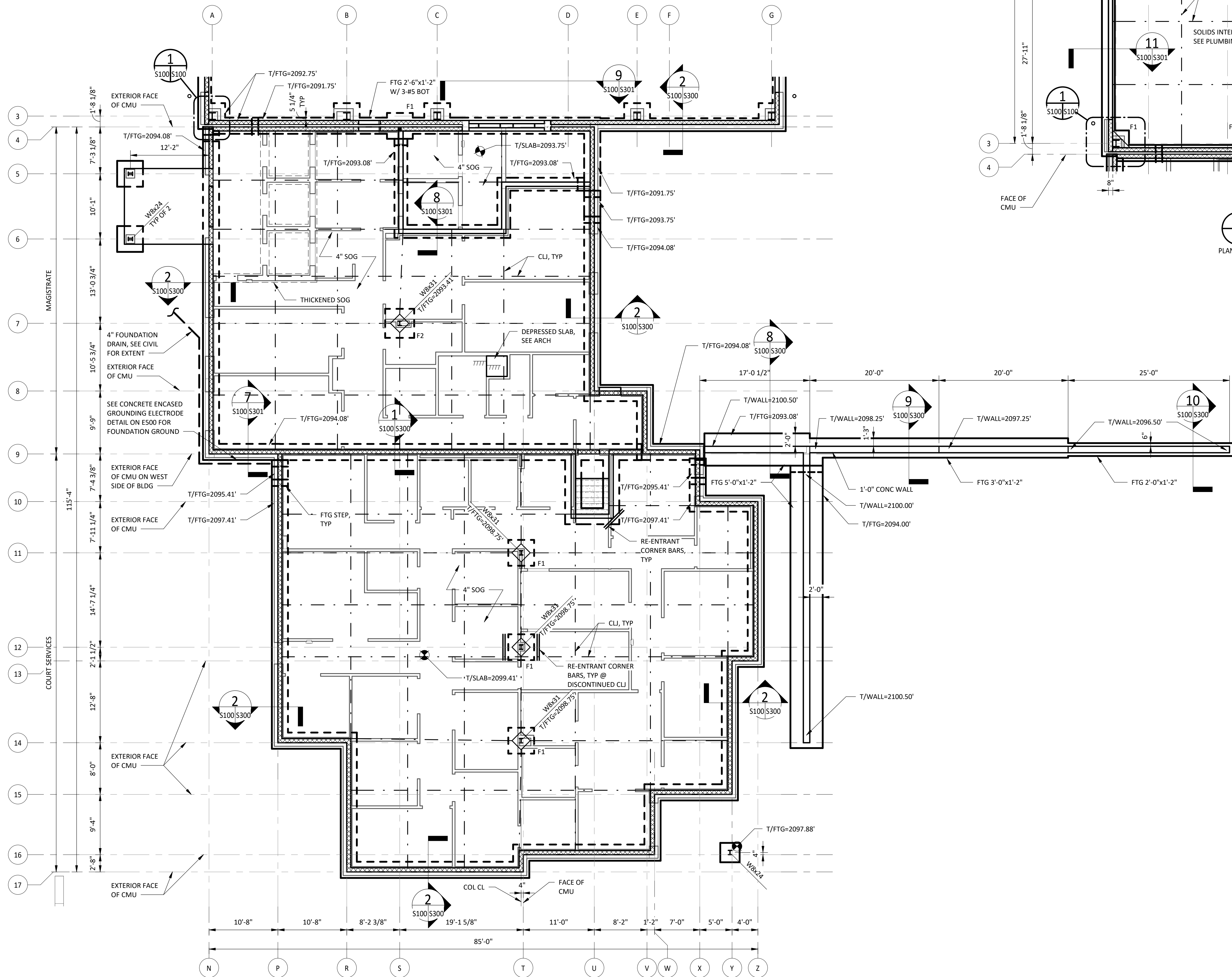
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A712

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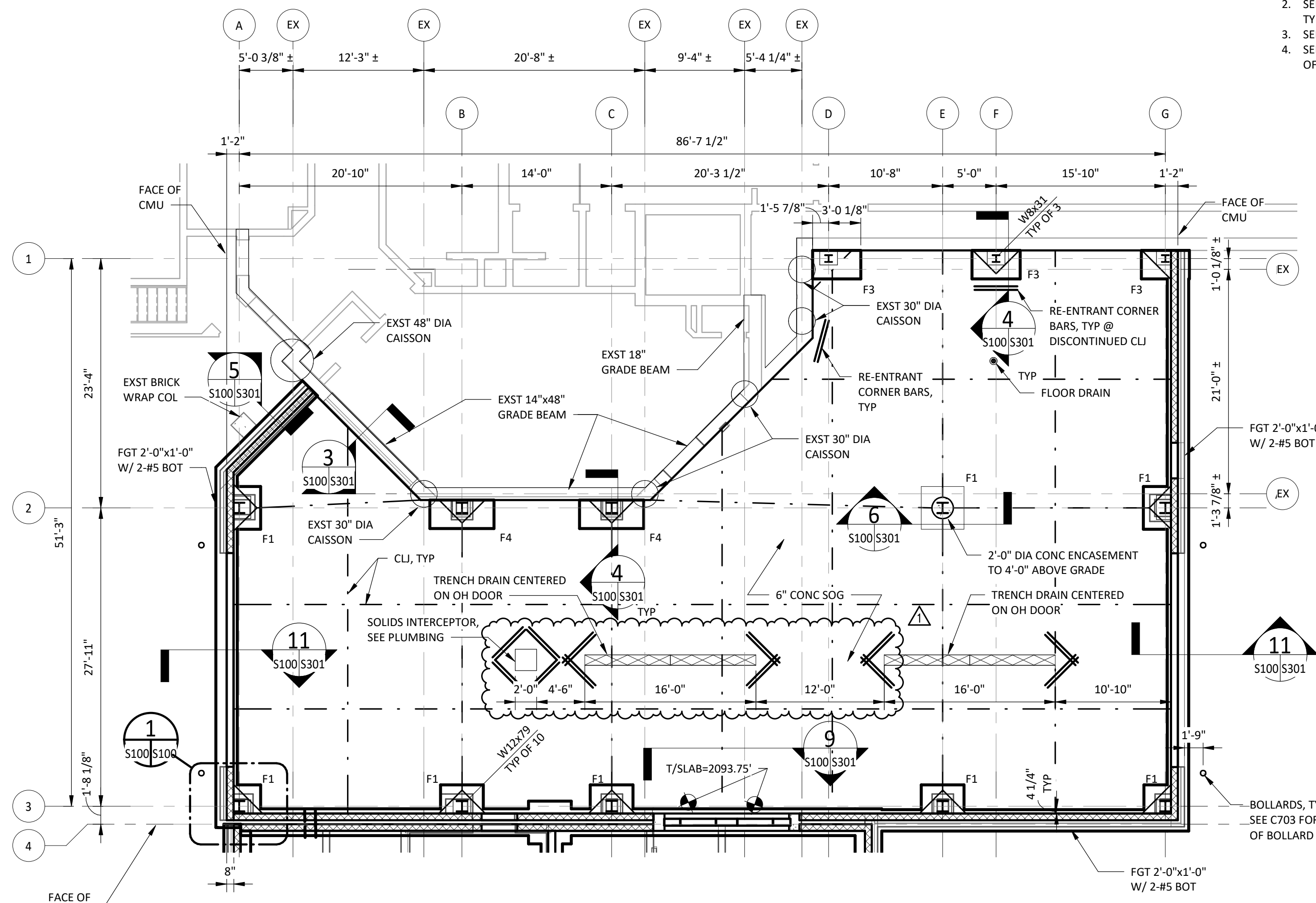


DETAIL 1
SCALE: 3/4" = 1'-0"



FOUNDATION/SLAB PLAN
1/8" = 1'-0"

T/SLAB=2096.08' UNO
T/FTG=2094.08' UNO



FOUNDATION/SLAB PLAN-SALLYPORT
1/8" = 1'-0"

T/FTG=2091.68' UNO
SEE C301 FOR SLAB SPOT ELEVATIONS

| FOUNDATION SCHEDULE | | | |
|---------------------|-------------------|---------------------|---------|
| MARK | FOOTING SIZE | FOOTING REINFORCING | REMARKS |
| F1 | 4'-0"x4'-0"x1'-2" | 5 #5 EW, BOT | |
| F2 | 4'-6"x4'-6"x1'-2" | 5 #5 EW, BOT | |
| F3 | 2'-8"x4'-0"x1'-2" | 3 #5 AND 5 #5 | |
| F4 | 2'-8"x6'-0"x1'-2" | 3 #5 AND 7 #5 | |

- SHEET NOTES:
- SEE S001 FOR GENERAL NOTES.
 - SEE SHEETS S200 AND S201 FOR TYPICAL DETAILS.
 - SEE S300 AND S301 FOR SECTIONS.
 - SEE ARCH DRAWINGS FOR LOCATIONS OF DOORS, WINDOWS, AND WALLS.



MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES BUILDING

FOUNDATION/SLAB PLAN

| No. | Date | ADDENDUM NO. 2 | Purpose of Document Issue |
|-----|------------|----------------|---------------------------|
| 1 | 11-17-2023 | | |

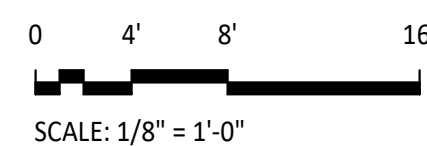
| | |
|----------|------------|
| Designed | KAA |
| Drawn | MLT |
| Checked | RHT |
| Date | 10/11/2023 |

Project No.
16910



Sheet No.

S100



| A.D.A. MOUNTING HEIGHT FOR (H.C.) FIXTURES | | |
|--|---------------------|--|
| | DESCRIPTION | HEIGHT (A.F.F.) |
| 1. | WATER CLOSETS | SEAT 17"-19" CONTROLS 44" (MAX.) |
| 2. | URINALS | RIM 17" (MAX.) CONTROLS 44" (MAX.) |
| 3. | LAVATORIES AND SINK | RIM OR COUNTERTOP 34" (MAX.) KNEE CLEARANCE 8" (MIN.) TOE CLEARANCE 6" (MAX.) DEPTH 17" (MIN.) BOTTOM 27" (MIN.) APRON (BOTTOM) 29" (MIN.) |
| 4. | DRINKING FOUNTAINS | APRON (BOTTOM) 27" (MIN.) RIM OR COUNTERTOP 34" (MAX.) |
| 5. | SHOWERS STALLS | SEAT 17"-19" (36"x36" STALL) (MOUNTED ON OPPOSITE SIDE OF CONTROLS AND FULL LENGTH OF STALL) CONTROLS 38" (MAX. TO BOTTOM AND 48" MAX. TO TOP) GRAB BARS 33"-36" |

TYPICAL PLUMBING NOTES

1. COORDINATE WITH ARCHITECTURAL PLANS FOR ALL FIRE-RATED BUILDING ASSEMBLIES, PROVIDE AND INSTALL U.L. RATED FIRE-STOP ASSEMBLIES IN ANY SUCH AREAS AS REQUIRED BY CODE.
2. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO SUBMITTING A BID.
3. WORKMANSHIP: PLUMBING FIXTURES AND ACCESSORIES SHALL BE INSTALLED IN A NEAT WORKMANLIKE MANNER. UNSIGHTLY INSTALLATIONS SHALL BE REMOVED OR REWORKED AT NO EXPENSE TO THE OWNER.
4. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL COORDINATION WITH THESE DRAWINGS.
5. SEAL ALL WALL, ROOF, AND FLOOR PENETRATIONS BY PLUMBING SERVICE AIRTIGHT.
6. PROVIDE CHROME-PLATED ESCUTCHEONS AT ALL EXPOSED PIPE PENETRATIONS THROUGH WALLS.
7. COORDINATE ALL PENETRATIONS OF FLOOR SLABS, ROOF, AND WALLS WITH STRUCTURAL DRAWINGS.
8. PROVIDE WATER STOP VALVES AT EACH EQUIPMENT ITEM.
9. COORDINATE WITH APPROVED ARCHITECTURAL DRAWINGS BEFORE ROUGHING-IN PLUMBING
10. ALL FLOOR DRAINS AND OPEN HUB DRAINS SHALL BE INSTALLED WITH DEEP SEAL P-TRAPS. PROVIDE GREEN TRAP SEALS AS SHOWN ON PLANS AND AT ALL LOCATIONS REQUIRED BY CODE AND LOCAL AUTHORITY.
11. SLOPES OF SANITARY WASTE AND VENT SHALL BE ESTABLISHED AND VERIFIED BY THE CONTRACTOR PRIOR TO PIPING BEING INSTALLED IN ORDER THAT PROPER SLOPES WILL BE MAINTAINED AND NECESSARY INVERT ELEVATIONS OBTAINED.
12. THE CONTRACTOR SHALL PROVIDE ALL VALVES, PRESSURE REDUCING VALVES, SHOCK ABSORBERS AND ACCESSORIES TO COMPLETELY INSTALL ALL EQUIPMENT TO MAKE A COMPLETE INSTALLATION.
13. THE CONTRACTOR SHALL INSTALL ALL OWNER-FURNISHED EQUIPMENT WITH ALL ITEMS TO MAKE EQUIPMENT OPERABLE.
14. ALL VENTING OF FIXTURES SHALL COMPLY WITH APPLICABLE CODES AND ORDINANCES.
15. USE DIELECTRIC UNIONS WHERE PIPE OF DIFFERENT METALS ARE JOINED.
16. MAKE PROPER HOT & COLD WATER, WASTE, VENT ETC. PIPING CONNECTIONS TO ALL FIXTURES AND EQUIPMENT EVEN THOUGH ALL BRANCH RUNS, ELBOWS AND CONNECTIONS ARE NOT SHOWN.
17. PVC OR OTHER PLASTIC COMPOSITE PIPING SHALL NOT BE INSTALLED IN RETURN AIR PLENUMS.
18. CLEANOUTS FOR SOIL AND WASTE LINES SHALL BE INSTALLED WHERE INDICATED ON THE DRAWINGS AND EVERY 90-DEGREE CHANGE IN DIRECTION.
19. ALL PIPING SHOWN ON THESE PLANS ARE TO BE ROUTED ABOVE CEILINGS, BELOW FLOORS AND IN CHASES UNLESS OTHERWISE NOTED.
20. SEE SITE PLAN FOR EXTENT OF ALL PIPING LEAVING OR ENTERING THE BUILDING.
21. THE CONTRACTOR SHALL COORDINATE THE EXACT LOCATION OF SANITARY AND WATER TIE-IN POINTS WITH THE LOCAL WATER AND SEWER AUTHORITIES.
22. THE CONTRACTOR SHALL PAY ALL ASSOCIATED COSTS FOR TAP FEES, PERMITS FOR SUPPLY AND INSTALLATION OF BACKFLOW PREVENTER AND/OR WATER METER ON SITE AS REQUIRED.
23. SERVICE VALVES SHALL BE FURNISHED AND INSTALLED ON ALL HOT AND COLD-WATER LINES AT EQUIPMENT IN AN ACCESSIBLE POSITION.
24. ALL FLOOR OPENINGS ARE TO BE SEALED WATERTIGHT BY MEANS OF SLEEVES.
25. ALL HORIZONTAL AND VERTICAL PIPING LINES EXTENDED AND CONNECTED TO EQUIPMENT SHALL BE RUN AT THE HIGHEST POSSIBLE ELEVATION AND NOT LESS THAN 4" ABOVE FLOOR TO PROVIDE CLEARANCE FOR CLEANING. AT WALL OR COLUMN LOCATIONS, PIPING ROUGH IN SHALL BE STUBBED IN WALLS WHEREVER POSSIBLE.
26. EXISTING CONDITIONS SHOWN HEREIN WERE TAKEN FROM SITE OBSERVATIONS, ORIGINAL DESIGN DRAWINGS AND AS-BUILT DOCUMENTATION WHERE AVAILABLE; ANY DISCREPANCIES BETWEEN THE PLANS AND ACTUAL FIELD CONDITIONS SHALL BE REPORTED TO THE ARCHITECT / ENGINEER.
27. IN AREAS WHERE A WATER LINE IS TO BE LOCATED IN AN EXTERIOR WALL, THE PIPE IS TO BE PLACED ON THE INSIDE (LIVING SIDE) OF THE INSULATION.
28. DOMESTIC WATER INSULATION SHALL BE FIBERGLASS PIPE INSULATION MINIMUM DENSITY 3.5 PCF; 1/2" THICKNESS FOR COLD WATER AND 1" THICKNESS FOR HOT WATER.
29. WASTE AND VENT PIPE TO BE SCHEDULE 40 PVC; DOMESTIC WATER PIPE TO BE TYPE L OR K HARD DRAWN COPPER.
30. EQUIPMENT AND MATERIALS SUBMITTED AS ALTERNATES TO THE SPECIFIED DATA MUST BE CLEARLY MARKED AS TO THE DIFFERENCES IN THE SUBMITTED VERSUS SPECIFIED. FAILURE TO CLEARLY MARK THE SUBMITTALS AS SUCH IS GROUNDS FOR REJECTION. SUBMITTALS NOT CLEARLY MARKED AS BEING ALTERNATE TO THE SPECIFIED DATA CAN BE ASSUMED TO MEET ALL SPECIFIED REQUIREMENTS. THE PROVIDER IS RESPONSIBLE TO PROVIDE AS SUCH.
31. THE CONTRACTOR IS TO REFER TO THE ARCHITECTURAL PLANS FOR THE LOCATION AND ELEVATIONS OF ALL ADA FIXTURES.
32. THE "REDUCTION IN LEAD IN DRINKING WATER ACT" REQUIRES MATERIALS AND FIXTURES USED FOR DELIVERY OF POTABLE WATER TO CONTAIN LESS THAN 0.2% LEAD FOR SOLDER AND FLUX, AND NOT MORE THAN A WEIGHT AVERAGE OF 0.25% LEAD FOR PIPES FITTING AND FIXTURES. EXCLUDED FROM THIS ACT ARE TOILETS, BIDETS, URINALS, FLUSH VALVES, TUB FILLERS, SHOWER VALVES. IT IS THE INTENT OF THIS PROJECT TO CONFORM WITH THE REQUIREMENTS OF THE 2014 LEAD FREE ACT. EVERY EFFORT HAS BEEN MADE TO CALL FOR FIXTURES THAT COMPLY WITH THE ACT. EVEN SO, IT SHALL BE THE RESPONSIBILITY OF THE PLUMBING CONTRACTOR TO INSTALL PRODUCTS THAT COMPLY WITH THE 2014 LEAD FREE SAFE WATER DRINKING ACT.
33. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS. DRAWINGS SHALL NOT BE SCALED FOR FINAL CONSTRUCTION DIMENSIONS.
34. DO NOT ROUTE ANY PIPING DIRECTLY OVER ELECTRICAL PANELS AND EQUIPMENT, ELEVATOR EQUIPMENT AND CONTROLS, OR TELECOMMUNICATIONS EQUIPMENT. SEE ELECTRICAL AND TELECOMMUNICATIONS DRAWINGS FOR EXACT EQUIPMENT LOCATIONS.
35. FOR BELOW GRADE SANITARY WASTE PIPING, CAST IRON SHALL BE INSTALLED FOR THE FIRST TEN FEET ON DRAINS SERVING BOILER ROOMS, FOOD PREP/DISHWASHING, STERILIZERS OR ANY OTHER EQUIPMENT THAT MAY DISCHARGE WASTEWATER ABOVE 140 DEGREES FAHRENHEIT.

| EEMAX TANKLESS WATER HEATER SCHEDULE (ELECTRIC) | | | | | | |
|---|-----------------|-----------------------|-----------|-----------|--------------|---------|
| WATER HEATER | MODEL | TURN-ON FLOW RATE GPM | H.W. SIZE | C.W. SIZE | LOCATION | VOLTAGE |
| WH-1 | FLOWCO SPEX2412 | 0.25 | 3/8" | 3/8" | POINT OF USE | 120 V |

| PLUMBING LEGEND | |
|-----------------|----------------------|
| | COLD WATER |
| | HOT WATER |
| | HOT WATER RETURN |
| | PIPE TURN DOWN |
| | PIPE TURN UP |
| | SANITARY |
| | VENT |
| | CLEANOUT |
| | FLOOR CLEANOUT |
| | PIPE TURN DOWN |
| | PIPE TURN UP |
| | ISOLATION BALL VALVE |
| | CONNECT TO EXISTING |

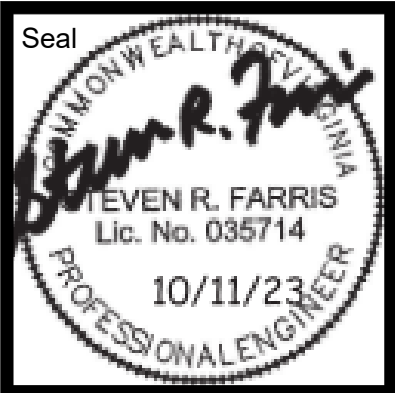
FIXTURE CONNECTION SCHEDULE

| "P" NO. | DESCRIPTION | H.W. | C.W. | TRAP | WASTE | VENT |
|---------|------------------------|------|--------|--------|-------|--------|
| P-1 | WATER CLOSET (H.C.) | -- | 1 1/4" | 3" | 3" | 3" |
| P-2 | LAVATORY (H.C.) | 1/2" | 1/2" | 1 1/4" | 2" | 1 1/2" |
| P-3 | SINK | 1/2" | 1/2" | 1 1/4" | 2" | 1 1/2" |
| P-4 | SHOWER | 1/2" | 1/2" | 3" | 3" | 1 1/2" |
| P-5 | WATER COOLER | -- | 1/2" | 1 1/4" | 3" | 1 1/2" |
| P-6 | SERVICE BASIN | 1/2" | 1/2" | 3" | 3" | 1 1/2" |
| P-7 | ROOF DRAIN | -- | -- | -- | -- | -- |
| P-8 | REFRIGERATOR/ICE MAKER | -- | 1/2" | -- | -- | -- |
| P-9 | FLOOR DRAIN | -- | -- | -- | -- | -- |

PLUMBING FIXTURE SCHEDULE
(APPROVED EQUALS ALSO ACCEPTED)
PLUMBING FIXTURES AND ALL ACCESSORIES SHALL BE COORDINATED AND VERIFIED WITH THE ARCHITECT

| | | |
|------|-------------------------|--|
| P-1 | WATER CLOSET (H.C.) | Z5665 "ZURN" ADA 16-3/4" HIGH, ELONGATED BOWL, FLOOR MOUNTED, 1.28 OR 1.6 GAL. FLUSH (FLUSH VALVE) SEAT Z59555S-EL-ST5 "ZURN" ELONGATED, WHITE, OPEN FRONT SEAT LESS COVER WITH SELF-SUSTAINING STEEL CHECK HINGE. VALVE 1.6GPF Z6000AV-W51 "ZURN" 1.6GPF MODEL MANUAL FLUSHOMETER |
| P-2 | LAVATORY (H.C.) | Z5354 "ZURN" 19" X 17" 4" CC HIGH BACK WALL MOUNTED SINK FAUCET Z81104-3M-XL ZURN CHROME PLATED FAUCET WITH WRIST BLADE HANDLES AND 0.5 GPM VANDAL RESISTANT AERATOR GRID DRAIN Z-8743 "ZURN", 1- 1/4" 17 GA. CHROME PLATED BRASS P-TRAP Z-8700 "ZURN", 1-1/4" CHROME PLATED CAST BRASS, 17 GAUGE, DIE CAST NUTS, CLEANOUTS AND ESCUTCHEON SUPPLY Z-8804-LR-PC-XL "ZURN" CHROME PLATED BRASS ANGLE STOPS AND 12" FLEXIBLE CHROME PLATED COPPER RISERS. CARRIER ZURN WALL CARRIER |
| P-3 | SINK | CR2522 "ELKAY" 25" X 22" STAINLESS STEEL SINK FAUCET Z83184-XL "ZURN" GOOSENECK SPOUT WITH WIDE SPREAD WRISTE BLADE HANDLES DRAIN Z8741-SS "ZURN" STAINLESS STEEL BASKET STRAINER P-TRAP Z-8702-PC "ZURN" 1-1/2" CHROME PLATED CAST BRASS, 17 GA. DIE CAST NUTS, CLEANOUTS AND ESCUTCHEON SUPPLY Z-8804-LR-PC-20-XL "ZURN" CHROME PLATED BRASS ANGLE STOPS AND 20" FLEXIBLE CHROME PLATED COPPER RISERS. |
| P-4 | SHOWER (H.C.) | G36988F "AQUARIUS", 36"x36" I.D. (39"x39"-1/2" O.D.) ONE PIECE FIBERGLASS REINFORCED GEL COAT SHOWER, WHITE, CENTER OUTLET, CURTAIN ROD, VINYL SHOWER CURTAIN AND HOOKS, FOLD UP SEAT SHOWER VALVES-96-300-830-X-L-V PRESSURE BALANCING CONTROL VALVE ADJUSTABLE TEMPERATURE. LIMIT STOP AND HANDHELD SHOWER WITH ADJUSTABLE SLIDING WALL BAR. |
| P-5 | WATER COOLER(H.C.) | VRCHDTLASC"ELKAY" WALL HUNG, SPLIT LEVEL TWIN UNIT VANDAL RESISTANT WITH 14GA STAINLESS STEEL MOUNT CENTERLINE NOZZLE 36" A.F.F. FOR LOWER UNIT P-TRAP Z-8700-PC "ZURN" 1-1/4" CHROME PLATED CAST BRASS, 17 GAUGE DIE CAST NUTS, CLEANOUT, AND ESCUTCHEON. SUPPLY Z8804-LRLKA-PC "ZURN" CHROME PLATED BRASS ANGLE STOP AND 12" CHROME PLATED COPPER RISERS. CARRIER ZURN WALL CARRIER |
| P-6 | SERVICE BASIN | ZURN Z 5850 28"x28"x12" T-35 STERN WILLIAMS 36" RUNNER HOSE AND BRACKET Z843M1-XL WITH VACUUM BREAKER, INTEGRAL STOPS AND PAIL HOOK BRADLEY 559-4008 MIXING VALVE |
| P-7 | ROOF DRAIN | ZURN Z100 15" DIAMETER ROOF DRAIN, PRIMARY. |
| P-8 | REFRIGERATOR/ ICE MAKER | CONNECTION ONLY WITH OATEY ICE MAKER OUTLET BOX. REFRIGERATOR PROVIDED BY OTHERS. |
| P-9 | FLOOR DRAIN | ZURN Z415B DURA-COATED CAST IRON BODY WITH BOTTOM OUTLET. WITH STRAINER AND GREEN TRAP SEAL |
| P-10 | DOWNSPOUT | ZF199 "ZURN" DOWNSPOUT |

NOTE: HANDICAPPED UNITS TO BE MOUNTED CONFORMING TO CURRENT A.D.A. GUIDELINES FOR ACCESSIBILITY
NOTE: PROVIDE INSTITUTIONAL A.D.A. COMPLIANT INSULATORS FOR EXPOSED WASTE, HOT AND COLD WATER PIPES.
HOT AND COLD WATER STOP/SUPPLIES AND TRAP INSULATOR KIT BY ZURN INDUSTRIES, INC.



MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES
BUILDING

PLUMBING NOTES, SCHEDULES & SPECIFICATION

| No. | Date | Purpose of Document Issue |
|-----|------------|---------------------------|
| 1 | 11-17-2023 | ADDENDUM NO. 2 |

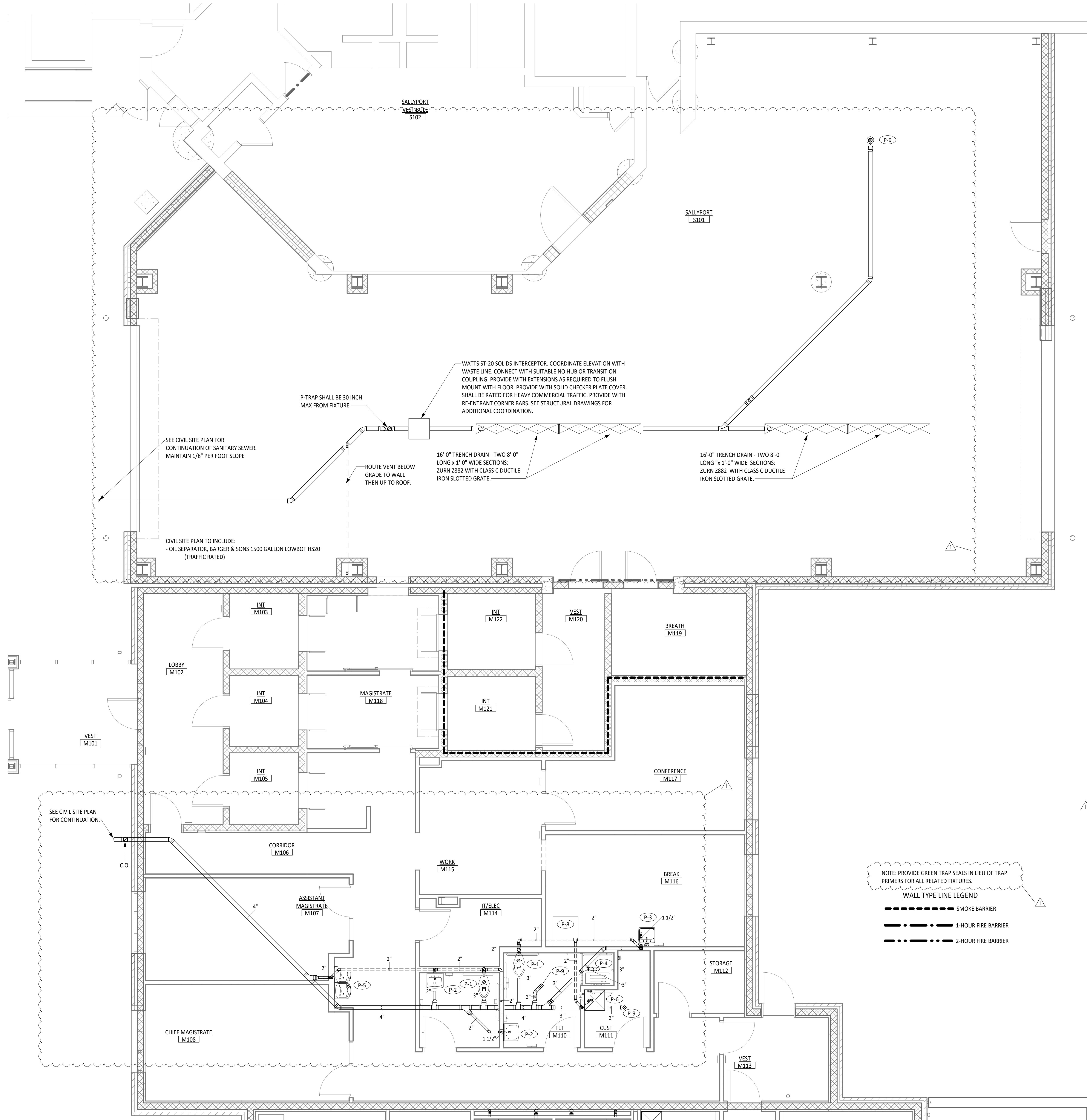
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| Project No. | 16910 |
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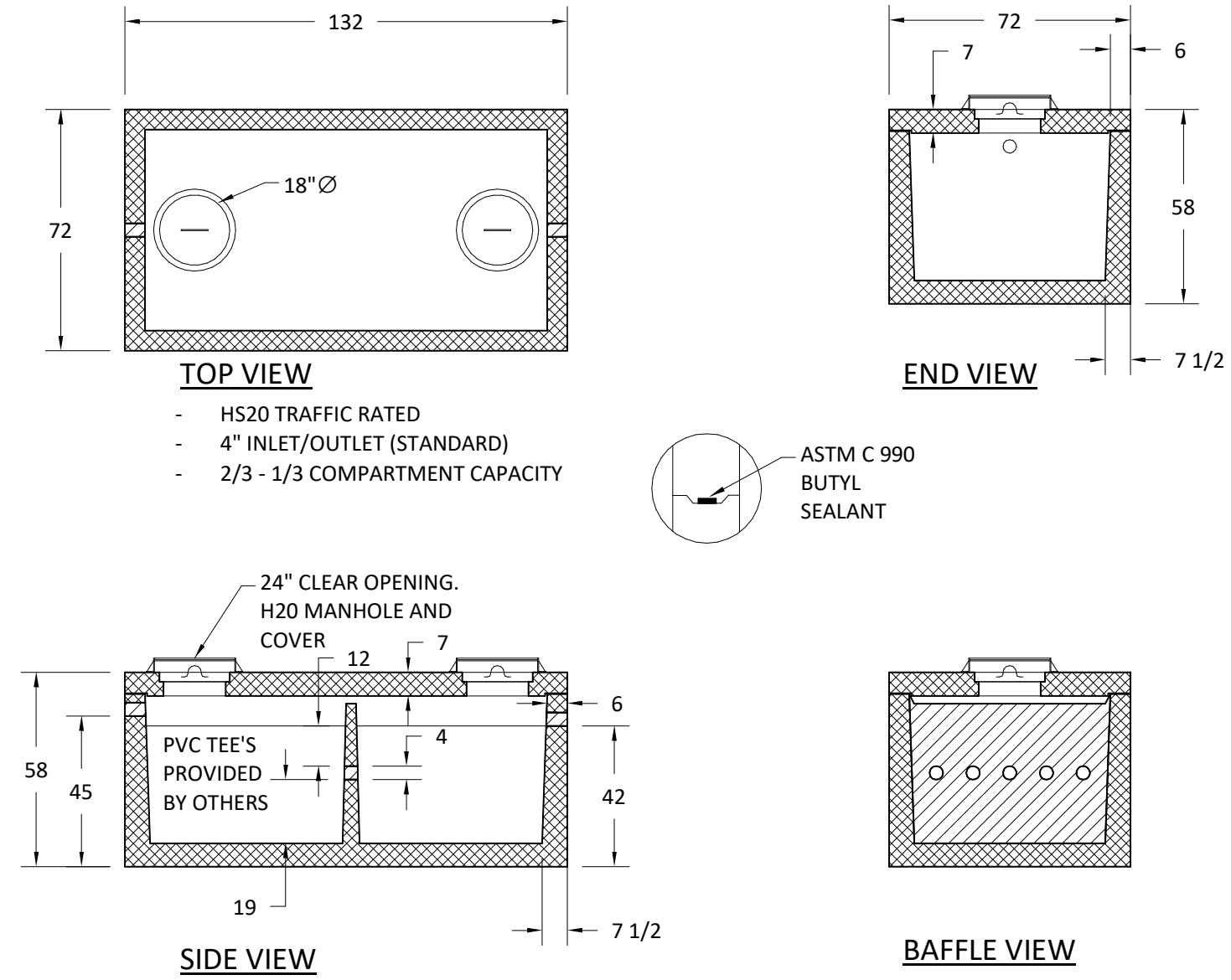


MAGISTRATE OFFICE BUILDING & SALLYPORT FLOOR - WASTE & VENT PIPING
1/4" = 1'-0"
PLAN NORTH

NOTE: PROVIDE GREEN TRAP SEALS IN LIEU OF TRAP PRIMERS FOR ALL RELATED FIXTURES.

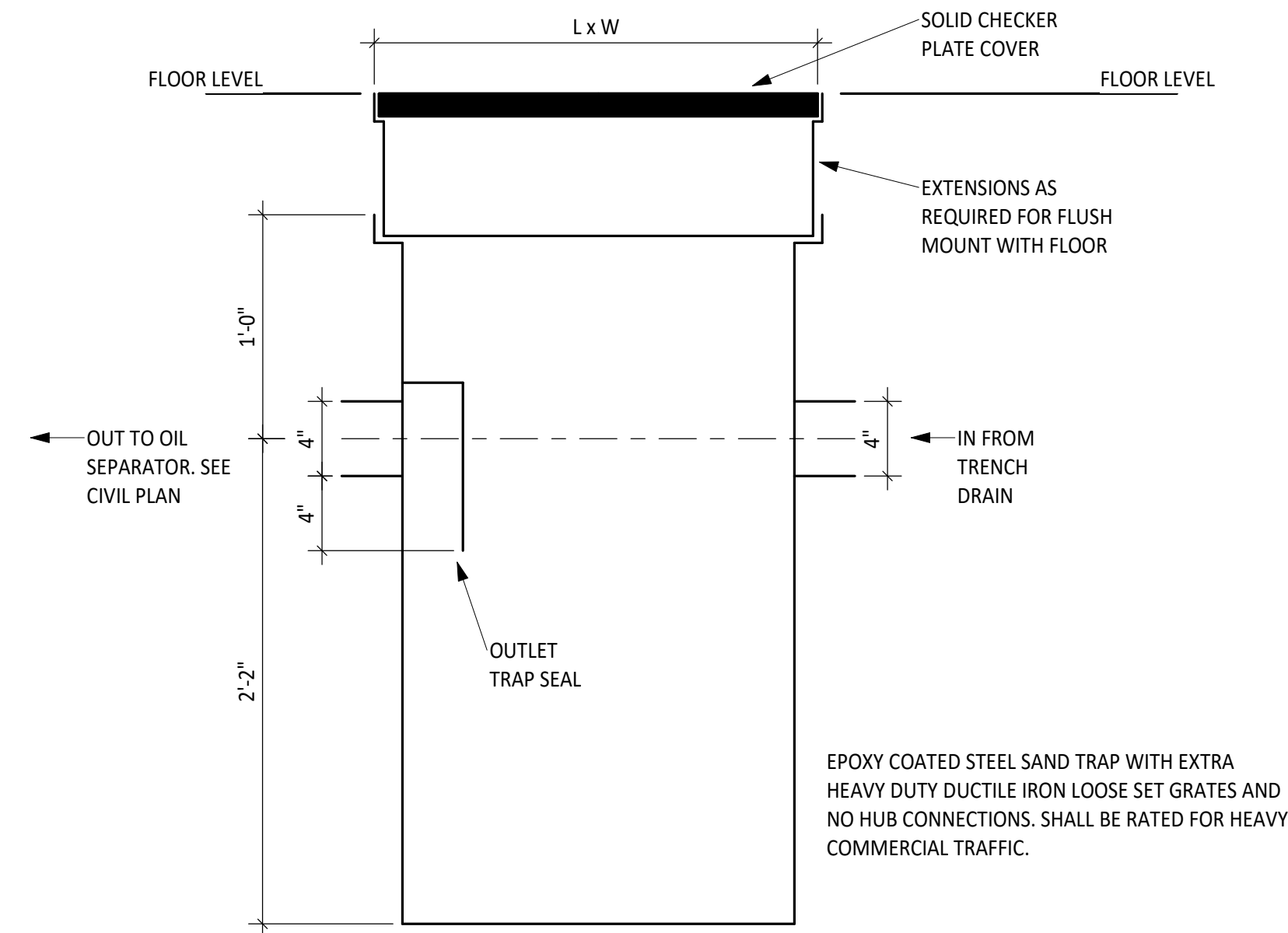
WALL TYPE LINE LEGEND

- SMOKE BARRIER
- - - 1-HOUR FIRE BARRIER
- . - . 2-HOUR FIRE BARRIER

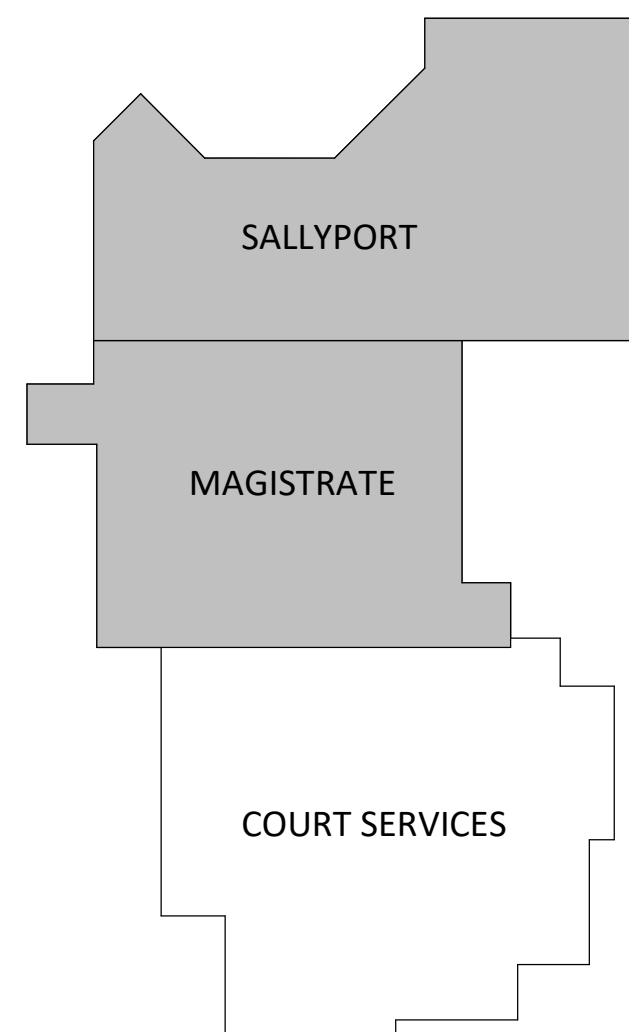


SPECIFICATIONS
CONCRETE: 5,000 PSI MINIMUM STRENGTH (28 DAY)
REINFORCING: PRIMARY REINFORCEMENT WILL BE REBAR.
RISERS: GRADE RINGS AND MANHOLE FRAMES AND COVERS TO BE PROVIDED.
SEALANT: SEALANT USED IN THE SEAM OF THE TANK WILL MEET OR EXCEED ASTM C990.
PIPE PENETRATIONS: INLET AND OUTLETS ARE FITTED WITH SEALS THAT MEET OR EXCEED ALL ASTM C923 SPECIFICATIONS.
PARTITION WALL: THE PARTITION WALL, IF PRESENT, IS POURED MONOLITHICALLY.
WATERTIGHT: ASTM C 1227 LATEST REVISION. TANK MUST BE TESTED WITHIN 3 WORKING DAYS OF DELIVERY.
DRAWING: ALL MEASUREMENTS ARE ACCURATE WITHIN +/- 1 INCH.
WARRANTY: PROVIDE 1 YEAR WARRANTY FROM DATE OF DELIVERY.
INSTALLATION: INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. THE TANK HOLE IS NOT TO BE MORE THAN 18 INCHES LONGER AND WIDER THAN THE TANK. THERE SHALL BE A MINIMUM OF 6" OF 3/4" STONE BEDDING. THIS TANK IS DESIGNED FOR HS20 TRAFFIC LOADS AND WITH A MAX BACKFILL COVER OF 8" AND A MINIMUM OF 6".

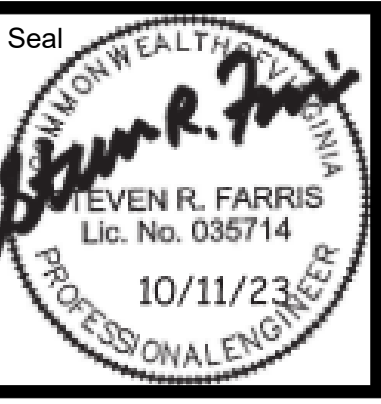
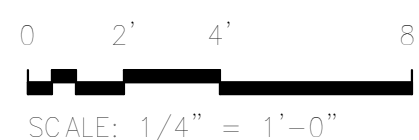
2
P101
OIL SEPARATOR DETAIL
1/4" = 1'-0"



3
P101
SOLIDS INTERCEPTOR DETAIL
1 1/2" = 1'-0"



KEY PLAN
NOT TO SCALE



MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES
BUILDING

MAGISTRATES OFFICE BUILDING & SALLYPORT WASTE AND VENT

No. 1 Date 11-17-2023 Purpose of Document Issue ADDENDUM NO. 2

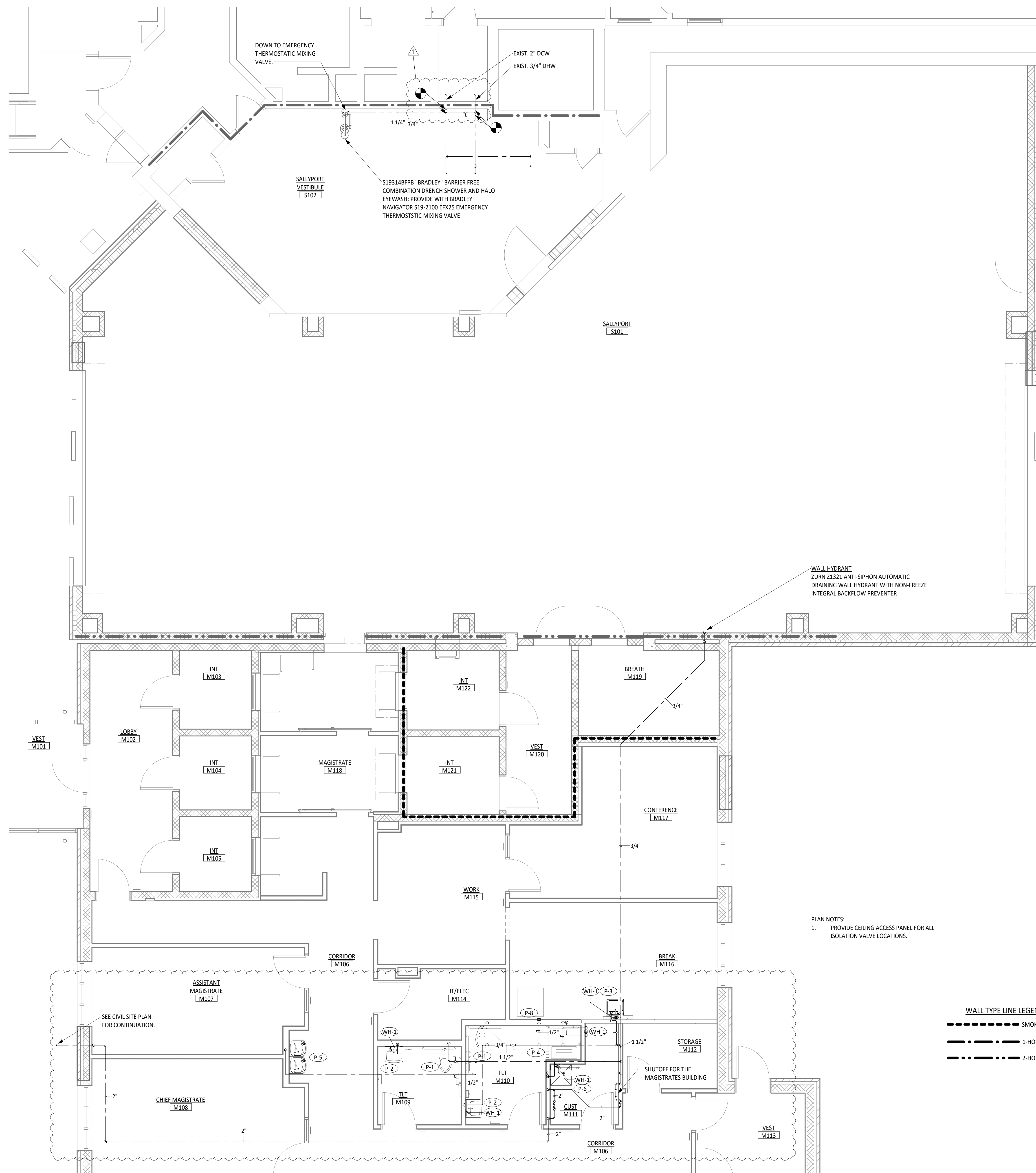
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Date 10/11/2023

Project No.
16910



Sheet No.

P101



 MAGISTRATE OFFICE BUILDING & SALLYPORT FLOOR - WATER SUPPLY PIPING
1/4" = 1'-0"
PLAN NORTH

Classified by
Underwriters Laboratories, Inc.
to UL 1479 and CANULC S115

System No. C-AJ-591

C-AJ-591

| ANSI/UL1479 (ASTM E814) | | CANULC S115 |
|--|--|--|
| F Rating — 2 Hr | | F Rating — 2 Hr |
| T Ratings — 0 and 1 Hr (See Items 2 and 4) | | FT Ratings — 0 and 1 Hr (See Items 2 and 4) |
| L Rating At Ambient — 4 CFM/sq ft | | FH Rating — 2 Hr |
| L Rating At 400 F — Less Than 1 CFM/sq ft | | FTH Ratings — 0 and 1 Hr (See Items 2 and 4) |
| | | L Rating At Ambient — 4 CFM/sq ft |
| | | L Rating At 400 F — Less Than 1 CFM/sq ft |

1. Floor or Wall Assembly — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) concrete. Wall must also be constructed of any UL Classified Concrete Blocks*. Max diam of opening is 29 in. (737 mm).

See Concrete Blocks (CAZT) categories in the Fire Resistance directory for names of manufacturers.

2. Metallic Sleeve — (Optional) — Nom 30 in. (762 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe sleeve cast or grouted into floor or wall assembly, flush with floor or wall surfaces or extending a max of 1 in. (25 mm) above floor or beyond both surfaces of wall. If the steel sleeve extends beyond the top surface of the floor or both surfaces of the wall, the T Rating of the firestop system is 0 hr.

2A. Sheet Metal Sleeve — (Optional) — Max 6 in. (152 mm) diam, min 26 ga galv steel provided with a 26 ga galv steel square flange spot welded to the sleeve at approximately mid- height or flush with bottom of sleeve in floors, and sized to be a min of 2 in. (51 mm) larger than the sleeve diam. The sleeve is to be cast in place flush with bottom surface of floor and may extend a max of 1 in. (25 mm) above the top surface of the floor.

2B. Sheet Metal Sleeve — (Optional) — Max 12 in. (305 mm) diam, min 24 ga galv steel provided with a 24 ga galv steel square flange spot welded to the sleeve at approximately mid- height, or flush with bottom of sleeve in floors, and sized to be a min of 2 in. (51 mm) larger than the sleeve diam. The sleeve is to be cast in place flush with bottom surface of floor and may extend a max of 1 in. (25 mm) above the top surface of the floor.

HILTI
Hilti Firestop Systems

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January 13, 2015

Page 1 of 2

System No. C-AJ-5091

3. Through Penetrants — One metallic pipe or tubing to be installed either concentrically or eccentrically within the firestop system. Pipe or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes or tubing may be used:

- A. Steel Pipe — Nom 12 in. (305 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
- B. Iron Pipe — Nom 12 in. (305 mm) diam (or smaller) cast or ductile iron pipe.
- C. Copper Pipe — Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.
- D. Copper Tubing — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.

4. Pipe Covering — Min 12 in. (313 mm) to max 2 in. (51 mm) thick yellow cylindrical heavy density (min 3.5 pcf or 58 kg/m³) glass fiber units jacketed on the outside with an all-service jacket. Longitudinal joints sealed with metal fasteners or factory applied, self-sealing tape. Transverse joints secured with metal fasteners or with butt tape supplied with the product. The annular space between the insulated pipe and the edge of the perimeter of the opening shall be 1/2 in. (13 mm) to max 12 in. (313 mm). When thickness of pipe covering is less than 2 in. (51 mm), the T Rating for the firestop system is 0 hr.

5. See Pipe Equipment Coverings — Materials — (BRG) category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.

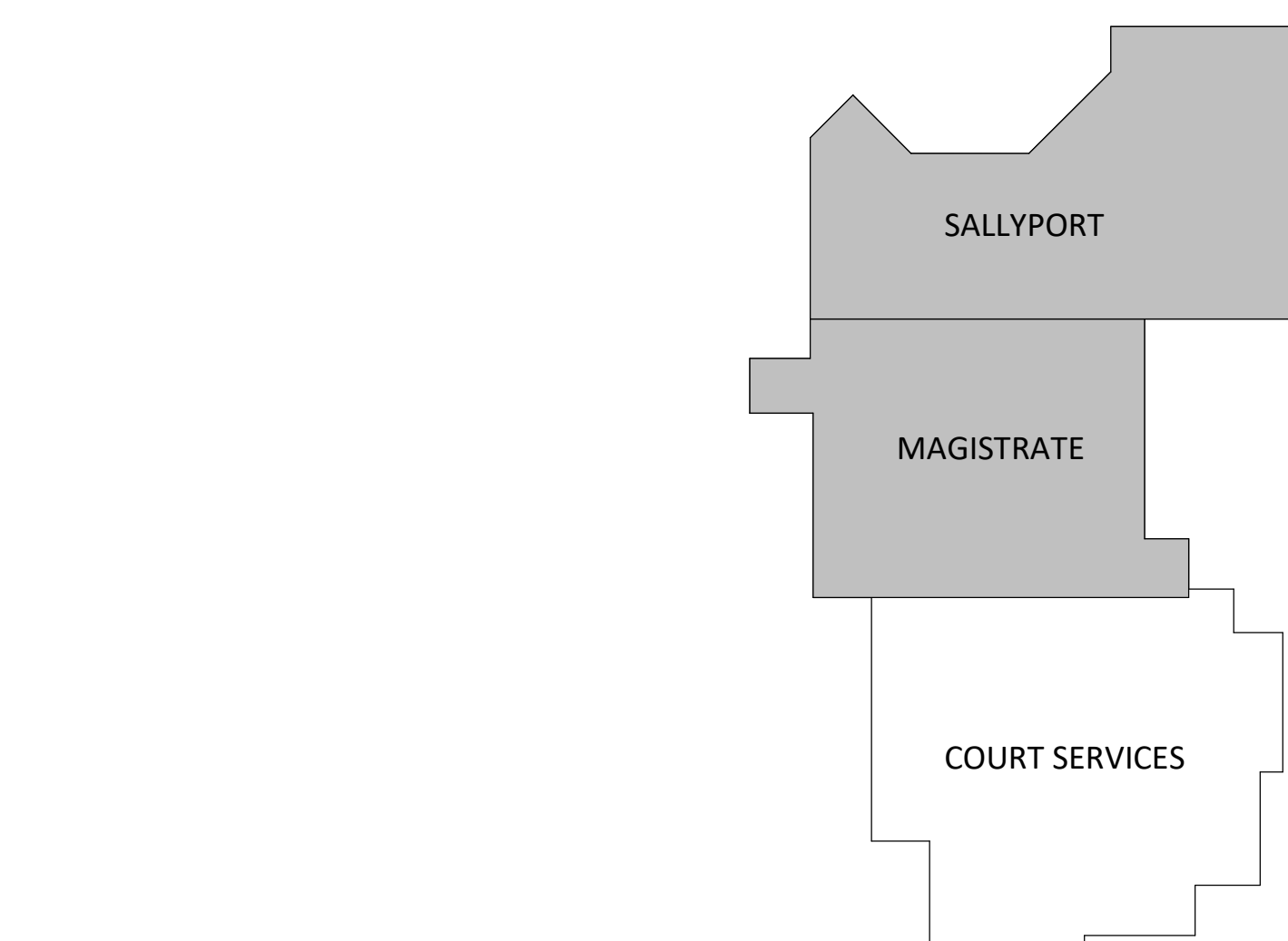
4A. Pipe Covering (Not Shown) — As an alternate to Item 4, max 2 in. (51 mm) thick cylindrical calcium silicate (min 14 pcf or 224 kg/m³) units jacketed on the outside with the same tape may be used. Pipe insulation secured with stainless steel bands or min 18 AWG stainless steel wire spaced max 12 in. (305 mm) OC. The annular space shall be max 12 in. (313 mm) to max 12 in. (305 mm).

5. Firestop System — The firestop system shall consist of the following:

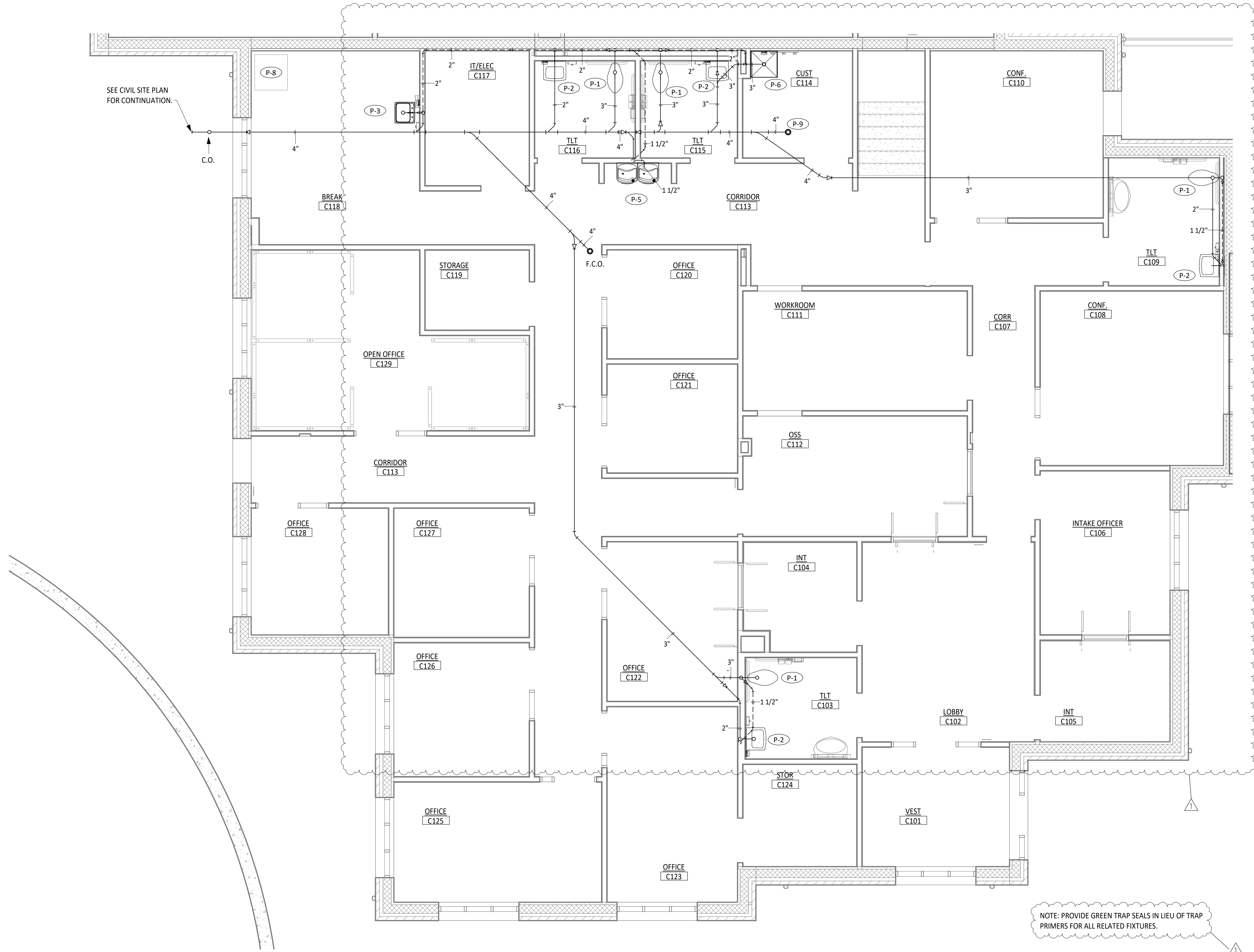
- A. Packing Material — Min 4 in. (102 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed applied into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material.
- B. Fill/Void or Cavity Material* — Sealant — Min 1/2 in. (13 mm) thickness of fill material applied within the annulus, flush with top surface of floor or with both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC. — FS-One Sealant or FS-One MAX Intumescent Sealant

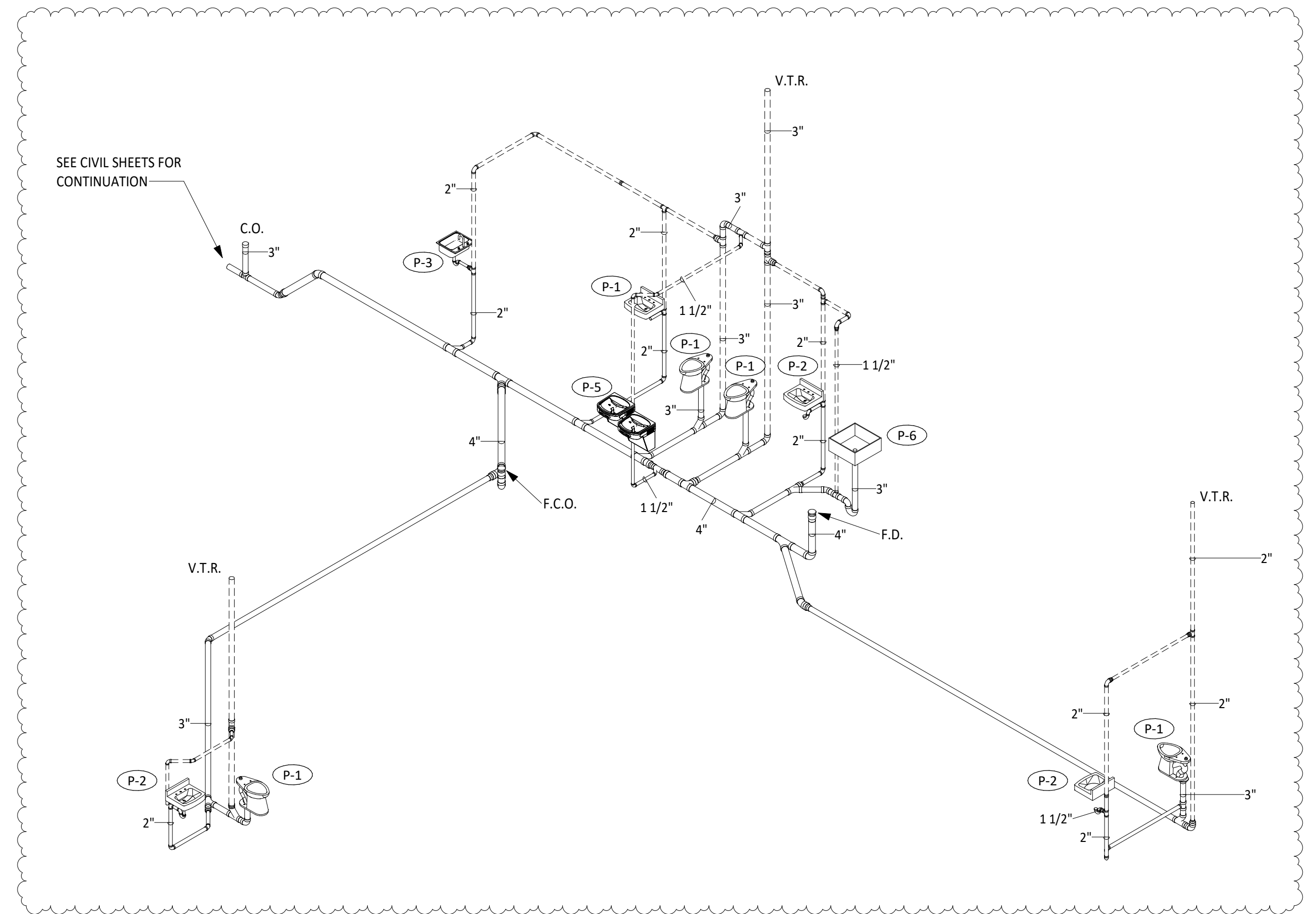
* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions accepting the UL or cUL Certification (such as Canada), respectively.



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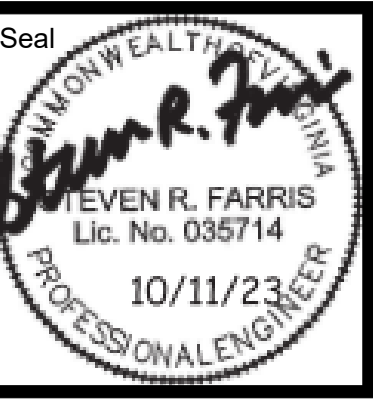
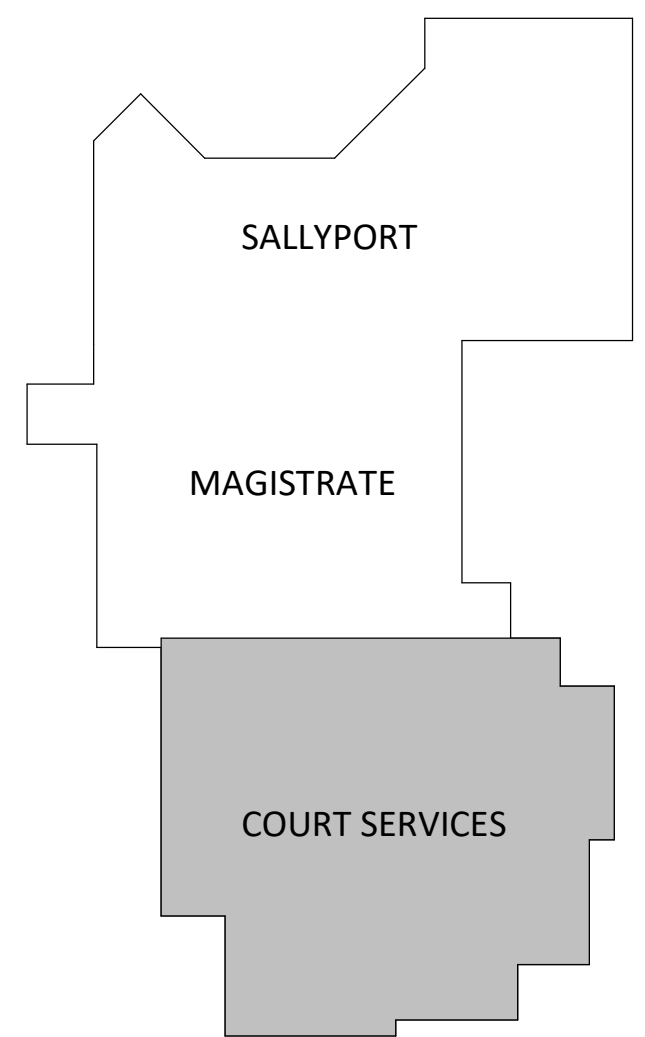
COURT SERVICES FLOOR - WASTE & VENT PIPING
1/4" = 1'-0"
PLAN NORTH



2 COURT SERVICES SANITARY & VENT PIPING DIAGRAM
P103 NOT TO SCALE

0 2' 4' 8'
SCALE: 1/4" = 1'-0"

KEY PLAN
NOT TO SCALE



**MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES
BUILDING**

COURT SERVICES BUILDING WASTE AND VENT PIPING

No. 1 Date 11-17-2023 Purpose of Document Issue ADDENDUM NO. 2

Designed RB
Drawn RB
Checked RB
Date 10/11/2023

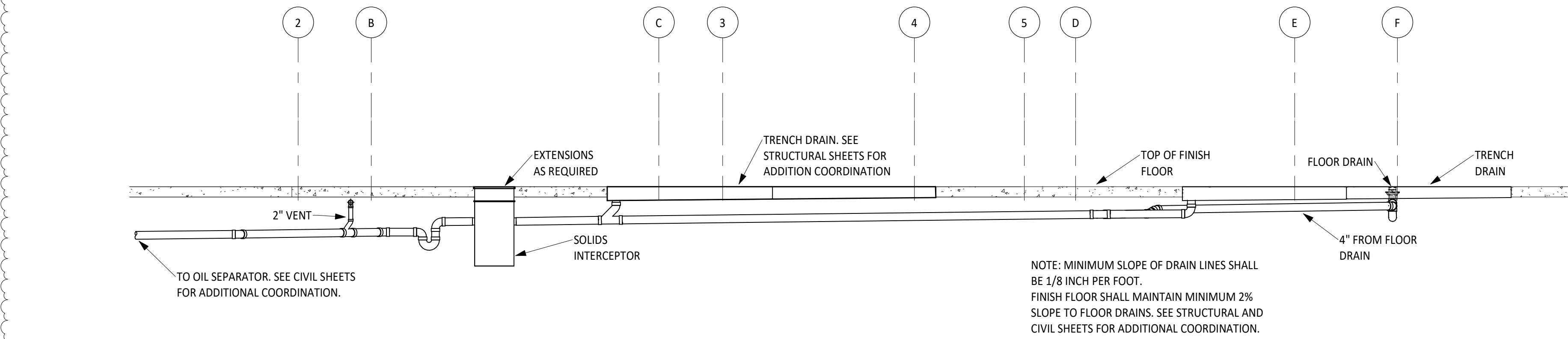
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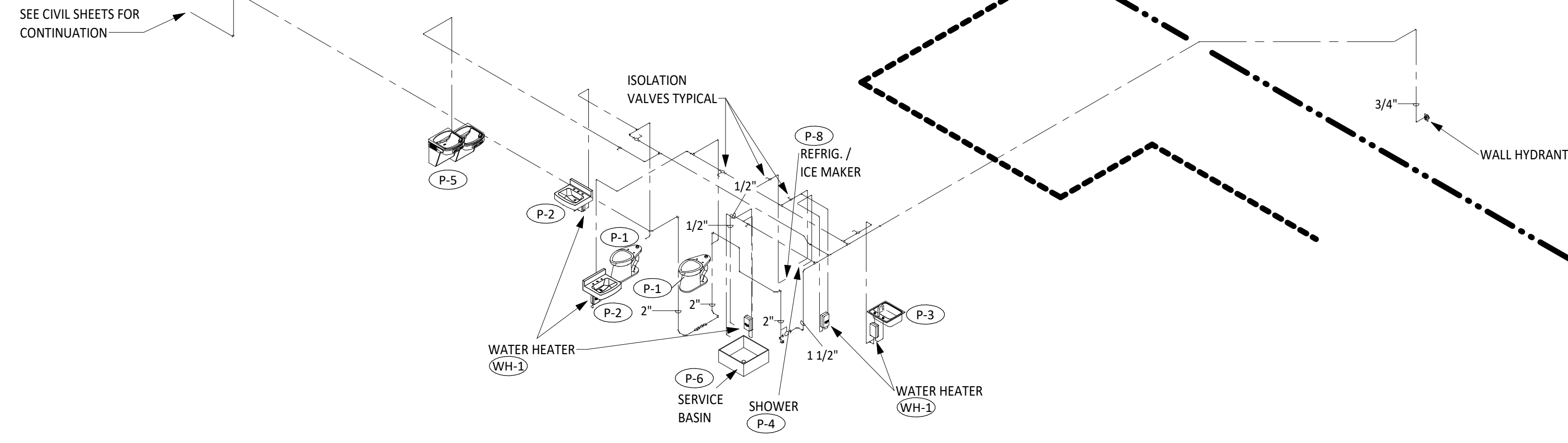
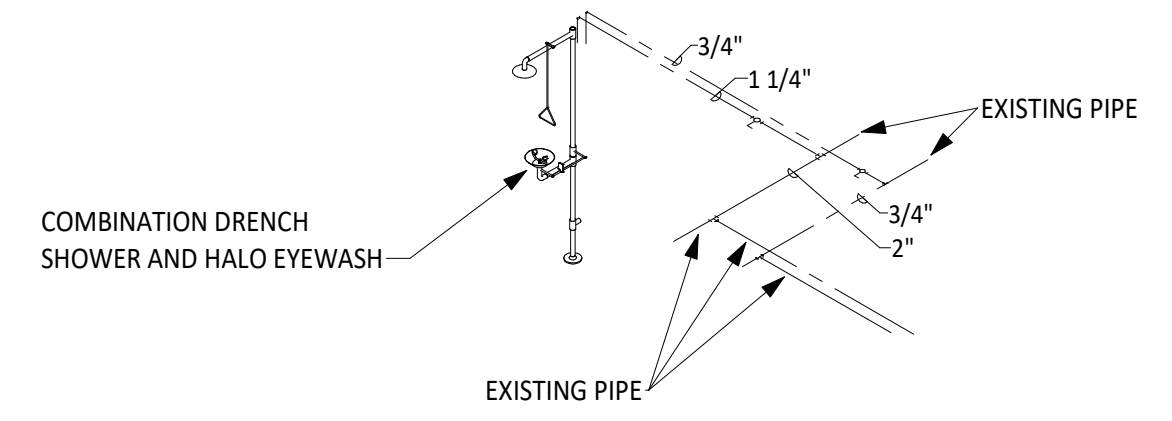
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P103

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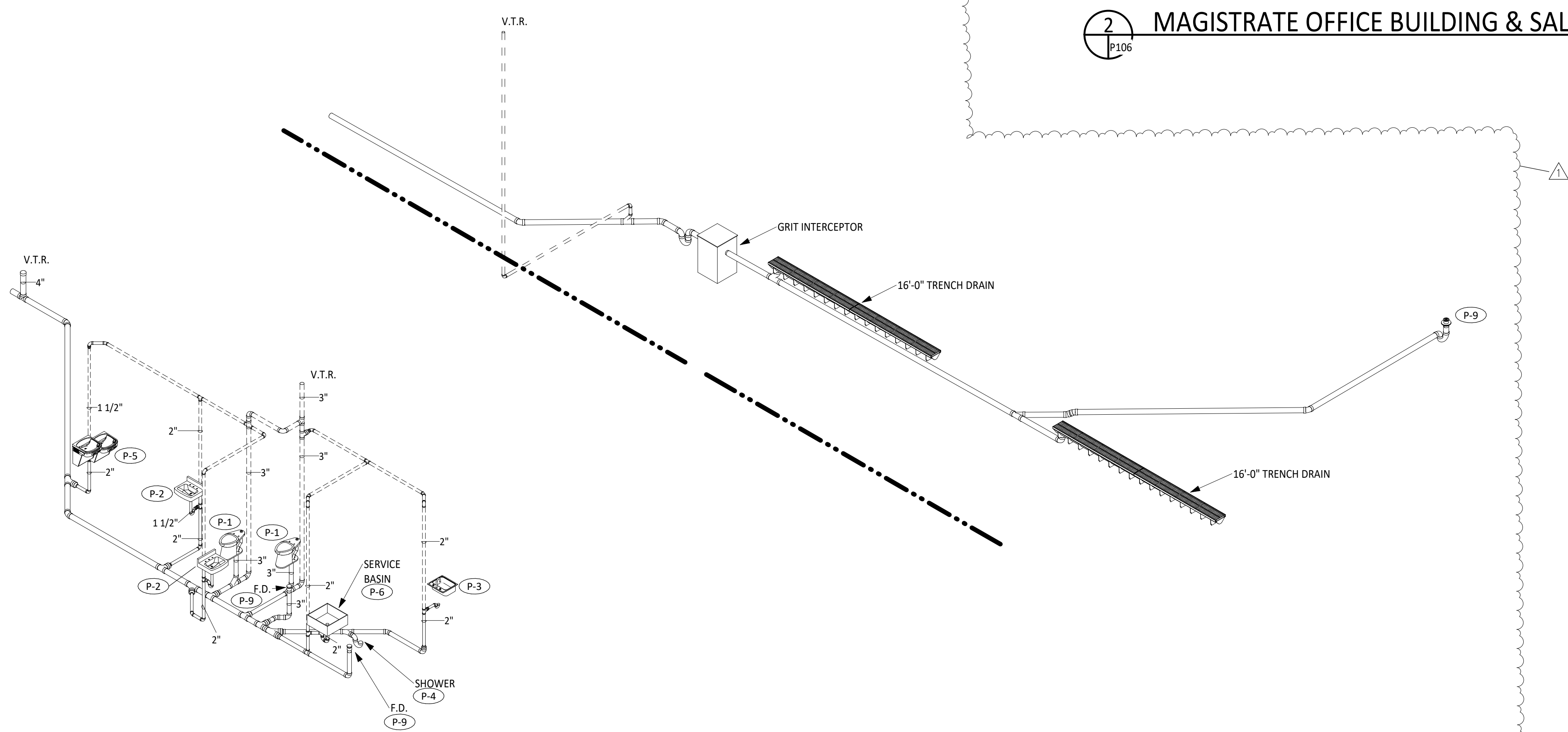


3 SALLYPORT TRENCH DRAIN SYSTEM DETAIL
1/4" = 1'-0"

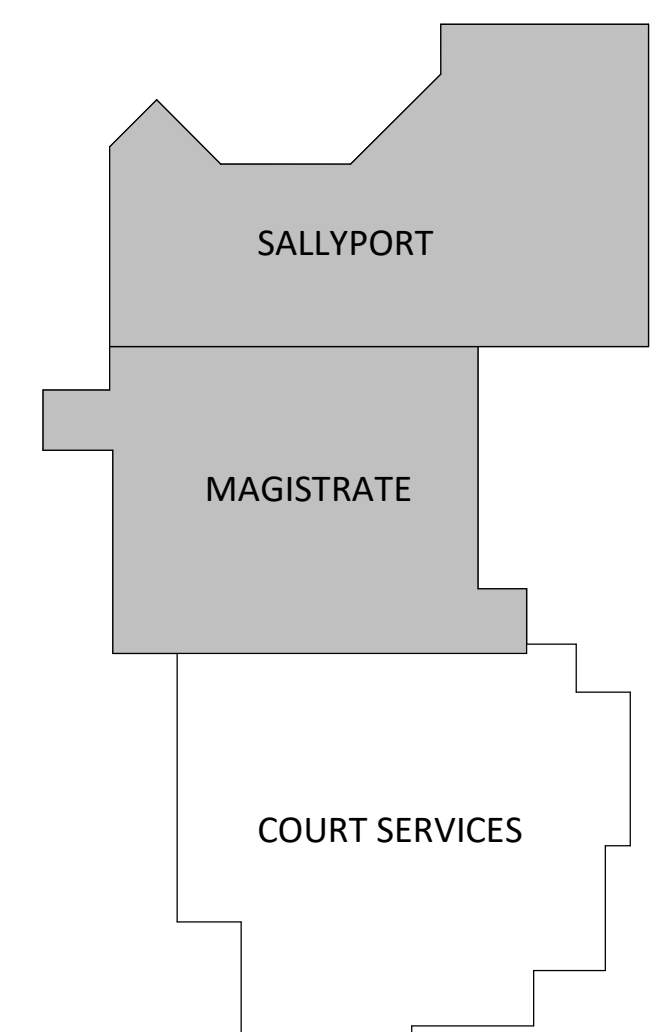


2 MAGISTRATE OFFICE BUILDING & SALLYPORT WATER PIPING DIAGRAM
1/4" = 1'-0"

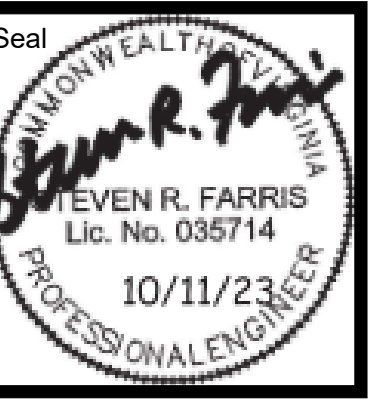
WALL TYPE LINE LEGEND
--- SMOKE BARRIER
--- 1-HOUR FIRE BARRIER
--- 2-HOUR FIRE BARRIER



1 MAGISTRATE OFFICE BUILDING & SALLYPORT SANITARY & VENT PIPING DIAGRAM
1/4" = 1'-0"



KEY PLAN
NOT TO SCALE



MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES
BUILDING
MAGISTRATES OFFICE BUILDING AND SALLYPORT PIPING
DIAGRAMS

| | | | |
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| No. | 1 | ADDENDUM NO. 2 | Purpose of Document Issue |
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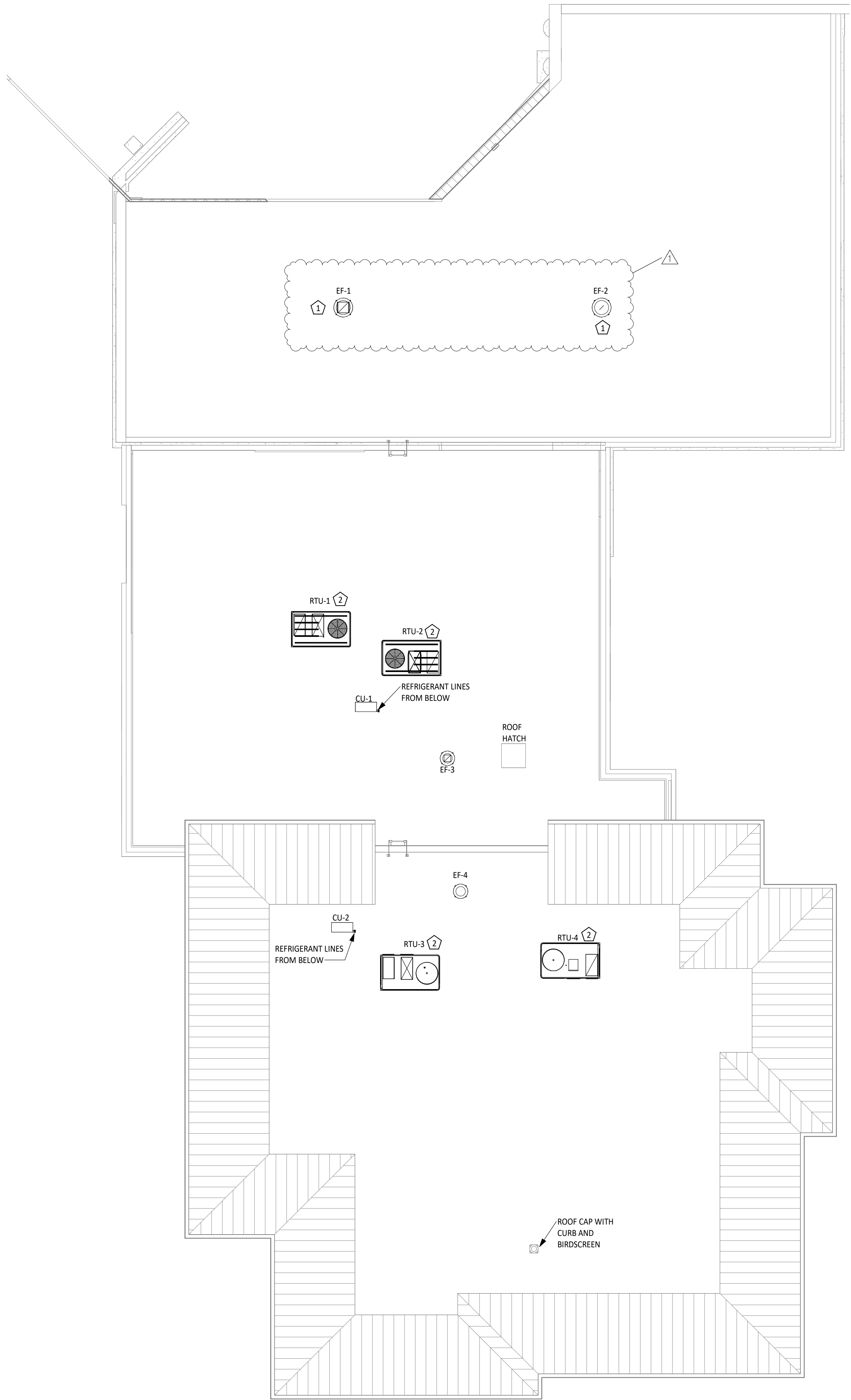
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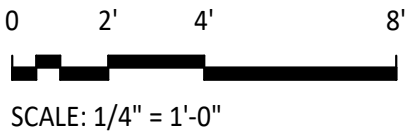
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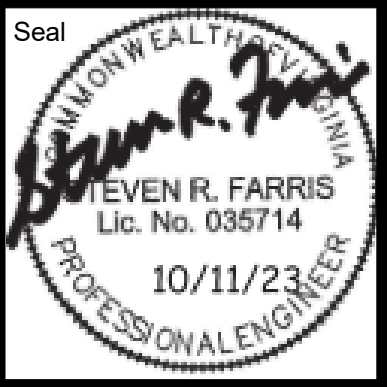
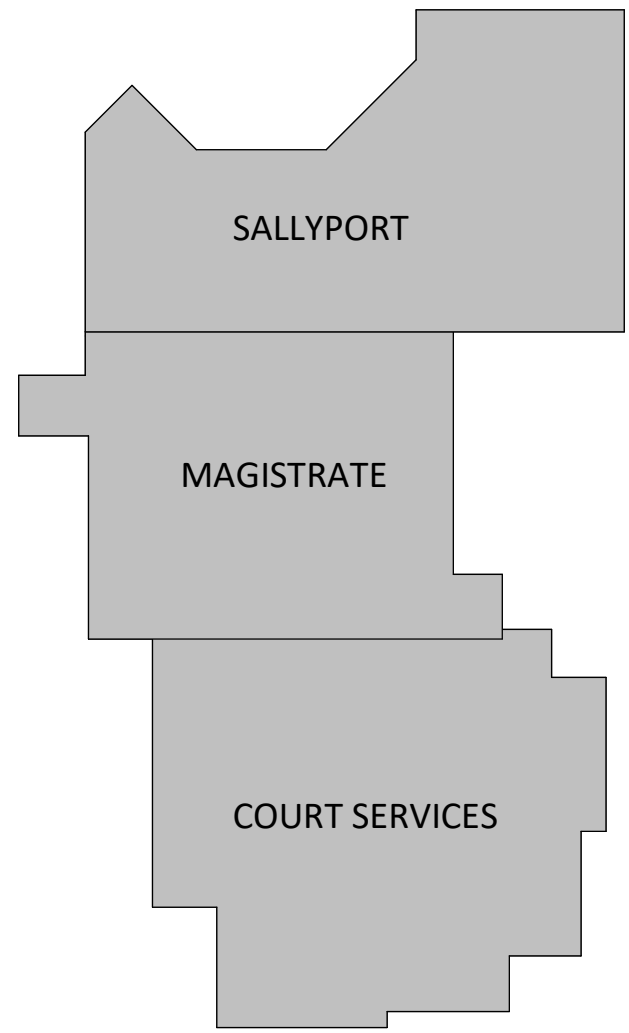


HVAC ROOF PLAN
 1/8" = 1'-0"
 PLAN NORTH

- ROOF PLAN KEYED NOTES:
- EXHAUST FAN TO INTERFACE WITH PARKING GARAGE GAS DETECTION SYSTEM. UPON ALARM FOR HIGH CO/NO2 CONCENTRATION LEVELS, FAN SHALL INITIALIZE. ONCE CONCENTRATION LEVELS DROP BELOW THE PRESET CUTOFF, A 5-MINUTE TIMER SHALL BEGIN FOR FAN SHUTDOWN. FANS SHALL BE MONITORED BY BAS AND HAVE LOCAL CONTROLS.
 - INSTALL RTU AND ROOF CURB. MAINTAIN 10 FT MINIMUM CLEARANCE BETWEEN OUTDOOR AIR INTAKE AND EXHAUST SOURCES.



KEY PLAN



MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES
BUILDING

HVAC ROOF PLAN

| No. | Date | ADDENDUM NO. 2 | Purpose of Document Issue |
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| 1 | 11-17-2023 | | |

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| Checked | SF |
| Date | 10/11/2023 |

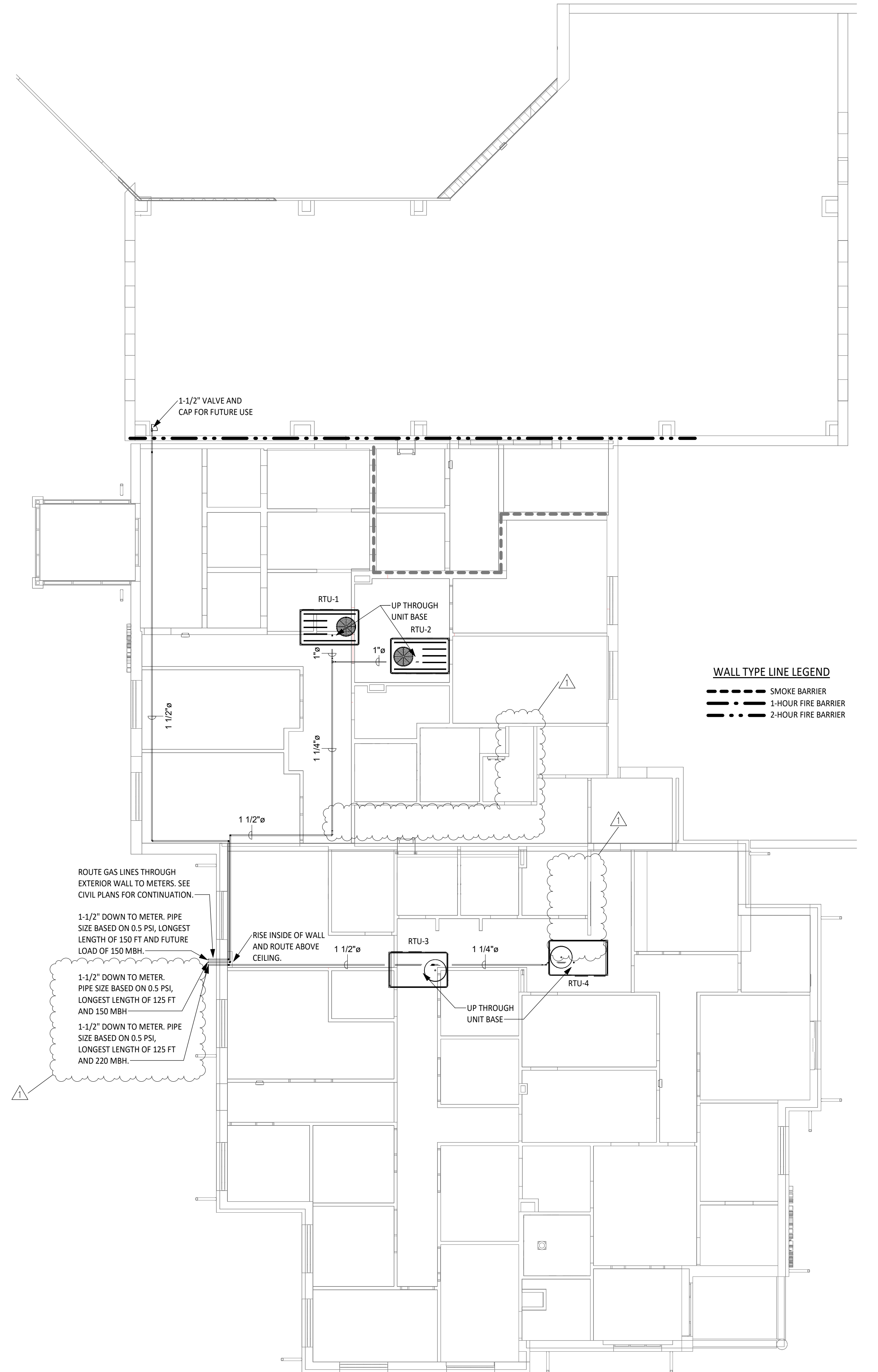
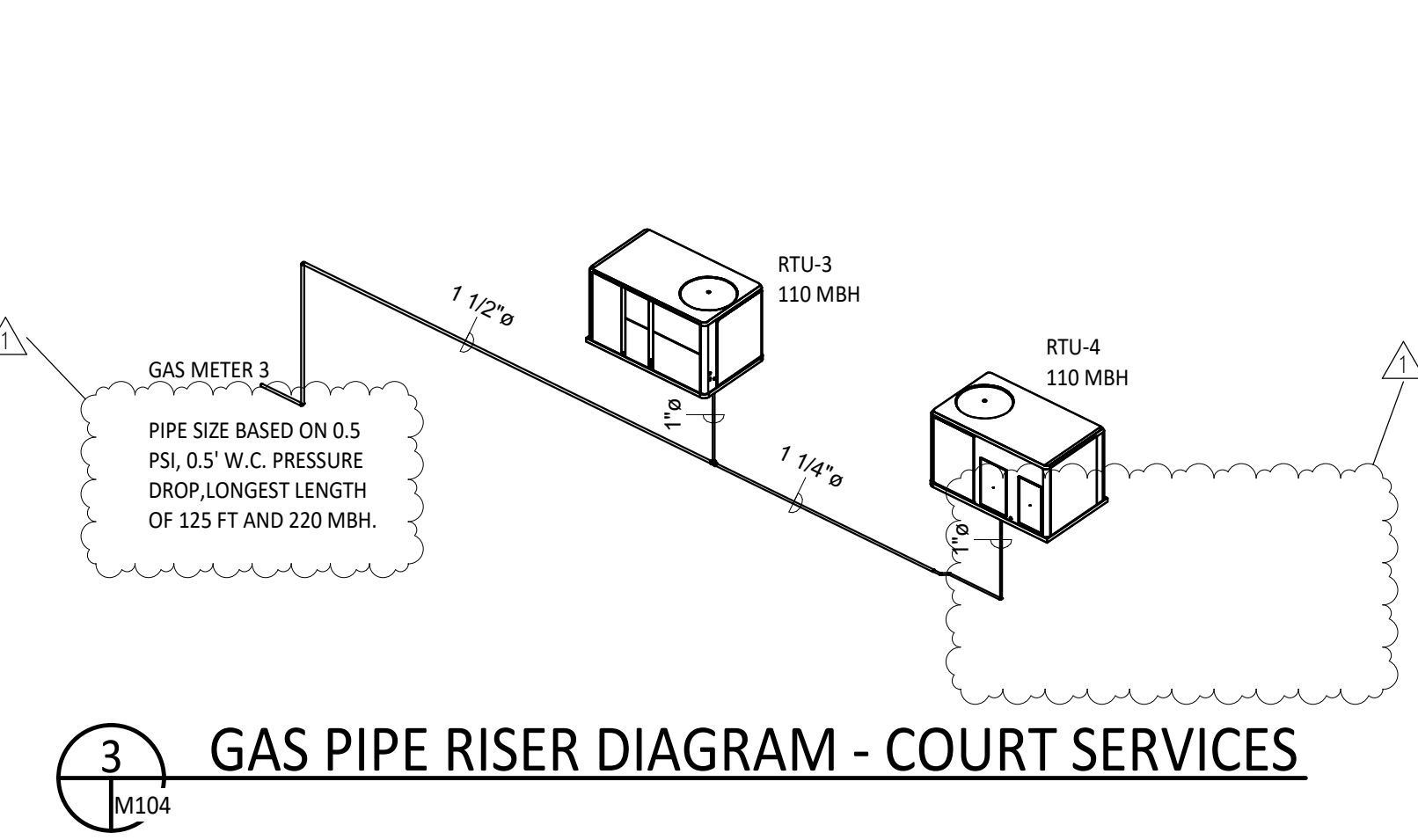
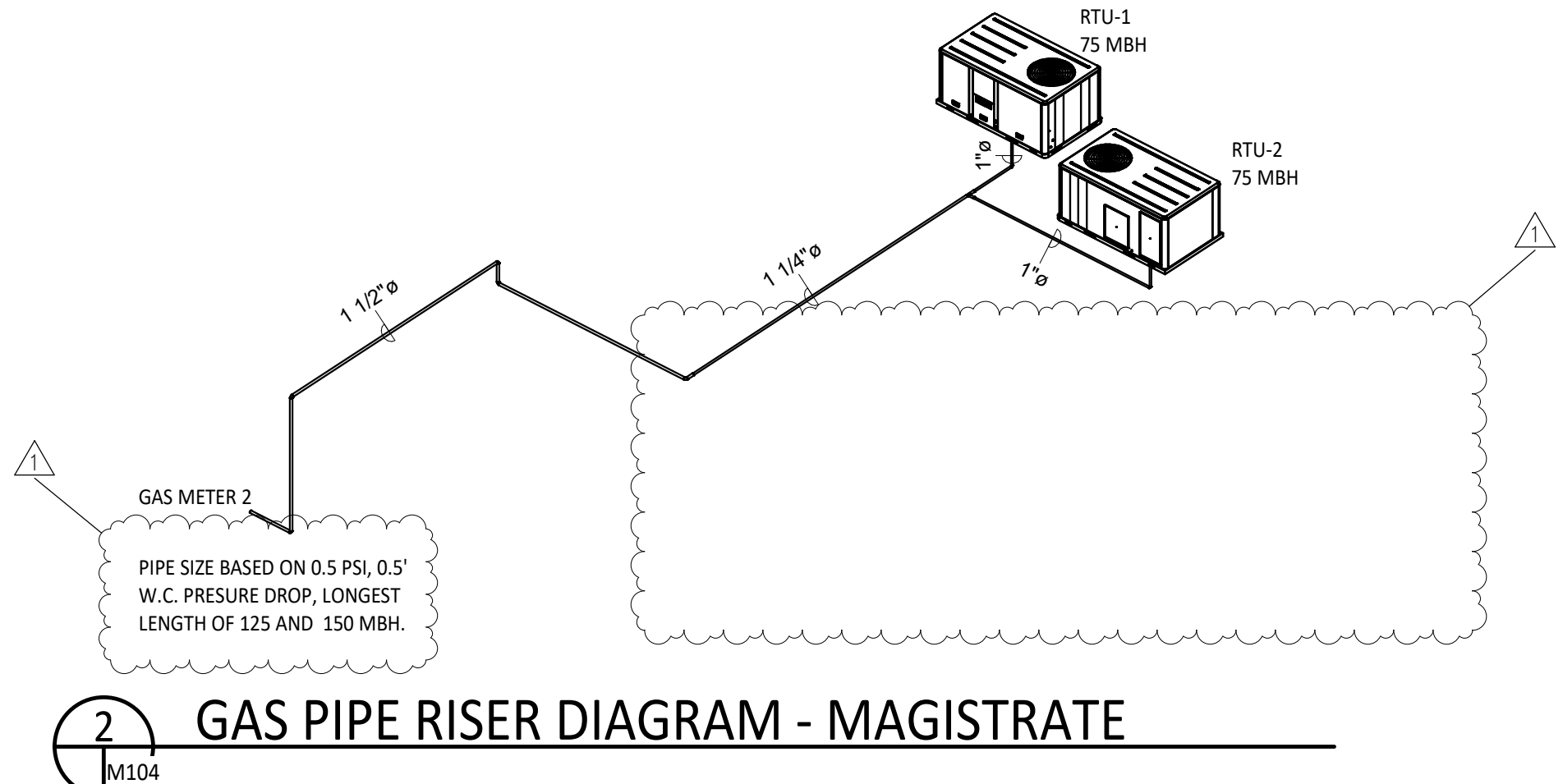
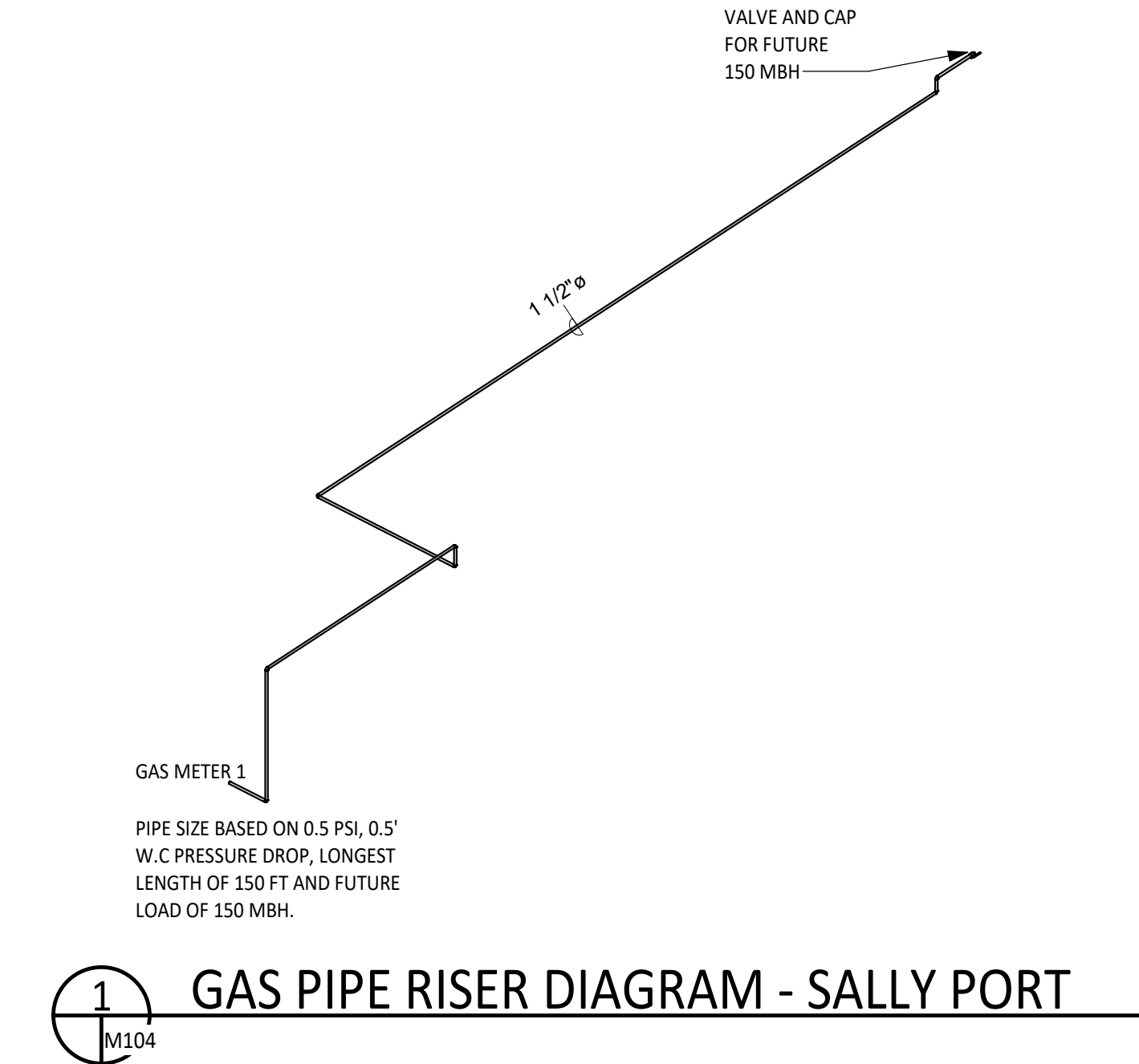
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GAS PIPING PLAN

1/8" = 1'-0"

PLAN NORTH

System No. C-AJ-5091

Classified by Underwriters Laboratories, Inc. to UL 1479 and CANULC S115

| ANSI/UL 1479 (ASTM E814) | CANULC S115 |
|--|--|
| F Rating — 2 Hr | F Rating — 2 Hr |
| T Ratings — 0 and 1 Hr (See Items 2 and 4) | FT Ratings — 0 and 1 Hr (See Items 2 and 4) |
| L Rating At Ambient — 4 CFM/sq ft | FH Rating — 2 Hr |
| L Rating At 400 F — Less Than 1 CFM/sq ft | FTH Ratings — 0 and 1 Hr (See Items 2 and 4) |
| | L Rating At Ambient — 4 CFM/sq ft |
| | L Rating At 400 F — Less Than 1 CFM/sq ft |

SECTION A-A

1. Floor or Wall Assembly — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) concrete. Wall may also be constructed of any UL Classified Concrete Blocks*. Max diam of opening is 29 in. (737 mm). See Concrete Blocks (CA21) category in the Fire Resistance directory for names of manufacturers.

2. Metallic Sleeve — (Optional) — Nom 30 in. (762 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe sleeve cast or grouted into floor or wall assembly, flush with floor or wall surfaces or extending a max of 3 in. (76 mm) above floor or beyond both surfaces of wall. If the steel sleeve extends beyond the top surface of the floor or both surfaces of the wall, the T Rating of the firestop system is 0 hr.

2A. Sheet Metal Sleeve — (Optional) — Max 6 in. (152 mm) diam, min 26 ga galv steel provided with a 26 ga galv steel square flange spot welded to the sleeve at approximately mid-height, or flush with bottom of sleeve in floors, and sized to be a min of 2 in. (51 mm) larger than the sleeve diam. The sleeve is to be cast in place flush with bottom surface of floor and may extend a max of 1 in. (25 mm) above the top surface of the floor.

2B. Sheet Metal Sleeve — (Optional) — Max 12 in. (305 mm) diam, min 24 ga galv steel provided with a 24 ga galv steel square flange spot welded to the sleeve at approximately mid-height, or flush with bottom of sleeve in floors, and sized to be a min of 2 in. (51 mm) larger than the sleeve diam. The sleeve is to be cast in place flush with bottom surface of floor and may extend a max of 1 in. (25 mm) above the top surface of the floor.

Hilti Firestop Systems

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Page: 1 of 2

System No. C-AJ-5091

Classified by Underwriters Laboratories, Inc. to UL 1479 and CANULC S115

3. Through Penetrants — One metallic pipe or tubing to be installed either concentrically or eccentrically within the firestop system. Pipe or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes or tubing may be used:

A. Steel Pipe — Nom 12 in. (305 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. Iron Pipe — Nom 12 in. (305 mm) diam (or smaller) cast or ductile iron pipe.

C. Copper Pipe — Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.

D. Copper Tubing — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.

4. Pipe Covering — Min 1/2 in. (13 mm) to max 2 in. (51 mm) thick hollow cylindrical heavy density (min 3.5 pcf or 56 kg/m³) glass fiber units jacketed on the outside with an all-service jacket. Longitudinal joints sealed with metal fasteners or factory-applied, self-sealing lap tape. Transverse joints secured with metal fasteners or with butt tape supplied with the product. The annular space between the insulated pipe and the edge of the periphery of the opening shall be min 1/2 in. (13 mm) to max 12 in. (305 mm). When thickness of pipe covering is less than 2 in. (51 mm), the T Rating for the firestop system is 0 hr.

See Pipe Equipment Covering — Materials — (BRGU) category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.

4A. Pipe Covering — (Not Shown) — As an alternate to Item 4, max 2 in. (51 mm) thick cylindrical calcium silicate (min 14 pcf or 224 kg/m³) units sized to the outside diam of the pipe or tube may be used. Pipe insulation secured with stainless steel bands or min 18 AWG stainless steel wire spaced max 12 in. (305 mm) OC. The annular space shall be min 1/2 in. (13 mm) to max 12 in. (305 mm).

5. Firestop System — The firestop system shall consist of the following:

A. Packing Material — Min 4 in. (102 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material.

B. Fill, Void or Cavity Material — Sealant — Min 1/2 in. (13 mm) thickness of fill material applied within the annulus, flush with top surface of floor or with both surfaces of wall.

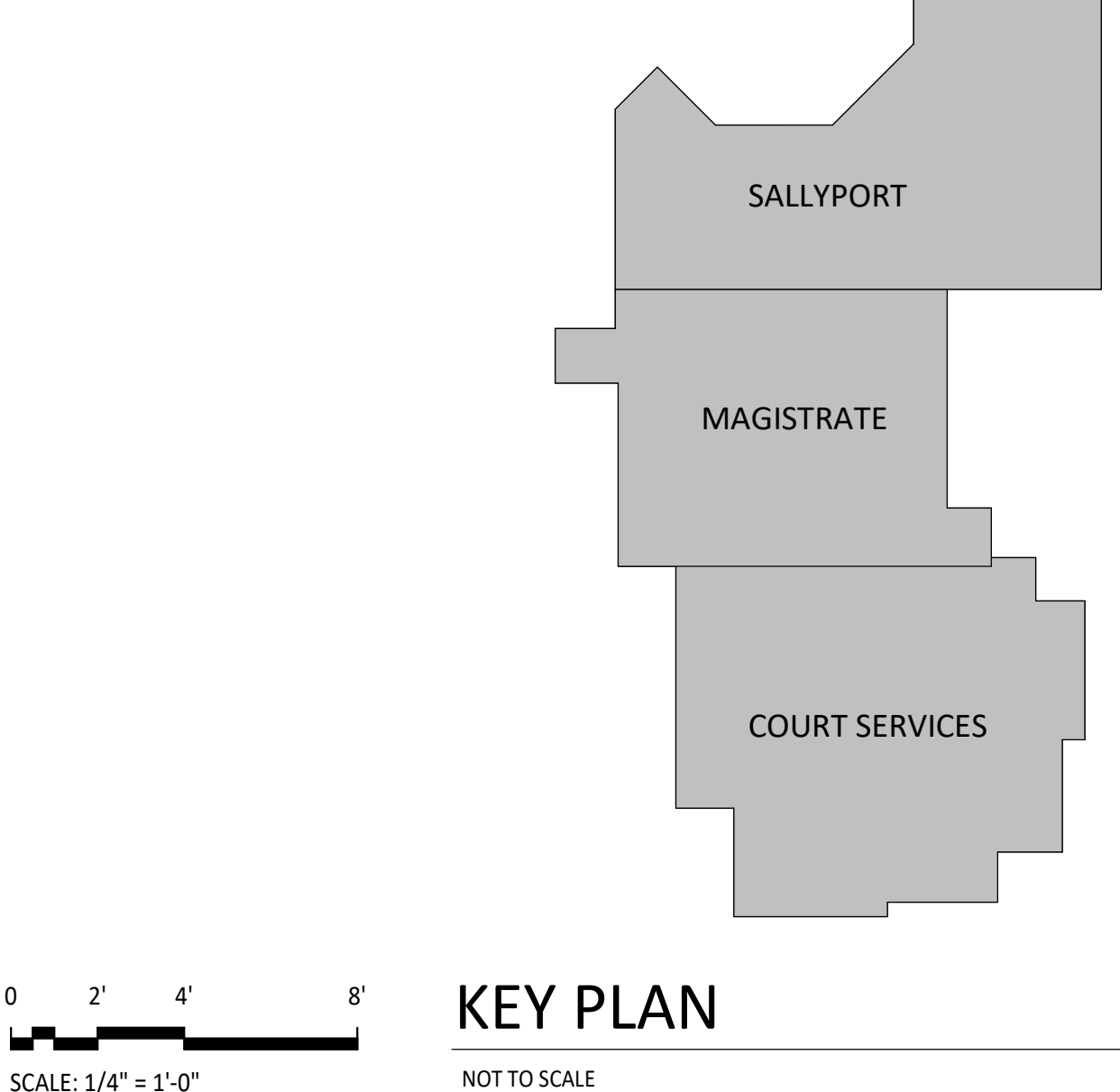
HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-One Sealant or FS-ONE MAX Intumescent Sealant.

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

Hilti Firestop Systems

Reproduced by HILTI, Inc. Courtesy of Underwriters Laboratories, Inc. January 13, 2015

Page: 2 of 2



Seal

THOMPSON & LITTON

STEVEN R. FARRIS

Lic. No. 035714

10/11/23

PROFESSIONAL ENGINEER

MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES

BUILDING

GAS PIPING PLANS

Purpose of Document Issue

ADDENDUM NO. 2

Date

11-17-2023

No.

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Date

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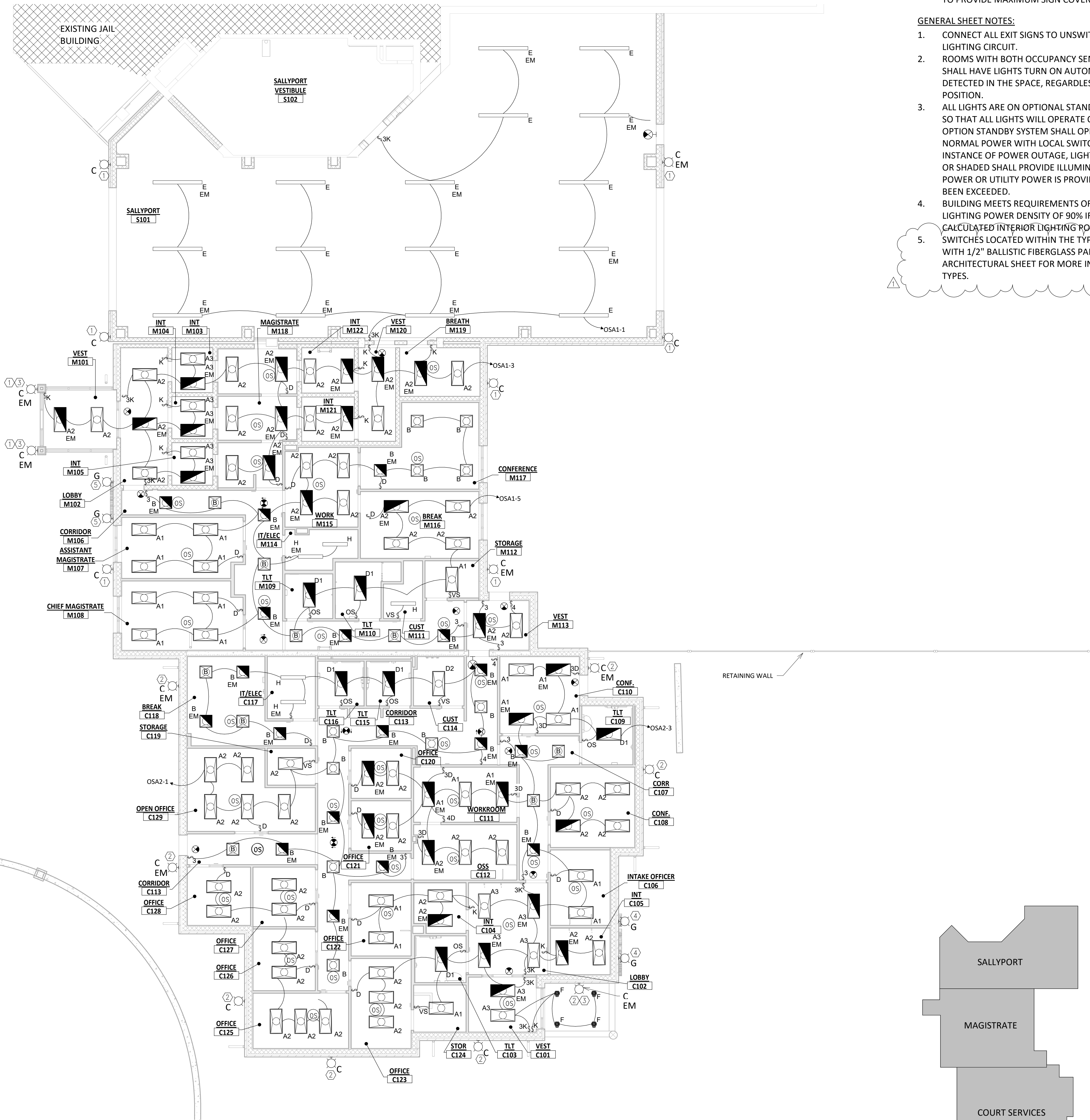
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THOMPSON & LITTON

Sheet No.

M104

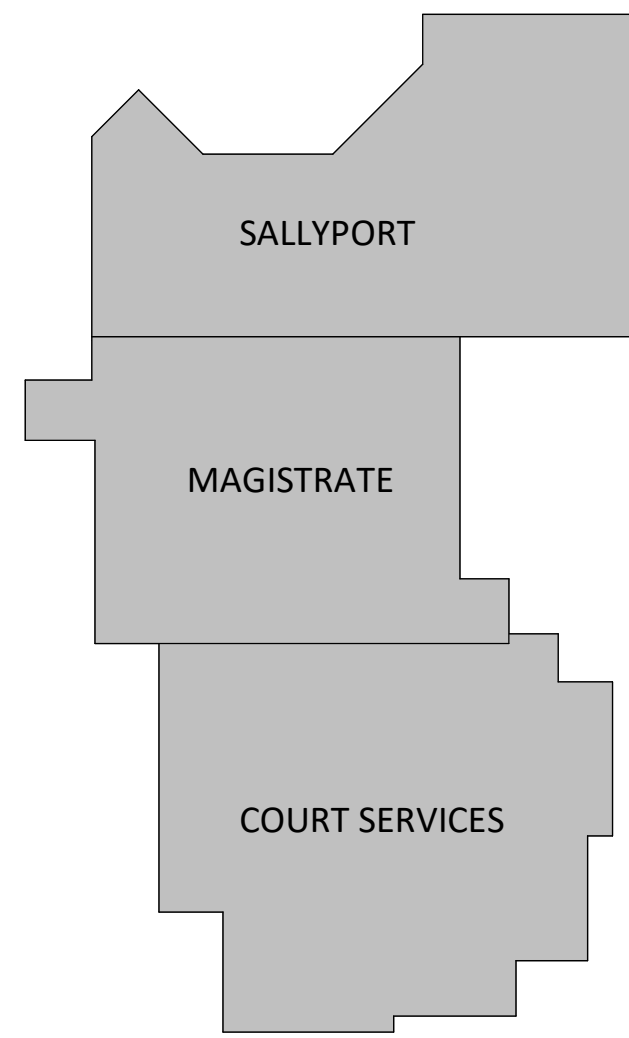
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LIGHTING PLAN
1/8" = 1'-0"
PLAN NORTH

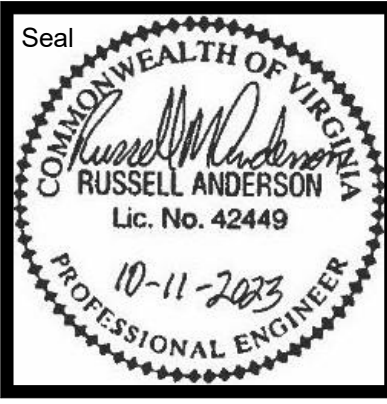
KEY PLAN
NTS

0 4' 8' 16'
SCALE: 1/8" = 1'-0"



- SHEET KEYED NOTES:**
- CIRCUIT EXTERIOR LIGHTING TO CIRCUIT OSA1-7. SEE PANEL SCHEDULE FOR FEEDER INFORMATION.
 - CIRCUIT EXTERIOR LIGHTING TO CIRCUIT OSA2-5. SEE PANEL SCHEDULE FOR FEEDER INFORMATION.
 - MOUNT EXTERIOR LIGHT FIXTURE 7'-6" AFF.
 - MOUNT EXTERIOR LIGHT FIXTURE 10'-6" AFF. ADJUST LIGHT FIXTURE TO PROVIDE MAXIMUM SIGN COVERAGE.
 - MOUNT EXTERIOR LIGHT FIXTURE 14'-0" AFF. ADJUST LIGHT FIXTURE TO PROVIDE MAXIMUM SIGN COVERAGE

- GENERAL SHEET NOTES:**
- CONNECT ALL EXIT SIGNS TO UNSWITCHED PORTION OF NEAREST LIGHTING CIRCUIT.
 - ROOMS WITH BOTH OCCUPANCY SENSORS AND TOGGLE SWITCHES SHALL HAVE LIGHTS TURN ON AUTOMATICALLY WHEN MOTION IS DETECTED IN THE SPACE, REGARDLESS OF TOGGLE SWITCH POSITION.
 - ALL LIGHTS ARE ON OPTIONAL STANDBY PANELS (OSA1 AND OSA2) SO THAT ALL LIGHTS WILL OPERATE ON THE GENERATOR. LIGHTS ON OPTION STANDBY SYSTEM SHALL OPERATE THE SAME AS ON NORMAL POWER WITH LOCAL SWITCHING AND CONTROLS. IN THE INSTANCE OF POWER OUTAGE, LIGHT FIXTURES INDICATED IN "EM" OR SHADED SHALL PROVIDE ILLUMINATION UNTIL GENERATOR POWER OR UTILITY POWER IS PROVIDED OR UNTIL 90 MINUTES HAS BEEN EXCEEDED.
 - BUILDING MEETS REQUIREMENTS OF VECC 406.3 FOR REDUCED LIGHTING POWER DENSITY OF 90% IF 1.01 WATTS/SF (COURTHOUSE). CALCULATED INTERIOR LIGHTING POWER DENSITY IS .55 WATTS/SF. SWITCHES LOCATED WITHIN THE TYPE D WALLS SHALL BE WRAPPED WITH 1/2" BALLISTIC FIBERGLASS PANELS ON ALL SIDES. SEE ARCHITECTURAL SHEET FOR MORE INFORMATION REGARDING WALL TYPES.



MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES
BUILDING
LIGHTING PLAN

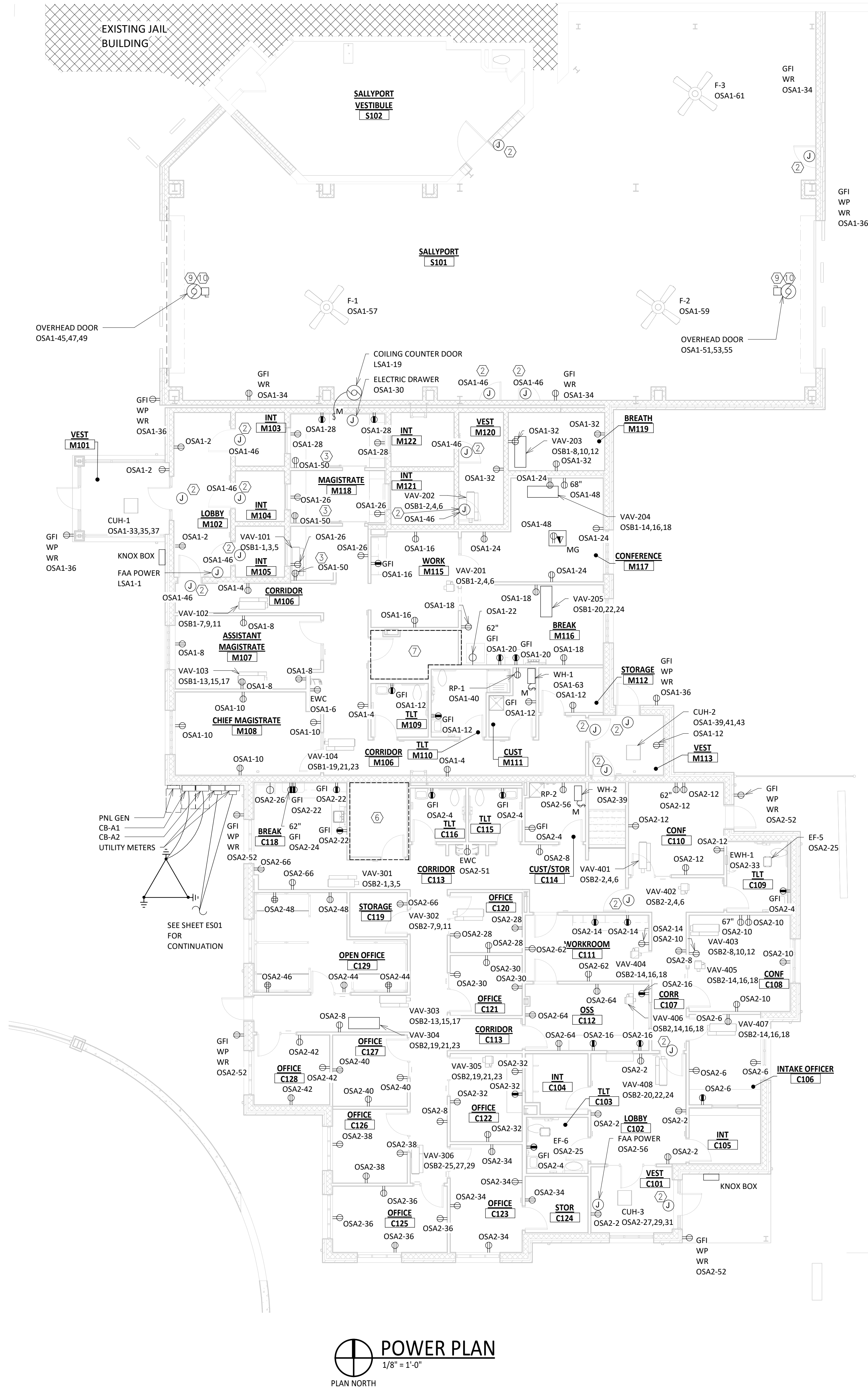
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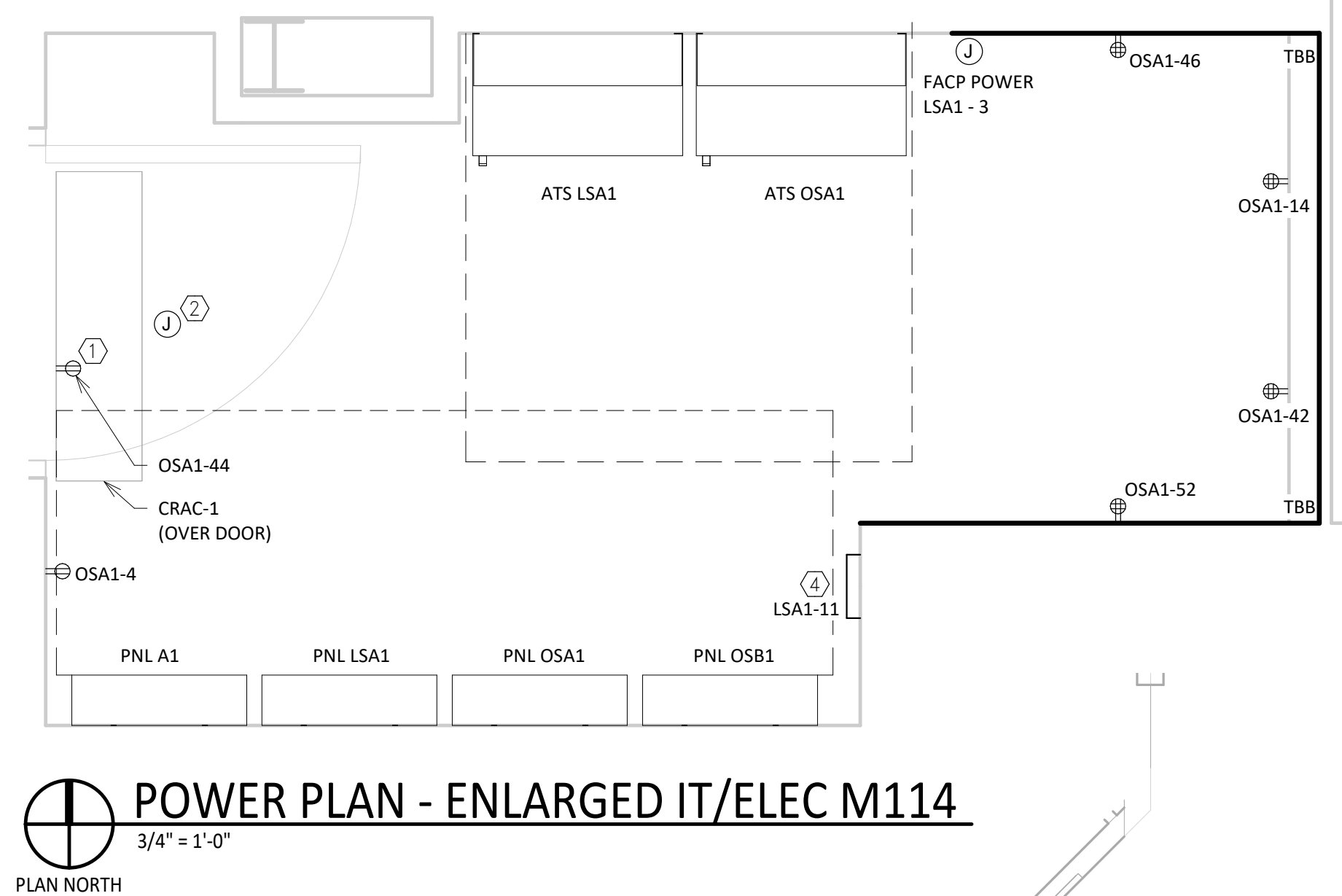
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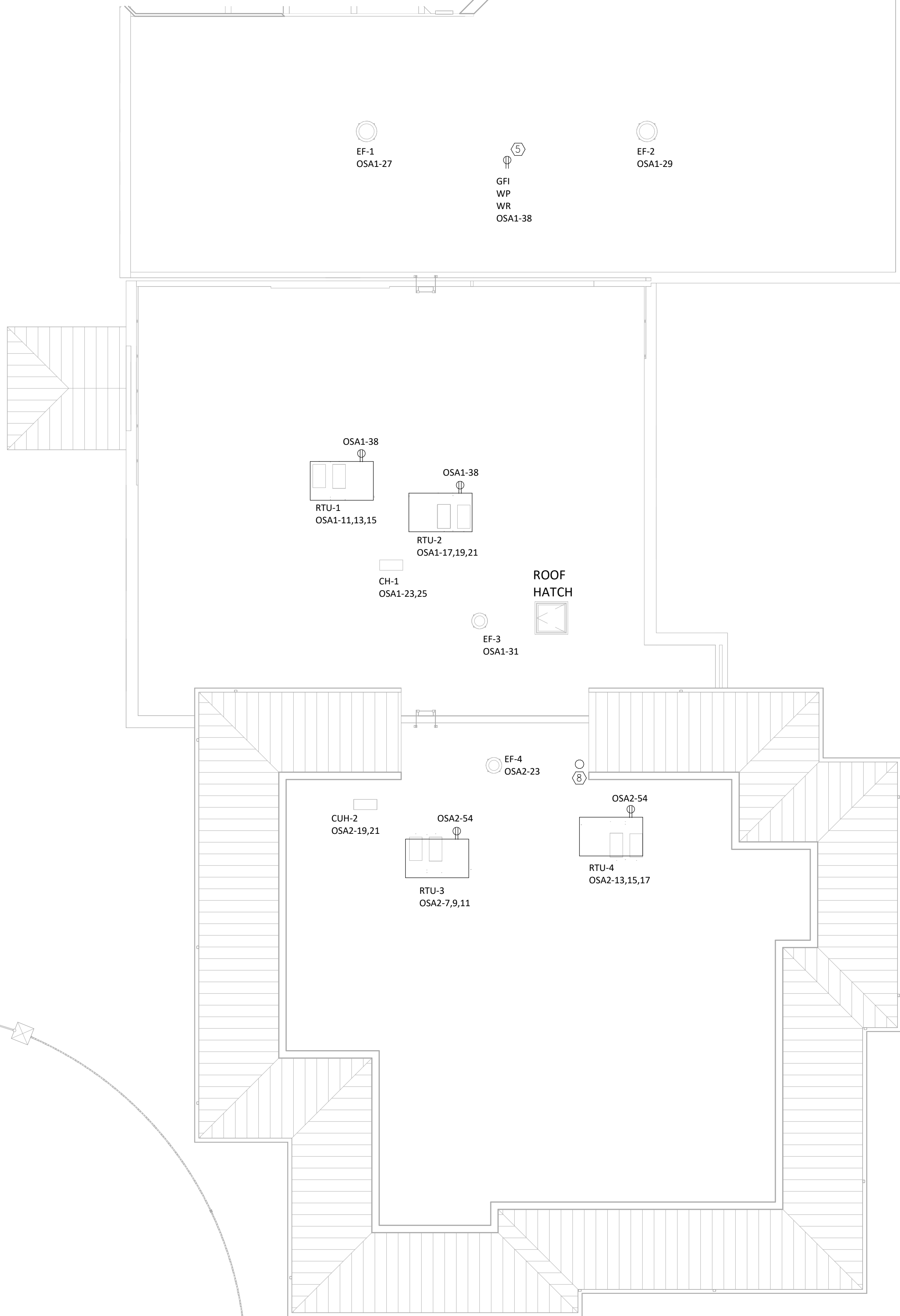
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E101



POWER PLAN
1/8" = 1'-0"
PLAN NORTH



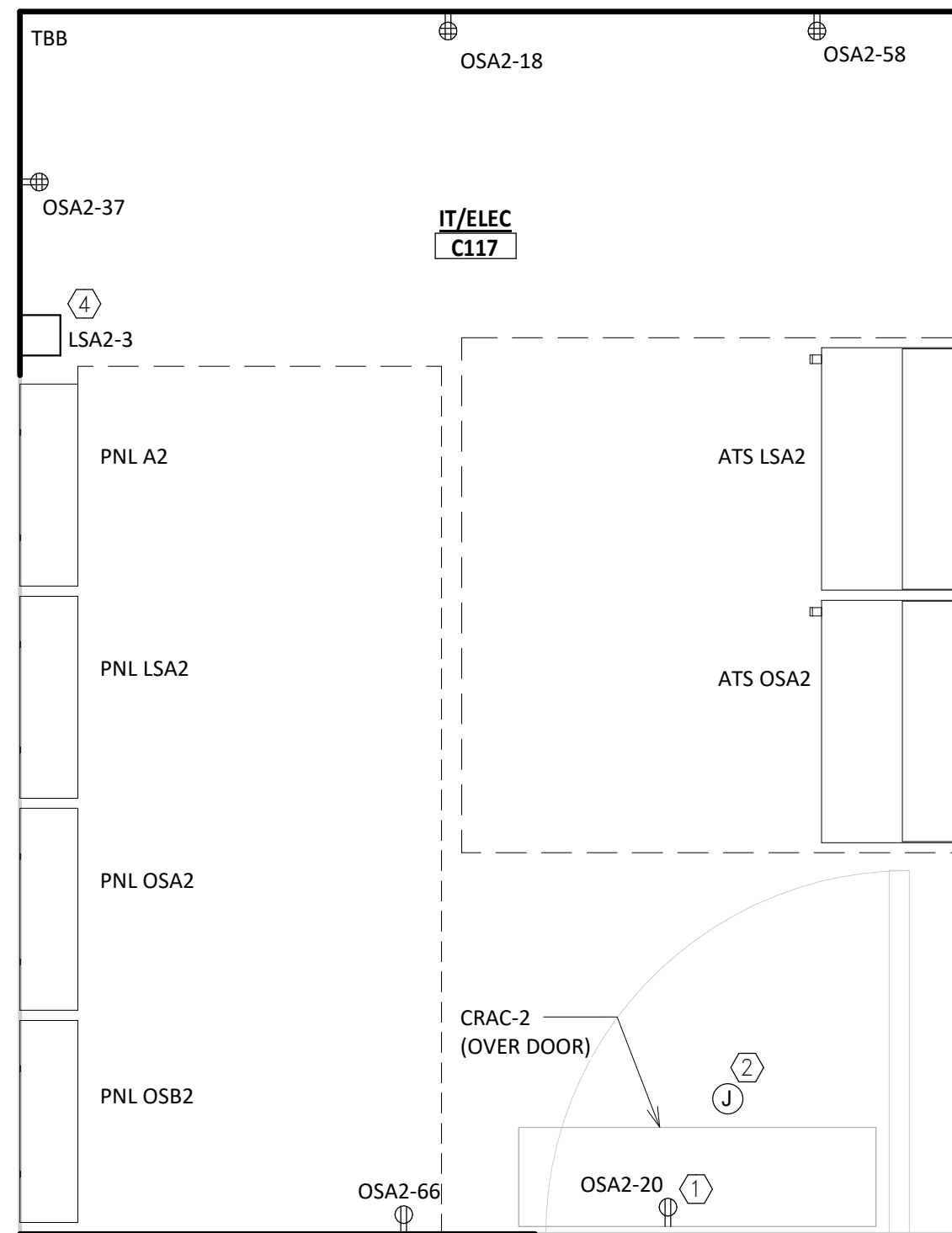
POWER PLAN - ENLARGED IT/ELEC M114
3/4" = 1'-0"
PLAN NORTH



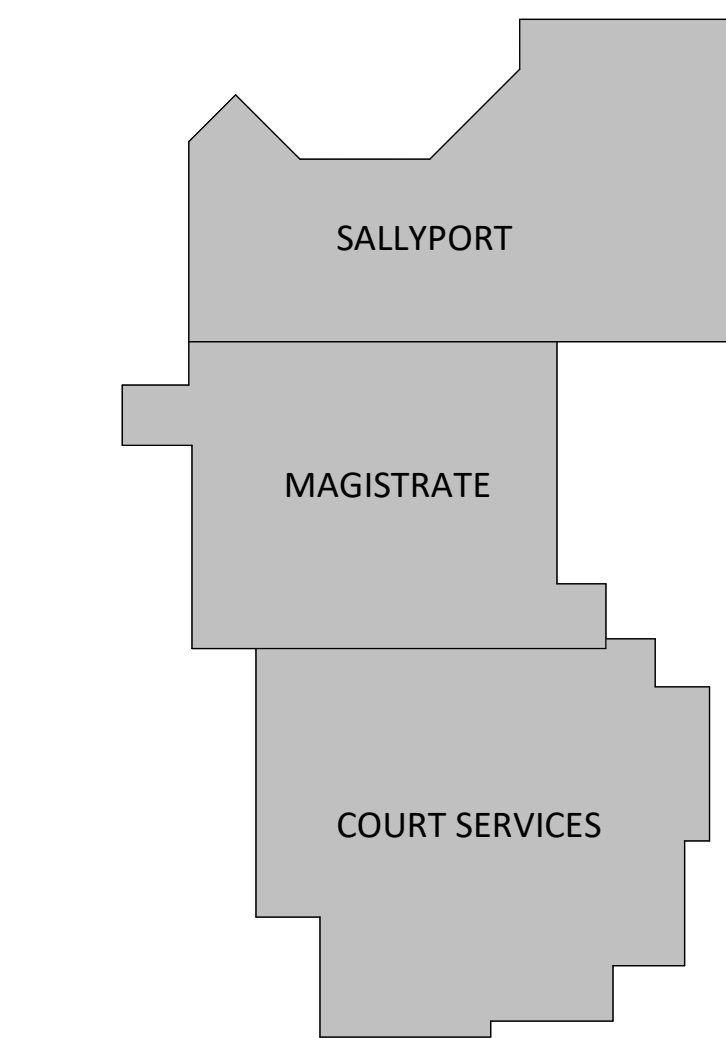
POWER PLAN ROOF
1/8" = 1'-0"
PLAN NORTH

- SHEET KEYED NOTES:**
1. PROVIDE RECEPTACLE ADJACENT TO MECHANICAL UNIT FOR CONDENSATE PUMP. CIRCUIT AS INDICATED.
 2. PROVIDE POE NETWORK BOARD ABOVE ACCESSIBLE CEILING FOR ACCESS CONTROL. WHERE NO ACCESS CEILING EXISTS, WALL MOUNT 12" ABOVE DOOR ON SECURE SIDE. COORDINATE CLEARANCE AND ACCESS WITH CRAC LOCATION.
 3. RECEPTACLE POWERING MONITOR/VIDEO SYSTEM FOR ADJACENT INTERVIEW ROOM. COORDINATE FINAL LOCATION AND MOUNTING HEIGHT WITH OWNER. MOUNT ADJACENT TO DATA OUTLET.
 4. REMOTE GENERATOR ANNUNCIATOR WITH EMERGENCY STOP. CIRCUIT AS INDICATED. COORDINATE FINAL LOCATION WITH OWNER.
 5. SEE MAINTENANCE RECEPTACLE MOUNTING DETAIL ON SHEET E501 MOUNTING INFORMATION.
 6. SEE POWER PLAN - ENLARGED IT/ELEC C117 THIS SHEET.
 7. SEE POWER PLAN - ENLARGED IT/ELEC M114 THIS SHEET.
 8. PROVIDE 3/4" C STUBBED THROUGH ROOF AND CAPPED FOR FUTURE CAMERA.
 9. INTERLOCK GARAGE DOOR ACCESS CONTROLS SO ONLY ONE GARAGE DOOR WILL BE ALLOWED TO OPEN AT A TIME.
 10. GARAGE DOOR SHALL BE OPERATED ONLY BY THE JAIL CONTROL ROOM VIA PUSH BUTTON.

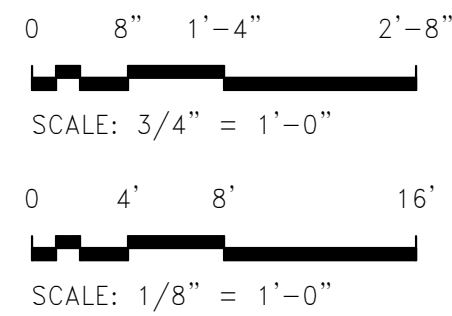
- GENERAL SHEET NOTES:**
1. FLOOR BOXES SHOWN ON BOTH POWER AND COMMUNICATION SHEETS IN SAME LOCATIONS ARE THE SAME SINGLE FLOOR BOX WITH REQUIRED DIVIDERS.
 2. PROVIDE CONTINUOUS TBB ON WALLS WHERE INDICATED IN IT/ELEC ROOMS. SEE LEGEND FOR SPECIFIC MOUNTING HEIGHTS AND TBB REQUIREMENTS
 3. SEE ARCHITECTURE SHEETS FOR KNOX BOX REQUIREMENTS.
 4. SWITCHES AND RECEPTACLES LOCATED WITHIN THE TYPE D WALLS SHALL BE WRAPPED WITH 1/2" BALLISTIC FIBERGLASS PANELS ON ALL SIDES. SEE ARCHITECTURAL SHEET FOR MORE INFORMATION REGARDING WALL TYPES.



POWER PLAN - ENLARGED IT/ELEC C117
3/4" = 1'-0"
PLAN NORTH



KEY PLAN
NTS



Seal

COMMONWEALTH OF VIRGINIA

RUSSELL ANDERSON

Lic. No. 42449

10-11-2023

PROFESSIONAL ENGINEER

MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES BUILDING

POWER PLAN

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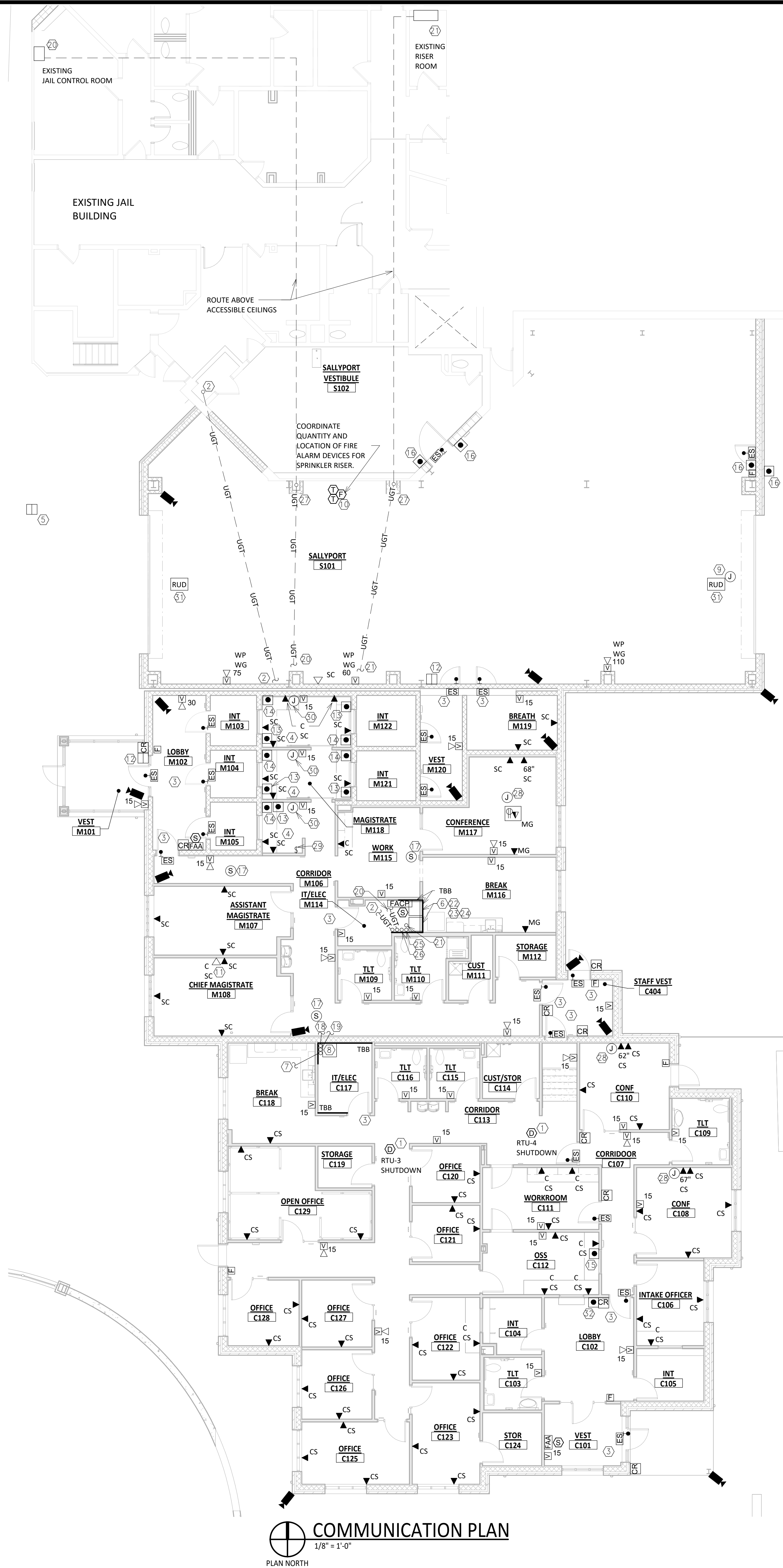
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THOMPSON & LITTON

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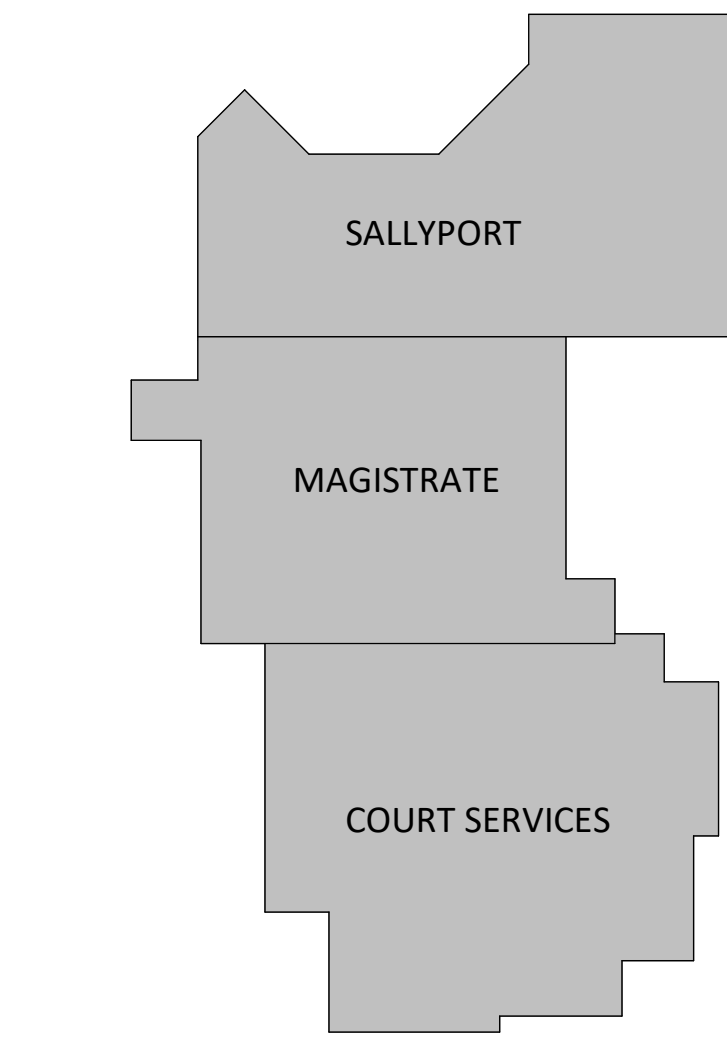
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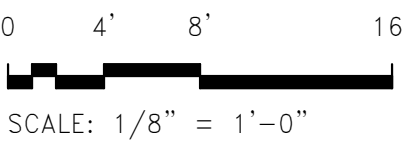
COMMUNICATION PLAN
1/8" = 1'-0"
PLAN NORTH

- SHEET KEYED NOTES:**
1. PROVIDE A DUCT SMOKE DETECTOR IN THE RETURN AND SUPPLY DUCT SERVING THIS AREA FOR HVAC UNIT SHUTDOWN.
 2. PROVIDE SPARE 4" C WITH PULL CORD UNDERGROUND FROM IT/ELEC M114 TO EXISTING BUILDING, STUB-UP AND CAP FOR FUTURE EXPANSIONS.
 3. DOOR TO REMAIN SECURE UPON FIRE ALARM ACTIVATION OR LOSS OF POWER.
 4. DATA OUTLET FOR MONITOR/VIDEO SYSTEM FOR ADJACENT INTERVIEW ROOM. COORDINATE FINAL LOCATION AND MOUNTING HEIGHT WITH OWNER. MOUNT ADJACENT TO POWER RECEPTACLE.
 5. PROVIDE (1) 1" C WITH PULL CORD TO INTERCOM PEDESTAL FOR PLC INTERCOM. ROUTE 1" C WITH PULL CORD TO EXISTING CONTROL ROOM IN EXISTING JAIL CONTROL ROOM. SEE SHEET E501 INTERCOM PEDESTAL DETAIL FOR MORE INFORMATION. CABLING AND DEVICES BY OTHERS.
 6. FULL FLOOR MOUNTED IT RACKS FOR SUPREME COURT (SC) AND MAGISTRATE (MG). NETWORKS SHALL REMAIN SEPARATED.
 7. COMMUNICATION SERVICE CONDUIT, SEE SITE PLAN FOR CONTINUATION.
 8. FULL FLOOR MOUNTED IT RACK FOR COURT SERVICES.
 9. PROVIDE 3/4" C TO VEHICLE PROBE DETECTOR FOR OVERHEAD DOOR CONTROLS. SEE SHEET E501 VEHICLE PROBE DETECTOR DETAIL FOR MORE INFORMATION. OVERHEAD DOOR IS CONTROLLED BY THE EXISTING JAIL CONTROL ROOM.
 10. PROVIDE POWER AND FIRE ALARM MONITORING FOR SPRINKLER DRY PIPE SYSTEM EXPANSION FROM EXISTING BUILDING SYSTEM. POWER AND FA CONNECTION SHALL BE FROM NEW ADDITION.
 11. PROVIDE 1" C TO CHIEF MAGISTRATE OFFICE M108 FOR INTERCOM FEED FROM VEST M101 LOCATION. ROUTE CONDUIT BACK TO IT RACK IN ROOM IT/ELEC M114.
 12. PROVIDE ROUGH-IN WITH CONDUIT AND SINGLE GANG JUNCTION BOX FOR PAXTON INTERCOM DEVICE, 48" TO CENTER. CONDUIT SHALL BE ROUTED TO ROOM IT/ELEC M114 AND CONTROLLED FROM M118 A,B, AND C.
 13. PROVIDE DURESS/PANIC BUTTON ROUGH-IN WITH CONDUIT AND SINGLE GANG JUNCTION BOX IN AREAS INDICATED AT A HEIGHT OF 26" AFF. FINAL LOCATION SHALL BE COORDINATED WITH OWNER. ROUTE CONDUIT FROM ROOM IT/ELEC M114.
 14. PUSH BUTTON FOR CONTROL OF INTERVIEW ROOM DOOR. PROVIDE ROUGH-IN CONDUIT AND SINGLE GANG JUNCTION BOX. ROUTE CONDUIT FROM ROOM IT/ELEC M114.
 15. PUSH BUTTON FOR CONTROL OF LOBBY C102 DOOR. PROVIDE ROUGH-IN CONDUIT AND SINGLE GANG JUNCTION BOX. ROUTE CONDUIT FROM ROOM IT/ELEC M114.
 16. PROVIDE ROUGH-IN WITH CONDUIT AND SINGLE GANG JUNCTION BOX FOR INTERCOM PUSH BUTTON FOR BUZZER LOCK SYSTEM. MOUNT AT 48" AFF. CONDUIT SHALL BE ROUTED TO EXISTING JAIL CONTROL ROOM.
 17. PROVIDE ROUGH-IN WITH 1" CONDUIT AND SINGLE GANG JUNCTION BOX FOR ACTION DEVICE FOR ALERTS WHEN INCOMING NOTIFICATION OCCURS FROM PAXTON INTERCOM DEVICES. COORDINATE ALL REQUIREMENTS WITH OWNER'S SECURITY VENDOR. ROUTE CONDUIT TO PAXTON INTERCOM HEADEND EQUIPMENT IN ROOM IT/ELEC M114.
 18. PROVIDE 4" C TO IT/ELEC M114 WITH PULL CORD.
 19. PROVIDE 1" C TO IT/ELEC M114 WITH 24 STRAND SINGLE MODE FIBER. TERMINATION BY OTHERS.
 20. PROVIDE 1 1/2" C TO EXISTING IT RACK IN JAIL CONTROL ROOM WITH 24 STRAND SINGLE MODE FIBER. TERMINATION BY OTHERS.
 21. PROVIDE 6 STRAND FIBER FROM IT/ELEC M114 TO EXISTING VIDEO CABINET IN JAIL RISER ROOM. PROVIDE 2 FIBERS FOR PLC FOR DURESS PLC. PROVIDE 2 FIBERS FOR VIDEO. COORDINATE REMAINING STRANDS WITH OWNER'S SECURITY VENDOR. CABLES TO BE TERMINATED BY OWNER/OWNER'S SECURITY VENDOR.
 22. OWNER'S SECURITY VENDOR TO PROVIDE PLC FOR DURESS TO REPORT TO JAIL CONTROL AND INSTALL IN RACK.
 23. OWNER'S SECURITY VENDOR TO PROVIDE 24 PORT POE NETWORK SWITCH AND UPS FOR CAMERAS AND INSTALL IN RACK. COORDINATE LOCATION WITH OWNER'S SECURITY VENDOR.
 24. OWNER'S SECURITY VENDOR TO PROVIDE 24 PORT POE NETWORK SWITCH AND UPS FOR CARD ACCESS AND INSTALL IN RACK. COORDINATE LOCATION WITH OWNER'S SECURITY VENDOR.
 25. 4" CONDUIT FROM IT/ELEC C117 WITH PULL CORD.
 26. 1" CONDUIT WITH 24 STRAND SINGLE MODE FIBER FROM IT/ELEC C117. CABLES TO BE TERMINATED BY OWNER/OWNER'S SECURITY VENDOR.
 27. ROUTE CONDUIT VERTICAL ON COLUMNS TO ABOVE EXISTING CEILING.
 28. PROVIDE 3/4" C WITH PULL CORD DOWN FROM ACCESSIBLE CEILING FOR FUTURE USE TO EMPTY RECESSED 4" SQUARE JUNCTION BOX AT A HEIGHT OF 68". LOCATE EMPTY 4" SQUARE JUNCTION BOX CONCEALED BEHIND TV.
 29. PROVIDE ROUGH-IN WITH 1" CONDUIT AND SINGLE GANG JUNCTION BOX FOR TOGGLE SWITCH FOR THE ENABLING AND DISABLING CALL IN SOUNDERS. ROUTE CONDUIT TO PAXTON HEADEND EQUIPMENT IN ROOM IT/ELEC M114.
 30. PROVIDE ROUGH-IN FOR PAXTON ENTRY PREMIUM MONITOR. COORDINATE LOCATION AND HEIGHT WITH SECURITY PROVIDER. PROVIDE 1" CONDUIT WITH PULL CORD BACK TO PAXTON HEADEND EQUIPMENT IN ROOM IT/ELEC M114 AND SINGLE GANG JUNCTION BOX. PAXTON PREMIUM ENTRY MONITORS SHALL CONTROL PAXTON INTERCOM DEVICES.
 31. ROLL UP DOOR (RUD) SHALL BE CONTROLLED BY JAIL CONTROL ROOM. ROUTE 1" CONTROL CONDUIT BACK TO EXISTING JAIL CONTROL ROOM. DOOR ROLL UP DOOR SHALL BE OPERATED BY PUSH BUTTON.
 32. PROVIDE ROUGH-IN WITH CONDUIT AND SINGLE GANG JUNCTION BOX FOR INTERCOM PUSH BUTTON FOR BUZZER LOCK SYSTEM. MOUNT AT 48" AFF. SYSTEM PROVIDED BY OWNER'S SECURITY VENDOR. TO BE CONTROLLED BY PUSH BUTTON LOCATED IN ROOM OSS C112.

- GENERAL SHEET NOTES:**
1. FLOOR BOXES SHOWN ON BOTH POWER AND COMMUNICATION SHEETS IN SAME LOCATIONS ARE THE SAME SINGLE FLOOR BOX WITH REQUIRED DIVIDERS.
 2. SECURED NETWORK THROUGH SUPREME COURT SHALL BE SEPARATED FROM REGULAR NETWORK IN MAGISTRATE AND COURT SERVICE AREAS.
 3. FIRE ALARM OR DATA DEVICES LOCATED WITHIN THE TYPE D WALLS SHALL BE WRAPPED WITH 1/2" BALLISTIC FIBERGLASS PANELS ON ALL SIDES. SEE ARCHITECTURAL SHEET FOR MORE INFORMATION REGARDING WALL TYPES.
 4. SEE LOW VOLTAGE RESPONSIBILITY MATRIX ON SHEET E601.
 5. SEE LEGEND FOR DEVICE DEFINITION FOR CONDUIT AND BOX SIZE.



KEY PLAN
NTS



Seal

RUSSELL ANDERSON
Lic. No. 42449
10-11-2023
PROFESSIONAL ENGINEER

MONTGOMERY COUNTY MAGISTRATE AND COURT SERVICES
BUILDING

COMMUNICATIONS PLAN

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