To: Prospective Bidders

From: Wold Architects and Engineers

Date: March 3, 2023

Comm. No: 213106

Subject: Addendum No. 3 for Bidding Documents for the
Regional Operations and Communications Facility
Libertyville, Illinois

BIDS DUE MARCH 9, 2023, AT 11:00 A.M.

This addendum forms a part of the Contract Documents dated December 30, 2022. Acknowledge receipt of this Addendum on the space provided on the Bid Form. Failure to do so may result in disqualification of Bid.

This Addendum consists of three (4) typed sheets and attachments:
Specifications: 01 22 00, 01 30 00, 09 27 00, 10 11 00, 10 28 00, 10 75 00, 23 34 16, 23 09 93
Drawings: Project Cover Sheet, C4, C6, C7, C8, S0.11, S2.00b, A2.01a, A2.03, A2.095, A2.901, A3.01a, A4.102, A4.103, A4.104, A4.201, A5.101, A6.101, M2.01, M3.01, M3.02, M3.03, M4.01, M5.01, M6.10, M6.15, M8.12, M9.10, M9.11, E1.11b, E2.11a, E3.11a, E4.00, E5.01, E5.02, E6.02, E6.10, E6.12, E6.13, E7.10, E7.11
Memorandum: Addendum #3

PROJECT MANUAL

1. **SPECIFICATION SECTION 01 22 00 UNIT PRICES**
   A. Issued this addendum.
2. **SPECIFICATION SECTION 01 30 00 ADMINISTRATIVE REQUIREMENTS**
   A. Reissued this addendum.
3. **SPECIFICATION SECTION 09 27 00 FLUID APPLIED FLOORING**
   A. Issued this addendum.
4. **SPECIFICATION SECTION 10 11 00 VISUAL DISPLAY BOARDS**
   A. Reissued this addendum.
5. **SPECIFICATION SECTION 10 28 00 TOILET ACCESSORIES**
   A. Reissued this addendum.
6. **SPECIFICATION SECTION 10 75 00 FLAGPOLES**
   A. Reissued this addendum.

7. **SPECIFICATION SECTION 23 34 16 AIR HANDLING**
   A. Reissued this addendum.
8. **SPECIFICATION SECTION 23 09 93 BAS SEQUENCE OF OPERATIONS**
   A. Reissued this addendum.
9. **SPECIFICATION SECTION 23 73 13 CENTRAL-STATION AIR-HANDLING UNITS**
   A. Reissued this addendum.

PRIOR APPROVALS

The following schedule amends designated specification sections to list additional acceptable manufacturers. Use of any product by any of these manufacturers will be permitted only if after review of shop drawings or detailed product data per Section 01 33 00, Architect determines that proposed materials or equipment are equivalent in performance, construction and appearance to product(s) specified.

Where anticipated product substitutions would alter the design or space requirements indicated on the Drawings, pay for cost of design and construction revisions including the cost of associated work by other contractors.

For complete requirements, see Specification Section 01 25 00 – Substitutions and Product Options.

Section No.	Type	Acceptable Manufacturer
07 91 00	CSS Series, CSS (2FR) Series, FB-Series	Erie Metal Specialties
07 95 13	CSS Series, CSS (2FR) Series, FB-Series	Erie Metal Specialties

DRAWINGS

1. **DRAWING PROJECT COVER SHEET & INDEX**
   A. Reissued this addendum.
2. **DRAWING C4 GEOMETRIC PLAN**
   A. Reissued this addendum.
3. **DRAWING C6 GRADING PLAN**
   A. Reissued this addendum.
4. **DRAWING C7 GRADING PLAN – NORTHWEST**
   A. Reissued this addendum.
5. **DRAWING C8 GRADING PLAN – SOUTHWEST**
   A. Reissued this addendum.
6. **DRAWING S0.11 STRUCTURAL SCHEDULES**
   A. Reissued this addendum.
7. **DRAWING S2.00b FOUNDATION PLAN – AREA 'B'**

A. Reissued this addendum.

8. **DRAWING S0.11 STRUCTURAL SCHEDULES**
   A. Reissued this addendum.

9. **DRAWING S2.00b FOUNDATION PLAN – AREA 'B'**
   A. Reissued this addendum.
10. **DRAWING A2.01a FLOOR PLAN – AREA 'A'**
    A. Reissued this addendum.
11. **DRAWING A2.03 PRICING DIAGRAM**
    A. Reissued A0.201 as A2.03
12. **DRAWING A2.095 ROOF PLAN**
    A. Reissued this addendum.
13. **DRAWING A2.901 DOOR/ FRAME/ LOUVER TYPES & SCHEDULE**
    A. Reissued this addendum.
14. **DRAWING A3.01a REFLECTED CEILING PLAN – AREA 'A'**
    A. Reissued this addendum.
15. **DRAWING A4.102 DETAILS – GENERAL MOUNTING HEIGHTS**
    A. Reissued this addendum.
16. **DRAWING A4.103 ENLARGED ROOM PLANS**
    A. Reissued this addendum.
17. **DRAWING MAIN LEVEL ACCESS FLOOR PLAN**
    A. Reissued this addendum.
18. **DRAWING DETAILS – VERTICAL CIRCULATION**
    A. Reissued this addendum.
19. **DRAWING EXTERIOR ELEVATIONS**
    A. Reissued this addendum.
20. **DRAWING DETAILS – SITE**
    A. Reissued this addendum.
21. **DRAWING M2.01 HYDRONIC AND BAS PLAN – AREA 'A'**
    A. Reissued this addendum.
22. **DRAWING M3.01 HVAC PLAN – AREA 'A'**
    A. Reissued this addendum.
23. **DRAWING M3.02 HVAC PLAN – AREA 'B'**
    A. Reissued this addendum.
24. **DRAWING M3.03 ACCESS FLOOR PLANS**
    A. Reissued this addendum.
25. **DRAWING M4.01 ROOF PLAN – AREA 'A'**
    A. Reissued this addendum.
26. **DRAWING M5.01 FIRE PROTECTION PLAN**
    A. Reissued this addendum.
27. **DRAWING M6.10 BOILER AND MECHANICAL ROOM PLAN**
    A. Reissued this addendum.

28. **DRAWING M6.15 SECTION VIEWS**
    A. Reissued this addendum.
29. **DRAWING M8.12 MECHANICAL DETAILS**
    A. Reissued this addendum.
30. **DRAWING M9.10 SCHEDULES**
    A. Reissued this addendum.
31. **DRAWING M9.11 SCHEDULES**
    A. Reissued this addendum.
32. **DRAWING E1.11b MAIN LEVEL LIGHTING PLANS – AREA 'B'**
    A. Reissued this addendum.
33. **DRAWING E2.11a MAIN LEVEL POWER AND FIRE ALARM PLAN – AREA 'A'**
    A. Reissued this addendum.
34. **DRAWING E3.11a MAIN LEVEL SYSTEMS PLAN – AREA 'A'**
    A. Reissued this addendum.
35. **DRAWING E4.00 ROOF PLAN – ELECTRICAL**
    A. Reissued this addendum.
36. **DRAWING E5.01 ONE-LINE DIAGRAM**
    A. Reissued this addendum.
37. **DRAWING E5.02 METERING AND BAS DETAILS**
    A. Reissued this addendum.
38. **DRAWING E6.02 MOTOR SCHEDULE**
    A. Reissued this addendum.
39. **DRAWING E6.10 PANEL SCHEDULES**
    A. Reissued this addendum.
40. **DRAWING E6.12 PANEL SCHEDULES**
    A. Reissued this addendum.
41. **DRAWING E6.13 PANEL SCHEDULES**
    A. Reissued this addendum.
42. **DRAWING E7.10 ELECTRICAL DETAILS – SYSTEMS**
    A. Reissued this addendum.
43. **DRAWING E7.11 ELECTRICAL DETAILS – SYSTEMS**
    A. Reissued this addendum.

END OF ADDENDUM #3

SECTION 01 22 00
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. In the space indicated on the Bid Form, submit unit prices as required by this section and listed in the Unit Price Schedule. Only one value for each unit price will be allowed.

B. A unit price is a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the quantities of Work required by the Contract Documents are increased or decreased.

C. Refer to individual Specification Sections for construction activities requiring the establishment of unit prices.

1.02 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; applicable taxes; overhead and profit.

B. While unit prices are not to be used in the selection of the successful Bidder, they must be submitted and approved prior to execution of the Contract.

1. The Owner reserves the right to reject a unit price they deem unsatisfactory and to require a resubmittal, based other bidders unit prices.
2. The Owner reserves the right to reject the Contractor's measurement of quantities, and to have this Work measured by an independent party.
3. The Owner reserves the right to throw out a bid that does not include a unit price or assign a unit price based on other bidders unit prices.

1.03 UNIT QUANTITIES SPECIFIED

A. Quantities and measurements of actual Work during construction will determine the payment amount.

1.04 MEASUREMENT OF QUANTITIES

A. Take all measurements and compute quantites. Measurements and quantities may be verified by an independent party selected by the Owner.

B. Assist by providing necessary equipment, workers, and survey personnel as required.

C. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

D. Measurement by Area: Measured by square dimension using mean length and width or radius.

E. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

F. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

G. Contractor's Engineer Responsibilities: Sign surveyor's or testing agency's field notes or keep duplicate field notes, calculate and certify quantities for payment purposes.

1.05 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:

1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.

3. Products not completely unloaded from the transporting vehicle.
4. Products placed beyond the lines and levels of the required Work.
5. Loading, hauling, and disposing of rejected Products.

1.06 SCHEDULE OF UNIT PRICES

A. Unit Price #1: Pre-mixed glycol/DI Solution
   1. Description: The addition of glycol/DI solution as outlined in Division 23 Specifications.
   2. Unit of measurement: Gallons

B. Unit Price #2: Removal and Disposal of Unsuitable Materials
   1. Description: Excavation, removal and disposal offsite of existing soils below the soil correction depths indicated in the geotechnical evaluation report that are beyond the scope of Work represented by the Contract Documents, determined to be unsuitable by the project geotechnical engineer for support of foundations, slabs, utilities, traffic, or additional fill materials
   2. Unit of measurement: In place cubic yard.

C. Unit Price #3: Aggregate Subgrade Improvement
   1. Description: Providing and installing additional aggregate subgrade improvements that are beyond the scope of Work represented by the Contract Documents.
   2. Unit of measurement: Compacted cubic yard.

D. Unit Price #4: Preparation of Base
   1. Description: Providing and installing additional base preparation that is beyond the scope of Work represented by the Contract Documents.
   2. Unit of measurement: Installed square yard

E. Unit Price #5: Geotechnical Fabric for Ground Stabilization
   1. Description: Providing and installing additional geotechnical fabric that is beyond the scope of Work represented by the Contract Documents.
   2. Unit of measurement: Installed square yard

F. Unit Price #6: Combination Concrete Curb & Gutter, Type B-6.12
   1. Description: Providing and installing additional curb and gutter, type listed above, that is beyond the scope of Work represented by the Contract Documents.
   2. Unit of measurement: Installed lineal feet

G. Unit Price #7: Portland Cement Concrete Sidewalk, 5 inch
   1. Description: Providing and installing additional PCC sidewalk, type listed above, that is beyond the scope of Work represented by the Contract Documents.
   2. Unit of measurement: Installed square feet

H. Unit Price #8: Ribbon Curb
   1. Description: Providing and installing additional ribbon curb that is beyond the scope of Work represented by the Contract Documents.
   2. Unit of measurement: Installed lineal feet

I. ~~**Unit Price #9: Pavers**~~
   1. ~~**Description: Providing and installing additional pavers that are beyond the scope of Work represented by the Contract Documents.**~~
   2. ~~**Unit of measurement: Installed square feet**~~

J. Unit Price #10: Audio/Visual Extended Warranty
   1. Description: The addition audio/visual extended warranty as outlined in Division 27 Specifications.
   2. Unit of measurement: Additional years of extended service.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 22 00

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A General administrative requirements.
B Electronic document submittals
1. Construction Project Management Software
C Preconstruction meeting.
D Progress meetings.
E Schedule of Values.
F Contractor's daily reports.
G Progress photographs.
H Coordination drawings.
I Submittals for review and information.
J Requests for Information (RFI) procedures.
K Submittal procedures.
L Building Information Modeling (BIM) and provision of electronic BIM submittal data.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL

A All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format, as appropriate to the document, and transmitted via email the architect's staff assigned to the project.
1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
2. It is Contractor's responsibility to submit documents in allowable format.
3. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B Contractor is required to conduct project management with an industry standard project management software. Project Management Software must allow for:
1. Document management of all items listed in this specification during the construction process
2. Be available for Owner, Architect, Consultants, and Vendors use throughout construction.
3. Provide a full download of archive documents at close out of the project.
4. Provide the Owner and Architect the ability to set up workflows.

C If the Owner elects to provide their own project management software, Bidder shall work with the Owner to implement workflows as required to achieve Bullets A and B above.

3.02 LIST OF MATERIALS

A Within 7 days after the award of the Contract (notice to proceed or letter of intent), submit a complete list electronically of all material, products, and equipment proposed to be used in construction to the Architect for acceptance.

1. Do not order materials until the proposed listed materials, products and equipment to be used in construction are accepted by the Architect.

B Where two or more makes or kinds of items are named in the specifications (or additional names are called for in addenda), the Contractor shall state which particular make or kind of each item they proposes to provide. If the Contractor fails to state a preference, the Owner shall have the right to select any of the makes or kinds named without change in price.

C This list shall be arranged generally in order of specification sections. The items listed shall fully conform to project requirements and specifications. All materials are subject to the Architect's acceptance.

1. After acceptance, changes or substitutions will not be permitted.

D Clearly identify or list the material, product or equipment by manufacturer and brand by listing the names for all items, including those where only one material or product is specified. Each and every material, product and equipment shall be specifically named, not listed "as specified".

3.03 LIST OF SUBCONTRACTORS

A Immediately after Contract award submit a subcontractor and supplier list.

1. Propose use of subcontractors or sub-subcontractors who are established, reputable firms of recognized standing with a record of successful and satisfactory past performance. Include the following information: specification section, item of work, subcontractor or supplier, material/manufacturer (as specified will not be allowed), project manager, phone and email. List major sub-subcontractors for mechanical and electrical work. Use only those subcontractors (and sub-sub-contractors, when appropriate) who are acceptable to the Architect and Owner on the Work.

3.04 SCHEDULE OF VALUES

A Requirements

1. Submit Schedule of Values to Architect ten (10) days prior to first Application For Payment (AIA Form G702, G702a).
    a. For projects with specific bid allocations included on the bid form, break down Schedule of Values by allocation.
    b. Break down labor and material separately.
    c. Round off amounts to nearest ten dollars.
    d. Provide separate line items for each of the following items:
        1) Operations and Maintenance Manuals, equaling of 0.125% of Contract value.
        2) As-Built Drawings, equaling of 0.0625% of Contract value.
        3) Training, equaling of 0.125% of Contract value.
        4) Attic Stock Materials, equaling 0.0625% of Contract value.
        5) Mechanical and Electrical Coordination Drawings, equaling 0.0625% of Contract value.
2. Use Schedule of Values only as basis for Contractor's Application For Payment.

B Form of Submittal

1. Base format on Sections listed in Section 00 01 10 Table of Contents, as well as, the Mechanical and Electrical Table of Contents. Break down labor and material separately.

C Development with Owner
1. Owner is utilizing multiple funding mechanisms including: capital, bonds, grants, and 3rd party contributions in the financing of this project. Contractor shall work with the Owner to develop a schedule of values in conformance with the various monitoring and reporting requirements associated with these funding streams.

D Multiple Purchase Order Issuance
1. Owner may issue one or more purchase orders to Bidder for the sum total of the bid award as may be required for tracking and reporting associated with funding streams
2. Bidder shall submit separate invoices against individual purchase orders (including required backup materials) as may be required by owner.

3.05 CONSTRUCTION SCHEDULES

A Refer to Section 01 32 16 Construction Progress Schedule.

3.06 PRECONSTRUCTION MEETING

A Schedule meeting within 15 days after Notice to Proceed.

B Attendance Required:
1. Owner's representative.
2. Architect and their consultants.
3. Contractor's Project Manager and Site Superintendent.
4. Major Subcontractors.
5. Major Suppliers.
6. Others as appropriate.

C Agenda:
1. Distribution and discussion of:
   a. List of subcontractors.
   b. List of major suppliers.
   c. Projected construction schedules.
   d. Submittal schedule.
   e. Scheduling of pre-installation conferences.
2. Project coordination and scheduling:
   a. Designation of responsible personnel representing the Owner, Contractor, Architect and Architect's Consultants.
   b. Major equipment deliveries and priorities, including expected submittals for such.
   c. Critical work sequencing.
   d. Mock-up Panels.
   e. Temporary utilities.
   f. Use of onsite utilities.
   g. NFPA 285 field coordination meeting to ensure that all materials being proposed align with NFPA 285 test reports. Attendance is mandatory for products being installed by the following contractors:
      1) Spray foam.
      2) Exterior studs.
      3) Exterior sheathing and or continuous insulation.
      4) Weather barrier.
      5) Cladding materials.
   h. Storm Shelter Quality Assurance Plan.
      1) Must proceed any submittals associated with the Strom Shelter.

3. Procedures and processing of: field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
    a. Status of Building Permit and:
        1) AHJ required development agreements
        2) AHJ required bonds and indemnifications
        3) Steel Fabricator Certification.
        4) Special Inspection Form.
    b. Field decisions.
    c. Submittals.
        1) Mechanical and Electrical Coordination drawings.
    d. Product substitutions.
    e. Applications for payments.
    f. Time limit on claims of 21 days.
    g. Proposal Requests and Supplemental Instructions.
    h. Change Orders.
    i. Scheduling activities of a Geotechnical Engineer.
4. Procedures for maintaining Record Documents.
5. Use of Premises:
    a. Office, work and storage areas.
    b. Owner's requirements.
6. Construction facilities, controls and construction aids.
    a. Construction Dust Control and Periodic Cleaning:
        1) Submittal of work area and procedures schedule.
        2) Dust proof enclosures.
        3) Maintaining negative air flow.
        4) Dust control by water mist of surfaces.
        5) Debris removal weekly.
        6) Daily cleaning requirements.
    b. Failure to Comply.
        1) A written warning will be issued for correction by the Architect.
            (a) If correction notice is not complied within 8 hours, Owner may take over cleaning.
            (b) Cost will be back charged to the Contractor(s) by Change Order.
    c. Final Cleaning:
        1) Schedule in time for Owner to complete furniture installation, and cleaning/waxing of floors.
        2) Any cleaning done by the Owner due to unacceptable cleaning by the Contractor, or not proceeding in a timely fashion will be back charged to Contractor.
7. Contractor to record minutes and distribute copies within two days after meeting to participants, with electronic copies to Architect, Owner, participants, and those affected by decisions made.

3.07 PROGRESS MEETINGS

A Schedule and administer meetings throughout progress of the work at regular intervals and as required due to the progress of the work.

B Hold called meetings at the Contractor's project field office.

C Attendance Required:
1. Contractor.
2. Owner.
3. Architect may attend as needed.

4. Architect' consultants may attend as needed.
5. Contractor's superintendent.
6. Subcontractors appropriate to the progress of the work.
7. Suppliers and manufacturer's representatives as appropriate to the agenda.

D Agenda:

1. Review and approval of minutes from previous meetings.
2. Review of work progress since previous meeting.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period before the next meeting.
10. Maintenance of quality and work standards.
11. Effect of proposed changes on progress schedule and coordination.
12. Other business relating to work.

E Contractor to record minutes and distribute copies within two days after meeting to participants, with electronic copies to Architect, Owner, participants, and those affected by decisions made.

3.08 STORM SHELTER QUALITY ASSURANCE PLAN

A All Contractors providing components to construct the storm shelter shall include a quality assurance plan to the Architect, Structural engineer of record (EOR), Owner and Building Official by the time submittals are sent for review.

1. Submittals preceding a quality assurance plan will be rejected upon receipt.
2. The quality assurance plan shall conform to, and address, the requirements set forth in Section 107.3 of ICC 500. As follows:
    a. Acknowledgement of awareness of the special requirements contained in the quality assurance plan.
    b. Acknowledgement that control will be exercised to obtain compliance with the construction documents.
    c. Procedures for exercising control within the contractor’s organization, the method and frequency of reporting and distribution of reports.
    d. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

B Specification Section 01 45 33.1, Contractor Quality Assurance Plan provides the template for the quality assurance plan to be completed by Contractors.

3.09 DAILY CONSTRUCTION REPORTS

A Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.

1. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
    a. Date.
    b. High and low temperatures, and general weather conditions.
    c. List and count of contractors/ personnel at Project site.
    d. Material deliveries.
    e. Safety, environmental, or industrial relations incidents.

f. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities.
g. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
h. Testing and/or inspections performed.

3.12 PROGRESS PHOTOGRAPHS

A In addition to periodic, recurring views, take photographs of each of the following events:
1. Completion of site clearing.
2. Excavations in progress.
3. Foundations in progress and upon completion.
4. Structural framing in progress and upon completion.
5. Enclosure of building, upon completion.
6. Take photographs as evidence of existing project conditions at the interior and exterior through the duration of the project.

3.13 COORDINATION DRAWINGS

A Refer to "Common Work Results" in Mechanical and Electrical Specifications for requirements.
B Prior to construction occurring above grade plane, submit Mechanical/Electrical Coordination Drawings for design team review.

3.14 REQUESTS FOR INFORMATION (RFI)

A Definition: A request seeking one of the following:
1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
2. A resolution to an issue which has arisen due to field conditions and affects design intent.
B Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
C Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
1. Prepare a separate RFI for each specific item.
a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
b. Do Not forward requests which solely require internal coordination between subcontractors.
D Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
a. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
b. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
c. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).

3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question.
    a. They will be rejected.
    b. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

E Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
2. Discrete and consecutive RFI number, and descriptive subject/title.
3. Issue date, and requested reply date no sooner than 7 working days.
4. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
5. Annotations: Field dimensions and/or description of conditions which have engendered the request.
6. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

3.15 SUBMITTAL SCHEDULE

A Submit to Architect for review a schedule for submittals in tabular format.
1. Submit at the same time as the preliminary schedule specified in Section - 01 32 16 - Construction Progress Schedule.
2. Coordinate with Contractor's construction schedule and schedule of values.
3. Format schedule to allow tracking of status of submittals throughout duration of construction.
4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
    a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.16 SUBMITTALS FOR REVIEW

A When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
   1. Prepare clearly identified shop drawings or schedules to this specific project, containing only data applicable. Include with the shop drawings or schedules a letter of transmittal listing and dating the submitted drawings in sets.
   2. Contractor to review all submittals prior to submittal to Architect, and indicate such review with a stamp and signature. Review submittals for conformance to Drawings, Specifications, coordination with other trades and adjacent construction and verification of field dimensions. Failure of Contractor to adequately review submittals shall be cause for rejection.
   3. Prepare and submit electronically (with exception for color charts and samples) to Architect for review, all shop drawings and manufacturers catalog sheets showing illustrated cuts of items to be furnished, scale details, sizes, dimensions, performance characteristics, capacities, wiring diagrams, weights and arrangements. Each submittal to include a transmittal on contractor letterhead. Submittal to be in the form of one combined PDF, labeled with project name, professionally assembled so all documents are facing the same way.

C If equipment other than that used in the design of this project is proposed to be used, the Contractor and/or supplier shall verify electrical differences, dimension variations and weight increases. The Contractor shall be responsible for any extra costs incurred as a result of equipment substitutions.

D Samples will be reviewed for aesthetic, color, or finish selection.
   1. Unless otherwise specified, submit samples of size, and nature representing typical qualities. Where required, submit a sufficient number of samples to demonstrate the complete range of variations of the material or quality. Written acceptance of the Architect is required prior to ordering any item for which samples are required.

E After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.17 SUBMITTALS FOR INFORMATION

A When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Sustainability design submittals and reports.
   3. Certificates.
   4. Test reports.
   5. Inspection reports.
   6. Manufacturer's instructions.
   7. Manufacturer's field reports.
   8. Other types indicated.

B Submit for Architect's knowledge as contract administrator or for Owner.

3.18 SUBMITTALS FOR PROJECT CLOSEOUT

A Submit Correction Punch List for Substantial Completion.

B Submit Final Correction Punch List for Substantial Completion.

C When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D Submit for Owner's benefit during and after project completion.

3.19 NUMBER OF COPIES OF SUBMITTALS

A Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.20 SUBMITTAL PROCEDURES

A General Requirements:
   1. Use a separate transmittal for each item.
   2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
   3. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
      a. When labeling shop drawings or product data, include the Specification Section number of where the product is specified for a submittal . For example, for cavity wall insulation Section 07 21 00 Insulation does not require an insulation submittal, but Section 04 20 00 Non-Bearing Masonry does require that submittal.
      b. Identify “BacNet Review” on submittals requiring such review.
      c. Identify "LEED” on submittals requiring such review.
   4. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will be rejected.
   5. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
      a. Deliver submittals to Architect via project management software.
      b. Submit samples to Architect's office, securely packaged, with the name of the Owner and Project clearly indicated on the package exterior. Each physical sample shall have a label or tag, firmly attached to the sample, bearing the following information: (a) Name of Owner and Project, (b) Name of Supplier, (c) Name of Contractor, and (d) Product information such as manufacturer's designation, finish, type, class, grade, etc. as is appropriate. The Architect will retain one copy of each sample.
   6. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. When submitting multiple submittals at the same time, provide the Architect with a priority list for review.

b. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
c. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
d. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.

7. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
8. When revised for resubmission, identify all changes made since previous submission.
9. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
10. Submittals not requested will not be recognized or processed.

B Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Submit concurrently with related shop drawing submittal.
4. Do not submit (Material) Safety Data Sheets for materials or products.
5. Submit sustainable design reporting submittals under separate cover.

C Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Do not reproduce Contract Documents to create shop drawings.
a. Contractor is to generate shop drawings based on the information identified in the contract documents and notify the architect of discrepancies in the documents.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D Samples Procedures:
1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.21 SUBMITTAL REVIEW

A The Architect will take one of the following actions on submittals:
1. “Reviewed”: Contractor shall proceed with ordering and/or fabrication.
2. “Review Comments”: Contractor shall proceed with ordering and/or fabrication after taking into account noted comments.
3. “Rejected”: Contractor shall provide a submittal that meets the intent of the specifications.
4. “Revise and Resubmit”: Contractor shall modify submittal to address comments and resubmit.

B Submittals for Information: Architect will not acknowledge receipt, and take no other action.

C Contractor to update the project management software to provide the action options listed above. “Approved” is not an acceptable action item and will not be used during the submittal review process.

3.22 BIM REQUIREMENTS AND SUBMITTALS

A General:
1. Refer to Specification Section 01 32 50 Building Information Model (BIM) and Provision of Electronic Submittal Data for additional project BIM requirements.
2. Provide a BIM model of the final construction with all equipment, materials and schedules populated in Owner ~~**provided**~~ ***preferred*** BIM software.

3. After Bid award the Contractor shall be provided with the Contract Document BIM model.
4. The Contractor shall submit a resume for their proposed BIM Manager demonstrating their ability to manage and develop the model to a Level of Development (LOD) of minimum 400.

B BIM Model Level of Development (LOD) applicable to the Work.

1. After Bid award, a BIM Model LOD 300 will be provided to the Contractor.
2. The Contractor will be required to interface with the Owner's Autodesk software (Revit, Tandem, etc.). ***Acceptable versions of Revit include 2021 or newer. (Link to Autodesk Tandem – https://intandem.autodesk.com/).***
3. The Contractor will be responsible for providing a final BIM Model LOD 350 at substantial completion. See Alternate #9 for providing a BIM Model LOD 400.
4. The model elements shall be graphically represented within the model as a specific system, object, or assembly in terms of quantity, size, shape, orientation, and interfaces with other building systems. Non-graphic information may also be attached to the model elements. Equipment and material schedules shall not be included as a model element. Provide equipment and material schedules as an excel spreadsheet from a template provided by Owner.
5. Contractor is responsible for providing the following building components:
    a. Make and model numbers of all product data. Including, but not limited to all mechanical, electrical, low-voltage, and audio/visual equipment installed in the building, as well as all finish materials. Refer to Specification Section 01 32 50 for additional lists/ requirements.
    b. Hyperlinks of all product data and Operation and Maintenance manuals linked to each room as applicable for use and installation.
    c. Equipment, Finish Material, and Door Hardware schedules.
    d. BAS schedules.
    e. All Mechanical and Electrical equipment (e.g., starters) in the Mechanical/Sprinkler Rooms.
    f. All perimeter wall Work in the Mechanical/Sprinkler Rooms full height.
    g. All ceiling hung equipment Work in the Mechanical/Sprinkler Rooms.
    h. Mechanical and Electrical Work in main corridors including ceilings.
    i. Mechanical and Electrical Work located in the UFAD floor systems.
    j. All Electrical Work in the Electrical Rooms.
    k. All perimeter wall Work in the Electrical Rooms full height.
    l. All ceiling hung equipment Work in the Electrical Rooms.
    m. All Mechanical and Electrical exterior service connections that are within a distance of 4 ft. in any direction of any exterior wall.
    n. All Mechanical and Electrical exterior service connections that are 4 ft. or a greater distance from any exterior wall.
    o. All remaining Architectural, Mechanical and Electrical Work not included above.
    p. All remaining exterior Work (Solar PV array, parking areas, landscaping).
    q. All roof Work.

C Contractor shall appoint a BIM Manager who is responsible for the following:

1. Overall responsibility for proper use, implementation, and creation of BIM during construction.
2. Manage and maintain the creation of all BIM content.
3. Coordinate and manage BIM related meetings with Owner BIM Technicians ***and the Design Team***. Allow for a minimum of one on-site meeting per month, with supplemental virtual meeting as required to complete work.
4. Work with Owner's IT department to ensure proper hardware and software is in place and functioning properly.
5. Collect model information from all trades and input this information into the BIM model for the Work.

6. Follow Owner provided naming conventions in a spreadsheet for all equipment, materials, and schedules added to the BIM model.

D Record Documents: Provide an electronic copy of the final as-built version of the BIM model.

E Training: Provide a minimum of 4 hours of training to Owner's staff.

END OF SECTION 01 30 00

SECTION 09 67 00
FLUID-APPLIED FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floor preparation as specified in Section 09 05 61 Common Work Results for Floor Preparation:
   1. Substrate Prep and Patching.
   2. Porosity Inhibiting Admixture (PIA) in new slabs.
   3. Required Floor Flatness.
B. Urethane Slurry Flooring with integral base.

1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
C. Provide data on substrate preparation materials.
D. Materials for Substrate Prep and Patching.
E. Samples: Submit two samples, 6 by 6 inch (152.4 by 152.4 mm) in size illustrating color and pattern for each floor material for each color specified.
F. Applicator's and Supervisor Qualification Statement from Manufacturer.
G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.03 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section.
   1. Minimum 10 years of documented experience.
   2. Approved by manufacturer.
B. Supervisor Qualifications: Trained by product manufacturer , under direct full time supervision of manufacturer's own foreman.

1.04 MOCK-UPS

A. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.
   1. Number of Mock-Ups to be Prepared: As many as required to match intent of specification.
   2. Use same materials and methods for use in the work.
   3. Locate where directed.
   4. Minimum Size: 48 inches by 48 inches (1220 mm by 1220 mm).
B. Obtain approval of mock-up by Architect before proceeding with work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.
B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.06 FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F (13 degrees C).
B. Store materials in area of installation for minimum period of 24 hours prior to installation.
C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Urethane Slurry Flooring:
   1. Sherwin-Williams Company: www.industrial.sherwin-williams.com.
   2. Equivalent products from other manufacturers are acceptable.

2.02 FLUID-APPLIED FLOORING SYSTEMS

A. Urethane Slurry Flooring System with integral pour over perimeter curbs: Polyurethane slurry base coat(s) with broadcast aggregate.
   1. System Thickness: 1/4 -3/8 inches,250-375 mils (6.35-9.525 mm), nominal, dry film thickness (DFT).
   2. Texture: Slip resistant.
   3. Sheen: Matte.
   4. VOC Content: Maximum100g/L.
   5. Color: As chosen from Manufacturer's full color line.
   6. Products:
      a. Sherwin-Williams Company: www.industrial.sherwin-williams.com.
         1) Flooring:
            (a) Binder Resin: S-W FasTop Multi SL45.
               (1) Broadcast: 40-60 mesh dry silica sand to refusal.
               (2) Provide sample for Owner review and approval before proceeding.
         2) Sealer: S-W 3741 Resuflor Solvent/Acid Resistant Coating.
         3) Coved Base:
            (a) FasTop Multi Cove Base with ¾" radius cove. Termination to Metal Base Edging.
      b. Tnemec Company Inc: Ultra-Tread: www.tnemec.com.
         1) Slurry Aggregate: Series 245 Ultra-Tread S.
            (a) Aggregate broadcast to refusal at an approximately rate of 0.5 pounds per SF (2.4412 kg per SM) .
               (1) Provide sample for Owner review and approval before proceeding.
         2) Sealer: Series 282 Tneme-Glaze.
         3) Coved base/ Transition over perimeter curb:
            (a) Binder Resin: Series 243 Ultra-Tread V
   7. Coved Base/ Perimeter Curb Height:
      a. As indicated on the Drawings.
   8. Accessories:
      a. Metal Base Edging: Schulter: RONDEC #RO100AE; www.schluter.com. Equivalent products by other manufacturers are acceptable.
         1) Material/Finish: Satin Anodized Aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.
B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.
C. Contact the General Contractor or Construction Manager for corrections to deficiencies prior to proceeding.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.
B. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler according to manufacturers instructions.

C. Prepare concrete according to SSPC-SP 13.
   1. Including, but not limited to shotblasting floor to resemble 100 grit sandpaper. Torch fiber reinforcing exposed after shot blasting. Fill cracks, voids, bug holes, gouges or divots with Crack Filler.
D. Apply primer to surfaces required by flooring manufacturer.

3.03 INSTALLATION - ACCESSORIES

A. Install terminating metal edge strip at top of base; attach securely to wall substrate.

3.04 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.
B. Apply each coat to minimum thickness required by manufacturer.
C. Finish to smooth level surface.
D. Cove at vertical surfaces.

END OF SECTION 09 67 00

SECTION 10 11 00
VISUAL DISPLAY BOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Porcelain enamel steel markerboards.
B. Glass markerboards.
C. ***Tackboards***

1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturer's data on chalkboard, porcelain enamel steel markerboard, glass markerboard, tackboard, trim, and accessories.
C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.
D. Samples: Two, 2 by 2 inches (50 by 50 mm) in size illustrating materials and finish, color and texture of chalkboard, porcelain enamel steel markerboard, glass markerboard, surfacing.
E. Manufacturer's Approval of Installer.

1.03 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.
B. Do not install visual display surfaces until spaces are enclosed and weather tight, surfaces are complete and dry, work above ceilings is complete, and temporary or permanent HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
C. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.

1.04 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
B. Provide manufacturers lifetime warranty for markerboard surfaces to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Markerboard Surfaces:
B. Polyvision Corporation; e3 environmental ceramic steel surface: www.polyvision.com.
C. Equivalent products by other manufacturers are acceptable.
D. Manufacturers/Fabricators of Visual Display Boards that meet the requirements of the specification are acceptable.

2.02 VISUAL DISPLAY UNITS

A. Markerboards: Porcelain enamel on steel, laminated to core.
   1. Surface consisting of enameling grade cold rolled steel manufactured from a minimum of 30 percent post-consumer and post-industrial waste, 0.016 inch, 28 gauge (0.4064 mm) thick for all preframed boards without joints. All face sheets shall be 0.025 inch, 24 gauge (0.635 mm) thick for boards with spline joints and have the same content as 0.016 inch, 28 gauge (0.4064 mm) thick face sheets.
   2. All enameling grade steel shall be coated with a coating process that exhibit the following characteristics:

a. All coatings shall contain less than a combined total of less than 0.1 percent of heavy metal cadmium, mercury, hexavalent chromium, and lead.
b. All coatings shall be free of arsenic and antimony as well as volatile organic compounds.
c. Writing surface face sheet shall be 99 percent recyclable.
d. Free of orange peel.
e. Facing sheet coatings:
1) 1.7-2.5 mils enameled ground coat on face minimum thickness.
2) 3.0-4.0 mils enameled cover (color) coat for markerboard.
3) 1.7-2.5 mils enameled minimum ground coat on back of facing.
4) Firing temperatures shall be 1475-1500 degrees minimum.

3. Color:
a. White.
b. Finish gloss:
1) High gloss.

4. Backing: Aluminum foil, laminated to core.

B. ***Tackboards: Linoleum tackable surface, laminated to core.***
1. ***Linoleum resilient homogenous tackable surface of natural materials. Surface shall be washable, self-healing and resistant to bacteria.***

C. Manufacturing:
1. Markerboard Core: Particleboard, 1/2 inch thick (13 mm thick) or gypsum board 1/2 inch (13 mm) thick laminated to face sheet with factory machine type only.
a. Maximum panel length of 16 feet (4.8768 m).
b. All particleboard joints/seams shall be equipped with continuous steel splines routed into the core to assure alignment of writing surfaces joined in the same plane.

2. ***Tackable Core:***
a. ***Fireboard gypsum board, or hardboard, ¼ inch (6.35 mm) thick laminated to covering with factory machine type only.***

3. Size: As indicated on drawings.
4. Perimeter Trim: Extruded aluminum, with concealed fasteners.
a. 0.062 inch (1.5748 mm) thick, ± 1/2 inch (12.7 mm) narrow profile, securely fastened with resin coated staples at the rear of the unit.
b. Top trim shall be combination perimeter trim and 1 inch (25.4 mm) map rail with cork inserts.
c. Trim shall be supplied with corners mitered to a hairline joint.
d. Spline trim for full height markerboards: Manufacturers standard aluminum spline/spline clip.

5. Frame Finish: Anodized, natural.
6. Attachment devices:
a. Adjustable slotted wall brackets (zinc plated).
b. Attachment screws (for bracket attachment to boards).

7. Accessories:
a. Provide marker tray, full width, blade tray, 2-3/4 inch (69.85 mm).

D. Magnetic Glass Markerboards: Back-coated glass, laminated to steel.
1. Glass: Laminated, low iron, 1/4 inch thick (6 mm thick), with bevel edges and radiused corners, laminated to steel backing sheet for use with magnets. Coated or treated for use as dry erase board or projection surface.
2. Glass Finish: White coating.
3. Steel Backing Sheet Thickness: 24 gauge, 0.0239 inch (0.61 mm).
4. Size: As indicated on drawings.
5. Frame: No frame, with concealed fasteners.
6. Mounting: Concealed Z clips.
7. Accessories: Provide magnetic marker tray and magnetic marker holder.

8. Manufacturers:
    a. Egan Visual Corporation; Egan Visual GlassBoards: www.egan.com.
    b. Equivalent products by other manufacturers are acceptable.

2.03 MATERIALS

A. Aluminum: Type 6063 alloy grade aluminum with T5 tempering treatment and shall receive type 2010R1 anodized finish.
    1. Trim shall be free of raw or ground edges, and untreated or uncoated edges.
    2. Trim shall be 99 percent recyclable.
B. Float Glass: Provide float-glass-based glazing unless otherwise indicated.
C. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
    1. Laminated Safety Glass: Comply with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.
D. Hardboard for Cores: ANSI A135.4, Class 1 - Tempered, S2S (smooth two sides).
E. Particleboard (urea formaldehyde free): ANSI A208.1; wood shavings, set with waterproof resin binder, sanded faces.
F. Gypsum Board: ASTM C1396/C1396M, paper/foil faced, plain type.
G. Fiber Board: ASTM C208, cellulosic fiber board.
H. Adhesives: Specifically formulated environmentally friendly adhesives containing no volatile organic compounds.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.
C. Check surface conditions to assure they are:
    1. Free from dust dirt or scaling paint.
    2. Free from projections or depressions that affect smooth finished surfaces of boards.
D. Verify flat wall surface for frameless adhesive-applied boards.
E. Notify General Contractor or Construction Manager for correction of deficiences.
    1. Do not proceed with installation until deficiencies are corrected.

3.02 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.
B. Secure units level and plumb.
C. Butt Joints: Install with tight hairline joints.
D. Fit aluminum frames to precise hairline joints with no rough edges.
E. Carefully cut holes in boards for thermostats and wall switches.

3.04 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.
B. Replace damaged and stained units that cannot be cleaned, at no additional cost to Owner.

END OF SECTION 10 11 00

SECTION 10 28 00
TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A Commercial toilet accessories.

B Commercial shower and bath accessories.

C ~~**Electric hand/hair dryers.**~~

D Utility room accessories.

1.02 ADMINISTRATIVE REQUIREMENTS

A Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.03 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C Product Schedule: Provide a spreadsheet indicating rooms to receive accessories and quantities of each accessory in the room. Include items provided by the Owner and installed by the Contractor.

1.04 WARRANTY

A Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage or frame corrosion defects within specified warranty period.

1. Warranty Period: 15 years.

B High Speed Hand Dryer Warranty:

1. Manufacturer's standard 7 year warranty

PART 2 PRODUCTS

2.01 MANUFACTURERS

A Commercial Toilet, Shower, and Bath Accessories:

1. Bobrick; www.bobrick.com.
2. Bradley Corporation: www.bradleycorp.com.

B ~~**Electric Hand/Hair Dryers:**~~

1. ~~**Excel Dryer: www.exceldryer.com.**~~
2. ~~**World Dryer Corporation: www.worlddryer.com.**~~

2.02 MATERIALS

A Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B Keys: Provide two keys for each accessory to the Owner; master key lockable accessories.

C Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

D Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

E Dispensing Accessories: Fully loaded and in operating condition at time of completion.

2.03 FINISHES

A Stainless Steel: Satin finish, unless otherwise noted.

B Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

2.04 COMMERCIAL TOILET ACCESSORIES

A Toilet Paper Dispenser (TPH): Owner Standard, no substitutes.
1. Georgia Pacific Side by Side Jumbo JR High Capacity Toilet Paper Dispenser #59209.
2. Color: Black

B Toilet Seat Cover Dispenser (SCD): Owner Standard, no substitutes.
1. Tough Guy Item #1ECK2
2. Stainless Steel

C Paper Towel Dispenser (PTD), surface mounted: Owner Standard, no substitutes.
1. Georgia Pacific Pacific Blue Ultra Mechanical High-Capacity #59589.
2. Color: Black

D Soap Dispenser (SD): Owner Standard, no substitutes.
1. GOJO FMX-12 Foam Soap Dispenser
2. Color: Black

E Mirrors: Stainless steel framed, 1/4 inch (6 mm) thick select plate glass.
1. Silvering, protective and physical characteristics in compliance with ASTM C1503.
2. Frame: 3/4 x 3/4 inch (19 x 19 mm)angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
3. Backing: Full-mirror sized, galvanized steel sheet and nonabsorptive filler material.
    a. MIR # 1: 24 x 36 inches (609.6 x 914.4 mm).
        1) Bobrick B-290 2436.
        2) Bradley 780-2436.

F Grab Bars: Stainless steel, slip-resistant surface.
1. Standard Duty Grab Bars:
    a. Support capacity: 900 pounds (408 kg), minimum.
    b. Dimensions: 1-1/2 inch (38 mm) outside diameter, concealed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
    c. Finish: Satin.
    d. Length and Configuration (Contractor to field verify conditions for sizes).
        1) GB # 1 (Used for Toilet Sidewall):
            (a) Bobrick B-6806 x 42" (horizontal) and B-6806 x 18" (vertical).
            (b) Bradley 812002- 42 (horizontal) and 812002-18 (vertical).
        2) GB # 2 (Used for Toilet Backwall):
            (a) Bobrick B6806 x 36".
            (b) Bradley 812002-36.
        3) GB # 3 (Used for 36" x 36" Shower -Vertical Sidewall):
            (a) Bobrick B6806 x 18".
            (b) Bradley 812002-18.
        4) GB # 5 (Used for 36" x 36" Shower - Horizontal):
            (a) Bobrick B6861- Two Walled 16" x 31" (Custom Size).
            (b) Bradley 812058/059 - Two Walled 16" x 31" (Custom Size).
        5) GB # 6 (Used for 36" x 60" Shower - Side and Back wall):
            (a) Bobrick B6806 x 30" (Sidewall) and B6806 x 48" (Backwall).
            (b) Bradley 812002-30 (Sidewall) and B812002-48 (Backwall).

G Toiletry Shelf (provide one for every toilet stall or room):
1. Fixed, 0.05 inch (1.2 mm) satin-finished stainless steel, with 3/4 inch (19.05 mm) edge at shelf front and sides. Shelf shall be minimum 5 inches (127 mm) deep. Two 0.05 inch (1.2 mm) satin-finished stainless steel brackets.
2. Products:
    a. Bobrick B-295 x 16.

b. Bradley 755 x 16.

H Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

1. SNR # 1:
   a. Bobrick B-270 ConturaSeries.
   b. Bradley 4A10 Diplomat.

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

A Shower Curtain Rod (SCR): Stainless steel tube, 1 inch (25 mm) outside diameter, 0.04 inch (1.0 mm) wall thickness, satin-finished, with no greater than 3 inch (75 mm) outside diameter, minimum 0.04 inch (1.0 mm) thick satin-finished stainless steel flanges, for installation with exposed fasteners.

1. Bobrick B-6107 x lengths required per drawings.
2. Bradley 953 x lengths required per drawings.

B Shower Curtain (36" x 60" shower):

1. Material: Opaque vinyl, 0.008 inch (0.2 mm) thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
2. Size: 70w or 72w x 72h inches (1066.8 x 1828.8 mm), hemmed edges.
3. Grommets: Stainless steel; pierced through top hem on 6 inch (150 mm) centers.
4. Color: White.
5. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
   a. Bobrick B204-3 with B204-1 Hooks.
   b. Bradley 9533 with 9536 Hooks.

C Folding Shower Seat (Used for 36" x 60" showers):

1. Wall-mounted surface; welded tubular seat frame, structural support members, swing-down legs, hinges, and mechanical fasteners of Type 304 stainless steel, [rectangular-shaped] seat.
2. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of ivory color.
3. Supports up to 500 pounds (226.796 mm).
4. Size: Local Building Code Compliant.
   a. Bobrick B-5191. Custom length of 32".
   b. Bradley 9562. Custom length of 32".

D Shower Soap Dispenser (SSD): Owner Standard, no substitutes.

1. GOJO FMX-20 Foam Soap Dispenser
2. Color: Black

E Robe Hook/Towel Pin (TP): Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.

1. Bobrick B-6777.
2. Bradley 9314.

2.06 ~~ELECTRIC HAND DRYERS~~

A ~~**High Speed Electric Hand Dryers (EHD): Traditional fan-in-case type, with downward fixed nozzle.**~~

1. ~~**Operation: Automatic, sensor-operated on and off.**~~
2. ~~**Mounting: Surface mounted.**~~
3. ~~**Cover: Stainless steel with brushed finish.**~~
4. ~~**Tamper-resistant screw attachment of cover to mounting plate.**~~
5. ~~**Performance:**~~
   a. ~~**Air Velocity: 12,000-20,000 LFM.**~~
   b. ~~**Air Flow: 39-64 CFM.**~~
   c. ~~**Air Temperature at 72 degrees F (22C) room temperature: 145 degrees F (63C).**~~
6. ~~**Electrical:**~~
   a. ~~**Voltage/Amps:**~~

1) ~~**120 VAC/13 amps.**~~
2) ~~**240/208/230/277 VAC/7 amps.**~~

b. ~~**Power: 1450 watts.**~~

7. ~~**Products:**~~

a. ~~**Excel Dryer Inc; XLERATOR Model XL-SB with 1.1" Noise Reduction Nozzle: www.exceldryer.com.**~~

2.07 UTILITY ROOM ACCESSORIES

A Combination Utility Shelf/Mop and Broom Holder (MH) (install one in each janitor closet directly above janitor sink/basin):

1. 0.05 inch (1.3 mm) thick stainless steel, Type 304, with 3/4 inch (19.05 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.
2. Hooks: Four, 0.06 inch (1.6 mm) stainless steel rag hooks at shelf front.
3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
4. Length: 34 inches (863.6 mm).
5. Products:
   a. Bobrick B-239.
   b. Bradley 9933.

PART 3 EXECUTION

3.01 EXAMINATION

A Verify existing conditions before starting work.

B Verify exact location of accessories for installation.

C For electrically-operated accessories, coordinate electrical power requirements and locations with on site electrician.

D Verify that field measurements are as indicated on drawings.

E Coordinate installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings with Section 06 10 53.

3.02 PREPARATION

A Deliver inserts and rough-in frames to site for timely installation.

B Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B Install plumb and level, securely and rigidly anchored to substrate.

C Mounting Heights: As required by accessibility regulations, unless otherwise indicated on drawings.

3.04 PROTECTION

A Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 10 28 00

SECTION 10 75 00
FLAGPOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum Flagpoles.

1.02 SUBMITTALS

A. Product Data: Provide data on pole, accessories, and configurations.
B. Calculations: Provide wind load calculations used to determine diameter, wall thickness and depth of flagpoles.
C. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.
B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flagpoles:
   1. Concord American Flagpole: www.concordamericanflagpole.com.
   2. Eagle Mountain Flag: www.emflag.com.
   3. Pole-Tech Co, Inc: www.poletech.com.

2.02 FLAGPOLES

A. Flagpoles: Designed in accordance with NAAMM FP 1001
   1. Material: Aluminum.
   2. Design: Cone tapered.
   3. Mounting: Ground mounted type.
   4. Outside Butt/Tip Diameter and Wall Thickness: To be determined by manufacturer based on pole height and maximum intended flag size for local wind loads.
   5. Flagpoles for American Flag:
      a. Nominal Height: 25’-0” ft; measured from nominal ground elevation.
B. Performance Requirements:
   1. Wind Pressure Loading on Flagpole with Flag: Resistant without permanent deformation to the local wind speed, in accordance with NAAMM FP 1001; the factor of safety used is 2.5.

2.03 POLE MATERIALS

A. Aluminum: ASTM B241/B241M , 6063 alloy , T6 temper.

2.04 ACCESSORIES

A. Finial Ball: Gold anodized aluminum, 6 inch (150 mm) diameter.
B. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.
C. American Flag (NIC): For flagpole design, ~~**8 ft by 12 ft (2.4 m by 3.7 m)**~~ ***4 ft by 6 ft or 5 ft by 8 ft*** size, nylon fabric, brass grommets, hemmed edges.
D. Cleats: 9 inch (230 mm) size, stainless steel with stainless steel fastenings, two per halyard.
E. Aluminum access door with continuous hinge and key lock for winch access.
F. Halyard: Mi1/8 inch (3.175 mm) diameter stainless steel aircraft cable.
G. Primer: Zinc chromate type.

2.05 OPERATORS

A. Manual Hand Crank: Removable type.

2.06 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M 36, corrugated 16 gauge, 0.0598 inch (1.52 mm) steel, galvanized, depth as required for flagpole height and no less than required by local codes for frost depth.
B. Pole Base Attachment: Flush; aluminum base with base cover.
C. Lighting Ground Rod: 60 inch (1524 mm) long copper rod, 5/8 inch (15.875 mm) diameter.
D. Lightning Ground Cable: Copper No. 6 AWG, soft drawn.

2.07 FINISHING

A. Metal Surfaces in Contact With Concrete: Asphaltic paint.
B. Concealed Steel Surfaces: Galvanized to ASTM A123/A123M requirements.
C. Aluminum: Satin Aluminum.
D. Finial: Spun finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.02 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

A. Install flagpole , base assembly, and fittings in accordance with manufacturer's instructions.
B. Electrically ground flagpole installation.
C. Fill foundation tube sleeve with concrete specified in Division 3.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1 inch (25 mm).

3.05 ADJUSTING

A. Adjust operating devices so that halyard and flag function smoothly.

END OF SECTION 10 75 00

SECTION 23 09 93

BAS SEQUENCE OF OPERATIONS

PART 1: GENERAL

1.01 SUMMARY

A. This Section includes control sequences for HVAC systems, subsystems, and equipment.

1.02 DEFINITIONS

A. DDC: Direct digital control.

B. VAV: Variable air volume.

1.03 CONTROL SEQUENCES

A. Refer to the attached control sequences and points schedule for required Building Automation Systems work.

PART 2: PRODUCTS (Not Applicable)

PART 3: EXECUTION

3.01 GENERAL REQUIREMENTS

A. System Programming: Provide the most current version of the system software that is available prior to the date of substantial completion.

1. It is the intent that the system be as easy as possible for the building operator to navigate. Modify the system programming and graphics as to include descriptors of the actual equipment names in addition to point mapping acronyms. In addition provide the following front-end graphic interface features:

    a. Graphic representation of each piece of equipment.
    b. Configuration of major systems including but not limited to central plants.
    c. Control points displayed on each page. Coordinate with the Owner's representative as to level of detail to include on each page.
    d. Major equipment including air handling equipment graphics shall include a secondary text page with detailed system points and parameters. Coordinate with the Owner's representative as to level of detail to include on each page.
    e. Navigation tools and page links. Provide additional navigation features at the request of the Owner.
    f. Building floor plan graphics showing air handling unit zone boundaries.
    g. Building floor plan graphics showing each temperature control zone with space temperatures represented.
    h. Building floor plan graphics with lighting control zones.
    i. Building floor plan graphics to show exhaust fan locations.
    j. A graphic page to show utility use summary information.
    k. Graphic page to show a summary of equipment time of day schedules.
    l. Graphic page to show a summary of dirty filter alarms.

2. For all existing equipment, compare the currently installed control program to the control sequences published here in and submit a report to the engineer of discrepancies in the control intent. At the direction of the engineer, modify the existing control sequences as required.

3. Complete the time of day program scheduling for all equipment at the direction of the Owner's representative. Modify the equipment schedules as necessary to associate equipment in control groups to minimize the number of schedules in the system. Provide a global holiday schedule for all equipment in the building.

4. Coordinate with the Owner's representative for the initial temperature setpoints for each space.

B. Building Automation System Alarms: Alarms generated by the building systems shall be categorized as either critical or non-critical and be handled with the attributes as listed in items 1 and 2 below. Any alarms identified in specific control sequences that are in addition to those listed below shall be handled as non-critical alarms.

1. Critical Alarms:
   a. Only generated when the alarmed system is enabled.
   b. Send an email notification to the Owner's personnel as designated 24 hours a day, 7 days a week.
   c. Log all critical alarms to server log.
   d. Generate pop up alarm box at the local display for building personnel as defined by user log-in.

2. Non-Critical Alarms:
   a. Only generated when the alarmed system is enabled.
   b. Log all non-critical alarms on server log.
   c. Generate pop-up alarm box at the local display for building personnel as defined by user log-in.

3. Heating Plants:

   a. Critical:
      1) Supply water temp 20 degrees +/- for a time period greater than 20 minutes (adjustable)
      2) Differential pressure +/- 30% of set point for a time period greater than 15 minutes (adjustable)

   b. Non-Critical:
      1) Each boiler general fault alarm.
      2) Each hot water circulating pump VFD status.

4. Cooling Plants:

   a. Critical:
      1) Supply water temp 5 degrees +/- for a time period greater than 30 minutes (adjustable)
      2) Differential pressure +/- 30% of setpoint for a time period greater than 15 minutes (adjustable)

   b. Non-Critical:
      1) Chiller general alarm.
      2) Each chiller water circulating pump status.

5. All Space Temperature Sensors:

   a. Critical:
      1) Space temperature less than 45 degrees F. for a time period greater than 15 minutes.

6. AHU/RTU – Variable Air Volume: Space temperature variation setpoint color-coded on floor plan graphic. All space temperatures are critical alarmed if less than 45 degrees F. for a time period greater than 15 minutes.

   a. Non-Critical:
      1) Freeze-stat
      2) Duct smoke detector
      3) Static safety switches
      4) Filter differential pressure
      5) High discharge air temperature exceeds 110 degrees F. for a time period greater than 15 minutes
      6) Low discharge air temperature less than 38 degrees F. for a time period greater than 15 minutes
      7) Supply fan status

7. Variable Air Volume Box Zones: Space temperature variation setpoint color-coded on floor plan graphic. All space temperatures are critical alarmed if less than 45 degrees F. for a time period greater than 15 minutes

8. Server Rooms – space temperature greater than 75 degrees F for a time period greater than 15 minutes.

9. Unit Heaters and Cabinet Unit Heaters:

    a. Critical:
        1) Space temperature is less than 45 degrees F for a time period greater than 15 minutes

    b. Non-Critical:
        1) Fan status

10. Domestic Water Pump:

    a. Non-Critical:
        1) Pump status

11. Miscellaneous:

    a. Critical:
        1) Generator alarm(s)
        2) Underfloor Leak Detection.

3.02 CONTROL SEQUENCE AND POINTS SCHEDULE
FOR: Variable Air Volume Systems

A. General

1. Air Handling Systems: All equipment indicated shall be controlled by the same software defined occupied/unoccupied schedule through the Building Automation System.

   a. Area Served: Dispatch/EOC Support
   Air Handling Unit AHU-1
   Supply & Return Fan(s)
   VAV Boxes
   Air Flow Stations
   Outside Air Hood IH-1
   Air Flow Stations
   Humidifier HU-1

   b. Area Served: Dispatch and EOC
   Air Handling Unit AHU-2
   Supply & Return Fan(s)
   Energy Recovery
   VAV Boxes
   Outside Air Hood IH-2
   Air Flow Stations
   Humidifier HU-2

   c. Area Served: Admin Office Area
   Air Handling Unit AHU-3
   Supply & Return Fan(s)
   VAV Boxes
   Air Flow Stations
   Humidifier HU-3

2. Provide all control dampers as referenced here-in unless specifically shown to be provided by the air handling unit manufacturer including but not limited to the outside air, relief air, and return air. Provide supply and return air crossover dampers. Installation specified under another DIV 23 section. Provide electric damper actuators for all dampers including those provided with the unit.

3. Provide all variable speed drives associated with these systems unless specifically stated to be provided by another Division 23 Section. Refer to specification sections and the drawings for required variable speed drives. For systems with multiple fans, provide a dedicated variable speed drive for each fan motor unless otherwise indicated. Coordinate installation requirements with the DIV 26 contractor.

4. Provide the hot water and chilled water valves and electric actuators. Refer to equipment schedules for 2 or 3 way valves. Installation specified under another DIV 23 section.

5. Provide and wire all sensors for input signals necessary to accomplish the control functions as described here in and where shown on the drawings. Field installed sensors located outside the AHU include at a minimum duct static pressure, building differential pressure, outside air temperature, outside air enthalpy, space humidity (a minimum one per floor and as shown on the drawings), space dew point (a minimum one per floor and as shown on the drawings), and CO2 (a minimum of the return air stream and as shown on the drawings).

6. Smoke detectors are furnished by the Electrical Contractor and installed by the electrical contractor.

7. Provide and wire static pressure safety switches.

8. Provide and wire all electrical interlocks to other equipment associated with this system, as indicated or otherwise necessary for proper system operation.

9. Provide all duct-mounted airflow measuring stations and electronic transducers. Air handler fans are furnished with airflow measuring stations. Refer to specification Section 23 73 13 and drawings for scope of airflow station work. Install and wire complete all airflow measuring stations and electronic transducers.

10. Provide and install the filter pressure differential sensor.

11. Provide on/off control and a 4-20mA signal to each humidifier.

B. Control Sequence

1. AHU Morning Warm-Up Mode

   a. AHU Morning Warm-Up Mode shall not be allowed to operate unless the “heating available” signal has been broadcast over the network by the central heating plant control module.

   b. The zone control modules (i.e. VAV boxes, Induction Displacement Units, or Chilled Beams) shall broadcast a signal to initiate the respective AHU Morning Warm-Up Mode. See “Morning Warm-Up Mode” control sequences for temperature zone control devices. Provide a reference on the BAS graphics page to denote when the unit is in AHU Morning Warm-Up Mode.

   c. If the AHU is started before occupancy time, the unit’s outside air and relief air dampers shall be fully closed, and the unit’s return air damper shall be fully opened. Heat recovery devices (if applicable) shall be bypassed.

   d. The AHU fans shall operate as described in “Fan Capacity Control” and “Building Pressure Control” under the Variable Air Volume Air Handling Units control sequence.

   e. The AHU chilled water control valves shall be closed and condensing unit operation shall be locked out.

   f. The heating coil valve shall be modulated open to maintain the AHU Warm-Up Mode discharge air temperature setpoint initially set to 95°F (adjustable).

   g. When the number of "cooling requests" from various zone control modules exceeds an operator-specified number, the AHU discharge air temperature setpoint shall be decreased to prevent overheating. The AHU Warm-Up Mode discharge air temperature shall be reset between a minimum and maximum operator adjustable setpoint. The maximum temperature shall be initially set for 95°F. The minimum temperature shall be initially set for 60°F.

   h. Morning Warm-Up Mode at the AHU and zone control modules shall be terminated at the scheduled occupancy period or when all temperature control zones have reached the occupied heating setpoint.

2. AHU Morning Cool-Down/Dehumidification Mode

   a. AHU Morning Cool-Down Mode shall not be allowed to operate unless the “cooling available” signal has been broadcast over the network by the central cooling plant control module.

   b. The zone control modules (i.e. VAV boxes, Induction Displacement Units, or Chilled Beams) shall broadcast a signal to initiate the respective AHU Morning Cool-Down Mode. See “Cool-Down Mode” control sequence for temperature zone control equipment. Provide a reference on the BAS graphics page to denote when the unit is in AHU Morning Cool-Down Mode.

   c. If the AHU is started before occupancy time, the unit’s outside air and relief air dampers shall be fully closed, and the unit’s return air damper shall be fully opened. Heat recovery devices (if applicable) shall be bypassed.

   d. The AHU fans shall operate as described in “Fan Capacity Control” and “Building Pressure Control” under the Variable Air Volume Air Handling Units control sequence.

   e. The AHU hot water control valve shall initially be closed.

   f. The AHU chilled water coil valve(s) shall modulate or the condensing unit shall stage/cycle on (Verify number of stages with unit manufacturer) as required to maintain the AHU cooling coil discharge air temperature setpoint initially set to 53°F (adjustable).

g. When the number of "heating requests" from various zone control modules exceeds an operator-specified number, the AHU discharge air temperature setpoint shall be increased to prevent overcooling. The AHU discharge air temperature setpoint shall be reset between a minimum and maximum operator adjustable setpoint. The maximum temperature shall be initially set for 68°F. The minimum temperature shall be initially set for 53°F.

h. Morning Cool-Down Mode at the AHU and temperature control zones shall be terminated at the scheduled occupancy period or when all spaces served by the air handling unit have reached the occupied cooling setpoint).

i. Active dehumidification control for variable systems with VAV shall not occur during AHU Morning Cool-Down Mode. Refer to dehumidification control sequences under Occupied Mode.

3. Occupied Mode

a. The system shall be indexed to occupied mode be a time clock schedule through the BAS.

b. Provide a “soft start” ramp function to bring the fans to speed slowly. All fans associated with this system shall run continuously.

c. Supply Fan Capacity Control

1) Provide a duct static pressure sensor and PID control loop to modulate the supply fan speed control to maintain the duct static pressure setpoint (adjustable). The balancing contractor shall determine the duct static pressure setpoint based on field measurements.

2) If none of the terminal VAV boxes associated with this unit are in the maximum open position, the static pressure setpoint shall be decreased to save fan energy.

3) Locate static pressure sensor approximately 2/3 distance downstream of the supply fan along the longest duct run. Coordinate location with ductwork installation contractor and test and balance contractor.

4) Totalize the real-time airflow rate from all VAV boxes served by the air handling unit and display this value on the front-end graphics.

d. Building Pressure Control

1) The return/exhaust fan shall track the supply fan CFM. Calibrate the return/exhaust fan airflow curve to the supply fan as follows: Set the supply fan at full flow and measure the CFM. Adjust the return/exhaust fan RPM so the return/exhaust fan CFM matches the supply fan CFM minus the exhaust CFM from the area served (include only exhaust fans scheduled on/off through the BAS). Repeat the procedure for supply RPM’s at decreasing 15% increments.

2) The building differential static pressure sensor shall modulate the relief air damper to maintain a positive building differential static pressure of 0.025 in w.c. The relief air damper shall not be modulated less than 20% open (adjustable) when the system is in occupied mode.

3) The building differential static pressure shall be determined through a signal dampening technique to provide a stable value for control. Provide a time average with a sliding 5 minute period and 15 second sampling rate or contractor suggested alternative. The average value shall be displayed on the front-end graphics and used as the point of control.

4) The outside air damper shall not be modulated below its minimum setting. If the outside air damper is at its minimum setting and the building static pressure drops below its setting, decrease the return fan speed.

e. Outside Air Damper Control

1) The outside air damper shall open to its minimum position. Where an outside airflow station is indicated to be provided, the outside air damper shall modulate to maintain the minimum outside airflow setpoint.

2) A carbon dioxide sensor in the combined return air stream shall reset the minimum outside airflow setpoint between a minimum and maximum setting to maintain an operator defined maximum CO2 concentration of 1,200 ppm (adjustable). Refer to the drawings for additional information.

3) The return damper position shall be adjusted if necessary such that the minimum outside airflow rate is achieved over the full range of system operation.

4) The minimum outside airflow setpoint shall never be reset below the current exhaust airflow. The current exhaust airflow shall be determined by totalizing the design CFM of all exhaust fans with a status of "on" within the area served by the air-handling unit. The intent is to prevent the system from creating a negative building differential static pressure.

f. Mixed-Air/Discharge Air Temperature Reset

1) The mixed air/discharge air temperature setpoint shall be reset based on requests for cooling or heating from the zone control modules (i.e. VAV boxes, Induction Displacement Units, or Chilled Beams). When requests for cooling or heating exceed the operator-defined number, the discharge air setpoint shall be reset. Refer to the cooling and heating sequences. The intent of the mixed air/discharge air reset strategy is to maintain the highest temperature setpoint to maximize ventilation to the spaces without overheating more than the operator defined number of spaces.

2) The mixed air/discharge air shall be reset between a minimum and maximum temperature operator adjustable setpoint. The maximum temperature shall be initially set for 65.0 degrees. The minimum temperature shall be initially set for 55.0 degrees (the de-humidification mode shall override the minimum temperature). Upon initial system start-up the system shall start at the same discharge air temperature that ended the last occupied period.

g. Economizer Control

1) The outside air damper and return air damper shall modulate to maintain the mixed air setpoint. The mixed air temperature setpoint shall be reset based on the number of cooling requests from operator adjustable zone control modules (i.e. VAV boxes). The mixed air set point shall reset between minimum and maximum limits initially set for 55°F and 65°F.

2) The economizer outside air damper shall be closed to minimum position when the outside air enthalpy is greater than the return air enthalpy, the outside air temperature is greater than 80.0 degrees, or the outside air enthalpy is greater than 26.0 BTU/lb.

3) The carbon dioxide reset shall be locked out when the system is in economizer operation.

h. Chilled Water Coil Valve Control

1) The system shall be indexed to the mechanical cooling mode when chilled water is available, the outside air dampers are full open, the outside air enthalpy is greater than the return air enthalpy, and the number of cooling requests exceeds the operator specified number.

2) The hot water control valve shall be closed.

3) The chilled water coil valve shall modulate to maintain the discharge air temperature setpoint. For systems with multiple chilled water valves, the lead valve shall fully open before each subsequent valve begins to modulate. The lower cooling coil shall be designated as the lead control valve.

4) When the number of "heating requests" exceeds the operator-specified number, the discharge air temperature shall be increased to prevent over cooling.

i. Hot Water Control Valve Control

1) The system shall be indexed to the heating mode when hot water is available and the discharge air temperature falls below its setpoint.

2) The cooling shall be locked out and the outside air damper shall close to its minimum position.

3) The heating coil valve shall be modulated open to maintain the discharge air temperature setpoint. For air-handling units with multiple coils stacked heating coils, the control valves shall modulate in unison.

4) When the number of "cooling requests" from various zones exceeds an operator-specified number, the discharge air temperature shall be decreased to prevent overheating.

j. Heat Recovery Wheel

1) An outside air temperature sensor located downstream of the wheel shall modulate the wheel speed through the variable frequency drive to maintain a maximum leaving wheel outside air temperature setpoint. The setpoint shall be initially set for the mixed air/discharge air setpoint less 2°F. As the leaving wheel outside air temperature rises above its setpoint the wheel speed shall slow. The leaving wheel outside air temperature setpoint shall not be reset down below an operator-defined setpoint initially set for 45°F.

2) An exhaust/relief air temperature sensor located downstream of the energy recovery wheel shall modulate the wheel speed through the variable speed drive to maintain a minimum leaving wheel exhaust/relief air temperature greater than the return air dewpoint plus 2 Deg. F as calculated with the return air dry bulb temperature and return air humidity. As the exhaust/relief air temperature drops below its set point, the wheel shall slow. The exhaust/relief air temperature sensor control shall override the outside air temperature control as described in item a. Coordinate with the unit manufacturer to confirm that the stated control strategy to prevent the wheel from freezing aligns with the manufacturer recommendations. Report any discrepancies to the engineer.

3) When the outside air temperature leaving the wheel is between the leaving exhaust air temperature set point and the leaving wheel outside air setpoint, the heat wheel shall turn at full speed to maximize heat recovery.

4) When the outside air temperature downstream of the heat wheel is greater than the temperature setpoint and the heat wheel is turning at is minimum speed, the system shall be indexed to economizer mode and the wheel shall stop rotating.

5) When the entering outside air enthalpy is greater than the building return air enthalpy, the heat recovery unit shall be indexed out of economizer mode and the wheel shall run at full speed to maximize heat recovery.

6) Provide a soft start ramp control for wheel speed operation. The wheel shall take approximately 30 seconds to ramp to full speed.

7) The bypass dampers on both the outside air and exhaust shall be controlled as follows. Refer to the drawings and specifications for additional information regarding the dampers provided with the unit:

Operation	Bypass
Wheel Rotating	Closed
Wheel Stopped	Open
Economizer	Open
Morning Warm-up/Cool Down	Open

k. Dehumidification Control

1) For variable air volume systems, provide a software switch allowing the BAS operator to enable/disable dehumidification control. The switch shall provide an option for a global command for all air handling systems.

2) For variable air volume systems, the system shall send a request to enable the boiler plant when the return air humidity exceeds 55% (adjustable) for a time period greater than 30 minutes (adjustable) and cooling is available. When hot water is available, the system shall initiate de-humidification control.

3) Provide a serpentine-type sensor for measuring the average cooling coil discharge air temperature. The discharge air reset control shall be overridden and the cooling coil discharge air temperature shall be set to an operator-defined setpoint initially set for 53°F (adj). For systems with multiple chilled water valves, the lead control valve shall fully open before each subsequent control valve begins to modulate. The lower cooling coil shall be designated as the lead control valve.

4) For systems where all variable air volume boxes have reheat coils, refer to the VAV Boxes with Terminal Reheat Control Sequence for the reheat coil valve control. For systems with VAV Boxes without reheat coils, the air handling unit heating coil valve shall modulate to maintain the discharge air temperature set point.

5) When the return air humidity drops to 50% (adjustable) for a time period greater than 30 minutes (adjustable), dehumidification control shall be terminated.

l. Humidification Control

1) During heating mode, enable the humidifier. Modulate the humidifier to maintain space humidity setpoint.

2) Reset the return humidity setpoint linearly between the user adjustable endpoints as follows:

Space Humidity	Outside Air Temperature
15%	0°
45%	60°

3) Provide a humidity sensor downstream of the humidifier. Turn off humidifier if humidity exceeds 85% (adjustable).

4) Disable the humidifier operation if the supply fan is not running.

4. Unoccupied Mode

a. Cooling

1) The system fans and return/exhaust fans shall be off.

2) The outside air and relief air dampers shall be in the closed position.

3) Cooling shall be disabled and the heating valve shall be closed.

b. Heating

1) The unoccupied heating setpoint temperature shall be operator-defined initially set for 58°F (adj) with a 6°F deadband (adj.). The intent is to provide a large deadband to reduce rapid cycling of the air-handling unit.

2) It is the intent that the perimeter finned tube radiation maintain the building unoccupied temperature setpoint. If the perimeter finned tube radiation valve is fully open and the space is below its unoccupied setpoint temperature then the VAV box serving that zone shall send a heating request.

3) When the number of "heating requests" from the VAV zones served by the air handling unit exceeds a user-defined number (initially set to 50% of the total quantity of VAV zones), the supply fan shall start with outside air and relief air dampers fully closed, return air dampers open. The AHU hot water heating coil valve shall remain closed and the VAV reheat coil valves shall modulate to maintain the unoccupied temperature setpoint.

4) When the "heating requests" are satisfied, the system shall be shutdown.

5) For systems with the heating coil installed within the unit, provide a low-limit control override to modulate the hot water control valve open to maintain a minimum mixed air temperature of 45.0 degrees.

c. Dehumidification Control

1) The intent of dehumidification control during unoccupied mode is to reduce the risk of microbial growth within the building and interstitial spaces.

2) Provide a software switch allowing the BAS operator to enable/disable dehumidification control during unoccupied mode. This software switch shall not affect occupied mode dehumidification control.

3) Dewpoint temperatures shall be calculated with the dry bulb temperature, relative humidity, and/or enthalpy sensors.

4) When the space dewpoint temperature and outdoor air dewpoint temperature both exceed 60°F (adj) for a time period greater than 30 minutes (adj), the BAS shall send a request to enable the cooling and heating plants. When the cooling and heating plants are available, the BAS shall initiate dehumidification control.

5) The supply fan and return fan shall start with outside air and relief air dampers fully closed and return air dampers fully open.

6) The cooling coil discharge air temperature shall be set to an operator-defined setpoint initially set for 53°F (adj). For systems with multiple chilled water valves, the lead control valve shall fully open before each subsequent control valve begins to modulate. The lower cooling coil shall be designated as the lead control valve.

7) For systems where all variable air volume boxes have reheat coils, refer to the VAV Boxes with Terminal Reheat Control Sequence for the reheat coil valve control. For systems with VAV Boxes without reheat coils, the air handling unit heating coil valve shall modulate to maintain the discharge air temperature set point.

8) When the space dewpoint temperature drops below 60°F (adj) for a time period greater than 30 minutes (adj), unoccupied mode dehumidification control shall be terminated.

5. AHU-1 and AHU-2 Crossover Mode:

a. All air handling unit have redundant supply and return air fans, however, in the case AHU-2 needs to be shutdown or is out of service, provide a pushbutton on the graphics to go into “Crossover Mode.” In this mode the supply and return air dampers SD-1,2 and RD-1,2 will modulate and allow supply and return air from AHU-1 to serve the ductwork for AHU-2. All areas from AHU-1 will not have ventilation during this time.

b. Once the front-end graphics pushbutton is activated, the following damper sequence shall occur:

Supply Air Damper SD-1	Open
Supply Air Damper SD-2	Closed
Return Aur Damper RD-1	Open
Return Air Damper RD-2	Closed

c. Once the front-end graphic pushbutton is activated a second time, the dampers shall return to their normal positions and AHU-1 and AHU-2 shall operate normally.

6. ***Provide a building flush out per LEED v4 requirements prior to occupancy. Coordinate schedule requirements with Division 23 contractors, general contractor, and Owner.***

a. Install new filtration media and perform a building flush-out by supplying a total air volume of 14,000 cubic feet of outdoor air per square foot of gross floor area while maintaining an internal temperature of at least 60°F and no higher than 80°F and relative humidity no higher than 60%.

C. Safeties

1. Smoke - Transmit alarm to BAS when smoke is detected in duct system. The alarm shall automatically reset when the smoke detection alarm is cleared.

2. Static Pressure Switch - Provide static pressure sensing safety switches (manual reset) located in the mixed air chamber, supply duct, and return duct. Shutdown system fans and transmit an alarm to the BAS when the static pressure is outside of the setpoint range of the pressure switch.

3. High Discharge Air Temperature - De-energize fan and transmit alarm to BAS when the discharge air temperature exceeds 90.0 degrees while in occupied mode.

4. Low Discharge Air Temperature - De-energize fan and transmit alarm to BAS when the discharge air temperature drops below 50.0 degrees.

D. Alarms

1. Generate an alarm when one of the following devices trips:

a. Duct Smoke Detectors
b. Mixed Air Static Safety Switch
c. Supply Air Static Safety Switch
d. Return Air Static Safety Switch
e. Relief Air Static Safety Switch

2. Generate an alarm for each fan associated with this system when the system is enabled but the status of any of the fans is off.

3. Generate an alarm if the filter differential pressure is above setpoint. Display the filter alarms on a global filter summary page for the building.

4. Generate a high temperature and low temperature alarm as noted in “Safeties”.

5. Generate an alarm when the discharge air static pressure is 0.5” wc above or below the setpoint for more than a 5 minute duration (all variables operator adjustable).

6. Generate an alarm when condensate is at risk of overflowing the condensate pan.

7. Generate an alarm when the return humidity is +/- 10% of setpoint for a period of more than one hour.

E. Points Schedule

Provide at a minimum the following control points for each system and as required to accomplish the indicated control sequences.

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Occupancy Schedule								x	x		x
Dehumidification Mode						x			x		x
Crossover Mode						x			x		x
Heating/Cooling Available						x			x		x
Supply Fan Start/Stop				x					x		x
Supply Fan Status			x						x	x	x
Supply Fan VFD Modulation		x							x		x
Supply Fan VFD Speed	x								x		x
Supply Fan VFD Fault			x						x	x	x
Return Fan Start/Stop				x					x		x
Return Fan Status			x						x	x	x
Return Fan VFD Modulation		x							x		x
Return Fan VFD Speed	x								x		x
Return Fan VFD Fault			x						x	x	x
Clg. Control Valve Modulation		x							x		x
Htg. Control Valve Modulation		x							x		x
Outside Air Temperature Setpoint (Leaving Heat Rec. Wheel)					x				x		x
Outside Air Temperature (Leaving Heat Rec. Wheel)	x								x		x
Exhaust Air Temperature Setpoint (Leaving Heat Rec. Wheel)					x				x		x
Exhaust Air Temperature (Leaving Heat Rec. Wheel)	x								x		x
Heat Rec. Wheel Start/Stop				x					x		x
Heat Rec. Wheel Status			x						x	x	x
Heat Rec. Wheel VFD Modulation		x							x		x
Heat Rec. Wheel VFD Speed	x								x		x
Heat Rec. Wheel VFD Fault			x						x	x	x
Heat Rec. Wheel Outside Air Bypass Damper Control						x			x		x
Heat Rec. Wheel Exhaust Air Bypass Damper Control						x			x		x
Supply Air Static Pressure Setpoint					x				x		x
Supply Air Static Pressure	x								x	x	x
Bldg. Diff. Static Press. Setpoint					x				x		x
Building Differential Static Pressure	x								x	x	x

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Occupancy Schedule								x	x		x
Dehumidification Mode						x			x		x
Crossover Mode						x			x		x
Heating/Cooling Available						x			x		x
Supply Fan Start/Stop				x					x		x
Filter Differential Static Pressure	x								x	x	x
Supply Air Temperature Setpoint					x				x		x
Supply Air Temperature	x								x	x	x
Return Air Temperature	x								x		x
Mixed Air Temperature	x								x		x
Clg. Coil Discharge Air Temperature Setpoint					x				x		x
Clg. Coil Discharge Air Temperature	x								x		x
Return Air Humidity Setpoint					x				x		x
Return Air Humidity	x								x	x	x
Return Air Damper Modulation		x							x		x
Exhaust Air Damper Modulation		x							x		x
Outside Air Damper Modulation		x							x		x
Crossover Sup. Air Damper Control				x					x		x
Crossover Ret. Air Damper Control				x					x		x
Return Air CO_2 Setpoint					x				x		x
Return Air CO_2	x								x	x	x
Supply Air CFM (VAV Total)					x				x		x
Exhaust Air CFM (EF Total)					x				x		x
Supply Air CFM (Meas. Station)	x								x		x
Return Air CFM (Meas. Station)	x								x		x
Outside Air CFM (Meas. Station)	x								x		x
Humidifier Start/Stop				x					x		x
Humidifier Control		x							x		x
Heating/Cooling Available						x			x		x
Smoke Alarm			x						x	x	x
Freezestat Alarm			x						x	x	x
Static Pressure Safety Switch (Each Switch)			x						x	x	x
Condensate Overflow Alarm			x						x	x	x
Supply Air Humidity	x								x	x	x
Outside Air Enthalpy					x				x		x
Outside Air Temperature					x				x		x
Totals	**18**	**9**	**10**	**6**	**12**	**6**	**0**	**1**	**62**	**17**	**62**

Total Hardware (43) **Total Software (98)**

3.03 CONTROL SEQUENCE AND POINTS SCHEDULE
FOR: VAV Boxes with Terminal Reheat

A. General

1. For new VAV boxes, provide the electronic VAV box control module and floating point damper motor to the VAV box manufacturer for mounting at the factory. The VAV box manufacturer will install and wire the electronic VAV box control module and damper motor, and connect air flow sensor to the control module at the factory.

2. Provide a space temperature sensor for each VAV box and wire it to the respective control module.

    a. At locations indicated on the drawings, supply combination temperature and relative humidity or CO2 sensors.

    b. Provide additional under floor temperature sensors where indicated on the drawings. These will be for monitoring only at their respective VAV zone.

3. Provide control valves and actuators for the reheat coil (RH) and finned tube radiation (FTR), where applicable; refer to equipment schedule for valve type and control. Installation of control valve is work of another Division 23 specification section.

4. Provide a separate heating, cooling setpoint for each VAV box. Each setpoint shall be individually adjustable from the front end computer graphic.

5. Provide leaving air temperature sensor at VAV box outlet. Locate sensor minimum 3'-0" downstream of reheat coil.

6. The BAS contractor shall provide and wire all occupancy sensor(s) as required to accomplish the Standby Mode sequence unless otherwise indicated on the lighting control drawings.

7. The front-end graphics shall indicate which mode the VAV box is in: Occupied Mode, Unoccupied Mode, Morning Warm-Up Mode, Morning Cool-Down Mode, Standby Mode, or Dehumidification Mode.

8. The front-end graphics shall show VAV zones overlaid onto the building floor plan. Each VAV zone shall be labeled on the floor plan with the Owner's room number. Selecting the Owner's room number shall bring the user to a detailed VAV summary page, which displays both the Owner's room number and VAV box number.

B. Control Sequence

1. Morning Warm-Up Mode

    c. Morning Warm-Up Mode shall automatically bring the space temperature up to warm-up temperature setpoint (3°F below occupied heating setpoint) based on its scheduled occupancy period. The calculation used in this mode shall predict the shortest time required to achieve the space's warm-up temperature setpoint. The intent is to reduce central system energy by not starting the HVAC system earlier than required.

    d. Morning Warm-Up Mode shall not be allowed to operate unless the "heating available" signal has been broadcast over the network by the central heating plant control module.

    e. For each VAV box, the BAS shall calculate the "Space Warm-Up Time Requirement" based on the space's warm-up temperature setpoint, current space temperature, current outdoor air temperature, current AHU discharge air temperature setpoint, and the space's heating capacity factor. The BAS shall have an algorithm to self-tune the heating capacity factor for each space. Provide a software switch on the BAS graphics that enables the operator to turn on or off the self-tuning algorithm, such that self-tuning can be stopped after the system has been trained. The BAS shall inhibit input to the self-tuning algorithm during override periods to prevent distortion of the heating capacity factors.

f. Each VAV box shall be assigned a Warm-Up Mode Minimum CFM Setpoint, equal to 10% of maximum design CFM (adjustable) and assigned a Warm-Up Mode Maximum CFM Setpoint, equal to 75% of maximum design CFM (adjustable).

g. The “Warm-Up Cycle” (see below) shall start simultaneously for each VAV box based on the calculated Space Warm-Up Time Requirement, but no earlier than 2 hours (adjustable) before the start of the scheduled occupied period, and shall end at the scheduled occupancy time. A failure to achieve the space’s warm-up temperature setpoint at the scheduled occupancy time shall be used as an input to the space’s heating capacity factor self-tuning algorithm.

h. Warm-Up Cycle:

1) The radiation valve(s) (if applicable) associated with the VAV box shall modulate fully open.

2) The destratification fan(s) (if applicable) associated with the zone shall start.

3) The VAV box reheat coil valve shall modulate fully open.

4) The VAV box airflow damper shall modulate to warm-up mode maximum CFM setpoint.

5) The VAV box control module shall broadcast a “heating request” signal to the respective AHU that initiates “AHU Morning Warm-Up Mode”. See control sequence under Variable Air Volume Air Handling Units.

6) As the space temperature approaches the warm-up temperature setpoint, the VAV airflow damper shall modulate towards the Warm-Up Mode Minimum CFM Setpoint. The radiation control valve(s) (if applicable) and the VAV box reheat coil valve shall modulate to maintain the warm-up temperature setpoint.

i. If the VAV box reheat coil valve is closed and the radiation control valve(s) (if applicable) is closed and the airflow damper is at Warm-Up Mode Minimum CFM Setpoint and the space temperature is above the occupied heating setpoint, a "cooling request" shall be transmitted over the network to the respective air-handling unit. This message shall reset the AHU discharge air temperature setpoint as described under the “AHU Morning Warm-Up Mode” sequence.

2. Morning Cool-Down/Dehumidification Mode

a. Morning Cool-Down/Dehumidification Mode shall automatically bring the space temperature down to cool-down/dehumidification temperature setpoint (2°F above occupied cooling setpoint) based on its scheduled occupancy period. The calculation used in this mode shall predict the shortest time required to achieve the space occupied cooling setpoint. The intent is to reduce central system energy by not starting the HVAC system earlier than required.

b. Morning Cool-Down/Dehumidification Mode shall not be allowed to operate unless the “cooling available” signal has been broadcast over the network by the central cooling plant control module. VAV Box Morning Cool-Down/Dehumidification Mode shall be locked out if the outside air temperature is less than 68°F (adjustable).

c. For each VAV box, the BAS shall calculate the “Space Cool-Down/Dehumidification Time Requirement” based on the space’s cool-down/dehumidification temperature setpoint, current space temperature, current outdoor air temperature, current AHU discharge air temperature setpoint, and the space’s cooling capacity factor. The BAS shall have an algorithm to self-tune the cooling capacity factor for each space. Provide a software switch on the BAS graphics that enables the operator to turn on or off the self-tuning algorithm, such that self-tuning can be stopped after the system has been trained. The BAS shall inhibit input to the self-tuning algorithm during override periods to prevent distortion of the cooling capacity factors.

d. Each VAV box shall be assigned a Cool-Down/Dehumidification Mode Minimum CFM Setpoint, equal to 10% of maximum design CFM (adjustable) and assigned a Cool-Down/Dehumidification Mode Maximum CFM Setpoint, equal to 75% of maximum design CFM (adjustable). If cooling source is a condensing unit, verify the minimum CFM setpoint is adjusted to exceed the manufacturer's guidelines.

e. The "Cool-Down/Dehumidification Cycle" (see below) shall start simultaneously for each VAV box based on the calculated Space Cool-Down/Dehumidification Time Requirement, but no earlier than 2 hours (adjustable) before the start of the scheduled occupied period, and shall end at the scheduled occupancy time. A failure to achieve the space's cool-down/dehumidification temperature setpoint at the scheduled occupancy time shall be used as an input to the space's cooling capacity factor self-tuning algorithm.

f. Cool-Down/Dehumidification Cycle:

1) The radiation valve(s) (if applicable) associated with the VAV box shall be closed.

2) The VAV box airflow damper shall modulate to the cool-down/dehumidification mode maximum CFM setpoint.

3) The VAV box control module shall broadcast a "cooling request" signal to the respective AHU that initiates "AHU Morning Cool-Down/Dehumidification Mode". See control sequence under Variable Air Volume Air Handling Units.

4) As the space temperature approaches the cool-down/dehumidification temperature setpoint the airflow damper shall modulate towards the Cool-Down/Dehumidification Mode Minimum CFM Setpoint.

g. If the VAV box airflow damper is at Cool-Down/Dehumidification Mode Minimum CFM Setpoint and the space temperature is below the occupied cooling setpoint and:

1) The "heating available" signal has been broadcast over the network by the central heating plant control module, then the VAV reheat coil valve shall modulate to maintain space temperature.

2) The "heating available" signal has <u>not</u> been broadcast over the network by the central heating plant control module, then a "heating request" shall be transmitted over the network to the respective air-handling unit. This message shall reset the AHU discharge air temperature setpoint as described under the "AHU Morning Cool-Down/Dehumidification Mode" sequence.

3. Occupied Mode

a. Cooling

1) The VAV boxes shall be indexed to occupied mode by the BAS.

2) The maximum/minimum CFM flow rates shall be software adjustable.

3) The space temperature setpoint shall be definable in the software.

4) As the space temperature rises above cooling setpoint, the VAV box damper shall be modulated from minimum towards open position.

5) When the VAV box is in full cooling and the space is still calling for cooling, a "cooling request" shall be transmitted over the network to the respective air-handling unit. This message shall reset the discharge air temperature as described under the air handling unit control sequence.

6) When the space is satisfied and calling for less cooling, the VAV box damper shall modulate towards minimum position.

7) When the VAV box damper is in minimum cooling and the space is still calling for less cooling, a "heating request" shall be transmitted over the network to the respective air-handling unit. This message shall reset the discharge air temperature as described under the air handling unit control sequence.

b. Heating

1) Radiation (if applicable) shall be first stage of heat, prior to modulating the reheat valve open. Refer to radiation control sequence.

2) The VAV boxes shall remain in cooling mode unless the "heating available" signal has been broadcast over the network by the central plant control module. VAV boxes shall then be indexed to the heating mode by the BAS.

3) The reheat coil valve shall be modulated to maintain a discharge air temperature between a minimum temperature initially set for 50.0 Deg F (adjustable) and a maximum temperature initially set for 115 Deg F (adjustable).

4) As the space temperature drops below heating setpoint, the reheat coil valve shall modulate towards open position and the VAV box airflow control shall modulate open.

5) When the VAV box is in full heating and the space is still calling for heating, a "heating request" shall be transmitted over the network to the respective air-handling unit. This message shall reset the discharge air temperature as described under the air handling unit control sequence.

6) When the VAV box is in minimum heating and the space is still calling for cooling, the VAV box damper shall be modulated towards open position.

7) On a further call for cooling, a "cooling request" shall be transmitted over the network to the respective air-handling unit. This message shall reset the discharge air temperature as described under the air handling unit control sequence.

c. Minimum damper position reset

1) If the total CFM of all VAV boxes is less than the AHU minimum outside air CFM setpoint, increase the minimum CFM setpoint of all VAV boxes proportionally to equal the AHU minimum outside CFM setpoint. The intent is to prevent the VAV dampers from reducing the AHU outside air CFM below the minimum setpoint.

d. Standby Mode

1) The VAV box shall initiate standby mode when all spaces served by the VAV are unoccupied for a period of more than 15 minutes (adjustable) as determined by the occupancy sensors. Standby mode shall be terminated when any of the spaces served by the VAV becomes occupied as determined by the occupancy sensor.

2) Reset VAV airflow setpoint. VAV damper shall modulate to 10% (adjustable) of maximum design CFM.

3) Reset space temperature setpoint. Offset temperature from normal setpoints as follows (all variables adjustable):

i. Cooling +5°F.
ii. Heating -5°F.

4. Unoccupied Mode

a. Cooling

1) The VAV boxes are indexed to unoccupied mode by the BAS.

2) The VAV box reheat coil valves are closed.

3) The VAV boxes shall operate as described in "Morning Cool-Down/Dehumidification Mode" (see above).

4) The "cooling requests" from various zones are ignored by the system and no action is taken.

b. Heating

1) Where finned tube radiation is installed, it shall be the first stage of heat. The finned element control valve shall modulate open to maintain an unoccupied temperature setpoint initially set for 55.0 Deg F. Refer to the radiation control sequence.

2) When the radiation control valve is in the full open position and the space temperature drops below heating setpoint plus a 3 Deg F differential, then a heating request shall be sent to the associated air handling unit.

3) The coil control valve shall be closed unless the associated air handling system is in operation and a "heating available" signal has been broadcast over the network by the central plant control module. On a call for heating from the space temperature sensor, the heating valve shall modulate open to maintain the unoccupied temperature setpoint.

4) When the number of heating requests exceeds an operator definable number, the air handling unit shall start with the outside air and relief air dampers fully closed, return air dampers fully open, and the heating coil valve closed.

5) The VAV boxes shall operate as described in "Morning Warm-up Mode" (see above).

6) When the heating requests are satisfied, the air-handling unit shall be turned off.

5. Dehumidification Mode

a. Where noted in the associated air handling unit control sequence, provide a dehumidification mode of operation. When the unit initiates a dehumidification mode, the VAV air valve shall move to the dehumidification airflow setpoint initially set for 50% of the maximum airflow. The heating control valve shall modulate open as required to maintain the space temperature setpoint.

C. Alarms

1. Generate an alarm when the space temperature is 5°F above the occupied/unoccupied cooling temperature setpoint.

2. Generate an alarm when the space temperature is 5°F below the occupied/unoccupied heating temperature setpoint.

D. Point Schedule

Provide at a minimum the following control points for each system and as required to accomplish the control sequences indicated.

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Occupancy Schedule								x	x		x
Local Occupancy Sensor			x						x		x
Warm-Up/Cool-Down Mode Tuning On/Off						x			x		x
VAV Supply Air Setpoint (Clg., Min.)					x				x		x
VAV Supply Air Setpoint (Clg., Max.)					x				x		x
VAV Supply Air Setpoint (Htg., Min.)					x				x		x
VAV Supply Air Setpoint (Htg., Max.)					x				x		x
VAV Supply Air CFM	x								x		x
VAV Damper Modulation		x							x		x
VAV Damper Position	x								x		x
Space Temp. Setpoint Adjust (Local)	x								x		x
Space Temperature Setpoint					x				x		x
Space Temperature	x								x		x
Space RH	x								x		x
Space CO2	x								x		x
VAV Leaving Air Temperature	x								x		x
Htg. Control Valve Modulation (Perimeter FTR)		x							x		x
Htg. Control Valve Modulation (VAV Reheat)		x							x		x
High Space Temperature									x	x	x
Low Space Temperature									x	x	x
Totals	**7**	**3**	**1**	**0**	**5**	**1**	**0**	**1**	**20**	**2**	**20**

Total Hardware (11) **Total Software (29)**

3.04 CONTROL SEQUENCE AND POINTS SCHEDULE
FOR: Exhaust Fans – Scheduled On/Off

A. General

1. Exhaust fans as indicated on the drawings and unless indicated to be controlled by another method, shall be controlled on/off by a time of day schedule through the BAS system.

Fan Number	Serves	Associated AHU System
EF-1	Storm Shelter Locker Room and Bathrooms	AHU-1
EF-2	Wellness, Bathrooms, Janitor, Breakroom	AHU-1
EF-3	Bathrooms, Janitor, Copy Area, Coffee Area	AHU-3
EF-4	Bathrooms, Copy Area, Coffee Area	AHU-3

2. Each fan shall be capable of being individually controlled. The final time of day schedules and how systems may be grouped together shall be reviewed and approved by the Owner prior to occupancy.

3. 480/3 volt exhaust fans are furnished with magnetic contactors or motor starter/switches by Division 26. Division 23 to provide all required control relays for all exhaust fans. Coordinate an accessible relay location for installation by Division 26.

4. Provide motorized dampers and 2-position electric actuators where noted on the drawings. Coordinate connection requirements to each fan with the fan manufacturer. Provide the damper actuator with a compatible voltage, damper end switch, and control transformer where necessary. Damper installation by another DIV 23 section.

5. Provide and wire all electrical interlocks to other equipment associated with this system, as indicated or otherwise necessary for proper system operation.

B. Control Sequence

1. Occupied Control

   a. Enable each exhaust fan to run continuously.

   b. For exhaust fans provided with motorized dampers, the damper shall prove fully open prior to enabling the exhaust fan.

   c. For exhaust fans serving areas where hazardous or fume producing materials are stored (i.e. chemical storage rooms) shall be initially scheduled to run continuously.

2. Unoccupied Control

   a. Disable each exhaust fan off.

   b. For exhaust fans with motorized dampers, fully close the damper when the fan is disabled.

C. Alarms

1. Generate an alarm if the fan is enabled and its status is off.

D. Points Schedule

Provide at a minimum the following control points for each system and as required to accomplish the control sequences indicated.

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Occupancy Schedule								x	x		x
Exhaust Fan Start/Stop				x					x		x
Exhaust Fan Status			x						x	x	x
Motorized Damper Modulation				x					x		x
Motorized Damper End Switch			x						x		x
Totals	**0**	**0**	**2**	**2**	**0**	**0**	**0**	**1**	**5**	**1**	**5**

Total Hardware (4) **Total Software (7)**

3.05 CONTROL SEQUENCE AND POINTS SCHEDULE
FOR: Cabinet Unit Heaters

A. General

1. Provide a space temperature sensor and control sequence for each cabinet unit heater.

2. Provide 2-way modulating heating control valves and actuators. Installation is work of another Division 23 Section.

3. Provide and wire a surface mounted aquastat. Coordinate installation with the Division 26 contractor.

4. The unit heaters shall be indexed between its occupied and unoccupied modes by a timeclock schedule through the BAS system.

B. Control Sequence

1. Occupied Mode

a. The heating coil valve shall modulate open to maintain a space temperature setpoint initially set for 68.0 Deg F (adjustable).

b. An aquastat mounted on the return hot water line shall de-energize fan motor when fluid temperature falls below setpoint of aquastat (adjustable). The aquastat shall be enable/disabled via a control relay based on the space temperature call for heat shall such that the unit heater fan will run only if there is a call for heat and there is hot water available in the system.

c. To comply with the Energy Code, the space temperature setpoint for unit heaters serving vestibules shall be set for 60.0 Deg F and the control valve shall be fully closed and the operation locked out when the outside air temperature is greater than 45.0 Deg F.

2. Unoccupied Mode

a. The heating coil valve shall modulate open to maintain a unoccupied space temperature setpoint initially set for 50.0 Deg F (adjustable).

b. An aquastat mounted on the return hot water line shall de-energize fan motor when fluid temperature falls below setpoint of aquastat (adjustable). The aquastat shall be enable/disabled via a control relay based on the space temperature call for heat shall such that the unit heater fan will run only if there is a call for heat and there is hot water available in the system.

c. To comply with the Energy Code, the control valve shall be fully closed and the operation locked out when the outside air temperature is greater than 45.0 Deg F.

C. Alarms

1. Generate an alarm when space temperature drops 5°F below setpoint for 5-minute duration in heating mode.

D. Points Schedule

Provide at a minimum the following control points for each system and as required to accomplish the control sequences indicated.

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Occupancy Schedule								x	x		x
Occ. Space Temperature Setpoint					x				x		x
Unocc. Space Temperature Setpoint					x				x		x
Space Temperature	x								x	x	x
Htg. Control Valve Modulation		x							x		x
Aquastat Setpoint					x				x		x
CUH Fan Start/Stop				x					x		x
CUH Fan Status			x						x	x	x
Totals	**1**	**1**	**1**	**1**	**3**	**0**	**0**	**1**	**8**	**1**	**8**

Total Hardware (4) **Total Software (13)**

3.06 CONTROL SEQUENCE AND POINTS SCHEDULE
FOR: Horizontal Unit Heaters

A. General

1. Provide a space temperature sensor and control sequence for each horizontal unit heater.

2. Provide 2-way modulating heating control valves and actuators. Installation is work of another Division 23 Section.

3. Provide and wire a surface mounted aquastat. Coordinate installation with the Division 26 contractor.

4. The unit heaters shall be indexed between its occupied and unoccupied modes by a timeclock schedule through the BAS system.

B. Control Sequence

1. Occupied Mode

a. On a call for heat from a space temperature sensor, the heating valve shall modulate open, to maintain a temperature setpoint of 70.0 degrees.

b. An aquastat mounted on the return hot water line shall de-energize fan motor when fluid temperature falls below setpoint of aquastat (adjustable). The aquastat shall be enable/disabled via a control relay based on the space temperature call for heat shall such that the unit heater fan will run only if there is a call for heat and there is hot water available in the system.

2. Unoccupied Mode

a. On a call for heat from a space temperature sensor, the heating valve shall modulate open to maintain a temperature setpoint of 55.0 degrees.

b. An aquastat mounted on the return hot water line shall de-energize fan motor when fluid temperature falls below setpoint of aquastat (adjustable). The aquastat shall be enable/disabled via a control relay based on the space temperature call for heat shall such that the unit heater fan will run only if there is a call for heat and there is hot water available in the system.

C. Alarms

1. Generate an alarm when the space temperature drops 5°F below setpoint for a 5-minute duration.

D. Point Schedule

Provide at a minimum the following control points for each system and as required to accomplish the control sequences indicated.

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Occupancy Schedule								x	x		x
Occ. Space Temperature Setpoint					x				x		x
Unocc. Space Temperature Setpoint					x				x		x
Space Temperature	x								x	x	x
Htg. Control Valve Modulation		x							x		x
Aquastat Setpoint					x				x		x
UH Fan Start/Stop				x					x		x
UH Fan Status			x						x	x	x
Totals	**1**	**1**	**1**	**1**	**3**	**0**	**0**	**1**	**8**	**1**	**8**

Total Hardware (4) **Total Software (13)**

3.07 CONTROL SEQUENCE AND POINTS SCHEDULE
FOR: Finned Tube Radiation

A. General

1. Provide a space temperature sensor and control sequence for each heating terminal device. Refer to the drawings for system configuration and additional information regarding temperature control zones.

2. Provide 2-way modulating heating control valves and actuators. Installation is work of another Division 23 section.

3. The system shall be indexed between their occupied and unoccupied modes by a timeclock schedule through the BAS system.

B. Control Sequence

1. Occupied Mode

a. On a call for heating, the radiation valves shall open 25% (operator adjustable) before the heating coil valve associated with the ar handling unit heating zone begins to modulate. On a continued call for heat, the reheat valve shall modulate in unison with the radiation valve to maintain a temperature setpoint of 72.0 degrees.

2. Unoccupied Mode

a. On a call for heating from the space temperature sensor, the heating valve shall modulate open to maintain a space temperature setpoint of 55.0 degrees.

b. For areas also served by air handling systems, the finned tube radiation valve shall be fully open prior to the air handling unit heating zone sending a request for heating.

C. Alarms

1. Generate an alarm when the space temperature drops 5°F below setpoint for a 5-minute duration in the heating mode.

D. Point Schedule

Provide at a minimum the following control points for each system and as required to accomplish the control sequences indicated.

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Occupancy Schedule								x	x		x
Occ. Space Temperature Setpoint					x				x		x
Unocc. Space Temperature Setpoint					x				x		x
Space Temperature	x								x	x	x
Htg. Control Valve Modulation		x							x		x
Totals	**1**	**1**	**0**	**0**	**2**	**0**	**0**	**1**	**5**	**1**	**5**

Total Hardware (2) **Total Software (9)**

3.08 CONTROL SEQUENCE AND POINTS SCHEDULE
FOR: Computer Room Air Conditioning Units

A. General

1. The computer room units CRU-1 & CRU-2 are factory packaged vertical down flow computer room units with chilled water and DX cooling coils, remote condensing units, humidification systems, and electric reheat. The units are provided with factory packaged internal controls. Coordinate with equipment manufacturer for BACnet 135-2004 open protocol interface. Refer to Specification Section 23 81 23.

2. Install area leak detection system provided by the computer room unit manufacturer. Coordinate with manufacturer for requirements.

3. Provide field installation and wiring for all remote mounted field installed control components including, but not limited to, space temperature sensor and space humidity sensor. Coordinate with manufacturer for all component installation requirements.

4. Provide all wiring between units as required to link factory on-board controls from each unit. Coordinate with unit manufacturer for requirements. Provide two Ethernet cables from each unit to a remote switch provided by the unit manufacturer.

5. Coordinate with the transfer switch manufacturer to receive a signal when the generator is started. Refer to electrical drawings for transfer switch location.

6. Provide motorized dampers MD-2 and MD-3 with electric actuators and end switches in the return duct for each unit. Installation by the mechanical contractor.

7. Monitor the smoke alarm status of each room. Wire to the clean agent fire suppression control panel for each room and connect as required.

B. Control Sequence

1. The unit shall operate on its own internal controls. Provide the following control functions for each system through the Building Automation System.

   a. Space temperature setpoint.
   b. Space humidity setpoint.
   c. Humidifier enable/disable.
   d. System enable/disable.
   e. Reheat/humidifier lockout.

2. The computer room units shall be staged on and off through the on-board controls supplied with the Computer Room units.

3. When a unit is enabled, the damper in the return duct shall prove open prior to allowing the unit to start.

4. The chilled water coil shall be the primary cooling source. The DX cooling shall be the secondary cooling and shall be staged on/off through the factory on-board controls.

5. Upon the signal through the automatic transfer switch for the generator to start, the unit electric reheat and humidifier operation shall be locked out.

C. Alarms

Provide alarm notifications through the BACnet 135-2004 open protocol interface for all critical alarms including, but not limited to, the following:

1. High temperature
2. Low temperature
3. High humidity
4. Low humidity
5. Humidifier fault
6. Main fan fault
7. Filter change required
8. Loss of airflow
9. Loss of power
10. Leak detected
11. Compressor-1 Faults
12. Compressor-2 Faults

D. Point Schedule

Provide at a minimum the following control points for each system and as required to accomplish the control sequences.

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Space Temperature Setpoint					x				x		x
Space Temperature	x								x	x	x
Space Humidity Setpoint					x				x		x
Space Humidity	x								x	x	x
Humidifier Start/Stop				x					x		x
Electric Reheat Start/Stop				x					x		x
CRAC Unit Start/Stop				x					x		x
Emergency Power Active			x						x	x	x
Motorized Damper Control (Each damper)				x					x		x
Motorized Damper End Switch (Each Damper End Switch)			x						x		x
Condenser Status (Each Condenser)			x						x	x	x
Clean Agent Smoke Alarm (Each Alarm)			x						x	x	x
Humidifier Fault (Unit Alarm)			x						x	x	x
CRAC Fan Fault (Unit Alarm)			x						x	x	x
Filter Alarm (Unit Alarm)			x						x	x	x
Loss of Airflow Alarm (Unit Alarm)			x						x	x	x
Loss of Power Alarm (Unit Alarm)			x						x	x	x
Leak Detection Alarm (Unit Alarm)			x						x	x	x
Compressor Fault (Each Compressor) (Unit Alarm)			x						x	x	x
Totals	**2**	**0**	**11**	**4**	**2**	**0**	**0**	**0**	**19**	**12**	**19**

Total Hardware (17) **Total Software (33)**

3.09 CONTROL SEQUENCE AND POINTS SCHEDULE
FOR: Central Heat Pump System and Backup Boiler

A. General

1. The central heat pump is factory packaged with multiple heat pump modules with integral flow control valves between modules. The central heat pump is provided with factory mounted and wired controls and control components. The factory provided controller is capable of open protocol communications through the BACnet ANSI/ASHRAE communication standard 135-2004. Integrate the heat pump into the Building Automation System. Refer to specification section 23 81 23.

2. Flow switches are factory provided in each heat pump module. No BAS work is required.

3. Provide and wire differential pressure sensors on the hot water and chilled water distribution system across the remote piping mains. Coordinate requirements with other Division 23 sections. Provide modulating end of loop bypass valves. Control to maintain end of loop differential setpoint.

4. Coordinate with the boiler manufacturer to provide the following control functions through the Building Automation System: enable/disable, and general fault alarm.

5. Provide and wire differential pressure sensors on the hot water, chilled water and geothermal water systems next to the heat pump in the boiler room. Control pump VFD to maintain differential setpoint as recommended by heat pump manufacturer. Provide two position bypass valves at heat pump inlets. Fully open bypass valve when all internal heat pump module valves are closed and flow will be reduced to zero. Coordinate signal with heat pump. Fully open valve within 20 seconds. Fully close valve when internal valves re-open.

6. Boiler isolation control valves and electric actuators are provided by boiler manufacturer and installed by another Division 23 section.

B. Control Sequence

1. Heat Pump Control:

   a. The central plant system shall be enabled manually through the BAS graphics or by the BAS through a user defined time clock schedule. The central plant shall broadcast an enable signal across the network.

   b. When the plant is enabled, the wellfield circulating pump P-1 or P-2 shall operate continuously. Wellfield Pumps P-1 and P-2 are 100% redundant and shall operate on a lead/lag basis. When the lead pump is indicated to run but its status is off, the lag pump shall start. The lead pump designation shall alternate on a user defined time clock schedule initially set for one week.

   c. Pump P-1 and P-2 shall each be controlled through their variable speed drives to maintain the loop field supply water setpoint. The supply water setpoint shall be reset between a user defined maximum and minimum setpoint based upon heat pump cooling and heating demand. Pumps speed shall be overridden to maintain differential pressure setpoint across the geothermal supply and return mains at the heat pump. Coordinate pressure setpoint with the heat pump manufacturer.

   d. When the plant is enabled, the cooling water circulating pump P-3 or P-4 shall operate continuously. Cooling Pumps P-3 and P4 are 100% redundant and shall operate on a lead/lag basis. When the lead pump is indicated to run but its status is off, the lag pump shall start. The lead pump designation shall alternate on a user defined time clock schedule initially set for one week.

   e. Pumps P-3 and P-4 shall each be controlled through their variable speed drives to maintain differential pressure setpoint in the cooling system ***out in the building.*** ~~**at the heat pump.**~~

   f. When the plant is enabled, the heating water circulating pump P-5 or P-6 shall operate continuously. Heating Pumps P-5 and P-6 are 100% redundant and shall operate on a lead/lag basis. When the lead pump is indicated to run but its status is off, the lag pump shall start. The lead pump designation shall alternate on a user defined time clock schedule initially set for one week.

g. Pumps P-5 and P-6 shall each be controlled through their variable speed drives to maintain differential pressure setpoint in the cooling heating system ***out in the building.*** ~~**at the heat pump.**~~

h. The heat pump shall operate on their own internal controls to maintain the heating water temperature setpoint. The heating water setpoint shall be reset linearly based on a user adjustable reset schedule as follows: 125° F at 20° F outside air temperature or less, and 85° F at 60° F outside air temperature or greater.

i. The heat pump shall operate on their own internal controls to maintain the chilled water temperature setpoint of 42 degrees (adjustable).

j. Modulate end of loop heating bypass valve to maintain ***the heat pump*** ~~**end of loop**~~ differential pressure setpoint.

k. Modulate end of loop cooling bypass valve to maintain ***the heat pump*** ~~**end of loop**~~ differential pressure setpoint.

2. Boiler Control:

a. Boiler B-1 shall be enabled when the heat pump is off. The boiler will operate on its own internal controls. Turn off the boiler when the above conditions are no longer valid.

b. The boiler isolation valves are controlled through the boiler control panel to open when each boiler is enabled. Refer to the Electric Boiler specification section for additional information. Monitor the position of the boiler isolation valves. The valve shall be open prior to starting pumps

c. The boilers shall operate on their internal burner firing controls. Boilers will stage on/off and modulate firing rates through Boiler Management System to optimize plant efficiency. The boiler supply water temperature setpoint for the high efficiency boilers shall be reset as follows (adjustable).

HW Supply Temperature	Outside Air Temperature
125 °F	10°F and below
95°F	60°F and above

d. Boiler primary heating water pump P-7 shall be enabled and disabled via the Boiler Management System such that the primary pump runs when its respective boiler runs. Utilize VFD for soft start and balancing.

C. Safeties

1. The heat pump flow switch shall be wired directly to the heat pump control panel circuit as and operational safety; coordinate installation methods with heat pump manufacturer.

D. Alarms

1. Generate an alarm when the heat pump is indicated to run but its status is off.

2. Generate an alarm when any of the heat pump parameters are outside of the manufacturer's recommended limits.

3. Generate an alarm when the boiler is indicated to run but is in fault.

4. Generate an alarm when any of the pumps are indicated to run but its status is off.

5. Generate an alarm when the well field supply temperature is ± 3° F off setpoint for a period greater than 30 minutes.

6. Generate an alarm when the heating supply loop is ± 5° F off setpoint for a period greater than 30 minutes.

7. Generate an alarm when the chilled supply loop is ± 5° F off setpoint for a period greater than 30 minutes.

E. Point Schedule

Provide at a minimum the following control points for each system and as required to accomplish the control sequences indicated.

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Occupancy Schedule								x	x		x
Outside Air Temperature	x								x		x
Heat Pump System Start/Stop				x					x		x
Heat Pump System General Alarm			x						x	x	x
Heat Pump System Clg. Load Limit					x				x		x
Heat Pump System Htg. Load Limit					x				x		x
Heat Pump System Clg. Load Reset					x				x		x
Heat Pump System Htg. Load Reset					x				x		x
Heat Pump System Stages			x						x		x
Pump P-1 Start/Stop				x					x		x
Pump P-1 Status			x						x	x	x
Pump P-1 VFD Modulation		x							x		x
Pump P-1 VFD Speed	x								x		x
Pump P-1 VFD Fault			x						x	x	x
Pump P-2 Start/Stop				x					x		x
Pump P-2 Status			x						x	x	x
Pump P-2 VFD Modulation		x							x		x
Pump P-2 VFD Speed	x								x		x
Pump P-2 VFD Fault			x						x	x	x
Pump P-3 Start/Stop				x					x		x
Pump P-3 Status			x						x	x	x
Pump P-3 VFD Modulation		x							x		x
Pump P-3 VFD Speed	x								x		x
Pump P-3 VFD Fault			x						x	x	x
Pump P-4 Start/Stop				x					x		x
Pump P-4 Status			x						x	x	x
Pump P-4 VFD Modulation		x							x		x
Pump P-4 VFD Speed	x								x		x
Pump P-4 VFD Fault			x						x	x	x
Pump P-5 Start/Stop				x					x		x
Pump P-5 Status			x						x	x	x
Pump P-5 VFD Modulation		x							x		x
Pump P-5 VFD Speed	x								x		x
Pump P-5 VFD Fault			x						x	x	x
Pump P-6 Start/Stop				x					x		x
Pump P-6 Status			x						x	x	x

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Occupancy Schedule								x	x		x
Outside Air Temperature	x								x		x
Heat Pump System Start/Stop				x					x		x
Heat Pump System General Alarm			x						x	x	x
Pump P-6 VFD Modulation		x							x		x
Pump P-6 VFD Speed	x								x		x
Pump P-6 VFD Fault			x						x	x	x
Pump P-7 Start/Stop				x					x		x
Pump P-7 Status			x						x	x	x
Pump P-7 VFD Modulation		x							x		x
Pump P-7 VFD Speed	x								x		x
Pump P-7 VFD Fault			x						x	x	x
Boiler B-1 Start/Stop				x					x		x
Boiler B-1 Fault			x						x	x	x
Boiler B-1 Supply Water Temp. Setpoint					x				x		x
Boiler B-1 Supply Water Temp.	x								x		x
Boiler B-1 Return Water Temp.	x								x		x
Boiler B-1 Mot. Valve Control				x					x		x
Geo. Well Supply Water Temp.	x								x		x
Geo. Well Return Water Temp.	x								x		x
Geo. Well Water Flow Setpoint (Each Stage)					x				x		x
Geo. Well Water Flow	x								x		x
Geo. Well Water Diff. Press. Setpoint (At Heat Pump)					x				x		x
Geo. Well Water Diff. Press. (At Heat Pump)	x								x		x
Geo. Well Ret. Water Below 35°F (30-min. Duration)									x	x	x
Geo. Well Ret. Water Above 85°F (30-min. Duration)									x	x	x
Chilled Supply Water Temp. Setpoint					x				x		x
Chilled Supply Water Temp.	x								x		x
Chilled Return Water Temp.	x								x		x
Chilled Water Flow Setpoint (Each Stage)					x				x		x
Chilled Water Flow	x								x		x
Chilled Water Diff. Press. Setpoint (At Heat Pump)					x				x		x
Chilled Water Diff. Press. (At Heat Pump)	x								x		x

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Occupancy Schedule								x	x		x
Outside Air Temperature	x								x		x
Heat Pump System Start/Stop				x					x		x
Heat Pump System General Alarm			x						x	x	x
Chilled Water Diff. Press. Setpoint (At End of Loop)					x				x		x
Chilled Water Diff. Press. (At End of Loop)	x								x		x
Chilled Supply Water 5°F Above Setpoint (30-min. Duration)									x	x	x
Chilled Supply Water 5°F Below Setpoint (30-min. Duration)									x	x	x
Heating Supply Water Temp. Setpoint (After HP, After Boiler)					x				x		x
Heating Supply Water Temp.	x								x		x
Heating Return Water Temp.	x								x		x
Heating Water Flow Setpoint (Each Stage)					x				x		x
Heating Water Flow	x								x		x
Heating Water Diff. Press. Setpoint (At Heat Pump)					x				x		x
Heating Water Diff. Press. (At Heat Pump)	x								x		x
Heating Water Diff. Press. Setpoint (At End of Loop)					x				x		x
Heating Water Diff. Press. (At End of Loop)	x								x		x
Heating Supply Water 5°F Above Setpoint (30-min. Duration)									x	x	x
Heating Supply Water 5°F Below Setpoint (30-min. Duration)									x	x	x
Geo. Well Water Bypass Valve Control (At Heat Pump)				x					x		x
Chilled Water Bypass Valve Control (At Heat Pump)				x					x		x
Heating Water Bypass Valve Control (At Heat Pump)				x					x		x
Chilled Water Bypass Valve Modulation (At End of Loop)		x							x		x
Heating Water Bypass Valve Modulation (At End of Loop)		x							x		x
Totals	**24**	**9**	**17**	**13**	**15**	**0**	**0**	**1**	**85**	**22**	**85**

Total Hardware (63) **Total Software (136)**

3.10 SEQUENCE OF OPERATION AND POINTS SCHEDULES
FOR: Domestic Water Heating Systems

A. General

1. The following types of water heater control sequences are described in this section:

Edit the following for each system and the features of each system intended to be covered by the sequence.

a. Location: Mechanical Room
Water Heater WH-1, 2
Recirculation Pumps P-7

2. Three phase motors are furnished with magnetic contactors or motor starter/switches by Division 26. Provide all required control relays necessary for operation. Coordinate relay installation with the Division 26 contractor to be in an accessible relay location.

3. Provide a temperature sensor located at the water heater outlet and at each associated mixing valve. Installation is work of the Division 22 section. Coordinate installation as required. Coordinate system temperature settings for each sensor location with the Owner's representative.

B. Control Sequence

1. Occupied

a. The domestic water heaters shall operate continuously on their own internal controls.

b. Domestic water circulating pump(s) shall be enabled.

2. Unoccupied

a. The domestic water heaters shall operate continuously on their own internal controls.

b. The domestic water circulating pump(s) shall be disabled.

C. Alarms

1. Generate an alarm when any pump is controlled on but the status is off.

2. Generate an alarm when the water heater supply temperature is 5 Deg F above or below setpoint for a time period greater than 30 minutes.

3. Generate an alarm when any mixing valve supply temperature is 5 Deg F above or below setpoint for a time period greater than 30 minutes.

D. Points Schedule

Provide at a minimum the following control points for each system and as required to accomplish the control sequences indicated.

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Occupancy Schedule								x	x		x
Dom. Hot Water Temperature (At Water Heater)	x								x		x
Dom. Hot Water Temperature (After Mixing Valve)	x								x		x
Dom. Circ. Hot Water Temperature	x								x		x
Circ. Pump Start/Stop				x					x		x
Circ. Pump Status			x						x	x	x
Totals	**3**	**0**	**1**	**1**	**0**	**0**	**0**	**1**	**6**	**1**	**6**

Total Hardware (5) **Total Software (8)**

3.11 CONTROL SEQUENCE AND POINTS SCHEDULE
FOR: Storm Shelter Natural Ventilation

A. General

1. Provide motorized damper MD-1 at the storm shelter natural ventilation relief louver, installation by another Div. 23 contractor. Dampers shall be ultra low-leakage AMCA Class 1.

2. Provide and install 120V actuator for motorized damper MD-1. Electrical connection to actuator by Div. 26 contractor, connected to UPS/inverter.

3. Provide 120V pushbutton switch within Roll Call Room 01315 where indicated on the drawings at 4'-0" AFF to function as an emergency natural ventilation activation device. Provide a fully recessed wall box enclosure with protective cover for pushbutton. Label with red plastic laminate sign with white lettering "Emergency Natural Ventilation Mode". Electrical connection to push button by Div. 26 contractor, connected to UPS/inverter.

4. Coordinate requirements between 120V damper actuator and pushbutton with Div. 26 contractor.

B. Control Sequence

1. Normal Mode:

a. Motorized damper MD-1 shall be closed.

b. All other ventilation equipment serving the storm shelter shall operate as normal.

2. Natural Ventilation Storm Mode:

a. Upon activation of the emergency storm mode natural ventilation pushbutton, motorized damper MD-1 shall open.

b. Upon activation of the pushbutton a second time, motorized damper MD-1 shall be closed.

C. Alarms

1. Generate an alarm when the pushbutton is activated to initiate storm mode.

D. Points Schedule

Provide at a minimum the following control points for each system and as required to accomplish the control sequences indicated.

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Storm Mode			x						x	x	x
Motorized Damper Control				x					x		x
Motorized Damper End Switch			x						x	x	x
Totals	**0**	**0**	**2**	**1**	**0**	**0**	**0**	**0**	**3**	**2**	**3**

Total Hardware (3) **Total Software (5)**

3.12 CONTROL SEQUENCE AND POINT SCHEDULE
FOR: Emergency Power Monitoring

A. General

1. Provide run status and fault alarm on each emergency generator and status of each emergency generator transfer switch. Refer to the electrical drawings quantities and locations. Coordinate with the equipment manufacturer and Division 26 contractor for connection requirements. Provide additional equipment and components, as may be necessary to complete the connections.

B. Alarms

1. Generate an alarm when the generator has a fault alarm.

C. Point Schedule

Provide at a minimum the following control points for each system and as required to accomplish the control sequences indicated.

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Generator Status (Each Generator)			x						x		x
Generator Fault (Each Generator)			x						x	x	x
Transfer Switch Status (Each Switch)			x						x		x
Totals	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**3**	**1**	**3**

Total Hardware (3) **Total Software (4)**

3.13 CONTROL SEQUENCE AND POINT SCHEDULE
FOR: Water Consumption and History

A. General

1. Refer to the full building metering plan included in the Div. 23 and Div. 26 drawings and specifications. This contractor shall provide a graphics page displaying all values indicated within the matrix. Everything shall be capable of trending to the values and times indicated.

2. The temperature control contractor shall request, and coordinate in advance, the work with the water supplier to receive a proper demand pulse/signal (3-wire pulse). Any fees or service charges for such signal shall be paid by this contractor to the utility. This contractor shall also be responsible to interface with given signal and connection to the microprocessor. Provide required meters, relays, and related wiring, equipment, and connections for a complete and fully operable system.

3. The controller shall monitor the water meter for water consumption on a continual basis. These values shall be made available to the user at all times.

4. The controller shall monitor and record the peak demand readings from the water meter. Peak readings shall be recorded on a daily, month-to-date, and year-to-date basis.

5. The controller shall monitor and record water meter readings so as to provide a water consumption history. Usage readings shall be recorded on a daily, month-to-date, and year-to-date basis.

6. Provide and wire all electrical interlocks to other equipment associated with this system, as indicated or otherwise necessary for proper operation.

B. Point Schedule

Provide at a minimum the following control points for each system and as required to accomplish the control sequences indicated. This shall include each meter on the Full Building Metering Plan.

	Hardware Points				Software Points						
Point Name (each)	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Water Demand (3-Pulse Meter Signal)	x								x		x
Peak Today					x				x		x
Peak Month-to-Date					x				x		x
Peak Year-to-Date					x				x		x
Usage Today					x				x		x
Usage Month-to-Date					x				x		x
Usage Year-to-Date					x				x		x
Meter Failure (Loss of Pulse Signal)									x	x	x
Totals	**1**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**8**	**1**	**8**

Total Hardware (1) **Total Software (15)**

3.14 CONTROL SEQUENCE AND POINT SCHEDULE
FOR: Electric Consumption and History

A. General

1. Refer to the full building metering plan included in the Div. 23 and Div. 26 drawings and specifications. This contractor shall provide a graphics page displaying all values indicated within the matrix. Everything shall be capable of trending to the values and times indicated.

2. The temperature control contractor shall request, and coordinate in advance, the work with the electric supplier to interface with given signal and connection to the microprocessor. Provide required relays, and related wiring, equipment, and connections for a complete and fully operable system. Connect to each meter provided by Div. 26 contractor. Refer to E501 and E502 for further information and quantities.

3. The controller shall monitor the electric meter for electricity consumption on a continual basis. These values shall be made available to the user at all times.

4. The controller shall monitor and record the peak demand readings from the electric meter. Peak readings shall be recorded on a daily, month-to-date, and year-to-date basis.

5. The controller shall monitor and record electric meter readings so as to provide a electricity consumption history. Usage readings shall be recorded on a daily, month-to-date, and year-to-date basis.

6. Provide and wire all electrical interlocks to other equipment associated with this system, as indicated or otherwise necessary for proper operation.

B. Point Schedule

Provide at a minimum the following control points for each system and as required to accomplish the control sequences indicated. This shall include everything on the Building Metering Plan.

	Hardware Points				Software Points						
Point Name (each)	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Electric Demand (kW) (Meter Signal)	x								x		x
Peak Today (kW)					x				x		x
Peak Month-to-Date (kW)					x				x		x
Peak Year-to-Date (kW)					x				x		x
Usage Today (kWh)					x				x		x
Usage Month-to-Date (MWh)					x				x		x
Usage Year-to-Date (MWh)					x				x		x
Meter Failure (Loss of Pulse Signal)									x	x	x
Totals	**1**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**8**	**1**	**8**

Total Hardware (1) **Total Software (15)**

3.15 CONTROL SEQUENCE AND POINTS SCHEDULE
FOR: Fan Coil Units

A. General

1. All equipment indicated shall be controlled by the same software defined occupied/unoccupied schedule through the Building Automation System.

a. Area Served: UPS Equip Room 01650C
Fan Coil Unit FC-1

b. Area Served: AV Room 01400A
Fan Coil Unit FC-2

2. Provide the chilled water valves and actuators. Refer to equipment schedules for 2 or 3 way valves. Installation is work of another Division 23 Section.

3. Provide a space temperature sensor for each fan coil unit.

4. Provide leaving air temperature sensor at each fan coil outlet. Locate sensor minimum 3'-0" downstream of coils.

5. Provide and wire static pressure safety switches.

6. Provide and wire all electrical interlocks to other equipment associated with this system, as indicated or otherwise necessary for proper system operation.

B. Control Sequence

1. Occupied Mode

a. The system shall be indexed to occupied mode by a timeclock schedule through the BAS.

b. The supply fan shall run continuously.

c. Chilled Water Coil Valve Control

1) The system shall be indexed to the mechanical cooling mode when chilled water is available and the space temperature rises above setpoint.

2) The hot water control valve shall be closed.

3) The chilled water coil valve shall modulate to maintain the space temperature setpoint.

d. Hot Water Control Valve Control

1) The system shall be indexed to the heating mode when hot water is available and the space temperature falls below its setpoint.

2) The chilled water control valve shall be closed

3) The heating coil valve shall be modulated open to maintain the space temperature setpoint.

2. Safeties

1. <u>High Discharge Air Temperature</u> - De-energize fan and transmit alarm to EMCS when the discharge air temperature exceeds 100.0 degrees.

2. <u>Low Discharge Air Temperature</u> - De-energize fan and transmit alarm to EMCS when the discharge air temperature drops below 38.0 degrees.

C. Alarms

1. Generate an alarm when the supply fan control is on but the fan status is off.

2. Generate an alarm when the space temperature is 5°F above or below the setpoint for more than a 10-minute duration (all variables operator adjustable).

D. Points Schedule

Provide at a minimum the following control points for each system and as required to accomplish the control sequences.

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Occupancy Schedule					x			x	x		x
Space Temperature	x								x	x	x
Fan Coil Fan Start/Stop				x					x		x
Fan Coil Fan Status			x						x	x	x
Fan Coil Leaving Air Temperature	x								x		x
Heating Water Valve Modulation			x						x		x
Chilled Water Valve Modulation			x						x		x
Totals	**2**	**0**	**3**	**1**	**1**	**0**	**0**	**1**	**7**	**2**	**7**
Total Hardware (6)					**Total Software (11)**						

END OF SECTION 23 09 93

SECTION 23 34 16

AIR HANDLING

PART 1: GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Centrifugal roof ventilators.
2. ***In-line centrifugal fans.***

B. Related Sections:

1. Section 25 09 23. 34.16 Integrated Automation – Stick Built Device Controls – Constant Speed Exhaust Fans (All Types). This section applies to Exhaust Fans in this Specification Section that are not controlled by VFDs.

    a. "Stick Built Device Controls" means that Division 25 shall supply and/or install controls for this device. See the above referenced Division 25 section and Responsibility Matrix for Work responsibilities.

2. Section 25 20 23.09.50 Integrated Automation – BACnet Interface Device (Gateway/Native BACnet Devices) Variable Frequency Motor Controller (All Types). This section applies to Exhaust Fans in this Specification Section that are controlled by VFDs.

3. Section 25 00 13 Integrated Automation – General Requirements – All Trades Work Responsibilities.

4. Division 25 Schedule 3 – BACnet Single Line Diagram and Responsibility Matrix (Applies to all Trades).

5. Section 25 20 23.34.16 Integrated Automation – BACnet Interface Device (Gateway/Native BACnet Devices) HVAC Fans (Air Handling) with Variable Frequency Drives (All Types).

1.02 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on sea level.

B. Operating Limits: Classify according to AMCA 99.

1.03 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

C. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Roof framing and support members relative to duct penetrations.
2. ***Ceiling suspension assembly members.***
3. ***Size and location of initial access modules for acoustical tile.***
4. ***Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.***

D. Include the BACnet Interface Device with Submittal for exhaust fans requiring variable speed motor controllers showing proprietary points listed in 25 20 23.09.50 are mapped to BACnet Object Types. Failure to do so will result in automatic rejection of the Submittal.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.06 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2: PRODUCTS

2.01 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Engineering & Mfg. Corp.
2. Aerovent; a Twin City Fan Company
3. Ammerman; General Resource Corp.
4. Captive Aire
5. Carnes Company HVAC.
6. Delhi Industries Inc.
7. Greenheck.
8. Loren Cook Company.
9. Penn Ventilation.
10. Twin City Fan and Blower Co.

B. Description: Direct driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.

C. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.

2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.

D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

E. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent. Provide on all direct drive fans and as noted on the drawings.

2. Disconnect Switch: For single phase motors, provide nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit for three phase motors, a combination starter/disconnect will be provided by Division 26.

3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.

4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

5. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Self-flashing without a cant strip, with mounting flange or built-in raised cant and mounting flange as required for roofing type.

2. Overall Height: 24 inches unless otherwise noted on plans.

3. Sound Curb: Curb with sound-absorbing insulation matrix.

4. Pitch Mounting: Manufacture curb for roof slope.

5. Metal Liner: Galvanized steel.

6. Mounting Pedestal: Galvanized steel with removable access panel.

7. Vented Curb: Unlined with louvered vents in vertical sides.

2.02 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment", including, but not limited to, efficiency ad power factor correction requirements, and 25 20 23.09.50 Variable Frequency Motor Controllers.

B. Enclosure Type: Totally enclosed, fan cooled.

C. Direct-Driven Units: Encase motor in housing outside of airstream, factory wired to disconnect switch located on outside of fan housing.

2.03 BACnet INTERFACE DEVICES

A. There is no BACnet Interface Device for the equipment specified in this Specification Section if the exhaust fan motor is not controlled by a Variable Frequency Motor Controller.

B. The controls for the devices specified in this section are "Stick Built Device Controls" that are supplied installed by Division 25 if the exhaust fan motor is not controlled by a Variable Frequency Motor Controller.

C. If the exhaust fan is controlled by a Variable Frequency Motor Controller, provide BACnet Interface Devices for each Variable Frequency Motor Controller so that the units are presented as a series of AV, BV and MSV BACnet objects. See 25 20 23.09.50 for the list of objects that must be supported. This list is the minimum acceptable.

2.04 *IN-LINE CENTRIFUGAL FANS*

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Engineering & Mfg. Corp.
2. Ammerman; General Resource Corp.
3. Captive Aire
4. Greenheck.
5. Hartzell Fan, Inc.
6. JencoFan; Div. of Breidert Air Products.
7. Loren Cook Company.
8. Penn Ventilation.
9. Twin City Fan

B. Description: In-line, direct or belt-driven centrifugal fans as indicated on the drawings, consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.

C. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

D. Direct-Driven Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent. Provide on all direct drive fans and as noted on the drawings.

2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.

3. Companion Flanges: For inlet and outlet duct connections.

4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.

5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

6. Vibration Isolators: Elastomeric hangers.

2.05 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3: EXECUTION

3.01 INSTALLATION

A. Install power ventilators level and plumb.

B. Support units using elastomeric mounts, restrained elastomeric mounts, spring isolators or restrained spring isolators having a static deflection of 1 inch.

C. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 07 and architectural details of construction for installation of roof curbs.

D. Install units with clearances for service and maintenance.

E. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

F. There is no BACnet interface for this exhaust fan if it is a constant speed device. This is a component that is instrumented by Division 25.

G. See 25 20 23.09.50 for BACnet requirements for an exhaust fan that is controlled by a Variable Frequency Motor Controller.

H. ***Support suspended units from structure using threaded steel rods and elastomeric hangers or spring hangers as specified having a static deflection of 1 inch.***

3.02 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Label fans according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.03 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.

2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.

3. Verify that cleaning and adjusting are complete.

4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.

5. Adjust damper linkages for proper damper operation.

6. Verify lubrication for bearings and other moving parts.

7. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.

8. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.

9. Shut unit down and reconnect automatic temperature-control operators.

10. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.04 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Refer to Division 23 Section "Testing, Adjusting, and Balancing " for testing, adjusting, and balancing procedures.

C. Replace fan and motor pulleys as required to achieve design airflow.

D. Lubricate bearings.

3.05 PROJECT CLOSEOUT

A. Replace fan drives and sheaves as directed by the Engineer as required for systems to perform to the intended design conditions. The Contractor's bid shall include labor and materials required to replace the quantity of drives and sheaves specified in Part 1.0 "Extra Materials".

B. Replace fan motors as directed by the Engineer as required for systems to perform to the intended design conditions. The Contractor's bid shall include all material and labor required to replace the quantity at motors, specified in Part 1.0 "Extra Materials".

3.06 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate and maintain fans. Refer to Division 01 Section "Demonstration and Training."

1. Required Time: 2 hours.

B. Refer to 25 08 00, 25 08 01 and 25 09 23.34.16 for the Stick Built controls commissioning, demonstration and training requirements for the constant speed exhaust fan equipment provided in this Specification Section.

C. Refer to 25 08 00, 25 08 01 and 25 20 23.34.16 for the networked controls commissioning, demonstration and training requirements for the equipment controlled by a Variable Speed Motor Controller provided in this Specification Section.

END OF SECTION 23 34 16

SECTION 23 73 13

CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes constant-volume and variable volume, factory fabricated, double wall, central-station air-handling units for indoor and outdoor installations.

B. Related Sections:

1. Section 25 09 23.73.13 Integrated Automation – Stick Built – UV Lamp Monitors for Central-Station Air-Handling Units (All Types).
2. Section 25 20 23.09.50 Integrated Automation – BACnet Interface Device (Gateway/Native BACnet Devices) Variable Frequency Motor Controllers (All Types).
3. Section 25 20 23.73.13 Integrated Automation – BACnet Interface Device (Gateway/Native BACnet Devices) Central-Station Air-Handling Units (All Types).
4. Section 25 20 23.84.13 Integrated Automation – BACnet Interface Device (Gateway/Native BACnet Devices) Humidifiers for Central-Station Air-Handling Units (All Types).
5. Section 25 20 23.85 Integrated Automation – BACnet Interface Device (Gateways/Native BACnet Devices) – Air Flow Measuring Stations for Central-Station Air-Handling Units (All Types).
6. Section 25 00 13 Integrated Automation – General Requirements – All Trades Work Responsibilities.
7. Division 25 Schedule 3 – BACnet Single Line Diagram and Responsibility Matrix (Applies to all Trades).

1.02 SUBMITTALS

A. Product Data: For each air-handling unit indicated.

1. Unit dimensions and weight.
2. Cabinet material, metal thickness, finishes, insulation, and accessories.
3. Fans:
   a. AMCA 210 certified fan-performance curves with system operating conditions indicated.
   b. AMCA 301 certified fan-sound power ratings at each octave band.
   c. Fan construction details and accessories.
   d. Motor ratings, electrical characteristics, and motor accessories.
4. Coils:
   a. AHRI 410 certified coil-performance ratings at the system operating conditions indicated.
   b. Support frame details to include materials of construction.
   c. Condensate drain pan and trap details to include materials of construction.
5. Dampers, including housings, linkages, and operators.
6. Air filters with performance characteristics and mounting frame details.
7. Energy recovery devices with certified performance ratings at the operating conditions specified.
8. Accessories as indicated.

B. Wiring diagrams detailing wiring for power and controls and differentiating between manufacturer-installed wiring and field-installed wiring.

C. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Mechanical-room layout and relationships between components and adjacent structural and mechanical elements.

2. Support location, type, and weight.

3. Field measurements.

D. Field quality control test reports specified in Part 3 of this Section.

E. Maintenance data for central-station air-handling units for inclusion in Operating and Maintenance Manual specified in Division 1 and Division 23 Section 23 05 00 Common Work Results for HVAC.

F. Include the BACnet Interface Device with Submittal showing proprietary points listed in 25 20 23.09.50 (VFDs), 25 20 23.73.13 (Central Station AHUs), 25 20 23.84.13 (Humidifiers for AHUs) and 25 20 23.85 (Air Flow Measuring Stations) are mapped to BACnet Object Types. Failure to do so will result in automatic rejection of the Submittal.

1.03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled by a testing agency as defined in NFPA 70 and marked for intended location and application. Electrical components shall be acceptable to authorities having jurisdiction. Unit shall carry the ETL or UL sticker and certification.

B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.

C. AMCA Compliance: Comply with AMCA Standard 210-16 “Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating”, and AMCA Standard 301-14, Methods For Calculating Fan Sound Ratings From Laboratory Test Data”

D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2016, Section 5 – “Systems and Equipment” and Section 7 – “Construction and Startup.”

E. ASHRAE 90.1-2010 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2010, Section 6 – “Heating, Ventilating, and Air Conditioning.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project site factory-assembled in the largest practical sizes (to the extent allowable by shipping limitations). Ship products with 12 mil poly shrink-wrap.

B. Store in a clean, dry place. Protect from physical damage, water and moisture penetration, corrosion and general construction dirt and debris. Use extraordinary means to assure the units are turned over to the Owner in like-new condition without damage from shipping, storing or handling. Fans shall be rotated every two weeks by Contractor to minimize damage to the fan and motor bearings.

C. Lift and support units with the manufacturer's designated lifting or supporting points.

D. Disassemble and reassemble units as required for movement into the final location following manufacturer's written instructions.

E. Deliver central-station air-handling units factory-assembled to the extent allowable by shipping limitations, with protective crating and covering.

1.05 COORDINATION

A. Coordinate sizes and location of concrete bases with actual equipment provided.

B. Coordinate size and location of structural-steel support members, if any, with actual equipment provided.

1.06 EXTRA MATERIALS

A. Provide a minimum of three sets of both pre and final filters for each unit. One set shall be installed during temporary operation. Monitor filter dust and debris build-up and replace as needed such that the total pressure drop across the filter bank does not exceed 1.0 in w.c. Install a clean set of both pre and final filters just prior to system balancing. Coordinate scheduling with the Test and Balance Contractor to ensure that new filters are installed when Test and Balance work begins. Deliver to the Owner all remaining filters. A minimum of one set of both pre and final filters shall be turned over. Obtain a receipt from the Owner that new filters have been installed and the quantity of additional filters that have been turned over.

PART 2: PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include the following:

1. Custom Air Handling Units

    a. Haakon
    b. Temptrol
    c. Scott Springfield

2.02 CUSTOM AIR HANDLING UNITS

B. Custom air handling units shall be factory engineered and assembled to comply with all requirements here-in. Units shall consist of casings, internally isolated fans, motor and drive assembly, heating and cooling coils, condensate drain pans, energy recovery wheels, access and plenum sections, filters and mounting frames, mixing dampers, airflow stations, and accessories.

1. Units shall be of the sizes, types, arrangements and capacities as indicated on the Drawings, Details, and Schedules.

2. Unit dimensions shall be as indicated on the Drawings and Details with allowances made for minor variations in manufacturing methods.

    a. Manufactured products with deviations less than plus or minus 3 inches in width or height, or 12 inches in overall length will be accepted.

    b. Manufactured products with greater deviations that plus or minus 3 inches in width or height, or 12 inches in overall length will be considered only if it can be shown installation, service and maintenance clearances are not compromised.

    c. 12 inches w.g. casing pressure or 1.5 times the peak static pressure rating of the supply fam whichever is greater.

    d. Structural Performance: Unit casings shall be self-supporting and capable of withstanding 150 percent of internal static pressures indicated, plus 30-pounds per square foot of live load on the roof without panel joints exceeding a deflection of L/240 where “L” is the unsupported span length within a completed cabinet casing

    e. See notes on the drawings for units that are required to be field assembled. Refer to part 3.0 for field assemble requirements.

C. General Fabrication Requirements for Cabinets: Formed and reinforced 2 inch double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with sealed joints between each shipping section. Units over 30,000 cfm or over 8' tall shall have 4" walls.

1. Exterior Casing Walls: 16 gauge galvannealed steel. Clench individual panels to create a clean wall panel structure. Units utilizing post and panel construction shall have thermally broken posts to minimize heat transfer. ~~**TEK screws, bolt / nut assemblies, pop rivets, and adhesives shall not be used to secure panels to any structural member.**~~

2. Interior Liner:

   a. 22 gauge stainless steel - cooling, mixing and humidifier section.

   b. 22 gauge perforated galvanized steel-supply fan discharge and return fan inlet plenums for sound control. Provide hydrophobic mineral wool insulation to maximize sound attenuation.

   c. 22 gauge thermally broken stainless steel panels in outside air sections.

   d. 22 gauge solid galvanized steel in all other areas.

3. Floor: 1/8 inch aluminum tread-plate floor shall be welded ***or secured*** to structural C-channels. Floor seams shall be continuously welded to form an integral water-tight drain pan 1.5" deep. ~~**No screws, bolts / nut assemblies, pop rivets, or adhesives shall be used to secure the floor to the structure.**~~ Floors shall not deflect more than 1/32 of an inch with a 300# live load.

4. Drain holes and or drain pans shall be located as shown on the drawings at the area downstream of the drain pan, outside air mixing section, and humidifier section

5. Base Pan Liner: 3" closed cell spray foams insulation with 18 gauge galvanized liner.

6. Unit cabinet shall be designed to withstand air pressure differentials up to 12 inches w.g. positive static pressure.

7. Air-Handling Unit Base Rail: 6 inch high structural steel C-channel designed for low deflection, and continuously welded with integral lifting lugs. Provide engineering calculations based on the design plenum pressure at the cooling coil section to assure that the condensate drain location will be of adequate height to drain the cooling coil condensate

8. Factory finish for galvannealed steel cabinets: Immediately after cleaning and pre-treating sheet metal apply Manufacturer's standard ***paint finish*** ~~**two (2) coat acrylic enamel finish consisting of prime coat and thermosetting top-coat. Custom color shall be selected by the Architect/Engineer**~~.

D. Casing Insulation and Adhesive:

1. Materials: ASTM C 1071 Type II.

2. Location and Application: Encased full thickness inches between solid inside and outside cabinet walls.

3. Acoustical Insulation at Perforated Casing Walls: Encased full thickness inches mineral wool insulation between inside and outside cabinet walls with the air-stream surface with a Tedlar temperature and moisture resistant neoprene coating.

E. Access Door Fabrication: Formed and reinforced double wall and insulated panels of the same materials and thicknesses as unit casing Access Doors:

1. Door Hinges: Stainless steel piano hinge and two (2) Ventlok #310***, or equal,*** wedge-lever-type metal latches, operable from inside or outside. Doors shall be designed to open against air pressure differential. Plastic handles are not acceptable.

2. Gasket: EPDM automotive type bulb seal applied around entire perimeter of access doors.

3. Windows: Fabricate 10" ~~**round**~~ windows in access section doors of double-glazed, safety glass with an air space between the panes and sealed with interior and exterior rubber seals. Windows in UV sections shall be designed to block 99.9% of the UV light rays.

4. Door Size: Minimum 24 inches wide x full height of unit casing up to a maximum height of 60 inches, or as indicated on the Drawings. Doors must be the same thickness as the unit casing to maximize thermal and acoustical resistance

5. Provide a fan and filter section access door wide enough to remove the motor, fan wheel, or filters but not less than 24" wide.

6. Test Ports: Provide one (1) inch diameter test ports for unit air stream testing in each access section. Test ports shall have a tube that extends between the inside and outside of the unit and a screwed cap on the exterior to allow access

F. Fan, Motor, and Drive Sections:

1. Provide direct or belt drive fans as indicated on the equipment schedules. The fan assembly shall be factory installed inside unit casings on vibration isolation springs and structural C-channel steel bases. Fans shall be selected for stable operation at both 100% of design airflow at design static pressure, and at 50% of design airflow at 25% of the design static pressure. In no case shall a fan be selected at more than 85% of peak design static pressure. In direct-drive applications the motors shall be shall be selected as close to the synchronous speed of the motor as possible. All fan wheels shall be optimized to produce the highest possible fan static efficiency.

2. Provide flexible duct connection on the inlet of each plenum fan.

3. Provide thrust restraints, OSHA approved belt guards, inlet screens, and OSHA approved fan cages. Belt guards shall be sized to allow fan and belt sheaves to be increased by two sizes.

4. Tapered roller or spherical bearings shall have an L10 life of 200,000 hours

5. Fans shall be AMCA 210/300 rated for Air and Sound Performance.

6. Motor removal I-beams: Beams shall be installed in the fan section to remove the fan motors. Trolley shall be supplied by the Owner.

7. Motors: Refer to Division 23 Section "Common Motor Requirements for HVAC Equipment" and 25 20 23.09.50 VFDs for requirements.

8. Acoustical Diffuser: Provide acoustical diffuser to attenuate the noise in the mid-octave bands and provide efficiency enhancement. Two diffuser sections mounted at the front and back of the fan impeller. Acoustic attenuating material is inserted within a solid housing and a perforated front plate that directs airflow across the diffuser reducing fan noise and increasing static efficiency.

G. Coil Section:

1. Fabricate coil sections to allow for unimpeded access for service and maintenance of coil(s).

2. Coil header and return bends shall be completely enclosed by the air-handling unit casing. Piping connections, including air vents and coil drains, shall extend to outside the casing through rubber grommet holes and escutcheons sealed with industrial silicone caulk.

3. Provide sheet metal blank-offs around coil(s) to prevent air from bypassing around them.

4. Water coils shall have 5/8" x 0.025 inch tube walls, and 0.010 inch thick aluminum fins. Provide coils with ½" x .020 inch tubes if the flow is less than 25 GPM to increase the fluid tube velocity. Manufacture shall circuit the coils to maintain a fluid tube velocity rate between 3-5 fps. Turbospirals are not allowed to artificially increase the fluid velocity rate. Cooling coils shall not be higher than 48" header height. Coil U-bends shall be full tube thickness.

5. Provide stainless steel coil casings for cooling coils and galvanized steel coil casings for heating coils to mitigate corrosion.

6. Individual Coil Racking: All cooling coil racking shall be constructed of #304 stainless steel, and heating coil racking shall be galvanized steel. All coils shall be individually racked so that if any one coil needs to be replaced the adjacent coil and piping will not be disturbed, and be available for service. Provide access panels to remove the individual coils from the side of the unit.

7. Coil Removal: Coils and coil sections shall be mounted on coil racks designed to allow the coils to be removed individually by sliding out through removable access panels in the casing wall. Racks for the cooling coils shall be stainless steel, and heating coil racks shall be galvanized. Racks that slide the coils out through access doors are not acceptable.

H. Pans:

1. Material: Continuously welded, 304 stainless steel sheet.

2. Fabricated with slope in two planes to collect condensate from cooling coils including coil piping connections, coil headers, and return bends to direct water toward drain connections.

3. Length: Extend main drain pan downstream from leaving face of coil to comply with the latest version of ASHRAE 62.1, but not less than 18".

4. Depth: 1.5 inches deep

5. Units with stacked coils shall have an intermediate stainless steel sloped drain pan and stainless steel downspout drain extension to collect condensate from the upper coils. Slope pan towards the cooling coil to minimize condensate formation on the underside of the pan. Main drain pans shall be designed so the drain pan is at least 18" from the leaving edge of the cooling coil.

6. Stainless Steel Drain Connection: Located at lowest point of drain pan and sized to prevent overflow. Terminate with threaded nipple on access door side of drain pan.

7. Manufacturer shall provide a certified drain pan trap detail for fabrication by the Contractor based on plenum design pressures in the cooling coil sections.

I. Steam Distribution Tube:

1. Provide DriSteem steam dispersion manifold with insulated #304 SS tubes rated at scheduled capacity and steam pressure. Casings shall be constructed of 304 stainless steel. Factory mount the steam distribution manifolds and the distribution piping in the coil section and extend tubes thru the casing using escutcheons and high temperature silicone. Mechanical Contractor shall be responsible for the connection from the steam humidifier piping to the piping. Provide Models as shown below:

   a. DriSteem Ultrasorb Model MP for use with pressurized or atmospheric steam, and same side supply steam inlet/outlet connections.

2. Provide double sloped stainless steel drain pan beneath humidifier section. Drain connection shall be on one side.

3. Refer to Specification Section 23 84 13 "Humidifiers" for Humidifier requirements.

4. Refer to Specification Section 25 20 23.84.13 for Humidifier BACnet Interface Device Requirements.

J. Sensible and Latent Heat Wheel:

1. General: Dehumidification wheels shall be desiccant coated rotary air-to-air heat exchangers meeting the performance as listed in equipment schedules.

2. Flame and Smoke Test and Rating: Wheels shall have a flamespread rating of 25 or less and smoke-developed rating of 50 or less as tested in accordance with ASTM E84.

3. Wheel shall constructed of alternate layers of corrugated and flat aluminum.

4. Wheels shall be coated with a corrosion-prohibiting, non-migrating, permanently-bonded desiccant adsorbent specifically developed for the selective transfer of water vapor.

5. The air channels shall be formed smooth to ensure laminar airflow for low-pressure drops and allow free passage of particles up to 900 microns in diameter.

6. Rotor structure shall be internally reinforced and mounted on flange type bearings.

7. The rotor shall also be removable from the frame.

8. Brush seals shall be provided around the periphery of the rotor and between the inlet and outlet air passages to effectively prevent air leakage and cross contamination between airflows.

9. An adjustable purging sector shall be installed to prevent carryover of air from one side of the wheel to the other.

10. Cross contamination shall be verified in writing by an independent laboratory confirming that the desiccant surface freely transmits water vapor without detectable gaseous cross contamination.

11. Sensible and latent recovery performance and leakage must be clearly measured and certified through ARI in accordance with the AMCA 1060 Standard.

12. Factory mounted electronic speed control shall provide soft-start/stop, rotation detection and alarm, and self-cleaning jog functions.

13. The rotor drive system shall consist of an adjustable belt around the rotor perimeter driven by an AC motor with gear reduction. The variable speed drive shall be specifically designated for heat wheel applications and include: an AC inverter, soft start/stop, rotation detection w/alarm contacts, automatic self cleaning function, and self testing capability.

14. The speed controller shall be capable of accepting a potentiometer, VDC , or mA control signal.

15. Controls: The control of wheel rotational speed is to be by the use of a variable frequency drive (VFD) rated for the full rpm range of the wheel. The wheel speed shall be modulated in response to a signal from air stream temperature sensors mounted in the air ducts. The temperature sensors shall be supplied by the BMS/BAS controls vendor. The speed controller shall be energized by a remote signal from the owner's BMS/BAS.

16. BACnet Interface Devices: Provide BACnet Interface Devices for each Variable Frequency Motor Controller so that the units are presented as a series Provide of AV and BV BACnet objects. See 25 20 23.09.50 for the list of objects that must be supported. This list is the minimum acceptable.

K. Dampers: General Leakage rate when tested in accordance with AMCA Standard 500 - Test Method for Louvers, Dampers and Shutters, shall not exceed 1 percent of air quantity calculated at 2,000 fpm face velocity through damper and 4.0 inches wag. pressure differential.

1. Provide all dampers shown within the air handling units.

2. Damper operators are specified in Division 23 Section 23 09 00 "Building Automation System."

3. Dampers for outside, and exhaust air shall be low leakage, insulated Tamco Series 9000, no substitute.

4. Dampers for return air, or bypass shall be Tamco Series 1000, no substitute.

5. Provide face and by-pass dampers at the heating coil for all variable air volume units and where noted on the drawings.

L. Filter Section: Filters shall comply with NFPA Standard 90A "Standard for the Installation of Air Conditioning and Ventilating System".

1. Outside and Return Air: Provide filter section and media as indicated where required to protect heat recovery components.

a. Provide disposable type air filters 2 inches thick, consisting of viscous coated fibers with filtering media encased in fiberboard cell sides having perforated metal grids on each face to provide media support. Airflow resistance with clean media shall not exceed 0.10 inch wag. at face velocity of 300 fpm. Filters shall have a MERV 8 efficiency rating in accordance with ASHRAE Test Standard 52 - Method of Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.

2. Supply Air Extended Surface Filters: Provide filter section and media as indicated.

a. Pre-Filters: Provide disposable type air filters 2 inches thick, consisting of viscous coated fibers with filtering media encased in fiberboard cell sides having perforated metal grids on each face to provide media support. Airflow resistance with clean media shall not exceed 0.20 inch wag. at face velocity of 300 fpm. Filters shall have a MERV 8 efficiency rating in accordance with ASHRAE Test Standard 52 - Method of Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.

b. Extended Surface Self-Supporting Filters: Provide factory-fabricated, dry, extended surface, self-supporting filters with holding frames; where indicated, in sizes indicated. Equip with UL Class I fibrous media material constructed so that individual pleats are maintained in tapered form by flexible internal supports under rated air flow conditions. Construct holding frames of 18 gauge galvanized steel and provide suitable fasteners and gasketing to hold filter units and prevent unfiltered air particles between media frames and holding devices. Design holding frames which are suitable for bolting together into built-up filter banks. Provide filters with rate face velocity of 500 fpm, initial resistance of 0.25" wag. Filters shall have a MERV 13 efficiency rating in accordance with ASHRAE Test Standard 52 – Method of Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.

M. Air Flow Stations: Provide factory-mounted fan inlet airflow traverse probes on the inlet of all fans to continuously measuring air volume.

1. Shall contain multiple total and static pressure sensors connected to an averaging manifold.

2. Sensors shall be designed to eliminate adverse effects of airflow particle contamination.

3. Traverse probes shall be of aluminum construction, with anodized finish.

4. Probes shall not induce a measurable pressure drop or amplify sound levels.

5. Accuracy: 3% of actual air flow, as per U.S.G.A. certification tests.

6. Provide electronic transducers for a 4-20mA or 0-10 volt signal to the building system.

7. See 25 20 23.85 for Air Flow Station BACnet Interface Device Requirements.

J. Ultra Violet Lights:

1. Provide factory mounted UV Resources Model DEF-SO UV***, or equal,*** stainless steel fixtures and lights as shown on the Drawings. Include all necessary stainless steel mounting brackets to provide one row of lights for every 24" of vertical coil surface. Lights shall be mounted at a distance of 12" from the cooling coils, and cover the entire length of the unit. Include two (2) sets of bulbs to be turned over to the Owner at start-up. Do not ship bulbs with the Equipment to minimize damage. ***Provide a minimum of 20 watts/square foot.***

2. Provide a UV-C Lamp Hour Meter c/w Analog Output for monitoring lamp runtime hours. See 25 09 23.73.13 for BACnet Stick Built Device requirements.

N. Electrical: Provide factory-mounted and wired electrical components, devices, and accessories in accordance with the requirements of Division 26 Sections. Factory wiring shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency, and marked for intended location and application. Provide at a minimum the following:

1. Marine lights shall be provided in all access sections wired to a single switch. GFCI outlets provided in fan access segments. Lights and GFCI's shall be provided on a separate 120/1 volt circuit with a single point connection.

2. Provide empty conduit, raceway, and junction boxes for field installation of control wiring. A junction box shall be provided in unit section. The conduit penetration of the unit casing shall be sealed air tight.

3. Electrical power wiring connections for the unit fans shall be provided to each of the variable frequency drives with connection in conduit to the motors. Variable frequency drives are provided by the Building Automation System Contractor and field installed by the Electrical Contractor. Coordinate locations for VFD's and identify locations on the air handling unit submittals.

4. The unit wiring diagram shall be provided in the panel.

O. BACnet Interface Devices: Provide BACnet Interface Devices for each Central-Station Air-Handling Unit so that the units are presented as a series of AV, BV and MSV BACnet objects. See 25 20 23.73.13 for the list of objects that must be supported. This list is the minimum acceptable.

PART 3: EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, housekeeping pads, and other conditions affecting performance of central-station air-handling units.

B. Examine casing insulation materials and filler media before air-handling unit installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Examine rough-in for hydronic, condensate drainage piping and electrical to verify actual locations of connections prior to installation.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Install central-station air-handling units level and plumb, in accordance with manufacturer's written instructions.

1. Support floor-mounted units on concrete equipment bases. Secure units to anchor bolts installed in concrete equipment base.

B. Arrange installation of units to provide access space around air-handling units for service and maintenance.

C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used or during construction with new clean filters.

3.03 INSTALLATION OF BACnet INTERAFCE DEVICES

A. See The Division 25 Responsibility Matrix for the execution responsibilities for Equipment Supplier, Controls and Electrical Subcontractor.

B. The supplier is responsible for supplying and installing the BACnet Interface Device.

C. Electrical is responsible for power and any control wiring if the device does not have a single point of connection.

D. Division 25 is responsible for communicating with the BACnet Interface Device using BACnet objects and services to access this data and for mapping the BACnet objects from the device(s) in this Specification Section to the BACnet Object Integration Device to create graphics, reports, trends, alarms, schedules and other requirements specified in Division 25.

E. This BACnet Interface Device is a BACnet/IP device with BACnet MS/TP device components – the VFDs and the Air Flow Stations. See Division 27 for BACnet/IP networking responsibilities. Division 25 is responsible for networking the BACnet MS/TP devices to a BAS Contractor provided BACnet/IP device.

3.04 EQUIPMENT BASES

A. Construct concrete equipment pads as follows:

1. Coordinate size of equipment bases with actual unit sizes provided. Construct base 4 inches larger in both directions than the overall dimensions of the supported unit.

2. Place anchor bolts and sleeves to facilitate securing units.

3. Allow concrete to cure before installation of units.

4. Clean exposed steel form and apply 2 coats of rust-preventative metal primer.

3.05 CONNECTIONS

A. Piping installation requirements are specified in Section 23 21 13 “Hydronic Piping”. The Drawings indicate the general arrangement of piping, valves, fittings, and specialties. The following are specific connection requirements:

1. Arrange piping installations adjacent to units to allow unit servicing and maintenance.
2. Connection piping to air-handling units with flexible connectors.
3. Connect condensate drain pans using 1-1/4-inch, Type M copper tubing. Extend to the nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.

B. Duct installations and connections are specified in Section 23 31 13 "Ductwork" and 23 33 00 "Air Duct Accessories". Make final duct connections with flexible connections.

C. Connection requirements for units shipped in sections.

1. The mechanical contractor is responsible for all field wiring required as a result of units shipped in sections. Complete wiring in accordance with manufacturer’s instructions and guidelines. Comply with all NEC requirements. Field wiring shall be verified and approved by the equipment manufacturer and shall not void the warranty.

D. Electrical Connections: The following requirements apply:

1. Electrical power wiring is specified in Division 26.

2. Temperature control wiring and interlock wiring is specified in Section 23 09 00 Building Automation System

3. Grounding: Connect unit components to ground in accordance with the National Electrical Code.

3.06 FIELD QUALITY CONTROL

A. Manufacturer's Field Inspection: Arrange and pay for a factory-authorized service representative to perform the following:

1. Inspect the field assembly of components and installation of central-station air-handling units including piping, ductwork, and electrical connections.

2. Prepare a written report on findings and recommended corrective actions.

3.07 ADJUSTING, CLEANING, AND PROTECTING

A. Adjust water coil flow, with control valves to full coil flow, to indicated gpm.

B. Adjust damper linkages for proper damper operation.

C. Clean unit cabinet interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel, fan cabinet, and coils entering air face.

3.08 SYSTEM START-UP

A. Provide the services of a factory authorized service representative to provide start-up services.

B. Final Checks Before Start-Up: Perform the following operations and checks before start-up:

1. Remove shipping, blocking, and bracing.

2. Verify unit is secure on mountings and supporting devices and that connections for piping, ductwork, and electrical are complete. Verify proper thermal overload protection is installed in motors, starters, and disconnects.

3. Perform cleaning and adjusting specified in this Section.

4. Disconnect fan drive from motor and verify proper motor rotation direction and verify fan wheel free rotation and smooth bearings operations. Reconnect fan drive system, align belts, and install belt guards.

5. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.

6. Set outside-air and return-air mixing dampers to minimum outside-air setting.

7. Comb coil fins for parallel orientation.

8. Install clean filters.

9. Verify manual and automatic volume control, and fire and smoke dampers in connected ductwork systems are in the full-open position.

10. Disable automatic temperature control operators.

C. Starting procedures for central-station air-handling units:

1. Energize motor, verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM.

a. Replace fan and motor pulleys as required to achieve design conditions.

2. Measure and record motor electrical values for voltage and amperage.

D. Shut unit down and reconnect automatic temperature control operators.

E. Refer to Division 1 Section 23 90 00 "Testing, Adjusting, and Balancing" for procedures for air-handling-system testing, adjusting, and balancing.

F. See Division 25 08 00, 25 08 01 and 25 08 02 and the Related Sections listed above in this Specification Section for BAS and BACnet Interface Device commissioning requirements. Complete point forms for all points supplied and installed by Equipment Supplier. Division 25 shall complete forms for all points supplied and installed by Division 25.

G. Engage a factory authorized service representative to perform and/or assist with integration of equipment with the Building Automation System as part of the commissioning process. This shall be a separate, second visit at a different date than startup.

3.09 TEMPORARY OPERATION

A. Manually operate air handling systems to provide suitable environment for installation of interior finishes. Perform commissioning operations prior to starting units. Follow commissioning starting procedures and the following manual operation sequence:

1. Open outdoor air dampers, close return air dampers, open all air terminals to full open. Verify filters installed, heating coil operating (outdoor air temperatures below 40° F), condensate drain functioning, and electrical protection devices installed. Start fan, monitor indoor and outdoor conditions, and manually operate heating and cooling systems to control space conditions; shut down systems completely and close outdoor air dampers at end of each work day.

3.10 PROJECT CLOSEOUT

A. Replace fan drives and sheaves as directed by the Engineer as required for systems to perform to the intended design conditions. The Contractor’s bid shall include labor and materials required to replace the quantity of drives and sheaves specified in Part 1.0 “Extra Materials.”

B. Replace fan motors as directed by the Engineer as required for systems to perform to the intended design conditions. The Contractor’s bid shall include all material and labor required to replace the quantity at motors, specified in Part 1.0 “Extra Materials.”

3.11 DEMONSTRATION AND TRAINING

A. Train Owner’s maintenance personnel to adjust, operate and maintain central-station air handling units. Refer to Division 01 Section “Demonstration and Training.”

1. Required Time: 8 hours.

A. Refer to 25 08 00, 25 08 01 and 25 20 23.73.13 for start-up, commissioning and training requirements for the BACnet Interface Devices provided in this Specification Section.

END OF SECTION 23 73 13

IL

REGIONAL OPERATIONS AND COMMUNICATIONS FACILITY

Libertyville, IL 60048

CIVIL

C0.000	CIVIL TITLE SHEET
C1	TITLE SHEET
C2	EXISTING CONDITIONS / DEMOLITION PLAN
C3	OVERALL SITE PLAN
C4	GEOMETRIC PLAN
C5	UTILITY PLAN
C6	GRADING PLAN
C6.1	GRADING PLAN - CLOSEUPS, ALTERNATE #4
C7	GRADING PLAN - NORTHWEST
C8	GRADING PLAN - SOUTHWEST
C9	SOIL EROSION AND SEDIMENT CONTROL PLAN
C10	SOIL EROSION AND SEDIMENT CONTROL DETAILS
C11	GENERAL NOTES
C12	DETAILS
C13	DETAILS
C14	DETAILS

LANDSCAPE

L-100	LANDSCAPE PLAN-OVERALL
L-101	LANDSCAPE PLAN-NORTHEAST
L-102	LANDSCAPE PLAN-NORTHWEST
L-103	LANDSCAPE PLAN-SOUTHEAST
L-104	LANDSCAPE PLAN-WEST
L-105	LANDSCAPE PLAN-SOUTHWEST
L-106	LANDSCAPE PLANT SCHEDULE & SEED MIXES
L-107	LANDSCAPE DETAILS
L-108	LANDSCAPE SPECIFICATIONS
L-109	LANDSCAPE SPECIFICATIONS
L-110	LANDSCAPE SPECIFICATIONS

STRUCTURAL

S0.000	STRUCTURAL TITLE SHEET
S0.10	STRUCTURAL GENERAL NOTES
S0.11	STRUCTURAL SCHEDULE
S0.12	JOIST LOADING DIAGRAMS
S2.00	OVERALL FOUNDATION PLAN
S2.00a	FOUNDATION PLAN - AREA 'A'
S2.00b	FOUNDATION PLAN - AREA 'B'
S2.01	OVERALL UPPER FLOOR / ROOF FRAMING PLAN
S2.01a	UPPER FLOOR / ROOF FRAMING PLAN - AREA 'A'
S2.01b	UPPER FLOOR / ROOF FRAMING PLAN - AREA 'B'
S2.02	CLERESTORY ROOF FRAMING PLAN
S2.095	OVERALL HIGH ROOF FRAMING PLAN
S2.095a	HIGH ROOF FRAMING PLAN - AREA 'A'
S2.095b	HIGH ROOF FRAMING PLAN - AREA 'B'
S4.00	FOUNDATION DETAILS AND SECTIONS
S4.01	FOUNDATION DETAILS AND SECTIONS
S4.02	FOUNDATION DETAILS AND SECTIONS
S4.10	FLOOR FRAMING DETAILS AND SECTIONS
S4.20	ROOF FRAMING DETAILS AND SECTIONS
S4.21	ROOF FRAMING DETAILS AND SECTIONS
S4.22	ROOF FRAMING DETAILS AND SECTIONS
S4.23	ROOF FRAMING DETAILS AND SECTIONS
S4.24	ROOF FRAMING DETAILS AND SECTIONS

ARCHITECTURAL

A0.001	CODE ANALYSIS
A0.101	CODE PLAN
A0.401	STORM SHELTER PLAN
A1.00	ARCHITECTURAL SITE PLAN
A2.01a	FLOOR PLAN - AREA 'A'
A2.01b	FLOOR PLAN AREA 'B'
A2.02	CLERESTORY & MEZZANINE PLAN
A2.03	PRICING DIAGRAM
A2.095	ROOF PLAN
A2.901	DOOR/ FRAME/ LOUVER TYPES & SCHEDULE
A3.01a	REFLECTED CEILING PLAN - AREA 'A'
A3.01b	REFLECTED CEILING PLAN - AREA 'B'
A3.02	REFLECTED CEILING PLAN - UPPER CEILING OVERALL
A4.101	DETAILS - GENERAL - SYMBOLS, ABBREVIATIONS & FINISH SCHEDULE
A4.102	DETAILS - GENERAL - MOUNTING HEIGHTS
A4.103	ENLARGED ROOM PLANS
A4.104	MAIN LEVEL ACCESS FLOOR PLAN
A4.105	MAIN LEVEL - UNDERFLOOR DRAINAGE
A4.201	DETAILS - VERTICAL CIRCULATION
A4.202	DETAILS - VERTICAL CIRCULATION
A4.301	MAIN LEVEL SIGNAGE PLAN - AREA 'A'
A4.302	MAIN LEVEL SIGNAGE PLAN - AREA 'B'
A4.305	FLOOR FINISH PLAN - AREA 'A'
A4.306	FLOOR FINISH PLAN - AREA 'B'
A4.400	INTERIOR AND MATERIAL FINISH LEGENDS
A4.401	INTERIOR ELEVATIONS
A4.402	INTERIOR ELEVATIONS
A4.403	INTERIOR ELEVATIONS
A4.405	INTERIOR ELEVATIONS

ARCHITECTURAL (CONTINUED)

A4.406	INTERIOR ELEVATIONS & SECTIONS
A4.407	CASEWORK ELEVATIONS
A4.601	INTERIOR PLAN DETAILS
A4.701	DETAILS - CONCRETE BLOCK WALL TYPES
A4.702	DETAILS - METAL STUD WALL TYPES
A4.703	DETAILS - INTERIOR WALL DETAILS
A4.704	DETAILS - INTERIOR WALL DETAILS
A4.707	DETAILS - ACCESS FLOOR DETAILS
A4.710	DETAILS - INTERIOR CASEWORK SECTIONS
A4.801	DETAILS - INTERIOR OPENING DETAILS
A4.802	DETAILS - INTERIOR OPENING DETAILS
A4.901	DETAILS - INTERIOR CEILING DETAILS
A4.902	DETAILS - INTERIOR CEILING DETAILS
A4.903	DETAILS - INTERIOR CEILING DETAILS
A5.101	EXTERIOR ELEVATIONS
A5.102	EXTERIOR ELEVATIONS
A5.200	EXTERIOR WALL TYPES
A5.201	WALL SECTIONS
A5.202	WALL SECTIONS
A5.203	WALL SECTIONS
A5.301	CURTAINWALL ELEVATIONS
A5.302	STOREFRONT ELEVATIONS
A5.501	DETAILS - EXTERIOR WALL
A5.502	DETAILS - EXTERIOR WALL
A5.503	DETAILS - EXTERIOR WALL
A5.504	DETAILS - EXTERIOR WALL
A5.505	DETAILS - EXTERIOR WALL
A5.601	DETAILS - EXTERIOR OPENINGS
A5.602	DETAILS - EXTERIOR OPENINGS
A5.701	DETAILS - EXTERIOR ROOF
A6.101	DETAILS - SITE

1

MECHANICAL

M0.0	MECHANICAL TITLE SHEET
M1.00a	UNDERGROUND PLUMBING PLAN - AREA 'A'
M1.00b	UNDERGROUND PLUMBING PLAN - AREA 'B'
M1.01a	PLUMBING PLAN - AREA 'A'
M1.01b	PLUMBING PLAN - AREA 'B'
M2.01	HYDRONIC & BAS PLAN - AREA 'A'
M2.02	HYDRONIC & BAS PLAN - AREA 'B'
M2.03	GEOTHERMAL SOURCE PIPING PLAN
M3.01	HVAC PLAN - AREA 'A'
M3.02	HVAC PLAN - AREA 'B'
M3.03	ACCESS FLOOR PLANS
M4.01	ROOF PLAN - AREA 'A'
M4.02	ROOF PLAN - AREA 'B'
M5.01	FIRE PROTECTION PLAN
M6.10	BOILER AND MECHANICAL ROOM PLAN
M6.11	WASTE AND VENT RISER DIAGRAMS
M6.12	WASTE AND VENT RISER DIAGRAMS
M6.13	SUPPLY RISER DIAGRAMS
M6.14	SUPPLY RISER DIAGRAMS
M6.15	SECTION VIEWS
M6.16	SECTION VIEWS
M6.17	MECHANICAL ROOM SECTION VIEWS
M7.10	GEOTHERMAL WELL FIELD SITE PLAN NOTES, DETAILS, AND ENLARGED PLANS
M7.11	GEOTHERMAL WELL FIELD SITE PLAN
M7.12	GEOTHERMAL WELL FIELD SITE PLAN
M8.10	MECHANICAL DETAILS
M8.11	MECHANICAL DETAILS
M8.12	MECHANICAL DETAILS
M8.13	MECHANICAL STORM SHELTER DETAILS
M8.14	MECHANICAL SCHEMATICS
M9.10	SCHEDULES
M9.11	SCHEDULES

ELECTRICAL

E0.00	ELECTRICAL SYMBOLS AND ABBREVIATIONS
E0.000	ELECTRICAL TITLE SHEET
E0.01	ELECTRICAL CAMPUS SITE PLAN OUTSIDE PLANT FIBER AND PATHWAY
E0.02	ELECTRICAL SITE PLAN
E0.04	ELECTRICAL OVERALL PLANS
E1.11a	MAIN LEVEL LIGHTING PLAN - AREA 'A'
E1.11b	MAIN LEVEL LIGHTING PLANS - AREA 'B'
E1.12a	CLERESTORY LIGHITNG PLANS - AREA 'A'
E1.12b	CLERESTORY LIGHTING PLANS - AREA 'B'
E2.11a	MAIN LEVEL POWER & FIRE ALARM PLAN - AREA 'A'
E2.11b	MAIN LEVEL POWER & FIRE ALARM PLANS - AREA 'B'
E3.11a	MAIN LEVEL SYSTEMS PLAN - AREA 'A'
E3.11b	MAIN LEVEL SYSTEMS PLAN - AREA 'B'
E3.21a	SYSTEMS PLANS - SOUND MASKING - AREA 'A' ALTERNATE #6
E3.21b	SYSTEMS PLANS - SOUND MASKING - AREA 'B' ALTERNATE #6
E4.00	ROOF PLAN - ELECTRICAL
E5.01	ONE-LINE DIAGRAM
E5.02	METERING AND BAS DETAILS
E5.10	GROUNDING PLANS
E5.11	GROUNDING DETAILS
E5.20	LIGHTNING PROTECTION
E6.01	LUMINAIRE SCHEDULE
E6.02	MOTOR SCHEDULE
E6.10	PANEL SCHEDULES
E6.11	PANEL SCHEDULES
E6.12	PANEL SCHEDULES
E6.13	PANEL SHCEDULES
E7.00	ELECTRICAL DETAILS
E7.01	ELECTRICAL DETAILS
E7.02	FIRE ALARM RISER
E7.10	ELECTRICAL DETAILS - SYSTEMS
E7.11	ELECTRICAL DETAILS - SYSTEMS

AV & RADIO TOWERS

AV1.01A	FLOOR PLAN
AV1.01B	FLOOR PLAN
AV2.01	RISER DIAGRAM
AV2.02	RISER DIAGRAM
AV2.03	RISER DIAGRAM
AV3.01	A/V DETAILS
AV3.02	A/V DETAILS
AV3.03	A/V DETAILS
R2.01	RADIO RISER DIAGRAM (REFERENCE ONLY)
R2.02	RADIO RISER DIAGRAM (REFERENCE ONLY)
R2.03	RADIO RISER DIAGRAM (REFERENCE ONLY)
R3.01	RADIO DETAILS (REFERENCE ONLY)
R3.02	RADIO DETAILS (REFERENCE ONLY)

ISSUE FOR BID SET

DEC. 30, 2022

Regional Operations and Communications Facility

Lake County Campus
Libertyville, IL 60048

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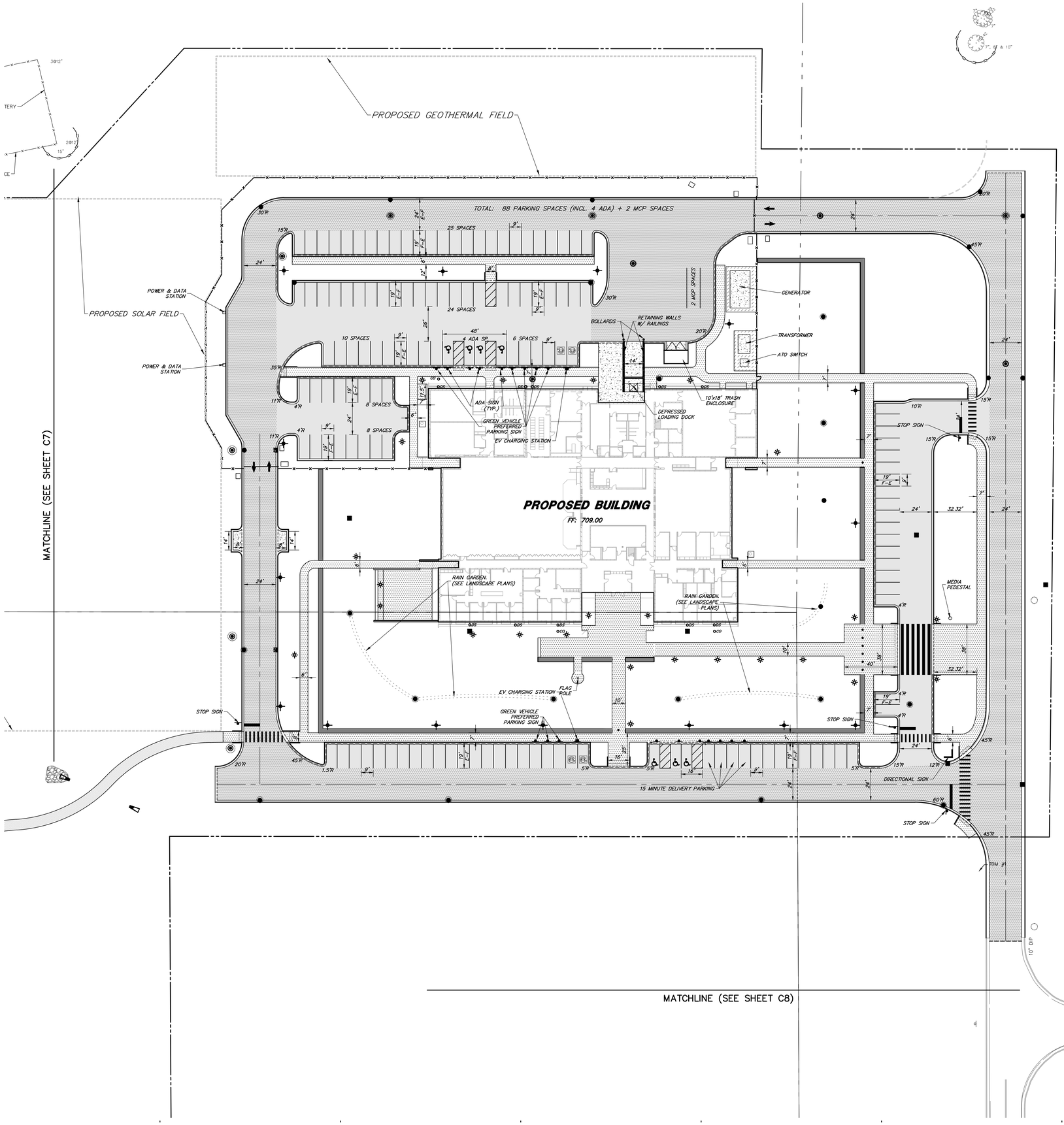

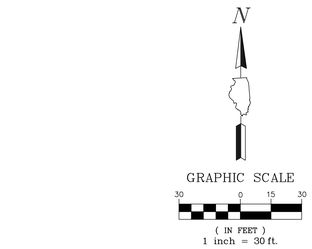

PROPOSED LEGEND

- HEAVY DUTY BITUMINOUS PAVEMENT
- NORMAL DUTY BITUMINOUS PAVEMENT
- PCC PAVEMENT
- PCC SIDEWALK
- HMA PATH
- SOD RESTORATION
- STONE RIP RAP, CLASS A1
- AGGREGATE
- DETECTABLE WARNINGS
- B6.12 CURB & GUTTER (REGULAR)
- B6.12 CURB & GUTTER (DEPRESSED)
- B6.12 CURB & GUTTER (REVERSE PITCH)
- PAVEMENT SAWCUT
- FENCE
- TREE TRUNK PROTECTION FENCE
- PERIMETER EROSION BARRIER
- CF CONSTRUCTION FENCE
- RETAINING WALLS

GEOMETRIC AND PAVING PLAN

1. All pavement dimensions are to edge of pavement, unless otherwise noted. E=edge of pavement, B=back of curb, F=face of curb. Radii dimensions are to back of curb.
2. Install all curb and sidewalk as shown. Note some curbs require reverse pitch gutter. Dowel new sidewalk and curb to existing and proposed curbs per general notes. When constructing a carriage walk, the proposed sidewalk contraction and expansion joints shall align with existing curb joints. All concrete sidewalk and curb will have 2 coats of WHITE curing compound applied. Clear curing compound will not be accepted.
3. Provide 1.90% cross slope and 4.5% maximum longitudinal slope on all sidewalks and pedestrian path ways unless otherwise indicated. Illinois accessibility code requires a maximum constructed cross slope of 2.00% and longitudinal slope of 5.00%.
4. Hot mix Asphalt (HMA) paving - After passing proof roll, the contractor shall string line the parking lot with the engineer from all summit points and curb lines with the engineer. Any areas that do not meet minimum pavement cross slope (1.1%) will be corrected, re-compacted and re-proof rolled. Refer to detail sheet for specific pavement sections and general note sheet for construction, testing and compaction requirements.
5. Install all 8" PCC pavement, sidewalk and B6.12 curb and gutter per plans and details. Contraction joints shall be sawcut a minimum of 2" deep within 12 hours of pour for all curb and PCC pavement. Sidewalk joints will be tooled and will line up when adjacent to curb. Refer to detail sheet for specific pavement section and general notes for construction, testing and compaction requirements. Refer to Architectural Plans for Loading Dock details.
6. All parking lot stall markings shall be 4" Yellow paint and all other parking lot pavement markings shall be paint, color as noted, in accordance with Section 780 of the IDOT Standard Specifications. (Two single applications, 16 mils each required). Site pavement marking shall be coordinated with Site engineer. Contractor shall notify site engineer 48 hrs prior to installing pavement marking.
7. For handicapped stall markings, refer to Handicapped Parking Stall and Sign Dimensioning Detail. Stripe EV spaces as shown on details.
8. Install new signs and handicapped parking signs using 2" galvanized square tube post and telescoping post sleeve per IDOT standard.
9. Install transformer pads as shown. Pad shall be set 4" above finished grade. Refer to MEP plans for final pad size and design requirements.
10. Refer to Architectural plans for all fencing details.

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License Number: 184.000922-0010 EXPIRES: 4/30/2023

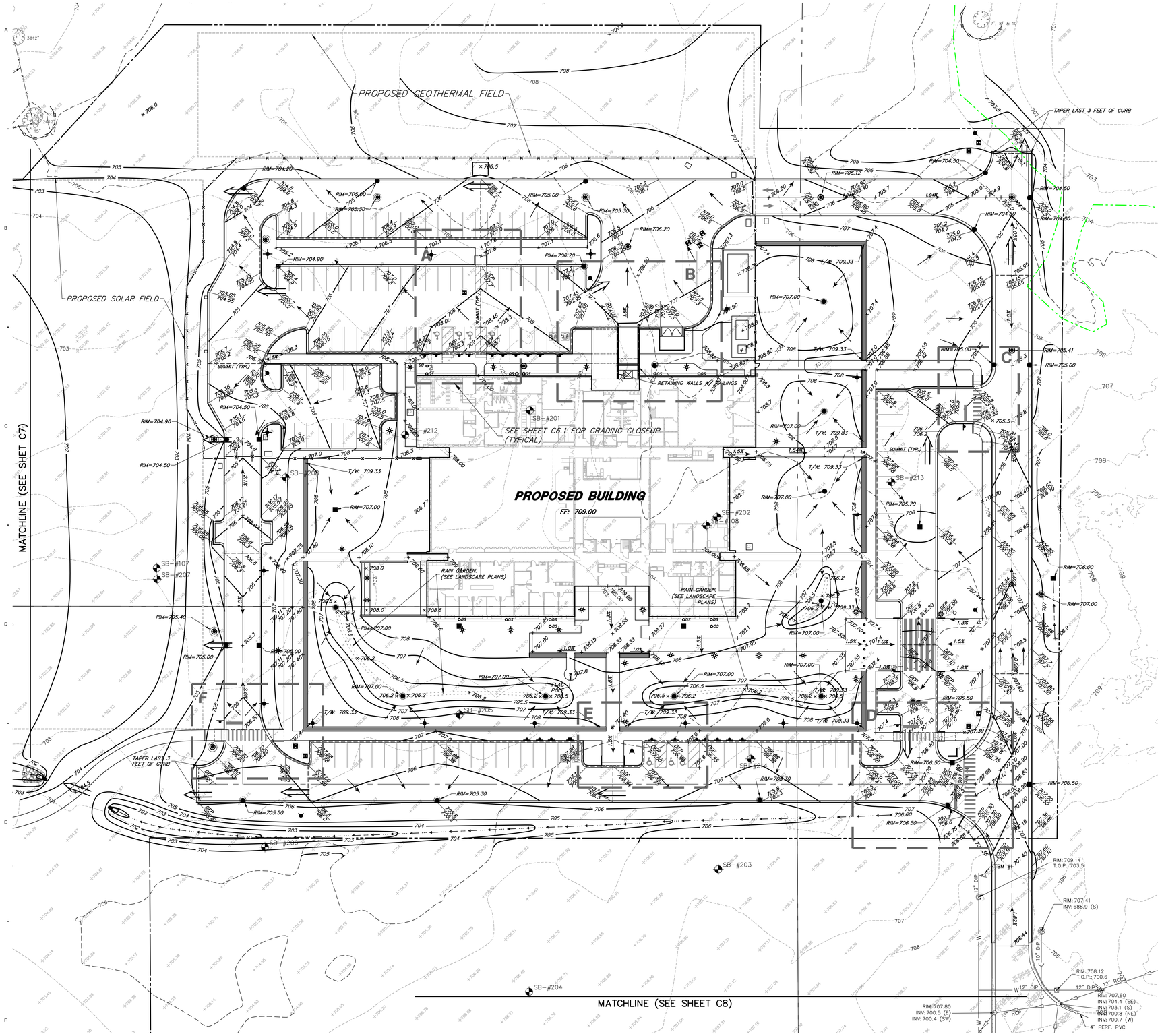
Revisions		
Description	Date	Num.
Addendum #2	2/25/2023	1

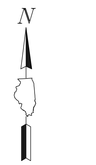
Comm: 213106
Date: 12-30-22
Drawn: LLM
Check: MTS
North

GEOMETRIC PLAN

Scale: 1" = 30'

C4





GRADING LEGEND

- TOP OF CURB / FLOW LINE
- PROPOSED SPOT ELEVATION
- XXX — CONTOUR
- ADJ: #### — STRUCTURE ADJUSTMENT
- SUMMIT — SUMMITS
- 0.50% — SLOPES
- SWALES
- OVERLAND FLOW ROUTE

GRADING PLAN NOTES

1. Prior to starting any construction, provide soil erosion and sediment control devices as shown on the plans and as required per IEPA NPDES guidelines. Refer to notes and details throughout the entire plan set.
2. Contractor shall refer to geotechnical report(s). Mass grading work zones shall be minimized to prevent erosion. Areas will be finish graded outside of active building zones as soon as possible. Proposed detention/sedimentation basin improvements will be made after initial erosion control measures have been installed. Basin improvements will be finished graded, seeded and blanketed as an initial operation on site. Perforated riser, earthen embankment and sedimentation will be removed once the majority of the site has been stabilized. The disturbed basin areas will then be topsoiled 12" stabilized and restored per the landscape plan.
3. In areas of proposed building, pavement, concrete and all hardscape, strip all topsoil and compact soil to 95% Modified Proctor density (ASTM D-1557). In fill areas, compact lifts in maximum 8" thicknesses to meet the 95% Modified Proctor density. Prior to installing any improvements, proof roll is required per the General Notes. All green space areas will have a minimum of 12" of topsoil. See Landscape Architect plans for restoration requirements. The contractor shall stockpile topsoil and suitable clay to meet proposed grades as part of the base bid. Stockpiles that are not active per the WDO, will be stabilized as part of the base bid. Such work is considered incidental to the contract and no additional compensation shall be allowed for such work. Adjustments to grades (+/- 12") in the proposed solar field can be accommodated with Project Engineer approval to allow for site balance.
5. Handicap accessible parking spaces shall be constructed between 1.0% and 1.90% maximum slopes in any one direction. Illinois accessibility code permits a maximum constructed slope of 2.00%.
6. All sidewalks shall have less than 2.0% cross slope.
7. All structures shall be adjusted to meet finished turf and pavement grades.
8. Refer to soil erosion and sediment control notes and details for seed and blanket requirements for temporary stabilization.
9. Refer to landscape plan for final restoration requirements.
10. Note mass grading work zone areas shall be minimized to prevent erosion. Once a work zone has been rough graded, stabilize area with mulch and proceed to next work area until site is completed.
11. Contractor shall ensure positive drainage to all inlets and catchbasins. Areas of surface ponding shall be corrected by the contractor at no additional expense to the Owner.
12. Contractor shall install temporary erosion control seed and blanket as necessary to meet soil erosion and sediment control requirements. Refer to notes and details throughout the plan set for specific material requirements. Maintenance of all erosion control items is the responsibility of the contractor until the site is accepted.
13. For final restoration, the contractor shall be responsible for restoring all disturbed turf areas and proposed turf areas as follows:
    a. Refer to Landscape plans for plant and tree material and installation requirements.
    b. Refer to Landscape plans for topsoil, seed, sod material, erosion control blanket, and restoration requirements.
    d. Spread a minimum of 12" of existing site salvaged screened topsoil or new pulverized topsoil on all disturbed areas. Compact to 80% standard proctor.
    e. Topsoil must be free of litter, brush, rocks and earth clods of greater than 1 inch in any dimension. Contain between 1%-10% organic matter, 12%-50% clay, and less than 55% sand content. pH shall be between 6.0 and 8.0.
14. Once restoration has been completed, the contractor shall remove erosion control devices. Silt fence trenches shall be backfilled and restored in kind. Storm structures shall be cleaned of debris.

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Description	Date	Num
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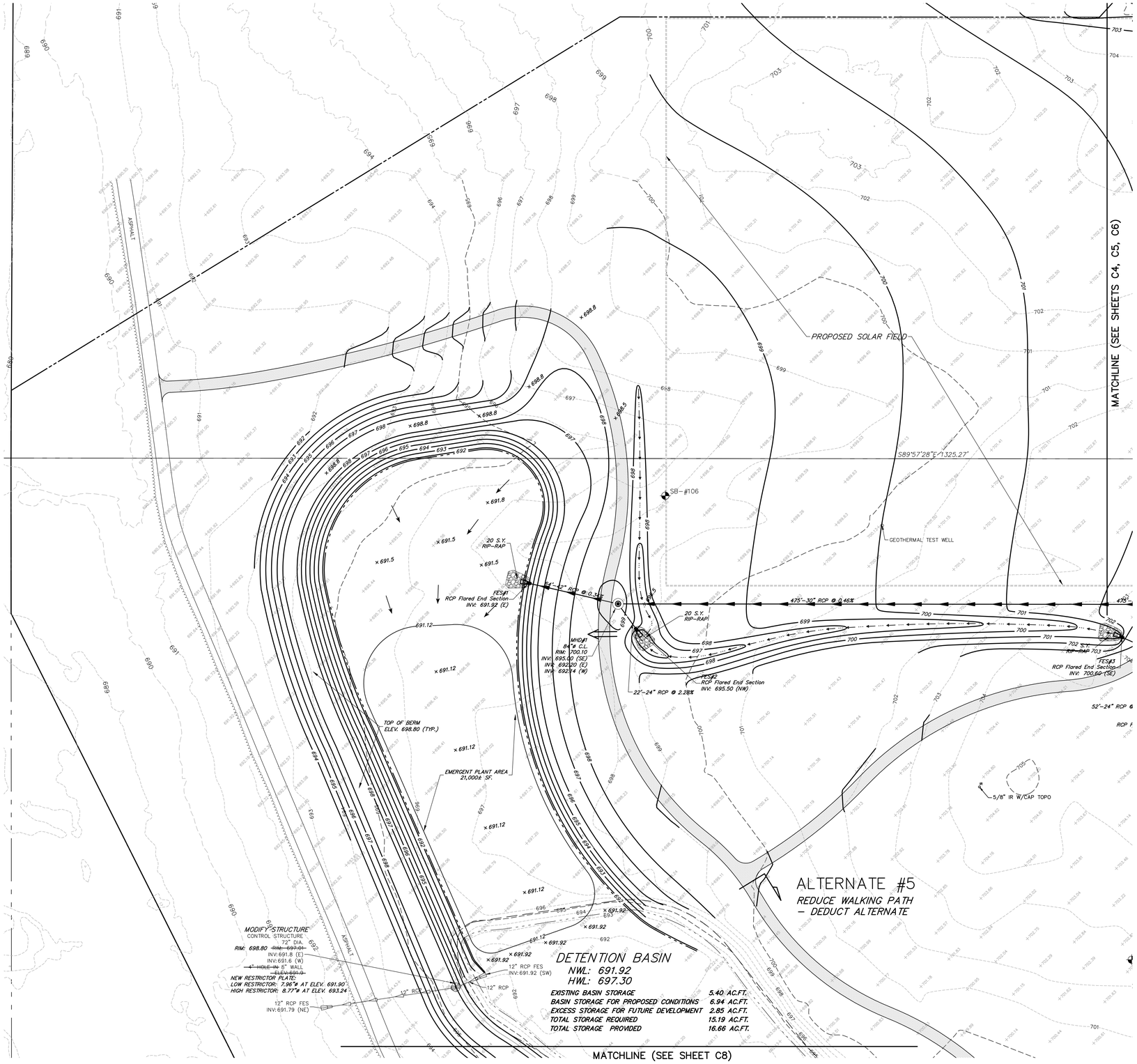
Comm: 213106
Date: 12-30-22
Drawn: LLM
Check: MTS
North

GRADING PLAN

Scale: 1" = 30'

C6

IL



A

N

GRAPHIC SCALE

30 0 15 30

(IN FEET)

1 inch = 30 ft.

GRADING LEGEND

624.70 / 624.20	TOP OF CURB / FLOW LINE
×670.30	PROPOSED SPOT ELEVATION
XXX	CONTOUR
ADJ: ###.##	STRUCTURE ADJUSTMENT
SUMMIT	SUMMITS
0.50%	SLOPES
	SWALES
	OVERLAND FLOW ROUTE

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Drawn: LLM
Check: MTS

North

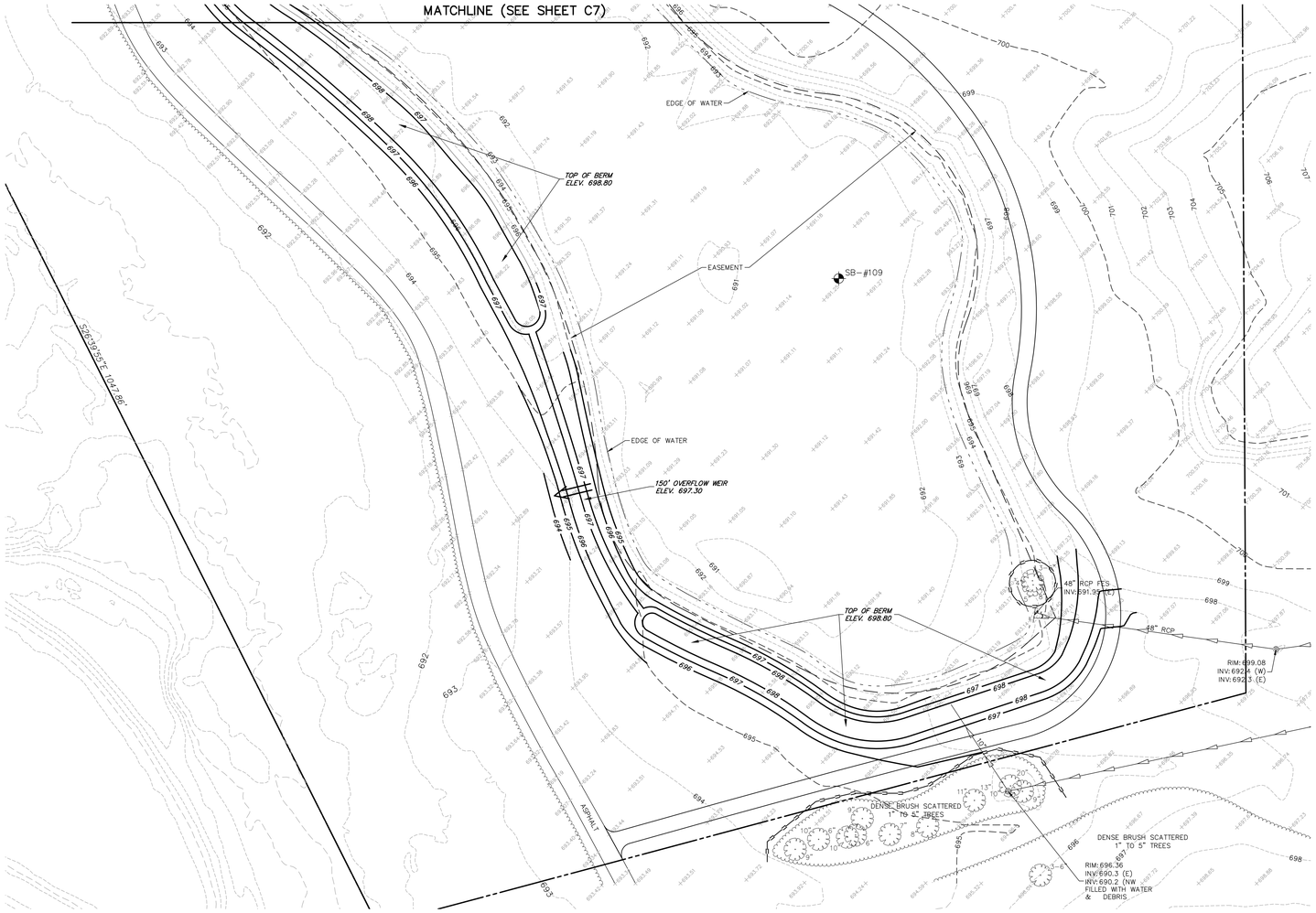
GRADING PLAN - NORTHWEST

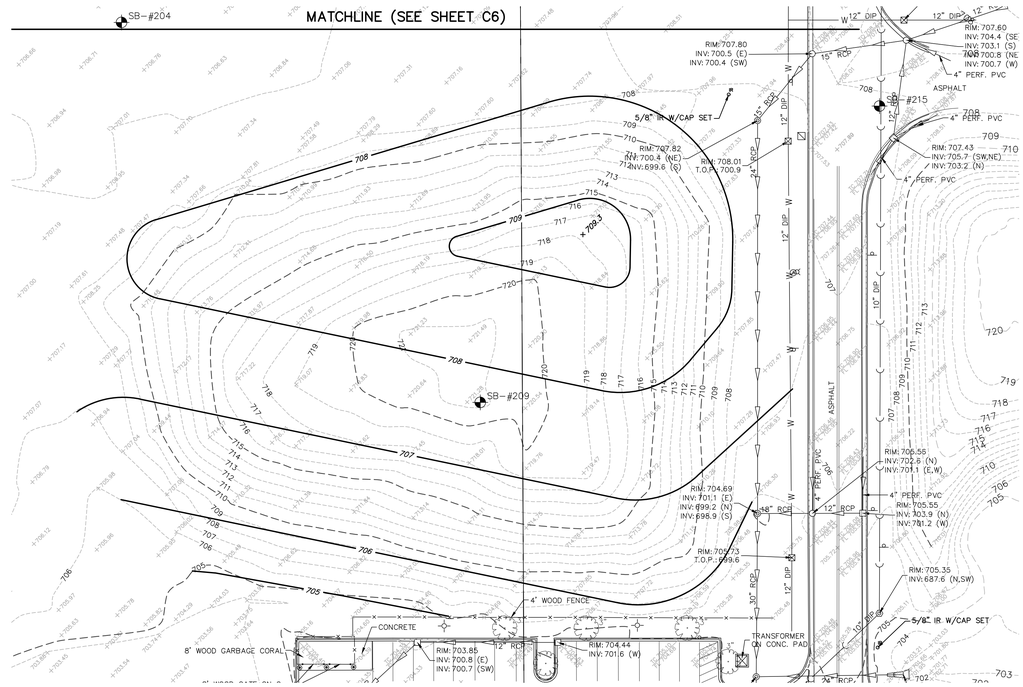
Scale: 1" = 30'

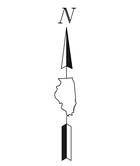
C7

IL

A







GRADING LEGEND

- TOP OF CURB FLOW LINE (694.10 / 694.20 / 694.30)
- PROPOSED SPOT ELEVATION (×670.30)
- CONTOUR (XXX)
- STRUCTURE ADJUSTMENT (ADJ: ###.##)
- SUMMITS (SUMMIT)
- SLOPES (0.50%)
- SWALES
- OVERLAND FLOW ROUTE

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Drawn: LLM
Check: MTS

North

Scale: 1" = 30'

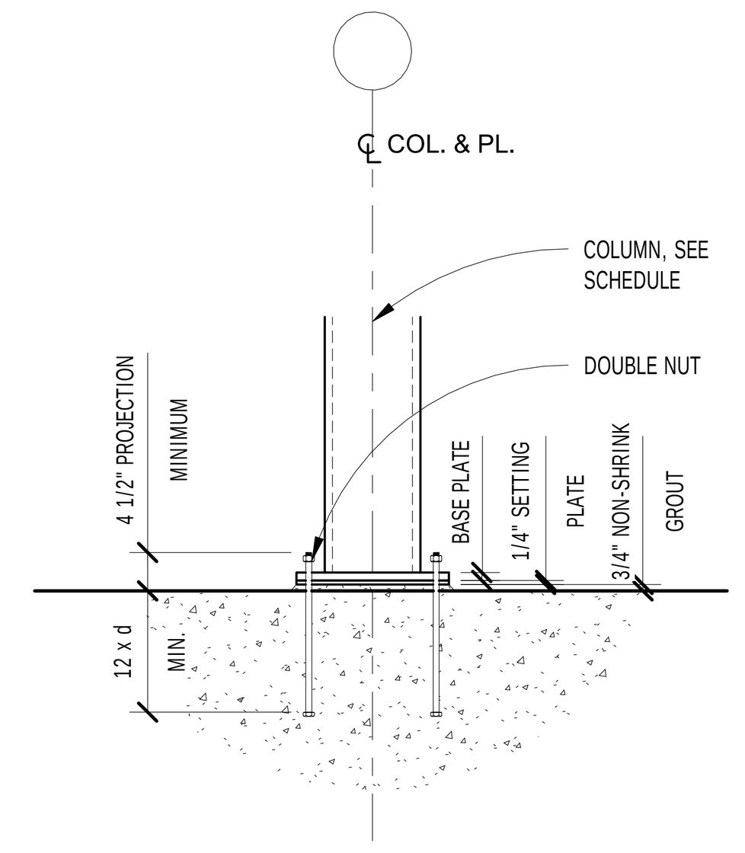
GRADING PLAN - SOUTHWEST

C8

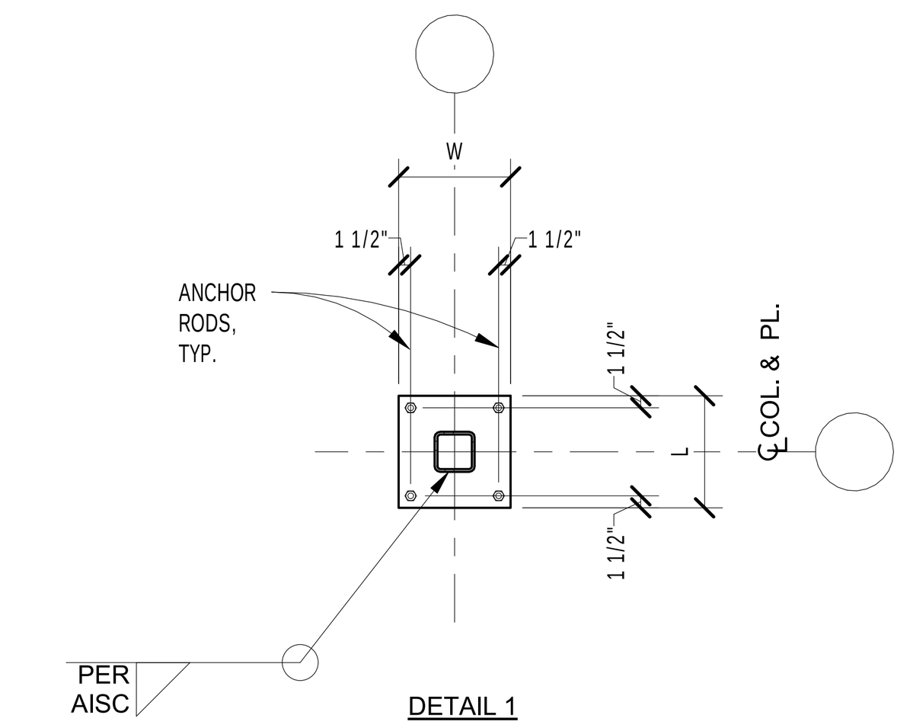
COLUMN SCHEDULE (B4)

1/2" = 1'-0"

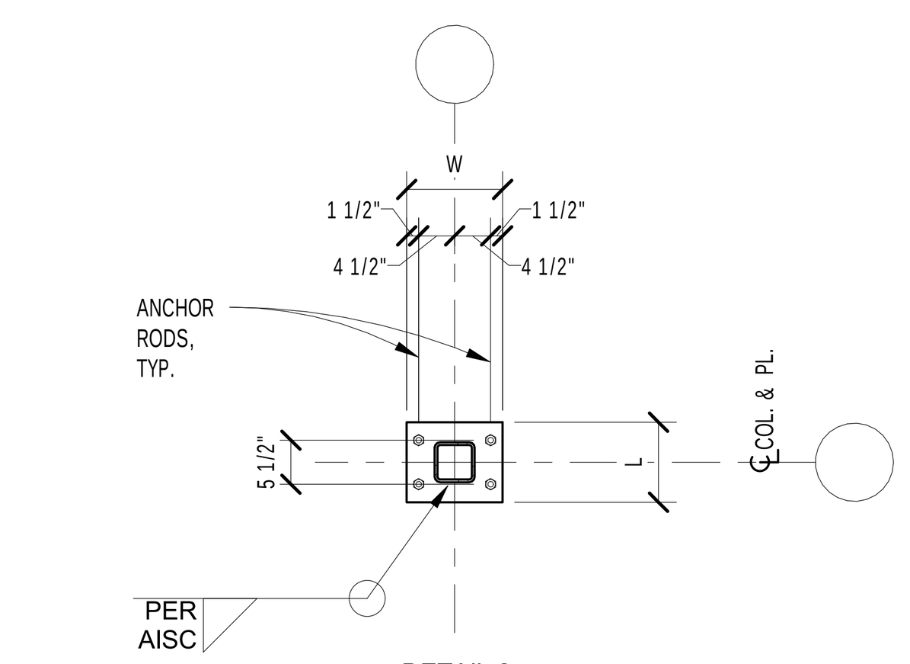
COLUMN MARK	C1	C2	C3	C4	C5	C6	C7	
LOCATION								
COLUMN (CLERESTORY ROOF / HIGH ROOF / MEZZANINE / LOW ROOF / EL. 0'-0" / B/BASE PLATE)	HSS5x5x3/8	HSS6x4x3/8	HSS4x5x5/16	HSS8x6x5/8	HSS6x6x5/16	HSS8x6x5/8	HSS6x8x1/2 (GB3)	
BASE PLATE (t x W x L)	PL.1"x11"x0'-11"	PL.1 1/4"x10"x1'-0"	PL.3/4"x10"x0'-10"	PL.3/4"x12"x1'-2"	PL.1"x12"x1'-0"	PL.1"x10"x0'-10"	-	
ANCHOR RODS	(4)-3/4"Ø F1554-36	(4)-1"Ø F1554-36	(4)-3/4"Ø F1554-36	(4)-3/4"Ø F1554-36	(4)-1"Ø F1554-36	(4)-3/4"Ø A325	-	
BASE PLATE DETAIL	1	1	1	1	1	2	-	



TYPICAL BASE PLATE SECTION



DETAIL 1



DETAIL 2

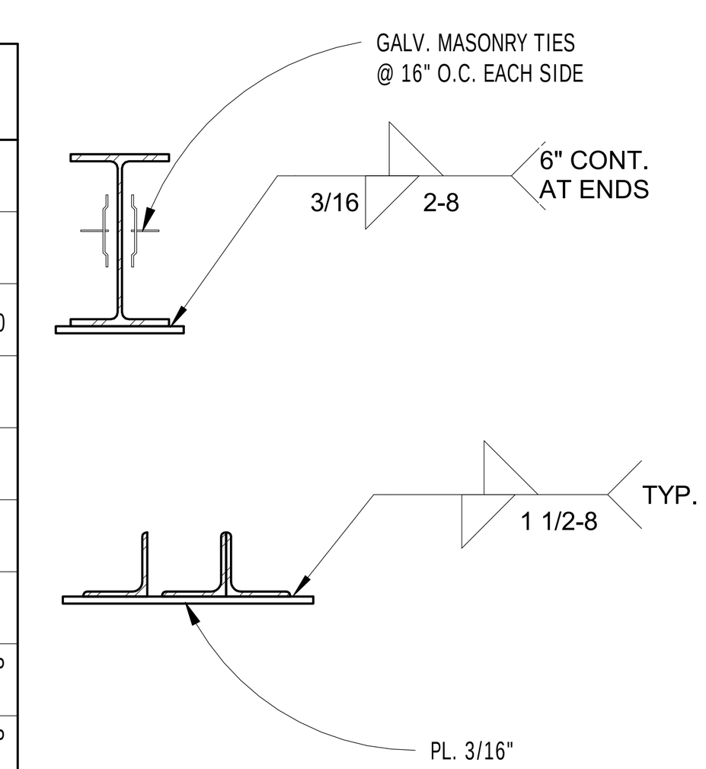
LINTEL SCHEDULE (D3)

1/2" = 1'-0"

LINTEL MARK	WALL TYPE	LINTEL INFORMATION: SHAPE	LINTEL INFORMATION: SIZE	LINTEL INFORMATION: END BEARING	REMARKS
L1	12" CMU		W8x31 + PL. 5/16"	BP1, EACH END	-
L2	12" CMU		W8x35 + PL. 5/16"	BP1, EACH END	
L3	12" CMU		W8x35 + PL. 5/16"	ATTACH TO W30	PROVIDE SHEAR PL. 3/8" CONN. TO W30
L4	8" CMU		2L6x3 1/2x5/16 + PL. 5/16"	8" EACH END	
L5	8" CMU		W8x28 + PL. 5/16"	BP2, EACH END	
L6	8" CMU		W8x18 + PL. 5/16"	8" EACH END	
L7	12" CMU		W8x31 + PL. 5/16"	8" EACH END	
L8	8" CMU		W16x31 + PL. 5/16"	BP5, EACH END	PROVIDE WELDABLE DOWELS FROM TOP OF LINTEL TO MATCH WALL REINF.
L9	8" CMU		W8x24 + PL. 5/16"	BP5, EACH END	PROVIDE WELDABLE DOWELS FROM TOP OF LINTEL TO MATCH WALL REINF.
L10	8" CMU		W16x36 + PL. 5/16"	BP6, EACH END	PROVIDE WELDABLE DOWELS FROM TOP OF LINTEL TO MATCH WALL REINF.
L11	6" CMU		W8x18 + PL. 5/16"	8" EACH END	
L12	10" CMU		W8x31 + PL. 5/16"	BP1, EACH END	
L13	10" CMU		W16x36 + PL. 5/16"	BP5, EACH END	
L14	8" CMU		W16x36 + PL. 5/16"	BP6, EACH END	PROVIDE WELDABLE DOWELS FROM TOP OF LINTEL TO MATCH WALL REINF.
L15	8" CMU		16"x8" CMU LINTEL BEAM W/ 2-#5, TOP & BOTT.	8", EACH END, TYP. @ MECH. OPGS., TYP., U.N. ON PLANS	
L16	12" CMU		16"x12" CMU LINTEL BEAM W/ 2-#5, TOP & BOTT.	8", EACH END, TYP. @ MECH. OPGS., TYP., U.N. ON PLANS	

LINTEL NOTES:

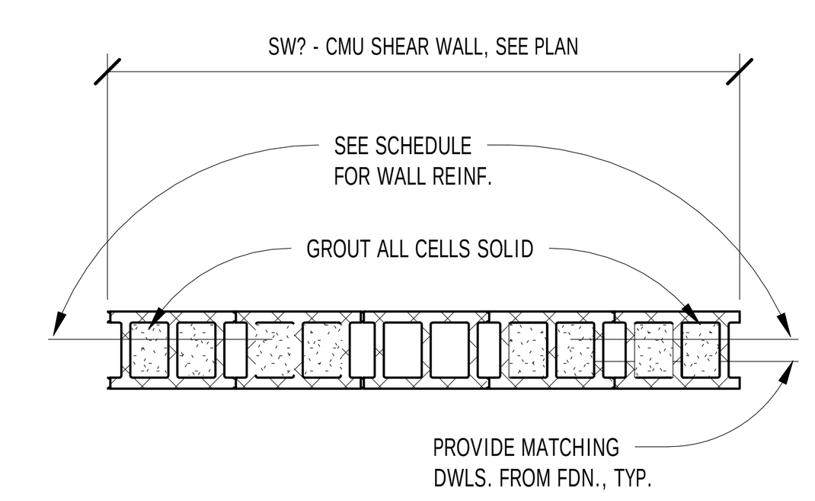
PROVIDE LINTELS AS SPECIFIED PER LINTEL SCHEDULE. WHERE LINTELS ARE NOT SPECIFIED, SELECT LINTEL FROM SCHEDULE WHICH IS MOST APPROPRIATE FOR CASE INVOLVED.
EXTEND LINTELS PAST BRICK AND CAVITY & BEAR COMPLETELY ON CMU.
ALL LINTELS IN EXTERIOR CONSTRUCTION SHALL BE HOT-DIP GALVANIZED



CMU SHEAR WALL SCHEDULE (D5)

1/2" = 1'-0"

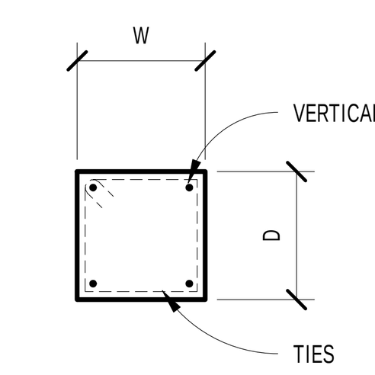
SHEAR WALL MARK	ADDITIONAL REBAR @ END CELL, FULL HEIGHT
MSW1	1-#8
MSW2	2-#8
MSW3	2-#7
MSW4	2-#6



CONCRETE PIER SCHEDULE (D7)

1/2" = 1'-0"

PIER MARK	PIER SIZE: W	PIER SIZE: D	REINFORCING: VERTICAL	REINFORCING: TIES	REMARKS
P1	18"	18"	4-#5	#3 @ 10"	T/ PIER EL.(-)1'-0"



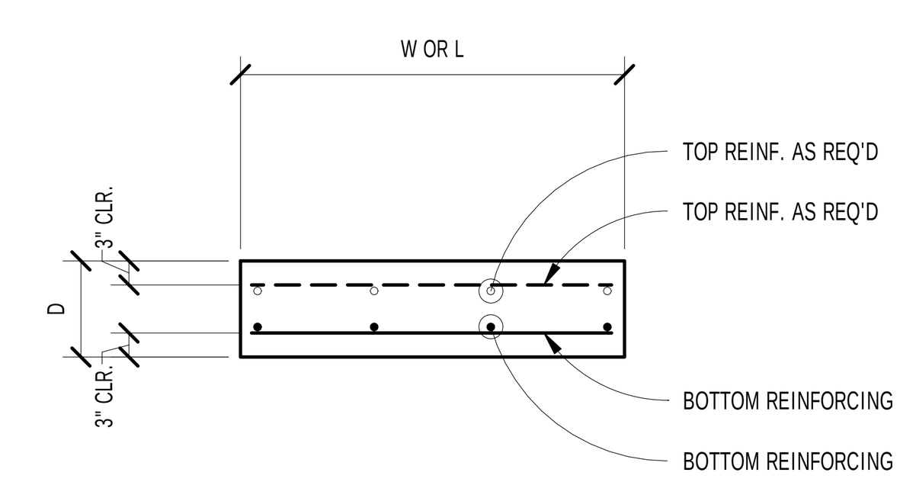
DETAIL 1

FOOTING SCHEDULE (E7)

1/2" = 1'-0"

1

FOOTING MARK	FOOTING SIZE (W x L x D)	REINFORCING EACH WAY, BOTTOM, U.N.	REMARKS
F3.0	3'-0"x3'-0"x1'-0"	3-#5	-
F4.0	4'-0"x4'-0"x1'-0"	5-#5, TOP & BOTT. EACH WAY	
F5.0	5'-0"x5'-0"x1'-0"	6-#5, TOP & BOTT. EACH WAY	
F6.0	6'-0"x6'-0"x1'-2"	7-#6, TOP & BOTT. EACH WAY	
F7.0	7'-0"x7'-0"x1'-5"	8-#6, TOP & BOTT. EACH WAY	
F8.0	8'-0"x8'-0"x1'-7"	9-#6, TOP & BOTT. EACH WAY	
F9.0	9'-0"x9'-0"x1'-9"	10-#6, TOP & BOTT. EACH WAY	
F10.0	10'-0"x10'-0"x3'-0"	11-#6, TOP & BOTT. EACH WAY	



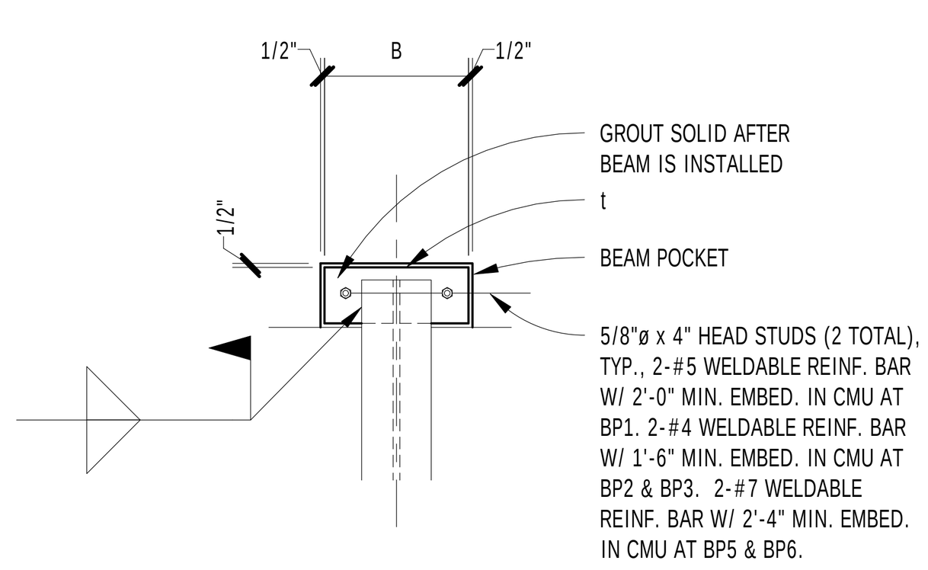
BEARING PLATE SCHEDULE (F7)

1/2" = 1'-0"

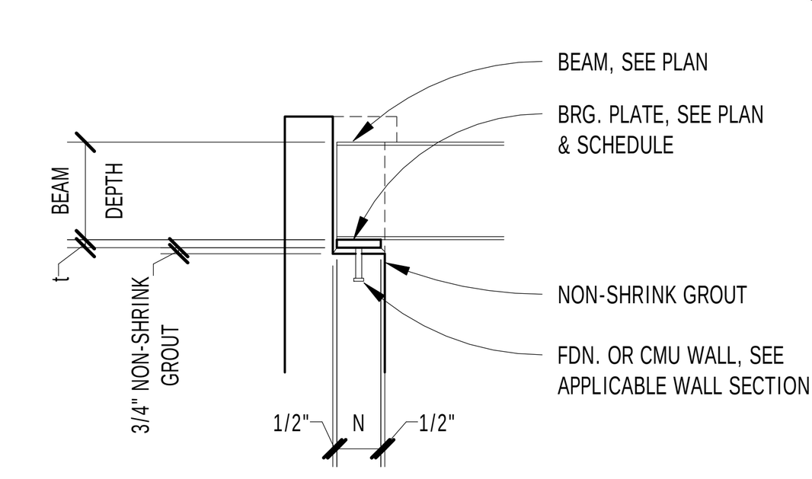
BEARING PLATE MARK	SIZE t x N x B
BP1	PL. 3/4"x10"x1'-0" LONG
BP2	PL. 1/2"x6 1/2"x0'-10" LONG
BP3	PL. 1/2"x5"x1'-4" LONG
BP4	PL. 1/2"x5"x0'-10" LONG
BP5	PL. 1/2"x6 1/2"x0'-10" LONG
BP6	PL. 1/2"x7 5/8"x0'-10" LONG
BP8	PL. 1/2"x9"x1'-0" LONG
GB1	W8x28x3'-0" GRILLAGE BEAM
GB2	W8x28x3'-0" GRILLAGE BEAM
GB3	W8x31x2'-0" GRILLAGE BEAM

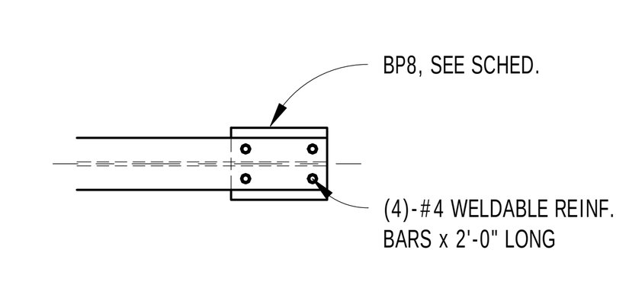
NOTE:

AT CONCRETE AND CMU WALLS FORM POCKETS FOR BEARING PLATES 1/2" LARGER ALL AROUND THAN THE BEARING PLATE SIZE.

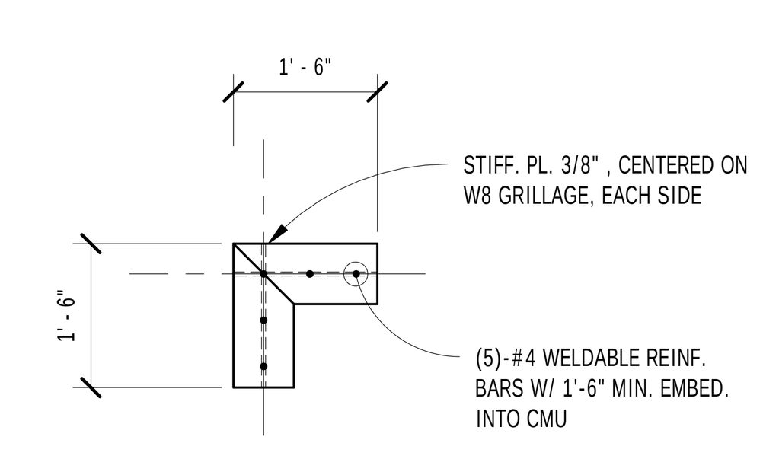


BEARING PLATE

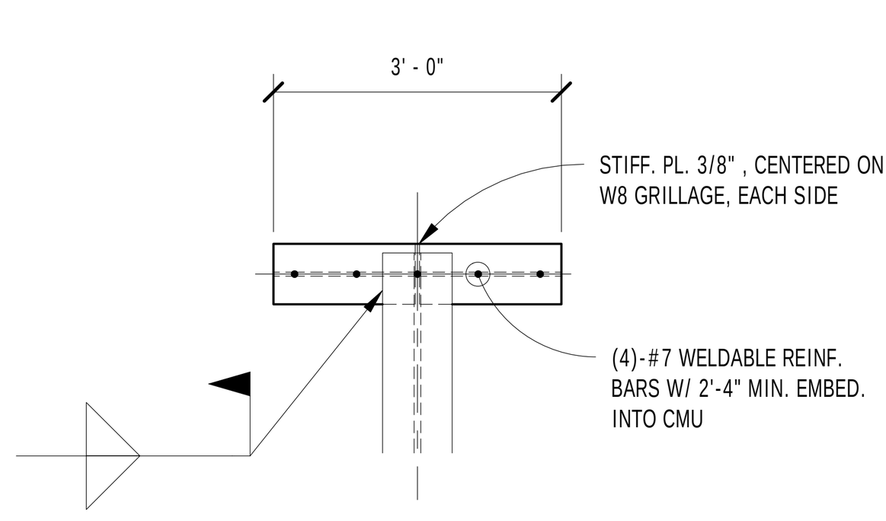




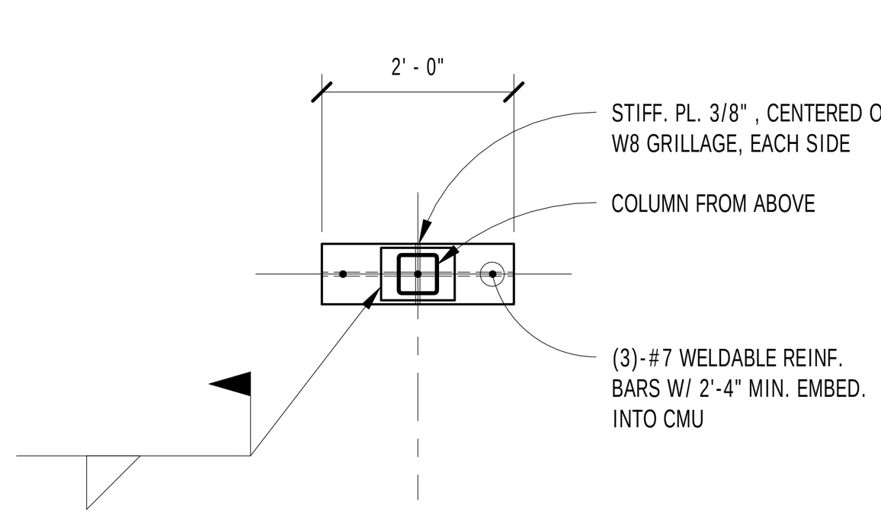
BP8



GB1



GB2



GB3

IL

A

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License Number: Date

Revisions		
Description	Date	Num
Issued for Bid	**12/30/22**	**0**
Addendum #3	**03.03.23**	**1**

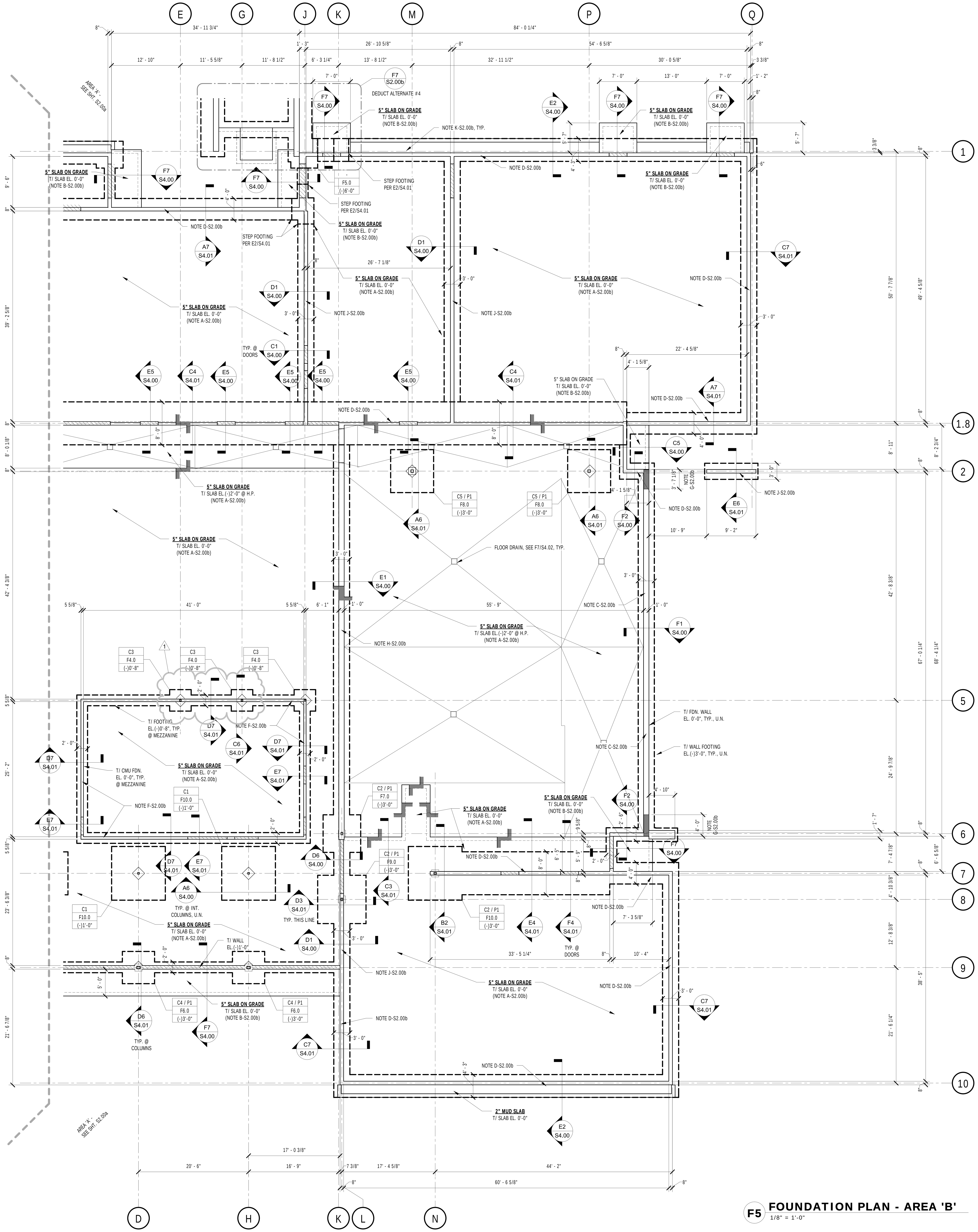
Comm: **213106**
Date: **12/30/2022**
Drawn: **PCW**
Check: **KLA**

North

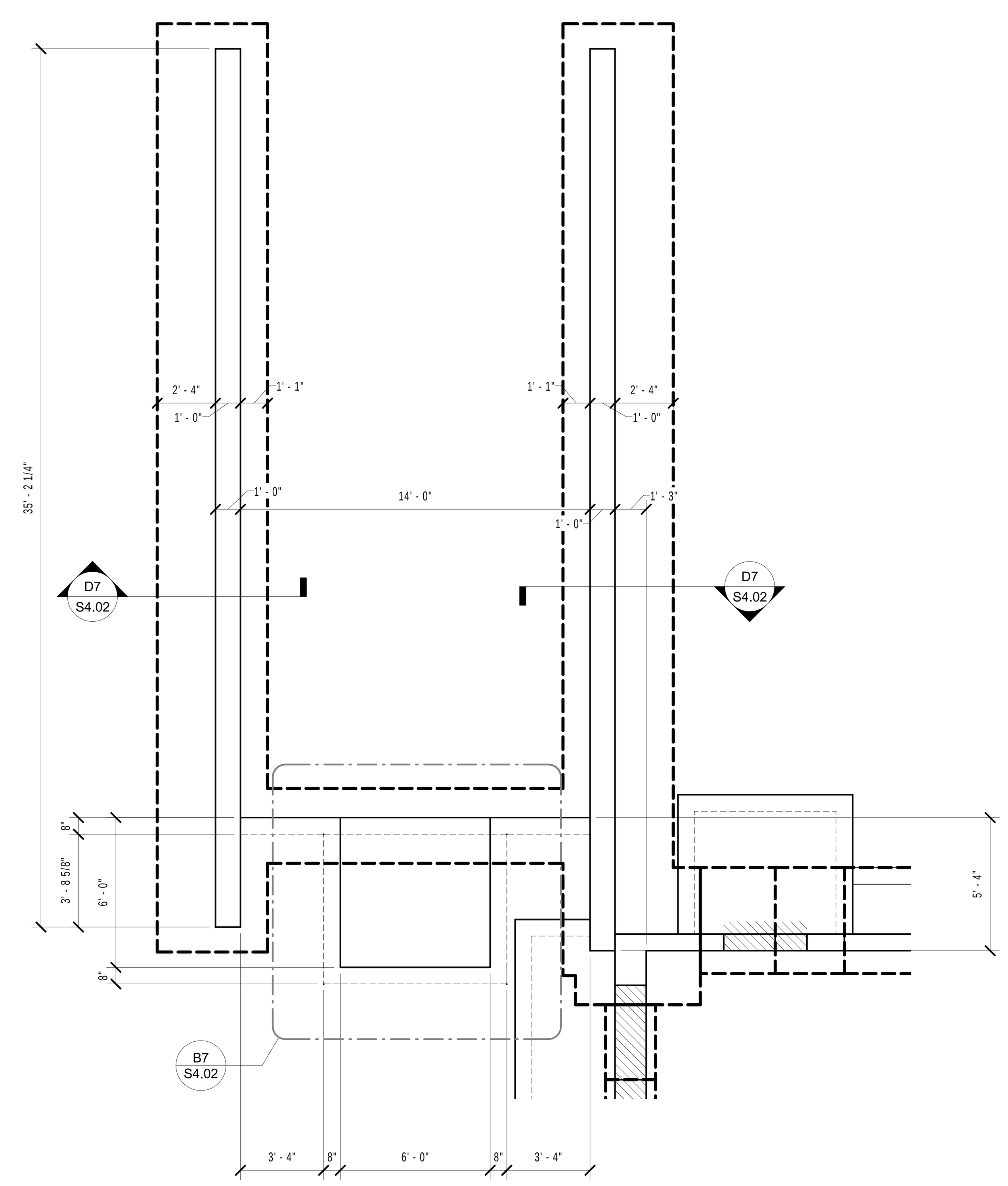
STRUCTURAL SCHEDULES

Scale: 1/2" = 1'-0"

S0.11



F5 FOUNDATION PLAN - AREA 'B'
1/8" = 1'-0"



F7 ENLARGED DOCK FOUNDATION PLAN
1/4" = 1'-0"

DRAWING S2.00b GENERAL NOTES:

C? / P?	- INDICATES COLUMN MARK / PIER MARK; SEE B4 & D7/S0.11
F?	- INDICATES FOOTING MARK; SEE E7/S0.11
x'-x"	- INDICATES TOP OF FOOTING ELEVATION BELOW TOP OF SLAB ELEVATION.

DRAWING S2.00b LEGEND:

MP1	INDICATES MASONRY PIER, SEE SCHEDULE ON SHT.
MSW?	INDICATES CMU SHEAR WALL, SEE SCHEDULE ON SHT.
	INDICATES TOP OF FOUNDATION WALL TO BE DEPRESSED, SEE SECTION x/Sx.x
	INDICATES EXTENT OF SHEAR WALL / BRACED BAY

DRAWING S2.00b KEYNOTES:

A-S2.00b: PROVIDE 5" SLAB ON GRADE, REINFORCED WITH 6x6-W2.9xW2.9 WELDED WIRE FABRIC. PLACE SLAB ON VAPOR BARRIER OVER 6" OF COMPACTED GRANULAR FILL. SLOPE SLAB TO FLOOR DRAINS. SEE ARCHITECTURAL AND PLUMBING SHTS.

B-S2.00b: PROVIDE 5" SLAB ON GRADE, REINFORCED WITH 6x6-W2.9xW2.9 WELDED WIRE FABRIC. PLACE SLAB OVER 6" OF COMPACTED GRANULAR FILL. SLOPE SLAB TO DRAIN AWAY FROM BUILDING.

C-S2.00b: PROVIDE #8 @ 8" O.C. - 12" CMU REINFORCING EACH FACE, FULL HEIGHT OF WALL IN GROUTED CELLS. PROVIDE MATCHING DOWELS IN FOUNDATION WALLS.

D-S2.00b: PROVIDE #6 @ 16" O.C. - 8" CMU REINFORCING EACH FACE, FULL HEIGHT OF WALL IN GROUTED CELLS. PROVIDE MATCHING DOWELS IN FOUNDATION WALLS. GROUT ALL CELLS SOLID. PROVIDE #6 @ 8" O.C. REINFORCING EACH FACE IN GROUTED CELLS FOR A MINIMUM DISTANCE OF 2'-0" FROM CORNERS, ALLEDGES OF OPENINGS AND EACH SIDE OF CONROL JOINTS. PROVIDE MATCHING DOWELS IN FOUNDATION WALLS.

E-S2.00b: PROVIDE 10" THICKENED SLAB UNDER AREA OF NON-LOAD BEARING CMU WALL, SEE B6/S4.00. SEE ARCHITECTURAL SHEETS FOR EXACT LOCATIONS OF CMU WALLS.

F-S2.00b: PROVIDE #5 @ 48" O.C. - 6" CMU REINFORCING EACH FACE, FULL HEIGHT OF WALL IN GROUTED CELLS. PROVIDE MATCHING DOWELS IN FOUNDATION WALLS. PROVIDE ADDITIONAL 1-#5 6" CMU RIENFORCING FULL HEIGHT OF WALL IN GROUTED CELLS IN ALL CORNERS, ALL EDGES OF OPENINGS AND EACH SIDE OF CONROL JOINTS. PROVIDE MATCHING DOWELS IN FOUNDATION WALLS.

G-S2.00b: PROVIDE #9 @ 8" O.C. - 12" CMU REINFORCING EACH FACE, FULL HEIGHT OF WALL IN GROUTED CELLS. PROVIDE MATCHING DOWELS IN FOUNDATION WALLS.

H-S2.00b: PROVIDE #6 @ 24" O.C. - 12" CMU REINFORCING EACH FACE, FULL HEIGHT OF WALL, GROUT ALL CELLS SOLID. PROVIDE MATCHING DOWELS IN FOUNDATION WALLS.

J-S2.00b: PROVIDE #6 @ 24" O.C. - 8" CMU REINFORCING EACH FACE, FULL HEIGHT OF WALL IN GROUTED CELLS. PROVIDE MATCHING DOWELS IN FOUNDATION WALLS.

K-S2.00b: CONTRACTOR SHALL COORDINATE THE LOCATION OF ALL SLEEVES PENETRATING THE FOUNDATION WALLS PRIOR TO POURING THE FOUNDATION, SEE DETAIL E1/S4.01 FOR DETAILS.

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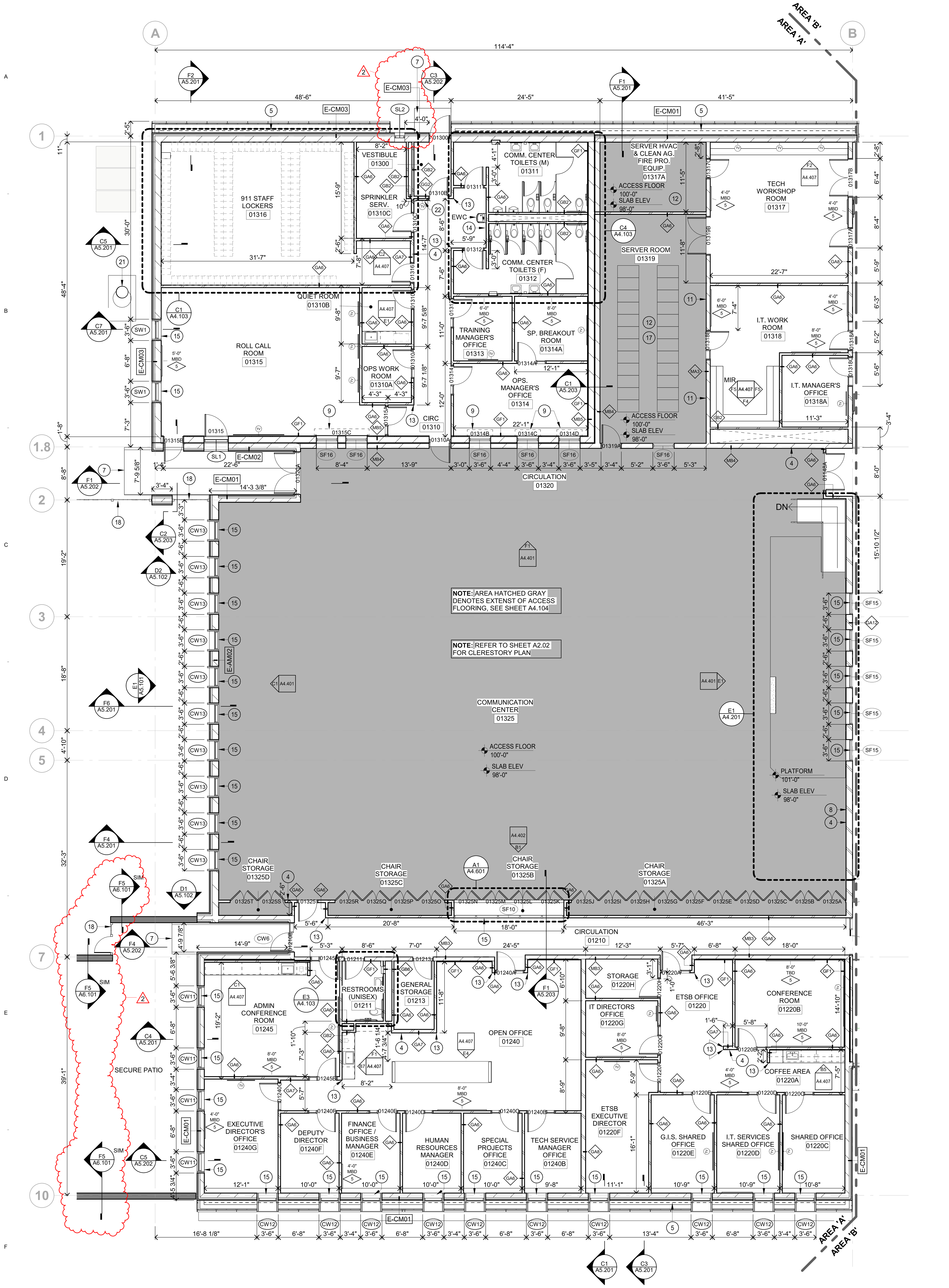
North

FOUNDATION PLAN - AREA 'B'

Scale: **As indicated**

S2.00b



F1 MAIN LEVEL FLOOR PLAN - AREA 'A'
1/8" = 1'-0"

PLAN GENERAL NOTES

1. ALL PLAN DIMENSIONS ARE NOMINAL TO FACE OF WALL. WALL THICKNESSES ARE SHOWN NOMINAL, SEE WALL TYPES FOR ACTUAL THICKNESS.
2. ALL GYP. WALLS ARE TO BE 5 INCHES THICK UNLESS OTHERWISE NOTED.
3. ALL CONCRETE BLOCK WALLS ARE TO BE 8 INCHES THICK UNLESS OTHERWISE NOTED.
4. COORDINATE SIZE AND LOCATION OF ALL DUCT AND SHAFT OPENINGS IN WALLS AND FLOORS W/ MECH. AND ELEC. PROVIDE ALL REQUIRED LINTELS FOR OPENINGS. SEE LINTEL SCHEDULE.
5. FIELD VERIFY ALL MILLWORK OPENINGS.
6. SET FLOOR DRAINS 3/4" BELOW FINISHED CONCRETE FLOORS UNLESS OTHERWISE NOTED. PROVIDE CONSISTENT SLOPE FROM WALL TO DRAIN BY SLOPING CONCRETE, MIN. 1/4" PER FOOT.
7. VERIFY LOCATION, SIZE AND QUANTITY OF ALL MECHANICAL AND ELECTRICAL EQUIPMENT PADS.
8. ALL DOOR/SIDELITE OPENINGS TO BEGIN 4" FROM ADJACENT WALL UNLESS OTHERWISE NOTED.
9. ALL GYP. WALLS ARE CENTERED ON GRID UNLESS OTHERWISE NOTED. ALL EXPOSED CORNERS SHALL BE BULLNOSE.
10. FIRE RATED WALLS ARE INDICATED ON CODE PLANS.
11. PROVIDE BLOCKING AT ALL VISUAL DISPLAY BOARD AND MONITOR LOCATIONS. SEE DETAIL C7 / A4.102
12. COORDINATE FINAL LOCATION OF ALL MONITORS WITH OWNER PRIOR TO INSTALLATION.
13. CONTRACTOR TO PROVIDE BIM CLASH DETECTION IN ACCORDANCE WITH ALL REQUIREMENTS AS INDICATED IN SPECIFICATION SECTION 01 32 50

ROOM FINISH SCHEDULE GENERAL NOTES

1. SEE INTERIOR MATERIAL FINISH / COLOR SCHEDULE FOR ABBREVIATIONS
2. IF ALL WALLS IN ROOM HAVE THE SAME FINISH, THE "N WALL-TYP" COLUMN WILL BE USED.
3. DISCREPANCIES BETWEEN THE ROOM FINISH SCHEDULE AND DRAWINGS SHALL BE REPORTED TO THE ARCHITECT FOR FINISH DETERMINATION.
4. ON WALLS WHICH ARE COVERED WITH MILLWORK AND TACK SURFACES, A FINISH SHALL NOT BE APPLIED TO THE WALL BEHIND EXCEPT FOR LOCATIONS WHICH MAY BE EXPOSED (I.E. SPACE BETWEEN MILLWORK AND TACK SURFACE.) CONCRETE BLOCK BEHIND MILLWORK AND MARKERBOARDS TO BE TOOLED.
5. REFER TO MATERIAL FINISH/ COLOR SCHEDULE FOR SPECIFIC FINISH TYPES AND COLORS.
6. FOR CEILING MATERIAL WHEN MORE THAN ONE CEILING MATERIAL OCCURS THE CEILING FINISH IS INDICATED THUS: "/".

ROOM FINISH SCHEDULE REMARKS

1. SEE INTERIOR ELEVATIONS FOR ADDITIONAL FINISH INFORMATION.
2. PROVIDE GYPSUM BOARD SOFFIT ABOVE CASEWORK. (SEE CASEWORK ELEVATIONS AND REFLECTED CEILING PLANS.)
3. PROVIDE VINYL BASE AT CASEWORK.
4. PAINT CEILING AND ALL EXPOSED STRUCTURE, PIPING, CONDUIT, MECHANICAL DUCTS AND VENTS.
5. NOT USED
6. SEE A4.305 FOR TILE PATTERNS.
7. SEE FLOOR FINISH PLANS FOR ADDITIONAL FLOORING INSTALLATION INFORMATION.
8. PROVIDE FRP PANELS AND TRIM TO 4'-0" AFF AT ALL WALLS WITH PAINT ABOVE.

FLOOR PLAN KEY NOTES:

1. DOOR ACTUATORS
2. BOLLARD - SEE DETAIL 21001.
3. MOP SINK - SEE MECHANICAL
4. FIRE EXTINGUISHER. COORDINATE LOCATION WITH OWNER AND FIRE MARSHALL.
5. DRAIN TILE TO EXTENTS AS INDICATED BY DASHED LINE.
6. CABINET UNIT HEATER. SEE DETAIL 43046. SEE MECH. FOR SPECIFICATIONS, COORDINATE LOCATION WITH MECH.
7. CONCRETE STOOP, ALIGN WITH CENTER OF DOOR U.N.O - SEE STRUCT.
8. LOCATION OF SEMI-RECESSED DEFIBRILLATOR CABINET. COORDINATE LOCATION WITH OWNER.
9. WALL MOUNTED COILING FIRE/STORM SHUTTER
10. SHELF AND MOP HOLDER
11. FIRE RATED CONSTRUCTION WALL PANEL. FULL SHEETS MOUNTED VERTICALLY ABOVE WALL BASE - COORDINATE WITH ELEC
12. ALL DOORS, WALLS, AND WINDOWS ARE TO BE SEALED AIR TIGHT.
13. CORNER GAURD, SEE C4/A4.601
14. PROVIDE FULL HEIGHT TILE AT INDICATED WALL. SEE B7/A4.305
15. MANUAL ROLLER SHADE.
16. MOTORIZED ROLLER SHADE, SEE ELEC. & REFERENCE DETAIL F5/A4.903
17. SEE MAIN LEVEL ACCESS FLOOR PLAN FOR ADDITIONAL DETAIL
18. ORNAMENTAL METAL FENCE - SEE ARCH SITE PLAN
19. INTERCOM KIOSK
20. NEW AUXCOM TOWER - REFER TO SHEET R2.02
21. NEW 911 TOWER - REFER TO SHEET R2.01
22. WALL MOUNTED MONITOR. PROVIDED BLOCKING AS TYPICAL. VERIFY FINAL HEIGHT WITH OWNER

ROOM FINISH SCHEDULE

ROOM NO	ROOM NAME	FLOOR	BASE	N WALL - TYP MATL	N WALL - TYP FIN	E WALL MATL	E WALL FIN	S WALL MATL	S WALL FIN	W WALL MATL	W WALL FIN	REMARKS
01210	CIRCULATION	LVT-1	VB	GWB	PT 6A	GWB	PT 6A	B BLK-1 / GWB	-- / PT 6A	GWB	PT 6A	
01211	RESTROOMS (UNISEX)	P TILE-2	P TILE-1	GWB	PT 6A	GWB	P TILE-1	GWB	PT 6A	GWB	PT 6A	6
01213	GENERAL STORAGE	CPT-1	VB	CMU	PT 6A	GWB	PT 6A	GWB	PT 6A	GWB	PT 6A	
01220	ETSB OFFICE	CPT-3 / LVT-1	VB	GWB	PT 6A	GWB	PT 6D	GWB	PT 6A	GWB	PT 6A	7
01220A	COFFEE AREA	LVT-1	VB	GWB	PT 6A							2, 3, 7
01220B	CONFERENCE ROOM	CPT-3	VB	GWB	PT 6D	GWB	PT 6A	GWB	PT 6A	GWB	PT 6A	
01220C	SHARED OFFICE	CPT-1	VB	GWB	PT 6A							
01220D	I.T. SERVICES SHARED OFFICE	CPT-1	VB	GWB	PT 6A							
01220E	G.I.S. SHARED OFFICE	CPT-1	VB	GWB	PT 6A							
01220F	ETSB EXECUTIVE DIRECTOR	CPT-1	VB	GWB	PT 6A							
01220G	IT DIRECTORS OFFICE	CPT-1	VB	GWB	PT 6A							
01220H	STORAGE	CPT-1	VB	CMU	PT 6A	GWB	PT 6A	GWB	PT 6A	GWB	PT 6A	
01240	OPEN OFFICE	CPT-3 / LVT-1	VB	GWB	PT 6A	GWB	PT 6D	GWB	PT 6A	GWB	PT 6A	2, 3, 7
01240B	TECH SERVICE MANAGER OFFICE	CPT-1	VB	GWB	PT 6A							
01240C	SPECIAL PROJECTS OFFICE	CPT-1	VB	GWB	PT 6A							
01240D	HUMAN RESOURCES MANAGER	CPT-1	VB	GWB	PT 6A							
01240E	FINANCE OFFICE / BUSINESS MANAGER	CPT-1	VB	GWB	PT 6A							
01240F	DEPUTY DIRECTOR	CPT-1	VB	GWB	PT 6A							
01240G	EXECUTIVE DIRECTOR'S OFFICE	CPT-1	VB	GWB	PT 6A							
01245	ADMIN CONFERENCE ROOM	CPT-3 / LVT-1	VB	GWB	PT 6A	GWB	PT 6A	GWB	PT 6A	GWB	PT 6D	2, 3, 7
01300	VESTIBULE	CPT-4	VB	GWB	PT 6A							
01310	CIRC	LVT-1	VB	GWB	PT 6A	GWB	PT 6A / P TILE-1	GWB	PT 6A	GWB	PT 6A	6
01310A	OPS WORK ROOM	CPT-1	VB	GWB	PT 6A							
01310B	QUIET ROOM	CPT-1	VB	GWB	PT 6A							2, 3
01310C	SPRINKLER SERV.	CPT-1	VB	CMU	PT 6A	GWB	PT 6A	GWB	PT 6A	GWB	PT 6A	
01311	COMM. CENTER TOILETS (M)	P TILE-2	P TILE-1	CMU	P TILE-1	GWB	PT 6A	GWB	P TILE-1	GWB	PT 6A	6
01312	COMM. CENTER TOILETS (F)	P TILE-2	P TILE-1	GWB	P TILE-1	GWB	PT 6A	GWB	P TILE-1	GWB	PT 6A	6
01313	TRAINING MANAGER'S OFFICE	CPT-1	VB	GWB	PT 6A							
01314	OPS. MANAGER'S OFFICE	CPT-1	VB	GWB	PT 6A							
01314A	SP. BREAKOUT ROOM	CPT-1	VB	GWB	PT 6A							
01315	ROLL CALL ROOM	CPT-1	VB	GWB	PT 6A							
01316	911 STAFF LOCKERS	CPT-1	VB	CMU	PT 6A	GWB	PT 6A	GWB	PT 6A	CMU	PT 6A	
01317	TECH WORKSHOP ROOM	POLISHED CONC	VB	CMU	PT 6A	GWB	PT 6A	GWB	PT 6A	CMU	PT 6A	
01317A	SERVER HVAC & CLEAN AG. FIRE PRO. EQUIP.	HPL	VB	CMU	PT 6A	CMU	PT 6A	GWB	PT 6A	CMU	PT 6A	
01318	I.T. WORK ROOM	CPT-1	VB	GWB	PT 6A	GWB	PT 6A	GWB	PT 6A	CMU	PT 6A	
01318A	I.T. MANAGER'S OFFICE	CPT-1	VB	GWB	PT 6A							
01319	SERVER ROOM	HPL	VB	GWB	PT 6A	CMU	PT 6A	CMU	PT 6A	CMU	PT 6A	
01320	CIRCULATION	LVT-1	VB	B BLK-1	--	GWB	PT 6A	--	--	GWB	PT 6A	1
01325	COMMUNICATION CENTER	CPT-1 / CPT-2	VB	GWB	PT 6A	GWB	PT 6A / PT 6B	GWB	PT 6A	GWB	PT 6A / PT 6B	1, 7
01325A	CHAIR STORAGE	CPT-1	VB	GWB	PT 6A							
01325B	CHAIR STORAGE	CPT-1	VB	GWB	PT 6A							
01325C	CHAIR STORAGE	CPT-1	VB	GWB	PT 6A							
01325D	CHAIR STORAGE	CPT-1	VB	GWB	PT 6A							

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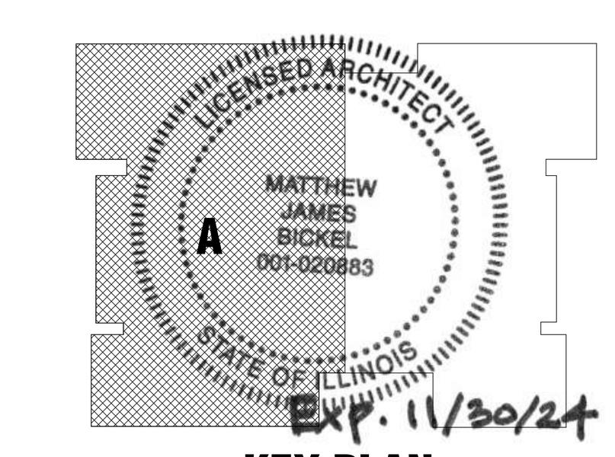


MATTHEW JAMES BICKEL 001-020883 STATE OF ILLINOIS LICENSED ARCHITECT
EXP. 11/30/24

KEY PLAN

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed **ARCHITECT** under the laws of the State of **Illinois**

Matthew J Bickel
License Number: **001.020883** Date **11/30/2024**

Revisions		
Description	Date	Num
Addendum #2	02/24/2023	1
Addendum #3	03/01/2023	2

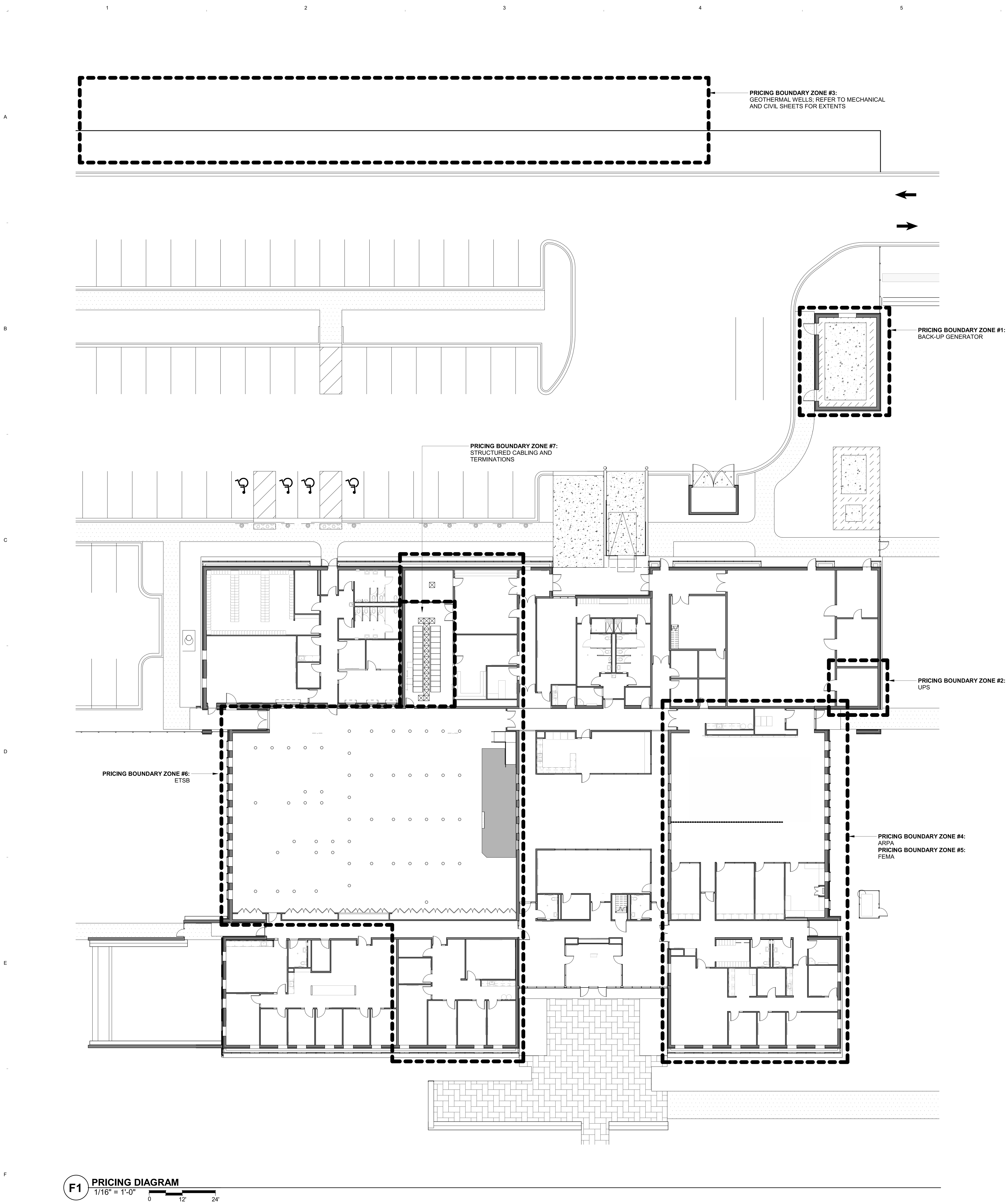
Comm: 213106
Date: 12/30/2022
Drawn: JMK / MB
Check: KME

North

FLOOR PLAN - AREA 'A'

Scale: As indicated

A2.01a



F1 PRICING DIAGRAM
1/16" = 1'-0"

PRICING BOUNDARY ZONES GENERAL NOTES:

1. REFER TO ALL TRADES/ DISCIPLINES DRAWINGS AND SPECIFICATIONS FOR ALL ITEMS INCLUDED WITHIN THE PRICING BOUNDARY ZONES.
2. REFER TO PROJECT BID FORM AND LAKE COUNTY BID SOLICITATION FORM FOR ADDITIONAL INFORMATION.
3. ZONE MAP IS DIAGRAMMATIC AND FINAL COSTS PER ZONE WILL BE REVIEWED WITH THE OWNER FOR BILLING PURPOSES AND REFLECTED IN THE PROJECT SCHEDULE OF VALUES.

ZONE #1:
Backup Generator (equipment and install), including: foundation, barrier wall, wiring, controls, testing, and start up.

ZONE #2:
UPS (equipment and install): wiring, controls, testing and start up.

ZONE #3:
Geothermal Wells (equipment and install), including: wells, piping, manifolds, pumps, testing, and start up.

ZONE #4:
ARPA EQUIPMENT AND INSTALL. WITHIN BOUNDARY SHOWN, ASSUME 41% (ASSUME A 60/40 ZONE 4/5 SPLIT OF ALLOCATED FUNDING) PROPORTIONAL COSTS WITHIN THE OVERALL CONSTRUCTION COST. ADDITIONAL ASSIGNED COSTS SHALL ACCOUNT FOR STRUCTURED CABLING, SECURITY, AND AUDIO/ VISUAL SYSTEMS SPECIFIC TO THE EOC.

ZONE#5:
FEMA FINISHES, EQUIPMENT AND INSTALLATION. WITHIN BOUNDARY SHOWN, ASSUME 41% (ASSUME A 4/5 SPLIT OF ALLOCATED FUNDING) PROPORTIONAL COSTS WITHIN THE OVERALL CONSTRUCTION COST. ADDITIONAL ASSIGNED COSTS SHALL ACCOUNT FOR STRUCTURED CABLING, SECURITY, AND AUDIO/ VISUAL SYSTEMS SPECIFIC TO THE EOC. FINISHES ASSOCIATED WITH THE EOC SHALL BE INCLUDED AND LISTED SEPARATELY.

ZONE #6:
ETSB EQUIPMENT AND INSTALLATION. WITHIN BOUNDARY SHOWN, ASSUME 9% PROPORTIONAL COSTS WITHIN THE OVERALL CONSTRUCTION COST. ADDITIONAL ASSIGNED COSTS SHALL ACCOUNT FOR ELECTRONICS, SYSTEMS, STRUCTURED CABLING, AND OTHER FEEDS FOR THE DISPATCH CONSOLES.

ZONE #7:
ALL STRUCTURED CABLING RUNS AND TERMINATIONS

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License Number: 001.020883 Date 11/30/2024

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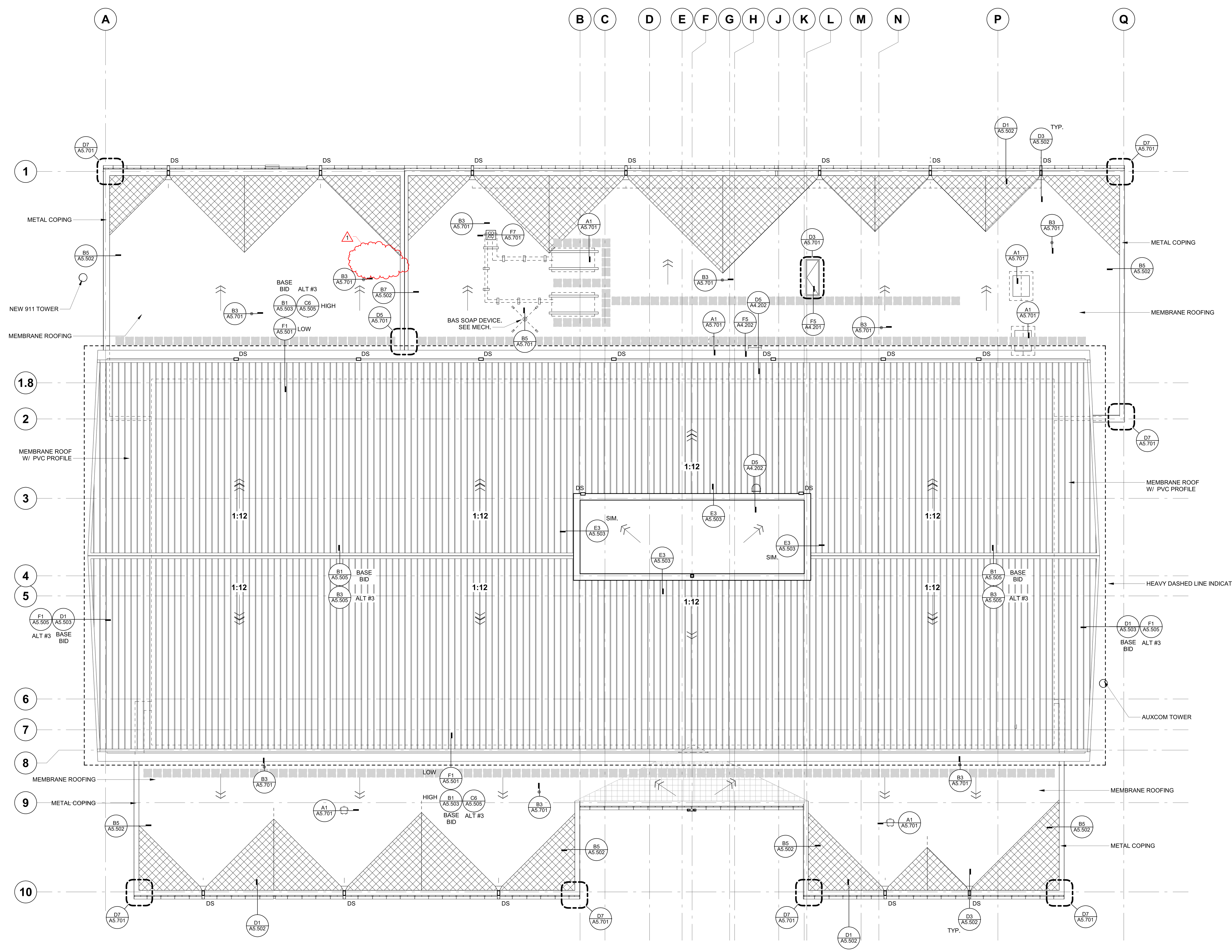
Check: JMK
North

PRICING DIAGRAM

Scale: As indicated

A2.03

IL



F1 ROOF PLAN
3/32" = 1'-0"
0 8' 16'

A

ROOF LEGEND

- ROOF DOWNSPOUT (DS)
- MECH HOOD
- EQUIPMENT CURB AT MECHANICAL EQUIPMENT
- ROOF EXHAUST
- EQUIPMENT CURB SUPPORTING PIPING OR CONDUIT. INSTALL MAXIMUM SPACING OF 5'-0" O.C.
- VENT STACK, PIPE OR CONDUIT
- COMBUSTION STACK
- CRICKET FOR POSITIVE DRAINAGE
- SLOPE OF TAPERED INSULATION
- SLOPED STRUCTURE
- ROOF LADDER
- ROOF WALKWAY PAD

ROOF PLAN GENERAL NOTES

1. TAPERED ROOF INSULATION AND CRICKETS SHALL SLOPE AT 1/4" PER 1'-0". THE THICKNESS OF THE BASE INSULATION SHALL MEET R-45.
2. SHOP DRAWING DESIGN AND INSTALLATION OF TAPERED INSULATION MUST ACCOUNT FOR CAMBER IN STRUCTURE TO INSURE THAT THE ROOF DRAINS AS DESIGNED.
3. AT MECH. OPENINGS AND CURBS ON ROOF, PROVIDE CRICKETS AS REQUIRED FOR POSITIVE DRAINAGE OR CUT OPENINGS IN FREE-STANDING CURBS AS AN ALTERNATIVE.
4. MECHANICAL ITEM LOCATIONS ARE SHOWN FOR REFERENCE ONLY. REFER TO MECH. DRAWINGS FOR EXTENT OF MECH. EQUIP. AND SIZE AND LOCATION OF ALL ROOF PENETRATIONS.
5. ALL MECHANICAL AND ELECTRICAL ROOFTOP EQUIPMENT, PIPING, CONDUIT, ETC. TO BE PAINTED.
6. COORDINATE ROOF AND OVERFLOW DRAIN LOCATIONS WITH STRUCTURAL COMPONENTS TO AVOID LOCATING ROOF OR OVERFLOW DRAINS OVER TOP OF BEAMS OR JOISTS.
7. REFER TO EXTERIOR ELEVATIONS FOR LOCATION OF OVERFLOW SCUPPERS AND OUTFLOWS.
8. AT ALL LADDERS, TOP AND BOTTOM, PROVIDE AND INSTALL A 4'-0" X 4'-0" CONCRETE PAVER LANDING.
9. ROOF LADDERS WITH NUMBER IN PARENTHESIS INDICATE RELATIVE ROOF DECK ELEVATION DIFFERENCES, NOT INCLUDING PARAPET, VERIFY EXACT LADDER HEIGHT REQUIREMENTS.
10. REFER TO REFLECTED CEILING PLAN FOR EXTENTS OF METAL METAL SOFFITS
11. REFER TO SHEET E5.20 FOR ROOF MOUNTED LIGHTING PROTECTION

Regional Operations and Communications Facility

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LICENSED ARCHITECT
MATTHEW JAMES BICKEL
001-020883
STATE OF ILLINOIS
Exp. 11/30/24

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed **ARCHITECT** under the laws of the State of **Illinois**

Matthew J Bickel
License Number: **001.020883** Date **11/30/2024**

Revisions		
Description	Date	Num
Addendum #3	**03/01/2023**	**1**

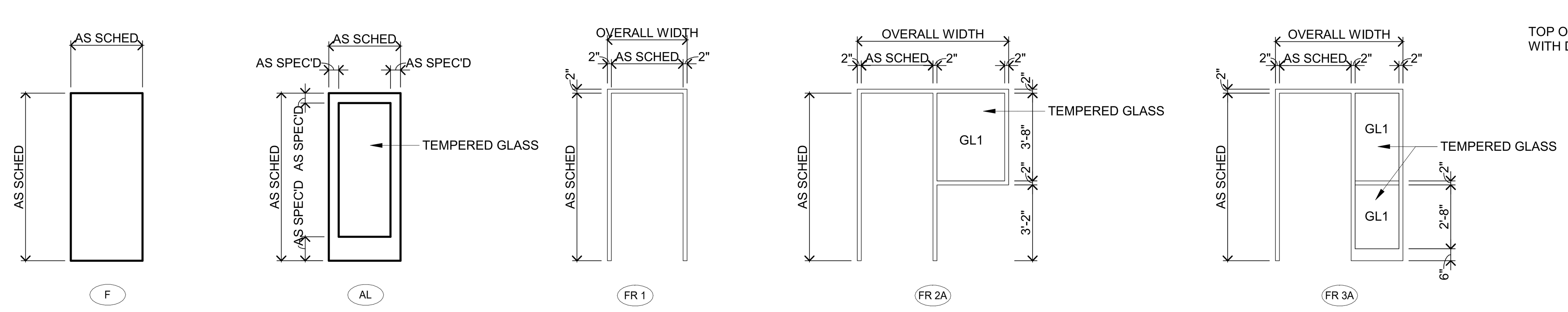
Comm: **213106**
Date: **12/30/2022**
Drawn: **ML**
Check: **JMK**

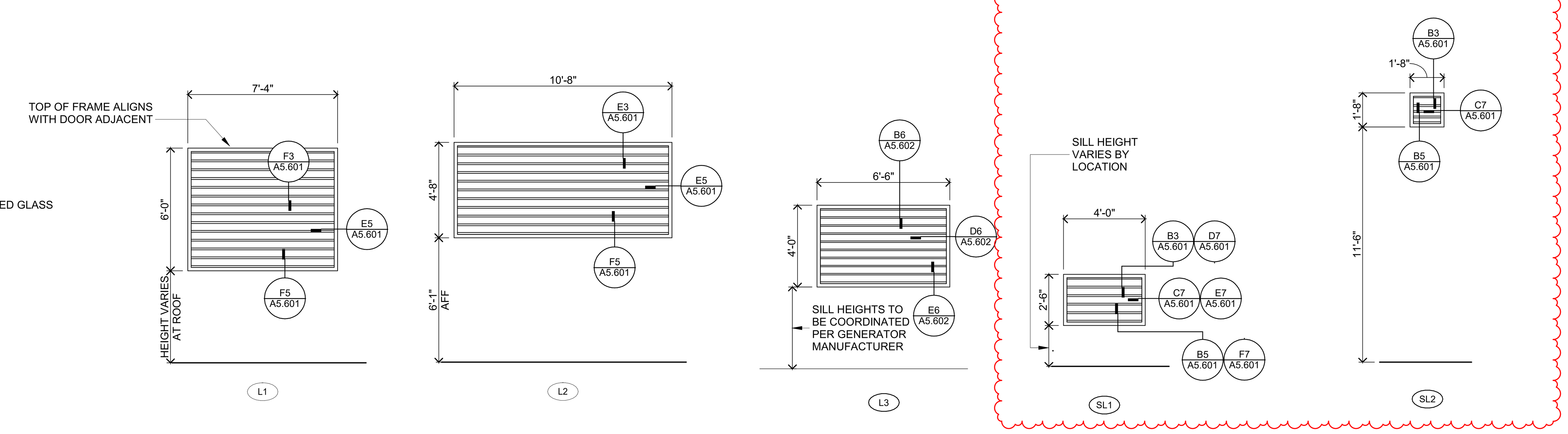
North

ROOF PLAN

Scale: **As indicated**

A2.095





DOOR SCHEDULE GENERAL NOTES

1. ALL DOORS ARE 1 3/4" THICK UNLESS OTHERWISE NOTED.
2. FOR FRAME DEPTH, ONLY EXCEPTIONS TO THE FOLLOWING TABLE ARE SCHEDULED:

   GYPSUM BOARD PARTITIONS: THROAT OF FRAME TO MATCH WALL THICKNESS.

   MASONRY PARTITIONS:

   4" WALL: 3 3/4" FRAME
   6" WALL: 5 3/4" FRAME
   8" AND GREATER WALL: 7 3/4" FRAME

   FRAME DEPTHS ARE SCHEDULED IN NOMINAL DIMENSIONS. SEE FRAME/ DOOR TYPES (DETAIL SECTION 51000) FOR CORRESPONDING ACTUAL DIMENSIONS.
3. FOR GLASS TYPES, ONLY EXCEPTIONS TO THE FOLLOWING TABLE ARE SCHEDULED:

   INTERIOR NON RATED:

   CLEAR (SAFETY WHEN REQUIRED BY TABLE IN GLAZING SPECIFICATION.)

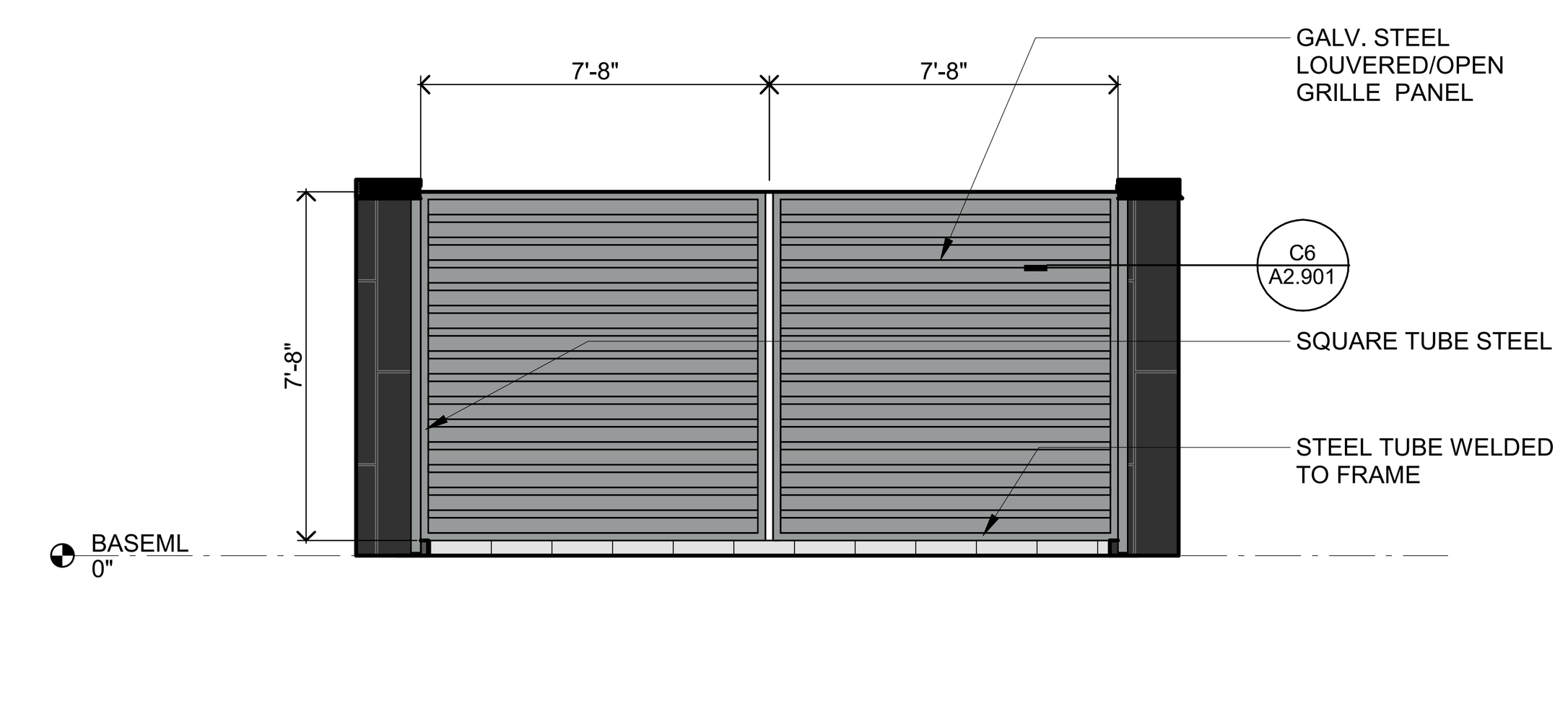
   INTERIOR AND EXTERIOR RATED:

   FIRE RATED

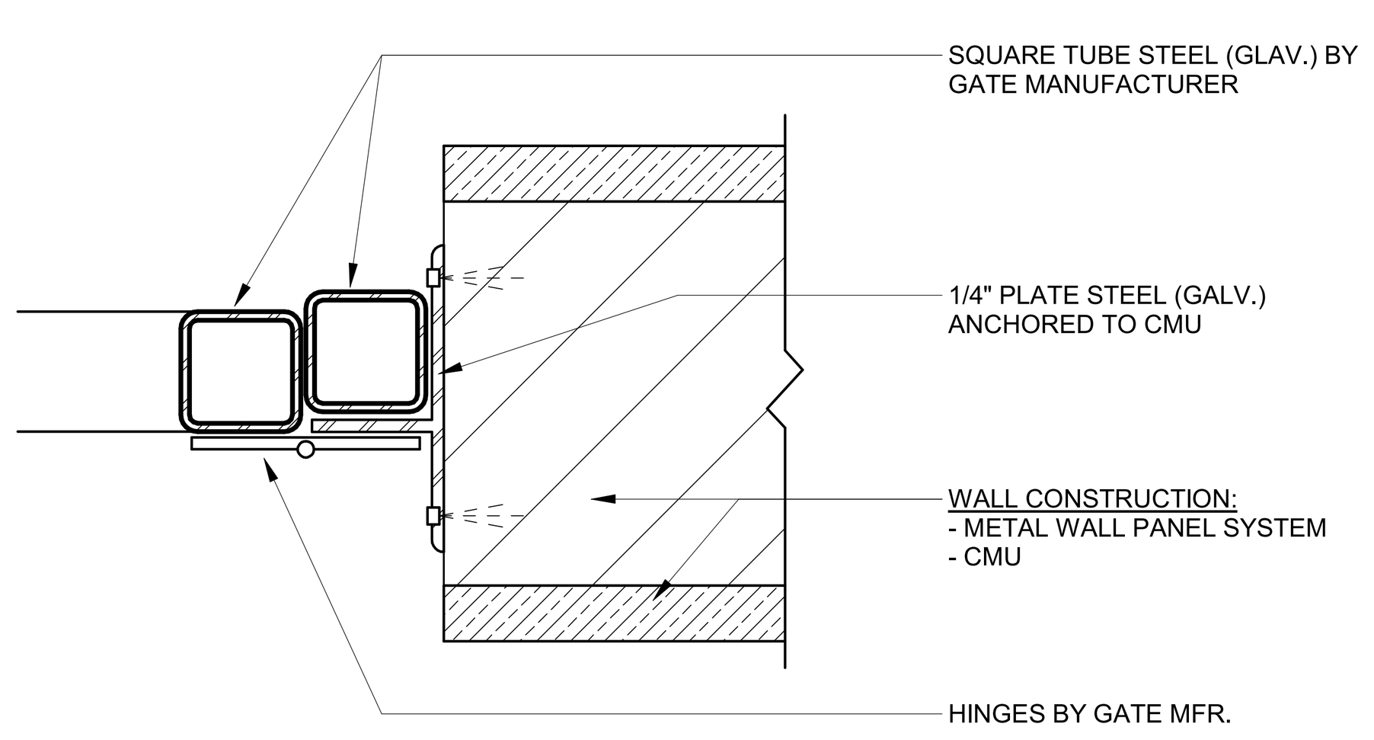
   EXTERIOR NON-RATED:

   CLEAR INSULATED (SAFETY INSULATED WHEN REQUIRED BY TABLE IN GLAZING SPECIFICATION.)
4. SEE SCHEDULE FOR FRAME TYPES.
5. SEE SCHEDULE FOR DOOR TYPES.
6. AT DOOR SCHEDULE, LABEL DESIGNATION "45/20" INDICATES:

   FOR ALL OPENINGS WITH SIDE LITES AND SCHEDULED TO BE RATED FOR 20 MINUTES, THE DOOR AND ANY GLASS WITHIN THE DOOR IS TO BE RATED FOR 20 MINUTES; THE FRAME AND ADJACENT SIDELITE(S) GLASS AND FRAME IS TO BE RATED FOR 45 MINUTES."



C4 TRASH ENCLOSURE DOORS
1/4" = 1'-0"



C6 JAMB DETAIL
3" = 1'-0"

DOOR SCHEDULE REMARKS

1. DOOR IS TO BE SEALED AIR TIGHT.
2. STORM DOOR, FRAME AND HARDWARE. DOOR HARDWARE TO BE BY STORM DOOR MANUFACTURER.
3. EXTERIOR DOOR AND HARDWARE. SEE ARCHITECTURAL SITE PLAN FOR LOCATION

DOOR / OPENING SCHEDULE - AREA 'A

	DOOR / OPENING					LABEL/	OVERALL	FRAME				MOUNTING CONDITIONS				
DOOR NO	TYPE	QTY	WIDTH	HEIGHT	MATL	RATING	WIDTH	TYPE	DEPTH	MATL	GL	HEAD	JAMB	SILL	HDW GRP	Remarks-Door
01148A	F	2	3'-0"	7'-0"	WD	--	6'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		AC1.00	
01210B	AL	1	3'-0"	9'-0"	AL	--	3'-0"	--	--	AL	--	SEE ELEV	SEE ELEV		AC6.00	
01211	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		1.00	
01213	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		2.00	
01220A	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		AC2.00	
01220B	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01220C	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01220D	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01220E	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01220F	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01220G	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01220H	F	1	3'-0"	7'-0"	WD	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		2.01	
01240A	F	1	3'-0"	7'-0"	WD	--	4'-8"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		AC2.00	
01240B	F	1	3'-0"	7'-0"	WD	--	4'-8"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01240C	F	1	3'-0"	7'-0"	WD	--	4'-8"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01240D	F	1	3'-0"	7'-0"	WD	--	4'-8"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01240E	F	1	3'-0"	7'-0"	WD	--	4'-8"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01240F	F	1	3'-0"	7'-0"	WD	--	4'-8"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01240G	F	1	3'-0"	7'-0"	WD	--	4'-8"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01245A	F	1	3'-0"	7'-0"	WD	--	4'-8"	FR 2A	--	HM	--	B3/A4.801	B4/A4.801		AC2.01	
01245B	F	1	3'-0"	7'-0"	WD	--	4'-8"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.01	
01300	FG2	1	3'-3"	7'-0"	AL	--	3'-7"	SFR 1	--	AL	--	C3/A5.601	D3/A5.601			2
01310A	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		1.00	
01310A	F	1	3'-3"	7'-0"	HM	90 MIN	3'-7"	FR 1	--	HM	--	F1/A4.801	F3/A4.801			2
01310B	F	1	3'-0"	7'-0"	WD	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		1.00	
01310B	F	1	3'-0"	7'-0"	WD	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		4.00	
01310C	F	1	3'-0"	7'-0"	WD	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		2.00	
01311	F	1	3'-0"	7'-0"	WD	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		5.00	
01312	F	1	3'-0"	7'-0"	WD	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		5.00	
01313	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.02	
01314	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.02	
01314A	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		6.00	
01315A	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		4.01	
01315B	F	1	3'-0"	7'-0"	HM	90 MIN	3'-4"	FR 1	--	HM	--	D5/A5.601	C5/A5.601		AC3.00	
01316	F	1	3'-0"	7'-0"	WD	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		6.01	
01317A	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		AC2.01	
01317B	F	2	3'-0"	7'-0"	WD	--	6'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		2.02	
01317C	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		AC2.00	1
01318A	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		AC2.01	
01318B	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B3/A4.801	B4/A4.801		AC2.00	1
01318C	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.02	
01319A	F	1	3'-0"	7'-0"	WD	--	3'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		AC2.01	1
01319B	F	2	3'-0"	7'-0"	WD	--	6'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		AC2.02	1
01320A	AL	2	3'-4"	9'-0"	AL	--	6'-0"	--	--	AL	--	SEE ELEV	SEE ELEV		AC6.03	
01325	F	1	3'-0"	7'-0"	WD	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		AC1.03	
01325A	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	
01325B	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	
01325C	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	
01325D	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	
01325E	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	
01325F	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	
01325G	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	
01325H	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	
01325I	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	
01325J	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	
01325K	F	2	4'-6"	3'-6"	P LAM-3	--	3'-6"	--	--	--	--				7.00	
01325L	F	2	4'-6"	3'-6"	P LAM-3	--	3'-6"	--	--	--	--				7.00	
01325M	F	2	4'-6"	3'-6"	P LAM-3	--	3'-6"	--	--	--	--				7.00	
01325N	F	2	4'-6"	3'-6"	P LAM-3	--	3'-6"	--	--	--	--				7.00	
01325O	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	
01325P	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	
01325Q	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	
01325R	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	
01325S	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	
01325T	F	2	4'-6"	10'-0"	P LAM-3	--	4'-6"	--	--	--	--				7.00	

DOOR / OPENING SCHEDULE - AREA 'B'

	DOOR / OPENING					LABEL/	OVERALL	FRAME				MOUNTING CONDITIONS				
DOOR NO	TYPE	QTY	WIDTH	HEIGHT	MATL	RATING	WIDTH	TYPE	DEPTH	MATL	GL	HEAD	JAMB	SILL	HDW GRP	Remarks-Door
01100A	AL	1	3'-0"	9'-0"	AL	--	3'-0"	--	--	AL	--	SEE ELEV	SEE ELEV		AC5.01	
01100B	AL	1	3'-0"	9'-0"	AL	--	3'-0"	--	--	AL	--	SEE ELEV	SEE ELEV		AC5.01	
01107	AL	1	4'-0"	9'-0"	AL	--	3'-0"	--	--	AL	--	SEE ELEV	SEE ELEV		AC1.01	
01109B	F	1	2'-11 7/8"	7'-0"	WD	--	4'-9 7/8"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		6.02	
01110A	AL	1	3'-0"	9'-0"	AL	--	3'-0"	--	--	AL	--	SEE ELEV	SEE ELEV		4.02	
01110B	AL	1	3'-0"	9'-0"	AL	--	3'-0"	--	--	AL	--	SEE ELEV	SEE ELEV		AC5.00	
01111	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		1.00	
01112	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		1.00	
01115A	F	1	3'-0"	7'-0"	HM	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		AC2.03	
01115B	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		AC2.01	
01115C	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		6.00	
01115D	F	1	4'-0"	7'-0"	HM	--	4'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		AC2.03	
01120	F	2	2'-10"	7'-0"	HM	--	6'-0"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		AC6.01	
01122A	F	2	3'-0"	7'-0"	HM	--	6'-4"	FR 1	--	HM	--	D1/A5.601	C1/A5.601		4.03	
01122B	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	F1/A5.601	E1/A5.601		AC1.05	
01125	AL	1	3'-0"	7'-0"	AL	--	3'-0"	--	--	AL	--	B1/A4.801	B1/A4.801		5.01	
01139	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		AC1.03	
01148B	F	2	2'-10"	7'-0"	WD	--	6'-0"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		AC6.02	
01149	AL	1	4'-0"	9'-0"	AL	--	3'-0"	--	--	AL	--	SEE ELEV	SEE ELEV		AC1.01	
01150	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		AC2.03	
01210C	AL	1	4'-0"	9'-0"	AL	--	3'-0"	--	--	AL	--	SEE ELEV	SEE ELEV		AC1.01	
01400	AL	1	3'-0"	9'-0"	AL	--	3'-0"	--	--	AL	--	SEE ELEV	SEE ELEV		AC6.00	
01400A	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		AC2.03	
01402A	AL	1	3'-0"	7'-0"	AL	--	3'-0"	--	--	AL	--	SEE ELEV	SEE ELEV		AC2.04	
01402B	AL	1	3'-0"	7'-0"	AL	--	3'-0"	--	--	AL	--	SEE ELEV	SEE ELEV		5.01	
01402C	AL	1	3'-0"	7'-0"	AL	--	3'-0"	--	--	AL	--	SEE ELEV	SEE ELEV		5.01	
01402D	AL	1	3'-0"	7'-0"	AL	--	3'-0"	--	--	AL	--	SEE ELEV	SEE ELEV		5.01	
01402E	F	2	3'-0"	7'-0"	WD	--	6'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		AC1.00	
01402F	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	E1/A4.801	E3/A4.801		2.00	
01402G	F	2	1'-6"	7'-0"	WD	--	3'-4"	FR 3	--	HM	--	B1/A4.801	B1/A4.801			
01410A	AL	2	3'-0"	9'-0"	AL	--	3'-0"	--	--	AL	--	SEE ELEV	SEE ELEV		AC1.06	
01410C	F	1	3'-0"	7'-0"	WD	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		2.00	
01411	F	1	3'-0"	7'-0"	WD	--	3'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		1.00	
01412	F	1	3'-0"	7'-0"	WD	--	3'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		1.00	
01420	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		AC2.03	
01420B	F	1	3'-0"	7'-0"	WD	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		2.03	
01420D	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01420E	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01420F	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01420G	F	1	3'-0"	7'-0"	WD	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		3.00	
01450	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		2.00	
01451	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		2.00	
01500	F	2	3'-0"	7'-0"	HM	--	6'-4"	FR 1	--	HM	--	D1/A5.601	C1/A5.601		AC5.02	
01502	F	2	2'-10"	7'-0"	WD	--	6'-0"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		4.04	
01504	F	1	3'-0"	7'-0"	HM	--	4'-10"	FR 2A	--	HM	--	B1/A4.801	B1/A4.801		AC2.03	
01504A	--	1	4'-0"	7'-0"	HM	--	4'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		5.02	
01510A	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	E1/A4.801	E3/A4.801		1.00	
01510B	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		5.03	
01510C	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	E1/A4.801	E3/A4.801		1.00	
01510D	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		2.00	
01511A	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		5.04	
01511B	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		5.02	
01512A	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		5.04	
01512B	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B1/A4.801	B1/A4.801		5.02	
01620	F	2	3'-0"	7'-0"	HM	--	6'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		AC2.05	
01620A	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		6.00	
01650	F	2	3'-3 3/8"	7'-0"	HM	--	6'-10 3/4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		AC1.02	
01650A	F	1	4'-0"	7'-0"	WD	--	4'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		4.07	
01650B	F	1	4'-0"	7'-0"	WD	--	4'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		4.07	
01650C	F	1	4'-0"	7'-0"	WD	--	4'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		4.05	
01650D	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	F1/A5.601	E1/A5.601		AC1.05	
01650D	F	1	3'-0"	7'-0"	WD	--	3'-4"	FR 1	--	HM	--	B3/A4.801	B4/A4.801		4.05	
01650E	F	1	3'-0"	7'-0"	HM	--	3'-4"	FR 1	--	HM	--	F1/A5.601	E1/A5.601		4.06	
EX01	F	1	4'-0"	7'-0"	FRP	--	4'-4"	FR 1	--	HM	--					3
EX02	F	1	4'-0"	7'-0"	FRP	--	4'-4"	FR 1	--	HM	--	B6/A5.602 SIM	D6/A5.602 SIM			3

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LICENSED ARCHITECT MATTHEW JAMES BICKEL 001-020883 STATE OF ILLINOIS
EXP. 11/30/24

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed ARCHITECT under the laws of the State of Illinois

Matthew J Bickel
License Number: 001.020883 Date: 11/30/2024

Revisions		
Description	Date	Num
Addendum #1	02/17/2023	1
Addendum #3	03/01/2023	2

Comm: 213106
Date: 12/30/2022
Drawn: MB/ML
Check: JMK

DOOR/ FRAME/ LOUVER TYPES & SCHEDULE

Scale: As indicated

A2.901

RCP GENERAL NOTES

1. ALL ACCESS PANELS TO BE COORDINATED WITH MECH/PLUMBING ACCESS PRIOR TO INSTALL.
2. SPRINKLER HEADS ARE NOT SHOWN. LOCATE ALL SPRINKLER HEADS IN THE CENTER OF CEILING TILES.
3. FOR DIFFUSER AND RETURN GRILL SIZES, SEE MECHANICAL PLANS
4. FOR LIGHT FIXTURE TYPES, SEE ELECTRICAL LIGHTING PLANS
5. CEILING HEIGHTS INDICATED ON PLAN (I.E. 9'-0") ARE FROM FINISHED FLOOR OF LEVEL OF PLAN SHOWN OR AS INDICATED
6. VERIFY GYP. BD. CONTROL JOINTS WITH ARCHITECT PRIOR TO INSTALLATION
7. SEE CASEWORK ELEVATIONS FOR ADDITIONAL SOFFIT PAINTING NOTES

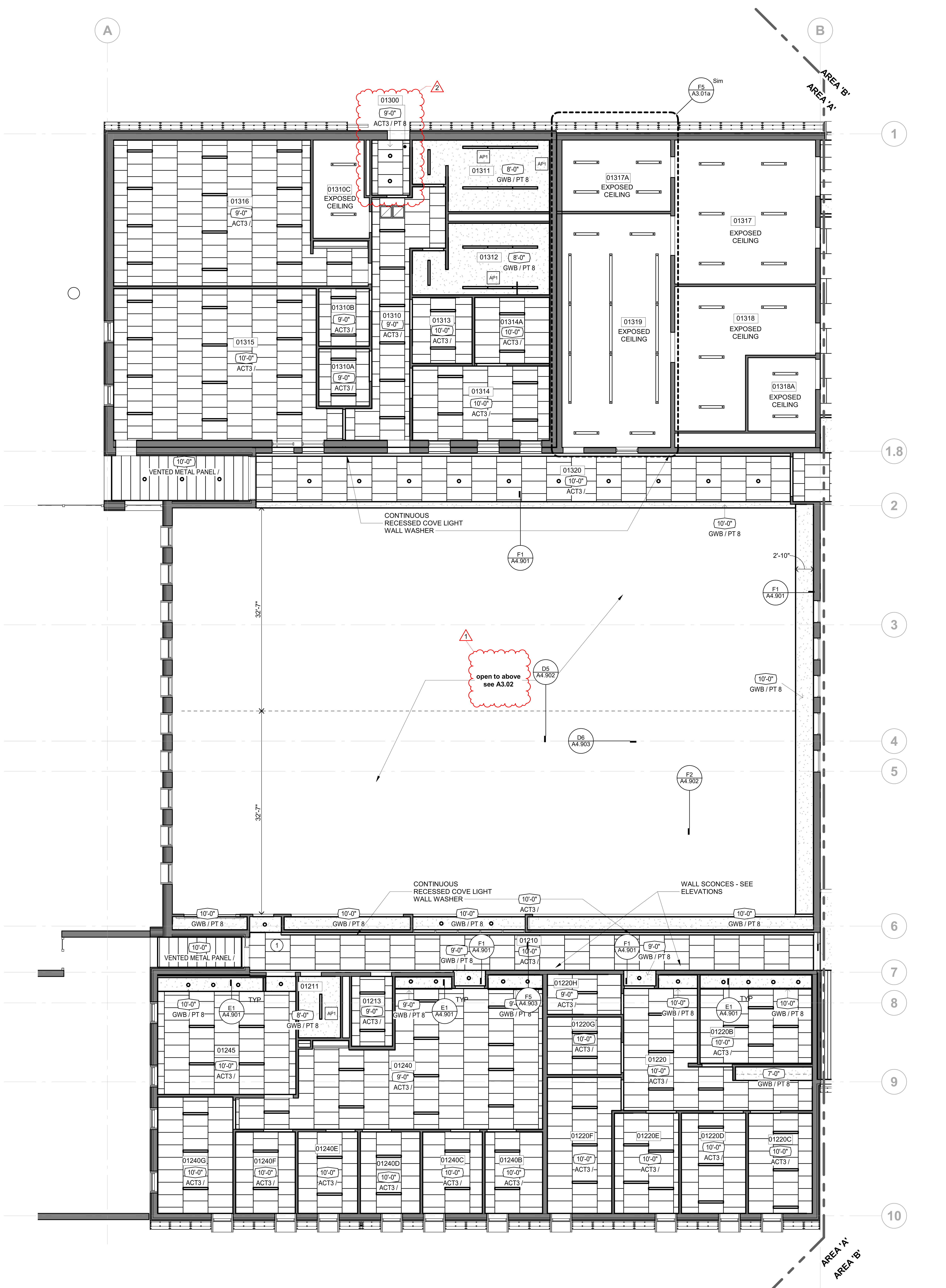
RCP KEY NOTES:

(1) CABINET UNIT HEATER, COORDINATE WITH MECH.
(2) ALL CONTRACTORS TO COORDINATE EQUIPMENT/UTILITY HEIGHTS AND LOCATIONS PRIOR TO INSTALLATION.
(3) HINGED FABRIC ACCESS DROP PANEL INTERATED INTO FABRIC CEILING FRAMING

RCP LEGEND

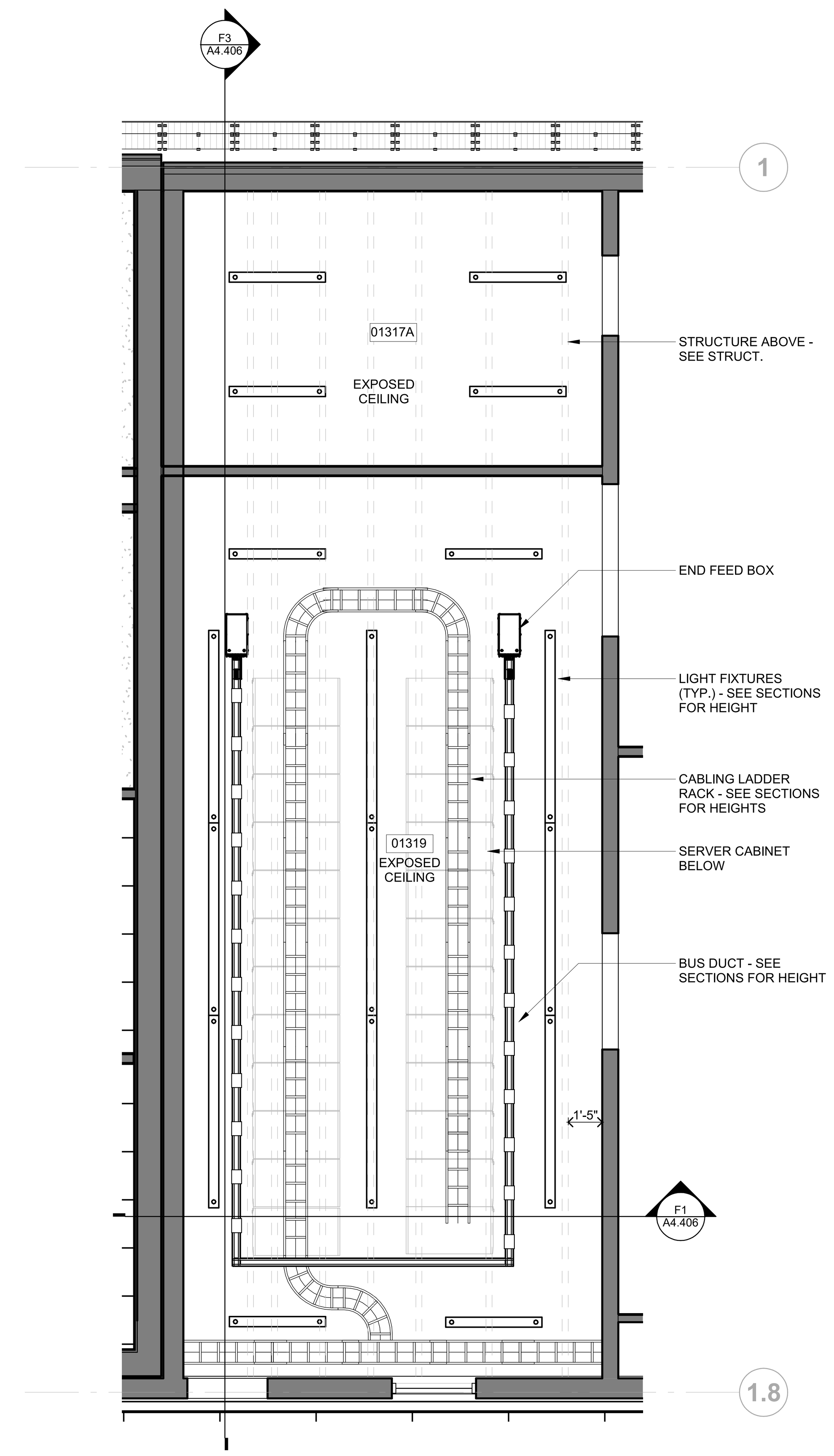
- CANLIGHT
- 1 X 4 LIGHT FIXTURE
- 4' STRIP LIGHT FIXTURE
- 8' STRIP LIGHT FIXTURE
- 2 X 2 LIGHT FIXTURE (IN CEILING GRID)
- 2 X 4 LIGHT FIXTURE (IN CEILING GRID)
- CEILING MOUNTED LIGHT FIXTURE
- SPEAKER
- AIR DIFFUSER (IN CEILING GRID)
- RETURN AIR GRILLE (IN CEILING GRID)
- AIR DIFFUSER
- EXHAUST GRILLE
- ACCESS PANEL
- LINEAR DIFFUSER (IN CEILING GRID)
- PTD. GYPSUM BOARD CEILING / SOFFIT
- PENDANT LIGHT FIXTURE
- 4' LINEAR RECCESSED LIGHT FIXTURE
- 6' PENDANT UP/DOWN LIGHT
- CONTINUOUS RECESSED COVE LIGHT WALL WASHER
- CONTINUOUS PENDANT LIGHT BETWEEN STRETCHED FABRIC CEILING SYSTEM PANELS
- RECESSED UPLIGHT, CONCEALED @ SLOPED SOFFIT SURFACE
- LINEAR WALL MOUNT LIGHT AROUND/BELOW CLERESTORY WINDOWS
- AC3: ACOUSTICAL PANEL CEILING 2x4
- ACP: ACOUSTIC PLASTER
- ACG: ACOUSTIC GYP BOARD CEILING, PERFORATED
- CLG1: LINEAR WOOD CEILING (MID WOOD TONE) (ALT. METAL SLAT CEILING @ TEAMING AREA, MATCH WOOD TONE)
- CLG2: STRETCHED FABRIC CEILING SYSTEM

IL



A

F1 **MAIN LEVEL REFLECTED CEILING PLAN - AREA 'A'**
1/8" = 1'-0"



F5 **ENLARGED REFLECTED CEILING PLAN - SERVER ROOM**
1/4" = 1'-0"

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Exp. 11/30/24

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KEY PLAN

Matthew J Bickel
License Number: **001.020883** Date **11/30/2024**

Revisions		
Description	Date	Num
Addendum #2	02/24/2023	1
Addendum #3	03/01/2023	2

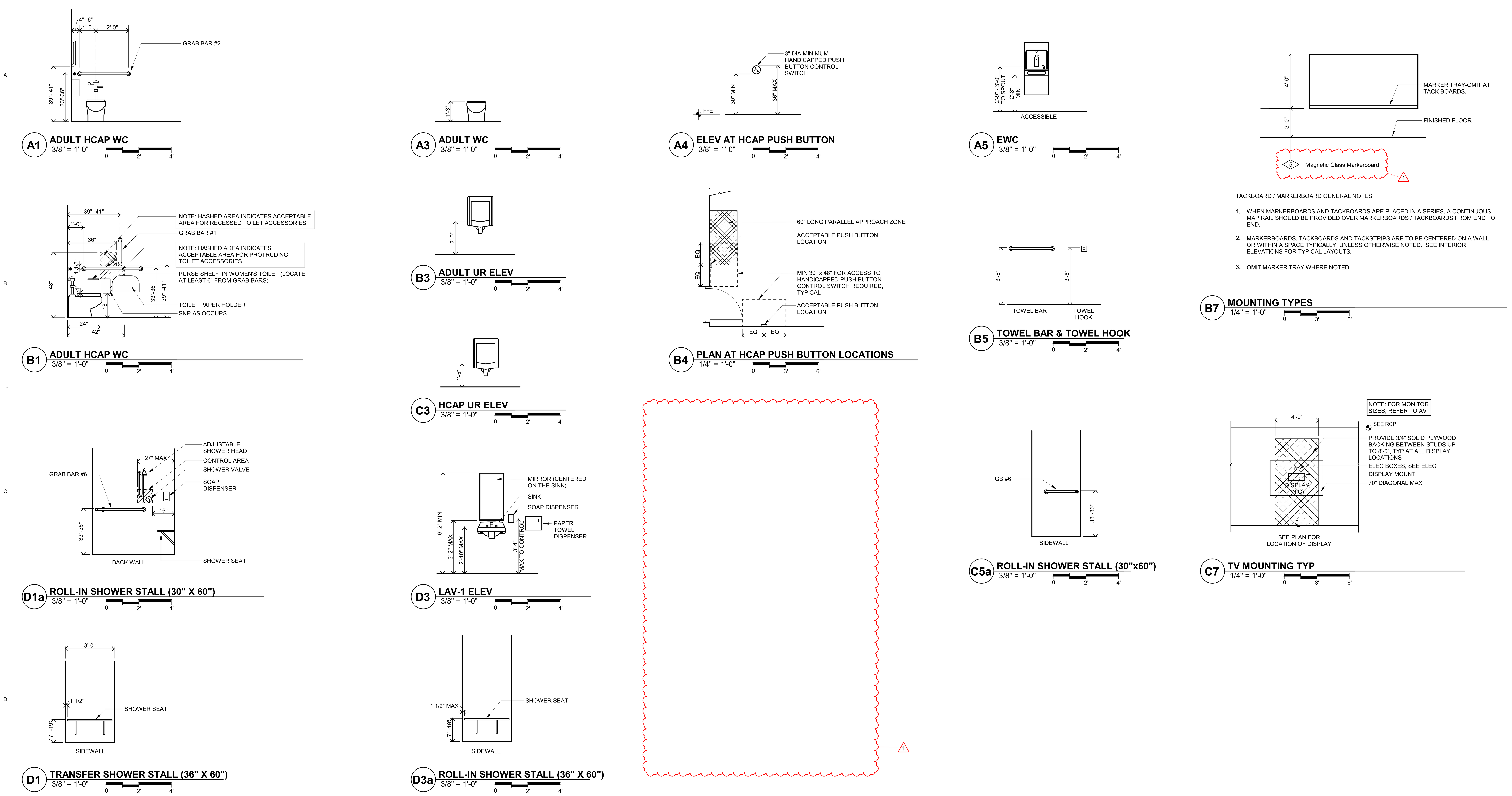
Comm: 213106
Date: 12/30/2022
Drawn: ML
Check: JMK

North

REFLECTED CEILING PLAN - AREA 'A'

Scale: As indicated

A3.01a



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Matthew J Bickel
License Number: 001.020883 Date: 11/30/2024

Revisions		
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Addendum #3	03/01/2023	1

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Drawn: MB
Check: JMK

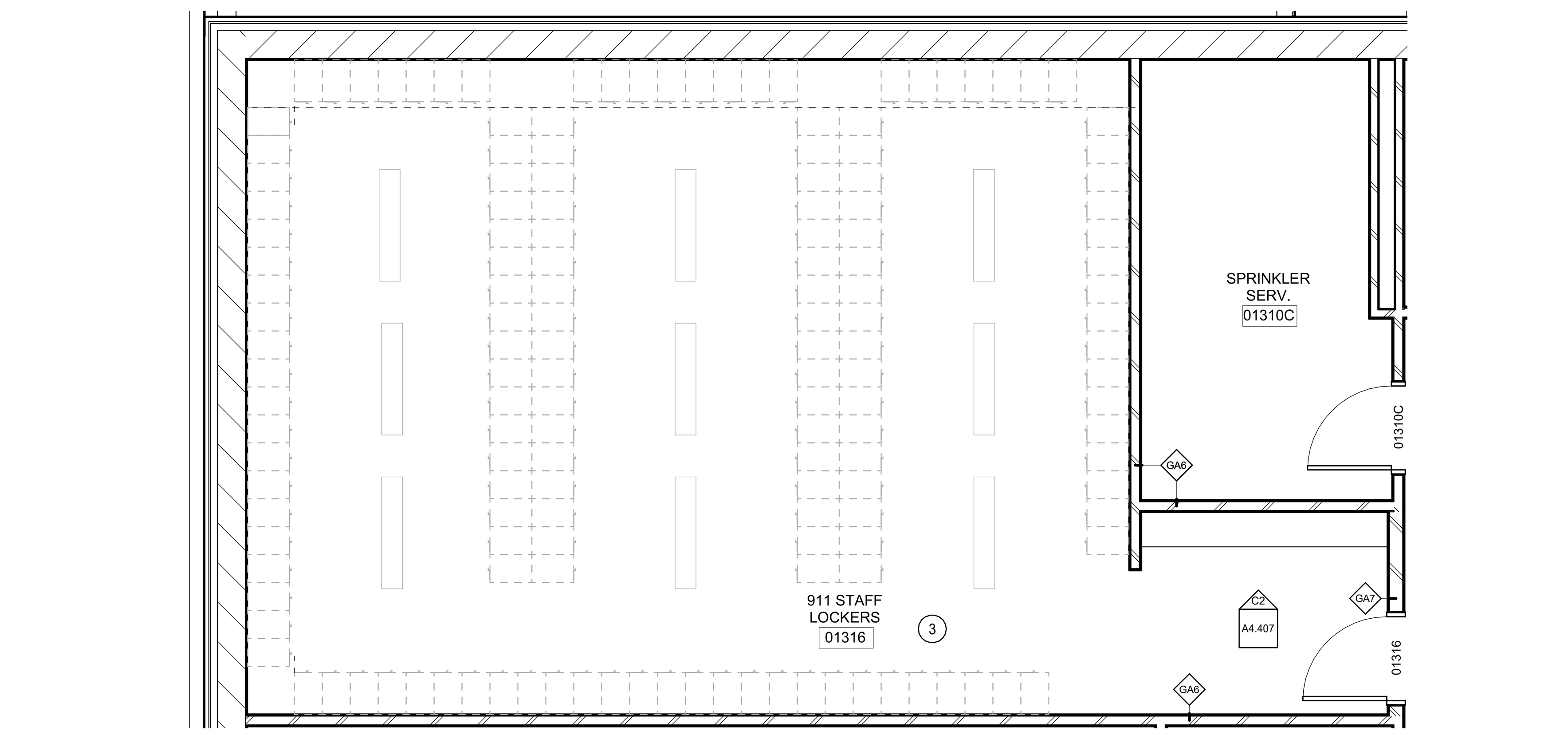
North

DETAILS - GENERAL - MOUNTING HEIGHTS

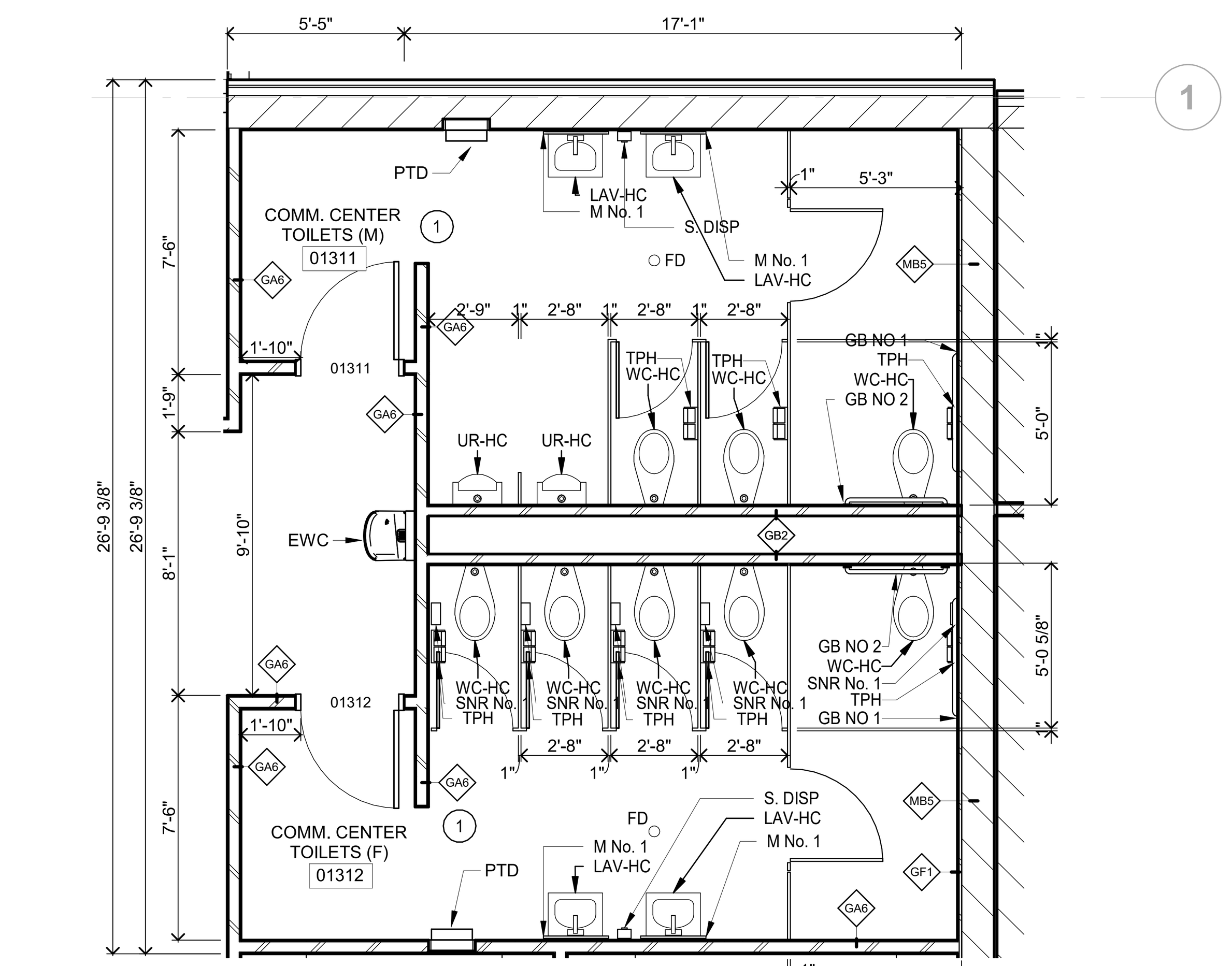
Scale: As indicated

A4.102

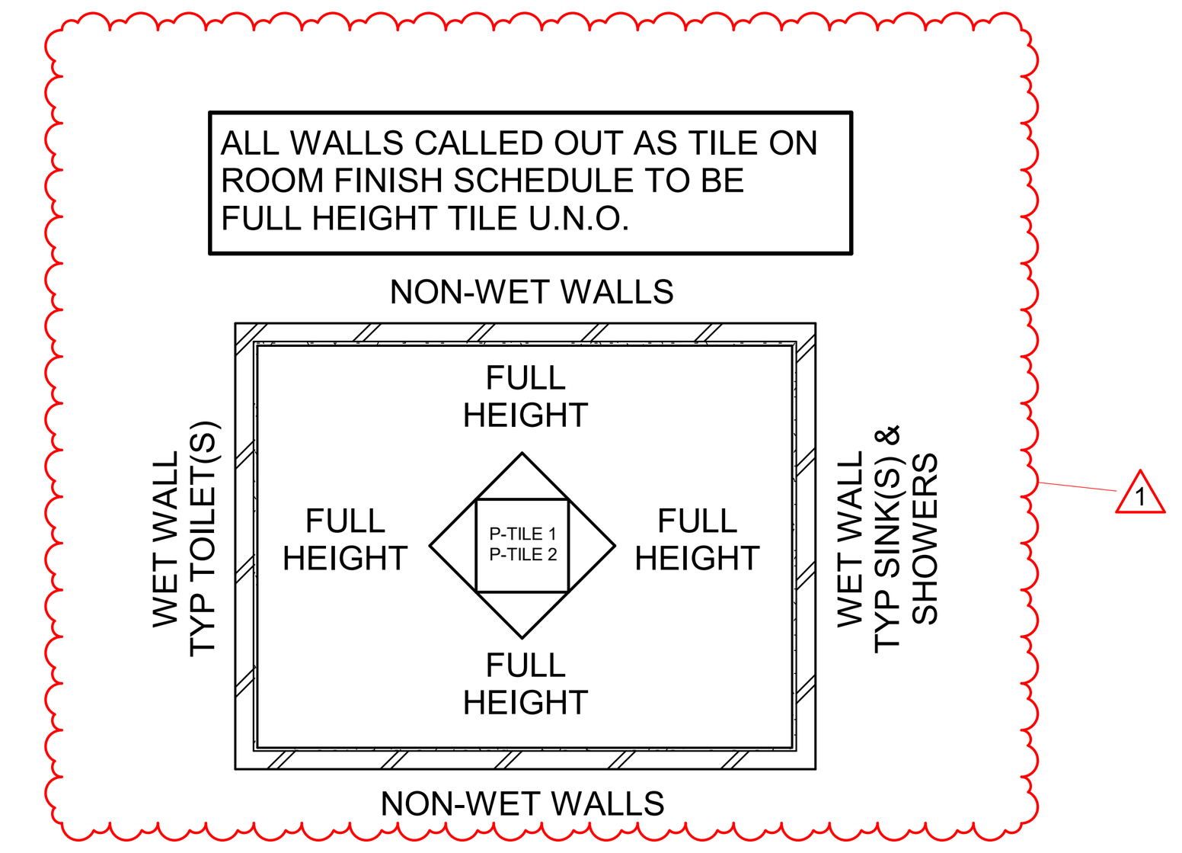
IL



C1 **142 - 911 LOCKERS**
1/4" = 1'-0"



C4 **140 - COMM. CENTER TOILETS**
1/4" = 1'-0"

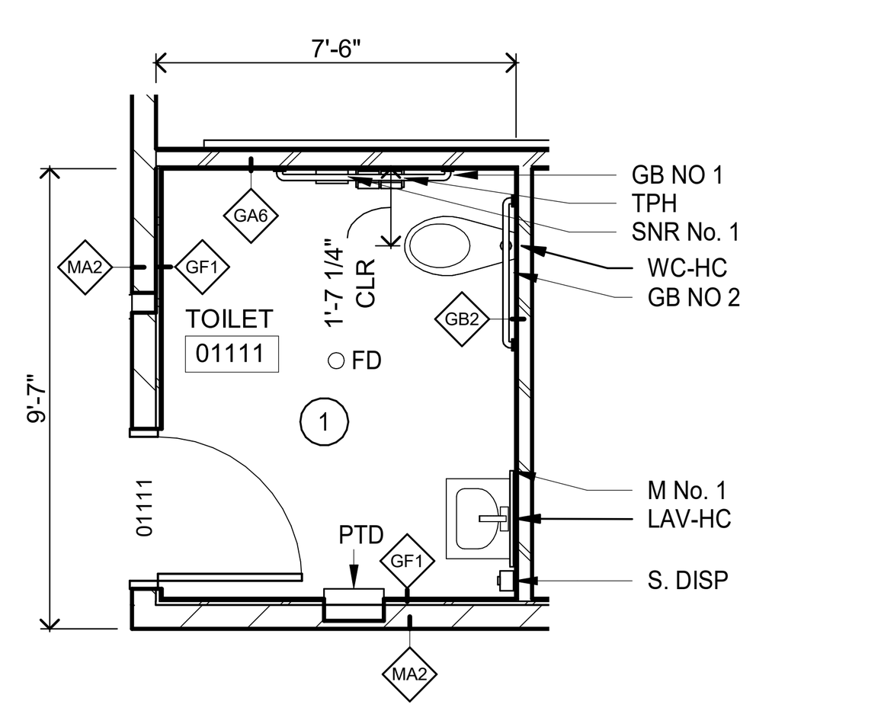


ENLARGED PLAN GENERAL NOTES:

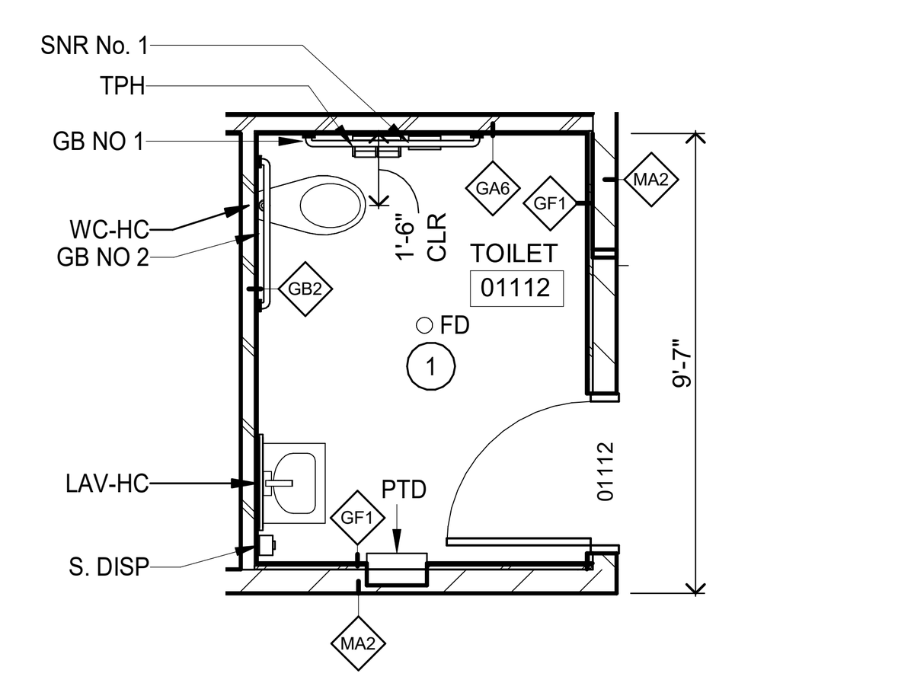
1. SEE TYPICAL TOILET ROOM ELEVATIONS ON A4.102 FOR WALL TILE APPLICATION. REFER ALSO TO ROOM FINISH SCHEDULE AND RCPS FOR FINISHES.
2. SEE TYPICAL MOUNTING HEIGHTS AND FIXTURE DETAILS ON A4.102.
3. SEE MECHANICAL FOR PLUMBING FIXTURE TYPES AND FLOOR DRAIN LOCATIONS.
4. FLOOR PLAN GENERAL NOTES APPLY.
5. ALL DIMENSIONS NOTED AS CLEAR TO INCLUDE FINAL WALL AND FLOOR FINISH. CLEAR DIMENSION REFERENCES REQUIRED ADA CLEARANCES.
6. REFER TO FLOOR PLAN AND CODE PLAN FOR WALLS THAT GO TO DECK.

ENLARGED PLAN KEY NOTES:

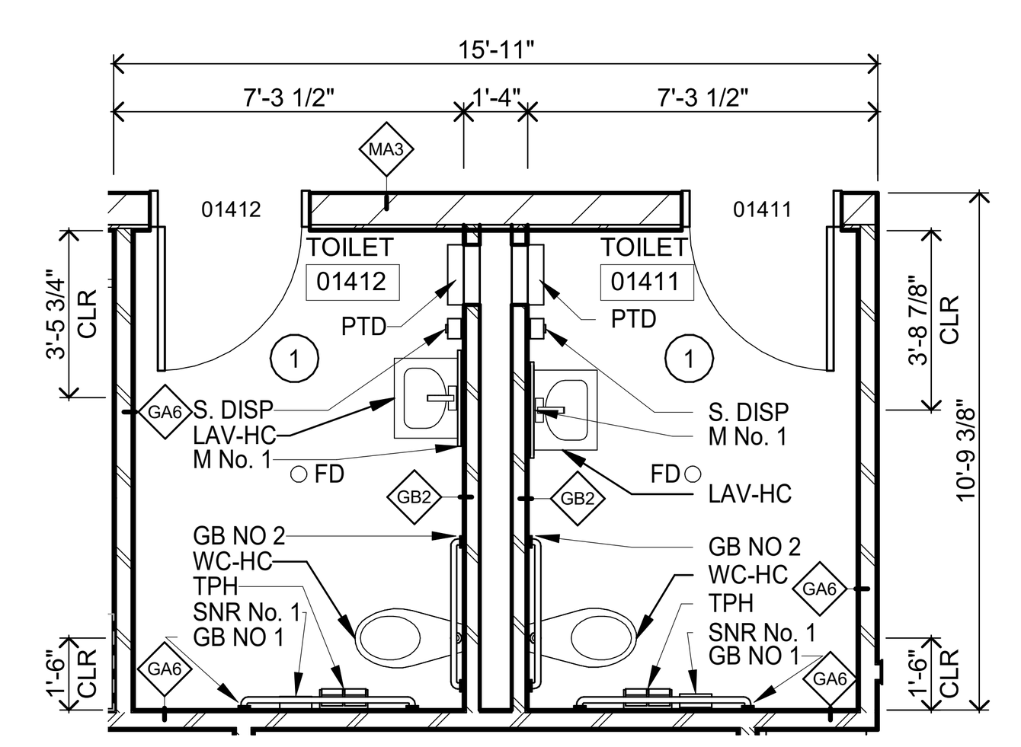
1. SEE DETAILS D7 & E7 ON SHEET A4.703 FOR TILE TRANSITION DETAILS
2. PROVIDE COAT HOOK ON INSIDE OF DOOR PANEL CENTERED AT HEIGHT OF 48" AFF.
3. LOCKERS ARE NIC AND SHOWN FOR REFERENCE ONLY. PROVIDE BLOCKING IN WALL. FLOORING TO BE INSTALLED TO EXTENTS OF THE ROOM
4. PROVIDE SHOWER RODS & CURTAINS.



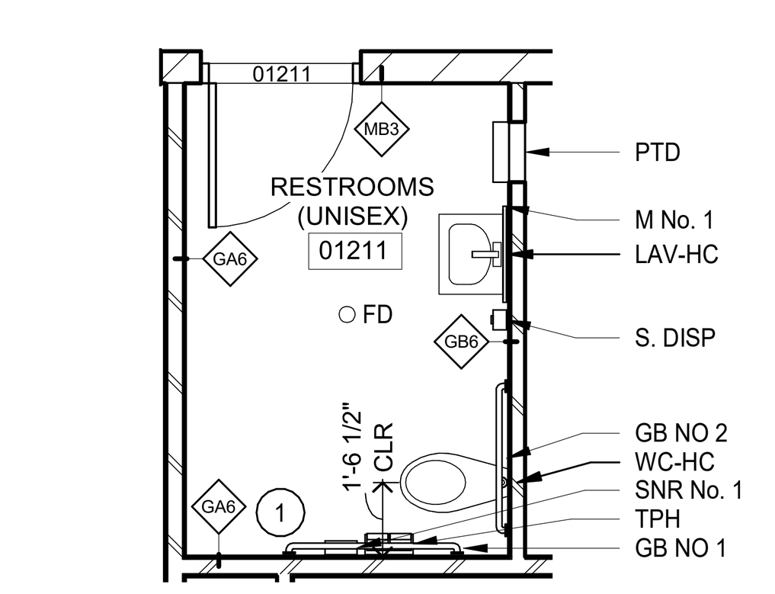
D1 **420 - PUBLIC TOILET**
1/4" = 1'-0"



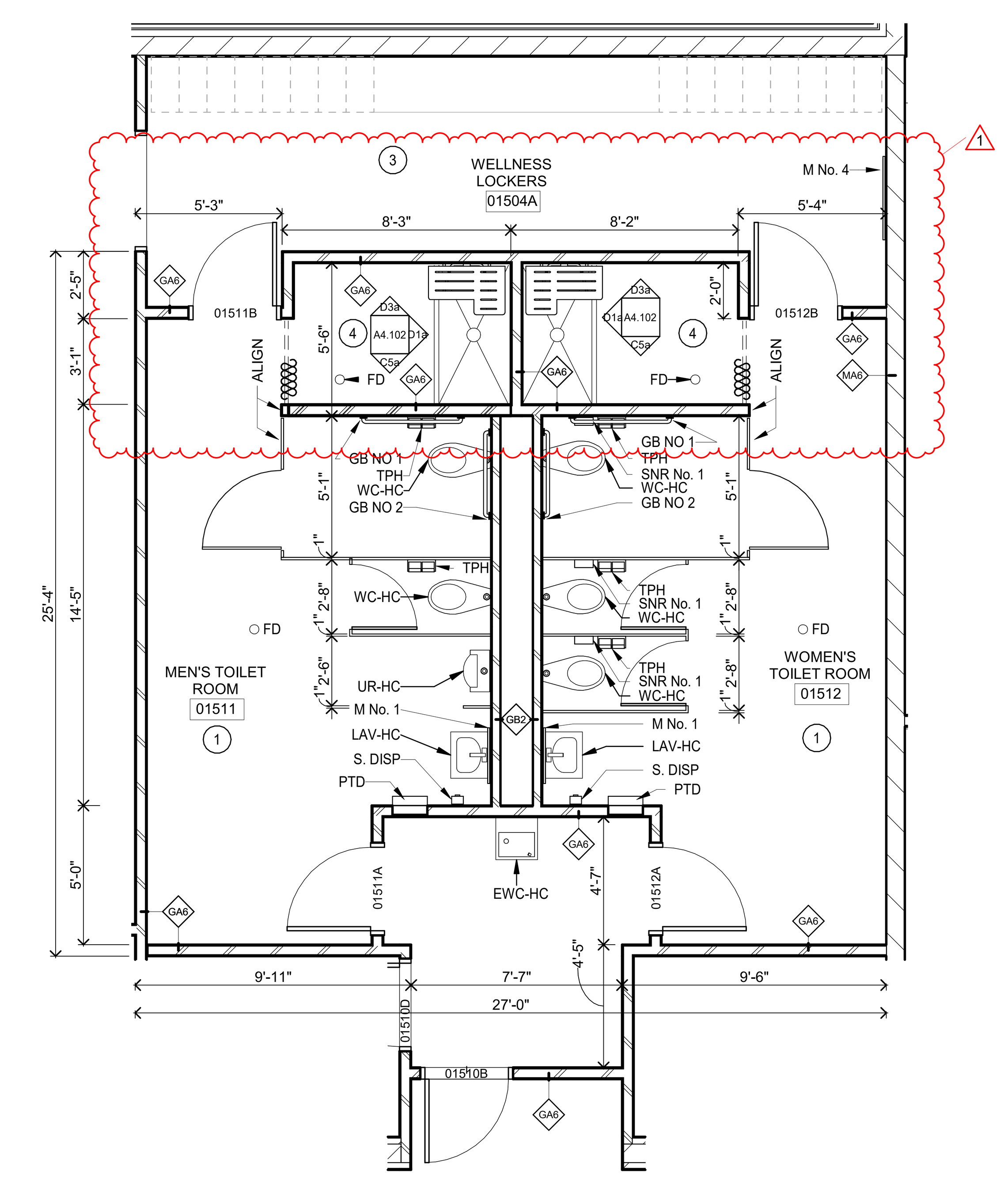
D3 **421 - PUBLIC TOILET**
1/4" = 1'-0"



E1 **220 / 230 - ACTIVATION / SECURE TOILETS**
1/4" = 1'-0"



E3 **124 - UNISEX TOILET**
1/4" = 1'-0"



F4 **406 / 221 - TOILET**
1/4" = 1'-0"

A

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Exp. 11/30/24

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Matthew J Bickel
License Number: **001.020883** Date **11/30/2024**

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Description	Date	Num
Addendum #3	03/01/2023	1

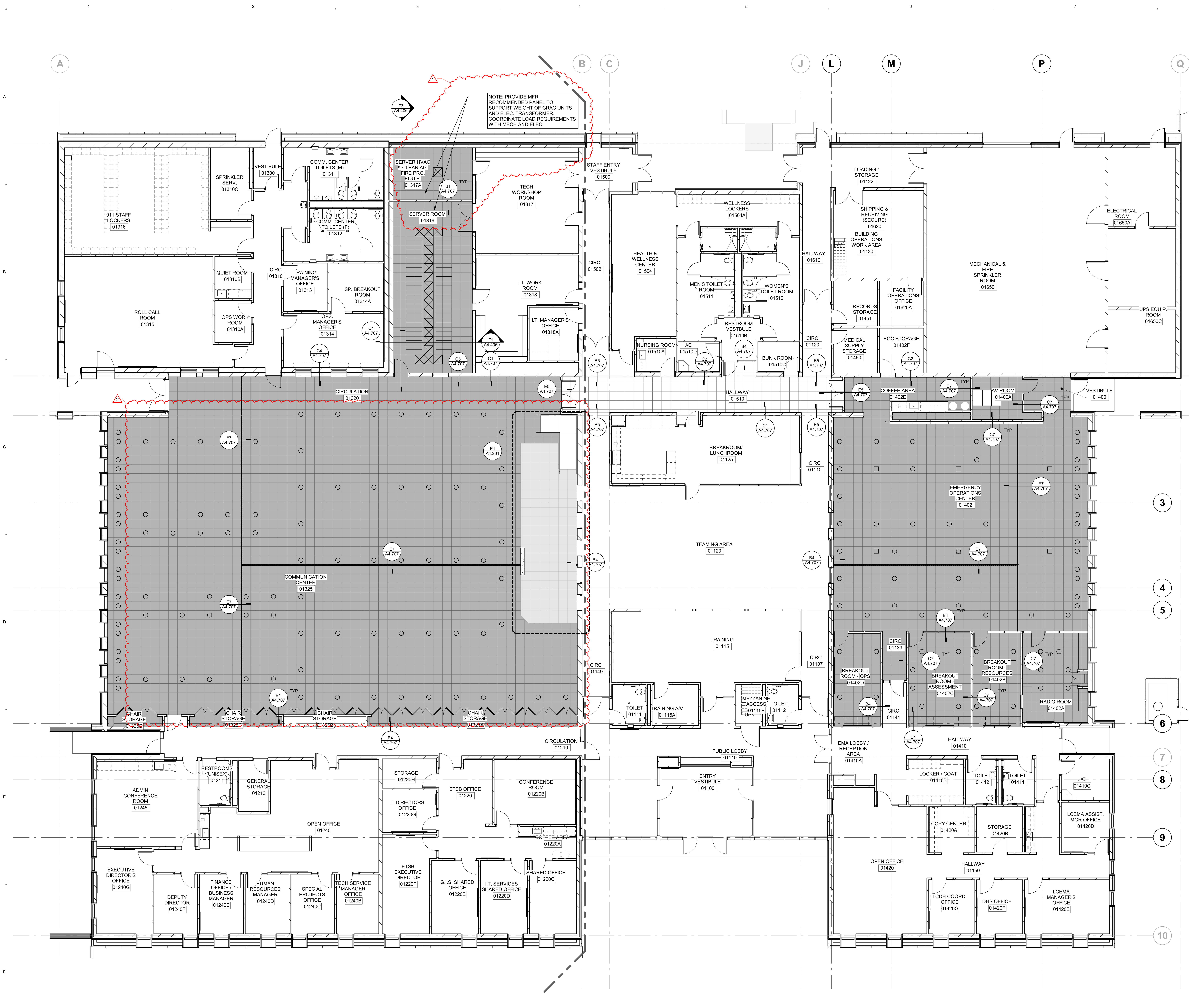
Comm: 213106
Date: 12/30/2022
Drawn: Author
Check: JMK

North

ENLARGED ROOM PLANS

Scale: As indicated

A4.103



F1 MAIN LEVEL ACCESS FLOOR PLAN
1/8" = 1'-0"

ACCESS FLOOR LEGEND

- ACCESS FLOOR
- ACCESS FLOOR - PRESSURIZED
- DATA ACCESS, SEE TECH
- DATA / ELEC PENETRATION BY ACCESS FLOOR, COORD W/ ELEC AND FURNITURE. PROVIDE AIR STOP GROMMET
- DIFFUSER BY MECH
- PERFORATED TILE BY ACCESS FLOOR

ACCESS FLOOR GENERAL NOTES

1. SEE STRUCTURAL, ELECTRICAL AND MECHANICAL PLANS FOR ADDITIONAL COORDINATION
2. SEE SHEET SHEET A4.105 FOR SLOPING SLAB BENEATH ACCESS FLOOR

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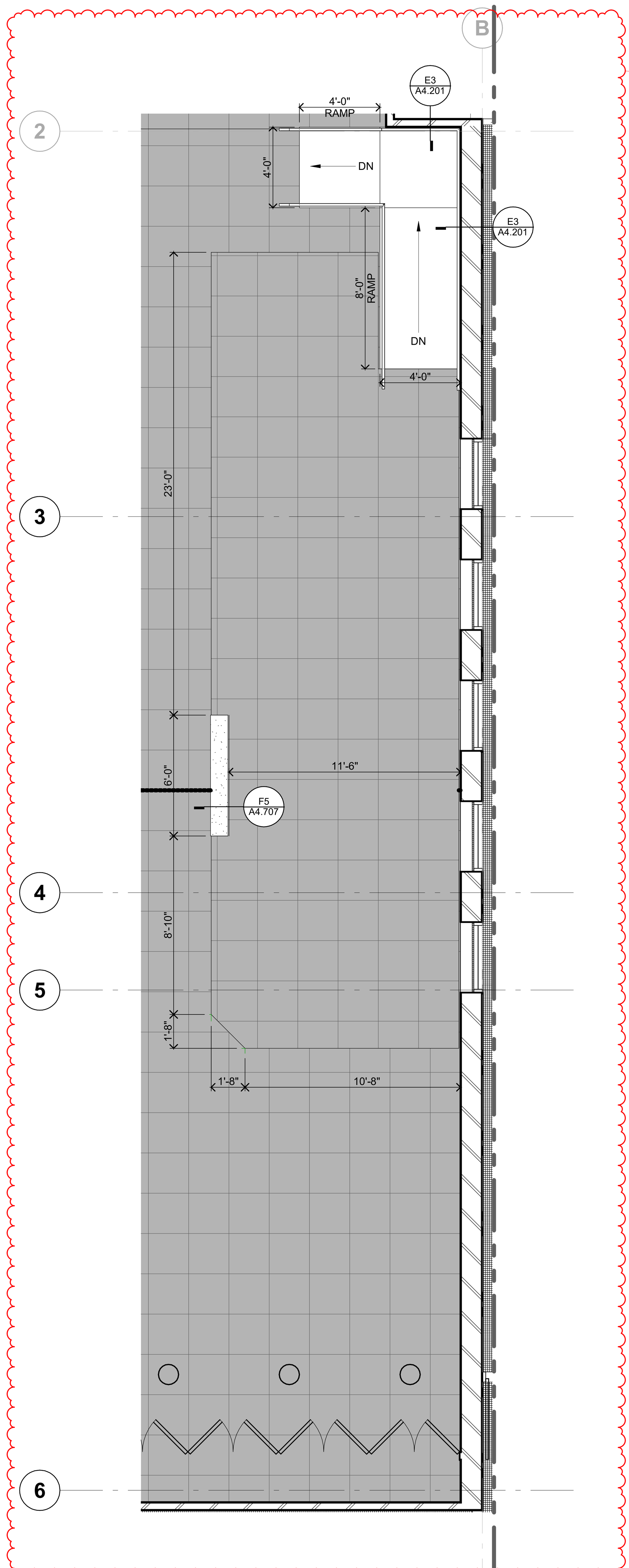
Check: JMK

North

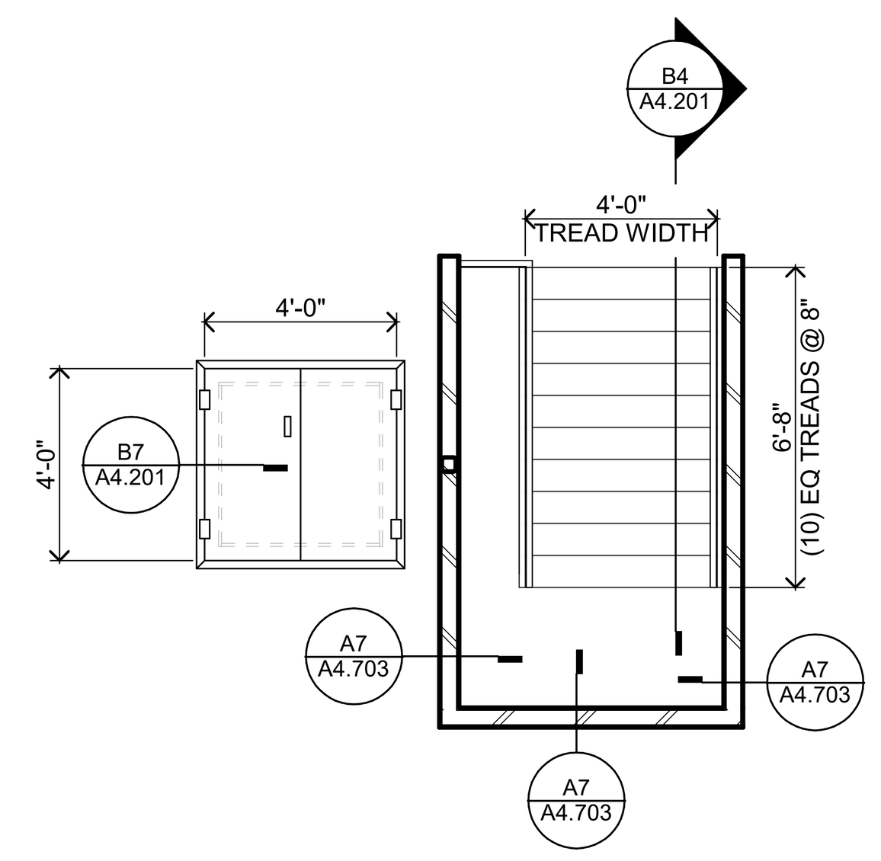
MAIN LEVEL ACCESS FLOOR PLAN

Scale: As indicated

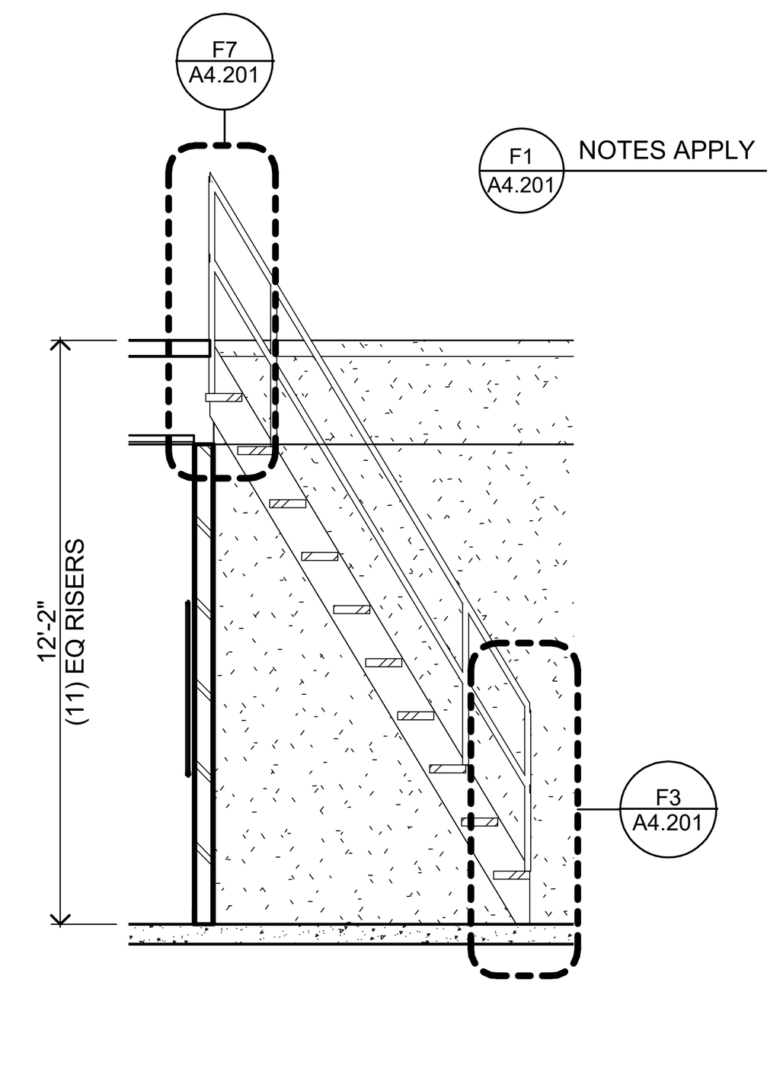
A4.104



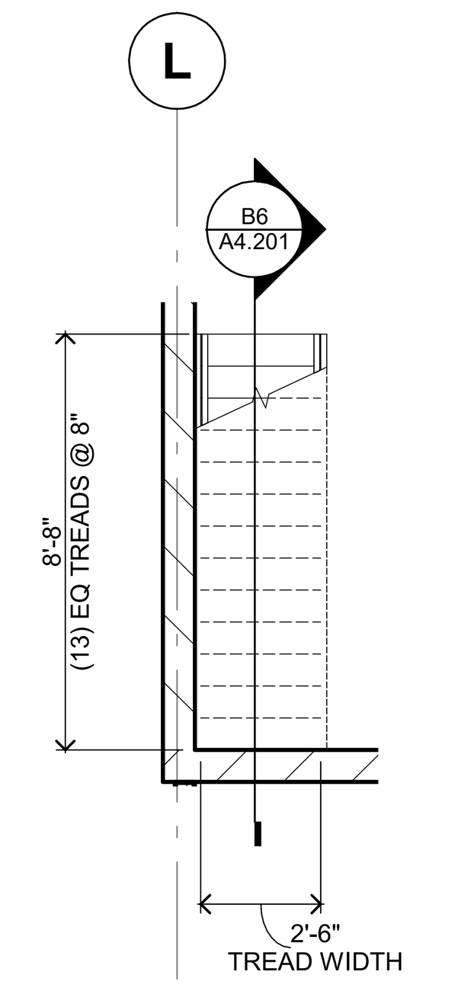
E1 COMMUNICATION CENTER PLATFORM
1/4" = 1'-0"



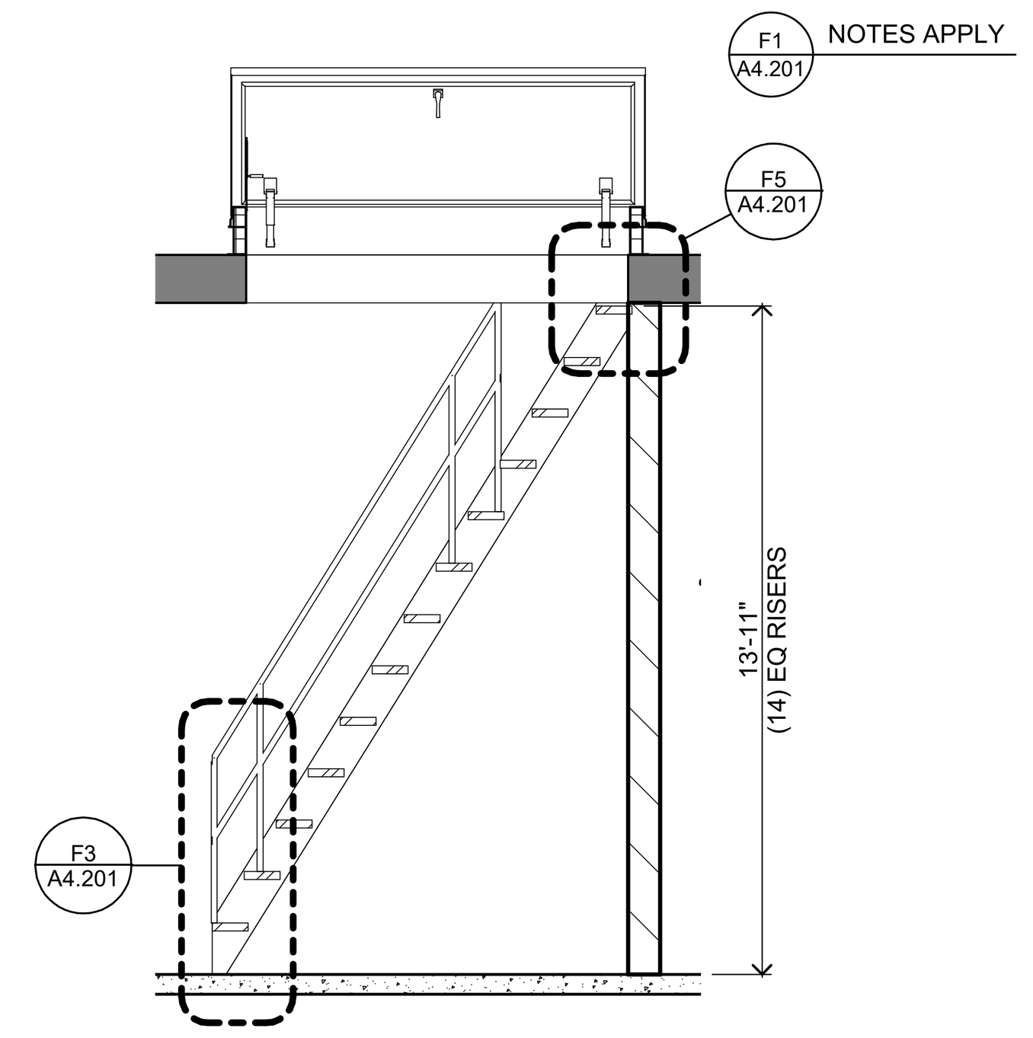
B3 STAIR AT MEZZANINE
1/4" = 1'-0"



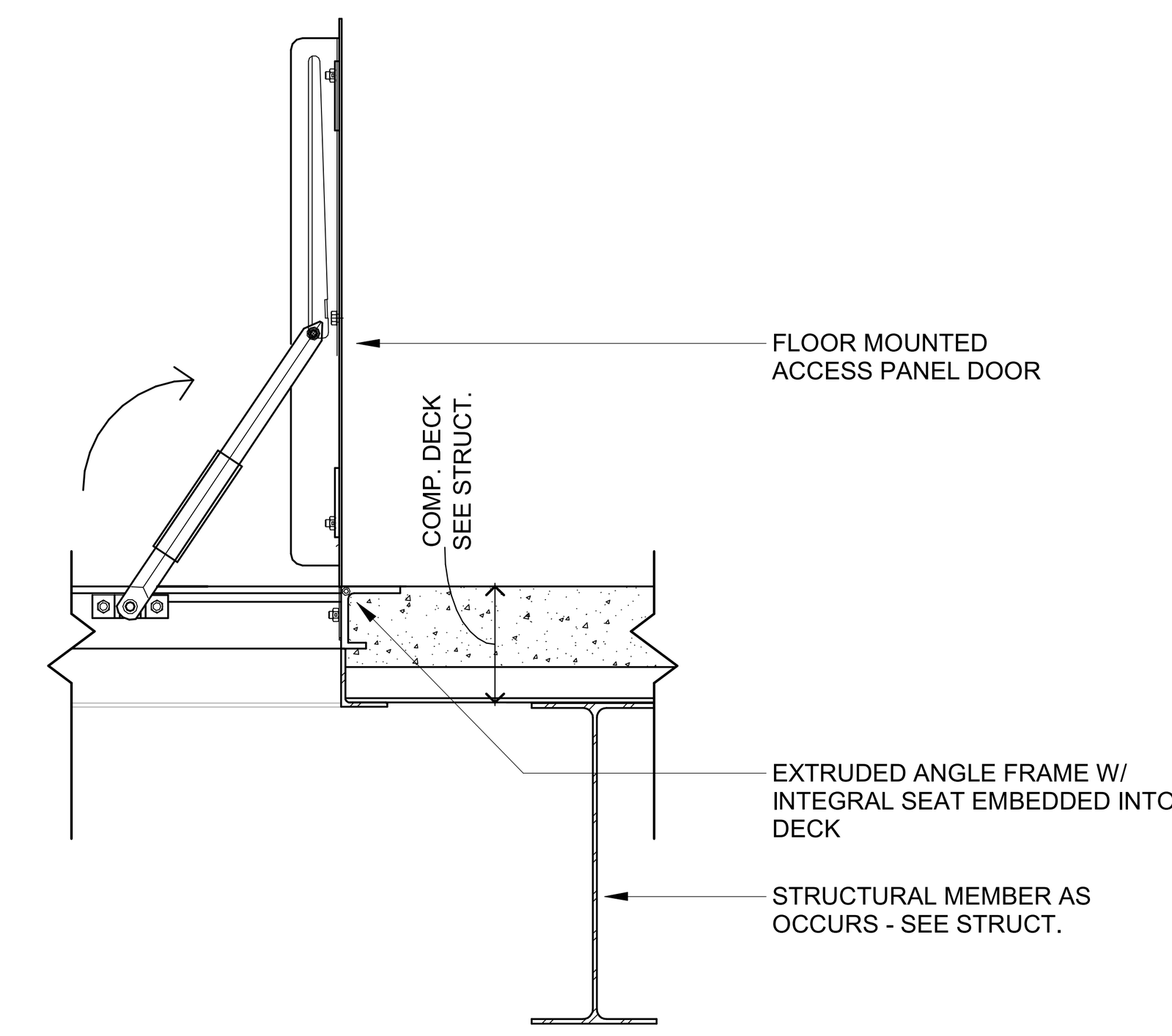
B4 MEZZANINE STAIR
1/4" = 1'-0"



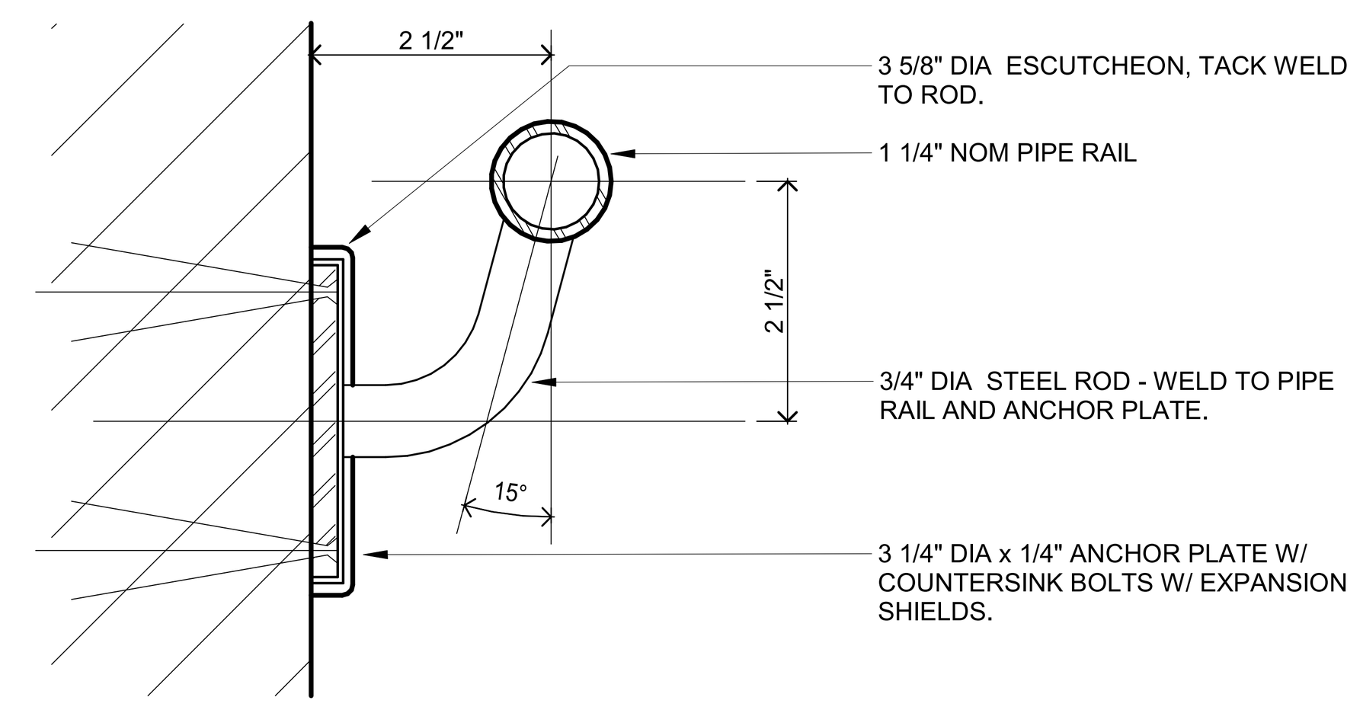
B5 STAIR AT ROOF HATCH
1/4" = 1'-0"



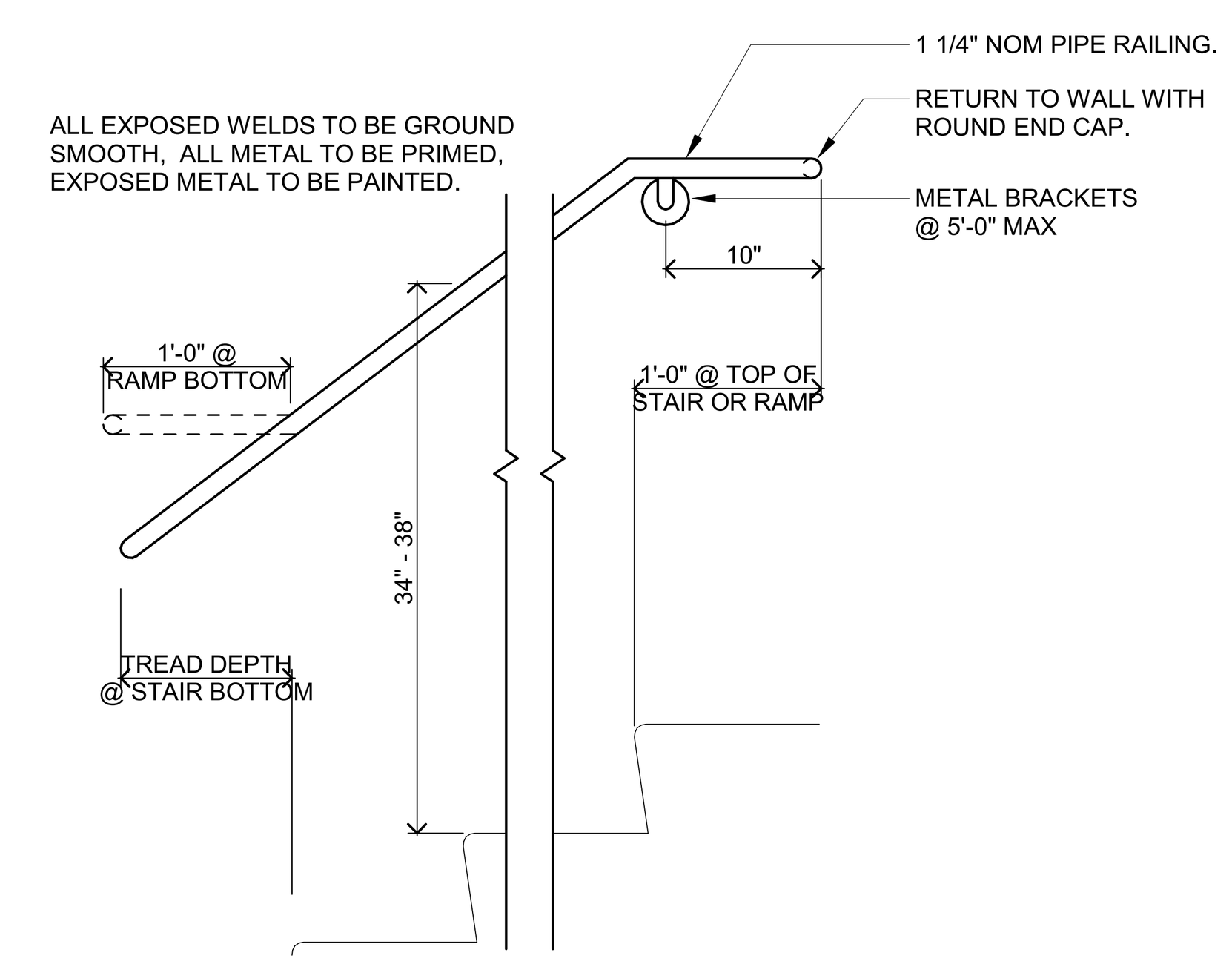
B6 SECTION AT ROOF HATCH STAIR
1/4" = 1'-0"



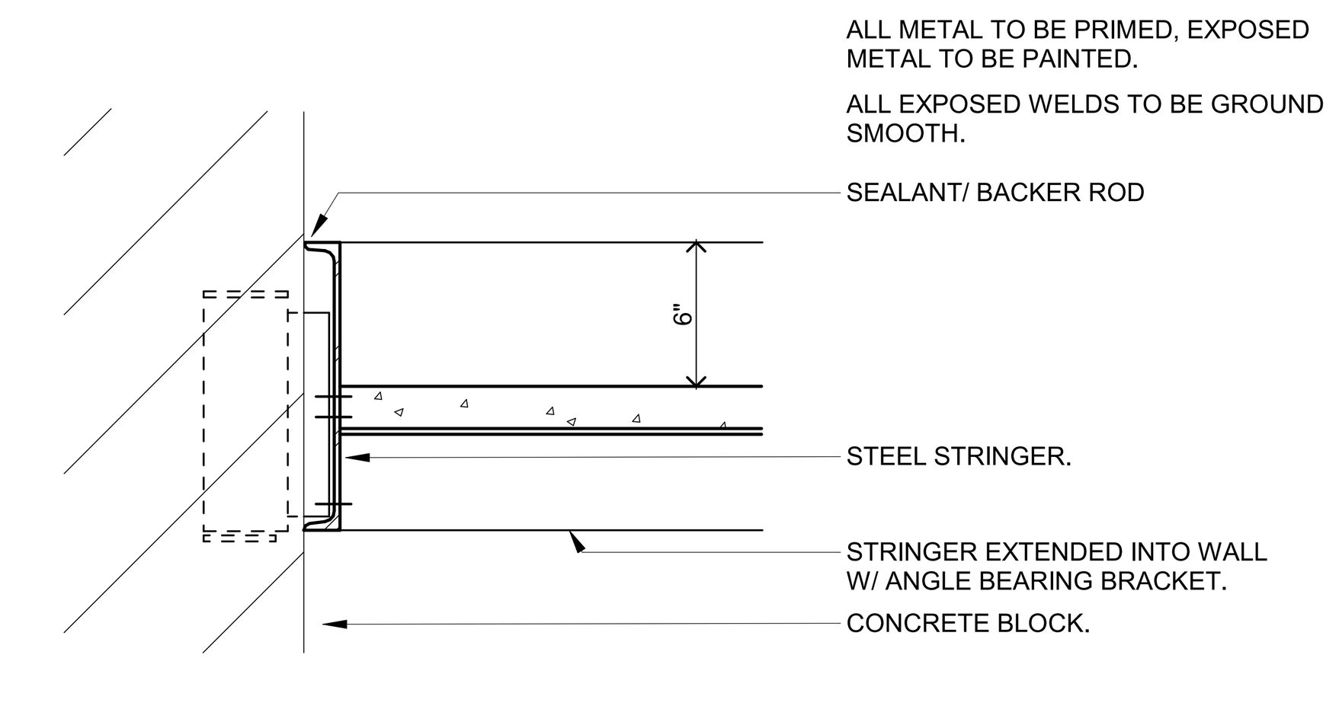
B7 MEZZANINE FLOOR ACCESS PANEL
1 1/2" = 1'-0"



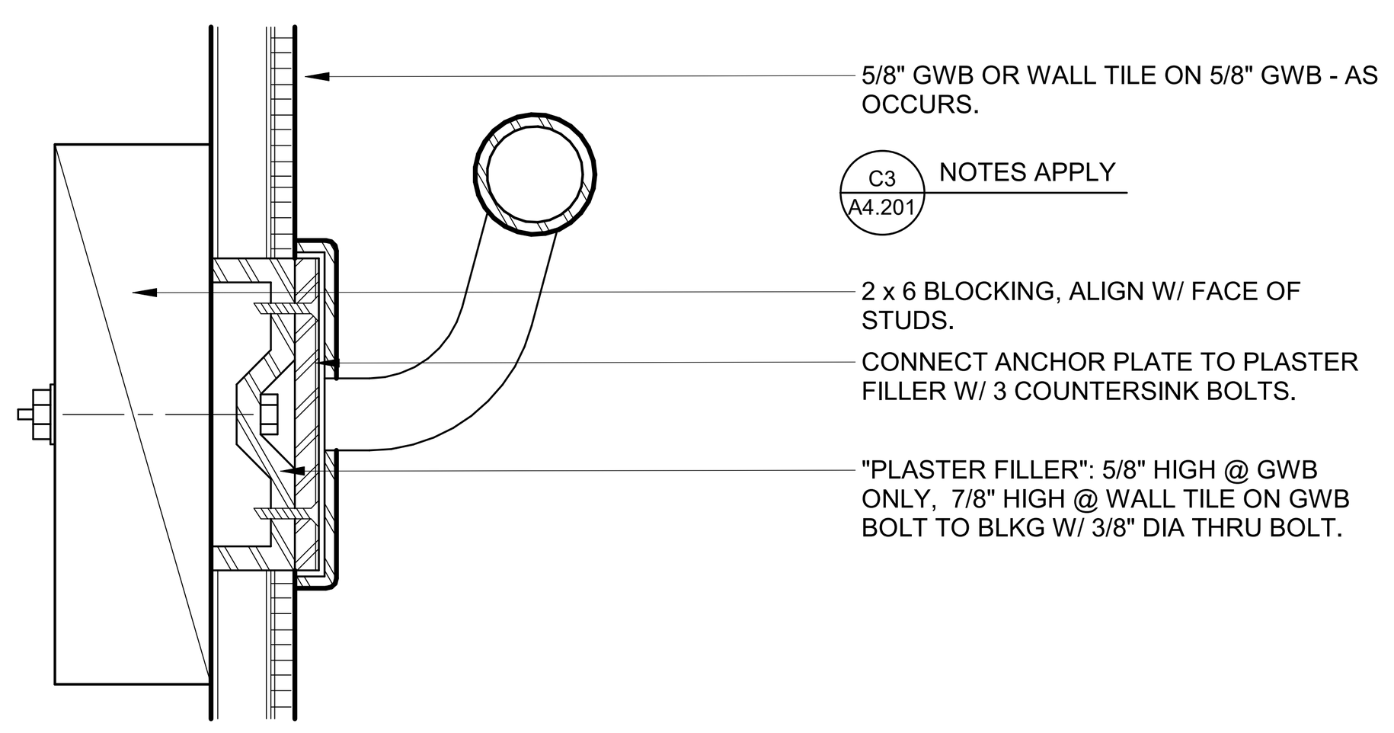
C3 SECTION AT BRACKET
6" = 1'-0"



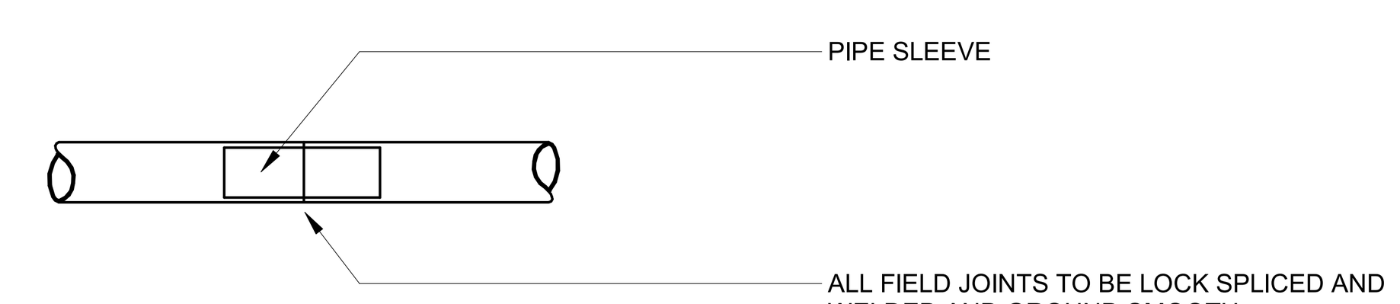
C5 WALL MOUNTED HANDRAIL
1" = 1'-0"



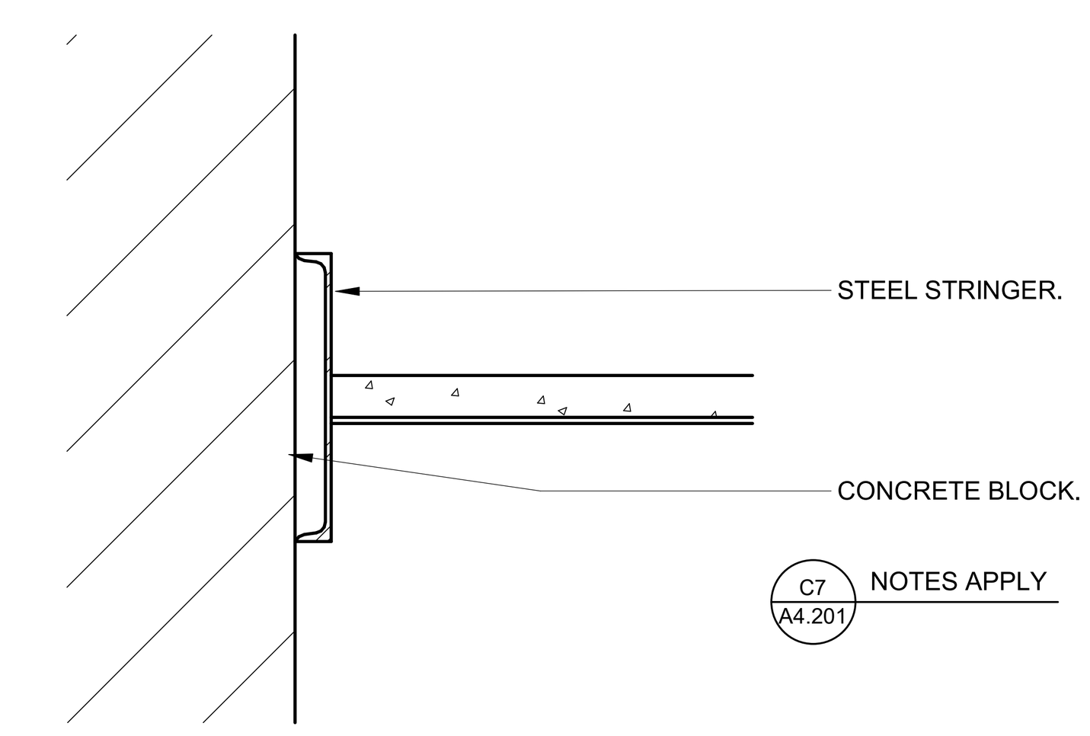
C7 LANDING AT WALL
1 1/2" = 1'-0"



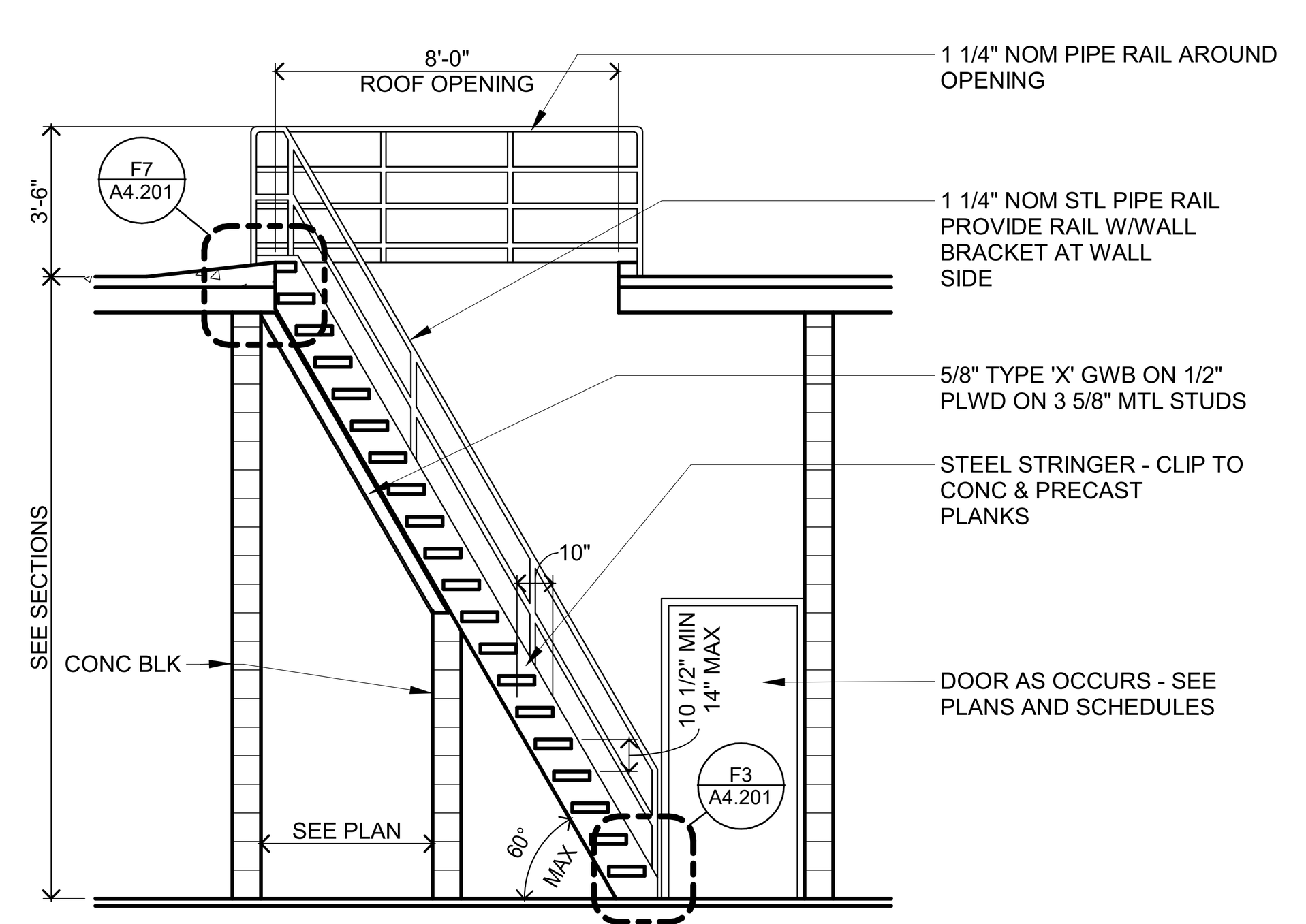
E3 SECTION AT BRACKET
6" = 1'-0"



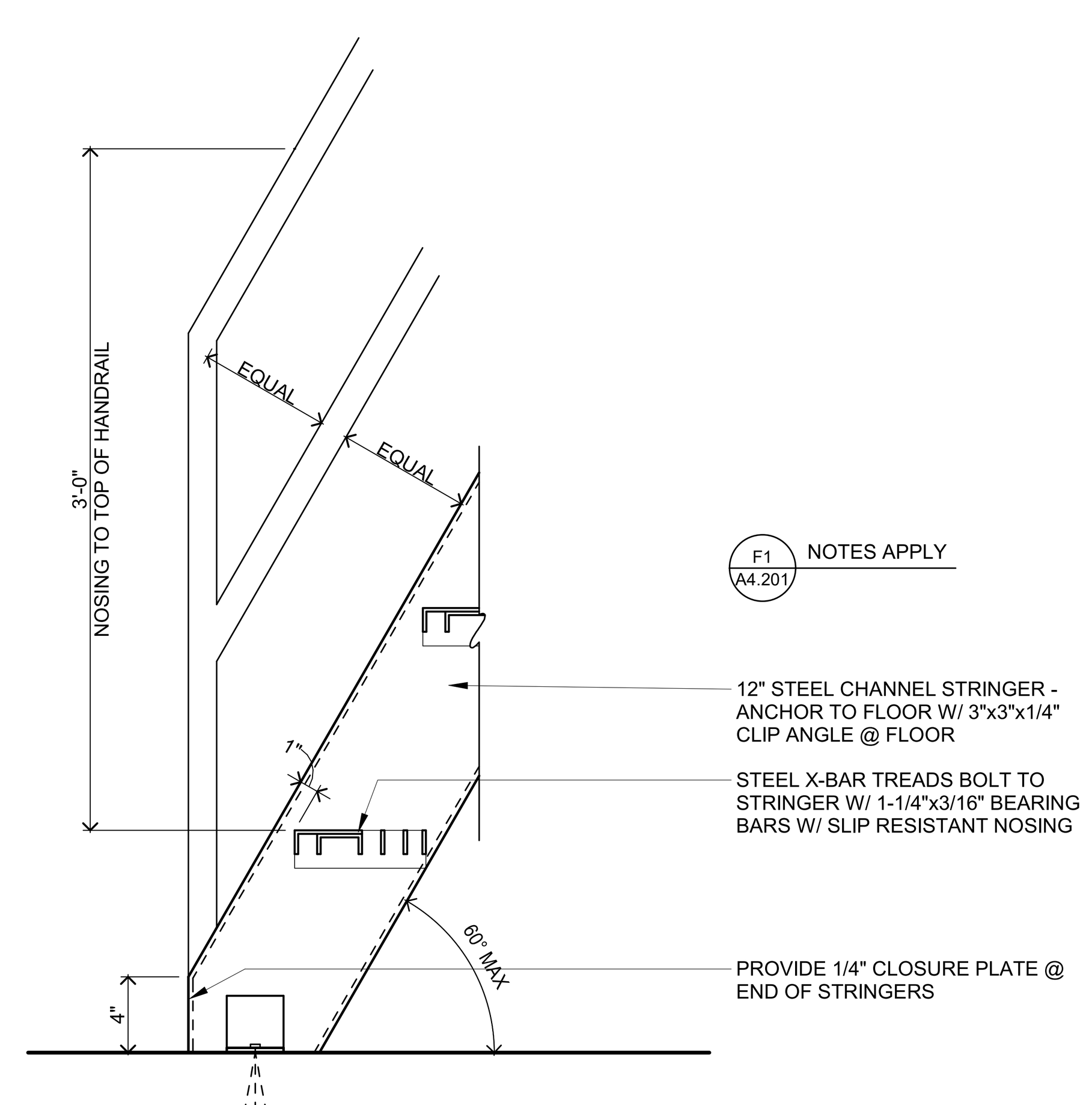
E5 TYP HANDRAIL JOINT
1 1/2" = 1'-0"



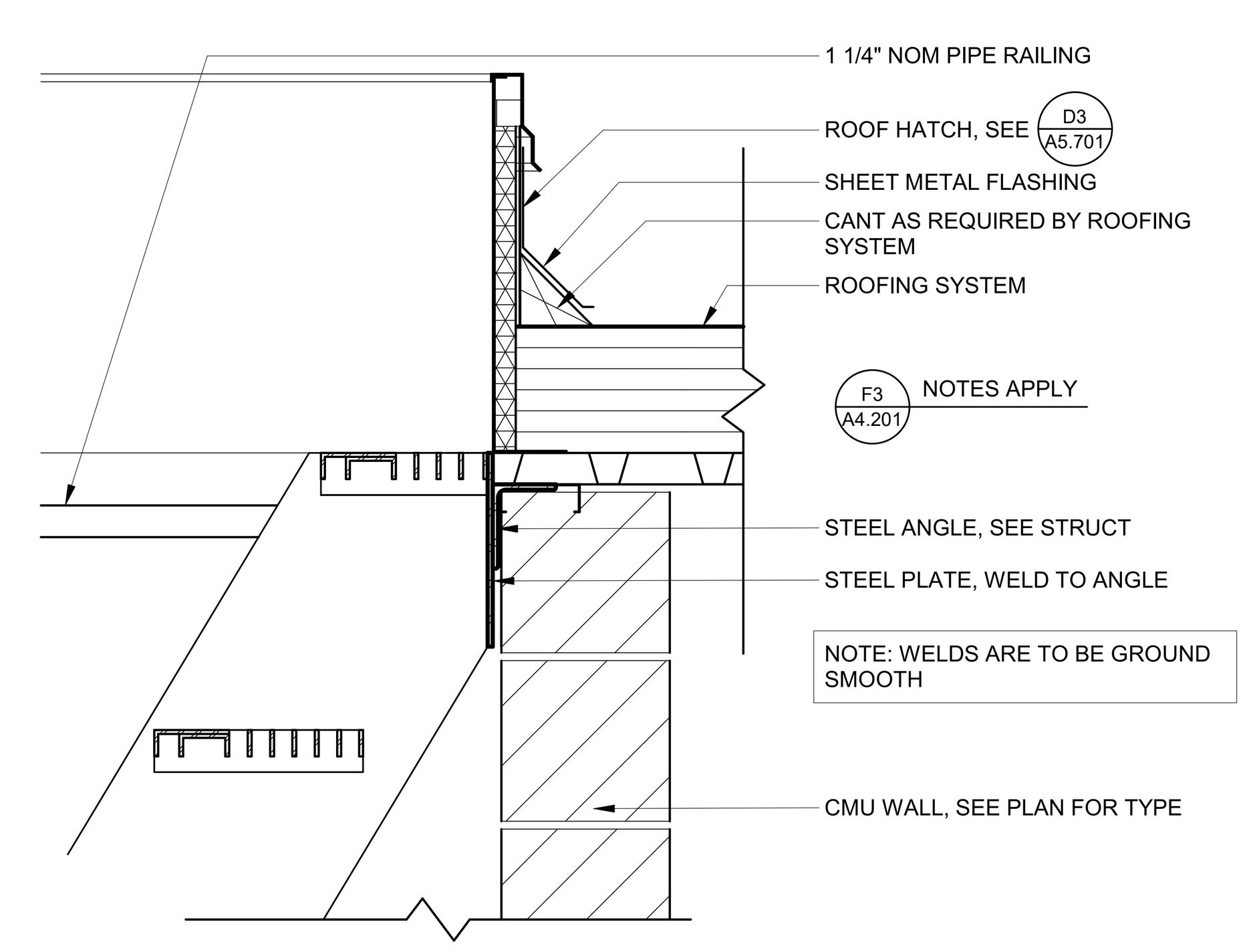
E7 TREAD AT WALL
1 1/2" = 1'-0"



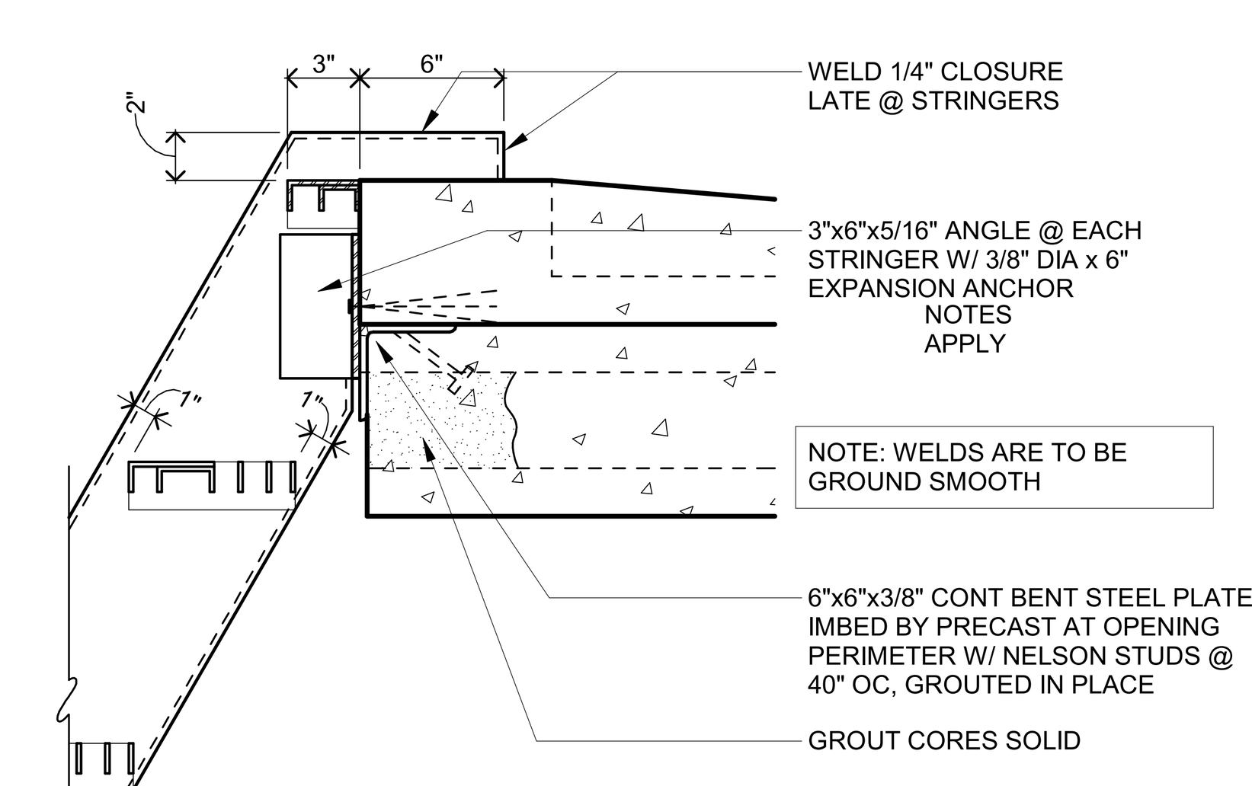
F1 TYPICAL SHIPS LADDER SECTION (REFERENCE)
1/4" = 1'-0"



F3 FLOOR AT SHIPS LADDER
1 1/2" = 1'-0"



F5 LANDING AT SHIPS LADDER & HATCH
1 1/2" = 1'-0"



F7 LANDING AT SHIPS LADDER
1 1/2" = 1'-0"

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Libertyville, IL 60048

Wold

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18294 Sonoma Highway
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LICENSED ARCHITECT MATTHEW JAMES BICKEL 001-020883 STATE OF ILLINOIS
EXP. 11/30/24

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed ARCHITECT under the laws of the State of Illinois

Matthew J Bickel
License Number: 001.020883 Date: 11/30/2024

Revisions

Description	Date	Num
Addendum #3	03/01/2023	1

Comm: 213106
Date: 12/30/2022
Drawn: MB/ML
Check: JMK

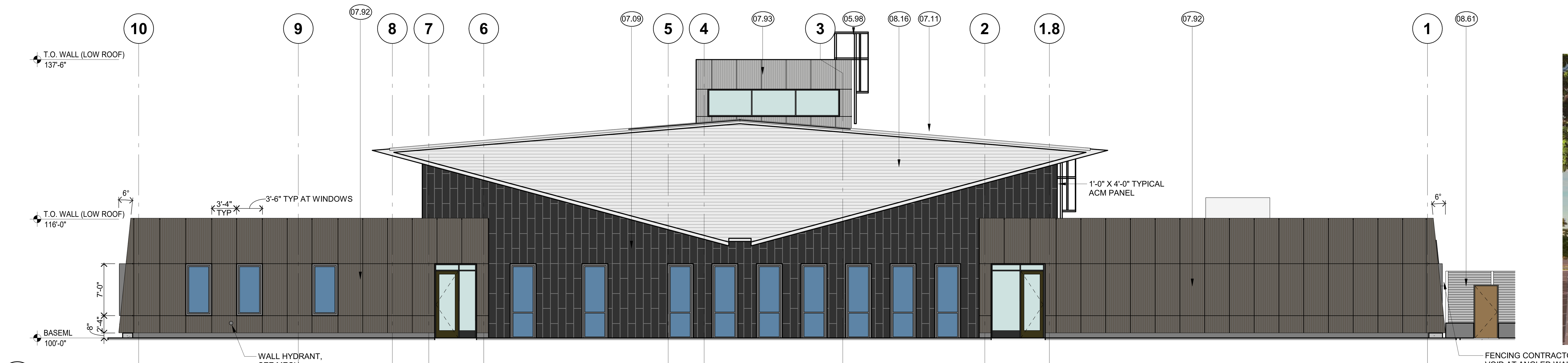
North

DETAILS - VERTICAL CIRCULATION

Scale: As indicated

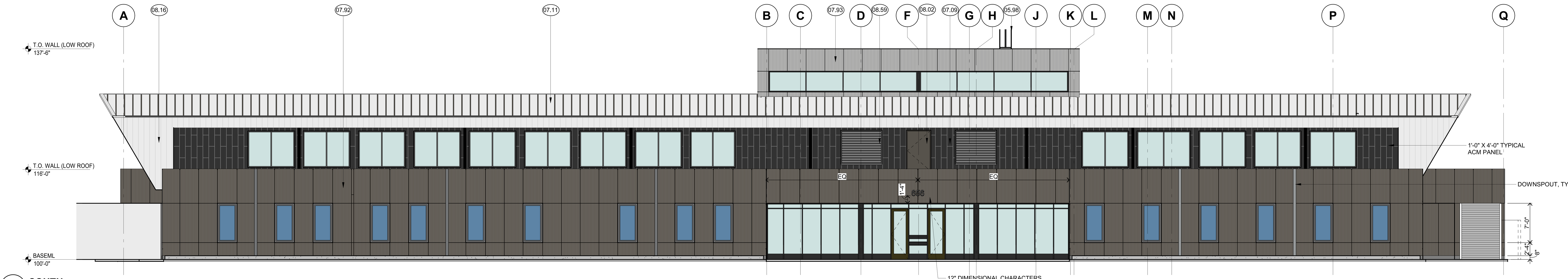
A4.201

IL



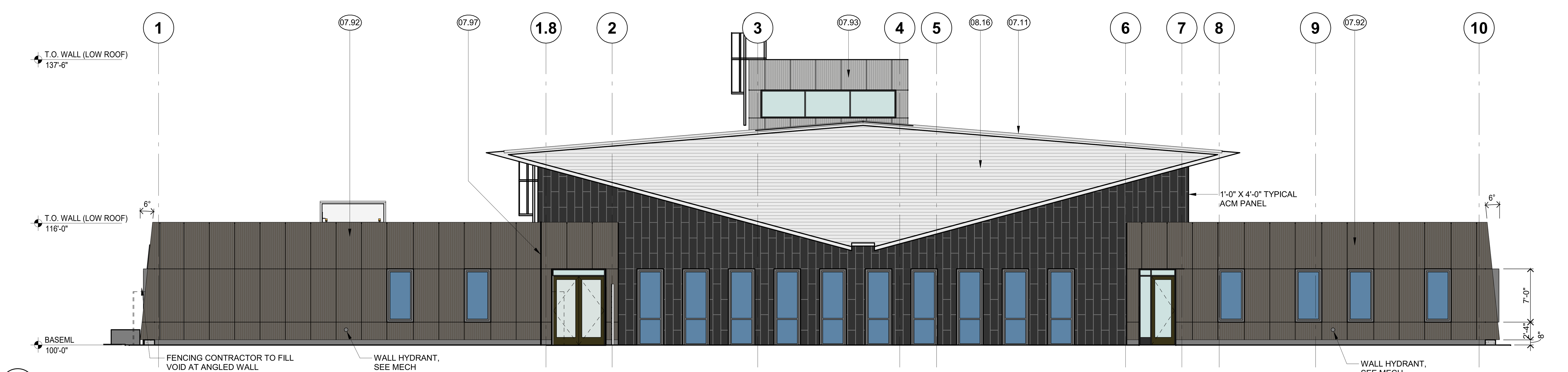
B1 EAST
1/8" = 1'-0"

EXTERIOR RENDERING - FOR REFERENCE ONLY

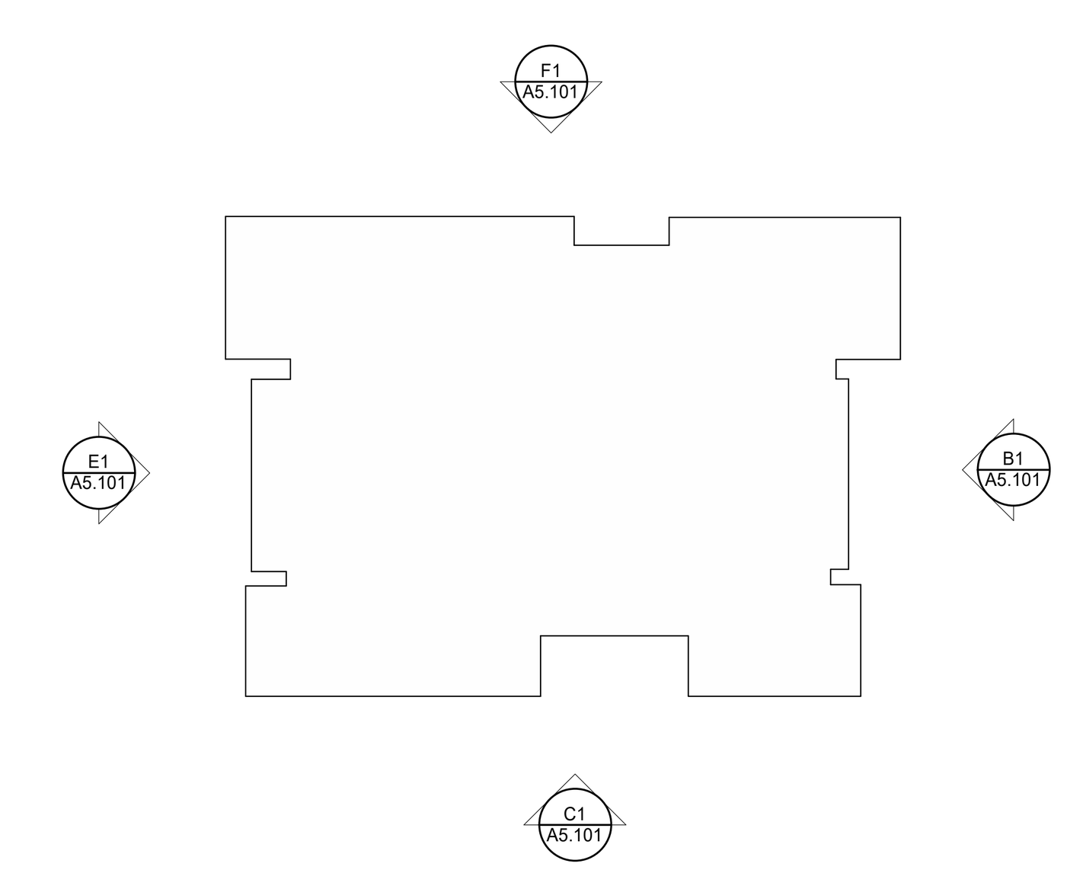


C1 SOUTH
1/8" = 1'-0"

MATERIALS KEY	
KEY	MATERIAL
05.98	STEEL LADDER
07.09	PREFINISHED RAINSCREEN PANEL
07.11	STEEL ROOFING
07.92	FIBER CEMENT PANEL 1
07.93	FIBER CEMENT PANEL 2
07.97	EXPANSION JOINT
08.02	HOLLOW METAL DOOR
08.16	PREFINISHED METAL PANEL
08.59	PREFINISHED METAL LOUVER
08.61	SCREEN LOUVER

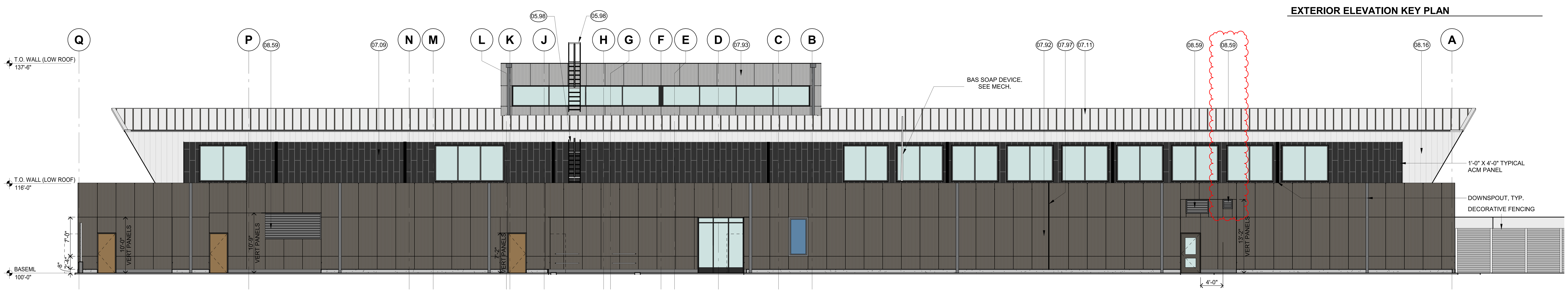


E1 WEST
1/8" = 1'-0"



EXTERIOR ELEVATION KEY PLAN

A



F1 NORTH
1/8" = 1'-0"

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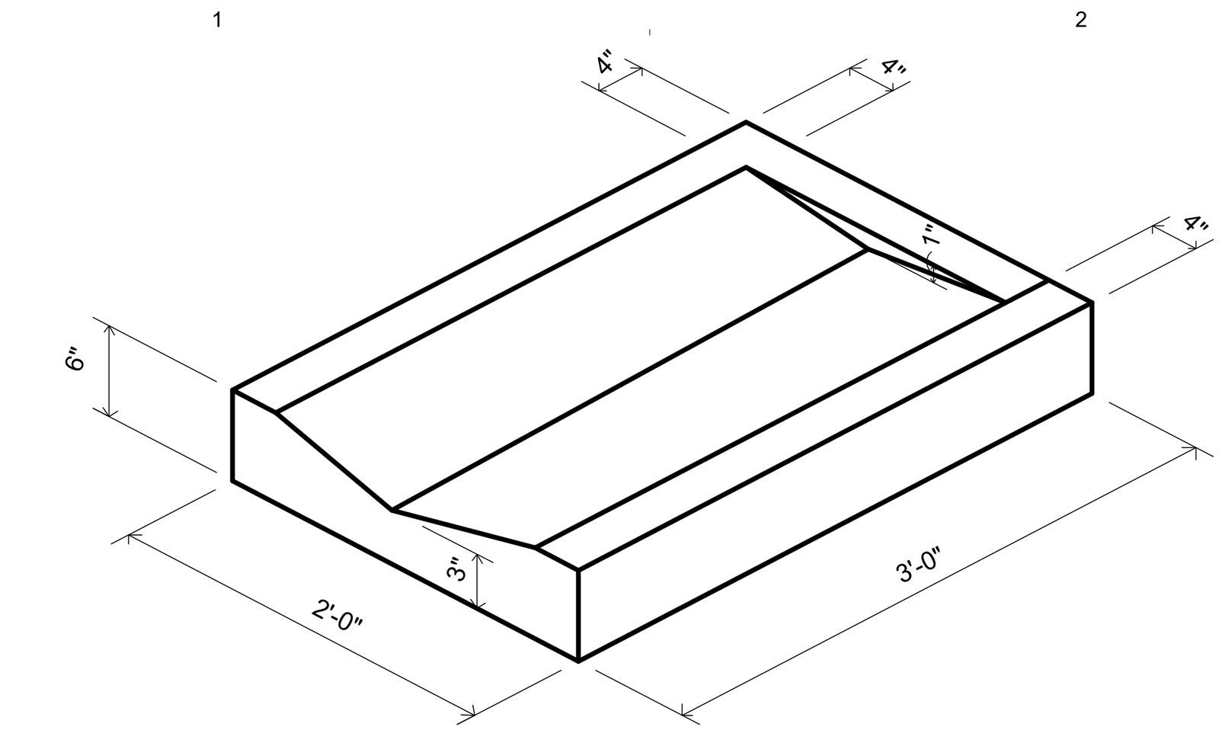
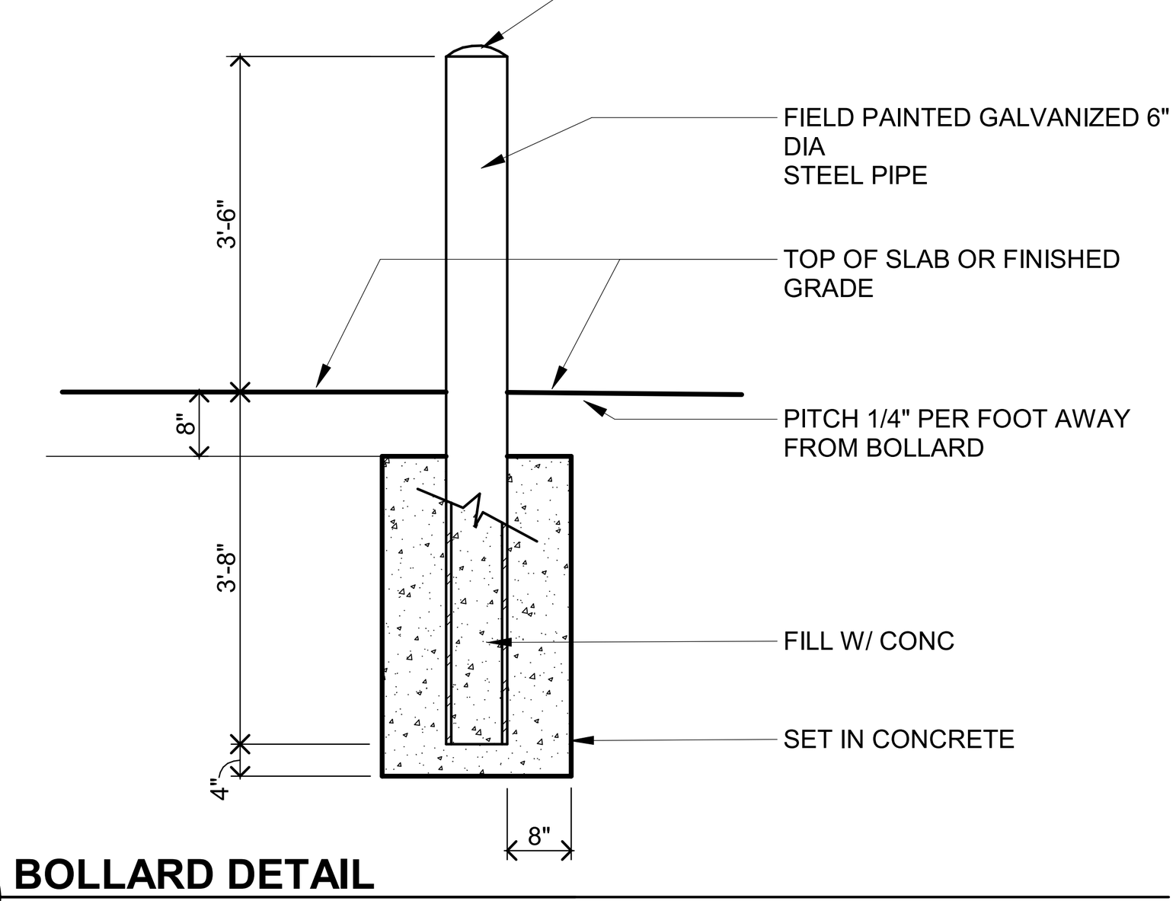
EXTERIOR ELEVATIONS

Scale: 1/8" = 1'-0"

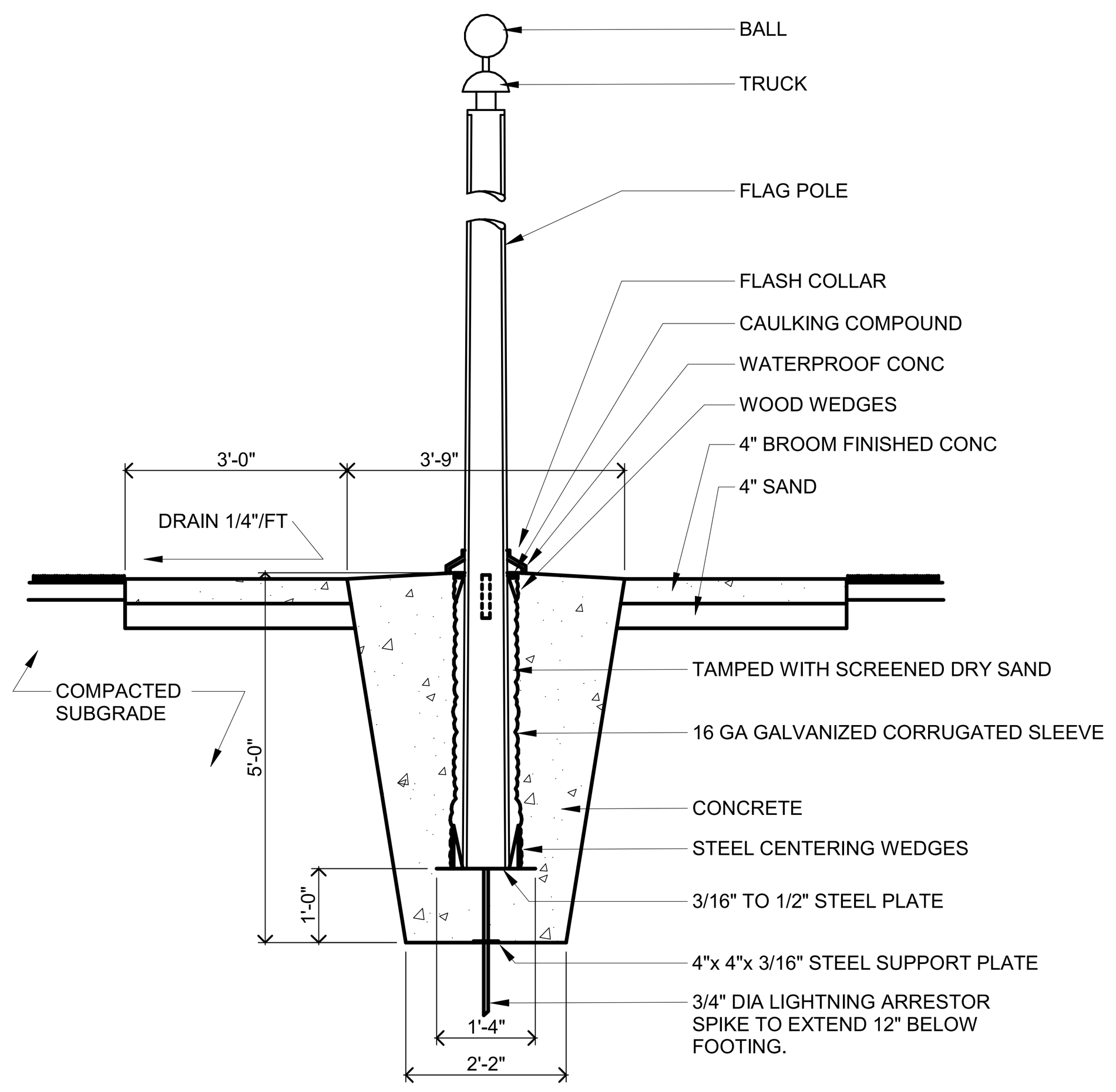
A5.101



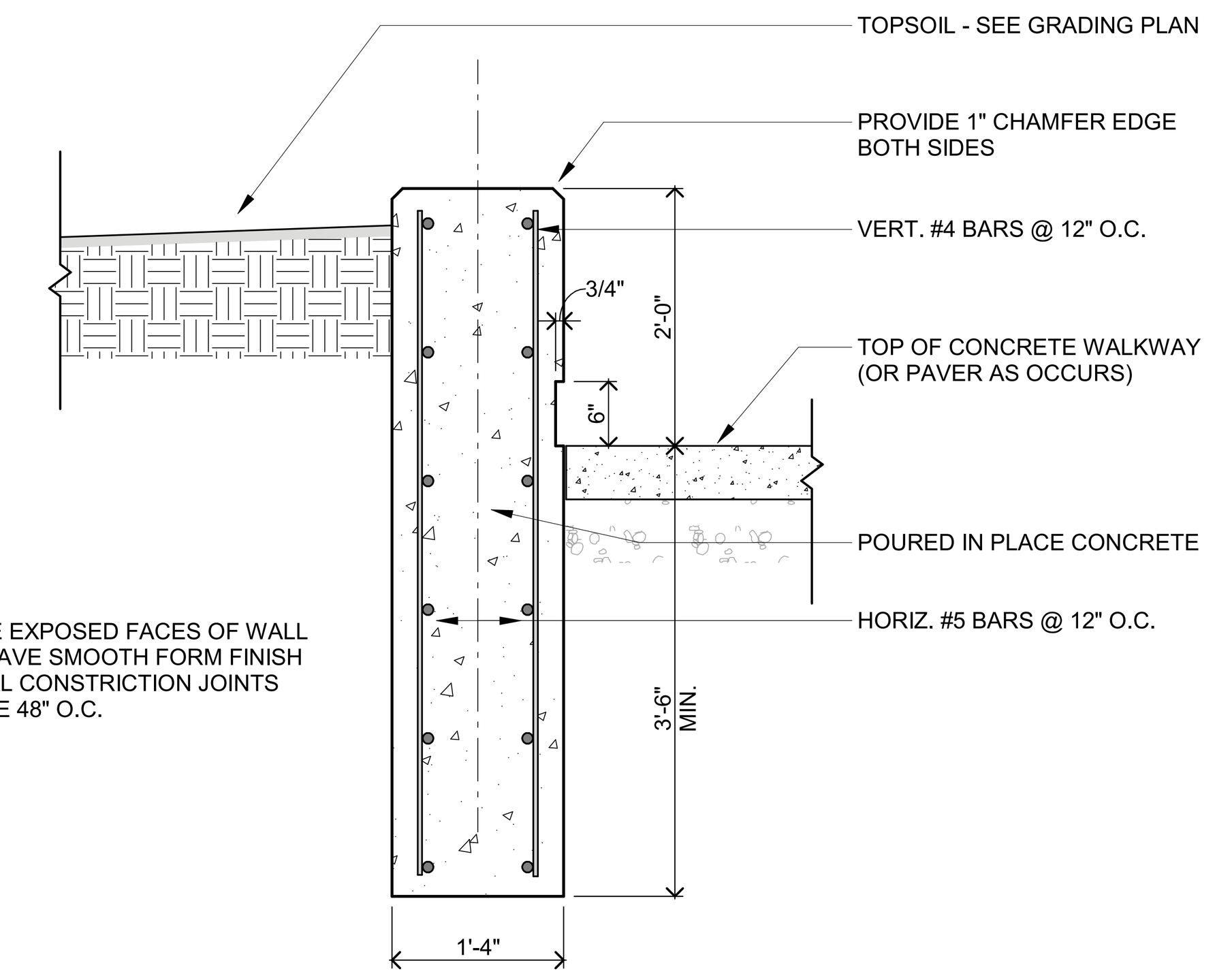
A1 **CONCRETE SPLASHBLOCK**
NOT TO SCALE



B1 **BOLLARD DETAIL**
1/2" = 1'-0"

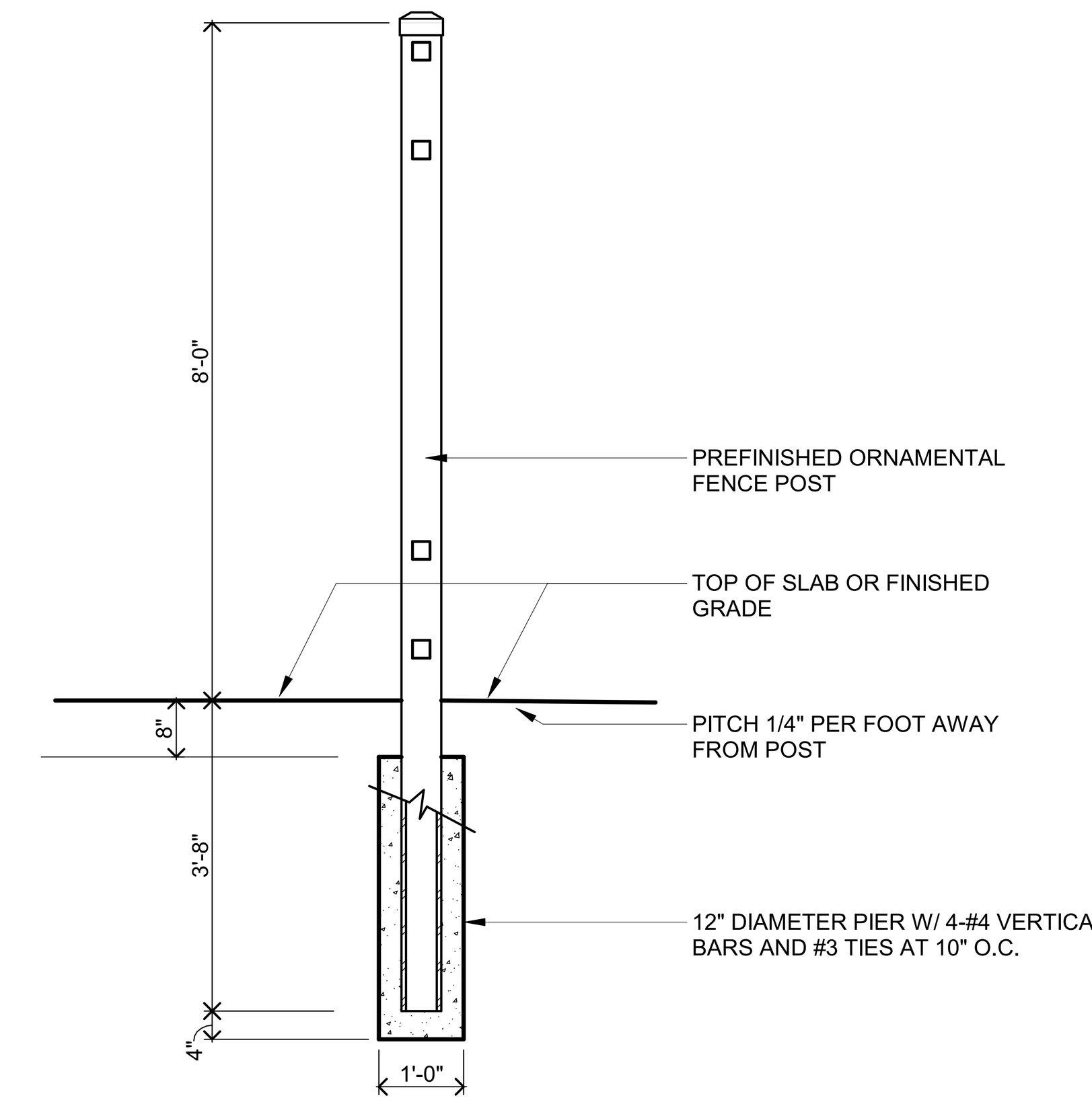


B3 **FLAGPOLE DETAIL**
NOT TO SCALE

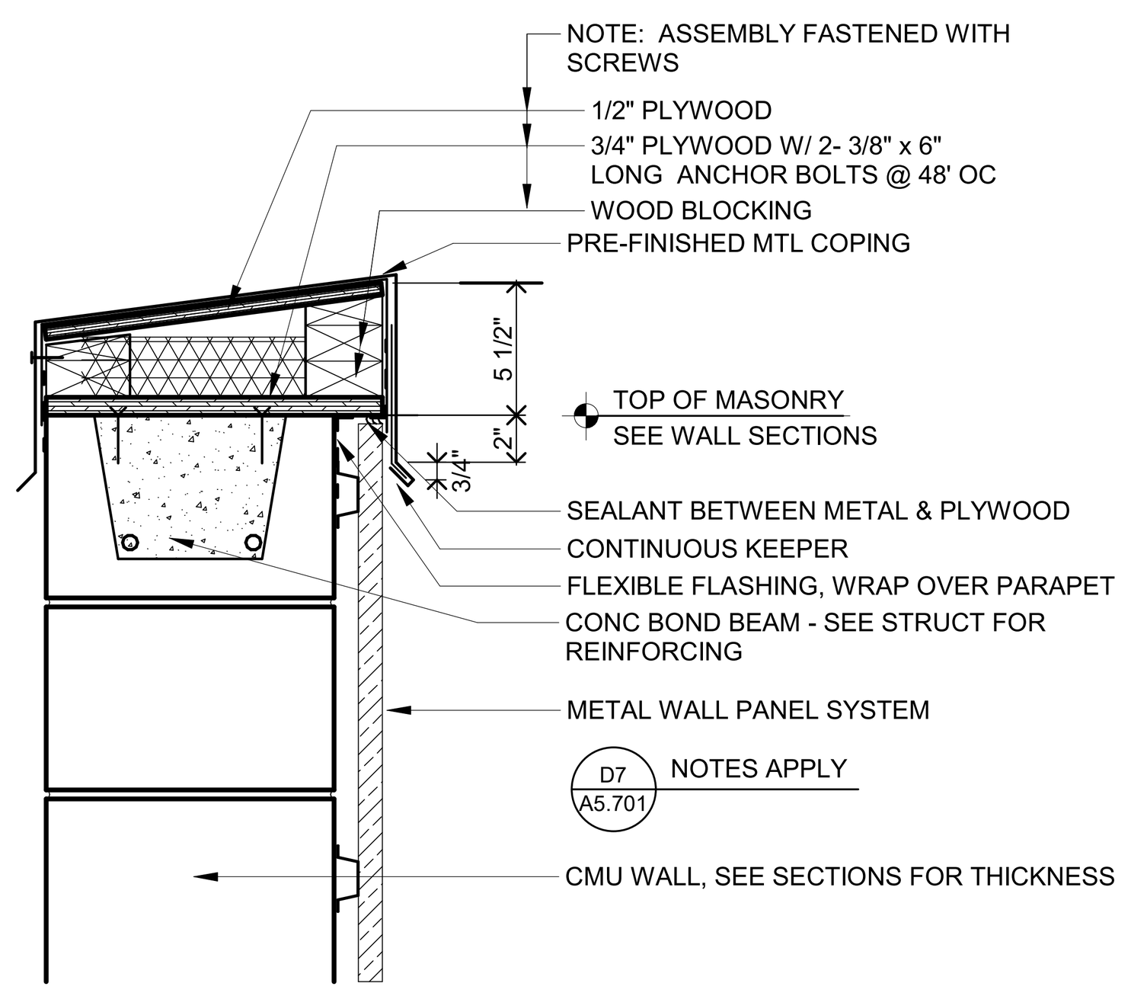


NOTES:
1. OUTSIDE EXPOSED FACES OF WALL SHALL HAVE SMOOTH FORM FINISH
2. VERTICAL CONSTRICTION JOINTS SHALL BE 48" O.C.

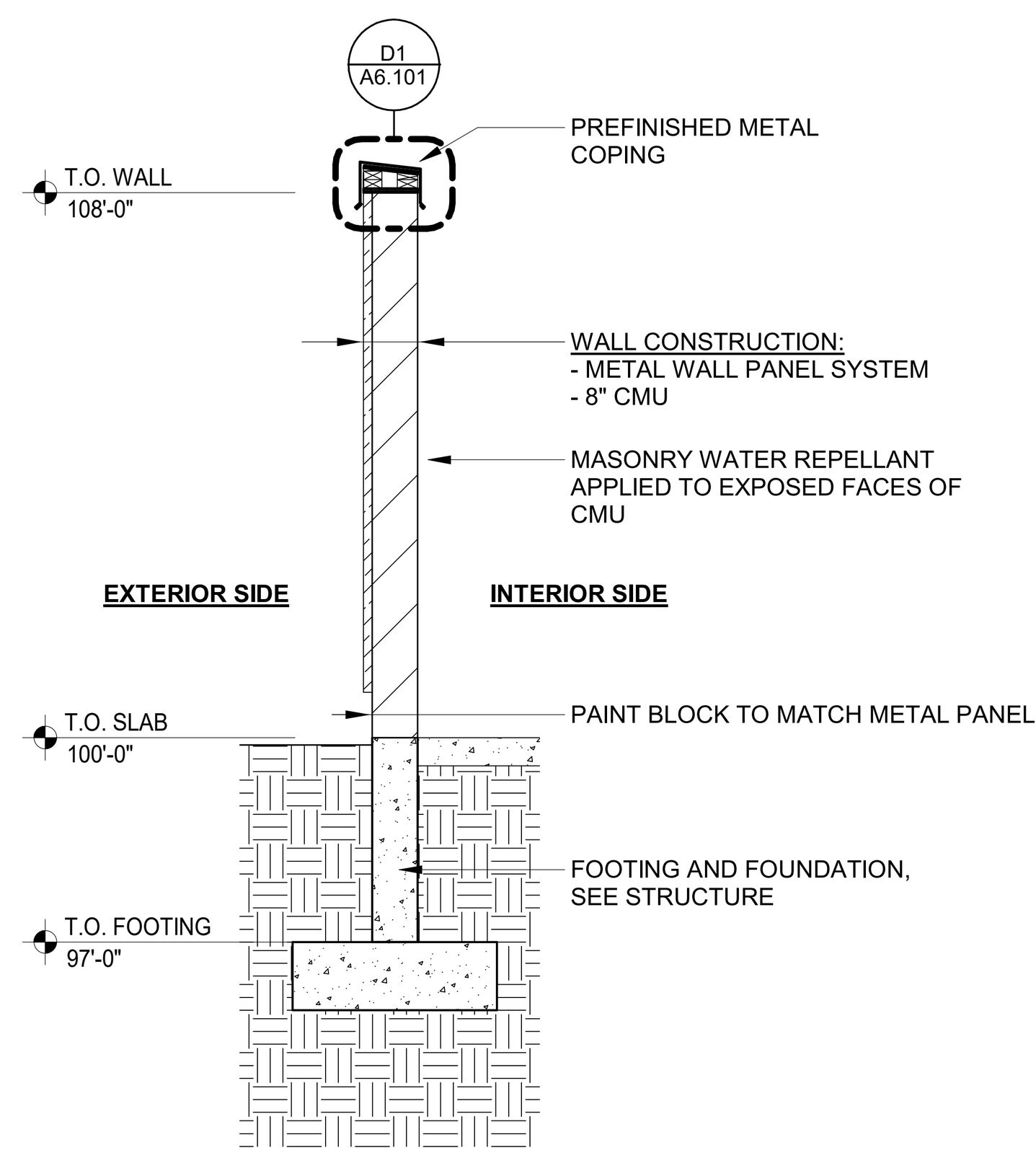
B5 **SEGMENTED RETAINING WALL DETAIL**
3/4" = 1'-0"



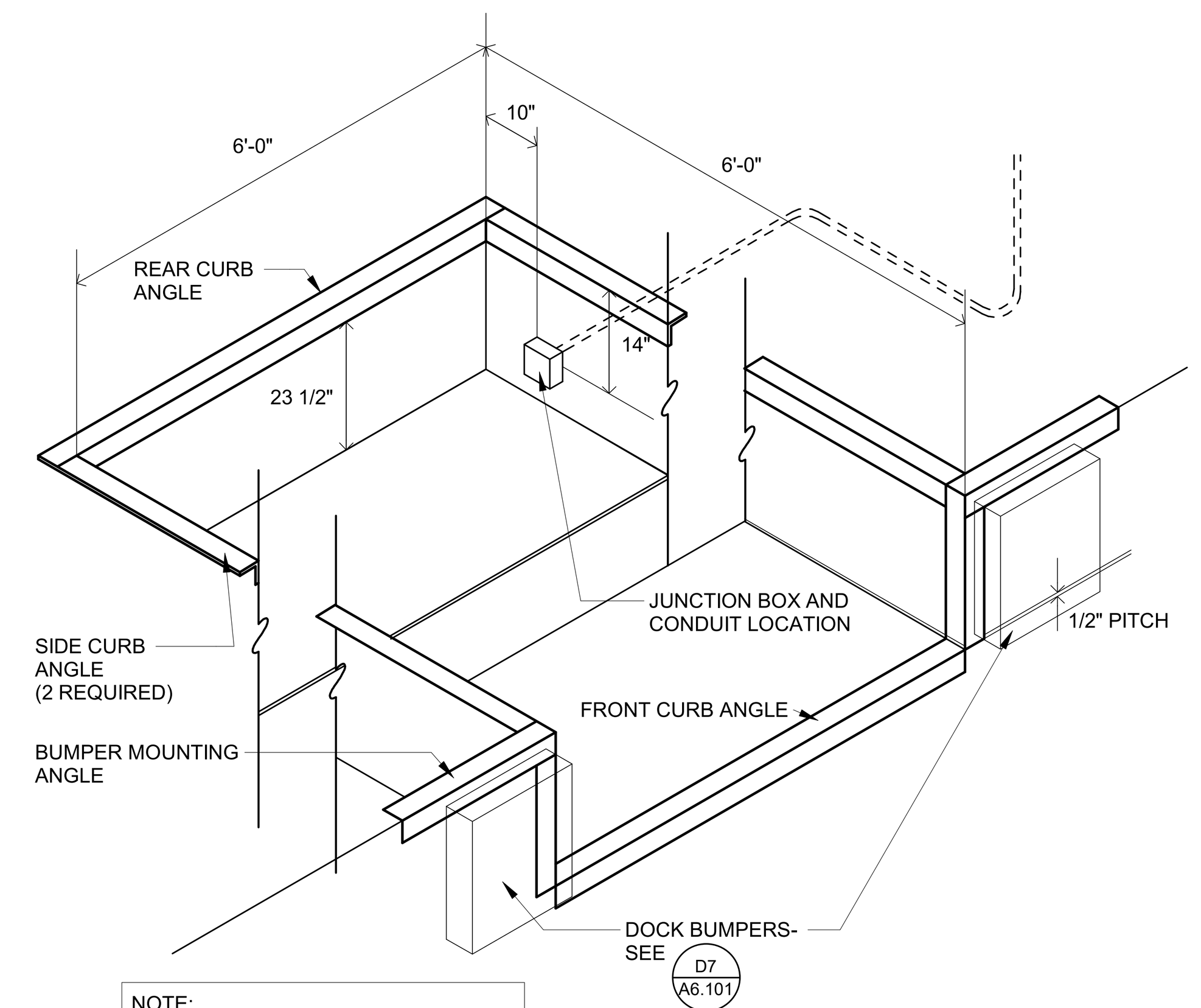
B7 **TYPICAL ORNAMENTAL FENCE POST DETAIL**
1/2" = 1'-0"



D1 **SECTION AT ENCLOSURE PARAPET**
1 1/2" = 1'-0"

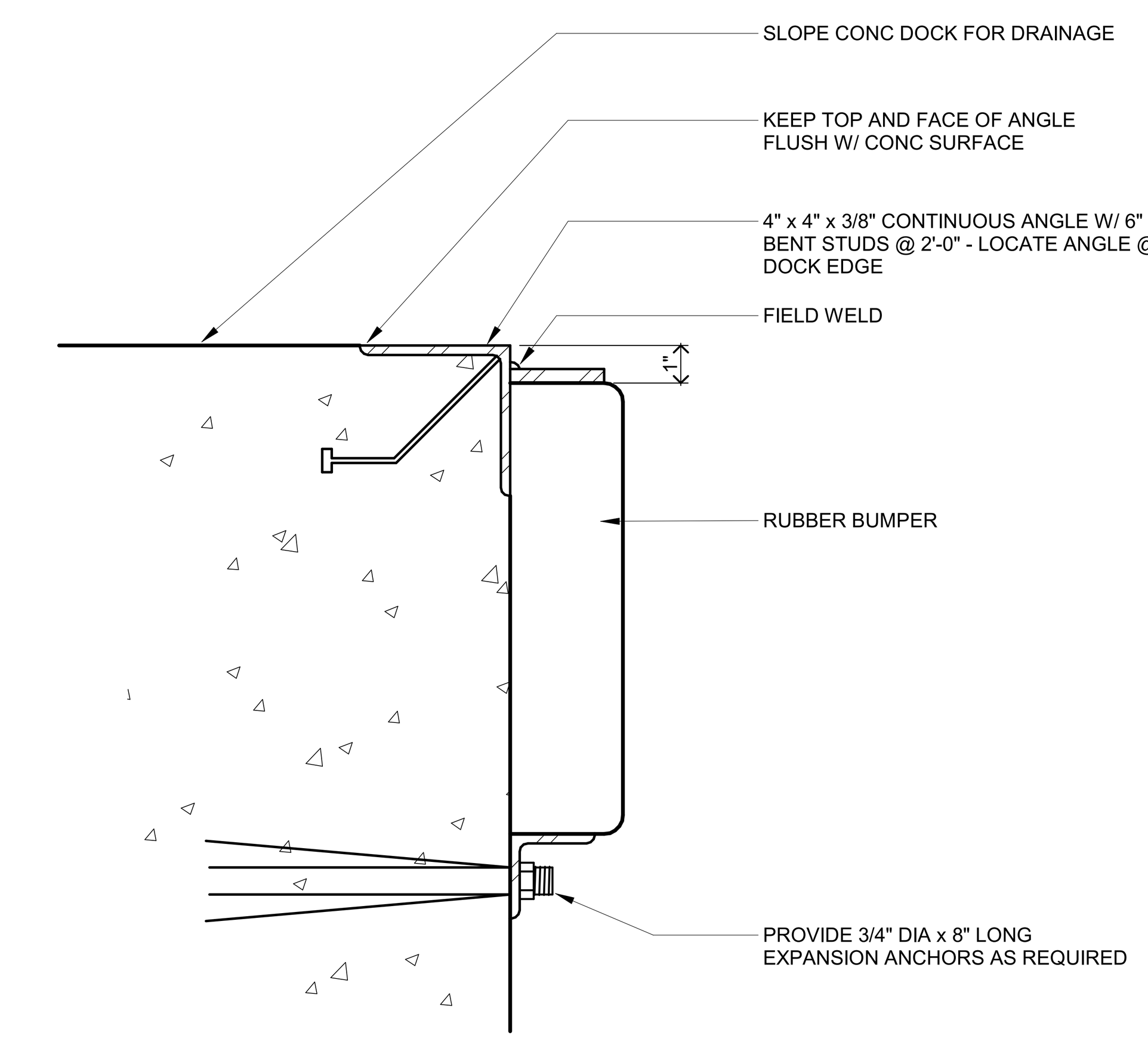


D3 **WALL SECTION @ TRASH ENCLOSURE**
3/8" = 1'-0"

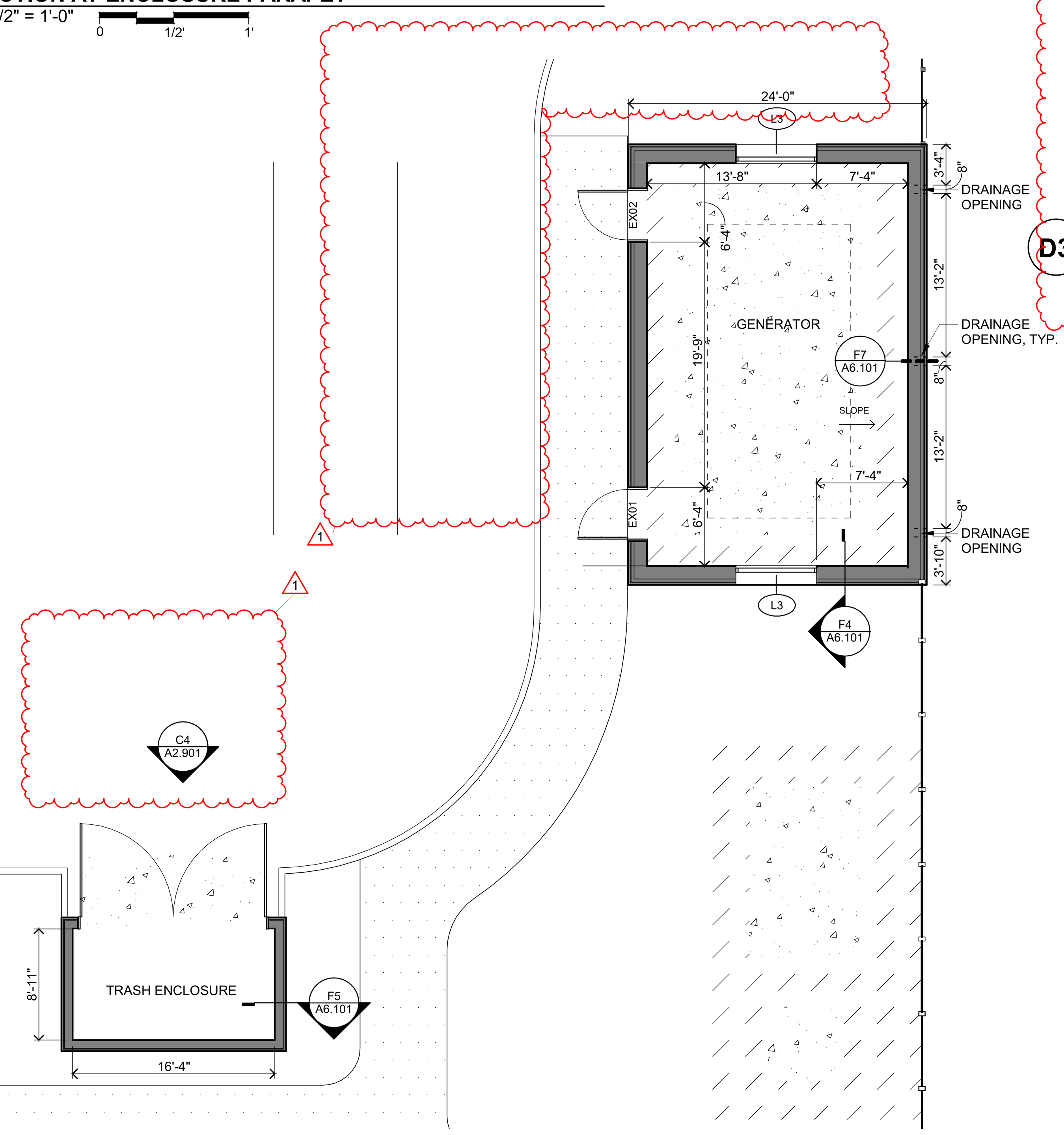


NOTE:
DRAWING AND DIMENSIONS ARE APPROXIMATE- VERIFY WITH DOCK MANUFACTURER.

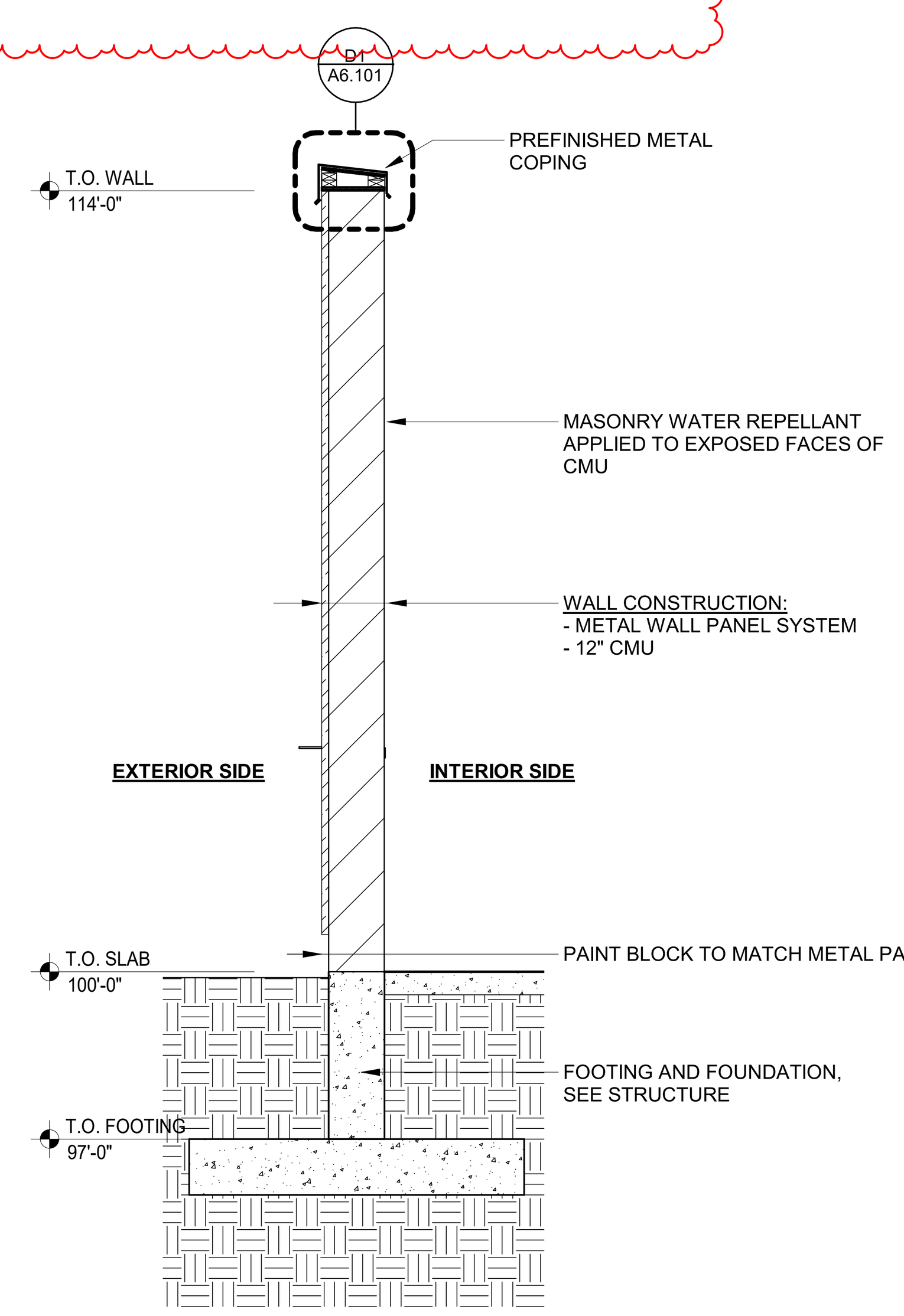
D5 **DOCK LEVELER**
1/2" = 1'-0"



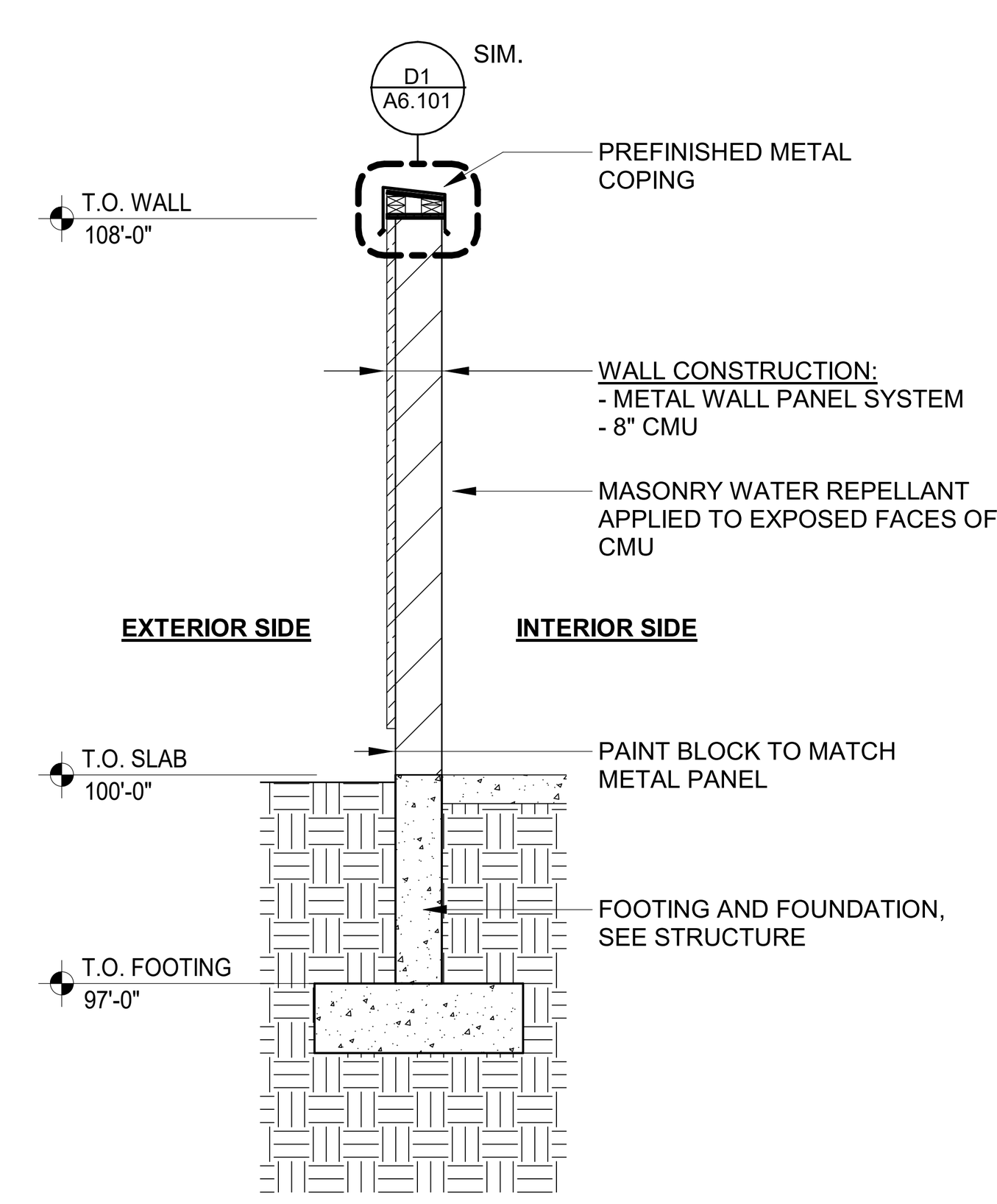
D7 **SECTION AT DOCK**
3" = 1'-0"



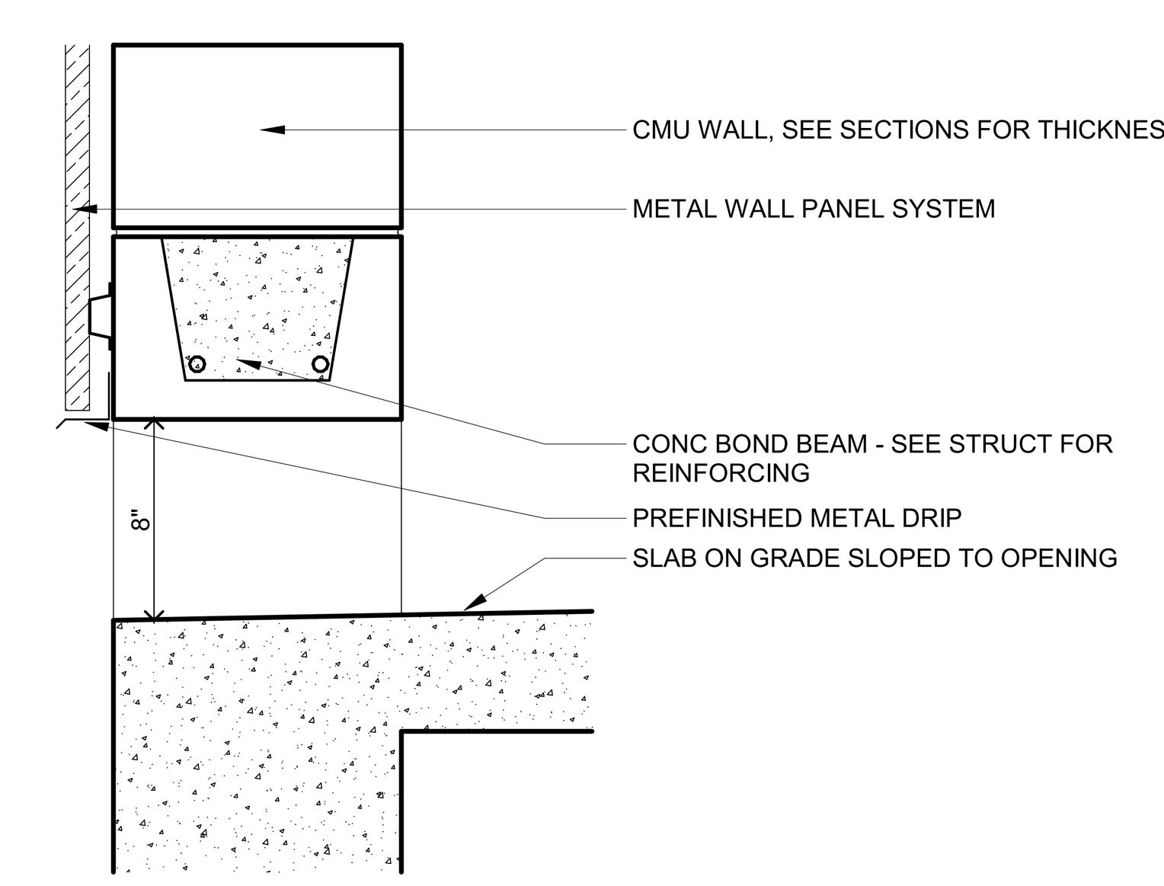
F1 **ENLARGED PLAN AT TRASH AND GENERATOR ENCLOSURES**
1/8" = 1'-0"



F4 **WALL SECTION @ GENERATOR ENCLOSURE**
3/8" = 1'-0"



F5 **WALL SECTION @ TRASH ENCLOSURE**
3/8" = 1'-0"



F7 **SECTION AT THRU-WALL DRAINAGE**
1 1/2" = 1'-0"

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Addendum #3	03/01/2023	1

Comm: 213106
Date: 12/30/2022
Drawn: Author
Check: JMK

North

DETAILS - SITE

Scale: As indicated

A6.101

HYDRONIC & BAS PLAN- AREA 'A'
1/8" = 1'-0"

HYDRONIC PLAN GENERAL NOTES:

1. ALL RISES AND DROPS IN PIPING ARE NOT NECESSARILY SHOWN. LAYOUT ROUTING AND COORDINATE WORK WITH OTHER TRADES BEFORE CONSTRUCTION.

2. MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR CUTTING AND PATCHING OF CONSTRUCTION UNLESS OTHERWISE NOTED ON THE PLANS. NO CUTTING OF STRUCTURAL MEMBERS OR STRUCTURE WHICH WILL DETERIORATE THE INTEGRITY AND STRENGTH OF THE BUILDING WILL BE ALLOWED WITHOUT WRITTEN APPROVAL FROM THE STRUCTURAL ENGINEER.

3. LOCATE ALL VALVES, METERS, GAUGES, AND PIPING SPECIALTIES ABOVE ACCESSIBLE CEILINGS.

4. COORDINATE TEMPERATURE SENSOR LOCATIONS WITH OTHER TRADES, BUILDING ELEMENTS, AND ELECTRICAL SWITCHES. ADJUST THE EXACT LOCATIONS AS REQUIRED TO AVOID CONFLICTS.

5. BRANCH PIPING TO EQUIPMENT TO BE 3/4" UNLESS OTHERWISE NOTED.

6. ROUTE PIPES BETWEEN JOIST WEBS WHERE REQUIRED TO COORDINATE WITH THE INSTALLATION OF OTHER TRADES AND TO MAINTAIN CEILING HEIGHTS. COORDINATE LOCATIONS PRIOR TO CROSS BRACING TO ENSURE THERE ARE NO CONFLICTS.

7. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REQUIRED REINFORCEMENT OF NEW AND EXISTING STRUCTURAL MEMBERS FOR MECHANICAL SYSTEMS. REFER TO "MECHANICAL SUPPORT REINFORCEMENT DETAIL" FOR ADDITIONAL REQUIREMENTS.

8. REFER TO M9.10, E5.01, AND E5.02 FOR THE BUILDING ENERGY METERING MATRIX AND RISER DIAGRAM.

9. CONTRACTOR TO PROVIDE BIM CLASH DETECTION IN ACCORDANCE WITH ALL REQUIREMENTS AS INDICATED IN SPECIFICATION SECTION 01 32 50.

HYDRONIC PLAN KEYED NOTES:

1 NATURAL VENTILATION STORM MODE PUSHBUTTON.

2 PROVIDE REFRIGERANT PIPING AND SIZE IN ACCORDANCE WITH MANUFACTURER'S GUIDELINES.

3 LOCATE HIGH SIDE OF SPACE STATIC PRESSURE SENSOR IN CORRIDOR CEILING IN THIS APPROXIMATE LOCATION.

4 COMBINATION TEMPERATURE AND CO2 SENSOR.

5 COMBINATION TEMPERATURE, CO2, AND RH SENSOR.

6 COMBINATION TEMPERATURE AND RH SENSOR.

7 BACnet BAS IP PANEL. COORDINATE FINAL LOCATION WITH DIV. 23/25/26/27 CONTRACTORS.

8 INSTALL LIQUID DETECTION CABLE AROUND FLOOR DEPRESSIONS AND CRAC UNIT DRAIN PANS UNDER THE RAISED FLOOR. REFER TO 23 09 00 FOR SPECIFICATIONS.

9 HEATING WATER BYPASS VALVE

10 CHILLED WATER BYPASS VALVE

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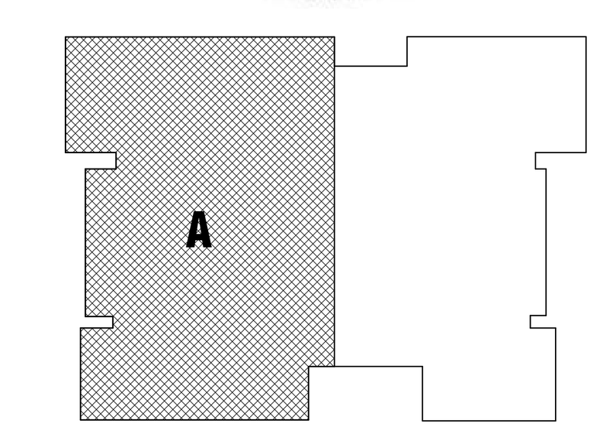

KEY PLAN

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Matthew T. Verdun
License Number: 062-059546 Date 12/30/2022

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Addendum #3	03/03/23	2

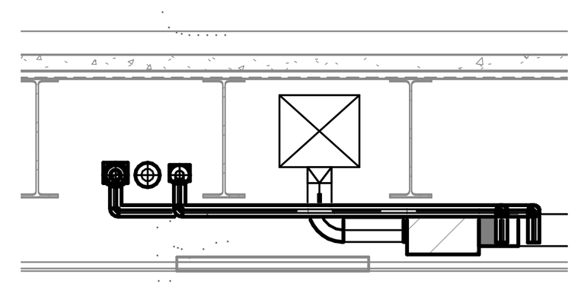
Comm: 213106
Date: 12/30/2022
Drawn: KO
Check: RP

North

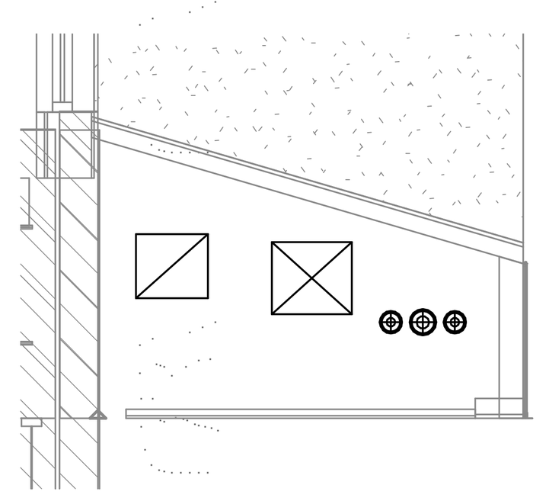
HYDRONIC & BAS PLAN- AREA 'A'

Scale: 1/8" = 1'-0"

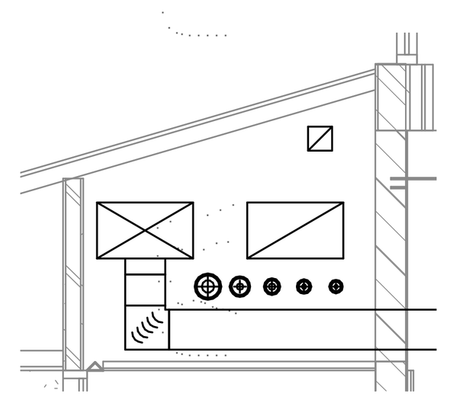
M2.01



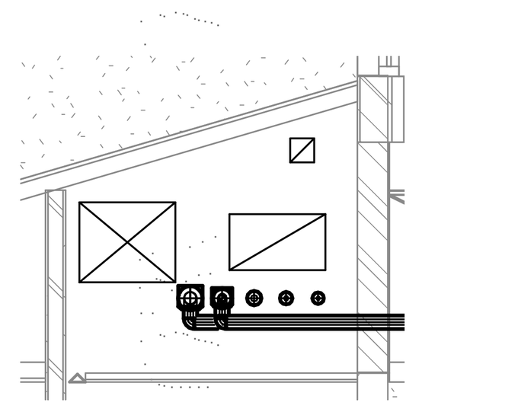
B1 ROLL CALL ROOM SECTION
1/4" = 1'-0"



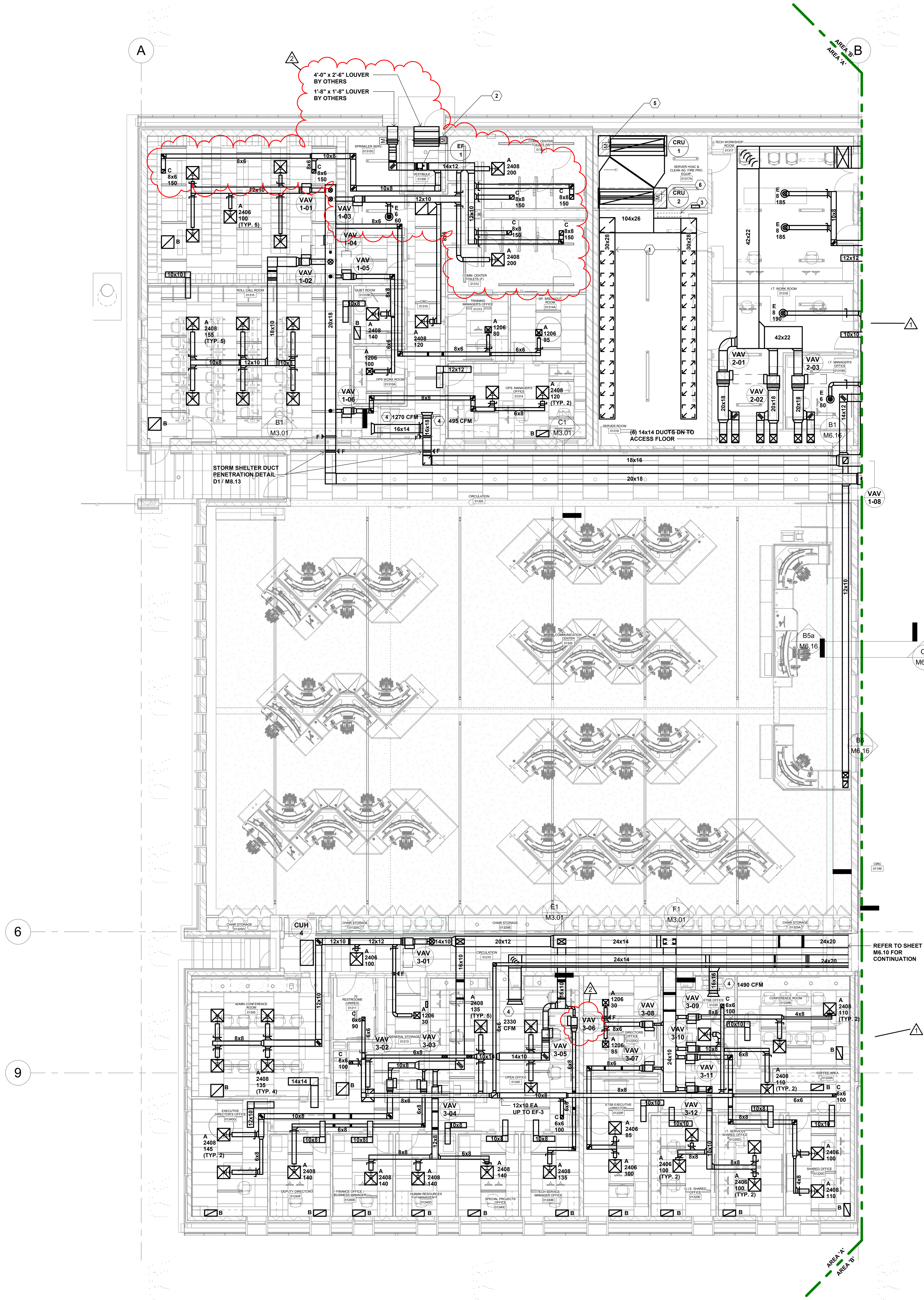
C1 NW CORRIDOR SECTION
1/4" = 1'-0"



E1 SW CORRIDOR SECTION
1/4" = 1'-0"



F1 SW CORRIDOR SECTION
1/4" = 1'-0"



F2 HVAC PLAN- AREA 'A'
1/8" = 1'-0"

HVAC PLAN KEYED NOTES:

1. ROUTE DUCTS UP BETWEEN JOISTS DIRECTLY ABOVE BOTH HOT AISLES.
2. 48"x32" LOUVER PLENUM WITH MOTORIZED DAMPER MD-1 FOR STORM MODE NATURAL VENTILATION.
3. LEAVE CLEAR SPACE WITH NO DUCT ABOVE FOR ELECTRICAL EQUIPMENT/PANEL.
4. BALANCE TO CFM INDICATED.
5. 104x26 MOTORIZED DAMPER MD-2 ON RETURN INLET OF CRU-1
6. 104x26 MOTORIZED DAMPER MD-3 ON RETURN INLET OF CRU-2
7. DUCTWORK SHOWN WITH INNER DASHED LINE SHALL BE CONSTRUCTED FROM PERFORATED DOUBLE-WALL DUCTWORK.

HVAC PLAN GENERAL NOTES:

1. TRANSFER DUCTS AND DUCTS CONNECTED TO TRANSFER FANS SHALL HAVE 1" INTERNAL SOUND ATTENUATING LINER
2. DO NOT INSTALL FLEXIBLE DUCT CONNECTIONS ABOVE INACCESSIBLE CEILINGS
3. DIFFUSER DUCT RUNOUTS AND FLEXIBLE DUCT CONNECTIONS SHALL BE THE SAME SIZE AS THE DIFFUSER NECK.
4. THE VARIABLE AIR VOLUME CONTROL BOX SHALL BE LOCATED IN A POSITION TO ENSURE ACCESSIBILITY. VARIABLE AIR VOLUME COIL CONNECTIONS SHALL BE ON THE SAME SIDE AS THE CONTROL BOX.
5. LOCATE BALANCING DAMPERS ABOVE ACCESSIBLE CEILINGS WHERE POSSIBLE.
6. COORDINATE LOCATIONS OF ANY ACCESS PANELS REQUIRED IN WALLS OR CEILINGS WITH GENERAL CONTRACTOR.
7. ROUTE DUCTS BETWEEN JOISTS AND THROUGH JOIST WEBS WHERE REQUIRED TO COORDINATE WITH THE INSTALLATION OF OTHER TRADES AND TO MAINTAIN CEILING HEIGHTS. COORDINATE LOCATIONS PRIOR TO CROSS BRACING TO ENSURE THERE ARE NO CONFLICTS. AREAS KEYNOTED ARE MINIMUM REQUIRED.
8. DIFFUSER AND REGISTER LOCATIONS SHALL BE COORDINATED WITH LIGHT FIXTURE LOCATIONS AND SHALL BE IN ACCORDANCE WITH CEILING PATTERNS AS SHOWN ON THE ARCHITECTURAL REFLECTED CEILING PLANS.
9. ALL RISES AND DROPS IN DUCTWORK ARE NOT NECESSARILY SHOWN. LAYOUT ROUTING AND COORDINATE WORK WITH OTHER TRADES BEFORE CONSTRUCTION.
10. MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR CUTTING AND PATCHING OF CONSTRUCTION UNLESS OTHERWISE NOTED ON THE PLANS. NO CUTTING OF STRUCTURAL MEMBERS OR STRUCTURE WHICH WILL DETERIORATE THE INTEGRITY AND STRENGTH OF THE BUILDING WILL BE ALLOWED WITHOUT WRITTEN APPROVAL FROM THE STRUCTURAL ENGINEER.
11. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REQUIRED REINFORCEMENT OF NEW AND EXISTING STRUCTURAL MEMBERS FOR MECHANICAL SYSTEMS. REFER TO "MECHANICAL SUPPORT REINFORCEMENT DETAIL" FOR ADDITIONAL REQUIREMENTS.
12. PROVIDE MIN. 3 FT OF CLEARANCE IN FRONT OF VAV ACCESS PANEL.
13. CONTRACTOR TO PROVIDE BIM CLASH DETECTION IN ACCORDANCE WITH ALL REQUIREMENTS AS INDICATED IN SPECIFICATION SECTION 01 32 50

DIVISION 25 BACNET GENERAL NOTES - HVAC

CRU UNITS:
CONTROLLER SHALL BE A BACNET/IP SINGLE DEVICE CONTROLLER TYPE OF BACNET INTERFACE DEVICE. THIRD PARTY GATEWAYS THAT ARE NOT FACTORY AUTHORIZED GATEWAYS ARE NOT ALLOWED IN THE WORK. NOTE THAT THE BACNET/IP GATEWAY SHALL BE FACTORY AUTHORIZED PRODUCT PROVIDED BY THE EQUIPMENT SUPPLIER. PROVIDE PROOF OF THIS DURING THE SUBMITTAL PROCESS. SEE DIVISION 25 FOR DETAILS ON THE BACNET OBJECT LIST TO BE PROVIDED AS BACNET AVS, BVS, AND MSVS BY THE EQUIPMENT SUPPLIER. POINT NAMES AND DEVICE NAMES SHALL BE WRITABLE IN THE EQUIPMENT SUPPLIER'S BACNET INTERFACE DEVICE SO THE NAMES CAN BE CHANGED TO THE LAKE COUNTY STANDARD. DEVICES THAT DO NOT SUPPORT WRITABLE DEVICE AND POINT NAMES ARE NOT ALLOWED IN THE WORK. IF THERE ARE POINTS IN THE DEVICE THAT DO NOT APPLY TO THE WORK, THE EQUIPMENT SUPPLIER SHALL WORK ON SITE WITH THE LAKE COUNTY CONTROLS CONSULTANT TO IDENTIFY THESE POINTS THAT DO NOT APPLY TO THE WORK. THEY SHALL BE DELETED FROM THE EQUIPMENT SUPPLIER'S BACNET INTERFACE DEVICE IF THEY ARE NOT USED IN THE WORK. SEE DIVISION 25 FOR BACNET AND NETWORKING DETAILS. ELECTRICAL SHALL PROVIDE AN IP DROP TO THE BACNET/IP DEVICE IN GOLD CONDUIT C/W A PULL WIRE SO DIVISION 27 CAN INSTALL PURPLE CAT 6 CABLE TO THE LAKE COUNTY STANDARD FROM THE DEVICE TO DESIGNATED PATCH PANEL.

THE BASIS OF DESIGN IS LIEBERT VERTIV. CONTROLLER SHALL BE A BACNET/IP SINGLE DEVICE CONTROLLER FOR EACH CRU UNIT. MECHANICAL SHALL PROVIDE NETWORK WIRING BETWEEN THE CRU UNITS TO IMPLEMENT TEAMWORK MODE. EACH CRU UNIT SHALL COME WITH AN ICOM PANEL FOR LOCAL DISPLAY AND MANUAL CONTROL. THE SINGLE DEVICE CONTROLLER SHALL COME C/W AN EMBEDDED LINUX WEBSERVER FOR CONFIGURATION. ALL OTHER DATA SHALL BE TRANSMITTED OVER THE BACNET/IP NETWORK. SEE DIVISION 25 FOR DETAILS.

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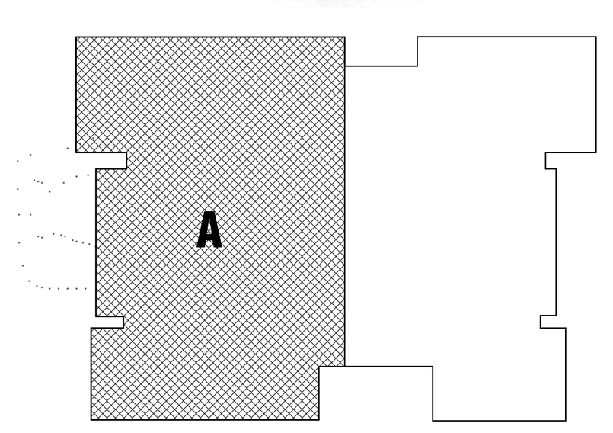

KEY PLAN

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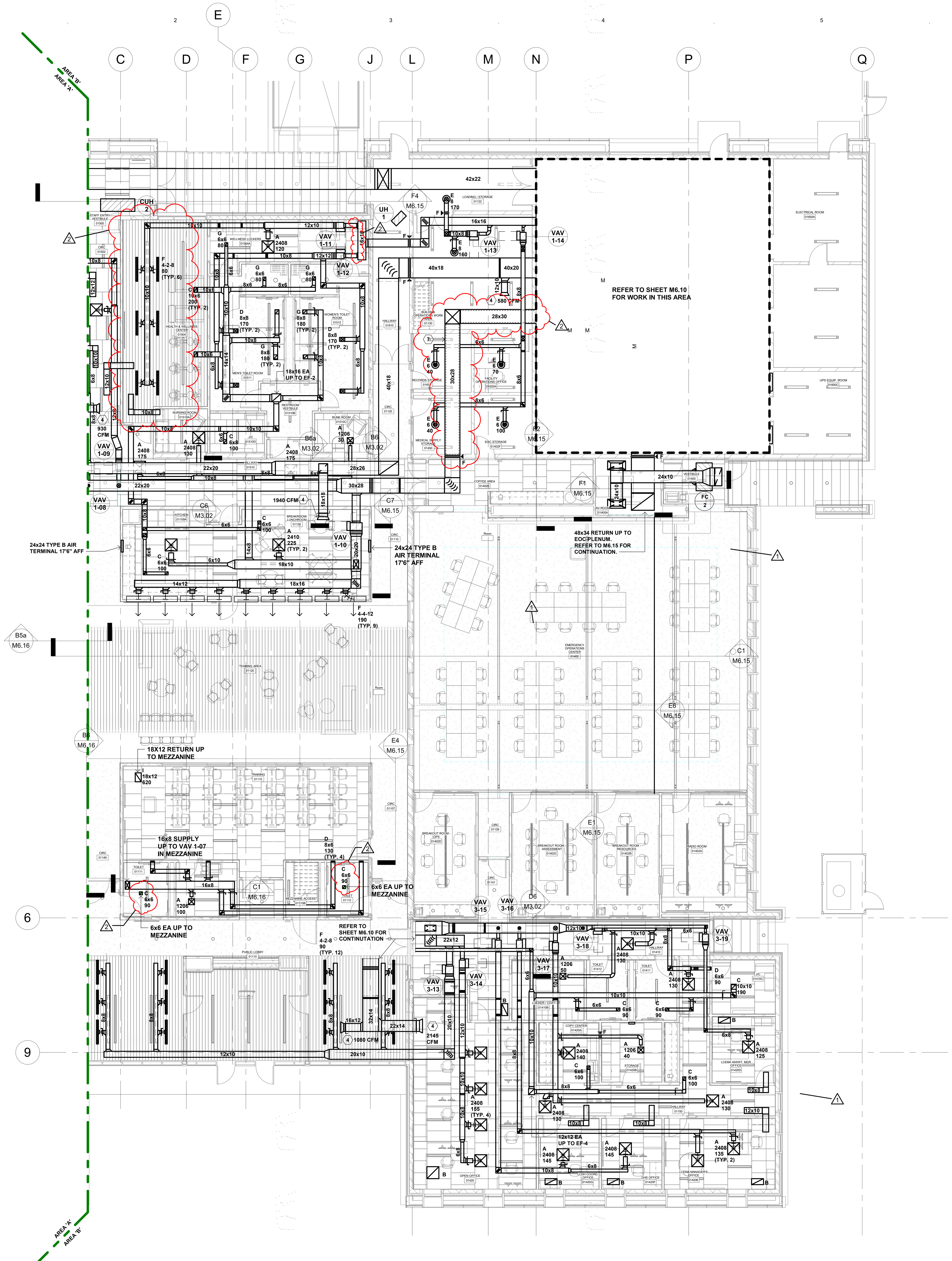
North

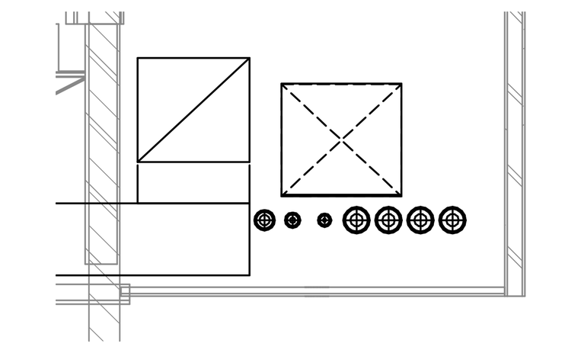
HVAC PLAN- AREA 'A'

Scale: As indicated

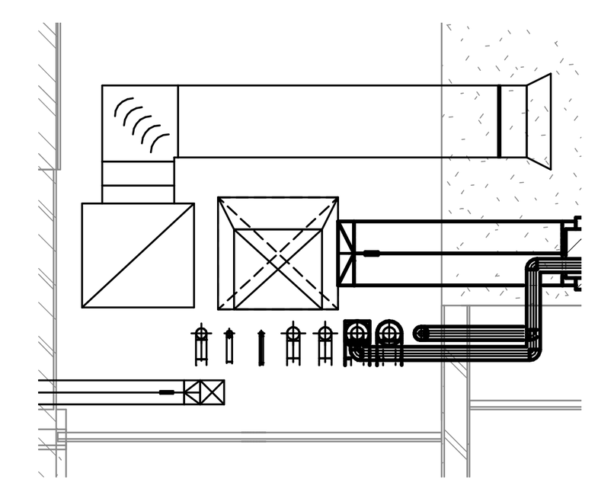
M3.01



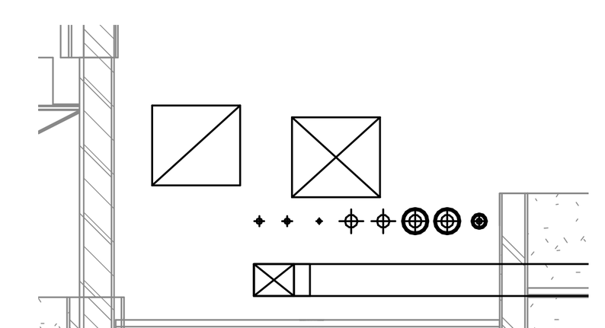
F1 HVAC PLAN- AREA 'B'
1/8" = 1'-0"



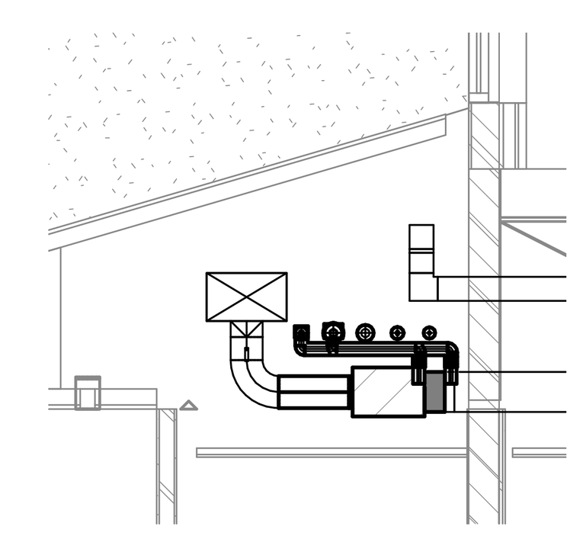
B6 NE CORRIDOR SECTION
1/4" = 1'-0"



B6a NW CORRIDOR SECTION
1/4" = 1'-0"



C6 NW CORRIDOR SECTION
1/4" = 1'-0"



D6 SE CORRIDOR SECTION
1/4" = 1'-0"

HVAC PLAN GENERAL NOTES:

1. TRANSFER DUCTS AND DUCTS CONNECTED TO TRANSFER FANS SHALL HAVE 1" INTERNAL SOUND ATTENUATING LINER

2. DO NOT INSTALL FLEXIBLE DUCT CONNECTIONS ABOVE INACCESSIBLE CEILINGS

3. DIFFUSER DUCT RUNOUTS AND FLEXIBLE DUCT CONNECTIONS SHALL BE THE SAME SIZE AS THE DIFFUSER NECK.

4. THE VARIABLE AIR VOLUME CONTROL BOX SHALL BE LOCATED IN A POSITION TO ENSURE ACCESSIBILITY. VARIABLE AIR VOLUME COIL CONNECTIONS SHALL BE ON THE SAME SIDE AS THE CONTROL BOX.

5. LOCATE BALANCING DAMPERS ABOVE ACCESSIBLE CEILINGS WHERE POSSIBLE.

6. COORDINATE LOCATIONS OF ANY ACCESS PANELS REQUIRED IN WALLS OR CEILINGS WITH GENERAL CONTRACTOR.

7. ROUTE DUCTS BETWEEN JOISTS AND THROUGH JOIST WEBS WHERE REQUIRED TO COORDINATE WITH THE INSTALLATION OF OTHER TRADES AND TO MAINTAIN CEILING HEIGHTS. COORDINATE LOCATIONS PRIOR TO CROSS BRACING TO ENSURE THERE ARE NO CONFLICTS. AREAS KEYNOTED ARE MINIMUM REQUIRED.

8. DIFFUSER AND REGISTER LOCATIONS SHALL BE COORDINATED WITH LIGHT FIXTURE LOCATIONS AND SHALL BE IN ACCORDANCE WITH CEILING PATTERNS AS SHOWN ON THE ARCHITECTURAL REFLECTED CEILING PLANS.

9. ALL RISES AND DROPS IN DUCTWORK ARE NOT NECESSARILY SHOWN. LAYOUT ROUTING AND COORDINATE WORK WITH OTHER TRADES BEFORE CONSTRUCTION.

10. MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR CUTTING AND PATCHING OF CONSTRUCTION UNLESS OTHERWISE NOTED ON THE PLANS. NO CUTTING OF STRUCTURAL MEMBERS OR STRUCTURE WHICH WILL DETERIORATE THE INTEGRITY AND STRENGTH OF THE BUILDING WILL BE ALLOWED WITHOUT WRITTEN APPROVAL FROM THE STRUCTURAL ENGINEER.

11. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REQUIRED REINFORCEMENT OF NEW AND EXISTING STRUCTURAL MEMBERS FOR MECHANICAL SYSTEMS. REFER TO "MECHANICAL SUPPORT REINFORCEMENT DETAIL" FOR ADDITIONAL REQUIREMENTS.

12. PROVIDE MIN. 3 FT OF CLEARANCE IN FRONT OF VAV ACCESS PANEL.

13. CONTRACTOR TO PROVIDE BIM CLASH DETECTION IN ACCORDANCE WITH ALL REQUIREMENTS AS INDICATED IN SPECIFICATION SECTION 01 32 50

HVAC PLAN KEYED NOTES:

1. ROUTE DUCTS UP BETWEEN JOISTS DIRECTLY ABOVE BOTH HOT AISLES.
2. 48"x32" LOUVER PLENUM WITH MOTORIZED DAMPER MD-1 FOR STORM MODE NATURAL VENTILATION.
3. LEAVE CLEAR SPACE WITH NO DUCT ABOVE FOR ELECTRICAL EQUIPMENT/PANEL.
4. BALANCE TO CFM INDICATED.
5. 104x26 MOTORIZED DAMPER MD-2 ON RETURN INLET OF CRU-1
6. 104x26 MOTORIZED DAMPER MD-3 ON RETURN INLET OF CRU-2
7. DUCTWORK SHOWN WITH INNER DASHED LINE SHALL BE CONSTRUCTED FROM PERFORATED DOUBLE-WALL DUCTWORK.

Regional Operations and Communications Facility

Lake County Campus
Libertyville, IL 60048

LakeCounty

656 Winchester Rd, Libertyville, IL 60048

Wold

WOLD ARCHITECTS AND ENGINEERS
220 North Smith Street, Suite 310
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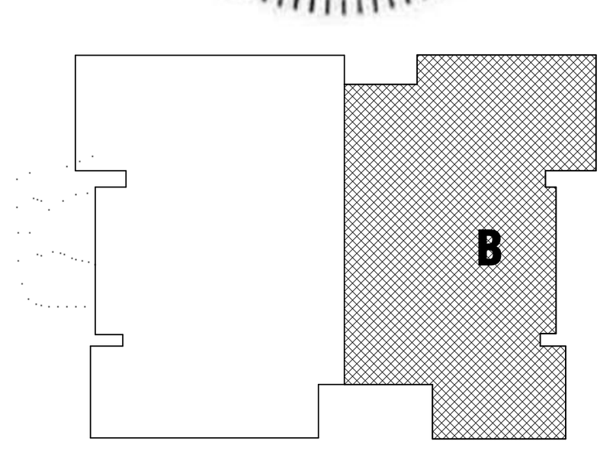
RossDrulisCusenbery ARCHITECTURE



KEY PLAN

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed **PROFESSIONAL ENGINEER** under the laws of the State of **ILLINOIS**

Matthew T. Verdun
License Number: 062-059546 Date 12/30/2022

Revisions		
Description	Date	Num
Addendum #2	02/24/23	1
Addendum #3	03/03/23	2

Comm: 213106
Date: 12/30/2022
Drawn: KO
Check: RP

North

HVAC PLAN- AREA 'B'

Scale: As indicated

M3.02