ADDENDUM NO. 2

State of Maine Cultural Building Asbestos Abatement & Mechanical Upgrades
Phase 2: Mechanical Upgrades & Museum Abatement
230 State Street
Augusta, ME

February 8, 2022

From: Wood
Environment & Infrastructure Solutions
511 Congress Street
Portland, Maine 04101

To: Prospective Bidders

This Addendum forms a part of the Contract Documents and modifies the original bidding documents dated January 7, 2022, as noted below. Bidder shall acknowledge receipt of this Addendum in the space provided on the Contractor Bid Form, failure to do so may subject the bidder to disqualification.

PERTAINING TO REQUEST FOR INFORMATION QUESTIONS
Responses to RFIs received through 1/31 are included with this addendum.

PERTAINING TO REFERENCE DRAWINGS
Reference files are included with this addendum to assist bidders and have been uploaded to the Project Plan Room. Those files consist of previous construction documents for the facility and light fixture circuiting plans from the Phase 1 scope of work.

PERTAINING TO SPECIFICATIONS

1. Section 040140.61 Stone Repair.

    a) DELETE section in its entirety, ADD the Section 040140.61 Stone Repair attached to this addendum

2. Section 040140.62 Stone Repointing

    a) DELETE section in its entirety, ADD the Section 040140.62 Stone Repointing attached to this addendum

3. Section 044200 Exterior Stone Cladding.

    a) ADD the Section 044200 Exterior Stone Cladding attached to this addendum

4. Section 230923 Direct Digital Control (DDC) System for HVAC.

    a) ADD the Section 230923 Direct Digital Control (DDC) System for HVAC attached to this addendum

PERTAINING TO THE DRAWINGS

DELETE sheets listed below and ADD drawings attached to this addendum.

1. Drawing GI002B:
    a) Revised Drawing Index
2. Drawing GI004B:
    a) Removed overhead door from Bid Alternate description.
3. Drawing GI112:
    a) Revised extend of rating at electrical vault
4. Drawing HA108:
    a) Revised extend of Abatement area
5. Drawing SF102:
    a) Revised equipment support locations per mechanical revisions
6. Drawing AD101:
    a) Added additional air transfer openings above ceiling.
7. Drawing AD104:
    a) Added additional air transfer openings above ceiling. Removed demolition keyed note.
8. Drawing AD105:
    a) Removed Door tag.
    b) Added Bid Alternate tag for clarity.
    c) Removed Keyed Note 47.
9. Drawing AD108:
    a) Removed GWB from existing wall areas.
10. Drawing AD109:
    a) Added additional air transfer openings above ceiling.
11. Drawing AE104:
    a) Removed wall tags and finish tags from stairwell.
12. Drawing AE105:
    a) Revised and removed door tags.
    b) Added Bid Alternate tag for clarity.
    c) Revised window tags.
13. Drawing AE106:
    a) Added door tag.
    b) Revised window tags.
14. Drawing AE107:
    a) Added door tags.
    b) Revised window tags.
15. Drawing AE108:
    a) Added GWB to existing wall areas. Added finish tag information.
16. Drawing AE201:
    a) Revised Notes and Keyed Notes.

17. Drawing AE202:
    a) Revised Notes and Keyed Notes.
    b) Revised Reveals
18. Drawing AE203:
    a) Revised/Removed Notes and Keyed Notes.
    b) Revised Reveals.
    c) Added crack repair
19. Drawing AE301:
    a) Revised insulation in soffit.
20. Drawing AE531:
    a) Revised Details
21. Drawing AE601:
    a) Revised/Removed Partition types.
22. Drawing AE611:
    a) Revised Door Schedule.
    b) Added Door Type C.
23. Drawing AE621:
    a) Revised Notes.
24. Drawing AE622:
    a) Revised Door Schedule notes.
25. Drawing AE623:
    a) Revised Details.
26. Drawing AE624:
    a) Revised Details.
27. Drawing AE701:
    a) Revised Notes.
28. Drawing M-001:
    a) Changes to Piping Symbols.
29. Drawing MH100:
    a) Add D-20 damper in Room Maintenance Storage B11
30. Drawing MH101:
    a) Reconfigured Ductwork in Office 207 & Conf Room 212
    b) Moved FCI-02-12 & FCU-02-13.
31. Drawing MH102:
    a) Added note to L-13.
    b) Reconfigured Ductwork in Maker Space 318, Office 319, Mimeo 320 & Lounge 321.
32. Drawing MH104:
    a) Reconfigured Ductwork in Office 333, Office 336 & Office 337.
    b) Reconfigured Ductwork in Records Management 354.
33. Drawing MH106:
    a) Added D-16 Damper to ductwork in Electrical Service Entrance 234.
34. Drawing MP100:
    a) Added Thermostat in Mechanical B5.
35. Drawing MP101:
    a) Moved Refrigerant Piping.

36. Drawing MP108:
    a) Moved BCC-6 and Refrigerant Piping to Mech Equip Room 416.
37. Drawing M-301:
    a) Made changes to Section: “B4 OUTSIDE AIR INTAKE - SECTION”
38. Drawing M-302:
    a) Made changes to Section: “A1 AHU-1,2,3 SECTION”
39. Drawing M-401:
    a) Made changes to Part Plan: “D2 MUSEUM – FOURTH LEVEL MECHANICAL 416 LOWER DUCTWORK PART PLAN”
40. Drawing M-402:
    a) Made changes to Part Plan: “D2 MUSEUM – FOURTH LEVEL MECHANICAL 416 UPPER DUCTWORK PART PLAN”
    b) Made changes to Part Plan: “A1 MUSEUM – FOURTH LEVEL MECHANICAL 416 UPPER PIPING PART PLAN”
41. Drawing M-403:
    a) Made changes to Part Plan: “D1 MECHANICAL ROOM B5 DUCTWORK PLAN”
    b) Made changes to Part Plan: “D4 MECHANICAL ROOM B5 PIPING PLAN”
42. Drawing M-501:
    a) Made changes to Detail: “A1 CONNECTION TO CEILING DIFFUSER DETAIL”
43. Drawing M-502:
    a) Renamed Detail: “E1 DUPLEX GLYCOL MAE UP UNIT DETAIL”
44. Drawing M-503:
    a) Made changes to Detail: “B1 DUCT MOUNTED HUMIDIFIER DETAIL”
45. Drawing M-504:
    a) Rename Detail “D4”
    b) Made changes to Detail: “D4 WET ROTOR INLINE PUMP SCHEMATIC DETAIL”
    c) Made changes to Detail: “B3 HOT WATER REHEAT COIL DETAIL”
    d) Made changes to Detail: “D5 LOUVER CONNECTION DETAIL”
    e) Deleted Detail: “A1 AHU HOT WATER COIL PIPING SCHEMATIC DETAIL”
46. Drawing M-602:
    a) Add Added MERV13 to FCU-02-12 to Fan Coil Unit Schedule.
    b) Add Added MERV13 to FCU-02-13 to Fan Coil Unit Schedule.
    c) Add Added MERV13 to FCU-03-09 to Fan Coil Unit Schedule.
47. Drawing M-603:
    a) Added MERV13 to FCU-05-02 to Fan Coil Unit Schedule.
    b) Added MERV13 to FCU-05-03 to Fan Coil Unit Schedule.
    c) Added MERV13 to FCU-05-04 to Fan Coil Unit Schedule.
48. Drawing M-605:
    a) Added D-16 to Control Damper Schedule.
    b) Added D-17 to Control Damper Schedule.
    c) Added D-18 to Control Damper Schedule.
    d) Added D-19 to Control Damper Schedule.
    e) Added D-20 to Control Damper Schedule.
49. Drawing M-706:
    a) Made changes to Control Diagram: “E1 ERV-1,2,3 CONTROL DIAGRAM”
    b) Add a Control Diagram: “D1 ERV-4 CONTROL DIAGRAM”
    c) Made chances to Control Diagram “C1 DOAS CONTOL DIAGRAM”
    d) Made changes to Control Diagram “D4 AHU-3 CONTROL DIAGRAM”
50. Drawing M-707:
    a) Changes to Sequence of Operation

51. Drawing M-708:
    a) Changes to Sequence of Operation
52. Drawing M-709
    a) Added drawing to the project.
53. Drawing PL101:
    a) Move condensate piping for FCU's.
54. Drawing EP101:
    a) Revised equipment locations per mechanical revisions.

END OF ADDENDUM NO. 2

State of Maine Cultural Building Asbestos Abatement & Mechanical Upgrades
Phase 2: Mechanical Upgrades & Museum Abatement
Pre-Bid Questions

Question No.	Discipline	Question	Date Received	Response
1	Architectural	A storefront contractor is asking for clarification between work required in the base bid and the work required under alternate No. 2. Can you help with a clarification?	1/21/2022	Storefront work is required under Bid Alternate #2.
2	Mechanical	The vibration control section does not provide a schedule for where required. Can one be provided? (Spec section 230458.13)	1/24/2022	Vibration control is indicated on the details and selection is delegated to the contractors/vendors. A schedule of vibration isolators is not planned.
3	Mechanical	The General Commissioning Requirements, Section 019113 Paragraph 1.5 A. Suggests that we may appoint our project manager or superindendent as the Commissioning coordinator. Paragraph 1.8 A. "Commissioning Coordinator qualifications" requires certifications more in-line with that of the commissioning authority (engaged by the owner). Please clarify your intent.	1/24/2022	The State has requested that the commissioning agent be retained by the contractor as part of the contract. The commissioning specifications and related spec sections will be modified to clarify this scope in an addendum.
4	Architectural	Wall Types: -Please see Wall Type F3a at AE601. *The drawing shows and lists 2" CC Foam against the concrete. *The drawing also shows batt insulaton filling the remainder of the cavity, bt does not list it in the description. *The Exterior Details at AE531 show Wall Type F3a without the batt insulation. *Please Clarify	1/26/2022	Wall types have been revised and will be issued with Addendum No. 2
5	Architectural	Wall Types: -Please see Wall Type F3d at AE601. *This Wall Type is drawn and described as having a full-cavity fill of Densepack Cellulose. - Densepack Cellulose is not an appropriate material for this application. Cellulose should not be used where it is in contact with a concrete or masonry suface. - Densepack is also not appropriate for infill of walls when and if there is an air gap behind the studs. There is not way to contain the cellulose from going beyond the work area, due to the nature of the installation. *There is also no detail provided for the size of the LGMF or the depth of the cavity. *Please provide a revision for this Wall Type to include all of the details and an insulation material appropriate for the application.	1/26/2022	Wall types have been revised and will be issued with Addendum No. 2

Question No.	Discipline	Question	Date Received	Response
6	Architectural	Wall Types: -There is a second Wall Type labeled F3d. *The 2nd one has no insulation, but does list a Vapor Barrier. -A Vapor Barrider at the inside of the stud cavity at a concrete wall is not appropriate. *Please review this Wall Type and provide it with a separate designation to avoid confusion.	1/26/2022	Wall types have been revised and will be issued with Addendum No. 2
7	Architectural	What are the opening tag, door material, frame material, or frame type for the first unknown opening on door schedule?	1/26/2022	Door schedule has been revised and will be issued with addendum No. 2
8	Architectural	What are the locations of openings 230, 240, 244, 245, 246, 247, 248, and 260 on the floor plans?	1/26/2022	Door schedule has been revised and will be issued with addendum No. 2
9	Architectural	What do door types 79, 152, G, H, J, and K indicate on openings 126b, 137a, 137b, 137c, 137d, 233, 234a, 234b, 245, 246, 247, 348a, 356, and 434?	1/26/2022	Door schedule has been revised and will be issued with addendum No. 2
10	Architectural	What is the door material for openings 126b, 245, 246, 247, 248, 260, 356, and 434?	1/26/2022	Door schedule has been revised and will be issued with addendum No. 2
11	Architectural	What are the frame material and frame types for openings 126a, 126b, 137a, 137b, 137c, 137d, 230, 240, 245, 246, 247, 248, 260, 315, 348b, 248c, 356, and 434?	1/26/2022	Door schedule has been revised and will be issued with addendum No. 2
12	Mechanical	Can Johnson Controls be listed as an acceptable manufacturer under specification section 230923 - 2.1-A?	1/27/2022	Yes, any qualified BACnet controls contractor can bid, as long as they can interface with the State of Maine Honeywell EBI system. Spec will be clarified by addendum.
13	Architectural	Please see Wall Type F3d at AE601. This Wall Type is drawn and described as having a full-cavity fill of Densepack Cellulose. Densepack Cellulose is not an appropriate material for this application. Cellulose should not be used where it is in contact with a concrete or masonry surface. Densepack is also not appropriate for infill of walls when and if there is an air gap behind the studs. There is no way to contain the cellulose from going beyond the work area, due to the nature of the installation. There is also no detail provided for the size of the LGMF or the depth of the cavity. Please provide a revision for this Wall Type to include all of the details and an insulating material appropriate for the application.	1/28/2022	Wall types have been revised and will be issued with Addendum No. 2
14	Architectural	There is a second Wall Type labeled F3d. The 2nd one has no insulation, but does list a Vapor Barrier. A Vapor Barrier at the inside of the stud cavity at a concrete wall is not appropriate. Please revise this Wall Type and provide it with a separate designation to avoid confusion.	1/28/2022	Wall types have been revised and will be issued with Addendum No. 2

Question No.	Discipline	Question	Date Received	Response
15	Architectural	The following doors are on the Door Schedule on Sheet AE611, I can't find them on the Floor Plans: Door Numbers 230, 240, 244, 245, 246, 247, 248, and 260. Are these part of this project, if so, where are they located?	1/31/2022	Door schedule has been revised and will be issued with addendum No. 2
16	Architectural	On Sheet G1004B - Bid Alternate #2 "Replace Exterior Doors, windows, and glazing systems." Please clarify which exterior doors - are they already on the Door Schedule?	1/31/2022	Doors integral with the storefront and curtainwall systems are required as part of Bid Alternate #2 and are shown on drawing AE622. Door 126a is also required as part of Bid Alternate #2.
17	Architectural	"Provide replacement insulated exterior entry door assembly at loading dock." Is this onte referring to door number 126a?	1/31/2022	Yes

SECTION 040140.61 - STONE REPAIR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Repairing stone masonry.
2. Removing abandoned anchors.
3. Painting steel uncovered during the work.

~~1.3 ALLOWANCES~~

~~A. Allowances for stone repair are specified in Section 012100 "Allowances."~~

~~B. Preconstruction testing is part of testing and inspecting allowance.~~

~~C. Abandoned anchor removal is part of stone repair allowance.~~

~~D. Stone removal and replacement is part of stone removal and replacement allowance.~~

~~E. Partial stone replacement (dutchman repair) is part of partial stone replacement allowance.~~

~~F. Crack injection is part of crack injection allowance.~~

~~G. Patching stone units is part of stone patching allowance.~~

~~1.4~~1.3 DEFINITIONS

A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

B. Rift: The most pronounced direction of splitting or cleavage of a stone.

C. Stone Terminology: ASTM C119.

~~1.5~~1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to stone repair including, but not limited to, the following:

    a. Materials, material application, sequencing, tolerances, and required clearances.
    b. Coordination with building occupants.

~~1.6~~1.5 SEQUENCING AND SCHEDULING

A. Work Sequence: Perform stone repair work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean stone.
5. Rake out mortar from joints surrounding stone to be replaced and from joints adjacent to stone repairs along joints.
6. Repair stonework, including replacing existing stone with new stone.
7. Rake out mortar from joints to be repointed.
8. Point mortar and sealant joints.
9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
10. Where water repellents are to be used on or near stonework, delay application of these chemicals until after pointing and cleaning.

B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in stone according to "Stone Patching" Article. Patch holes in mortar joints according to Section 040140.62 "Stone Repointing."

~~1.7~~1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include recommendations for product application and use.
3. Include test data substantiating that products comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, sections, and locations of replacement stone units on the structure and their jointing, showing relation of existing and new or relocated units.
2. Show partial replacement stone units (dutchmen).
3. Indicate setting number of each new stone unit and its location on the structure in annotated plans and elevations.
4. Show provisions for expansion joints or other sealant joints.
5. Show provisions for flashing, lighting fixtures, conduits, and weep holes as required.

6. Show replacement and repair anchors, including drilled-in pins. Include details of anchors within individual stone units, with locations of anchors and dimensions of holes and recesses in stone required for anchors, including direction and angle of holes for pins.
7. Show locations of scaffolding and points of scaffolding in contact with masonry. Include details of each point of contact or anchorage.

C. Samples for Initial Selection: For the following:

1. Colored Mortar: Install three mortar samples within existing masonry wall stones. Samples shall be 24 inches by 24 inches, with mortar recipe clearly recorded on label affixed to masonry. Once the mortar has appropriately cured, wash half of each sample (12 inches by 24 inches) with specified cleaning product at various mixture ratios. Clearly record each cleaning solution on label affixed to masonry.~~Submit sets of mortar that will be left exposed in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.~~

   a. Have each set contain a close color range of at least three Samples of different mixes of colored sands and cements that produce a mortar matching the existing, cleaned mortar when cured and dry.
   b. Submit with precise measurements on ingredients, proportions, gradations, and source of colored sands from which each Sample was made.

2. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of stone representative of the range of stone colors on the building.

   a. Have each set contain a close color range of at least three Samples of different mixes of patching compound that matches the variations in existing stone when cured and dry.

3. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For the following:

1. Each type of replacement stone. Include sets of Samples to show full range of color, texture, grain, veining, and finish to be expected. Provide sets of at least two 12-by-12-inch Samples for each type, but no fewer than necessary to indicate full range and proportion of variations within range.
2. Each type of patching compound in form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each Sample with manufacturer and stock number or other information necessary to order additional material.
3. Each type of adhesive.
4. Accessories: Each type of anchor, accessory, and miscellaneous support.

~~1.8~~1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For stone repair specialist.

B. Preconstruction Test Reports: For existing stone and mortar.

C. Quality-control program.

~~1.9~~1.8 QUALITY ASSURANCE

A. Stone Repair Specialist Qualifications: Engage an experienced stone repair firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing standard unit masonry or new stone masonry is insufficient experience for stone repair work.

1. Field Supervision: Stone repair specialist firms shall maintain experienced full-time supervisors on Project site during times that stone repair work is in progress.
2. Stone Repair Worker Qualifications: When stone units are being patched, ~~assign~~ at least one worker per crew who is trained and certified by manufacturer of patching compound to apply its products will be performing the stone patching repair.

B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging stonework. Include provisions for supervising performance and preventing damage.

C. Mockups: Prepare mockups of stone repair to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation.

1. Stone Repair: Prepare sample areas for each type of stone indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than two adjacent whole units or approximately 48 inches in least dimension. Construct sample areas in locations in existing walls where directed by Architect unless otherwise indicated. Demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:

   a. Crack Injection: Apply crack injection in two separate areas, each approximately 36 inches long.
   b. Patching: Three small holes at least 1 inch in diameter.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

~~1.10~~1.9 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on stone units as follows

1. Provide test specimens as indicated and representative of proposed materials and existing construction.

~~2. Existing Stone: Test each type of existing stone indicated for replacement according to ASTM C170/C170M for compressive strength, wet and dry, perpendicular and parallel to rift; ASTM C99/C99M for modulus of rupture, wet and dry, perpendicular and parallel to rift; and ASTM C97/C97M for absorption and bulk specific gravity. Carefully remove existing stones from locations designated by Architect. Take testing samples from these stones.~~

~~3.~~2. Existing Mortar: Test according to ASTM C1324, modified as agreed by testing service and Architect for Project requirements, to determine proportional composition of original ingredients, sizes and colors of aggregates, and approximate strength.

~~4.~~3. Temporary Patch: As directed by Architect, provide temporary materials followed by permanent repairs at locations from which existing samples were taken.

~~1.11~~1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver stone units to Project site strapped together in suitable packs or pallets or in heavy-duty crates and protected against impact and chipping.

B. Deliver each piece of stone with code mark or setting number on unexposed face, corresponding to Shop Drawings, using non-staining paint.

C. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

E. Store hydrated lime in manufacturer's original and unopened containers in a dry location. Discard lime if containers have been damaged or have been opened for more than two days.

F. Store sand where grading and other required characteristics can be maintained and contamination avoided.

G. Handle stone to prevent overstressing, chipping, defacement, and other damage.

~~1.12~~1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit stone repair work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits, General: Repair stone units only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for stone repair unless otherwise indicated:

1. When air temperature is below 40 deg F, heat mortar ingredients, repair materials, and existing stone to produce temperatures between 40 and 120 deg F.

2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after repair.

D. Hot-Weather Requirements: Protect stone repairs when temperature and humidity conditions produce excessive evaporation of water from mortar and patching materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

PART 2 - PRODUCTS

2.1 Jahn M-70

A. Jahn Restoration Mortars are distributed by Cathedral Stone® Products, Inc., 7266 Park Circle Drive, Hanover, MD 21076; tel. (410) 782-9150; fax. (410) 782-9155; website: www.cathedralstone.com email: info@cathedralstone.com. Jahn Mortars are premixed cementitious repair materials formulated to match the color and texture of the existing masonry, and do not contain any acrylic, latex, or other synthetic polymer additives. Mix the mortar with clean, potable water. Substitutions: If proposed equal is submitted, lab test to establish equivalent performance levels. Use an independent testing laboratory, as determined by the Specifier, and paid for by the submitting party. B. Setting anchors in existing masonry: Jahn Anchor Setting Mortar (M80). C. Mechanical anchors and dowels: Stainless steel threaded rod (ASTM F593) with a diameter as indicated on Contract Drawings, bent and cut to lengths required to achieve embedments shown on the Contract Drawings.

2.2 PERFORMANCE REQUIREMENTS

A. Source Limitations: Obtain each type of material for repairing stone (stone, cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.3 STONE MATERIALS

A. Stone Matching Existing: Natural building stone of variety, color, texture, grain, veining, finish, size, and shape that match existing stone and with physical properties within 10 percent of those determined from preconstruction testing of selected existing stone.

1. Physical Properties for Limestone:

   a. Compressive Strength: according to ASTM C170/C170M.
   b. Modulus of Rupture: according to ASTM C99/C99M.
   c. Absorption: according to ASTM C97/C97M.
   d. Bulk Specific Gravity: according to ASTM C97/C97M.

2. For existing stone that exhibits a range of colors, texture, grain, veining, finishes, sizes, or shapes, provide stone that proportionally matches that range rather than stone that

matches an individual color, texture, grain, veining, finish, size, or shape within that range.

3. Quarry: Subject to compliance with requirements, provide stone from Indiana Buff.

   a. Original Quarry: Indiana Buff.

B. Cutting New Stone: Cut each new stone so that, when it is set in final position, the rift or natural bedding planes will match the rift orientation of existing stones.

2.4 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction; white or gray, or both where required for color matching of mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Masonry Cement: ASTM C91/C91M.

D. Mortar Cement: ASTM C1329/C1329M.

E. Mortar Sand: ASTM C144.

1. Exposed Mortar: Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
2. Colored Mortar: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

F. Mortar Pigments: ASTM C979/C979M, compounded for use in mortar mixes, and having a record of satisfactory performance in stone mortars.

1. Use formulation that is vapor and water permeable (equal to or more than the stone), exhibits low shrinkage, has lower modulus of elasticity than stone units being repaired, and develops high bond strength to all types of stone.
2. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
3. Formulate patching compound in colors, textures, and grain to match stone being patched. Provide sufficient number of colors to enable matching of each piece of stone.

G. Cementitious Crack Filler: Ultrafine superplasticized grout that can be injected into cracks, is suitable for application to wet or dry cracks, exhibits low shrinkage, and develops high bond strength to all types of stone.

2.5 ACCESSORY MATERIALS

A. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

B. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer according to SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.

1. Surface Preparation: Use coating requiring no better than SSPC-SP 2, "Hand Tool Cleaning" surface preparation according to manufacturer's literature or certified statement.
2. VOC Limit: Use coating with a VOC content of 400 g/L or less.

C. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could leave residue on surfaces.

2.6 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by fixed volume containers or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mixes: Mix mortar materials in the following proportions:

1. Rebuilding (Setting) Mortar by Volume: 1 part portland cement, 1 part lime, and 6 parts sand.
2. Rebuilding (Setting) Mortar by Type: ASTM C270, Proportion Specification, Type N unless otherwise indicated, with cementitious material limited to portland cement and lime.
3. Rebuilding (Setting) Mortar by Property: ASTM C270, Property Specification, Type N unless otherwise indicated; with cementitious material limited to portland cement and lime.
4. Pigmented, Colored Mortar: Add mortar pigments to produce exposed, setting (rebuilding) mortar of colors required.

PART 3 - EXECUTION

3.1 REPAIR SPECIALIST

A. Stone Repair Specialist Firms: Subject to compliance with requirements, have stone repair performed by one of the following:

1. Knowles Industrial, Inc.

3.2 PROTECTION

A. Prevent mortar from staining face of surrounding stone and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below rebuilding and repair work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed stone and other surfaces.

B. Remove gutters and downspouts and associated hardware adjacent to stone and store during stone repair. Reinstall when repairs are complete.

1. Provide temporary rain drainage during work to direct water away from building.

3.3 STONE REPAIR, GENERAL

A. Appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 50 feet away by Architect.

3.4 PARTIAL STONE REPLACEMENT

A. Remove defective portion of existing stone unit (backing stone). Carefully remove defective portion of stone by making vertical and horizontal saw cuts at face of backing stone and removing defective material to depth required for fitting partial replacement (dutchman).

1. Make edges of backing stone at cuts smooth and square to each other and to finished surface; essentially rectangular. Make back of removal area flat and parallel to stone face.
2. Do not overcut at corners and intersections. Hand trim to produce clean sharp corners with no rounding and no damage to existing work to remain.
3. If backing stone becomes further damaged, remove damaged area and enlarge partial replacement as required.

B. Remove mortar from joints that abut area of stone removal to same depth as stone was removed. Remove loose mortar particles and other debris from surfaces to be bonded and surfaces of adjacent stone units that will receive mortar by cleaning with stiff-fiber brush.

C. Cut and trim partial replacement to accurately fit area where material was removed from backing stone. Fabricate to size required to produce joints between partial replacement and backing stone of no more than 1/16 inch in width, and to produce joints between partial

replacement and other stones that match existing joints between stones. Cut partial replacement so that, when it is set in final position, natural bedding planes will match the orientation of bedding planes of the backing stone unless otherwise indicated.

D. Exposed Pinning: Before applying adhesive, prepare for mechanical anchorage consisting of 1/4-inch-diameter, plain stainless-steel pins set into 1/4-inch-diameter holes drilled at a 45-degree downward angle through face of partial replacement and into backing stone. Center and space pins 3 to 5 inches apart and at least 2 inches from any edge. Insert pins at least 2 inches into backing stone and 2 inches into partial replacement with end countersunk at least 3/4 inch from exposed face of partial replacement.

E. Concealed Pinning: Before applying adhesive, prepare for concealed mechanical anchorage consisting of 1/4-inch-diameter, plain stainless-steel pins set into 1/4-inch-diameter holes drilled into backing stone and into, but not through, the partial replacement. Center and space pins 3 to 5 inches apart and at least 2 inches from any edge. Insert pins at least 2 inches into backing stone and 2 inches into partial replacement, but no closer than 3/4 inch from exposed face of partial replacement.

F. Apply stone-to-stone adhesive according to adhesive manufacturer's written instructions. Coat bonding surfaces of backing stone and partial replacement, completely filling all crevices and voids.

G. Apply partial replacement while adhesive is still tacky and hold securely in place until adhesive has cured. Use temporary shims, clamps, wedges, or other devices as necessary to align face of partial replacement with face of backing stone.

H. Clean adhesive residue from exposed surfaces and patch chipped areas and exposed drill holes as specified in "Stone Patching" Article.

3.5 STONE PLUG REPAIR

A. Remove cylindrical piece of damaged stone by core-drilling perpendicular to stone surface.

B. Prepare a replacement plug by core-drilling replacement stone. Use a drill sized to produce a core that will fit into hole drilled in damaged stone with only minimum gap necessary for adhesive. Cut and install plug so that, when it is set in final position, natural bedding planes will match the orientation of bedding planes of the backing stone unless otherwise indicated.

C. Apply stone-to-stone adhesive according to adhesive manufacturer's written instructions. Coat bonding surfaces of existing stone and plug, completely filling all crevices and voids.

D. Apply plug while adhesive is still tacky and hold securely in place until adhesive has cured.

E. Clean adhesive residue from exposed surfaces.

3.6 STONE-FRAGMENT REPAIR

A. Carefully remove cracked or fallen stone fragment indicated to be repaired. Reuse only stone fragment that is in sound condition.

B. Remove soil, loose particles, mortar, and other debris or foreign material from fragment surfaces to be bonded and from parent stone where fragment had broken off, by cleaning with stiff-fiber brush.

C. Pinning: Before applying adhesive, prepare for mechanical anchorage consisting of 1/4-inch-diameter, plain stainless-steel pins set into 1/4-inch-diameter holes drilled at a 45-degree downward angle through face of fragment and into parent stone. Center and space pins between 3 and 5 inches apart and at least 2 inches from any edge. Insert pins at least 2 inches into parent stone and 2 inches into fragment with end countersunk at least 3/4 inch from exposed face of fragment.

D. Concealed Pinning: Before applying adhesive, prepare for concealed mechanical anchorage consisting of 1/4-inch-diameter, plain stainless-steel pins set into 1/4-inch-diameter holes drilled into parent stone and into, but not through, the fragment. Center and space pins between 3 and 5 inches apart and at least 2 inches from any edge. Insert pins at least 2 inches into parent stone and 2 inches into fragment, but no closer than 3/4 inch from exposed face of fragment.

E. Apply stone-to-stone adhesive according to adhesive manufacturer's written instructions. Coat bonding surfaces of fragment and parent stone, completely filling all crevices and voids.

F. Fit stone fragment onto parent stone while adhesive is still tacky and hold fragment securely in place until adhesive has cured. Use shims, clamps, wedges, or other devices as necessary to align face of fragment with face of parent stone.

G. Clean adhesive residue from exposed surfaces and patch chipped areas as specified in "Stone Patching" Article.

3.7 CRACK INJECTION

A. General: Comply with cementitious crack-filler manufacturer's written instructions.

B. Drill 1/4-inch-diameter injection holes as follows:

1. Transverse Cracks Less Than 3/8 inch Wide: Drill holes through center of crack at 12 to 18 inches o.c.
2. Transverse Cracks More Than 3/8 inch Wide: Drill holes through center of crack at 18 to 36 inches o.c.
3. Delaminations: Drill holes at approximately 18 inches o.c. both vertically and horizontally.
4. Drill holes 2 inches deep.

C. Clean out drill holes and cracks with compressed air and water. Remove dirt and organic matter, loose material, sealants, and failed crack repair materials.

D. Place plastic injection ports in drilled holes and seal face of cracks between injection ports with clay or other nonstaining, removable plugging material. Leave openings at upper ends of cracks for air release.

E. Inject cementitious crack filler through ports sequentially, beginning at one end of area and working to opposite end; where possible, begin at lower end of injection area and work upward.

Inject filler until it extrudes from adjacent ports. After port has been injected, plug with clay or other suitable material and begin injecting filler at adjacent port, repeating process until all ports have been injected.

F. Clean cementitious crack filler from face of stone before it sets by scrubbing with water.

G. After cementitious crack filler has set, remove injection ports, plugging material, and excess filler. Patch injection holes and surface of cracks as specified in "Stone Patching" Article.

3.8 STONE PATCHING

A. Patch the following stone units unless another type of repair or replacement is indicated:

1. Units indicated to be patched.
2. Units with holes.
3. Units with chipped edges or corners. Patch chipped edges or corners measuring more than 3/4 inch in least dimension.
4. Units with small areas of deep deterioration. Patch deep deteriorations measuring more than 3/4 inch in least dimension and more than 1/4 inch deep.

B. Remove and replace existing patches.

C. Remove deteriorated material and remove adjacent material that has begun to deteriorate. Carefully remove additional material so patch does not have feathered edges but has square or slightly undercut edges on area to be patched and is at least 1/4 inch thick, but not less than recommended in writing by patching compound manufacturer.

D. Mask adjacent mortar joint or rake out for repointing if patch extends to edge of stone unit.

E. Mix patching compound in individual batches to match each stone unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.

F. Brush-coat stone surfaces with slurry coat of patching compound according to manufacturer's written instructions.

G. Place patching compound in layers as recommended in writing by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.

1. Simple Details: Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the stone. Shape and finish surface before or after curing, as determined by testing, to best match existing stone.
2. Carved Details: Build patch up 1/4 inch above surrounding stone, and carve surface to match adjoining stone after patching compound has hardened.

H. Keep each layer damp for 72 hours or until patching compound has set.

I. Remove and replace patches with hairline cracks or that show separation from stone at edges, and those that do not match adjoining stone in color or texture.

3.9 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Clean adjacent nonstone surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Remove masking materials, leaving no residues that could trap dirt.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

C. Notify Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Architect's Project representatives have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

3.11 STONE WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess stone materials are Contractor's property.

B. Stone Waste: Remove stone waste and legally dispose of off Owner's property.

END OF SECTION 040140.61

SECTION 040140.62 - STONE REPOINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Repointing joints with mortar.
2. Repointing joints with sealant.

B. Related Requirements:

1. Section 013516 "Alteration Project Procedures" for general remodeling, renovation, repair, and maintenance requirements.

1.3 DEFINITIONS

A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

B. Rift: The most pronounced direction of splitting or cleavage of a stone.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to repointing stonework including, but not limited to, the following:

a. Verify stone repointing specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Materials, material application, sequencing, tolerances, and required clearances.
c. Quality-control program.
d. Coordination with building occupants.

1.5 SEQUENCING AND SCHEDULING

A. Order sand and gray portland cement for pointing mortar immediately after approval of Samples mockups. Take delivery of and store at Project site enough quantity to complete Project.

B. Work Sequence: Perform stone repointing work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean stone.
5. Rake out mortar from joints surrounding stone to be replaced and from joints adjacent to stone repairs along joints.
6. Repair stonework, including replacing existing stone with new stone.
7. Rake out mortar from joints to be repointed.
8. Point mortar ~~and sealant~~ joints.
9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
10. Where water repellents are to be used on or near stonework, delay application of these chemicals until after pointing and cleaning.

C. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in stone according to Section 040140.61 "Stone Repair." Patch holes in mortar joints according to "Repointing" Article.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include recommendations for product application and use.
3. Include test data substantiating that products comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, sections, and locations of repointing work on the structure.
2. Show provisions for expansion joints or other sealant joints.
3. Show locations of scaffolding and points of scaffolding in contact with masonry. Include details of each point of contact or anchorage.

C. Samples for Initial Selection: For the following:

1. Pointing Mortar: Install three mortar samples within existing masonry wall stones. Samples shall be 24 inches by 24 inches, with mortar recipe clearly recorded on label affixed to masonry. Once the mortar has appropriately cured, wash half of each sample (12 inches by 24 inches) with specified cleaning product at various mixture ratios. Clearly record each cleaning solution on label affixed to masonry.~~Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.~~

a. Have each set contain a close color range of at least three Samples of different mixes of colored sands and cements that produce a mortar matching the existing, cleaned mortar when cured and dry.
b. Submit with precise measurements on ingredients, proportions, gradations, and source of colored sands from which each Sample was made.

2. Sand Type Used for Pointing Mortar: Minimum 8 oz. of each in plastic screw-top jars.
3. Sealant materials.
4. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For the following:

1. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.

a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.

2. Sealant materials.
3. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For stone repointing specialist.

B. Preconstruction Test Reports: For existing stone and mortar.

C. Quality-control program.

1.8 QUALITY ASSURANCE

A. Stone Repointing Specialist Qualifications: Engage an experienced stone repointing firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing standard unit masonry or new stone masonry is insufficient experience for stone repointing work.

1. Field Supervision: Stone repointing specialist firms shall maintain experienced full-time supervisors on Project site during times that stone repointing work is in progress.

B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging stonework. Include provisions for supervising performance and preventing damage.

C. Mockups: Prepare mockups of stone repointing to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Repointing: Install three mortar samples within existing masonry wall stones. Samples shall be 24 inches by 24 inches, with mortar recipe clearly recorded on label affixed to masonry. Once the mortar has appropriately cured, wash half of each sample (12 inches by 24 inches) with specified cleaning product at various mixture ratios. Clearly record each cleaning solution on label affixed to masonry.~~Rake out joints in two separate areas, each approximately 36 inches high by 48 inches wide .~~ Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on stone units as follows:

1. Provide test specimens as indicated and representative of proposed materials and existing construction.
2. Existing Stone: Test each type of existing stone indicated for repointing according to ASTM C170/C170M for compressive strength, wet and dry, perpendicular and parallel to rift; ASTM C99/C99M for modulus of rupture, wet and dry, perpendicular and parallel to rift; and ASTM C97/C97M for absorption and bulk specific gravity. Carefully remove five existing stones from locations designated by Architect. Take testing samples from these stones.
3. Existing Mortar: Test according to ASTM C1324, modified as agreed by testing service and Architect for Project requirements, to determine proportional composition of original ingredients, sizes and colors of aggregates, and approximate strength.
4. Temporary Patch: As directed by Architect, provide temporary materials followed by permanent repairs at locations from which existing samples were taken.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store hydrated lime in manufacturer's original and unopened containers in a dry location. Discard lime if containers have been damaged or have been opened for more than two days.

D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits: Repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for mortar-joint pointing unless otherwise indicated:

1. When air temperature is below 40 deg F, heat mortar ingredients and existing stone to produce temperatures between 40 and 120 deg F.
2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after pointing.

D. Hot-Weather Requirements: Protect mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Source Limitations: Obtain each type of material for stone repointing (cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction; white or gray, or both where required for color matching of mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Masonry Cement: ASTM C91/C91M.

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

a. Cemex S.A.B. de C.V.
b. Lafarge North America Inc.
c. Quikrete; The QUIKRETE Companies, LLC.

D. Mortar Cement: ASTM C1329/C1329M.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Lafarge North America Inc.

E. Mortar Sand: ASTM C144.

1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
2. Color: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

F. Mortar Pigments: ASTM C979/C979M, compounded for use in mortar mixes, and having a record of satisfactory performance in stone mortars.

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

a. Davis Colors.
b. Lanxess Corporation.
c. Solomon Colors Inc.

G. Water: Potable.

2.3 ACCESSORY MATERIALS

A. Sealant Materials:

1. Sealant manufacturer's standard elastomeric sealant(s) of base polymer and characteristics indicated below and according to applicable requirements in Section 079200 "Joint Sealants."

a. Type: Single-component, nonsag urethane sealant.

2. Colors: Provide colors of exposed sealants to match colors of mortar adjoining installed sealant unless otherwise indicated.
3. Ground-Mortar Aggregate: Custom crushed and ground pointing mortar sand or existing mortar retrieved from joints. Grind to a particle size that matches the adjacent mortar aggregate and color. Remove all fines passing the No. 100 sieve.

B. Joint-Sealant Backing:

1. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
2. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended in writing by sealant manufacturer for preventing sealant from adhering to rigid, inflexible, joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

C. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

D. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could leave residue on surfaces.

2.4 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by fixed volume containers~~or equivalent weight~~. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again, adding only enough water to produce a damp, unworkable mix that retains its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mixes: Mix mortar materials in the following proportions:

1. Pointing Mortar by Volume: ASTM C270, Proportion Specification, 1 part portland cement, 1 part lime, and 6 parts sand. Add mortar pigments to produce mortar colors required.

PART 3 - EXECUTION

3.1 REPOINTING SPECIALIST

A. Stone Repointing Specialist Firms: Subject to compliance with requirements, have stone repointing performed by one of the following firms that may provide stone repointing include, but are not limited to, the following:

3.2 PROTECTION

A. Prevent mortar from staining face of surrounding stone and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below pointing work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed stone and other surfaces.

B. Remove gutters and downspouts and associated hardware adjacent to stone and store during stone repointing. Reinstall when repointing is complete.

1. Provide temporary rain drainage during work to direct water away from building.

3.3 STONE REPOINTING, GENERAL

A. Appearance Standard: Repointed surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

3.4 REPOINTING

A. Rake out and repoint joints to the following extent:

1. All joints in areas indicated.
2. Joints indicated as sealant-filled joints.
3. Joints at locations of the following defects:

a. Holes and missing mortar.
b. Cracks that can be penetrated 1/4 inch or more by a knife blade 0.027 inch thick.
c. Cracks 1/16 inch or more in width and of any depth.
d. Hollow-sounding joints when tapped by metal object.
e. Eroded surfaces 1/4 inch or more deep.
f. Deterioration to point that mortar can be easily removed by hand, without tools.
g. Joints filled with substances other than mortar.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows, according to procedures demonstrated in approved mockup:

1. Remove mortar from joints to depth of 2 times joint width not less than that required to expose sound, unweathered mortar. Do not remove unsound mortar more than deep; consult Architect for direction.
2. Remove mortar from stone surfaces within raked-out joints to provide reveals with square backs and to expose stone for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of stone units or widen joints. Replace or patch damaged stone units as directed by Architect.

D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose stone, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:

1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer, and allow it to become thumbprint hard before applying next layer.
3. After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing stone has worn or rounded edges, slightly recess finished mortar surface below face of stone to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed stone surfaces or to featheredge the mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
6. Hairline cracking within mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

F. Pointing with Sealant: Comply with Section 079200 "Joint Sealants" and as follows:

1. After raking out, keep joints dry and free of mortar and debris.
2. Clean and prepare joint surfaces. Prime joint surfaces unless sealant manufacturer recommends against priming. Do not allow primer to spill or migrate onto adjoining surfaces.
3. Fill sealant joints with specified joint sealant.

    a. Install cylindrical sealant backing beneath the sealant. Where space is insufficient for cylindrical sealant backing, install bond-breaker tape.
    b. Install sealant using only proven installation techniques that ensure that sealant is deposited in a uniform, continuous ribbon, without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding stonework and matching the contour of adjoining mortar joints.
    c. Install sealant as recommended in writing by sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead:

        1) Fill joints to a depth equal to joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.

    d. Tool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant from surfaces adjacent to joint.
    e. Sanded Joints: Immediately after first tooling, apply ground-mortar aggregate to sealant, gently pushing aggregate into the surface of sealant. Lightly retool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant and aggregate from surfaces adjacent to joint.
    f. Do not allow sealant to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces, particularly rough textures. Remove excess and

spillage of sealant promptly as the work progresses. Clean adjoining surfaces by the means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved mockup.

G. Where repointing work precedes cleaning of existing stone, allow mortar to harden at least 30 days before beginning cleaning work.

3.5 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Clean adjacent nonstone surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Remove masking materials, leaving no residues that could trap dirt.

3.6 FIELD QUALITY CONTROL

A. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

B. Notify Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors and Architect's Project representatives have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

END OF SECTION 040140.62

SECTION 044200 - EXTERIOR STONE CLADDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stone panels set with individual anchors or as field conditions dictate.
2. Stone panels mechanically anchored on steel trusses if applicable.
3. Stone panels mechanically anchored on steel strongback frames if applicable.
4. Stone panels mechanically anchored on steel stud frames if applicable.
5. Stone panels mechanically anchored (field installed) on a metal-grid system if applicable.
6. Stone panels set in architectural precast concrete if applicable.
7. Stone panels glazed into aluminum curtain-wall framing system if applicable.
8. Stone trim units, including ~~[~~bands,~~]~~ ~~[~~copings,~~]~~ ~~[~~sills,~~]~~ ~~[~~jambs,~~]~~ ~~[~~and~~]~~ ~~[~~soffits~~]~~.
9. Stone units with carving or inscriptions.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing joints in stone cladding system with elastomeric sealants.
2. Section 084413 "Glazed Aluminum Curtain Walls" for installing stone panels in aluminum curtain-wall systems.
3. Section 097513 "Stone Wall Facing" for dimension stone applied as paneling on building interiors.

1.2 DEFINITIONS

A. Definitions contained in ASTM C119 apply to this Section.

B. IBC: International Building Code.

C. Stone Cladding Assembly: An exterior wall covering system consisting of stone panels and trim together with anchors, mortar, adhesives, fasteners, and sealants used to secure the stone to the building structure and to produce a weather-resistant covering.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each variety of stone, stone accessory, and manufactured product.

B. Shop Drawings: Show fabrication and installation details for stone cladding assembly, including dimensions and profiles of stone units.

1. Show locations and details of joints both within stone cladding assembly and between stone cladding assembly and other construction.
2. Include details of mortar joints and sealant joints.
3. Show locations and details of anchors and backup structure.
4. Show direction of veining, grain, or other directional pattern.
5. Include large-scale shaded elevations and details of decorative surfaces and inscriptions.

C. Samples for Initial Selection: For joint materials involving color selection.

D. Stone Samples for Verification: Sets for each variety, color, and finish of stone required; not less than 12 inches square.

1. Sets consist of at least three Samples, exhibiting extremes of the full range of color and other visual characteristics expected and will establish the standard by which stone will be judged.

E. Colored Pointing Mortar Samples for Verification: For each color required. Make Samples using same sand and mortar ingredients to be used on Project.

F. Sealant Samples for Verification: For each type and color of joint sealant required.

G. Delegated Design Submittal: For stone cladding assembly.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For ~~[~~Installer~~]~~ and ~~[~~fabricator~~] [professional engineer] [and] [testing agency]~~.

B. Material Test Reports:

1. Stone Test Reports: For each stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous five years.
2. For metal components, by a qualified testing agency, indicating chemical and physical properties of metal.
3. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer complying with requirements in Section 079200 "Joint Sealants" and indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

C. Preconstruction test reports.

D. Source quality-control reports.

E. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Stone Units: Furnish ~~<**Insert number**>~~ finished stone panels, as noted on Drawings, ~~<**Insert required dimensions**>~~field verify for each finish and variety of stone specified.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate stone cladding assemblies similar to that required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: A firm or individual experienced in installing stone cladding assemblies similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.

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

D. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Stone Testing Service: The material supplier will engage a qualified testing agency to perform preconstruction testing.

1. Physical Property Tests: For each stone variety proposed for use on Project, tested for compliance with physical property requirements, other than abrasion resistance, according to referenced ASTM standards.
2. Flexural Strength Tests: For each combination of stone variety, thickness, orientation of cut, and finish, proposed for use on Project, tested according to ASTM C880/C880M, in both wet and dry conditions.
3. Anchorage Tests: For each combination of stone variety, orientation of cut, finish, and anchor type proposed for use on Project, tested according to ASTM C1354/C1354M.
4. Anchoring System Mockup Test: For stone anchoring system, tested according to ASTM C1201/C1201M, Procedure B, with a maximum test load equal to 3 times the design load. Build laboratory mockup at testing agency facility; use personnel, materials, and methods of construction that will be used at Project site.

B. Preconstruction Sealant Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for compatibility and adhesion testing according to sealant manufacturer's standard testing methods and Section 079200 "Joint Sealants," Samples of materials that will contact or affect joint sealants.

C. Preconstruction Field Testing of Sealants: Before installing joint sealants, field test their adhesion to joint substrates according to Section 079200 "Joint Sealants."

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.

1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
2. Store stone on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.

B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels so that they are right side up when units are installed.

C. Deliver sealants to Project site in original unopened containers labeled with manufacturer's name, product name and designation, color, expiration period, pot life, curing time, and mixing instructions for multicomponent materials.

D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

E. Store aggregates in locations where grading and other required characteristics can be maintained and where contamination can be avoided.

1.10 FIELD CONDITIONS

A. Protect stone cladding during erection by doing the following:

1. Cover tops of stone cladding installation with nonstaining, waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 inches down both sides and hold securely in place.
2. Prevent staining of stone from mortar, grout, sealants, and other sources. Immediately remove such materials without damaging stone.
3. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
4. Protect sills, ledges, and projections from mortar and sealant droppings.

B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Remove and replace stone cladding damaged by frost or freezing conditions. Comply with cold-weather construction and protection requirements for masonry contained in TMS 602/ACI 530.1/ASCE 6.

C. Hot-Weather Requirements: Comply with hot-weather construction and protection requirements for masonry contained in TMS 602/ACI 530.1/ASCE 6.

D. Environmental Limitations for Sealants: Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or below 40 deg F or when joint substrates are wet.

1.11 COORDINATION

A. Coordinate installation of inserts that are to be embedded in concrete or masonry, flashing reglets, and similar items to be used by stone cladding Installer for anchoring, supporting, and flashing of stone cladding assembly. Furnish setting drawings, templates, and directions for installing such items and deliver to Project site in time for installation.

B. Time delivery and installation of stone cladding to avoid extended on-site storage and to coordinate with work adjacent to stone cladding.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from single quarry, whether specified in this Section or in another Section of the Specifications, with resources to provide materials of consistent quality in appearance and physical properties.

1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
2. Make quarried blocks available for examination by Architect.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality for each cementitious component from single manufacturer and each aggregate from single source or producer.

C. Source Limitations for Other Materials: Obtain each type of stone accessory, sealant, and other material from single manufacturer for each product.

D. Stone Fabricators: Subject to compliance with requirements, available fabricators whose products may be incorporated into the Work include, but are not limited to, the following:

1. Coldsprings, 17482 Granite West Rd., Cold Springs, MN 56320 Tele: (800) 328-5040.
2. New England Stone Inc., 15 Branch Pkke, Smithfield, RI 02917 Tele: (401) 232-2040.
3. Polycor, 75 rue Saint-Paul, Quebec, Canada GK3V9 Tele: 418-692-4695.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stone cladding assembly.

B. General: Design stone anchors and anchoring systems according to ASTM C1242.

1. Stone anchors withstand not less than two times the weight of the stone cladding in both compression and tension.

C. Structural Performance: Stone cladding assembly withstands the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Wind Loads: As indicated.
2. Equipment Loads: Allow for loads due to window cleaning and maintenance equipment.

D. Seismic Performance: Stone cladding assembly withstands the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.0.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

F. Horizontal Building Movement (Interstory Drift): Allow for maximum horizontal building movement equal to quotient resulting from dividing floor-to-floor height at any floor by 400.

G. Safety Factors for Stone: Design stone cladding assembly to withstand loads indicated without exceeding stone's allowable working stress determined by dividing stone's average ultimate strength, as established by testing, by the following safety factors:

1. Safety Factor for Granite: [3] ~~<Insert number>~~.
2. Safety Factor for Oolitic Limestone: [8] ~~<Insert number>~~.
3. Safety Factor for Dolomitic Limestone: [6] ~~<Insert number>~~.
4. Safety Factor for Concentrated Stresses: [4] [for granite] [and] [10] [for stone varieties other than granite].

H. Design stone anchors to withstand loads indicated without exceeding allowable working stresses established by the following:

1. For Structural Steel: AISC 360.
2. For Cold-Formed Steel: AISI's "North American Specification and Commentary for the Design of Cold-Formed Steel Structural Members."
3. For Cold-Formed Stainless Steel: ASCE/SEI 8, "Specification for the Design of Cold-Formed Stainless Steel Structural Members."
4. For Aluminum: AA ADM-1, "The Aluminum Design Manual."
5. For Cast-in-Place and Postinstalled Fasteners in Concrete: One-fourth of tested capacity when installed in concrete with compressive strength indicated.
6. For Postinstalled Fasteners in Masonry: One-sixth of tested capacity when installed in masonry units indicated.

I. Limit deflection in each prefabricated assembly caused by indicated loads and thermal movements, acting singly or in combination with one another, to not more than [1/720] ~~<Insert ratio>~~ of assembly's clear span or the following, whichever is smaller:

1. 1/16 inch, measured in plane of wall.
2. 1/4 inch, measured perpendicular to wall.

J. Provisions for Fabrication and Erection Tolerances: Allow for fabrication and erection tolerances of building's structural system.

K. Corrosion and Staining Control: Prevent galvanic and other forms of corrosion as well as staining by isolating metals and other materials from direct contact with incompatible materials. Materials do not stain exposed surfaces of stone and joint materials.

2.3 GRANITE

A. Material Standard: Comply with ASTM C615/C615M.

B. Description: Uniform, medium to coarse-grained, beige, pink, red stone with veining.

C. Varieties and Sources: Subject to compliance with requirements, provide one of the following:

1. Sunset Beige Granite, Sunset Red Granite or Indian Sunset Granite from quarries located in Marble Falls, Texas.

D. Cut: Vein.

1. Orientation of Veining: To match existing material on building.

E. Cut stone from one block or contiguous, matched blocks in which natural markings occur.

F. Finish: To match existing material on building.

G. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

H. Thickness: Not less than 2 inches unless otherwise indicated.

2.4 ANCHORS AND FASTENERS

A. Fabricate anchors from stainless steel, ASTM A240/A240M or ASTM A666, Type 304; temper as required to support loads imposed without exceeding allowable design stresses. Fabricate dowels and pins for anchors from stainless steel, ASTM A276, Type 304.

B. Postinstalled Anchor Bolts for Concrete and Masonry: ~~[**Chemical anchors**]~~ ~~[torque~~Torque-controlled expansion anchors~~]~~ ~~[or]~~ ~~[~~undercut anchors~~]~~ made from stainless steel components complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2 for bolts and nuts; ASTM A240/A240M, ASTM A276, or ASTM A666, Type 304 or 316, for anchors, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E488/E488M, conducted by a qualified independent testing agency.

C. Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers.

1. For ~~[~~stainless steel~~]~~ ~~[**and**]~~ ~~[**aluminum**]~~, use annealed stainless steel bolts, nuts, and washers; for bolts, ASTM F593; and for nuts, ASTM F594, Alloy ~~[~~Group 1~~]~~ ~~[**Group 2**]~~.
~~2. For [**galvanized-steel shelf angles**] [**and**] [**backup structure**], use carbon-steel bolts, nuts, and washers; for bolts, ASTM A307, Grade A; for nuts, ASTM A563, Grade A; and for washers, ASTM F436; all hot-dip or mechanically zinc coated.~~

~~D. Weld Plates for Installation in Concrete: Comply with Section 055000 "Metal Fabrications."~~

2.5 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction, natural color or white as required to produce mortar color indicated.

1. Low-Alkali Cement: Portland cement for use with limestone contains no more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207.

C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Pigments have a record of satisfactory performance in mortar.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime.

E. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Mix produces color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments do not exceed 10 percent of portland cement by weight.

F. Aggregate: ASTM C144; except for pointing mortar, 100 percent pass No. 16 sieve.

1. White Aggregates: Natural white sand or ground white stone.
2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other durable stone; of color necessary to produce required mortar color.

G. Water: Potable.

2.6 STONE ACCESSORIES

A. Setting Shims: Strips of vulcanized neoprene, non-staining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.

B. Setting Buttons: Resilient plastic buttons, non-staining to stone, sized to suit joint thicknesses and bed depths of stone units without intruding into required depths of pointing materials.

C. Concealed Sheet Metal Flashing: Fabricated from stainless steel in thicknesses indicated, but not less than 0.0156 inch thick, and complying with Section 076200 "Sheet Metal Flashing and Trim."

D. Weep and Vent Tubes: ~~[~~Medium-density polyethylene tubing, 1/4-inch OD~~]~~ ~~[~~or ~~R~~rectangular, cellular, polypropylene or clear butyrate extrusion, 3/8 by 1-1/2 inches~~]~~, of length required to extend from exterior face of stone to cavity behind.

E. Cellular Plastic Weep Hole/Vents: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, of length required to extend from exterior face of stone to cavity behind, in color selected from manufacturer's standard.

F. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, of length required to extend from exterior face of stone to cavity behind, in color selected from manufacturer's standard.

G. Wicking Material: Absorbent rope, made from [cotton] [or] [UV-resistant synthetic fiber], 1/4 to 3/8 inch in diameter, of length required to produce 2-inch exposure on exterior and 18 inches in cavity between wythes.

H. Sealants for Joints in Stone Cladding: Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants" and do not stain stone:

1. Silicone: Nonstaining, [S, NS, 100/50, NT] or [S, NS, 50, NT] **[S, NS, 100/50, T, NT] [M, NS, 50, NT]**.
2. Urethane: **[S, NS, 25, NT] [S, NS, 100/50, T, NT] [M, NS, 50, NT] [M, NS, 50, T, NT]** [M, NS, 25, T, NT].
3. Joint-Sealant Colors: [As selected by Architect from manufacturer's full range of colors] **[Match color of stone]**.

I. Preformed Joint Seals: Preformed [silicone] or [foam] joint seals that comply with applicable requirements in Section 079100 "Preformed Joint Seals" and do not stain stone.

J. Sealant for Filling Kerfs: **[Same sealant used for joints in stone cladding.]** [Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants" and that do not stain stone:]

1. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

      1) Adfast.
      2) GE Construction Sealants; Momentive Performance Materials Inc.
      3) May National Associates, Inc.; a subsidiary of Sika Corporation.
      4) Pecora Corporation.
      5) The Dow Chemical Company.
      6) Tremco Incorporated.

2. Urethane, M, NS, 25, T, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Bostik; Arkema.
2) LymTal International, Inc.
3) Master Builders Solutions.
4) Sika Corporation.

2.7 FABRICATION OF STONE

A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated.

1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
2. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."
3. For marble, serpentine, and travertine, comply with recommendations in MIA's "Dimension Stone - Design Manual VII."

B. Control depth of stone and back check to maintain minimum clearance of ~~[**1 inch**] [**1-1/2 inches**]~~ ~~<**Insert dimension**>~~field verify between backs of stone units and surfaces or projections of structural members, fireproofing (if any), backup walls, and other work behind stone.

C. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.

D. Cut and drill sinkages and holes in stone for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place.

E. Finish exposed faces and edges of stone~~[~~, except sawed reveals,~~]~~ to comply with requirements indicated for finish and to match approved samples~~[~~ and mockups~~]~~.

F. Quirk-miter corners unless otherwise indicated; provide for cramp anchorage in top and bottom bed joints of corner pieces.

G. Cut stone to produce uniform joints ~~[**3/8 inch**] [**1/2 inch**]~~ ~~<**Insert dimension**>~~match existing wide and in locations indicated.

H. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.

I. Fabricate molded work, including washes and drips, to produce stone shapes with a uniform profile throughout entire unit length, with precisely formed arris slightly eased to prevent snipping, and with matching profile at joints between units.

1. Produce moldings and molded edges with machines that use abrasive shaping wheels made to reverse contour of molding shape.

~~J. Carve and cut [**inscriptions**] [**and**] [**decorative surfaces**]. Use skilled stone carvers experienced in the successful performance of work similar to that indicated.~~

~~K.~~J. Clean backs of stone to remove rust stains, iron particles, and stone dust.

~~L.~~K. Inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

1. Grade and mark stone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved samples and mockups.

2.8 MORTAR MIXES

A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.

1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Do not use calcium chloride.
2. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer unless otherwise indicated. Discard mortar when it has reached initial set.

B. Portland Cement-Lime Setting Mortar: Comply with ASTM C270, Proportion Specification, for types of mortar indicated below:

1. Set granite with Type S mortar.
2. Set limestone with Type N mortar.
3. Set marble with Type S mortar.
4. Set quartz-based stone with ~~[~~Type S~~] [**Type N**]~~ mortar.
5. Set serpentine with Type S mortar.
6. Set slate with Type S mortar.
7. Set travertine with Type N mortar.
8. Backparge travertine with Type O mortar.

C. Pointing Mortar: Comply with ASTM C270, Proportion Specification, for types of mortar indicated. Provide pointing mortar mixed to match Architect's sample and complying with the following:

1. Pigmented Pointing Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1:10, by weight.
2. Packaged Portland Cement-Lime Mix Mortar: Use portland cement-lime mix of selected color.
3. Colored-Aggregate Pointing Mortar: Produce color required by combining colored aggregates with portland cement of selected color.
4. Point granite with ~~[~~Type S~~] [**Type N**]~~ mortar.
5. Point limestone with ~~[**Type N**]~~ ~~[~~Type O~~]~~ mortar.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform source quality-control testing.

1. Retesting of materials that fail to meet specified requirements is done at Contractor's expense.
2. Furnish test specimens selected by testing agency from same blocks as actual materials proposed for incorporation into the Work.
3. Flexural Strength Tests: ASTM C880/C880M, performed on specimens of same thickness, orientation of cut, and finish as installed stone. One set of test specimens is required to be tested for every 3000 sq. ft., but not fewer than two sets for each stone variety.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive stone cladding and conditions under which stone cladding will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone cladding.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone cladding.

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

3.2 INSTALLATION OF STONE CLADDING, GENERAL

A. Before setting stone, clean surfaces that are dirty or stained by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

B. Coat limestone with dampproofing to extent indicated below:

1. Stone at Grade: Beds, joints, and back surfaces to at least 12 inches above finish-grade elevations.
2. Stone Extending Below Grade: Beds, joints, back surfaces, and face surfaces below grade.
3. Allow dampproofing to cure before setting dampproofed stone. Do not damage or remove dampproofing while handling and setting stone.

C. Parge back of travertine panels with mortar not less than 3/8 inch thick.

D. Execute stone cladding installation by skilled mechanics and employ skilled stone fitters at Project site to do necessary field cutting as stone is set.

1. Use power saws with diamond blades to cut stone. Produce lines cut straight and true, with edges eased slightly to prevent snipping.

E. Contiguous Work: Provide reveals, reglets, and openings as required to accommodate contiguous work.

F. Set stone to comply with requirements indicated. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure stone cladding in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with uniform joints of widths indicated, and with edges and faces aligned according to established relationships and indicated tolerances.

G. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.

1. Sealing expansion and other joints is specified in Section 079200 "Joint Sealants."
2. Keep expansion joints free of mortar and other rigid materials.

H. Install concealed flashing at continuous shelf angles, lintels, ledges, and similar obstructions to downward flow of water, to divert water to building exterior. Extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.

I. Keep cavities open where unfilled space is indicated between back of stone units and backup wall; do not fill cavities with mortar or grout.

1. Place weep holes in joints where moisture may accumulate, including at base of cavity walls and above shelf angles and flashing. Locate weep holes at intervals not exceeding 24 inches. Use ~~[~~weep and vent tubes~~]~~ ~~,~~ ~~[~~plastic weep hole/vents~~]~~ ~~[~~or~~]~~ ~~[~~wicking material~~]~~.
2. Place vents in cavity walls at tops of cavities, below shelf angles and flashing, and at intervals not exceeding 20 feet vertically. Locate vents in joints at intervals not exceeding 60 inches horizontally. Use ~~[~~weep and vent tubes~~]~~ ~~[~~or~~]~~ ~~[~~plastic weep hole/vents~~]~~.

3.3 INSTALLATION OF MECHANICALLY ANCHORED STONE CLADDING

A. Set stone cladding with mechanical anchors without mortar unless otherwise indicated.

B. Attach anchors securely to stone and to backup surfaces. Comply with recommendations in ASTM C1242.

C. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant indicated for filling kerfs.

D. Set stone supported on clips or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.

3.4 INSTALLATION OF STONE CLADDING WITH MORTAR

A. Set stone cladding with mortar and mechanical anchors where indicated.

B. Set stone in full bed of mortar with head joints filled unless otherwise indicated.

1. Use setting buttons of adequate size, in sufficient quantity, and of thickness required to maintain uniform joint width and to prevent mortar from extruding. Hold buttons back from face of stone a distance at least equal to width of joint, but not less than depth of pointing materials.
2. Do not set heavy units or projecting courses until mortar in courses below has hardened enough to resist being squeezed out of joint.
3. Support and brace projecting stones until wall above is in place and mortar has set.
4. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with mortar.

C. Fill space between back of stone units and backup wall solidly with mortar or grout.

D. Embed ends of sills in mortar; leave remainder of joint open until final pointing.

E. Rake out joints for pointing with mortar to depths of not less than 1/2 inch. Rake joints to uniform depths with square bottoms and clean sides.

F. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply first layer of pointing mortar in layers not more than 3/8 inch until a uniform depth is formed.

G. Point stone joints by placing pointing mortar in layers not more than 3/8 inch. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.

H. Tool joints with a round jointer having a diameter 1/8 inch larger than width of joint, when pointing mortar is thumbprint hard.

I. Rake out mortar from sealant-pointed joints to depths required for sealant and sealant backing, but not less than 1/2 inch. Rake joints to uniform depths with square bottoms and clean sides.

J. Set the following stone cladding with unfilled head joints for installing joint sealants:

1. Cornices.
2. Copings.
3. Sills.
4. Belt and other projecting courses.

3.5 INSTALLATION OF JOINT-SEALANTS

A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.6 INSTALLATION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more. For external corners, corners and jambs

within 20 feet of an entrance, expansion joints, and other conspicuous lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch in 40 feet or more.

B. Variation from Level: For lintels, sills, water tables, parapets, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch maximum.

C. Variation of Linear Building Line: For positions shown in plan and related portions of walls and partitions, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.

D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus 1/4 inch.

E. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/8 inch or a quarter of nominal joint width, whichever is less. For joints within 60 inches of each other, do not vary more than 1/8 inch or a quarter of nominal joint width, whichever is less from one to the other.

F. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/16-inch difference between planes of adjacent units.

3.7 ADJUSTING AND CLEANING

A. Remove and replace broken, chipped, stained, or otherwise damaged stone, defective joints, and stone cladding that does not match approved samples{ and mockups}. Damaged stone may be repaired if Architect approves methods and results.

B. Replace damaged or defective work in a manner that results in stone cladding's matching approved samples{ and mockups}, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean stone cladding as work progresses.{ Remove mortar fins and smears before tooling joints.} Remove excess sealant and smears as sealant is installed.

D. Final Cleaning: Clean stone cladding no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.

END OF SECTION 044200

SECTION 230923 - DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE OF WORK SUMMARY

A. General: The control system shall consist of a high-speed, peer-to-peer network of DDC controllers, a control system server, and a web-based operator interface. The control system shall be seamlessly integrated with the State of Maine Building Control Center (BCC) which provides 24 hours a day, 7 days a week, 365 days a year monitoring of state facilities. The HVAC controls shall be an extension of the existing Honeywell Enterprise Building Integrator (EBI) with host server hardware located in Augusta Maine. The Building Automation System (BAS) shall enable monitoring and control of mechanical systems installed under the scope of this project through the BCC. Integration of HVAC system, panels, associated devices, front-end programming and graphics are proprietary to Honeywell International Inc.

B. Graphics package shall be 5 star or better graphics to include detailed graphics customized for this building showing all controlled equipment, device and sensor locations, and building floor plans indicating HVAC zones and current temperature and humidity conditions as applicable.

C. The project scope shall include but not necessarily be limited to the following:

D. Section Includes:

1. DDC system for monitoring and controlling of HVAC systems.
2. Delivery of selected control devices to equipment and systems manufacturers for factory installation and to HVAC systems installers for field installation.
3. Temperature and moisture instruments.
4. Section includes control valves and actuators for DDC systems.
5. Air temperature sensors.
6. Combination air temperature sensors and switches.
7. Air temperature switches.
8. Integration into existing Honeywell EBI system for the State of Maine.

E. Related Requirements: Electrical wiring and installation shall be in accordance with NEC and Division 26 specifications. Specific references include:

1. Section 260533 "Raceways and Boxes for Electrical Systems" for raceways for low-voltage control cable.
2. Section 260553 "Identification for Electrical Systems" for identification requirements for electrical components.

1.3 DEFINITIONS

A. Algorithm: A logical procedure for solving a recurrent mathematical problem. A prescribed set of well-defined rules or processes for solving a problem in a finite number of steps.

B. Analog: A continuously varying signal value, such as current, flow, pressure, or temperature.

C. BACnet Specific Definitions:

1. BACnet: Building Automation Control Network Protocol, ASHRAE 135. A communications protocol allowing devices to communicate data over and services over a network.
2. BACnet Interoperability Building Blocks (BIBBs): BIBB defines a small portion of BACnet functionality that is needed to perform a particular task. BIBBs are combined to build the BACnet functional requirements for a device.
3. BACnet/IP: Defines and allows using a reserved UDP socket to transmit BACnet messages over IP networks. A BACnet/IP network is a collection of one or more IP subnetworks that share the same BACnet network number.
4. BACnet Testing Laboratories (BTL): Organization responsible for testing products for compliance with ASHRAE 135, operated under direction of BACnet International.
5. PICS (Protocol Implementation Conformance Statement): Written document that identifies the particular options specified by BACnet that are implemented in a device.

D. BAS: Building Automation System

E. Binary: Two-state signal where a high signal level represents ON" or "OPEN" condition and a low signal level represents "OFF" or "CLOSED" condition. "Digital" is sometimes used interchangeably with "Binary" to indicate a two-state signal.

F. Controller: Generic term for any standalone, microprocessor-based, digital controller residing on a network, used for local or global control. Three types of controllers are indicated: Network Controller, Programmable Application Controller, and Application-Specific Controller.

G. Control System Integrator: An entity that assists in expansion of existing enterprise system and support of additional operator interfaces to I/O being added to existing enterprise system.

H. COV: Changes of value.

I. Cv: Design valve coefficient.

J. DDC: Direct-digital control.

K. DDC System Provider: Authorized representative of, and trained by, DDC system manufacturer and responsible for execution of DDC system Work indicated.

L. Distributed Control: Processing of system data is decentralized and control decisions are made at subsystem level. System operational programs and information are provided to remote subsystems and status is reported back. On loss of communication, subsystems shall be capable of operating in a standalone mode using the last best available data.

M. DOCSIS: Data-Over Cable Service Interface Specifications.

N. Gateway: Bidirectional protocol translator that connects control systems that use different communication protocols.

O. HART (Highway Addressable Remote Transducer) Protocol: The global standard for sending and receiving digital information across analog wires between smart devices and control or monitoring systems through bidirectional communication that provides data access between intelligent field instruments and host systems. A host can be any software application from a technician's hand-held device or laptop to a plant's process control, asset management, safety, or other system using any control platform.

P. HLC: Heavy load conditions.

Q. I/O: System through which information is received and transmitted. I/O refers to analog input (AI), binary input (BI), analog output (AO) and binary output (BO). Analog signals are continuous and represent control influences such as flow, level, moisture, pressure, and temperature. Binary signals convert electronic signals to digital pulses (values) and generally represent two-position operating and alarm status. "Digital," (DI and (DO), is sometimes used interchangeably with "Binary," (BI) and (BO), respectively.

R. LAN: Local area network.

S. LNS: LonWorks Network Services.

T. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

U. Mobile Device: A data-enabled phone or tablet computer capable of connecting to a cellular data network and running a native control application or accessing a web interface.

V. MS/TP: Master-slave/token-passing, IEE 8802-3. Datalink protocol LAN option that uses twisted-pair wire for low-speed communication.

W. MTBF: Mean time between failures.

X. NBR: Nitrile butadiene rubber.

Y. Network Controller: Digital controller, which supports a family of programmable application controllers and application-specific controllers, that communicates on peer-to-peer network for transmission of global data.

Z. Network Repeater: Device that receives data packet from one network and rebroadcasts it to another network. No routing information is added to protocol.

AA. Peer to Peer: Networking architecture that treats all network stations as equal partners.

BB. POT: Portable operator's terminal.

CC. PTFE: Polytetrafluoroethylene

DD. PUE: Performance usage effectiveness.

EE. RAM: Random access memory.

FF. RF: Radio frequency.

GG. RMS: Root-mean-square value of alternating voltage, which is the square root of the mean value of the square of the voltage values during a complete cycle.

HH. Router: Device connecting two or more networks at network layer.

II. Server: Computer used to maintain system configuration, historical and programming database.

JJ. TCP/IP: Transport control protocol/Internet protocol.

KK. UPS: Uninterruptible power supply.

LL. USB: Universal Serial Bus.

MM. User Datagram Protocol (UDP): This protocol assumes that the IP is used as the underlying protocol.

NN. VAV: Variable air volume.

OO. WLED: White light emitting diode.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Controls submittal shall be one integrated comprehensive submittal to include the requirements listed in this paragraph.

B. Multiple Submissions:

1. If multiple submissions are required to execute work within schedule, first submit a coordinated schedule clearly defining intent of multiple submissions. Include a proposed date of each submission with a detailed description of submittal content to be included in each submission.
2. Clearly identify each submittal requirement indicated and in which submission the information will be provided.
3. Include an updated schedule in each subsequent submission with changes highlighted to easily track the changes made to previous submitted schedule.

C. Product Data: For each type of product include the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical

power requirements, and limitations of ambient operating environment, including temperature and humidity.

3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation, operation and maintenance instructions including factors effecting performance.
5. Bill of materials of indicating quantity, manufacturer, and extended model number for each unique product.

    a. Workstations.
    b. Servers.
    c. Gateways.
    d. Routers.
    e. DDC controllers.
    f. Enclosures.
    g. Electrical power devices.
    h. UPS units.
    i. Accessories.
    j. Instruments.
    k. Control dampers and actuators.
    l. Control valves and actuators.

6. When manufacturer's product datasheets apply to a product series rather than a specific product model, clearly indicate and highlight only applicable information.
7. Each submitted piece of product literature shall clearly cross reference specification and drawings that submittal is to cover.

D. Software Submittal:

1. Cross-referenced listing of software to be loaded on each operator workstation, server, gateway, and DDC controller.
2. Description and technical data of all software provided, cross-referenced to products in which software will be installed.
3. Operating system software, operator interface and programming software, color graphic software, DDC controller software, maintenance management software, and third-party software.
4. Listing and description of each engineering equation used with reference source.
5. Listing and description of each constant used in engineering equations and a reference source to prove origin of each constant.
6. Description of operator interface to alphanumeric and graphic programming.
7. Description of each network communication protocol.
8. Description of system database, including all data included in database, database capacity and limitations to expand database.
9. Description of each application program and device drivers to be generated, including specific information on data acquisition and control strategies.

E. Shop Drawings:

1. General Requirements:

a. Include cover drawing with Project name, location, Owner, Architect, Contractor and issue date with each Shop Drawings submission.
b. Include a drawing index sheet listing each drawing number and title that matches information in each title block.

2. Include plans, elevations, sections, and mounting details where applicable.
3. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
4. Plan Drawings indicating the following:

a. Screened backgrounds of walls, structural grid lines, HVAC equipment, ductwork, and piping.
b. Room names and numbers with coordinated placement to avoid interference with control products indicated.
c. Each desktop workstation, server, gateway, router, DDC controller, control panel instrument connecting to DDC controller, and damper and valve connecting to DDC controller as indicated on the drawings.
d. Exact placement of products in rooms, ducts, and piping to reflect proposed installed condition.
e. Network communication cable and raceway routing.
f. Information, drawn to scale of 1/4- to 1/2-inch.
g. Proposed routing of wiring, cabling, conduit, and tubing, coordinated with building services for review before installation.

5. Schematic drawings for each controlled HVAC system indicating the following:

a. I/O points labeled with point names shown. Indicate instrument range, normal operating set points, and alarm set points. Indicate fail position of each damper and valve included in this Project.
b. I/O listed in table format showing point name, type of device, manufacturer, model number, and cross-reference to product data sheet number.
c. A graphic showing location of control I/O in proper relationship to HVAC system.
d. Wiring diagram with each I/O point having a unique identification and indicating labels for all wiring terminals.
e. Unique identification of each I/O that shall be consistently used between different drawings showing same point.
f. Elementary wiring diagrams of controls for HVAC equipment motor circuits including interlocks, switches, relays, and interface to DDC controllers.
g. Narrative sequence of operation.

6. Control panel drawings indicating the following:

a. Panel dimensions, materials, size, and location of field cable, raceways, and tubing connections.
b. Interior subpanel layout, drawn to scale and showing all internal components, cabling and wiring raceways, nameplates, and allocated spare space.
c. Front, rear, and side elevations and nameplate legend.
d. Unique drawing for each panel.

7. DDC system network riser diagram indicating the following:

a. Each device connected to network with unique identification for each.
b. Interconnection of each different network in DDC system (as applicable).
c. For each network, indicate communication protocol, speed and physical means of interconnecting network devices, such as copper cable type, or optical fiber cable type. Indicate raceway type and size for each.
d. Each network port for connection of an operator workstation or other type of operator interface with unique identification for each.

8. DDC system electrical power riser diagram indicating the following:

a. Each point of connection to field power with requirements (volts/phase/ hertz/amperes/connection type) listed for each.
b. Each control power supply including, as applicable, transformers, power-line conditioners, transient voltage suppression and high filter noise units, DC power supplies, and UPS units with unique identification for each.
c. Each product requiring power with requirements (volts/phase/ hertz/amperes/connection type) listed for each.
d. Power wiring type and size, race type, and size for each.

9. Monitoring and control signal diagrams indicating the following:

a. Control signal cable and wiring between controllers and I/O.
b. Point-to-point schematic wiring diagrams for each product.

F. System Description:

1. Full description of DDC system architecture, network configuration, operator interfaces and peripherals, servers, controller types and applications, gateways, routers and other network devices, and power supplies.
2. Complete listing and description of each report, log and trend for format and timing, and events which initiate generation.
3. System and product operation under each potential failure condition including, but not limited to, the following:

a. Loss of power.
b. Loss of network communication signal.
c. Loss of controller signals to inputs and outpoints.
d. Operator workstation failure.
e. Server failure.
f. Gateway failure.
g. Network failure
h. Controller failure.
i. Instrument failure.
j. Control damper and valve actuator failure.

4. Complete bibliography of documentation and media to be delivered to Owner.
5. Description of testing plans and procedures.
6. Description of Owner training.

G. Qualification Data:

1. Systems Provider Qualification Data:

    a. Resume of project manager assigned to Project.
    b. Resumes of application engineering staff assigned to Project.
    c. Resumes of installation and programming technicians assigned to Project.
    d. Resumes of service technicians assigned to Project.
    e. Brief description of past projects for the State of Maine including physical address, floor area, number of floors, building system cooling and heating capacity, and building's primary function.
    f. Description of past project DDC system, noting similarities to Project scope and complexity indicated.
    g. Names of staff assigned to past project that will also be assigned to execute work of this Project.

H. Product Test Reports: For each product that requires testing to be performed by manufacturer.

I. Field quality-control reports.

J. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For DDC system to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

    a. Project Record Drawings of as-built versions of submittal Shop Drawings provided in electronic PDF format.
    b. Testing and commissioning reports and checklists of completed final versions of reports, checklists, and trend logs.
    c. As-built versions of submittal Product Data.
    d. Names, addresses, e-mail addresses, and 24-hour telephone numbers of Installer and service representatives for DDC system and products.
    e. Operator's manual with procedures for operating control systems including logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing set points and variables.
    f. Programming manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
    g. Engineering, installation, and maintenance manuals that explain how to:

        1) Design and install new points, panels, and other hardware.
        2) Perform preventive maintenance and calibration.
        3) Debug hardware problems.
        4) Repair or replace hardware.

    h. Documentation of all programs created using custom programming language including set points, tuning parameters, and object database.

i. Backup copy of graphic files, programs, and database on electronic media such as DVDs or USB drives..
j. List of recommended spare parts with part numbers and suppliers.
k. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.
l. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.
m. Licenses, guarantees, and warranty documents.
n. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.
o. Owner training materials.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials and parts that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.8 QUALITY ASSURANCE

A. DDC System Manufacturer Qualifications:

1. System manufacturer shall be Honeywell and compatible with existing state of Maine BAS controls.

B. DDC System Provider Qualifications:

1. Authorized representative of, and trained by, DDC system manufacturer.
2. In-place facility located within 50 miles of Project.
3. Demonstrated past experience with installation of DDC system products being installed for period within three consecutive years before time of bid.
4. Each person assigned to Project shall have demonstrated past experience.
5. Staffing resources of competent and experienced full-time employees that are assigned to execute work according to schedule.
6. Service and maintenance staff assigned to support Project during warranty period.
7. Product parts inventory to support on-going DDC system operation for a period of not less than 5 years after Substantial Completion.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace products that fail in materials or workmanship within specified warranty period.

1. Failures shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner.
2. Include updates or upgrades to software and firmware if necessary to resolve deficiencies.

a. Install updates only after receiving Owner's written authorization.

3. Warranty service shall occur during normal business hours and commence within 24 hours of Owner's warranty service request.
4. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DDC SYSTEM MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:~~provide products by the following:~~

1. Honeywell International, Inc.
2. JCI – Johnson Controls.~~Sensors, actuators, transformers, enclosures, and other control components as selected by Honeywell.~~
3. Trane.
4. Automated Logic.
5. Alerton.
6. Other qualified contractors that provide BACnet control systems that meet this specification.

~~2.~~B. Acceptable BAS manufacturers must fully interface with the existing State of Maine Honeywell EBI system.

2.2 DDC SYSTEM DESCRIPTION

A. Microprocessor-based monitoring and control including analog/digital conversion and program logic. A control loop or subsystem in which digital and analog information is received and processed by a microprocessor, and digital control signals are generated based on control algorithms and transmitted to field devices to achieve a set of predefined conditions.

1. DDC system shall consist of a peer-to-peer network of distributed DDC controllers, operator interfaces, and software.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 WEB ACCESS

A. DDC system shall be web based.

1. Web-Based Access to DDC System:

a. DDC system software shall be based on server thin-client architecture, designed around open standards of web technology. DDC system server shall be accessed

using a web browser over DDC system network, using Owner's LAN, and remotely over Internet through Owner's LAN.

b. Intent of thin-client architecture is to provide operators complete access to DDC system via a web browser. No special software other than a web browser shall be required to access graphics, point displays, and trends; to configure trends, points, and controllers; and to edit programming.

c. Web access shall be password protected.

2.4 PERFORMANCE REQUIREMENTS

A. DDC system shall be designed to satisfy requirements indicated.

1. System Performance Objectives:

a. DDC system shall manage and control all other HVAC systems other than VRF systems.

b. DDC system shall interface with VRF system controllers to provide a graphics window into VRF system component status, space temperatures and setpoints, but shall not directly control VRF systems. VRF systems have their own controls that directly control VRF system components.

c. DDC system control shall operate HVAC systems to achieve optimum operating costs while using least possible energy and maintaining specified performance.

d. DDC system shall respond to power failures, HVAC equipment failures, and adverse and emergency conditions encountered through connected I/O points.

e. DDC system shall operate while unattended by an operator and through operator interaction.

f. DDC system shall record trends and transaction of events and produce report information such as performance, energy, occupancies, and equipment operation.

B. Surface-Burning Characteristics: Products installed in ducts, equipment, and return-air paths shall comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. DDC System Speed:

1. Response Time of Connected I/O:

a. AI point values connected to DDC system shall be updated at least every two seconds for use by DDC controllers. Points used globally shall also comply with this requirement.

b. BI point values connected to DDC system shall be updated at least every two seconds for use by DDC controllers. Points used globally shall also comply with this requirement.

c. AO points connected to DDC system shall begin to respond to controller output commands within one second(s). Global commands shall also comply with this requirement.

d. BO point values connected to DDC system shall respond to controller output commands within one second(s). Global commands shall also comply with this requirement.

2. Display of Connected I/O:

a. Analog point COV connected to DDC system shall be updated and displayed at least every five seconds for use by operator.
b. Binary point COV connected to DDC system shall be updated and displayed at least every five seconds for use by operator.
c. Alarms of analog and digital points connected to DDC system shall be displayed within 30 seconds of activation or change of state.
d. Graphic display refresh shall update within four seconds.
e. Point change of values and alarms displayed from workstation to workstation when multiple operators are viewing from multiple workstations shall not exceed graphic refresh rate indicated.

D. Network Bandwidth: Design each network of DDC system to include at least 30 percent available spare bandwidth with DDC system operating under normal and heavy load conditions indicated. Calculate bandwidth usage and apply a safety factor to ensure that requirement is satisfied when subjected to testing under worst case conditions.

E. DDC System Data Storage:

1. Include capability to archive not less than 24 consecutive months of historical data for all I/O points connected to system, including alarms, event histories, transaction logs, trends and other information indicated.
2. Local Storage:

a. Use storage on existing Honeywell EBI server. Server(s) shall use IT industry standard database platforms and be capable of functions described in "DDC Data Access" Paragraph.

F. DDC Data Access:

1. When logged into the system, operator shall be able to also interact with any DDC controller connected to DDC system as required for functional operation of DDC system.
2. System(s) shall be used for application configuration; for archiving, reporting and trending of data; for operator transaction archiving and reporting; for network information management; for alarm annunciation; and for operator interface tasks and controls application management.

G. Input/Output Point Displayed Accuracy: Input point displayed values shall meet following end-to-end overall system accuracy, including errors associated with meter, sensor, transmitter, lead wire or cable, and analog to digital conversion.

1. Flow:

a. Air: Within 5 percent of design flow rate.
b. Air (Terminal Units): Within 10 percent of design flow rate.
c. Water: Within 5 percent of design flow rate.

d. Steam: Within 5 percent of design flow rate.

2. Gas:

a. Carbon Dioxide: Within 50 ppm.
b. Carbon Monoxide: Within 20 ppm.
c. Refrigerant: Within 50 ppm.

3. Moisture (Relative Humidity):

a. Air: Within 5 percent RH.
b. Space: Within 5 percent RH.
c. Outdoor: Within 5 percent RH.

4. Level: Within 5 percent of reading.
5. Pressure:

a. Air, Ducts and Equipment: 1 percent of instrument range.
b. Space: Within 1 percent of instrument range.
c. Water: Within 1 percent of instrument range.
d. Steam: Within 1 percent of instrument range.

6. Speed: Within 5 percent of reading.
7. Temperature, Dew Point:

a. Air: Within 1 deg F.
b. Space: Within 1 deg F.
c. Outdoor: Within 2 deg F.

8. Temperature, Dry Bulb:

a. Air: Within 1 deg F.
b. Space: Within 1 deg F.
c. Outdoor: Within 1 deg F.
d. Heating glycol/Water: Within 1 deg F.
e. Heating Hot Water: Within 1 deg F.
f. Steam: Within 2 deg F.
g. Temperature Difference: Within 0.5 deg F.

9. Temperature, Wet Bulb:

a. Air: Within 0.5 deg F.
b. Space: Within 0.5 deg F.
c. Outdoor: Within 1 deg F.

H. Environmental Conditions for Controllers, Gateways, Routers, Instruments and Actuators:

1. Products shall operate without performance degradation under ambient environmental temperature, pressure and humidity conditions encountered for installed location.

a. If product alone cannot comply with requirement, install product in a protective enclosure that is isolated and protected from conditions impacting performance. Enclosure shall be internally insulated, electrically heated, cooled and ventilated as required by product and application.

2. Products shall be protected with enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Products not available with integral enclosures complying with requirements indicated shall be housed in protective secondary enclosures. Installed location shall dictate the following NEMA 250 enclosure requirements:

a. Outdoors, Protected: Type 3.
b. Outdoors, Unprotected: Type 4.
c. Indoors, Type 1.
d. Mechanical Equipment Rooms:

1) Pump and Boiler Rooms: Type 4.
2) Air-Moving Equipment Rooms: Type 2.

e. Localized Areas Exposed to Washdown: Type 4.

I. Electric Power Quality:

1. Power-Line Surges:

a. Protect DDC system products connected to ac power circuits from power-line surges to comply with requirements of IEEE C62.41.
b. Do not use fuses for surge protection.
c. Test protection in the normal mode and in the common mode, using the following two waveforms:

1) 10-by-1000-mic.sec. waveform with a peak voltage of 1500 V and a peak current of 60 A.
2) 8-by-20-mic.sec. waveform with a peak voltage of 1000 V and a peak current of 500 A.

2. Power Conditioning:

a. Protect DDC system products connected to ac power circuits from irregularities and noise rejection. Characteristics of power-line conditioner shall be as follows:

1) At 85 percent load, output voltage shall not deviate by more than plus or minus 1 percent of nominal when input voltage fluctuates between minus 20 percent to plus 10 percent of nominal.
2) During load changes from zero to full load, output voltage shall not deviate by more than plus or minus 3 percent of nominal.
3) Accomplish full correction of load switching disturbances within five cycles, and 95 percent correction within two cycles of onset of disturbance.
4) Total harmonic distortion shall not exceed 3-1/2 percent at full load.

3. Ground Fault: Protect products from ground fault by providing suitable grounding. Products shall not fail due to ground fault condition.

J. Backup Power Source:

1. HVAC systems and equipment served by a backup power source shall have associated DDC system products that control such systems and equipment also served from a backup power source.

K. UPS:

1. DDC system products powered by UPS units shall include the following:
   a. DDC controllers.

L. Continuity of Operation after Electric Power Interruption:

1. Equipment and associated factory-installed controls, field-installed controls, electrical equipment, and power supply connected to building normal and backup power systems shall automatically return equipment and associated controls to operating state occurring immediately before loss of normal power, without need for manual intervention by operator when power is restored either through backup power source or through normal power if restored before backup power is brought online.

M. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

N. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.

O. Backup Power Source: Systems and equipment served by a backup power source shall have associated control valve actuators served from a backup power source.

P. Environmental Conditions:

1. Provide electric control valve actuators with protective enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Electric control valve actuators not available with integral enclosures, complying with requirements indicated, shall be housed in protective secondary enclosures.

Q. Determine control valve sizes and flow coefficients by ISA 75.01.01.

R. Control valve characteristics and rangeability shall comply with ISA 75.11.01.

S. Selection Criteria:

1. Control valves shall be suitable for operation at following conditions:

   a. Heating Hot Water: .30 -200 deg F.
   b. Steam: 15 psi, 250 deg F.

2. Control valve shutoff classifications shall be FCI 70-2, Class IV or better unless otherwise indicated.
3. Valve pattern, three-way or straight through, shall be as indicated on Drawings.

4. Modulating straight-through pattern control valves shall have equal percentage flow-throttling characteristics unless otherwise indicated.
5. Modulating three-way pattern water valves shall have linear flow-throttling characteristics. The total flow through the valve shall remain constant regardless of the valve's position.
6. Modulating butterfly valves shall have linear flow-throttling characteristics.
7. Fail positions unless otherwise indicated:

    a. Heating Hot Glycol/Water: Open.
    b. Heating Hot Water: Open.
    c. Steam: Close.

8. Globe-type control valves shall pass the design flow required with not more than 95 percent of stem lift unless otherwise indicated.
9. Rotary-type control valves, such as ball and butterfly valves, shall have Cv falling between 65 and 75 degrees of valve full open position and minimum valve Cv between 15 and 25 percent of open position.
10. Selection shall consider viscosity, flashing, and cavitation corrections.
11. Valves shall have stable operation throughout full range of operation, from design to minimum Cv.
12. Minimum Cv shall be calculated at 10 percent of design flow, with a coincident pressure differential equal to the system design pump head.
13. In water systems, select modulating control valves at terminal equipment for a design Cv based on a pressure drop of 2 psig at design flow unless otherwise indicated.
14. Modulating valve sizes for steam service shall provide a pressure drop at design flow equal to lesser of the following:

    a. 50percent of the valve inlet pressure.
    b. percent of the absolute steam pressure at the valve inlet.

15. Two-position control valves shall be line size unless otherwise indicated.
16. In water systems, use ball- or globe-style control valves for two-position control for valves NPS 2 and smaller and butterfly style for valves larger than NPS 2.
17. In steam systems, use ball- or globe-style control valves regardless of size.

2.5 BALL-STYLE CONTROL VALVES

A. Ball Valves with Single Port and Characterized Disk:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Honeywell
    b. Belimo (USA), Inc.

2. Pressure Rating for NPS 1 and Smaller: Nominal 600 WOG.
3. Pressure Rating for NPS 1-1/2 through NPS 2: Nominal 400 WOG.
4. Close-off Pressure: 200 psig.
5. Process Temperature Range: Zero to 212 deg F.

6. Body and Tail Piece: Cast bronze ASTM B61, ASTM B62, ASTM B584, or forged brass with nickel plating.
7. End Connections: Threaded (NPT) ends.
8. Ball: Chrome-plated brass or bronze.
9. Stem and Stem Extension:

    a. Material to match ball.
    b. Blowout-proof design.
    c. Sleeve or other approved means to allow valve to be opened and closed without damaging the insulation or the vapor barrier seal.

10. Ball Seats: Reinforced PTFE.
11. Stem Seal: Reinforced PTFE packing ring with a threaded packing ring follower to retain the packing ring under design pressure with the linkage removed. Alternative means, such as EPDM O-rings, are acceptable if an equivalent cycle endurance can be demonstrated by testing.
12. Flow Characteristic: Equal percentage.

B. Ball Valves with Two Ports and Characterized Disk:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Honeywell
    b. Belimo (USA), Inc.

2. Pressure Rating for NPS 1 and Smaller: Nominal 600 WOG.
3. Pressure Rating for NPS 1-1/2 through NPS 2: Nominal 400 WOG.
4. Close-off Pressure: 200 psig.
5. Process Temperature Range: Zero to 212 deg F.
6. Body and Tail Piece: Cast bronze ASTM B61, ASTM B62, ASTM B584, or forged brass with nickel plating.
7. End Connections: Threaded (NPT) ends.
8. Ball: Chrome-plated brass or bronze.
9. Stem and Stem Extension:

    a. Material to match ball.
    b. Blowout-proof design.
    c. Sleeve or other approved means to allow valve to be opened and closed without damaging the insulation or the vapor barrier seal.

10. Ball Seats: Reinforced PTFE.
11. Stem Seal: Reinforced PTFE packing ring with a threaded packing ring follower to retain the packing ring under design pressure with the linkage removed. Alternative means, such as EPDM O-rings, are acceptable if an equivalent cycle endurance can be demonstrated by testing.
12. Flow Characteristics for A-Port: Equal percentage.
13. Flow Characteristics for B-Port: Modified for constant common port flow.

C. Pressure-Independent Ball Valves NPS 2 and Smaller:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Belimo (USA), Inc.
    b. HCI; Hydronics Components Inc.

2. Performance:

    a. Pressure Rating: 600 psig for NPS 1 and 400 psig for NPS 1-1/2 and NPS 2.
    b. Close-off pressure of 200 psig.
    c. Process Temperature Range: Between zero to 212 deg F.
    d. Rangeability: 100 to 1.

3. Integral Pressure Regulator: Located upstream of ball to regulate pressure, to maintain a constant pressure differential while operating within a pressure differential range of 5 to 50 psig.
4. Body: Forged brass, nickel plated, and with threaded ends.
5. Ball: Chrome-plated brass.
6. Stem and Stem Extension: Chrome-plated brass, blowout-proof design.
7. Stem sleeve or other approved means to allow valve to be opened and closed without damaging field-applied insulation and insulation vapor barrier seal.
8. Ball Seats: Reinforced PTFE.
9. Stem Seal: Reinforced PTFE packing ring stem seal with threaded packing ring follower to retain the packing ring under design pressure with the linkage removed. Alternative means, such as EPDM O-rings, are acceptable if equivalent cycle endurance can be achieved.
10. Flow Characteristic: Equal percentage.

2.6 BUTTERFLY-STYLE CONTROL VALVES

A. Commercial-Grade, Two-Way and 3 way Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Keystone; Tyco Flow Control.
    b. Milwaukee Valve
    c. Honeywell.

2. Performance:

    a. Bi-directional bubble tight shutoff at 250 psig.
    b. Comply with MSS SP-67 or MSS SP-68.
    c. Rotation: Zero to 90 degrees.
    d. Linear or modified equal percentage flow characteristic.

3. Body: Cast iron ASTM A126, Class B, ductile iron ASTM A536 or cast steel ASTM A216/A216M WCB fully lugged, suitable for mating to ASME B16.5 flanges.

4. Disc: 316 stainless steel.
5. Shaft: 316 or 17-4 PH stainless steel.
6. Seat: Reinforced EPDM or reinforced PTFE with retaining ring.
7. Shaft Bushings: Reinforced PTFE or stainless steel.
8. Replaceable seat, disc, and shaft bushings.
9. Corrosion-resistant nameplate indicating:

    a. Manufacturer's name, model number, and serial number.
    b. Body size.
    c. Body and trim materials.
    d. Flow arrow.

2.7 GLOBE-STYLE CONTROL VALVES

A. General Globe-Style Valve Requirements:

1. Globe-style control valve body dimensions shall comply with ISA 75.08.01.
2. Construct the valves to be serviceable from the top.
3. For cage guided valves, trim shall be field interchangeable for different valve flow characteristics, such as equal percentage, linear, and quick opening.
4. Reduced trim for one nominal size smaller shall be available for industrial valves NPS 1 and larger.
5. Replaceable seats and plugs.
6. Furnish each control valve with a corrosion-resistant nameplate indicating the following:

    a. Manufacturer's name, model number, and serial number.
    b. Body and trim size.
    c. Arrow indicating direction of flow.

B. Two-Way and Three-Way Globe Valves NPS 2 and Smaller:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Honeywell
    b. Johnson Controls, Inc.

2. Globe Style: Single port.
3. Body: Cast bronze or forged brass with ASME B16.5, Class 250 rating.
4. End Connections: Threaded.
5. Bonnet: Screwed.
6. Packing: PTFE V-ring.
7. Plug: Top guided.
8. Plug, Seat, and Stem: Brass.
9. Process Temperature Range: 35 to 248 deg F.
10. Ambient Operating Temperature: 35 to 150 deg F.
11. Leakage: FCI 70-2, Class IV.
12. Rangeability: 25 to 1.
13. Equal percentage flow characteristic.

C. Three-Way Globe Valves NPS 2 and Smaller:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Johnson Control, Inc.
    b. Honeywell.

2. Globe Style: Mix flow pattern.
3. Body: Cast bronze or forged brass with ASME B16.5, Class 250 rating.
4. End Connections: Threaded.
5. Bonnet: Screwed.
6. Packing: PTFE V-ring.
7. Plug: Top guided.
8. Plug, Seat, and Stem: Brass.
9. Process Temperature Range: 35 to 248 deg F.
10. Ambient Operating Temperature: 35 to 150 deg F.
11. Leakage: FCI 70-2, Class IV.
12. Rangeability: 25 to 1.
13. Linear flow characteristic.

D. Two-Way Globe Valves NPS 2-1/2 to NPS 6:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Johnson Controls, Inc.
    b. Honeywell.

2. Globe Style: Single port.
3. Body: Cast iron complying with ASME B61.1, Class 125.
4. End Connections: Flanged, suitable for mating to ASME B16.5, Class 150 flanges.
5. Bonnet: Bolted.
6. Packing: PTFE cone-ring.
7. Plug: Top or bottom guided.
8. Plug, Seat, and Stem: Brass or stainless steel.
9. Process Temperature Rating: 35 to 281 deg F.
10. Leakage: 0.1 percent of maximum flow.
11. Rangeability: Varies with valve size between 6 and 10 to 1.
12. Modified linear flow characteristic.

E. Three-Way Globe Valves NPS 2-1/2 to NPS 6:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Johnson Controls, Inc.
    b. Honeywell.

2. Globe Style: Mix flow pattern.
3. Body: Cast iron complying with ASME B61.1, Class 125.
4. End Connections: Flanged suitable for mating to ASME B16.5, Class 150 flanges.
5. Bonnet: Bolted.
6. Packing: PTFE cone-ring.
7. Plug: Top or bottom guided.
8. Plug, Seat, and Stem: Brass or stainless steel.
9. Process Temperature Rating: 35 to 281 deg F.
10. Leakage: 0.1 percent of maximum flow.
11. Rangeability: Varies with valve size between 6 and 10 to 1.
12. Modified linear flow characteristic.

2.8 SOLENOID VALVES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASCO Valve, Inc.

B. Description:

1. Action: Either normally open or normally closed in the event of electrical power failure as required by the application.
2. Size to close against the system pressure.
3. Manual override capable.
4. Heavy-duty assembly.
5. Body: Brass.
6. Seats and Discs: NBR or PTFE.
7. Solenoid Enclosure: NEMA 250, Type 4.

2.9 ELECTRIC AND ELECTRONIC CONTROL VALVE ACTUATORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Honeywell Water Controls.
2. Belimo

B. Actuators for Hydronic Control Valves: Capable of closing valve against system pump shutoff head.

C. Actuators for Steam Control Valves: Shutoff against 1.5 times steam design pressure.

D. Position indicator and graduated scale on each actuator.

E. Type: Motor operated, with or without gears, electric and electronic.

F. Voltage: 24-V ac.

G. Deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.

H. Function properly within a range of 85 to 120 percent of nameplate voltage.

I. Construction:

1. For Actuators Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
2. For Actuators from 100 to 400 W: Gears ground steel, oil immersed, shaft hardened steel running in bronze, copper alloy or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel or cast-aluminum housing.
3. For Actuators Larger Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.

J. Field Adjustment:

1. Spring Return Actuators: Easily switchable from fail open to fail closed in the field without replacement.
2. External manual adjustment mechanism to allow manual positioning when the actuator is not powered.

K. Two-Position Actuators: Single direction, spring return type.

L. Modulating Actuators:

1. Operation: Capable of stopping at all points across full range, and starting in either direction from any point in range.
2. Control Input Signal:

    a. Three Point, Tristate, or Floating Point: Clockwise and counter-clockwise inputs. One input drives actuator to open position and other input drives actuator to close position. No signal of either input remains in last position.
    b. Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation. Suitable for zero- to 10- or 2- to 10-V dc and 4- to 20-mA signals.

M. Position Feedback:

1. Equip two-position actuators with limit switches or other positive means of a position indication signal for remote monitoring of open and close position.
2. Equip modulating actuators with position feedback through current or voltage signal for remote monitoring.
3. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.

N. Fail-Safe:

1. Where indicated, provide actuator to fail to an end position.
2. Internal spring return mechanism to drive controlled device to an end position (open or close) on loss of power.

O. Integral Overload Protection:

1. Provide against overload throughout the entire operating range in both directions.
2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.

P. Valve Attachment:

1. Unless otherwise required for valve interface, provide an actuator designed to be directly coupled to valve shaft without the need for connecting linkages.
2. Attach actuator to valve drive shaft in a way that ensures maximum transfer of power and torque without slippage.
3. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.

Q. Temperature and Humidity:

1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.
2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.

R. Enclosure:

1. Suitable for ambient conditions encountered by application.
2. NEMA 250, Type 2 for indoor and protected applications.
3. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.
4. Provide actuator enclosure with heater and control where required by application.

S. Stroke Time:

1. Operate valve from fully closed to fully open within 60 seconds.
2. Operate valve from fully open to fully closed within 60 seconds.
3. Move valve to failed position within 30 seconds.
4. Select operating speed to be compatible with equipment and system operation.

T. Sound:

1. Spring Return: 62 dBA.
2. Non-Spring Return: 45 dBA.

2.10 ELECTRIC AND ELECTRONIC CONTROL DAMPER ACTUATORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following::

1. Belimo Aircontrols (USA), Inc.
2. Honeywell Building Solutions; Honeywell International, Inc.

B. Type: Motor operated, with or without gears, electric and electronic.

C. Voltage:

1. Provide 24 V actuators for dampers less than 36 inch and as possible. Use of 120 V actuators is acceptable for larger dampers with higher power requirements.
2. Actuator shall deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.
3. Actuator shall function properly within a range of 85 to 120 percent of nameplate voltage.

D. Construction:

1. Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
2. 100 up to 400 W: Gears ground steel, oil immersed, shaft-hardened steel running in bronze, copper alloy, or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel, or cast-aluminum housing.
3. Greater Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.

E. Field Adjustment:

1. Spring return actuators shall be easily switchable from fail open to fail closed in the field without replacement.
2. Provide external manual adjustment mechanism to allow manual positioning of the damper when the actuator is not powered.

F. Two-Position Actuators: Single direction, spring return.

G. Modulating Actuators:

1. Capable of stopping at all points across full range, and starting in either direction from any point in range.
2. Control Input Signal:

    a. Three Point, Tristate, or Floating Point: Clockwise and counter-clockwise inputs. One input drives actuator to open position, and other input drives actuator to close position. No signal of either input remains in last position.
    b. Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation. Suitable for zero- to 10- or 2- to 10-V dc and 4- to 20-mA signals.

H. Position Feedback:

1. Equip two-position actuators with limits switches or other positive means of a position indication signal for remote monitoring of open and close position.
2. Equip modulating actuators with a position feedback through current or voltage signal for remote monitoring.
3. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.

I. Fail-Safe:

1. Where indicated, provide actuator to fail to an end position.
2. Internal spring return mechanism to drive controlled device to an end position (open or close) on loss of power.
3. Batteries, capacitors, and other non-mechanical forms of fail-safe operation are acceptable only where uniquely indicated.

J. Integral Overload Protection:

1. Provide against overload throughout the entire operating range in both directions.
2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.

K. Damper Attachment:

1. Unless otherwise required for damper interface, provide actuator designed to be directly coupled to damper shaft without need for connecting linkages.
2. Attach actuator to damper drive shaft in a way that ensures maximum transfer of power and torque without slippage.
3. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.
4. The end of the damper shaft shall be marked with a line indicating the damper blade orientation.

L. Temperature and Humidity:

1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.
2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.

M. Enclosure:

1. Suitable for ambient conditions encountered by application.
2. NEMA 250, Type 2 for indoor and protected applications.
3. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.
4. Provide actuator enclosure with a heater and controller where required by application.

N. Stroke Time:

1. Operate damper from fully closed to fully open within 90 seconds.
2. Operate damper from fully open to fully closed within 90 seconds.
3. Move damper to failed position within 90 seconds.
4. Select operating speed to be compatible with equipment and system operation.
5. Actuators operating in smoke control systems comply with governing code and NFPA requirements.

O. Sound:

1. Spring Return: 62 dBA.
2. Non-Spring Return: 45 dBA.

2.11 SYSTEM ARCHITECTURE

A. System architecture shall consist of no more than two levels of LANs.

1. Level one LAN shall connect network controllers, operator workstations, programmable application controllers, and application-specific controllers over the IP network.
2. Level two LAN shall connect equipment controllers to the network controllers.

B. Minimum Data Transfer and Communication Speed:

1. LAN Level 1: 100 Mbps.
2. LAN Level 2: 38,400 bps.

C. DDC system shall consist of dedicated LANs that are not shared with other building systems and tenant data and communication networks.

D. System architecture shall be modular and have inherent ability to expand to not less than two times system size indicated with no impact to performance indicated.

E. System architecture shall perform modifications without having to remove and replace existing network equipment.

F. Number of LANs and associated communication shall be transparent to operator. All I/O points residing on any LAN shall be capable of global sharing between all system LANs.

G. System design shall eliminate dependence on any single device for system alarm reporting and control execution. Each controller shall operate independently by performing its' own control, alarm management and historical data collection.

H. Special Network Architecture Requirements:

1. Air-Handling Systems: For control applications of an air-handling system that consists of air-handling unit(s) and VAV terminal units, include a dedicated LAN of application-specific controllers serving VAV terminal units connected directly to controller that is controlling air-handling system air-handling unit(s). Basically, create a DDC system LAN that aligns with air-handling system being controlled.

2.12 DDC SYSTEM OPERATOR INTERFACES

A. Operator Means of System Access: Operator shall be able to access entire DDC system through any of multiple means, including, but not limited to, the following:

1. BCC.
2. Portable operator terminal or workstation with hardwired connection through LAN port.
3. Remote connection through web access.

B. Access to system, regardless of operator means used, shall be transparent to operator.

C. Network Ports: For hardwired connection of portable workstation. Network port shall be easily accessible, properly protected, clearly labeled, and installed at the following locations:

1. Each mechanical equipment room.
2. Each different roof level with roof-mounted air-handling units or rooftop units.

D. Critical Alarm Reporting:

1. Operator-selected critical alarms shall be sent by DDC system to notify the BCC operator of critical alarms that require immediate attention.
2. The BCC system shall notify recipients of alarms through the existing notification system.

E. Simultaneous Operator Use: Capable of accommodating up to five simultaneous operators that are accessing DDC system through any one of operator interfaces indicated.

2.13 NETWORKS

A. Acceptable networks for connecting workstations, mobile devices, and network controllers include the following:

1. IP.
2. IEEE 8802-3, Ethernet.

B. Acceptable networks for connecting programmable application controllers include the following:

1. IP.
2. IEEE 8802-3, Ethernet.

C. Acceptable networks for connecting application-specific controllers include the following:

1. IP.
2. IEEE 8802-3, Ethernet.
3. EIA-485A.

2.14 NETWORK COMMUNICATION PROTOCOL

A. Network communication protocol(s) used throughout entire DDC system shall be open to Owner and available to other companies for use in making future modifications to DDC system.

B. ASHRAE 135 Protocol:

1. ASHRAE 135 communication protocol shall be sole and native protocol used throughout entire DDC system.
2. DDC system shall not require use of gateways except if needed to integrate HVAC equipment and other building systems and equipment not available with ASHRAE 135 communication protocol.
3. If used, gateways shall connect to DDC system using ASHRAE 135 communication protocol and Project object properties and read/write services indicated by interoperability schedule.
4. Operator workstations, controllers and other network devices shall be tested and listed by BACnet Testing Laboratories.

C. Industry Standard Protocols:

1. DDC system shall use any one or a combination of the following industry standard protocols for network communication while complying with other DDC system requirements indicated:

   a. ASHRAE 135.
   b. CEA-709.1-C.
   c. Modbus Application Protocol Specification V1.1b.

2. Operator workstations and network controllers shall communicate through ASHRAE 135 protocol.
3. Portions of DDC system networks using ASHRAE 135 communication protocol shall be an open implementation of network devices complying with ASHRAE 135. Network devices shall be tested and listed by BACnet Testing Laboratories.
4. Portions of DDC system networks using Modbus Application Protocol Specification V1.1b communication protocol shall be an open implementation of network devices and technology complying with Modbus Application Protocol Specification V1.1b.
5. Gateways shall be used to connect networks and network devices using different protocols.

2.15 SERVERS

A. Server functions shall be provided by the existing permanently installed computers at BCC.

2.16 SYSTEM SOFTWARE

A. System Software Minimum Requirements:

1. Real-time multitasking and multiuser 32- or 64-bit operating system that allows concurrent multiple operator workstations operating and concurrent execution of multiple real-time programs and custom program development.
2. Operating system shall be capable of operating DOS and Microsoft Windows applications.
3. Database management software shall manage all data on an integrated and non-redundant basis. Additions and deletions to database shall be without detriment to existing data. Include cross linkages so no data required by a program can be deleted by an operator until that data have been deleted from respective programs.
4. Network communications software shall manage and control multiple network communications to provide exchange of global information and execution of global programs.
5. Operator interface software shall include day-to-day operator transaction processing, alarm and report handling, operator privilege level and data segregation control, custom programming, and online data modification capability.
6. Scheduling software shall schedule centrally based time and event, temporary, and exception day programs.

B. Operator Interface Software:

1. Operator interface shall conform to existing operator interface norms used for control of other buildings on the State of Maine Network.

2. Minimize operator training through use of English language prorating and English language point identification.
3. Minimize use of a typewriter-style keyboard through use of a pointing device similar to a mouse.
4. Operator sign-off shall be a manual operation or, if no keyboard or mouse activity takes place, an automatic sign-off.
5. Automatic sign-off period shall be programmable from one to 60 minutes in one-minute increments on a per operator basis.
6. Operator sign-on and sign-off activity shall be recorded and sent to printer.
7. Security Access:

    a. Operator access to DDC system shall be under password control.
    b. An alphanumeric password shall be field assignable to each operator.
    c. Operators shall be able to access DDC system by entry of proper password.
    d. Operator password shall be same regardless of which computer or other interface means is used.
    e. Additions or changes made to passwords shall be updated automatically.
    f. Each operator shall be assigned an access level to restrict access to data and functions the operator is cable of performing.
    g. Software shall have at least five access levels.
    h. Each menu item shall be assigned an access level so that a one-for-one correspondence between operator assigned access level(s) and menu item access level(s) is required to gain access to menu item.
    i. Display menu items to operator with those capable of access highlighted. Menu and operator access level assignments shall be online programmable and under password control.

8. Data Segregation:

    a. Include data segregation for control of specific data routed to a workstation, to an operator or to a specific output device, such as a printer.
    b. Include at least 32 segregation groups.
    c. Segregation groups shall be selectable such as "fire points," "fire points on second floor," "space temperature points," "HVAC points," and so on.
    d. Points shall be assignable to multiple segregation groups. Display and output of data to printer or monitor shall occur where there is a match of operator or peripheral segregation group assignment and point segregations.
    e. Alarms shall be displayed and printed at each peripheral to which segregation allows, but only those operators assigned to peripheral and having proper authorization level will be allowed to acknowledge alarms.
    f. Operators and peripherals shall be assignable to multiple segregation groups and all assignments are to be online programmable and under password control.

9. Operators shall be able to perform commands including, but not limited to, the following:

    a. Start or stop selected equipment.
    b. Adjust set points.
    c. Add, modify, and delete time programming.

d. Enable and disable process execution.
e. Lock and unlock alarm reporting for each point.
f. Enable and disable totalization for each point.
g. Enable and disable trending for each point.
h. Override control loop set points.
i. Enter temporary override schedules.
j. Define holiday schedules.
k. Change time and date.
l. Enter and modify analog alarm limits.
m. Enter and modify analog warning limits.
n. View limits.

10. Reporting:

a. Generated automatically and manually.
b. Sent to displays, printers and disk files.
c. Types of Reporting:

1) General listing of points.
2) List points currently in alarm.
3) List of off-line points.
4) List points currently in override status.
5) List of disabled points.
6) List points currently locked out.
7) List of items defined in a "Follow-Up" file.
8) List weekly schedules.
9) List holiday programming.
10) List of limits and deadbands.

11. Summaries: For specific points, for a logical point group, for an operator selected group(s), or for entire system without restriction due to hardware configuration.

C. Graphic Interface Software:

1. The graphics interface shall be designed and installed by Honeywell EBI for the BCC system.
2. Graphic Interface for the Cultural Building shall have a similar look, feel, and operation as other controls in existing State of Maine Buildings.
3. Include a full interactive graphical selection means of accessing and displaying system data to operator. Include at least five levels with the penetration path operator assignable (for example, site, building, floor, air-handling unit, and supply temperature loop). Native language descriptors assigned to menu items are to be operator defined and modifiable under password control.
4. Include a hierarchical-linked dynamic graphic operator interface for accessing and displaying system data and commanding and modifying equipment operation. Interface shall use a pointing device with pull-down or penetrating menus, color and animation to facilitate operator understanding of system.
5. Include at least 10 levels of graphic penetration with the hierarchy operator assignable.
6. Descriptors for graphics, points, alarms and such shall be modified through operator's workstation under password control.

7. Graphic displays shall be online user definable and modifiable using the hardware and software provided.
8. Data to be displayed within a graphic shall be assignable regardless of physical hardware address, communication or point type.
9. Graphics shall be online programmable and under password control.
10. Points may be assignable to multiple graphics where necessary to facilitate operator understanding of system operation.
11. Graphics shall also contain software points.
12. Penetration within a graphic hierarchy shall display each graphic name as graphics are selected to facilitate operator understanding.
13. Back-trace feature shall permit operator to move upward in the hierarchy using a pointing device. Back trace shall show all previous penetration levels. Include operator with option of showing each graphic full screen size with back trace as horizontal header or by showing a "stack" of graphics, each with a back trace.
14. Display operator accessed data on the monitor.
15. Operator shall select further penetration using pointing device to click on a site, building, floor, area, equipment, and so on. Defined and linked graphic below that selection shall then be displayed.
16. Include operator with means to directly access graphics without going through penetration path.
17. Dynamic data shall be assignable to graphics.
18. Display points (physical and software) with dynamic data provided by DDC system with appropriate text descriptors, status or value, and engineering unit.
19. Use color, rotation, or other highly visible means, to denote status and alarm states. Color shall be variable for each class of points, as chosen by operator.
20. Points shall be dynamic with operator adjustable update rates on a per point basis from one second to over a minute.
21. For operators with appropriate privilege, points shall be commanded directly from display using pointing device.

    a. For an analog command point such as set point, current conditions and limits shall be displayed and operator can position new set point using pointing device.
    b. For a digital command point such as valve position, valve shall show its current state such as open or closed and operator could select alternative position using pointing device.
    c. Keyboard equivalent shall be available for those operators with that preference.

22. Operator shall be able to split or resize viewing screen into quadrants to show one graphic on one quadrant of screen and other graphics or spreadsheet, bar chart, word processing, curve plot and other information on other quadrants on screen. This feature shall allow real-time monitoring of one part of system while displaying other parts of system or data to better facilitate overall system operation.
23. Help Features:

    a. On-line context-sensitive help utility to facilitate operator training and understanding.
    b. Bridge to further explanation of selected keywords. Document shall contain text and graphics to clarify system operation.

        1) If help feature does not have ability to bridge on keywords for more information, a complete set of user manuals shall be provided in an indexed

word-processing program, which shall run concurrently with operating system software.

c. Available for Every Menu Item:

1) Index items for each system menu item.

24. Graphic generation software shall allow operator to add, modify, or delete system graphic displays.

a. Include libraries of symbols depicting HVAC symbols such as fans, coils, filters, dampers, valves pumps, and electrical symbols.
b. Graphic development package shall use a pointing device in conjunction with a drawing program to allow operator to perform the following:

1) Define background screens.
2) Define connecting lines and curves.
3) Locate, orient and size descriptive text.
4) Define and display colors for all elements.
5) Establish correlation between symbols or text and associated system points or other displays.

D. Project-Specific Graphics: Graphics documentation including, but not limited to, the following:

1. Site plan showing each building, and additional site elements, which are being controlled or monitored by DDC system.
2. Plan for each building floor, including interstitial floors, and each roof level of each building, showing the following:

a. Room layouts with room identification and name.
b. Locations and identification of all monitored and controlled HVAC equipment and other equipment being monitored and controlled by DDC system.
c. Location and identification of each hardware point being controlled or monitored by DDC system.

3. Control schematic for each of following, including a graphic system schematic representation with point identification, set point and dynamic value indication, and sequence of operation.
4. Graphic display for each piece of equipment connected to DDC system through a data communications link. Include dynamic indication of all points associated with equipment.
5. DDC system network riser diagram that shows schematic layout for entire system including all networks and all controllers, gateways, operator workstations and other network devices.

E. Customizing Software:

1. Modifications to the DDC system graphics is done through the system integrator – Honeywell EBI.

F. Alarm Handling Software:

1. Include alarm handling software to report all alarm conditions monitored and transmitted through DDC controllers.
2. Include first in, first out handling of alarms according to alarm priority ranking, with most critical alarms first, and with buffer storage in case of simultaneous and multiple alarms.
3. Alarm handling shall be active at all times to ensure that alarms are processed even if an operator is not currently signed on to DDC system.
4. Alarms display shall include the following:

    a. Indication of alarm condition such as "Abnormal Off," "Hi Alarm," and "Low Alarm."
    b. "Analog Value" or "Status" group and point identification with native language point descriptor such as "Space Temperature, Building 110, 2nd Floor, Room 212."
    c. Discrete per point alarm action message, such as "Call Maintenance Dept. Ext-5561."
    d. Include extended message capability to allow assignment and printing of extended action messages. Capability shall be operator programmable and assignable on a per point basis.

5. Alarms shall be directed to appropriate operator workstations, printers, and individual operators by privilege level and segregation assignments using the existing BCC system.
6. Alarms shall be categorized and processed by class.

    a. Class 1:

        1) Associated with fire, security and other extremely critical equipment monitoring functions; have alarm, trouble, return to normal, and acknowledge conditions printed and displayed.
        2) Unacknowledged alarms to be placed in unacknowledged alarm buffer.
        3) All conditions shall cause an audible sound and shall require individual acknowledgment to silence audible sound.

    b. Class 2:

        1) Critical, but not life-safety related, and processed same as Class 1 alarms, except do not require individual acknowledgment.
        2) Acknowledgement may be through a multiple alarm acknowledgment.

    c. Class 3:

        1) General alarms; printed, displayed and placed in unacknowledged alarm buffer queues.
        2) Each new alarm received shall cause an audible sound. Audible sound shall be silenced by "acknowledging" alarm or by pressing a "silence" key.
        3) Acknowledgement of queued alarms shall be either on an individual basis or through a multiple alarm acknowledgement.
        4) Alarms returning to normal condition shall be printed and not cause an audible sound or require acknowledgment.

    d. Class 4:

1) Routine maintenance or other types of warning alarms.
2) Alarms to be printed only, with no display, no audible sound and no acknowledgment required.

7. Include an unacknowledged alarm indicator on display to alert operator that there are unacknowledged alarms in system. Operator shall be able to acknowledge alarms on an individual basis or through a multiple alarm acknowledge key, depending on alarm class.
8. To ensure that no alarm records are lost, it shall be possible to assign a backup printer to accept alarms in case of failure of primary printer.

G. Reports and logs shall be provided via the existing Honeywell EBI system and shall include the following:

1. All I/O: With current status and values.
2. Alarm: All current alarms, except those in alarm lockout.
3. Disabled I/O: All I/O points that are disabled.
4. Alarm Lockout I/O: All I/O points in alarm lockout, whether manual or automatic.
5. Alarm Lockout I/O in Alarm: All I/O in alarm lockout that are currently in alarm.
6. Logs:

a. Alarm history.
b. System messages.
c. System events.
d. Trends.

H. Standard Trends:

1. Trend all I/O point present values, set points, and other parameters indicated for trending.
2. Trends shall be associated into groups, and a trend report shall be set up for each group.
3. Trends shall be stored within DDC controller and uploaded to hard drives automatically on reaching 75 of DDC controller buffer limit, or by operator request, or by archiving time schedule.
4. Preset trend intervals for each I/O point after review with Owner.
5. Trend intervals shall be operator selectable from 10 seconds up to 60 minutes. Minimum number of consecutive trend values stored at one time shall be 100 per variable.
6. When drive storage memory is full, most recent data shall overwrite oldest data.
7. Archived and real-time trend data shall be available for viewing numerically and graphically by operators.

I. Custom Trends: Operator shall be able to define a custom trend log for any I/O point in DDC system.

1. Each trend shall include interval, start time, and stop time.
2. Data shall be sampled and stored on DDC controller, within storage limits of DDC controller, and then uploaded to archive on workstation hard drives.
3. Data shall be retrievable for use in spreadsheets and standard database programs.

J. Programming Software:

1. Include programming software as required to execute sequences of operation indicated.

K. Database Management Software:

1. Where a separate SQL database is used for information storage, DDC system shall include database management software that separates database monitoring and managing functions by supporting multiple separate windows.
2. Database secure access shall be accomplished using standard SQL authentication including ability to access data for use outside of DDC system applications.
3. Database management function shall include summarized information on trend, alarm, event, and audit for the following database management actions:

    a. Backup.
    b. Purge.
    c. Restore.

4. Database management software shall support the following:

    a. Statistics: Display database server information and trend, alarm, event, and audit information on database.
    b. Maintenance: Include method of purging records from trend, alarm, event and audit databases by supporting separate screens for creating a backup before purging, selecting database, and allowing for retention of a selected number of day's data.
    c. Backup: Include means to create a database backup file and select a storage location.
    d. Restore: Include a restricted means of restoring a database by requiring operator to have proper security level.

5. Database management software shall include information of current database activity, including the following:

    a. Ready.
    b. Purging record from a database.
    c. Action failed.
    d. Refreshing statistics.
    e. Restoring database.
    f. Shrinking a database.
    g. Backing up a database.
    h. Resetting Internet information services.
    i. Starting network device manager.
    j. Shutting down the network device manager.
    k. Action successful.

6. Database management software monitoring functions shall continuously read database information once operator has logged on.
7. Include operator notification through on-screen pop-up display and e-mail message when database value has exceeded a warning or alarm limit.
8. Monitoring settings window shall have the following sections:

    a. Allow operator to set and review scan intervals and start times.
    b. E-mail: Allow operator to create and review e-mail and phone text messages to be delivered when a warning or an alarm is generated.

c. Warning: Allow operator to define warning limit parameters, set reminder frequency and link e-mail message.
d. Alarm: Allow operator to define alarm limit parameters, set reminder frequency and link e-mail message.
e. Database Login: Protect system from unauthorized database manipulation by creating a read access and a write access for each of trend, alarm, event and audit databases as well as operator proper security access to restore a database.

9. Monitoring settings taskbar shall include the following informational icons:

a. Normal: Indicates by color and size, or other easily identifiable means that all databases are within their limits.
b. Warning: Indicates by color and size, or other easily identifiable means that one or more databases have exceeded their warning limit.
c. Alarm: Indicates by color and size, or other easily identifiable means that one or more databases have exceeded their alarm limit.

2.17 ASHRAE 135 GATEWAYS

A. Include BACnet communication ports, whenever available as an equipment OEM standard option, for integration via a single communication cable. BACnet-controlled plant equipment includes, but is not limited to pumps, variable-speed drives (VFD), humidifiers, DOAS units, and monitoring VRF systems.

B. New equipment is specified to include BACnet communications to allow direct connection into the BACnet DDC network in this building. If any equipment is not available with BACnet interface, then include gateways as needed to connect legacy non-BACnet DDC-controlled equipment into the building BACnet.

C. Include with each gateway an interoperability schedule showing each point or event on legacy side that BACnet "client" will read, and each parameter that BACnet network will write to. Describe this interoperability of BACnet services, or BIBBs, defined in ASHRAE 135, Annex K.

D. Gateway Minimum Requirements:

1. Read and view all readable object properties on non-BACnet network to BACnet network and vice versa where applicable.
2. Write to all writeable object properties on non-BACnet network from BACnet network and vice versa where applicable.
3. Include single-pass (only one protocol to BACnet without intermediary protocols) translation from non-BACnet protocol to BACnet and vice versa.
4. Comply with requirements of Data Sharing Read Property, Data Sharing Write Property, Device Management Dynamic Device Binding-B, and Device Management Communication Control BIBBs according to ASHRAE 135.
5. Hardware, software, software licenses, and configuration tools for operator-to-gateway communications.
6. Backup programming and parameters on CD or USB media and the ability to modify, download, backup, and restore gateway configuration.

2.18 ASHRAE 135 PROTOCOL ANALYZER

A. Analyzer and required cables and fittings for connection to ASHRAE 135 network.

B. Analyzer shall include the following minimum capabilities:

1. Capture and store to a file data traffic on all network levels.
2. Measure bandwidth usage.
3. Filtering options with ability to ignore select traffic.

2.19 DDC CONTROLLERS

A. DDC system shall consist of a combination of network controllers, programmable application controllers and application-specific controllers to satisfy performance requirements indicated.

B. DDC controllers shall perform monitoring, control, energy optimization and other requirements indicated.

C. DDC controllers shall use a multitasking, multiuser, real-time digital control microprocessor with a distributed network database and intelligence.

D. Each DDC controller shall be capable of full and complete operation as a completely independent unit and as a part of a DDC system wide distributed network.

E. Environment Requirements:

1. Controller hardware shall be suitable for the anticipated ambient conditions.
2. Controllers located in conditioned space shall be rated for operation at 32 to 120 deg F.
3. Controllers located outdoors shall be rated for operation at minus 20 to 150 deg F.

F. Power and Noise Immunity:

1. Controller shall operate at 90 to 110 percent of nominal voltage rating and shall perform an orderly shutdown below 80 percent of nominal voltage.
2. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios with up to 5 W of power located within 36 inches of enclosure.

G. DDC Controller Spare Processing Capacity:

1. Include spare processing memory for each controller. RAM, PROM, or EEPROM will implement requirements indicated with the following spare memory:

   a. Network Controllers: 50 percent.
   b. Programmable Application Controllers: Not less than 60 percent.
   c. Application-Specific Controllers: Not less than 70 percent.

2. Memory shall support DDC controller's operating system and database and shall include the following:

   a. Monitoring and control.
   b. Energy management, operation and optimization applications.

c. Alarm management.
d. Historical trend data of all connected I/O points.
e. Maintenance applications.
f. Operator interfaces.
g. Monitoring of manual overrides.

H. DDC Controller Spare I/O Point Capacity: Include spare I/O point capacity for each controller as follows:

1. Network Controllers:

a. 10 percent of each AI, AO, BI, and BO point connected to controller.
b. Minimum Spare I/O Points per Controller:

1) AIs: Three.
2) AOs: Three.
3) BIs: Three.
4) BOs: Five.

2. Programmable Application Controllers:

a. 10 percent of each AI, AO, BI, and BO point connected to controller.
b. Minimum Spare I/O Points per Controller:

1) AIs: Two.
2) AOs: Two.
3) BIs: Three.
4) BOs: Three.

3. Application-Specific Controllers:

a. 10 percent of each AI, AO, BI, and BO point connected to controller.
b. Minimum Spare I/O Points per Controller:

1) AIs: Two.
2) AOs: Two.
3) BIs: Two.
4) BOs: Two.

I. Maintenance and Support: Include the following features to facilitate maintenance and support:

1. Mount microprocessor components on circuit cards for ease of removal and replacement.
2. Means to quickly and easily disconnect controller from network.
3. Means to quickly and easily access connect to field test equipment.
4. Visual indication that controller electric power is on, of communication fault or trouble, and that controller is receiving and sending signals to network.

2.20 NETWORK CONTROLLERS

A. General Network Controller Requirements:

1. Include adequate number of controllers to achieve performance indicated.
2. System shall consist of one or more independent, standalone, microprocessor-based network controllers to manage global strategies indicated.
3. Controller shall have enough memory to support its operating system, database, and programming requirements.
4. Data shall be shared between networked controllers and other network devices.
5. Operating system of controller shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
6. Controllers that perform scheduling shall have a real-time clock.
7. Controller shall continually check status of its processor and memory circuits. If an abnormal operation is detected, controller shall assume a predetermined failure mode and generate an alarm notification.
8. Controllers shall be fully programmable.

B. Communication:

1. Network controllers shall communicate with other devices on DDC system Level one network.
2. Network controller also shall perform routing if connected to a network of programmable application and application-specific controllers.

C. Operator Interface:

1. Controller shall be equipped with a service communications port for connection to a portable operator's workstation.

D. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall maintain BIOS and programming information in event of a power loss for at least 96 hours.

2.21 PROGRAMMABLE APPLICATION CONTROLLERS

A. General Programmable Application Controller Requirements:

1. Include adequate number of controllers to achieve performance indicated.
2. Controller shall have enough memory to support its operating system, database, and programming requirements.
3. Capable of standalone operation and shall continue to include control functions without being connected to network.
4. Data shall be shared between networked controllers and other network devices.
5. Operating system of controller shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
6. Controllers that perform scheduling shall have a real-time clock.

7. Controller shall continually check status of its processor and memory circuits. If an abnormal operation is detected, controller shall assume a predetermined failure mode and generate an alarm notification.
8. Controllers shall be fully programmable.

B. Communication:

1. Programmable application controllers shall communicate with other devices on network.

C. Operator Interface:

1. Controller shall be equipped with a service communications port for connection to a portable operator's workstation.

D. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall maintain BIOS and programming information in event of a power loss for at least 72 hours.

2.22 APPLICATION-SPECIFIC CONTROLLERS

A. Description: Microprocessor-based controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment. Controllers are not fully user-programmable but are configurable and customizable for operation of equipment they are designed to control.

1. Capable of standalone operation and shall continue to include control functions without being connected to network.
2. Data shall be shared between networked controllers and other network devices.

B. Communication: Application-specific controllers shall communicate with other application-specific controller and devices on network, and to programmable application and network controllers.

C. Operator Interface: Controller shall be equipped with a service communications port for connection to a portable operator's workstation.

D. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall use nonvolatile memory and maintain all BIOS and programming information in event of power loss.

2.23 CONTROLLER SOFTWARE

A. General Controller Software Requirements:

1. Software applications shall reside and operate in controllers. Editing of applications shall occur at operator workstations.
2. I/O points shall be identified by up to 30-character point name and up to 16-character point descriptor. Same names shall be used at operator workstations.
3. Control functions shall be executed within controllers using DDC algorithms.
4. Controllers shall be configured to use stored default values to ensure fail-safe operation. Default values shall be used when there is a failure of a connected input instrument or loss of communication of a global point value.

B. Security:

1. Operator access shall be secured using individual security passwords and user names.
2. Passwords shall restrict operator to points, applications, and system functions as assigned by system manager.
3. Operator log-on and log-off attempts shall be recorded.
4. System shall protect itself from unauthorized use by automatically logging off after last keystroke. The delay time shall be operator-definable.

C. Scheduling: Include capability to schedule each point or group of points in system. Each schedule shall consist of the following:

1. Weekly Schedule:

   a. Include separate schedules for each day of week.
   b. Each schedule should include the capability for start, stop, optimal start, optimal stop, and night economizer.
   c. Each schedule may consist of up to 10 events.
   d. When a group of objects are scheduled together, include capability to adjust start and stop times for each member.

2. Exception Schedules:

   a. Include ability for operator to designate any day of the year as an exception schedule.
   b. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed, it will be discarded and replaced by regular schedule for that day of week.

3. Holiday Schedules:

   a. Include capability for operator to define up to 99 special or holiday schedules.
   b. Schedules may be placed on scheduling calendar and will be repeated each year.
   c. Operator shall be able to define length of each holiday period.

D. System Coordination:

1. Include standard application for proper coordination of equipment.

2. Application shall include operator with a method of grouping together equipment based on function and location.
3. Group may then be used for scheduling and other applications.

E. Binary Alarms:

1. Each binary point shall be set to alarm based on operator-specified state.
2. Include capability to automatically and manually disable alarming.

F. Analog Alarms:

1. Each analog object shall have both high and low alarm limits.
2. Alarming shall be able to be automatically and manually disabled.

G. Alarm Reporting:

1. Operator shall be able to determine action to be taken in event of an alarm.
2. Alarms shall be routed to BCC based on time and other conditions.

H. Maintenance Management: System shall monitor equipment status and generate maintenance messages based on operator-designated run-time, starts, and calendar date limits.

I. Sequencing: Include application software based on sequences of operation indicated to properly sequence ERVs, DOAS, Humidifiers, Pumps, and other applicable HVAC equipment.

J. Control Loops:

1. Support any of the following control loops, as applicable to control required:

a. Two-position (on/off, open/close, slow/fast) control.
b. Proportional control.
c. Proportional plus integral (PI) control.
d. Proportional plus integral plus derivative (PID) control.

1) Include PID algorithms with direct or reverse action and anti-windup.
2) Algorithm shall calculate a time-varying analog value used to position an output or stage a series of outputs.
3) Controlled variable, set point, and PID gains shall be operator-selectable.

e. Adaptive (automatic tuning).

K. Staggered Start: Application shall prevent all controlled equipment from simultaneously restarting after a power outage. Order which equipment (or groups of equipment) is started, along with the time delay between starts, shall be operator-selectable.

L. Anti-Short Cycling:

1. BO points shall be protected from short cycling.
2. Feature shall allow minimum on-time and off-time to be selected.

M. On and Off Control with Differential:

1. Include an algorithm that allows a BO to be cycled based on a controlled variable and set point.
2. Algorithm shall be direct- or reverse-acting and incorporate an adjustable differential.

N. Run-Time Totalization:

1. Include software to totalize run-times for all BI and BO points.
2. A high run-time alarm shall be assigned, if required, by operator.

2.24 ENCLOSURES

A. General Enclosure Requirements:

1. House each controller and associated control accessories in a single enclosure. Enclosure shall serve as central tie-in point for control devices such as switches, transmitters, transducers, power supplies and transformers.
2. Include enclosure door with key locking mechanism. Key locks alike for all enclosures and include one pair of keys per enclosure.

B. Internal Arrangement:

1. Arrange layout to group similar products together.
2. Include a barrier between line-voltage and low-voltage electrical and electronic products.
3. Factory or shop install products, cabling and wiring complying with requirements and standards indicated.
4. Terminate field cable and wire using heavy-duty terminal blocks.
5. Include spare terminals, equal to not less than 10 percent of used terminals.
6. Include spade lugs for stranded cable and wire.
7. Install a maximum of two wires on each side of a terminal.
8. Include enclosure field power supply with a toggle-type switch located at entrance inside enclosure to disconnect power.
9. Mount products within enclosure on removable internal panel(s).
10. Route cable and wire located inside enclosure within a raceway with a continuous removable cover.
11. Label each end of cable, wire and tubing in enclosure following an approved identification system that extends from field I/O connection and all intermediate connections throughout length to controller connection.
12. Size enclosure internal panel to include at least 25 percent spare area on face of panel.

C. Wall-Mounted, NEMA 250, Type 1:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Hoffman; a brand of nVent.

2. Enclosure shall be NRTL listed according to UL 50 or UL 50E.
3. Construct enclosure of steel, not less than:

a. Enclosure size less than 24 in.: 0.053 in. thick.
b. Enclosure size 24 in. and larger: 0.067 in. thick.

4. Finish enclosure inside and out with polyester powder coating that is electrostatically applied and then baked to bond to substrate.

a. Exterior color shall be manufacturer's standard.
b. Interior color shall be manufacturer's standard.

5. Hinged door full size of front face of enclosure and supported using:

a. Enclosures sizes less than 36 in. tall: Multiple butt hinges.
b. Enclosures sizes 36 in. tall and larger: Continuous piano hinges.

6. Removable internal panel with a white polyester powder coating that is electrostatically applied and then baked to bond to substrate.

a. Size less than 24 in.: Solid or Perforated steel, 0.053 in. thick.
b. Size 24 in. and larger: Solid steel, 0.093 in. thick.

7. Internal panel mounting hardware, grounding hardware and sealing washers.
8. Grounding stud on enclosure body.
9. Thermoplastic pocket on inside of door for record Drawings and Product Data.

D. Wall Mounted NEMA 250, Types 4 and 12:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Hoffman; a brand of nVent.

2. Enclosure shall be NRTL listed according to UL 508A.
3. Seam and joints are continuously welded and ground smooth.
4. Where recessed enclosures are indicated, include enclosures with face flange for flush mounting.
5. Externally formed body flange around perimeter of enclosure face for continuous perimeter seamless gasket door seal.
6. Single-door enclosure sizes up to 60 inches tall by 36 inches wide.
7. Double-door enclosure sizes up to 36 inches tall by 60 inches wide.
8. Construct enclosure of steel, not less than the following:

a. Size Less Than 24 Inches: 0.053 inch thick.
b. Size 24 Inches and Larger: 0.067 inch thick.

9. Finish enclosure with polyester powder coating that is electrostatically applied and then baked to bond to substrate.

a. Exterior color shall be manufacturer's standard.
b. Interior color shall be manufacturer's standard.

10. Corner-formed door, full size of enclosure face, supported using multiple concealed hinges with easily removable hinge pins.

    a. Sizes through 24 Inches Tall: Two hinges.
    b. Sizes between 24 Inches through 48 Inches Tall: Three hinges.
    c. Sizes Larger 48 Inches Tall: Four hinges.

11. Double-door enclosures with overlapping door design to include unobstructed full-width access.

    a. Single-door enclosures 48 inches and taller, and all double-door enclosures, with three-point (top, middle and bottom) latch system.

12. Removable internal panel with a white polyester powder coating that is electrostatically applied and then baked to bond to substrate.

    a. Size Less Than 24 Inches: Solid or perforated steel, 0.053 inch thick.
    b. Size 24 Inches and Larger: Solid steel, 0.093 inch thick.

13. Internal panel mounting studs with hardware, grounding hardware, and sealing washers.
14. Grounding stud on enclosure body.
15. Thermoplastic pocket on inside of door for record Drawings and Product Data.

2.25 RELAYS

A. General-Purpose Relays:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Functional Devices, Inc.
    b. Siemens Industry, Inc., Building Technologies Division.

2. Relays shall be heavy duty and rated for at least 10 A at 250-V ac and 60 Hz.
3. Relays shall be either double pole double throw (DPDT) or three-pole double throw, depending on the control application.
4. Use a plug-in-style relay with an eight-pin octal plug for DPDT relays and an 11-pin octal plug for three-pole double-throw relays.
5. Construct the contacts of either silver cadmium oxide or gold.
6. Enclose the relay in a clear transparent polycarbonate dust-tight cover.
7. Relays shall have LED indication and a manual reset and push-to-test button.
8. Performance:

    a. Mechanical Life: At least 10 million cycles.
    b. Electrical Life: At least 100,000 cycles at rated load.
    c. Pickup Time: 15 ms or less.
    d. Dropout Time: 10 ms or less.
    e. Pull-in Voltage: 85 percent of rated voltage.
    f. Dropout Voltage: 50 percent of nominal rated voltage.

g. Power Consumption: 2 VA.
h. Ambient Operating Temperatures: Minus 40 to 115 deg F.

9. Equip relays with coil transient suppression to limit transients to non-damaging levels.
10. Plug each relay into an industry-standard, 35-mm DIN rail socket. Plug all relays located in control panels into sockets that are mounted on a DIN rail.
11. Relay socket shall have screw terminals. Mold into the socket the coincident screw terminal numbers and associated octal pin numbers.

B. Current Sensing Relay (Current Transformer – CT):

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Veris
b. Square D; by Schneider Electric.
c. Flex Core
d. Eaton.

2. Monitors ac current.
3. Independent adjustable controls for pickup and dropout current.
4. Energized when supply voltage is present and current is above pickup setting.
5. De-energizes when monitored current is below dropout current.
6. Dropout current is adjustable from 50 to 95 percent of pickup current.
7. Include a current transformer, if required for application.

C. Combination On-Off Status Sensor and On-Off Relay:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Functional Devices Inc.

2. Description:

a. On-off control and status indication in a single device.
b. LED status indication of activated relay and current trigger.
c. Closed-Open-Auto override switch located on the load side of the relay.

3. Performance:

a. Ambient Temperature: Minus 30 to 140 deg F.
b. Voltage Rating: Single-phase loads rated for 300-V ac. Three-phase loads rated for 600-V ac.

4. Status Indication:

a. Current Sensor: Integral sensing for single-phase loads up to 20 A and external solid or split sensing ring for three-phase loads up to 150 A.

b. Current Sensor Range: As required by application.
c. Current Set Point: Adjustable.
d. Current Sensor Output:

1) Solid-state, single-pole double-throw contact rated for 30-V ac and dc and for 0.4 A.
2) Solid-state, single-pole double-throw contact rated for 120-V ac and 1.0 A.
3) Analog, zero- to 5- or 10-V dc.
4) Analog, 4 to 20 mA, loop powered.

5. Relay: Single-pole double-throw, continuous-duty coil; rated for 10-million mechanical cycles.
6. Enclosure: NEMA 250, Type 1 enclosure.

2.26 ELECTRICAL POWER DEVICES

A. Transformers:

1. Transformer shall be sized for the total connected load, plus an additional 25 percent of connected load.
2. Transformer shall be at least 40 VA.
3. Transformer shall have both primary and secondary fuses or overloads.

B. Transient Voltage Suppression and High-Frequency Noise Filter Unit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Current Technology Inc.

2. The maximum continuous operating voltage shall be at least 125 percent.
3. The operating frequency range shall be 47 to 63 Hz.
4. Protection modes according to NEMA LS-1.
5. The rated single-pulse surge current capacity, for each mode of protection, shall be no less than the following:

a. Line to Neutral: 45,000 A.
b. Neutral to Ground: 45,000 A.
c. Line to Ground: 45,000 A.
d. Per Phase: 90,000 A.

6. Clamping voltages shall be in compliance with test and evaluation procedures defined in NEMA LS-1. Maximum clamping voltage shall be as follows:

a. Line to Neutral: 360 V.
b. Line to Ground: 360 V.
c. Neutral to Ground: 360 V.

7. Electromagnetic interference and RF interference noise rejection or attenuation values shall comply with test and evaluation procedures defined in NEMA LS-1.

    a. Line to Neutral:

        1) 100 kHz: 42 dB.
        2) 1 MHz: 25 dB.
        3) 10 MHz: 21 dB.
        4) 100 MHz: 36 dB.

    b. Line to Ground:

        1) 100 kHz: 16 dB.
        2) 1 MHz: 55 dB.
        3) 10 MHz: 81 dB.
        4) 100 MHz: 80 dB.

8. Unit shall have LED status indicator that extinguishes to indicate a failure.
9. Unit shall be listed by an NRTL as a transient voltage surge suppressor per UL 1449, and as an electromagnetic interference filter per UL 1283.
10. Unit shall not generate any appreciable magnetic field.
11. Unit shall not generate an audible noise.

C. DC Power Supply:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Acopian Technical Company.

2. Plug-in style suitable for mating with a standard eight-pin octal socket. Include the power supply with a mating mounting socket.
3. Enclose circuitry in a housing.
4. Include both line and load regulation to ensure a stable output. To protect both the power supply and the load, power supply shall have an automatic current limiting circuit.
5. Performance:

    a. Output voltage nominally 25-V dc within 5 percent.
    b. Output current up to 100 mA.
    c. Input voltage nominally 120-V ac, 60 Hz.
    d. Load regulation within 0.5 percent from zero- to 100-mA load.
    e. Line regulation within 0.5 percent at a 100-mA load for a 10 percent line change.
    f. Stability within 0.1 percent of rated volts for 24 hours after a 20-minute warmup.

2.27 CONTROL WIRE AND CABLE

A. Wire: Single conductor control wiring above 24 V sized by control contractor for rated current.

1. Wire size shall be at least No. 18 AWG.

2. Conductor shall be 7/24 soft annealed copper strand with 2- to 2.5-inch lay.
3. Conductor insulation shall be 600 V, Type THWN or Type THHN, and 90 deg C according to UL 83.
4. Conductor colors shall be black (hot), white (neutral), and green (ground).
5. Furnish wire on spools.

B. Single Twisted Shielded Instrumentation Cable above 24 V sized by control contractor for rated current.:

1. Wire size shall be a minimum No. 18 AWG.
2. Conductors shall be a twisted, 7/24 soft annealed copper strand with a 2- to 2.5-inch lay.
3. Conductor insulation shall have a Type THHN/THWN or Type TFN rating.
4. Shielding shall be 100 percent type, 0.35/0.5-mil aluminum/Mylar tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
5. Outer jacket insulation shall have a 600-V, 90-deg C rating and shall be Type TC cable.
6. For twisted pair, conductor colors shall be black and white. For twisted triad, conductor colors shall be black, red and white.
7. Furnish wire on spools.

C. Single Twisted Shielded Instrumentation Cable 24 V and Less:

1. Wire size shall be a minimum No. 18 AWG.
2. Conductors shall be a twisted, 7/24 soft annealed copper stranding with a 2- to 2.5-inch lay.
3. Conductor insulation shall have a nominal 15-mil thickness, constructed from flame-retardant PVC.
4. Shielding shall be 100 percent type, 1.35-mil aluminum/polymer tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
5. Outer jacket insulation shall have a 300-V, 105-deg C rating and shall be Type PLTC cable.
6. For twisted pair, conductor colors shall be black and white. For twisted triad, conductor colors shall be black, red and white.
7. Furnish wire on spools.

D. LAN and Communication Cable: Comply with DDC system manufacturer requirements for network being installed.

1. Cable shall be balanced twisted pair.

    a. Cable shall be plenum rated.
    b. Cable shall have a unique color that is different from other cables used on Project.

2.28 RACEWAYS

A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for electrical power raceways and boxes.

2.29 ACCESSORIES

A. Pressure Electric Switches:

1. Diaphragm-operated snap acting switch.
2. Set point adjustable from 3 to 20 psig.
3. Differential adjustable from 2 to 6 psig.
4. Rated for resistance loads at 120-V ac.
5. Body and switch housing shall be metal.

B. Damper Blade Limit Switches:

1. Sense positive open and/or closed position of the damper blades.
2. NEMA 250, Type 13, oil-tight construction.
3. Arrange for the mounting application.
4. Additional waterproof enclosure when required by its environment.
5. Arrange to prevent "over-center" operation.

C. Instrument Enclosures:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Hoffman; a brand of nVent.

2. Include instrument enclosure for secondary protection to comply with requirements indicated in "Performance Requirements" Article.
3. NRTL listed and labeled to UL 50.
4. Sized to include at least 25 percent spare area on subpanel.
5. Instrument(s) mounted within enclosure on internal subpanel(s).
6. Enclosure face with engraved, laminated phenolic nameplate for each instrument within enclosure.
7. Enclosures housing multiple instruments shall route tubing and wiring within enclosure in a raceway having a continuous removable cover.
8. Enclosures larger than 12 inches shall have a hinged full-size face cover.
9. Equip enclosure with lock and common key.

D. Thermal Resistors (Thermistors): Common Requirements:

1. 10,000 ohms at 25 deg C and a temperature coefficient of 23.5 ohms/ohm/deg C.
2. Two-wire, PTFE-insulated, 22-gage stranded copper leads.
3. Performance Characteristics:

    a. Range: Typical Minus 50 to 275 deg F, or as modified for specific application.
    b. Interchangeable Accuracy: At 77 deg F within 0.5 deg F.
    c. Repeatability: Within 0.5 deg F.
    d. Drift: Within 0.5 deg F over 10 years.
    e. Self-Heating: Negligible.

4. Transmitter optional, contingent on compliance with end-to-end control accuracy.

E. Thermistor, Single-Point Duct Air Temperature Sensors:

1. Products: Subject to compliance with requirements, offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Minco; TS400 Series TB.
   b. Honeywell.

2. Temperature Range: Minus 50 to 250 deg F
3. Probe: Single-point sensor with a stainless-steel sheath.
4. Length: As required by application to achieve tip at midpoint of air tunnel, up to 18 inches.
5. Enclosure: Junction box with removable cover; NEMA 250, Type 1 for indoor applications and Type 4 for outdoor applications.
6. Gasket for attachment to duct or equipment to seal penetration airtight.
7. Conduit Connection: 1/2- inch trade size.

F. Thermistor Averaging Air Temperature Sensors:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Minco; TS400 Series TB.
   b. Honeywell.

2. Temperature Range: Minus 40 to 250 deg F
3. Multiple sensors to provide average temperature across entire length of sensor.
4. Rigid probe of aluminum, brass, copper, or stainless-steel sheath.
5. Flexible probe of aluminum, brass, copper, or stainless-steel sheath and formable to a 4-inch radius.
6. Length: As required by application to cover entire cross section of air tunnel.
7. Enclosure: Junction box with removable cover; NEMA 250, Type 1 for indoor applications and Type 4 for outdoor applications.
8. Gasket for attachment to duct or equipment to seal penetration airtight.
9. Conduit Connection: 1/2-inch trade size.

G. Thermistor Outdoor Air Temperature Sensors:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Minco; TS400 Series TB.
   b. Honeywell.

2. Temperature Range: Minus 50 to 275 deg F
3. Probe: Single-point sensor with a stainless-steel sheath.
4. Solar Shield: Stainless steel.
5. Enclosure: NEMA 250, Type 4 or 4X junction box or combination conduit and outlet box with removable cover and gasket.
6. Conduit Connection: 1/2-inch trade size.

H. Thermistor Space Air Temperature Sensors:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Honeywell
    b. Minco; TS400 Series TB.

2. Temperature Range: Minus 4 to 122 deg F
3. Sensor assembly shall include a temperature sensing element mounted under a bright white, non-yellowing, plastic cover.
4. Provide a mounting plate that is compatible with the surface shape that it is mounted to and electrical box used.
5. Concealed wiring connection.
6. Provide digital display of sensed temperature and setpoint.
7. Provide sensor with local controls.

    a. Local override to turn HVAC on.
    b. Local adjustment of temperature set point.
    c. Both features shall be capable of manual override through control system operator.

I. Humidity Sensors:

1. Description:

    a. Factory package consisting of humidity sensor, sensing probe, installation hardware, interconnecting sensor cabling, installation instructions, and operating manual.
    b. Each sensor shall be individually calibrated and provided with NIST traceable calibration certifications.

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Honeywell
    b. Minco

3. Humidity Sensor:

    a. Relative Humidity Measurement Range: Zero to 100 percent.
    b. Thin film capacitance technology resistant to damage from condensation
    c. Response time in still air within 40 seconds.
    d. Accuracy including non-linearity, hysteresis, and repeatability:

        1) For Temperature between 59 and 77 Deg F and Relative Humidity between Zero and 90 Percent: Within 2 percent.
        2) For Temperature between Minus 4 and 104 Deg F: Within 3 percent.

    e. Sintered, stainless steel filter, protecting sensor.

4. Electronics Enclosure:

a. Integral to sensors for wall (room) mounted applications and remote from temperature and humidity sensors for duct and equipment applications.
b. Labeled terminal strip for field wiring connections.

5. Programming:

a. Transmitter parameters to be field programmable.
b. Programmed parameters to be stored in nonvolatile EEPROM.

6. Output Signals:

a. 4 to 20 mA or 0 to 10-V dc for each output.

7. Power Supply:

a. Field Power: 24-V ac, 60 Hz powered from controller.

J. Combination Humidity and Temperature Sensor and Transmitter with Display:

1. Description:

a. Factory package consisting of humidity and temperature sensor, digital display, keypad user interface, installation hardware, interconnecting sensor cabling, installation instructions, and operating manual.
b. Each transmitter to be individually calibrated and provided with NIST traceable calibration certifications.

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Honeywell
b. Minco

3. Display:

a. Alphanumeric display of the following on the face of the enclosure:

1) Percent relative humidity.
2) Dry-bulb temperature.
3) Dew point temperature.

4. Electronics Enclosure:

a. Integral to sensors for wall (room) mounted applications and remote from temperature and humidity sensors for duct and equipment applications.
b. Labeled terminal strip for field wiring connections.

5. Programming:

a. Transmitter parameters to be field programmable through keypad on the face of the enclosure.
b. Programmed parameters to be stored in nonvolatile EEPROM.

6. Output Signals:

    a. Three Analog Outputs: 4 to 20 mA or 0 to 10-V dc for each output.

7. Temperature Sensor:
    a. Thermistor Space Air Temperature Sensors:
    b. Temperature range matched to application, but not less than minus 4 to 122 deg F
    c. Within 0.5 deg F accuracy over the temperature range of 50 to 100 deg F and within 1 deg F over the remainder of the range.

8. Humidity Sensor:

    a. Relative Humidity Measurement Range: Zero to 100 percent.
    b. Thin film capacitance technology resistant to damage from condensation
    c. Response time in still air within 40 seconds.
    d. Accuracy including non-linearity, hysteresis, and repeatability:

        1) For Temperature between 59 and 77 Deg F and Relative Humidity between Zero and 90 Percent: Within 1 percent.
        2) For Temperature between 59 and 77 Deg F and Relative Humidity between 90 and 100 Percent: Within 1.7 percent.
        3) For Temperature between Minus 4 and 104 Deg F: Within 1 percent plus 0.008 times relative humidity reading.

    e. Sintered, stainless steel filter, protecting sensor.

9. Power Supply:

    a. Field Power: 24-V ac, 60 Hz powered from controller.

K. Carbon Dioxide Sensor

1. Description:

    a. Factory package consisting of carbon dioxide (CO_2) sensor, digital display, keypad user interface, installation hardware, interconnecting sensor cabling, installation instructions, and operating manual.
    b. Each sensor to be individually calibrated and provided with NIST traceable calibration certifications.

2. Display:

    a. Alphanumeric display of the following on the face of the enclosure:

        1) Carbon Dioxide Concentration in PPM.

3. Electronics Enclosure:

    a. Integral to sensors for wall (room) mounted applications and remote from CO_2 sensors for duct and equipment applications.
    b. White plastic or painted metal enclosure.
    c. Labeled terminal strip for field wiring connections.

4. Programming:

    a. Sensor parameters and calibration shall be field programmable.
    b. Programmed parameters to be stored in nonvolatile EEPROM.
    c. Sensor shall be calibratable in the field. Provide calibration gas, connectors, and instructions for field calibrations.

5. Output Signals:

    a. One Analog Output: 4 to 20 mA or 0 to 10-V dc.

6. CO_2 Sensor:

    a. Non-dispersive infrared (NDIR) type sensor.
    b. Response time in still air within 5 minutes.
    c. Accuracy including non-linearity, hysteresis, and repeatability:

        1) Range: 0 – 2000 PPM.
        2) Accuracy: ±75 PPM.
        3) Operating Range: 32 -122°F and 0-95% RH non-condensing.

    d. Drift: No more than 25 PPM per year.

7. Power Supply:

    a. Field Power: 12-24-V dc or 18-24 V ac.

2.30 IDENTIFICATION

A. Control Equipment, Instruments, and Control Devices:

1. Self-adhesive label bearing unique identification.

    a. Include instruments with unique identification identified by equipment being controlled or monitored, followed by point identification.

2. Letter size shall be at least 0.5 inch or larger as needed to be read from the floor.

3. Legend shall consist of black lettering on a white background.
4. Laminated acrylic or melamine plastic sign shall be engraved phenolic consisting of three layers of rigid laminate. Top and bottom layers are color-coded black with contrasting white center exposed by engraving through outer layer and shall be fastened with drive pins.
5. Instruments, control devices, and actuators with project-specific identification tags having unique identification numbers following requirements indicated and provided by original manufacturer do not require additional identification.

B. Valve Tags:

1. Brass tags and brass chains attached to valve.
2. Tags shall be at least 1.5 inches in diameter.

3. Include tag with unique valve identification indicating control influence such as flow, level, pressure, or temperature; followed by location of valve, and followed by three-digit sequential number. For example: TV-1.001.
4. Valves with Project-specific identification tags having unique identification numbers following requirements indicated and provided by original manufacturer do not require an additional tag.

C. Raceway and Boxes:

1. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
2. Paint cover plates on junction boxes and conduit same color as the tape banding for conduits. After painting, label cover plate "HVAC Controls," using an engraved phenolic tag.

D. Equipment Warning Labels:

1. Self-adhesive label with pressure-sensitive adhesive back and peel-off protective jacket.
2. Lettering size shall be at least 14-point type with white lettering on red background.
3. Warning label shall read "CAUTION-Equipment operated under remote automatic control and may start or stop at any time without warning. Switch electric power disconnecting means to OFF position before servicing."
4. Lettering shall be enclosed in a white line border. Edge of label shall extend at least 0.25 inch beyond white border.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify compatibility with and suitability of substrates.

B. Examine roughing-in for products to verify actual locations of connections before installation.

1. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.
2. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.
3. Examine walls, floors, roofs, and ceilings for suitable conditions where product will be installed. Notify architect of any conditions detrimental to performance of the Work are found.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 DDC SYSTEM INTERFACE WITH OTHER SYSTEMS AND EQUIPMENT

A. Communication Interface to Equipment with Integral Controls:

1. DDC system shall have communication interface with equipment having integral controls and having a communication interface for remote monitoring or control.
2. Equipment to Be Connected:

    a. Air-terminal units specified in Section 233600 "Air Terminal Units."
    b. Air to air energy exchangers specified in Section 237223 "Air-to-Air Energy Recovery Equipment."
    c. Air-handling units specified in Section 237313 "Modular Indoor Central-Station Air-Handling Units."
    d. Dedicated outdoor-air DOAS units specified in Section 237433 "Dedicated Outdoor-Air Units."
    e. Self-contained steam humidifiers specified in Section 238413.29 "Self-Contained Steam Humidifiers."
    f. Dehumidification units specified in Section 238416 "Mechanical Dehumidification Units."
    g. Refrigerant monitoring.

3.3 DDC SYSTEM INTERFACE WITH EXISTING SYSTEMS

A. Interface with Existing Systems:

1. Existing pneumatic and electronic controls shall be completely demolished.

B. Integration with Existing Enterprise System:

1. DDC system shall interface with an existing BCC building control center enterprise system to adhere to Owner standards already in-place and to achieve integration.
2. Owner's control system integrator will provide the following services:

    a. Enterprise system expansion and development of graphics, logs, reports, trends and other operational capabilities of enterprise system for I/O being added to DDC control system for use by enterprise system operators.
    b. Limited assistance during commissioning to extent of DDC system integration with existing enterprise system.
    c. Prepare on-site demonstration mockup of integration of DDC system to be installed with existing system before installing DDC system.

3. Engage Owner's control system integrator Honeywell EBI to provide the following services:

    a. Enterprise system expansion and development of graphics, logs, reports, trends and other operational capabilities of enterprise system for I/O being added to DDC control system for use by enterprise system operators.
    b. Limited assistance during commissioning to extent of DDC system integration with existing enterprise system.
    c. Prepare on-site demonstration mockup of integration of DDC system to be installed with existing system before installing DDC system.

4. Control System Integrator Contact Information:

a. Company: Honeywell
b. Company Street Address: <**Insert address**>.
c. Company Contact: <**Insert name**>.
d. Phone Number: <**Insert phone number**>.
e. E-mail Address: <**Insert e-mail address**>.

5. Attend meetings with control system integrator to integrate DDC system.

3.4 CONTROL DEVICES FOR INSTALLATION BY INSTALLERS

A. Deliver selected control devices, specified in indicated HVAC instrumentation and control device Sections, to identified equipment and systems manufacturers for factory installation and to identified installers for field installation.

B. Deliver the following to duct fabricator and Installer for installation in ductwork. Include installation instructions to Installer and supervise installation for compliance with requirements.

1. Airflow sensors and switches, which are specified in Section 230923.
2. Pressure sensors, which are specified in Section 230923.23 "Pressure Instruments."

C. Deliver the following to plumbing and HVAC piping installers for installation in piping. Instruments are specified in 230923 “DDC System for HVAC” Include installation instructions to Installer and supervise installation for compliance with requirements.

1. Pipe-mounted sensors, switches, and transmitters.
2. Tank-mounted sensors, switches, and transmitters.
3. Liquid and steam temperature sensors, switches, and transmitters
4. Pipe- and tank-mounted thermowells.

3.5 GENERAL INSTALLATION REQUIREMENTS

A. Install products to satisfy more stringent of all requirements indicated.

B. Install products level, plumb, parallel, and perpendicular with building construction.

C. Support products, wiring and raceways. Brace products to prevent lateral movement and sway or a break.

D. If codes and referenced standards are more stringent than requirements indicated, comply with requirements in codes and referenced standards.

E. Fabricate openings and install sleeves in ceilings, floors, roof, and walls required by installation of products. Before proceeding with drilling, punching, and cutting, check for concealed work to avoid damage. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

F. Welding Requirements:

1. Restrict welding and burning to supports and bracing.

2. No equipment shall be cut or welded without approval. Welding or cutting will not be approved if there is risk of damage to adjacent Work.
3. Welding, where approved, shall be by inert-gas electric arc process and shall be performed by qualified welders according to applicable welding codes.
4. If requested on-site, show satisfactory evidence of welder certificates indicating ability to perform welding work intended.

G. Fastening Hardware:

1. Stillson wrenches, pliers, and other tools that damage surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening fasteners.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts and screws with graphite and oil before assembly.

H. If product locations are not indicated, install products in locations that are accessible and that will permit service and maintenance from floor, equipment platforms, or catwalks without removal of permanently installed furniture and equipment.

I. Corrosive Environments:

1. Do not install any instruments, sensors, or materials in corrosive airstreams and environments, including, but not limited to, the following:

a. Laboratory exhaust-air streams.
b. Paint booth exhaust-air streams.

3.6 CONTROL VALVES

A. Deliver control valves to the HVAC piping contractor for installation in the piping.

3.7 GATEWAY INSTALLATION

A. Install gateways if required for DDC system communication interface requirements indicated.

B. Test gateway to verify that communication interface functions properly.

3.8 ROUTER INSTALLATION

A. Install routers if required for DDC system communication interface requirements indicated.

B. Test router to verify that communication interface functions properly.

3.9 CONTROLLER INSTALLATION

A. Install controllers in enclosures to comply with indicated requirements.

B. Connect controllers to field power supply.

C. Install controller with latest version of applicable software and configure to execute requirements indicated.

D. Test and adjust controllers to verify operation of connected I/O to achieve performance indicated requirements while executing sequences of operation.

E. Installation of Network Controllers:

1. Quantity and location of network controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.
2. Install controllers in a protected location that is easily accessible by operators.
3. Top of controller shall be within 84 inches of finished floor.

F. Installation of Programmable Application Controllers:

1. Quantity and location of programmable application controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.
2. Install controllers in a protected location that is easily accessible by operators.
3. Top of controller shall be within 84 inches of finished floor.

G. Application-Specific Controllers:

1. Quantity and location of application-specific controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.
2. For controllers not mounted directly on equipment being controlled, install controllers in a protected location that is easily accessible by operators.

3.10 ENCLOSURES INSTALLATION

A. Install the following items in enclosures, to comply with indicated requirements:

1. Gateways.
2. Routers.
3. Controllers.
4. Electrical power devices.
5. UPS units.
6. Relays.
7. Accessories.

B. Attach wall-mounted enclosures to wall using the following types of steel struts:

1. For NEMA 250, Type 1 Enclosures: Use galvanized-steel strut and hardware.
2. For NEMA 250, Type 4 Enclosures and Enclosures Located Outdoors: Use stainless steel strut and hardware.
3. Install plastic caps on exposed cut edges of strut.

C. Align top of adjacent enclosures.

D. Install continuous and fully accessible wireways to connect conduit, wire, and cable to multiple adjacent enclosures. Wireway used for application shall have protection equal to NEMA 250 rating of connected enclosures.

3.11 ELECTRIC POWER CONNECTIONS

A. Connect electrical power to DDC system products requiring electrical power connections. Power circuits for controllers are provided in each mechanical room for use by the control contractor. Control contractor is responsible for final wiring of 120V circuits to the control devices.

B. Design of electrical power to products not indicated with electric power is delegated to DDC system provider and installing trade. Work shall comply with NFPA 70 and other requirements indicated.

C. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers" for electrical power circuit breakers.

D. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical power conductors and cables.

E. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for electrical power raceways and boxes.

3.12 TEMPERATURE INSTRUMENT INSTALLATIONS

A. Mounting Location:

1. Roughing In:

   a. Outline instrument mounting locations before setting instruments and routing cable, wiring, and conduit to final location.
   b. Provide independent inspection to confirm that proposed mounting locations comply with requirements indicated and approved submittals.

      1) Indicate dimensioned locations with mounting height for all surface-mounted products on Shop Drawings.
      2) Do not begin installation without submittal approval of mounting location.

   c. Complete installation rough-in only after confirmation by independent inspection is complete and approval of location is documented for review by Owner and Architect on request.

2. Install switches and transmitters for air and liquid temperature associated with individual air-handling units and associated connected ductwork and piping near air-handling units co-located in air-handling unit system control panel to provide service personnel a single and convenient location for inspection and service.
3. Install liquid and steam temperature transmitters for indoor applications in mechanical equipment rooms. Do not locate in user-occupied space unless indicated specifically on Drawings.

4. Install air temperature switches and transmitters for indoor applications in mechanical equipment rooms. Do not locate in user-occupied space unless indicated specifically on Drawings.
5. Mount switches and transmitters on walls, floor-supported freestanding pipe stands, or floor-supported structural support frames. Use manufacturer's mounting brackets to accommodate field mounting. Securely support and brace products to prevent vibration and movement.

B. Special Mounting Requirements:

1. Protect products installed outdoors from solar radiation, building and wind effect with stand-offs and shields constructed of Type 316 stainless.
2. Temperature instruments having performance impacted by temperature of mounting substrate shall be isolated with an insulating barrier located between instrument and substrate to eliminate effect. Where instruments requiring insulation are located in finished space, conceal insulating barrier in a cover matching the instrument cover.

C. Mounting Height:

1. Mount temperature instruments in user-occupied space to match mounting height of light switches unless otherwise indicated on Drawings. Mounting height shall comply with codes and accessibility requirements.
2. Mount switches and transmitters located in mechanical equipment rooms and other similar space not subject to code or state and Federal accessibility requirements within a range of 42 to 72 inches above the adjacent floor, grade, or service catwalk or platform.

    a. Make every effort to mount at 60 inches.

D. Seal penetrations to ductwork, plenums, and air-moving equipment to comply with duct static-pressure class and leakage and seal classes indicated using neoprene gaskets or grommets.

E. Space Temperature Sensor Installation:

1. Conceal assembly in an electrical junction box of sufficient size to house sensor and transmitter, if provided.
2. Install electrical box with a faceplate to match sensor cover if sensor cover does not completely cover electrical box.
3. In finished areas, recess electrical box within wall.
4. In unfinished areas, electrical box may be surface mounted if electrical light switches are surface mounted. Use a cast-aluminum electric box for surface-mounted installations.
5. Align electrical box with other electrical devices such as visual alarms and light switches located in the vicinity to provide a neat and well-thought-out arrangement. Where possible, align in both horizontal and vertical axis.

F. Outdoor Air Temperature Sensor Installation:

1. Mount sensor in a discrete location facing north.
2. Protect installed sensor from solar radiation and other influences that could impact performance.

G. Single-Point Duct Temperature Sensor Installation:

1. Install single-point-type, duct-mounted, supply- and return-air temperature sensors. Install sensors in ducts with sensitive portion of the element installed in center of duct cross section and located to sense near average temperature. Do not exceed 24 inches in sensor length.
2. Install return-air sensor in location that senses return-air temperature without influence from outdoor or mixed air.
3. Rigidly support sensor to duct and seal penetration airtight.

H. Averaging Duct Temperature Sensor Installation:

1. Install averaging-type air temperature sensor for temperature sensors located within air-handling units, similar equipment, and large ducts with air tunnel cross-sectional area of 20 sq. ft. and larger.
2. Install sensor length to maintain coverage over entire cross-sectional area. Install multiple sensors where required to maintain the minimum coverage.
3. Fasten and support sensor with manufacturer-furnished clips to keep sensor taut throughout entire length.

I. Low-Limit Air Temperature Switch Installation:

1. Install multiple low-limit switches to maintain coverage over entire cross-sectional area of air tunnel.
2. Fasten and support sensing element with manufacturer-furnished clips to keep element taut throughout entire length.
3. Mount switches outside of airstream at a location and mounting height to provide easy access for switch set-point adjustment and manual reset.
4. Install on leaving side of heating coil unless otherwise indicated on Drawings.

3.13 CLEANING

A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed interior and exterior surfaces.

B. Wash and shine glazing.

C. Polish glossy surfaces to a clean shine.

3.14 CONTROL VALVE APPLICATIONS

A. Control Valves:

1. Select from valves specified in "Control Valves" Article to achieve performance requirements and characteristics indicated while subjected to full range of system operation encountered.

3.15 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements in Section 260553 "Identification for Electrical Systems" for identification products and installation.

B. Install unique instrument identification on face of each instrument connected to a DDC controller.

C. Install unique identification on face of each control damper and valve actuator connected to a DDC controller.

D. Where product is installed above accessible tile ceiling, also install matching identification on face of ceiling grid located directly below.

E. Warning Labels and Signs:

1. Shall be permanently attached to equipment that can be automatically started by DDC control system.
2. Shall be located in highly visible location near power service entry points.

3.16 NETWORK INSTALLATION

A. Install category 6 communication cable for IP networks or balanced twisted pair for MS/TP networks.

B. Install cable in continuous raceway.

1. Where indicated on Drawings, cable trays may be used for copper cable in lieu of conduit.

3.17 NETWORK NAMING AND NUMBERING

A. Coordinate with Owner and provide unique naming and addressing for networks and devices.

B. ASHRAE 135 Networks:

1. MAC Address:

a. Every network device shall have an assigned and documented MAC address unique to its network.
b. Ethernet Networks: Document MAC address assigned at its creation.
c. MS/TP networks: Assign from 00 to 64.

2. Network Numbering:

a. Assign unique numbers to each new network.
b. Provide ability for changing network number through device switches or operator interface.
c. DDC system, with all possible connected LANs, can contain up to 65,534 unique networks.

3. Device Object Identifier Property Number:

a. Assign unique device object identifier property numbers or device instances for each device network.

b. Provide for future modification of device instance number by device switches or operator interface.
c. LAN shall support up to 4,194,302 unique devices.

4. Device Object Name Property Text:

a. Device object name property field shall support 32 minimum printable characters.
b. Assign unique device "Object Name" property names with plain-English descriptive names for each device.

1) Example 1: Device object name for device controlling boiler plant at Building 1000 would be "HW System B1000."
2) Example 2: Device object name for a VAV terminal unit controller could be "VAV unit 102".

3.18 INSTRUMENTATION INSTALLATION, GENERAL

A. Install products level, plumb, parallel, and perpendicular with building construction.

B. Properly support instruments, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway.

C. Fastening Hardware:

1. Stillson wrenches, pliers, and other tools that cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening nuts.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

D. Install products in locations that are accessible and that permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

3.19 MOISTURE INSTRUMENTS INSTALLATION

A. Mounting Location: Rough-in instrument-mounting locations before setting instruments and routing, cable, wiring, tubing, and conduit to final location.

B. Mounting Height:

1. Mount instruments in user-occupied space to match mounting height of light switches unless otherwise indicated on Drawings. Mounting height shall comply with codes and accessibility requirements.
2. Mount switches and transmitters located in mechanical equipment rooms and other similar space not subject to code, state, and Federal accessibility requirements within a range of 42 to 72 inches above the adjacent floor, grade, or service catwalk or platform.

a. Make every effort to mount at 60 inches.

3.20 CONTROL WIRE, CABLE AND RACEWAYS INSTALLATION

A. Comply with NECA 1.

B. Wire and Cable Installation:

1. Install cables with protective sheathing that is waterproof and capable of withstanding continuous temperatures of 90 deg C with no measurable effect on physical and electrical properties of cable.

    a. Provide shielding to prevent interference and distortion from adjacent cables and equipment.

2. Terminate wiring in a junction box.

    a. Clamp cable over jacket in junction box.
    b. Individual conductors in the stripped section of the cable shall be slack between the clamping point and terminal block.

3. Terminate field wiring and cable not directly connected to instruments and control devices having integral wiring terminals using terminal blocks.
4. Install signal transmission components according to IEEE C2, REA Form 511a, NFPA 70, and as indicated.
5. Use shielded cable to transmitters.
6. Use shielded cable to temperature sensors.
7. Perform continuity and meager testing on wire and cable after installation.

C. Conduit Installation:

1. Comply with Section 260533 "Raceways and Boxes for Electrical Systems" for control-voltage conductors.

3.21 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative as needed:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Testing:

1. Perform preinstallation, in-progress, and final tests, supplemented by additional tests, as necessary.
2. Preinstallation Cable Verification: Verify integrity and serviceability for new cable lengths before installation. This assurance may be provided by using vendor verification documents, testing, or other methods. As a minimum, furnish evidence of verification for cable attenuation and bandwidth parameters.

3. In-Progress Testing: Perform standard tests for correct pair identification and termination during installation to ensure proper installation and cable placement. Perform tests in addition to those specified if there is any reason to question condition of material furnished and installed. Testing accomplished is to be documented by agency conducting tests. Submit test results for Project record.
4. Final Testing: Perform final test of installed system to demonstrate acceptability as installed. Testing shall be performed according to a test plan supplied by DDC system manufacturer. Defective Work or material shall be corrected and retested. As a minimum, final testing for cable system, including spare cable, shall verify conformance of attenuation, length, and bandwidth parameters with performance indicated.
5. Test Equipment: Use an optical fiber time domain reflectometer for testing of length and optical connectivity.
6. Test Results: Record test results and submit copy of test results for Project record.

3.22 DDC SYSTEM I/O CHECKOUT PROCEDURES

A. Check installed products before continuity tests, leak tests and calibration.

B. Check instruments for proper location and accessibility.

C. Check instruments for proper installation on direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.

D. Control Damper Checkout:

1. Verify that control dampers are installed correctly for flow direction.
2. Verify that proper blade alignment, either parallel or opposed, has been provided.
3. Verify that damper frame attachment is properly secured and sealed.
4. Verify that damper actuator and linkage attachment is secure.
5. Verify that actuator wiring is complete, enclosed and connected to correct power source.
6. Verify that damper blade travel is unobstructed.

E. Control Valve Checkout:

1. Verify that control valves are installed correctly for flow direction.
2. Verify that valve body attachment is properly secured and sealed.
3. Verify that valve actuator and linkage attachment is secure.
4. Verify that actuator wiring is complete, enclosed and connected to correct power source.
5. Verify that valve ball, disc or plug travel is unobstructed.
6. After piping systems have been tested and put into service, but before insulating and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks. Replace the valve if leaks persist.

F. Instrument Checkout:

1. Verify that instrument is correctly installed for location, orientation, direction and operating clearances.
2. Verify that attachment is properly secured and sealed.
3. Verify that conduit connections are properly secured and sealed.

4. Verify that wiring is properly labeled with unique identification, correct type and size and is securely attached to proper terminals.
5. Inspect instrument tag against approved submittal.
6. For instruments with tubing connections, verify that tubing attachment is secure and isolation valves have been provided.
7. For flow instruments, verify that recommended upstream and downstream distances have been maintained.
8. For temperature instruments:

    a. Verify sensing element type and proper material.
    b. Verify length and insertion.

3.23 DDC SYSTEM I/O ADJUSTMENT, CALIBRATION AND TESTING:

A. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.

B. Provide a written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.

C. For each analog instrument, make a three-point test of calibration for zero, linearity, and accuracy.

D. Equipment and procedures used for calibration shall comply with instrument manufacturer's written instructions.

E. Provide diagnostic and test equipment for calibration and adjustment.

F. Field instruments and equipment used to test and calibrate installed instruments shall have accuracy at least twice the instrument accuracy being calibrated. For example, an installed instrument with an accuracy of 2 percent shall be checked by an instrument with an accuracy of 1 percent.

G. Calibrate each instrument according to instrument instruction manual supplied by manufacturer.

H. If after calibration indicated performance cannot be achieved, replace out-of-tolerance instruments.

I. Comply with field testing requirements and procedures indicated by ASHRAE's Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements, and to supplement requirements indicated.

J. Analog Signals:

1. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.
2. Check analog current signals using a precision current meter at zero, 50, and 100 percent.
3. Check resistance signals for temperature sensors at zero, 50, and 100 percent of operating span using a precision-resistant source.

K. Digital Signals:

1. Check digital signals using a jumper wire.
2. Check digital signals using an ohmmeter to test for contact making or breaking.

L. Control Dampers:

1. Stroke and adjust control dampers following manufacturer's recommended procedure, from 100 percent open to 100 percent closed and back to 100 percent open.
2. Check and document open and close cycle times.
3. For control dampers equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

M. Control Valves:

1. Stroke and adjust control valves following manufacturer's recommended procedure, from 100 percent open to 100 percent closed and back to 100 percent open.
2. Check and document open and close cycle times for applications with a cycle time less than 30 seconds.
3. For control valves equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

N. Sensors: Check sensors at zero, 50, and 100 percent of Project design values.

O. Switches: Calibrate switches to make or break contact at set points indicated.

3.24 DDC SYSTEM CONTROLLER CHECKOUT

A. Verify power supply.

1. Verify voltage, phase and hertz.
2. Verify that protection from power surges is installed and functioning.
3. Verify that ground fault protection is installed.
4. If applicable, verify that transient voltage suppression and high-frequency noise filter units are installed.

B. Verify that wire and cabling is properly secured to terminals and labeled with unique identification.

C. Verify that spare I/O capacity is provided.

3.25 DDC CONTROLLER I/O CONTROL LOOP TESTS

A. Testing:

1. Test every I/O point connected to DDC controller to verify that safety and operating control set points are as indicated and as required to operate controlled system safely and at optimum performance.
2. Test every I/O point throughout its full operating range.
3. Test every control loop to verify operation is stable and accurate.

4. Adjust control loop proportional, integral and derivative settings to achieve optimum performance while complying with performance requirements indicated. Document testing of each control loop's precision and stability via trend logs.
5. Test and adjust every control loop for proper operation according to sequence of operation.
6. Test software and hardware interlocks for proper operation. Correct deficiencies.
7. Operate each analog point at the following:

    a. Upper quarter of range.
    b. Lower quarter of range.
    c. At midpoint of range.

8. Exercise each binary point.
9. For every I/O point in DDC system, read and record each value at operator workstation, at DDC controller and at field instrument simultaneously. Value displayed at operator workstation, at DDC controller and at field instrument shall match.
10. Prepare and submit a report documenting results for each I/O point in DDC system and include in each I/O point a description of corrective measures and adjustments made to achieve desire results.

3.26 DDC SYSTEM VALIDATION TESTS

A. Perform validation tests before requesting final review and commissioning of the system. Before beginning testing, first submit Pretest Checklist and Test Plan.

B. After approval of Test Plan, execute all tests and procedures indicated in plan.

C. After testing is complete, submit completed test checklist.

D. Pretest Checklist: Submit the following list with items checked off once verified:

1. Detailed explanation for any items that are not completed or verified.
2. Required mechanical installation work is successfully completed and HVAC equipment is working correctly.
3. HVAC equipment motors operate below full-load amperage ratings.
4. Required DDC system components, wiring, and accessories are installed.
5. Installed DDC system architecture matches approved Drawings.
6. Control electric power circuits operate at proper voltage and are free from faults.
7. Required surge protection is installed.
8. DDC system network communications function properly, including uploading and downloading programming changes.
9. Using BACnet protocol analyzer, verify that communications are error free.
10. Each controller's programming is backed up.
11. Equipment, products, wiring cable, and conduits are properly labeled.
12. All I/O points are programmed into controllers.
13. Testing, adjusting, and balancing work affecting controls is complete.
14. Dampers and actuators zero and span adjustments are set properly.
15. Each control damper and actuator goes to failed position on loss of power.
16. Valves and actuators zero and span adjustments are set properly.
17. Each control valve and actuator goes to failed position on loss of power.

18. Meter, sensor and transmitter readings are accurate and calibrated.
19. Control loops are tuned for smooth and stable operation.
20. View trend data where applicable.
21. Each controller works properly in standalone mode.
22. Safety controls and devices function properly.
23. Interfaces with fire-alarm system function properly.
24. Electrical interlocks function properly.
25. Connection to the BCC is installed, operating, and graphics are created.
26. Record Drawings are completed.

E. Test Plan:

1. Prepare and submit a validation test plan including test procedures for performance validation tests.
2. Test plan shall address all specified functions of DDC system and sequences of operation.
3. Explain detailed actions and expected results to demonstrate compliance with requirements indicated.
4. Explain method for simulating necessary conditions of operation used to demonstrate performance.
5. Include a test checklist to be used to check and initial that each test has been successfully completed.
6. Submit test plan documentation 20 business days before start of tests.

F. Validation Test:

1. Verify operating performance of each I/O point in DDC system.

    a. Verify analog I/O points at operating value.
    b. Make adjustments to out-of-tolerance I/O points.

        1) Identify I/O points for future reference.
        2) Simulate abnormal conditions to demonstrate proper function of safety devices.
        3) Replace instruments and controllers that cannot maintain performance indicated after adjustments.

2. Simulate conditions to demonstrate proper sequence of control.
3. Readjust settings to design values and observe ability of DDC system to establish desired conditions.
4. After 24 Hours following Initial Validation Test:

    a. Re-check I/O points that required corrections during initial test.
    b. Identify I/O points that still require additional correction and make corrections necessary to achieve desired results.

5. After 24 Hours of Second Validation Test:

    a. Re-check I/O points that required corrections during second test.
    b. Continue validation testing until I/O point is normal on two consecutive tests.

6. Completely check out, calibrate, and test all connected hardware and software to ensure that DDC system performs according to requirements indicated.
7. After validation testing is complete, prepare and submit a report indicating all I/O points that required correction and how many validation re-tests it took to pass. Identify adjustments made for each test and indicate instruments that were replaced.

G. DDC System Response Time Test:

1. Simulate HLC.

   a. Heavy load shall be an occurrence of 50 percent of total connected binary COV, one-half of which represent an "alarm" condition, and 50 percent of total connected analog COV, one-half of which represent an "alarm" condition, that are initiated simultaneously on a one-time basis.

2. Initiate 10 successive occurrences of HLC and measure response time to typical alarms and status changes.
3. Measure with a timer having at least 0.1-second resolution and 0.01 percent accuracy.
4. Purpose of test is to demonstrate DDC system, as follows:

   a. Reaction to COV and alarm conditions during HLC.
   b. Ability to update DDC system database during HLC.

5. Passing test is contingent on the following:

   a. Alarm reporting at BCC beginning no more than 10 seconds after the initiation (time zero) of HLC.
   b. All alarms, both binary and analog, are reported and printed; none are lost.
   c. Compliance with response times specified.

6. Prepare and submit a report documenting HLC tested and results of test including time stamp and print out of all alarms.

H. DDC System Network Bandwidth Test:

1. Test network bandwidth usage on all DDC system networks to demonstrate bandwidth usage under DDC system normal operating conditions and under simulated HLC.
2. To pass, none of DDC system networks shall use more than 70 percent of available bandwidth under normal and HLC operation.

3.27 FINAL REVIEW

A. Submit written request to Architect and Construction Manager when DDC system is ready for final review. Written request shall state the following:

1. DDC system has been thoroughly inspected for compliance with contract documents and found to be in full compliance.
2. DDC system has been calibrated, adjusted and tested and found to comply with requirements of operational stability, accuracy, speed and other performance requirements indicated.

3. DDC system monitoring and control of HVAC systems results in operation according to sequences of operation indicated.
4. DDC system is complete and ready for final review.

B. Review by Architect and Construction Manager shall be made after receipt of written request. A field report shall be issued to document observations and deficiencies.

C. Take prompt action to remedy deficiencies indicated in field report and submit a second written request when all deficiencies have been corrected. Repeat process until no deficiencies are reported.

D. Should more than two reviews be required, DDC system manufacturer and Installer shall compensate entity performing review for total costs, labor and expenses, associated with third and subsequent reviews. Estimated cost of each review shall be submitted and approved by DDC system manufacturer and Installer before making the review.

E. Prepare and submit closeout submittals when no deficiencies are reported.

F. A part of DDC system final review shall include a demonstration to parties participating in final review.

1. Provide staff familiar with DDC system installed to demonstrate operation of DDC system during final review.
2. Provide testing equipment to demonstrate accuracy and other performance requirements of DDC system that is requested by reviewers during final review.
3. Demonstration shall include, but not be limited to, the following:

    a. Accuracy and calibration of 20 I/O points randomly selected by reviewers. If review finds that some I/O points are not properly calibrated and not satisfying performance requirements indicated, additional I/O points may be selected by reviewers until total I/O points being reviewed that satisfy requirements equals quantity indicated.
    b. HVAC equipment and system hardwired and software safeties and life-safety functions are operating according to sequence of operation. Up to 10 I/O points shall be randomly selected by reviewers. Additional I/O points may be selected by reviewers to discover problems with operation.
    c. Correct sequence of operation after electrical power interruption and resumption after electrical power is restored for randomly selected HVAC systems.
    d. Operation of randomly selected dampers and valves in normal-on, normal-off and failed positions.
    e. Reporting of alarm conditions for randomly selected alarms, including different classes of alarms, to ensure that alarms are properly received by operators and operator workstations.
    f. Trends, summaries, logs and reports set-up for Project.
    g. For up to three HVAC systems randomly selected by reviewers, use graph trends to show that sequence of operation is executed in correct manner and that HVAC systems operate properly through complete sequence of operation including different modes of operations indicated. Show that control loops are stable and operating at set points and respond to changes in set point of 20 percent or more.
    h. Software's ability to communicate with controllers and BCC.

i. Data entry to show Project-specific customizing capability including parameter changes.
j. Step through penetration tree, display all graphics at BCC, demonstrate dynamic update, and direct access to graphics.
k. Execution of digital and analog commands in graphic mode.
l. Online user guide and help functions.
m. Multitasking by showing different operations occurring simultaneously on four quadrants of split screen.
n. System speed of response compared to requirements indicated.
o. For Each Network and Programmable Application Controller:

1) Memory: Programmed data, parameters, trend and alarm history collected during normal operation is not lost during power failure.
2) Operator Interface: Ability to connect directly to each type of digital controller with a portable workstation. Show that maintenance personnel interface tools perform as indicated in manufacturer's technical literature.
3) Standalone Ability: Demonstrate that controllers provide stable and reliable standalone operation using default values or other method for values normally read over network.
4) Electric Power: Ability to disconnect any controller safely from its power source.
5) Wiring Labels: Match control drawings.
6) Network Communication: Ability to locate a controller's location on network and communication architecture matches Shop Drawings.
7) Nameplates and Tags: Accurate and permanently attached to control panel doors, instrument, actuators, and devices.

p. Communications and Interoperability: Demonstrate proper interoperability of data sharing, alarm and event management, trending, scheduling, and device and network management. Use ASHRAE 135 protocol analyzer to help identify devices, view network traffic, and verify interoperability. Requirements must be met even if only one manufacturer's equipment is installed.

1) Data Presentation: On the BCC operator workstation, demonstrate graphic display capabilities.
2) Reading of Any Property: Demonstrate ability to read and display any used readable object property of any device on network.
3) Set Point and Parameter Modifications: Show ability to modify set points and tuning parameters indicated.
4) Peer-to-Peer Data Exchange: Network devices are installed and configured to perform without need for operator intervention to implement Project sequence of operation and to share global data.
5) Alarm and Event Management: Alarms and events are installed and prioritized according to Owner. Demonstrate that time delays and other logic are set up to avoid nuisance tripping. Show that operators with sufficient privileges are permitted.
6) Schedule Lists: Schedules are configured for start and stop, mode change, occupant overrides, and night setback as defined in sequence of operations.
7) Schedule Display and Modification: Ability to display any schedule with start and stop times for calendar year. Show that all calendar entries and

schedules are modifiable from any connected operator workstation by an operator with sufficient privilege.

8) Archival Storage of Data: Data archiving is handled by operator workstation and server and local trend archiving and display is accomplished.

9) Modification of Trend Log Object Parameters: Operator with sufficient privilege can change logged data points, sampling rate, and trend duration.

10) Device and Network Management:

a) Display of network device status.
b) Display of BACnet Object Information.
c) Silencing devices transmitting erroneous data.
d) Time synchronization.
e) Remote device re-initialization.
f) Backup and restore network device programming and master database(s).
g) Configuration management of routers.

3.28 EXTENDED OPERATION TEST

A. Extended operation test is intended to simulate normal operation of DDC system by Owner.

B. Operate DDC system for an operating period of 14 consecutive calendar days following Substantial Completion. Coordinate exact start date of testing with Owner.

C. Provide an operator familiar with DDC system installed to man an operator workstation during up to eight hours of each normal business day occurring during extended operating period.

D. During operating period, DDC system shall demonstrate correct operation and accuracy of monitored and controlled points as well as operation capabilities of sequences, logs, trends, reports, specialized control algorithms, diagnostics, and other software indicated.

1. Correct defects of hardware and software when it occurs.

E. Definition of Failures and Downtime during Operating Period:

1. Failed I/O point constituting downtime is an I/O point failing to perform its intended function consistently and a point physically failed due to hardware and software.
2. Downtime is when any I/O point in DDC system is unable to fulfill its' required function.
3. Downtime shall be calculated as elapsed time between a detected point failure as confirmed by an operator and time point is restored to service.
4. Maximum time interval allowed between DDC system detection of failure occurrence and operator confirmation shall be 0.5 hours.
5. Downtime shall be logged in hours to nearest 0.1 hour.
6. Power outages shall not count as downtime, but shall suspend test hours unless systems are provided with UPS and served through a backup power source.
7. Hardware or software failures caused by power outages shall count as downtime.

F. During operating period, log downtime and operational problems are encountered.

1. Identify source of problem.

2. Provide written description of corrective action taken.
3. Record duration of downtime.
4. Maintain log showing the following:

    a. Time of occurrence.
    b. Description of each occurrence and pertinent written comments for reviewer to understand scope and extent of occurrence.
    c. Downtime for each failed I/O point.
    d. Running total of downtime and total time of I/O point after each problem has been restored.

5. Log shall be available to Owner for review at any time.

G. For DDC system to pass extended operation test, total downtime shall not exceed 1 percent of total point-hours during operating period.

1. Failure to comply with minimum requirements of passing at end of operating period indicated shall require that operating period be extended one consecutive day at a time until DDC system passes requirement.

H. Evaluation of DDC system passing test shall be based on the following calculation:

1. Downtime shall be counted on a point-hour basis where total number of DDC system point-hours is equal to total number of I/O points in DDC system multiplied by total number of hours during operating period.
2. One point-hour of downtime is one I/O point down for one hour. Three points down for five hours is a total of 15 point-hours of downtime. Four points down for one-half hour is 2 point-hours of downtime.
3. Example Calculation: Maximum allowable downtime for 30-day test when DDC system has 1000 total I/O points (combined analog and binary) and has passing score of 1 percent downtime is computed by 30 days x 24 h/day x 1000 points x 1 percent equals 7200 point-hours of maximum allowable downtime.

I. Prepare test and inspection reports.

3.29 SYSTEM ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.30 DEMONSTRATION

A. Engage a factory-authorized service representative with complete knowledge of Project-specific system installed to train Owner's maintenance personnel to adjust, operate, and maintain DDC system.

B. Extent of Training:

1. Base extent of training on scope and complexity of DDC system indicated and training requirements indicated. Provide extent of training required to satisfy requirements indicated even if more than minimum training requirements are indicated.
2. Inform Owner of anticipated training requirements if more than minimum training requirements are indicated.
3. Minimum Training Requirements:

    a. Provide not less than five days of training total.
    b. Stagger training over multiple training classes to accommodate Owner's requirements. All training shall occur before end of warranty period.
    c. Total days of training shall be broken into not more than four separate training classes.
    d. Each training class shall be not less than one consecutive day(s).

C. Training Schedule:

1. Schedule training with Owner 20 business days before expected Substantial Completion.
2. Schedule training to provide Owner with at least 10 business days of notice in advance of training.
3. Training shall occur within normal business hours at a mutually agreed on time. Unless otherwise agreed to, training shall occur Monday through Friday, except on U.S. Federal holidays, with two morning sessions and two afternoon sessions. Each morning session and afternoon session shall be split in half with 15-minute break between sessions. Morning and afternoon sessions shall be separated by 60-minute lunch period. Training, including breaks and excluding lunch period, shall not exceed eight hours per day.
4. Provide staggered training schedule as requested by Owner.

D. Training Attendee List and Sign-in Sheet:

1. Request from Owner in advance of training a proposed attendee list with name, phone number and e-mail address.
2. Provide a preprinted sign-in sheet for each training session with proposed attendees listed and no fewer than six blank spaces to add additional attendees.
3. Preprinted sign-in sheet shall include training session number, date and time, instructor name, phone number and e-mail address, and brief description of content to be covered during session. List attendees with columns for name, phone number, e-mail address and a column for attendee signature or initials.
4. Circulate sign-in sheet at beginning of each session and solicit attendees to sign or initial in applicable location.
5. At end of each training day, send Owner an e-mail with an attachment of scanned copy (PDF) of circulated sign-in sheet for each session.

E. Training Attendee Headcount:

1. Plan in advance of training for three attendees.
2. Make allowance for Owner to add up to two attendee(s) at time of training.
3. Headcount may vary depending on training content covered in session. Attendee access may be restricted to some training content for purposes of maintaining system security.

F. Training Attendee Prior Knowledge: For guidance in planning required training and instruction, assume attendees have the following:

1. High school and technical school education and degree.
2. Basic user knowledge of computers and office applications.
3. Intermediate knowledge of HVAC systems.
4. Intermediate knowledge of DDC systems.
5. Intermediate knowledge of DDC system and products installed.

G. Attendee Training Manuals:

1. Provide each attendee with a color hard copy of all training materials and visual presentations.
2. Hard-copy materials shall be organized in a three-ring binder with table of contents and individual divider tabs marked for each logical grouping of subject matter. Organize material to provide space for attendees to take handwritten notes within training manuals.
3. In addition to hard-copy materials included in training manual, provide each binder with a sleeve or pocket that includes a DVD or flash drive with PDF copy of all hard-copy materials.

H. Instructor Requirements:

1. One or multiple qualified instructors, as required, to provide training.
2. Instructors shall have not less than one years of providing instructional training on not less than five past projects with similar DDC system scope and complexity to DDC system installed.

I. Organization of Training Sessions:

1. Organize training sessions into logical groupings of technical content and to reflect different levels of operators having access to system. Plan training sessions to accommodate the following three levels of operators:

    a. Daily operators.
    b. Advanced operators.
    c. System managers and administrators.

2. Plan and organize training sessions to group training content to protect DDC system security. Some attendees may be restricted to some training sessions that cover restricted content for purposes of maintaining DDC system security.

J. Training Outline:

1. Submit training outline for Owner review at least 10 business days before scheduling training.
2. Outline shall include a detailed agenda for each training day that is broken down into each of four training sessions that day, training objectives for each training session and synopses for each lesson planned.

K. On-Site Training:

1. Owner will provide conditioned classroom or workspace with ample desks or tables, chairs, power and data connectivity for instructor and each attendee.

2. Instructor shall provide training materials, projector and other audiovisual equipment used in training.
3. Provide as much of training located on-site as deemed feasible and practical by Owner.
4. On-site training shall include regular walk-through tours, as required, to observe each unique product type installed with hands-on review of operation, calibration and service requirements.
5. Operator workstation provided with DDC system shall be used in training. If operator workstation is not indicated, provide a temporary workstation to convey training content.

L. Training Content for Daily Operators:

1. Basic operation of system.
2. Understanding DDC system architecture and configuration.
3. Understanding each unique product type installed including performance and service requirements for each.
4. Understanding operation of each system and equipment controlled by DDC system including sequences of operation, each unique control algorithm and each unique optimization routine.
5. Operating operator workstations, printers and other peripherals.
6. Logging on and off system.
7. Accessing graphics, reports and alarms.
8. Adjusting and changing set points and time schedules.
9. Recognizing DDC system malfunctions.
10. Understanding content of operation and maintenance manuals including control drawings.
11. Understanding physical location and placement of DDC controllers and I/O hardware.
12. Accessing data from DDC controllers.
13. Review of DDC testing results to establish basic understanding of DDC system operating performance and HVAC system limitations as of Substantial Completion.
14. Running each specified report and log.
15. Stepping through graphics penetration tree, displaying all graphics, demonstrating dynamic updating, and direct access to graphics.
16. Executing digital and analog commands in graphic mode.
17. Demonstrating control loop precision and stability via trend logs of I/O for not less than 10 percent of I/O installed.
18. Demonstrating DDC system performance through trend logs and command tracing.
19. Demonstrating scan, update, and alarm responsiveness.
20. Demonstrating on-line user guide, and help function and mail facility.
21. Demonstrating multitasking by showing dynamic curve plot, and graphic construction operating simultaneously via split screen.
22. Demonstrating the following for HVAC systems and equipment controlled by DDC system:

    a. Operation of HVAC equipment in normal-off, -on and failed conditions while observing individual equipment, dampers and valves for correct position under each condition.
    b. For HVAC equipment with factory-installed software, show that integration into DDC system is able to communicate with DDC controllers or gateways, as applicable.
    c. Using graphed trends, show that sequence of operation is executed in correct manner, and HVAC systems operate properly through complete sequence of

operation including seasonal change, occupied and unoccupied modes, warm-up and cool-down cycles and other modes of operation indicated.

d. Hardware interlocks and safeties function properly and DDC system performs correct sequence of operation after electrical power interruption and resumption after power is restored.
e. Reporting of alarm conditions for each alarm, and confirm that alarms are received at assigned locations, including operator workstations.
f. Each control loop responds to set point adjustment and stabilizes within time period indicated.
g. Sharing of previously graphed trends of all control loops to demonstrate that each control loop is stable and set points are being maintained.

M. Video of Training Sessions:

1. Provide a digital video and audio recording of each training session. Create a separate recording file for each session.
2. Stamp each recording file with training session number, session name and date.
3. Provide Owner with two copies of digital files on DVDs or flash drives for later reference and for use in future training.
4. Owner retains right to make additional copies for intended training purposes without having to pay royalties.

END OF SECTION 230923

DRAWING LIST

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GI002B	INDEX OF DRAWINGS
GI003B	GENERAL ARRANGEMENTS PLAN
GI004B	GENERAL INFORMATION
GI005B	CODE ANALYSIS
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GI111	FIRST LEVEL FIRE RATED PARTITIONS
GI112	SECOND LEVEL FIRE RATED PARTITIONS
GI113	THIRD LEVEL FIRE RATED PARTITIONS
GI114	FOURTH LEVEL FIRE RATED PARTITIONS
GI115	FIFTH LEVEL FIRE RATED PARTITIONS
GC001B	SITE ACCESS INFORMATION
GC100B	BASEMENT LEVEL ACCESS PLAN
GC101B	FIRST LEVEL ACCESS PLAN
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GD100	SITE DEMOLITION PLAN
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HD106B	ARCHITECTURAL MUSEUM - SECOND LEVEL HAZ-MAT DEMOLITION CEILING PLAN
HD107B	ARCHITECTURAL MUSEUM - THIRD LEVEL HAZ-MAT DEMOLITION CEILING PLAN
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HD115B	MECHANICAL - MUSEUM - FIRST LEVEL HAZ-MAT DEMOLITION PLAN
HD116B	MECHANICAL - MUSEUM - SECOND LEVEL HAZ-MAT DEMOLITION PLAN
HD117B	MECHANICAL - MUSEUM - THIRD LEVEL HAZ-MAT DEMOLITION PLAN
HD118B	MECHANICAL - MUSEUM - FOURTH LEVEL HAZ-MAT DEMOLITION PLAN
HD125B	ELECTRICAL - MUSEUM - FIRST LEVEL HAZ-MAT DEMOLTION PLAN
HD126B	ELECTRICAL - MUSEUM - SECOND LEVEL HAZ-MAT DEMOLITION PLAN
HD127	ELECTRICAL - MUSEUM - THIRD LEVEL HAZ-MAT DEMOLITION PLAN
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SF106	MUSEUM - SECOND LEVEL FRAMING PLAN
SF107	MUSEUM - THIRD LEVEL FLOOR FRAMING PLAN
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SF109	MUSEUM - FIFTH LEVEL & ROOF LEVEL FRAMING PLAN
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SF503	TYPICAL DETAILS
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AD102	LIBRARY - THIRD LEVEL AND ROOF DEMOLITION PLANS
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AD105	MUSEUM - FIRST LEVEL DEMOLITION PLAN
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AE105	MUSEUM - FIRST LEVEL FLOOR PLAN
AE106	MUSEUM - SECOND LEVEL FLOOR PLAN
AE107	MUSEUM - THIRD LEVEL FLOOR PLAN
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AE109	MUSEUM - FIFTH LEVEL FLOOR PLAN
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AK105	MUSEUM - FIRST LEVEL FIREPROOFING PLAN
AK106	MUSEUM - SECOND LEVEL FIREPROOFING PLAN
AK107	MUSEUM - THIRD LEVEL FIREPROOFING PLAN
AK108	MUSEUM - FOURTH LEVEL FIREPROOFING PLAN
AK109	MUSEUM - FIFTH LEVEL FIREPROOFING PLAN

DRAWING LIST

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MD115	MUSEUM FIRST LEVEL MECHANICAL DEMOLITION PLAN
MD118	MUSEUM FOURTH LEVEL MECHANICAL DEMOLITION PLAN
MD119	MUSEUM FIFTH LEVEL MECHANICAL DEMOLITION PLAN
MH100	BASEMENT LEVEL DUCTWORK PLAN
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MH105	MUSEUM - FIRST LEVEL DUCTWORK PLAN
MH106	MUSEUM - SECOND LEVEL DUCTWORK PLAN
MH107	MUSEUM - THIRD LEVEL DUCTWORK PLAN
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MP105	MUSEUM - FIRST LEVEL PIPING PLAN
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M-503	MECHANICAL DETAILS
M-504	MECHANICAL DETAILS
M-601	MECHANICAL SCHEDULES
M-602	MECHANICAL SCHEDULES
M-603	MECHANICAL SCHEDULES
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M-605	MECHANICAL SCHEDULES
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PL102	LIBRARY - THIRD LEVEL AND ROOF PLUMBING PLANS
PL103	ARCHIVES - FIRST AND SECOND LEVEL PLUMBING PLANS
PL104	ARCHIVES - THIRD LEVEL AND ROOF PLUMBING PLANS
PL105	MUSEUM - FIRST LEVEL PLUMBING PLAN
PL106	MUSEUM - SECOND LEVEL PLUMBING PLAN
PL107	MUSEUM - THIRD LEVEL PLUMBING PLAN
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PL109	MUSEUM - FIFTH LEVEL PLUMBING PLAN
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ED104	ARCHIVES - THIRD LEVEL LIGHTING DEMOLITION PLAN
ED105	MUSEUM - FIRST LEVEL LIGHTING DEMOLITION PLAN
ED108	MUSEUM - FOURTH LEVEL LIGHTING DEMOLITION PLAN
ED109	MUSEUM - FIFTH LEVEL LIGHTING DEMOLITION PLAN
ED110	BASEMENT LEVEL ELECTRICAL DEMOLITION PLAN
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ED112	LIBRARY - THIRD LEVEL AND ROOF ELECTRICAL DEMOLITION PLAN
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ED114	ARCHIVES - THIRD LEVEL ELECTRICAL DEMOLITION PLAN
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EL102	LIBRARY - THIRD LEVEL LIGHTING PLAN
EL103	ARCHIVES - FIRST LEVEL AND SECOND LEVEL LIGHTING PLAN
EL104	ARCHIVES - THIRD LEVEL LIGHTING PLAN
EL105	MUSEUM - FIRST LEVEL LIGHTING PLAN
EL106	MUSEUM - SECOND LEVEL LIGHTING PLAN
EL107	MUSEUM - THIRD LEVEL LIGHTING PLAN
EL108	MUSEUM - FOURTH LEVEL LIGHTING PLAN
EL109	MUSEUM - FIFTH LEVEL LIGHTING PLAN
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EP102	LIBRARY - THIRD LEVEL AND ROOF ELECTRICAL PLAN
EP103	ARCHIVES - FIRST LEVEL AND SECOND LEVEL ELECTRICAL PLAN
EP104	ARCHIVES - THIRD LEVEL AND ROOF ELECTRICAL PLAN
EP105	MUSEUM - FIRST LEVEL ELECTRICAL PLAN
EP106	MUSEUM - SECOND LEVEL ELECTRICAL PLAN
EP107	MUSEUM - THIRD LEVEL ELECTRICAL PLAN
EP108	MUSEUM - FOURTH LEVEL ELECTRICAL PLAN
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E-501	ELECTRICAL DETAILS
E-601	PARTIAL ONE-LINE RISER DIAGRAM- DEMOLITION
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E-605	PANEL SCHEDULES

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LICENSED ARCHITECT
ELIZABETH HUCKINS
No. 4338
STATE OF MAINE
2/8/2022

CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

REV.	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	EAH
DESIGNED BY:	TCM
DRAWN BY:	JLR

SHEET TITLE:
INDEX OF DRAWINGS

SHEET ID:
GI002B

NOT FOR CONSTRUCTION

CODE SUMMARY

THE DESIGN OF THIS PROJECT CONFORMS TO THE FOLLOWING APPLICABLE CODES AND GOVERNMENT REQUIREMENTS:

INTERNATIONAL BUILDING CODE (IBC), 2015 AS AMENDED BY CHAPTER 3 OF THE MAINE UNIFORM BUILDING AND ENERGY CODE (MUBEC)

INTERNATIONAL EXISTING BUILDING CODE (IEBC), 2015 AS AMENDED BY CHAPTER 4 OF THE MUBEC; ADOPTS CHAPTERS 1-16 AND APP A-C BY REFERENCE

INTERNATIONAL ENERGY CONSERVATION CODE (IECC), 2009 AS AMENDED BY CHAPTER 6 OF THE MUBEC

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONDITIONING ENGINEERS (ASHRAE) STANDARDS ADOPTED AS AMENDED BY MUBEC CHAPTER 3 – IBC, CHAPTER 4- IEBC AND CHAPTER 6 - IECC

STATE OF MAINE RULES OF THE STATE FIRE MARSHAL (ME RSFM)

STATE OF MAINE - ASBESTOS REMOVAL

AUGUSTA CODE OF ORDINANCES – PART III GENERAL LEGISLATION

PROJECT DATA

BUILDING AREA:

BASEMENT	4,313 SF
FIRST LEVEL	43,564 SF
SECOND LEVEL	44,801 SF
THIRD LEVEL	44,065 SF
FOURTH LEVEL	16,892 SF
FIFTH LEVEL	7,570 SF
TOTAL AREA	161,205 SF

BUILDING HEIGHT: 71 FT

NUMBER OF STORIES: 5 STORIES

FIRE PROTECTION: PARTIALLY SPRINKLERED

BUILDING OCCUPANCIES: IBC: GROUP A-3 ASSEMBLY, GROUP B BUSINESS, GROUP S-1 STORAGE, GROUP F-1 FACTORY
NFPA 101: ASSEMBLY, BUSINESS, STORAGE, ALL WITH BUILDING SERVICE AREAS

CONSTRUCTION TYPE: TYPE I-B

PROPOSED WORK: ASBESTOS ABATEMENT, MECHANICAL SYSTEM UPGRADES WITH RELATED WORK, ELECTRICAL ROOM WALL REPLACEMENT

NO CHANGE IN OCCUPANCY; NO RECONFIGURATION OF SPACE; NO ADDITIONS.

THE ARCHITECTURAL, ELECTRICAL AND FIRE PROTECTION SYSTEMS MODIFICATIONS FOR THIS PROJECT ARE CONSIDERED LEVEL 1 ALTERATIONS PER THE 2015 IEBC. THE EXISTING LEVEL OF PROTECTION PROVIDED FOR THE MEANS OF EGRESS SYSTEM WILL BE MAINTAINED. REPLACEMENT OF ARCHITECTURAL, ELECTRICAL, AND FIRE PROTECTION SYSTEMS SHALL BE IN COMPLIANCE WITH THE 2015 IBC WHERE REFERENCED BY CHAPTER 7 OF THE 2015 IEBC.

THE MECHANICAL SYSTEM UPGRADES ARE CONSIDERED A LEVEL 2 ALTERATION PER THE 2015 IEBC. WORK ASSOCIATED WITH THE MECHANICAL SYSTEM UPGRADES SHALL COMPLY WITH THE 2015 IEBC CHAPTER 8 AND THE 2015 I-CODES WHERE REFERENCED BY THE IEBC.

REFER TO SHEET **GI005B** FOR CODE ANALYSIS.

ACCESSIBILITY:

THE PROJECT IS CONSIDERED AN ALTERATION IN ACCORDANCE WITH , THE COST OF WHICH IS LESS THAN 75% OF THE REPLACEMENT COST OF THE COMPLETED FACILITY. THE FOLLOWING BARRIER REMOVALS ARE INCLUDED IN THIS PROJECT:
- ADA COMPLIANT DOOR HARDWARE ON DOORS BEING REPLACED
- REMOVAL OF NON-COMPLIANT RAMPS WITHIN THIRD LEVEL MUSEUM EXHIBITS; A SEPARATE PROJECT IS UNDER DEVELOPMENT THAT WILL ADDRESS ACCESSIBILITY OF THESE EXHIBIT AREAS

DELEGATED DESIGN

DELEGATED DESIGN SCOPE OF WORK

CONTRACTOR SHALL PROVIDE DELEGATED DESIGN SERVICES FOR THE PROTECTIVE PLATFORMS AND ENCLOSURES WITHIN THE MUSEUM EXHIBIT AREAS AS DEFINED ON THE DRAWINGS. REFER TO THE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS FOR EXHIBIT PROTECTION.

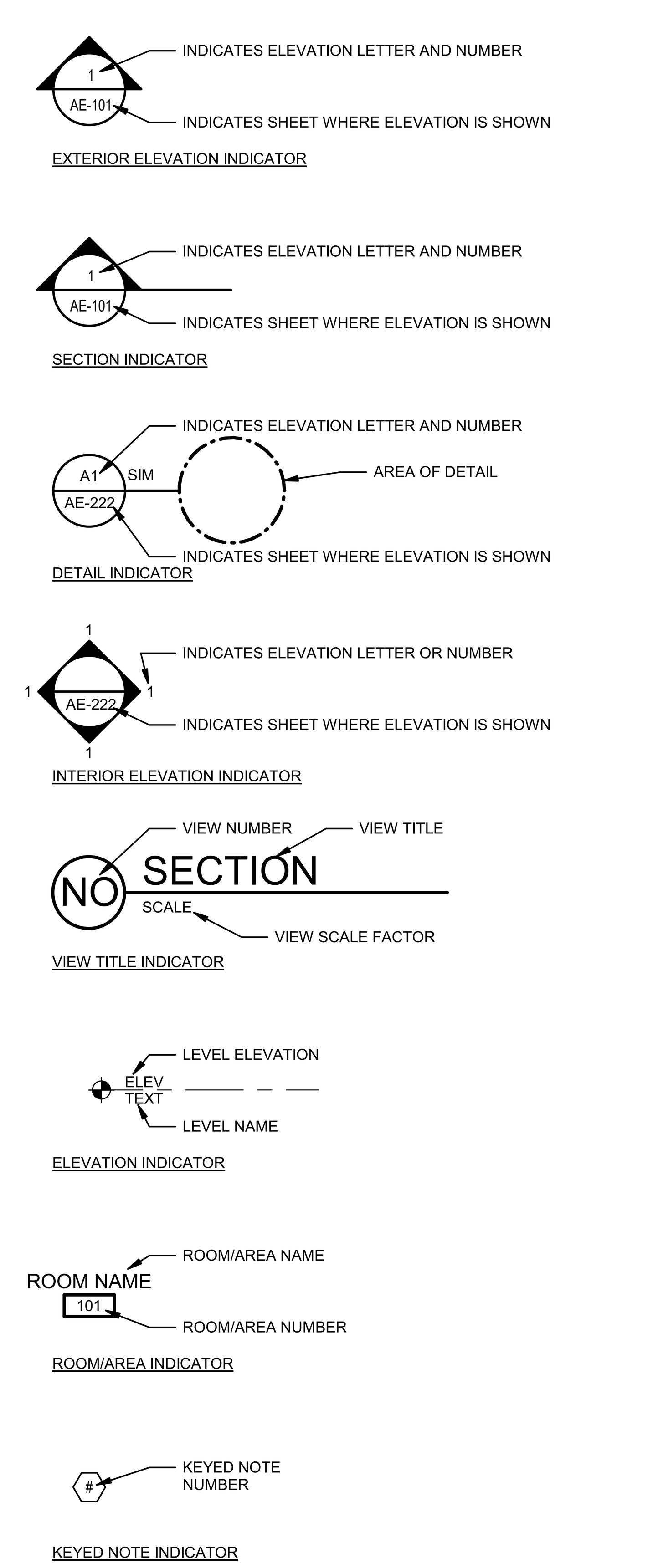
STRUCTURAL REQUIREMENTS
THE PLATFORMS SHALL BE DESIGNED TO SUPPORT THE CONSTRUCTION LOADS PRESCRIBED IN ASCE 37-14. THE MINIMUM CONCENTRATED PERSONNEL LOADS ARE GREATER OF 250 LBS DISTRIBUTED ABOUT AN AREA OF 1 FT BY 1 FT OR A DISTRIBUTED LOAD OF 50 PSF FOR MEDIUM DUTY CONSTRUCTION. MINIMUM HORIZONTAL LOADS ARE THE GREATER OF THE SELF-WEIGHT OF THE STRUCTURE SUBJECTED TO EARTHQUAKE LOADS WITH A RISK CATEGORY OF II OR 50 LB/PERSON APPLIED AT THE LEVEL OF THE PLATFORM ANY DIRECTION. IF DISTURBING WOOD EXHIBIT PLATFORM OR SURROUNDING WALL CONSTRUCTION IS REQUIRED FOR PLATFORM SUPPORTS, SUBMIT LOCATIONS IN WORK PLAN FOR APPROVAL

ARCHITECTURAL REQUIREMENTS
THE HORIZONTAL SURFACE OF THE PLATFORMS AND ENCLOSURES SHALL HAVE A RIGID SUBSTRATE (WHICH MAY SERVE AS A STRUCTURAL DIAPHRAGM). A WATERTIGHT MEMBRANE SHALL BE PROVIDED ON THE ENTIRE HORIZONTAL SURFACE AND PREVENT WATER AND/OR DUST FROM ENTERING BELOW THE PLATFORM OR ENCLOSURE, INCLUDING AROUND THE EDGES. A SURFACE PROTECTION LAYER SHALL BE PROVIDED OVER THE WATERTIGHT MEMBRANE TO PREVENT DAMAGE FROM TOOLS, EQUIPMENT, LADDERS, FOOT TRAFFIC AND OTHER CONSTRUCTION ACTIVITIES.

THE VERTICAL SURFACES OF THE PLATFORMS AND ENCLOSURES, WHERE APPLICABLE, SHALL HAVE PLASTIC SHEETING (OR SIMILAR) COVERING OVER THE STRUCTURAL FRAMING WITH ALL SEAMS WATERTIGHT. A RIGID SUBSTRATE MAY BE NECESSARY FOR STRUCTURAL PURPOSES, IN WHICH CASE THE PLASTIC SHEETING WOULD BE APPLIED OVER THE RIGID SUBSTRATE. EACH VERTICAL PLANE OF THE PLATFORM OR ENCLOSURE SHALL HAVE VIEWING PORTS STARTING ROUGHLY 48" ABOVE THE ADJACENT FLOOR. THE VIEWING PORTS SHALL BE NO LESS THAN 18" IN ANY DIRECTION. THE VIEWING PORTS SHALL BE SPACED 8'-0" O/C (MAX) WITH NO LESS THAN 2 PORTS ON ANY SIDE. A MINIMUM OF (1) OSHA COMPLIANT POINT OF ENTRY SHALL BE PROVIDED AT EACH PLATFORM OR ENCLOSURE LOCATION, IF NOT ALREADY INDICATED ON THE DRAWINGS.

OTHER REQUIREMENTS
PROVIDE PASSIVE VENTILATION FROM THE BOUNDARY OF THE ENCLOSURE TO OUTSIDE THE CONSTRUCTION CONTAINMENT AREA IN THE FORM OF A FLEXIBLE HOSE DUCTING OR SIMILAR. GENERAL ENVIRONMENTAL CONDITIONS WITHIN OR UNDER THE PLATFORMS OR ENCLOSURES SHALL BE THE SAME AS THE OVERALL SPACE THE ENCLOSURES OR PLATFORMS ARE IN.

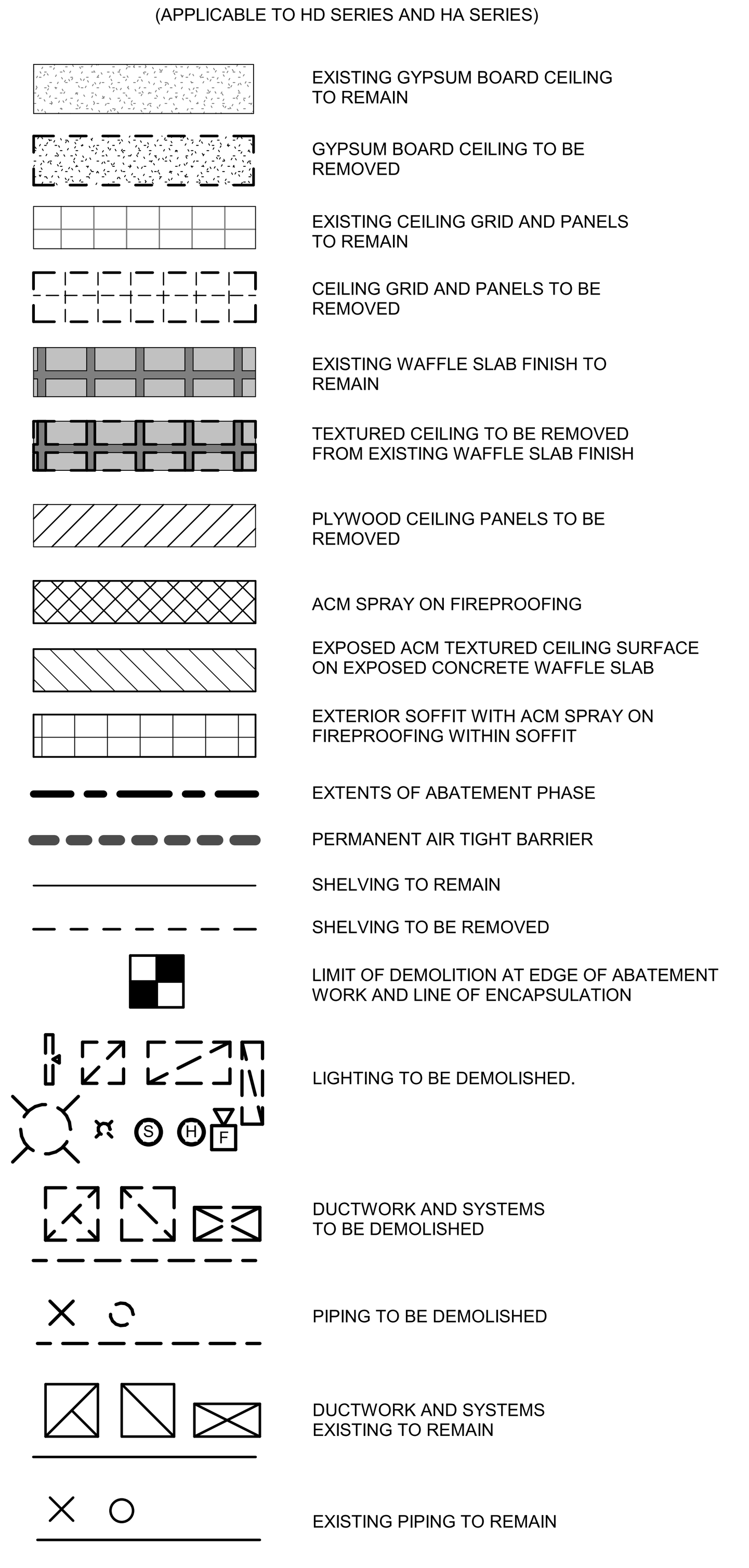
LEGEND



INDICATES ELEVATION LETTER AND NUMBER
1
AE-101
INDICATES SHEET WHERE ELEVATION IS SHOWN
EXTERIOR ELEVATION INDICATOR
INDICATES ELEVATION LETTER AND NUMBER
1
AE-101
INDICATES SHEET WHERE ELEVATION IS SHOWN
SECTION INDICATOR
INDICATES ELEVATION LETTER AND NUMBER
A1
SIM
AE-222
AREA OF DETAIL
INDICATES SHEET WHERE ELEVATION IS SHOWN
DETAIL INDICATOR
INDICATES ELEVATION LETTER OR NUMBER
AE-222
INDICATES SHEET WHERE ELEVATION IS SHOWN
INTERIOR ELEVATION INDICATOR
VIEW NUMBER
VIEW TITLE
NO
SECTION
SCALE
VIEW SCALE FACTOR
VIEW TITLE INDICATOR
LEVEL ELEVATION
ELEV
TEXT
LEVEL NAME
ELEVATION INDICATOR
ROOM/AREA NAME
ROOM NAME
101
ROOM/AREA NUMBER
ROOM/AREA INDICATOR
KEYED NOTE NUMBER
KEYED NOTE INDICATOR

HAZ MAT LEGEND

(APPLICABLE TO HD SERIES AND HA SERIES)



EXISTING GYPSUM BOARD CEILING TO REMAIN
GYPSUM BOARD CEILING TO BE REMOVED
EXISTING CEILING GRID AND PANELS TO REMAIN
CEILING GRID AND PANELS TO BE REMOVED
EXISTING WAFFLE SLAB FINISH TO REMAIN
TEXTURED CEILING TO BE REMOVED FROM EXISTING WAFFLE SLAB FINISH
PLYWOOD CEILING PANELS TO BE REMOVED
ACM SPRAY ON FIREPROOFING
EXPOSED ACM TEXTURED CEILING SURFACE ON EXPOSED CONCRETE WAFFLE SLAB
EXTERIOR SOFFIT WITH ACM SPRAY ON FIREPROOFING WITHIN SOFFIT
EXTENTS OF ABATEMENT PHASE
PERMANENT AIR TIGHT BARRIER
SHELVING TO REMAIN
SHELVING TO BE REMOVED
LIMIT OF DEMOLITION AT EDGE OF ABATEMENT WORK AND LINE OF ENCAPSULATION
LIGHTING TO BE DEMOLISHED.
DUCTWORK AND SYSTEMS TO BE DEMOLISHED
PIPING TO BE DEMOLISHED
DUCTWORK AND SYSTEMS EXISTING TO REMAIN
EXISTING PIPING TO REMAIN

ABBREVIATIONS

A/E	ARCHITECT/ENGINEER
ACT	ACOUSTICAL CEILING TILE
ADA	AMERICANS WITH DISABILITIES ACT
AFF	ABOVE FINISHED FLOOR
ALUM	ALUMINUM
APC	ACOUSTICAL PANEL CEILING
BAT	BATTEN
BD	BOARD
BITUM	BITUMINOUS
BLDG	BUILDING
BOT	BOTTOM
BS	BOTH SIDES
CAB	CABINET
CD	CONSTRUCTION DOCUMENTS
CF	CONTRACTOR FURNISHED
CF/CI	CONTRACTOR FURNISHED/CONTRACTOR INSTALLED
CF/GI	CONTRACTOR FURNISHED/GOVERNMENT INSTALLED
CF/OI	CONTRACTOR FURNISHED/OWNER INSTALLED
CIP	CAST-IN-PLACE
CJ	CONSTRUCTION JOINT OR CONTROL JOINT
CLG	CEILING
CLR	CLEAR
CMU	CONCRETE MASONRY UNIT
COL	COLUMN
CONC	CONCRETE
CONT	CONTINUE
COORD	COORDINATE
CT	CERAMIC TILE
D	DEPTH
DBL	DOUBLE
DEG	DEGREE
DEMO	DEMOLITION
DET	DETAIL
DIA	DIAMETER
DIM	DIMENSION
DOC	DOCUMENT
DWG	DRAWING
(E)	EXISTING
E	EAST
EFS	EXTERIOR FINISH SYSTEM
EIFS	EXTERIOR INSULATION AND FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELEVATION
ELEV	ELEVATOR
EQ	EQUAL
EQUIP	EQUIPMENT
ETC	ET CETERA OR AND SO FORTH
EXIST	EXISTING
FD	FLOOR DRAIN
FDTN	FOUNDATION
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FF EL	FINISH FLOOR ELEVATION
FF&E	FURNITURE, FIXTURE AND EQUIPMENT
FIN FLR	FINISH FLOOR
FIXT	FIXTURE
FLASH	FLASHING
FLR FIN	FLOOR FINISH
FT	FOOT OR FEET
FTG	FOOTING
GA	GAGE OR GYPSUM ASSOCIATION
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GSB	GYPSUM SHEATHING BOARD
GYP	GYPSUM
GYP BD	GYPSUM BOARD
H	HIGH
HAZ MAT	HAZARDOUS MATERIALS
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HT	HEIGHT
IBC	INTERNATIONAL BUILDING CODE
ID	INSIDE DIAMETER, IDENTIFICATION OR INTERIOR DESIGN
INCL	INCLUDED
INFO	INFORMATION
INSUL	INSULATION
INT	INTERIOR
JAN	JANITOR
JAN CLO	JANITOR CLOSET
J-BOX	JUNCTION BOX
L	ANGLE
LAM	LAMINATE
LAV	LAVATORY
LF	LINEAR FEET (FOOT)
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LT GA	LIGHT GAGE
LVR	LOUVER
LYR	LAYER
MAINT	MAINTENANCE
MATL	MATERIAL
MAX	MAXIMUM
MECH	MECHANICAL
MEMB	MEMBRANE
MEZZ	MEZZANINE
MFR	MANUFACTURER
MFR REC	MANUFACTURER'S RECOMMENDATION
MISC	MISCELLANEOUS
MO	MASONRY OPENING
MTL	METAL

N	NORTH
NA	NOT APPLICABLE
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NIC	NOT IN CONTRACT
NO	NUMBER
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF/CI	OWNER FURNISHED/CONTRACTOR INSTALLED
OF/OI	OWNER FURNISHED/OWNER INSTALLED
OPP	OPPOSITE
OPT	OPTIONAL
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
PART	PARTIAL
PLAM	PLASTIC LAMINATE
PLBG	PLUMBING
PLYWD	PLYWOOD
PR	PAIR
PREFAB	PREFABRICATE
PT	PAINT OR PRESSURE TREATED
PTN	PARTITION
QA	QUALITY ASSURANCE
QC	QUALITY CONTROL
QT	QUARRY TILE
R	RADIUS
RB	RUBBER BASE OR RESILIENT BASE
RCP	REFLECTED CEILING PLAN
RD	ROOF DRAIN
REF	REFERENCE OR REFRIGERATOR
REQ	REQUIRE
REQD	REQUIRED
RESIL	RESILIENT
REV	REVISION
RM	ROOM
RO	ROUGH OPENING
SAT	SUSPENDED ACOUSTICAL TILE
SCHED	SCHEDULE
SECT	SECTION
SF	SQUARE FOOT (FEET)
SHT	SHEET
SIM	SIMILAR
SK	SKETCH
SPEC	SPECIFICATION
SQ IN	SQUARE INCH
SST	STAINLESS STEEL
STC	SOUND TRANSMISSION CLASS
STD	STANDARD
STL	STEEL
STOR	STORAGE
STRUCT	STRUCTURAL
SUSP	SUSPENDED
SUSP CLG	SUSPENDED CEILING
SYM	SYMBOL
T&G	TONGUE AND GROOVE
TEMP	TEMPORARY
THK	THICKNESS
THRU	THROUGH
TO	TOP OF
TO FDN	TOP OF FOUNDATION
TOB	TOP OF BEAM
TOM	TOP OF MASONRY
TOP	TOP OF PARAPET
TOS	TOP OF STEEL
TYP	TYPICAL
UFC	UNIFORM FIRE CODE
UNO	UNLESS NOTED OTHERWISE
VAR	VARIES OR VARIATION
VB	VINYL BASE
VCT	VINYL COMPOSITION TILE
VERT	VERTICAL
VIF	VERIFY IN FIELD
VTR	VENT THROUGH ROOF
W	WEST OR WIDE
W/	WITH
W/O	WITHOUT
WD	WOOD
WF	WIDE FLANGE
WT	WEIGHT
X BRACE	CROSS BRACE
YD	YARD

PHASE 2 - PROJECT DESCRIPTION

RENOVATION OF THE CULTURAL BUILDING TO REMOVE ASBESTOS CONTAINING MATERIALS AND TO UPGRADE THE MECHANICAL SYSTEMS. ARCHITECTURAL FEATURES, BUILDING SYSTEMS AND DEVICES THROUGHOUT SHALL BE REMOVED AND REINSTALLED TO ACCOMMODATE THE ASBESTOS ABATEMENT ACTIVITIES. ARCHITECTURAL, STRUCTURAL, ELECTRICAL AND BUILDING AUTOMATION SYSTEMS MODIFICATIONS ARE INCLUDED AS NECESSARY TO SUPPORT THE MECHANICAL SYSTEM UPGRADES.

THE PROJECT INCLUDES PROVIDING PROTECTIVE ENCLOSURES FOR PROTECTION OF EXHIBITS REMAINING IN PLACE DURING THE WORK. EXHIBIT PROTECTION SHALL BE CONSTRUCTED PRIOR TO ASBESTOS ABATEMENT ACTIVITIES AND REMAIN IN PLACE FOR THE DURATION OF THE RENOVATION ACTIVITIES.

THE EXISTING BUILDING IS APPROXIMATELY 161,205 SF ON FIVE FLOORS AND A PARTIAL BASEMENT. THE INTERIOR SPACES INCLUDE MUSEUM EXHIBITS, ARCHIVES STORAGE, LIBRARY STACKS, PUBLIC LIBRARY SPACE, PUBLIC RESEARCH SPACE, MEETING SPACE, SEPARATE ADMINISTRATIVE SPACE FOR ALL THREE CULTURAL AGENCIES, A WORKSHOP, A MAILROOM, A LOADING DOCK, AND GENERAL STORAGE. ASBESTOS CONTAINING MATERIAL IS PRESENT THROUGHOUT MUCH OF THE BUILDING, INCLUDING SPRAY-APPLIED FIRE-PROOFING.

GENERAL NOTES

1. ALL WORK INCLUDED IN THIS CONTRACT SHALL CONFORM TO ALL STATE, NATIONAL AND OTHER CODES AND ORDINANCES WHICH APPLY TO THIS PROJECT.
2. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS PRIOR TO CONSTRUCTION AND REPORT ANY DISCREPANCIES TO THE ARCHITECT. THE CONTRACTOR SHALL PROCEED WITH THE WORK ONLY AFTER THE DISCREPANCIES HAVE BEEN RESOLVED AND APPROVED BY THE ARCHITECT AND OWNER.
3. THE CONTRACTOR SHALL PROTECT EXISTING SYSTEMS AND SURFACES TO REMAIN. ALL DAMAGE RESULTING FROM THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED AS APPROVED BY THE ARCHITECT AT NO ADDITIONAL COST TO THE OWNER.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS WHICH ARE REQUIRED FOR THE SATISFACTORY COMPLETION OF WORK.
5. THE CONTRACTOR SHALL PROVIDE BARRICADES AT ALL WORK AREAS TO PREVENT PERSONNEL FROM ENTERING AREAS OF WORK.
6. THE CONTRACTOR SHALL COORDINATE THE TIMING AND SEQUENCE OF WORK WITH THE OWNER.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL AND DISPOSAL OF ALL DEMOLITION MATERIALS UNLESS NOTED TO SALVAGE AND TURN OVER TO THE OWNER.
8. COORDINATE CLEANING OF THE WORK AREA WITH ALL APPLICABLE CITY, STATE AND FEDERAL REGULATIONS.
9. EXECUTE WORK IN A CAREFUL AND ORDERLY MANNER WITH LEAST POSSIBLE DISTURBANCE TO THE PUBLIC AND BUILDING OCCUPANTS.
10. DIMENSIONS OF ALL REPLACEMENT MATERIALS SHALL MATCH EXISTING MATERIAL DIMENSIONS, UNLESS NOTED OTHERWISE.

ADDITIVE BID ALTERNATES

BID ALTERNATE 1:

ELECTRICAL:

- REMOVE EXISTING GENERATOR AND TRANSFER SWITCH. MAINTAIN EXISTING FEEDERS.
- PROVIDE REPLACEMENT GENERATOR AND TRANSFER SWITCH. CONNECT EXISTING FEEDERS.

BID ALTERNATE 2:

REPLACE EXTERIOR DOORS, WINDOWS AND GLAZING SYSTEMS

ARCHITECTURAL:

- REMOVE EXTERIOR DOORS, WINDOW ASSEMBLIES, AND BLINDS. SALVAGE EXISTING BLINDS FOR REINSTALLATION. PREPARE OPENINGS TO RECEIVE NEW ASSEMBLIES
- PROVIDE REPLACEMENT THERMALLY BROKEN WINDOW ASSEMBLIES. REINSTALL SALVAGED BLINDS IN SAME LOCATION AS EXISTING.
- PROVIDE REPLACEMENT THERMALLY BROKEN CURTAIN WALL SYSTEM
- PROVIDE REPLACEMENT INSULATED EXTERIOR ENTRY DOOR ASSEMBLY AT LOADING DOCK.

B

BID ALTERNATE 3:

EXTERIOR VENEER SURFACE REPAIR & JOINT REPOINTING

ARCHITECTURAL:

- RAKE OUT AND REPOINT GRANITE PANEL HARD JOINTS
- RAKE OUT AND REPOINT GRANITE PANEL SOFT SEALANT JOINTS
- RAKE OUT AND REPOINT LIMESTONE PANEL HARD JOINTS
- RAKE OUT AND REPOINT CONCRETE PANEL SOFT SEALANT JOINTS
- RAKE OUT AND REPOINT SURFACE/MATERIAL TRANSITIONS

BID ALTERNATE 4:

EXTERIOR SURFACE CLEANING AND PRESERVATION

ARCHITECTURAL:

- CLEAN AND PRESERVE LIMESTONE PANELS OF STAINING AND DEGRADATION
- PATCH AND REPAIR CRACKED AND DAMAGED CEMENTITIOUS COATING ON CONCRETE SURFACES

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LICENSED ARCHITECT
ELIZABETH HUCKINS
No. 4338
STATE OF MAINE
2/8/2022

CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	EAH
DESIGNED BY:	TCM
DRAWN BY:	JLR

SHEET TITLE:
GENERAL INFORMATION

SHEET ID:
GI004B

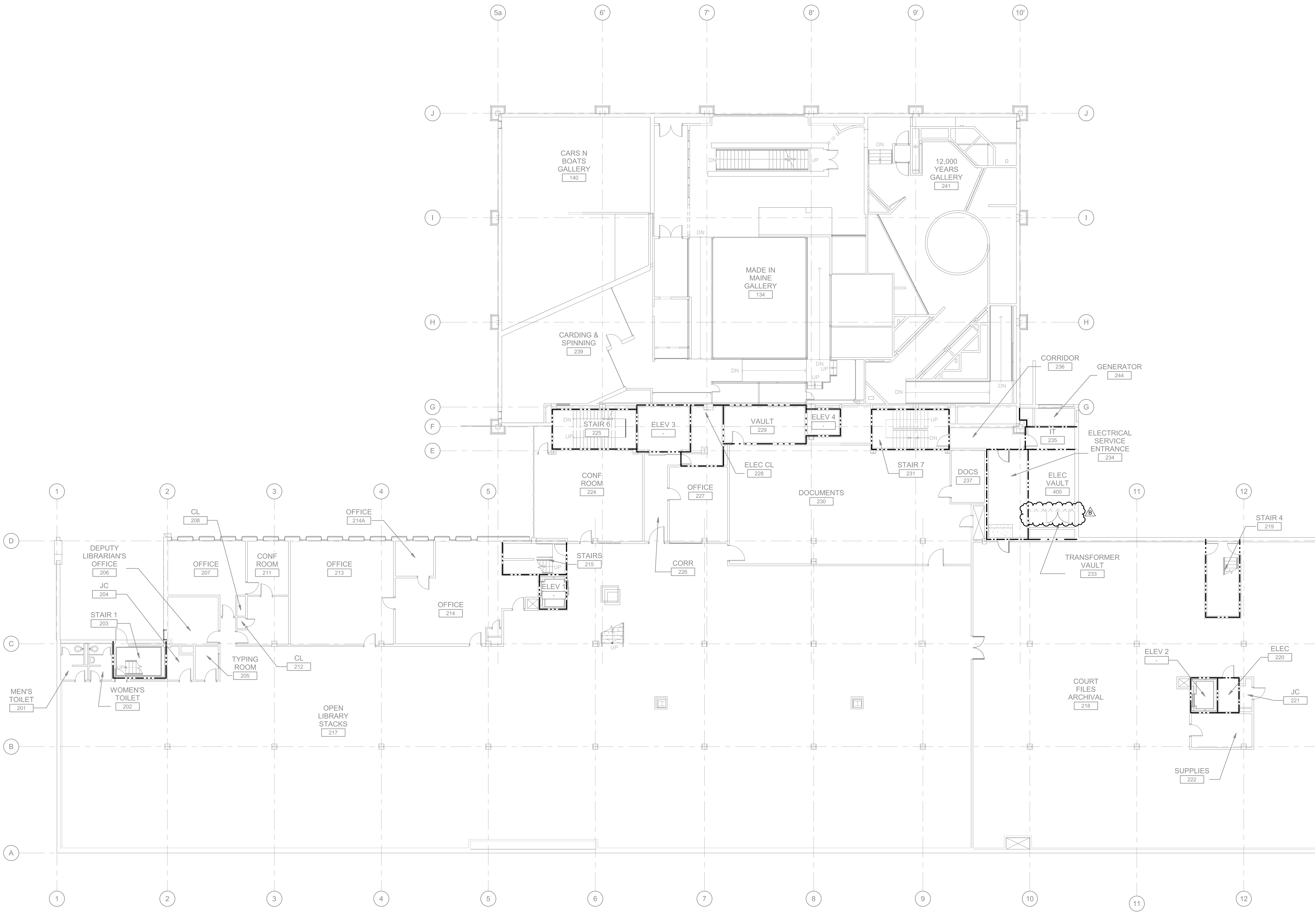
NOT FOR CONSTRUCTION

NOTES

1. SEE SHEET A-001 FOR LEGENDS, SYMBOLS AND GENERAL NOTES.
2. EGRESS TO REMAIN AS IS UNO
3. FIRE RATED PARTITIONS SHOWN ARE EXISTING UNLESS NOTED OTHERWISE.
4. EXISTING FIRE RATED PARTITIONS SHOWN ARE BASED ON BEST PRESENT KNOWLEDGE, EG., AS-BUILT DOCUMENTS. THIS INFORMATION IS PROVIDED FOR COORDINATION PURPOSES WITHOUT GUARANTEE OF ACCURACY. CONTRACTOR IS RESPONSIBLE FOR VERIFYING EXISTING CONDITIONS INCLUDING EXISTING CONSTRUCTION TO MAINTAIN INTEGRITY OF EXISTING PASSIVE FIRE PROTECTION FEATURES. IF DISCREPANCIES ARE FOUND BETWEEN THESE DRAWINGS AND FIELD CONDITIONS, NOTIFY THE ARCHITECT PRIOR TO PROCEEDING WITH THE WORK.
5. PATCH EXISTING PENETRATIONS IN FIRE-RATED CONSTRUCTION NOT OTHERWISE NOTED OR REQUIRED FOR THE WORK TO BE REUSED OR INFILLED. PATCH SHALL MAINTAIN INTEGRITY OF EXISTING PASSIVE FIRE PROTECTION FEATURES. REFER TO SPECIFICATIONS FOR ALLOWANCE.

LEGEND

- 1 HOUR FIRE RATED PARTITION
- 2 HOUR FIRE RATED WALL
- 2 1/2 HOUR FIRE RATED WALL
- 3 HOUR FIRE RATED WALL
- SIX HOUR FIRE RATED WALL
- 2 HOUR FIRE RATED CEILING OR SOFFIT

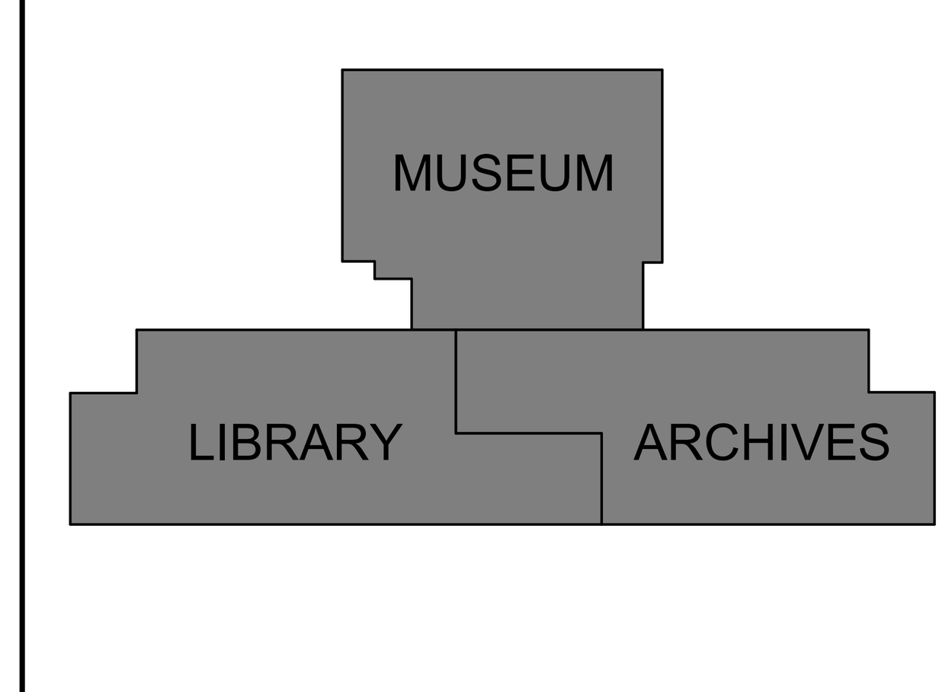


A1 SECOND LEVEL FIRE RATED PARTITIONS

3/32" = 1'-0"

PLAN NORTH

KEY PLAN



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LICENSED ARCHITECT ELIZABETH HUCKINS No. 4338 STATE OF MAINE
2/8/2022

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JANUARY 7, 2022

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STATE OF MAINE CULTURAL BUILDING
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REV.	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	EAH
DESIGNED BY:	TCM
DRAWN BY:	SMB

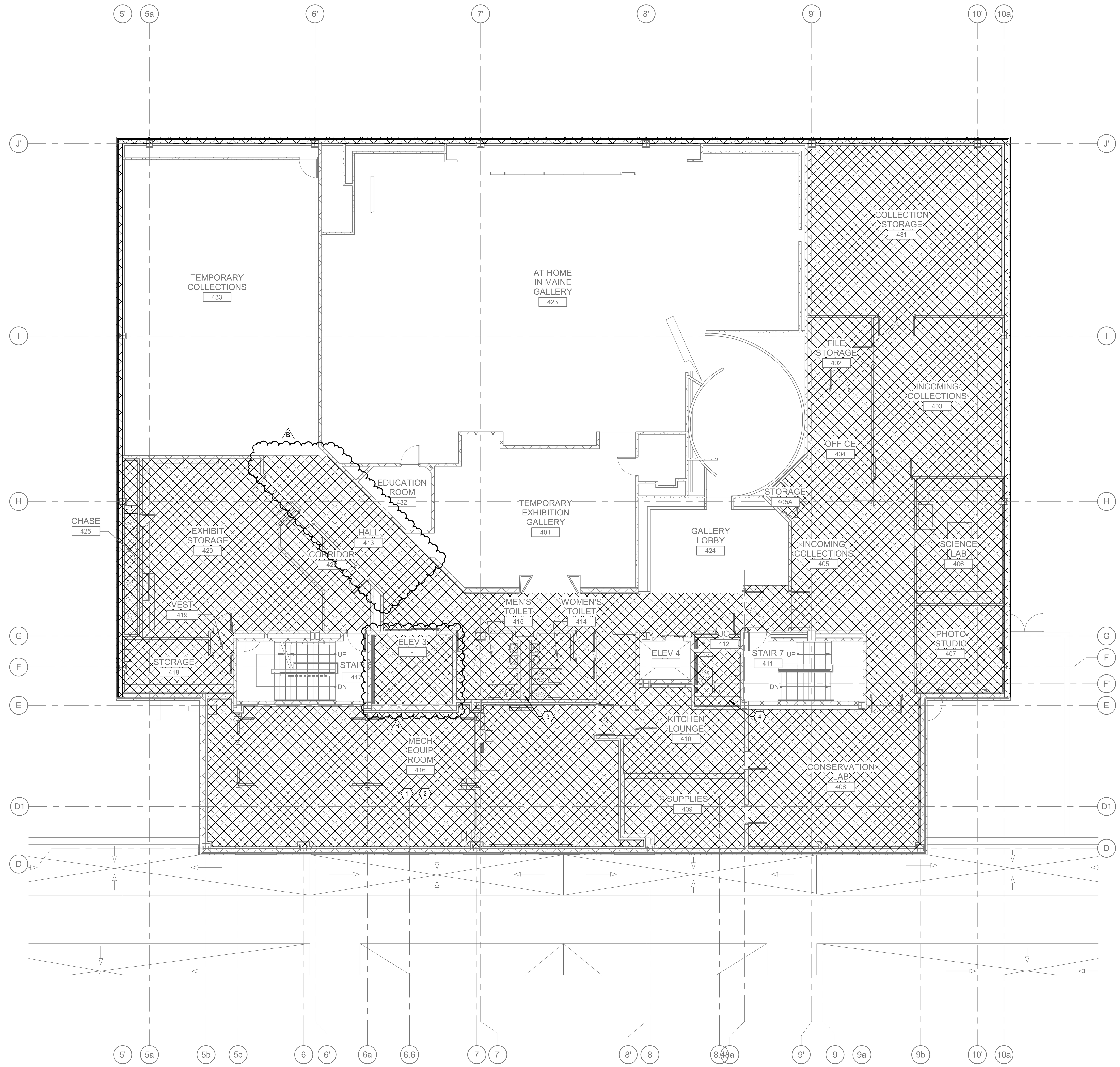
SHEET TITLE:
SECOND LEVEL FIRE RATED PARTITIONS

SHEET ID:
GI112

NOT FOR CONSTRUCTION

LEGEND

- ACM SPRAY ON FIREPROOFING
- EXTERIOR SOFFIT WITH ACM SPRAY ON FIREPROOFING WITHIN SOFFIT
- EXTENTS OF ABATEMENT PHASE
- PERMANENT AIR TIGHT BARRIER



A1 MUSEUM - FOURTH LEVEL ABATEMENT PLAN

1/8" = 1'-0"

PLAN NORTH

NOTES

1. SEE SHEET AE001 FOR SYMBOLS, LEGENDS AND GENERAL NOTES.
2. SEE SHEET GI004B FOR AZ-MAT LEGEND.
3. SEE AE100-SERIES FOR EXHIBIT PROTECTION TO BE PROVIDED PRIOR TO ABATEMENT ACTIVITIES.
4. EXTENSIVE ASBESTOS CONTAMINATION FROM EXISTING ASBESTOS-CONTAINING SPRAY-ON FIREPROOFING, IS PRESENT THROUGHOUT THE EXISTING CEILING PLENUM (ABOVE BOTH THE SUSPENDED CEILINGS AND "HARD" CEILINGS), AS WELL AS ON HORIZONTAL SURFACES BELOW EXPOSED ASBESTOS-CONTAINING SPRAY-ON FIREPROOFING. ASBESTOS CONTAMINATION IS ALSO ASSUMED TO BE PRESENT WITHIN WALL CHASES AND WITHIN OPENINGS IN EXISTING WALL SYSTEMS. UNLESS OTHERWISE NOTED ALL NON-ASBESTOS DEMOLITION, WORK SHALL BE PERFORMED WITHIN A NEGATIVE PRESSURE CONTAINMENT SYSTEM. PRIOR TO COMMENCEMENT OF SPRAY-ON FIREPROOFING REMOVAL, CLEAN AND PROTECT WALL OPENINGS (E.G., TOP OF CMU WALLS) TO PREVENT ASBESTOS-CONTAINING DEBRIS FROM ENTERING THE OPENINGS.
5. ABATEMENT CONTRACTOR SHALL BE RESPONSIBLE FOR CONFIRMING THAT ELECTRICAL COMPONENTS WITHIN EACH WORK AREA HAVE BEEN DE-ENERGIZED.
6. PRIOR TO COMMENCEMENT OF ASBESTOS ABATEMENT, OPENINGS IN EXISTING "TO REMAIN" LIGHTING BRANCH CIRCUIT CONDUITS AND JUNCTION BOXES SHALL BE IDENTIFIED. OPENINGS INCLUDE BUT ARE NOT LIMITED TO MISSING FACEPLATES AND KNOCKOUT SEALS. WHERE OPENINGS ARE IDENTIFIED, INVESTIGATE AND CLEAN CONDUIT AND JUNCTION BOX INTERIORS AND REPORT FINDINGS TO OWNER'S REPRESENTATIVE. PROTECT EXISTING OPENINGS DURING ASBESTOS SPRAY-ON FIREPROOFING ABATEMENT.
7. REMOVE AND PROPERLY DISPOSE OF LIGHT FIXTURES, CEILING FANS AND ASSOCIATED COMPONENTS (INCLUDING BULBS AND BALLASTS) AND WHIP TO THE NEAREST JUNCTION BOXES AND WIRE CAP THE FEEDER WIRES. BULBS AND BALLASTS SHALL BE DISPOSED OF IN ACCORDANCE WITH APPLICABLE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION (MDEP) UNIVERSAL WASTE/HAZARDOUS WASTE REGULATIONS. ALL FIXTURES ARE ASSUMED TO BE ASBESTOS CONTAMINATED. REFER TO SHEETS HD121 – HD127 FOR EXISTING LIGHTING PLAN.
8. REMOVE AND DISPOSE SUSPENDED CEILINGS (INCLUDING GRID AND HANGERS) AND "HARD" CEILINGS (E.G., PLASTER/LATHE, DRYWALL) AS NOTED. ASSUME "HARD" CEILING SYSTEMS ARE ASBESTOS CONTAMINATED. REFER TO SHEETS HD101 – HD107 FOR EXISTING CEILING PLANS.
9. REMOVE AND DISPOSE OF EXPOSED VENTILATION DUCT SYSTEM (INCLUDING HANGERS AND NON-ASBESTOS INSULATION) AS WELL AS THOSE PRESENT ABOVE SUSPENDED AND "HARD" CEILING SYSTEMS. WHERE DUCTS PENETRATE CEILING DECK OR ENTER NON-WORK AREA SPACES, DUCTS SHALL BE CUT SUCH THAT THEY CAN BE SEALED (AIR-TIGHT) WITH FIRE RATED POLYETHYLENE (POLY) SHEETING. ALL WORK SHALL BE COORDINATED WITH THE OWNER. REFER TO SHEETS HD111 – HD117 FOR EXISTING MECHANICAL PLAN.
10. WHERE ACCESS TO SPRAY-ON FIREPROOFING IS RESTRICTED (E.G., BEHIND OR UNDER FIXTURES/EQUIPMENT), THE ABATEMENT CONTRACTOR SHALL TEMPORARILY REMOVE THE OBSTRUCTION TO FACILITATE ABATEMENT AND RE-INSTALL ONCE AREA HAS BEEN CLEARED. SHOULD ASBESTOS-CONTAINING MATERIALS BE INACCESSIBLE, THE ABATEMENT CONTRACTOR WILL DOCUMENT LOCATION OF REMAINING MATERIALS AND REPORT TO THE OWNER'S REPRESENTATIVE.
11. REMOVE AND SALVAGE ALL FIRE NOTIFICATION, TELECOMMUNICATIONS, AND DETECTION DEVICES ATTACHED TO CEILING SURFACES INDICATED FOR REMOVALS AND/OR ABOVE FINISHED CEILINGS SYSTEM INDICATED FOR REMOVAL. REMOVE AND DISPOSE OF ASSOCIATED CONDUIT AND WIRING. SALVAGED DEVICES AND EQUIPMENT SHALL BE CLEANED OF ACM AND TURNED OVER TO THE OWNER WITH REQUIRED CLEARANCE DOCUMENTATION UPON COMPLETION OF THE PROJECT. SCHEDULE AND COORDINATE WITH THE OWNER'S FIRE ALARM VENDOR THE DISCONNECTION OF DEVICES FROM THE FIRE NOTIFICATION DEVICES. WALL MOUNTED DEVICES AND CONDUIT SHALL REMAIN UNLESS THE WALL IS SCHEDULED FOR REMOVAL.
12. REMOVE AND DISPOSE OF ALL THERMAL SYSTEM INSULATION (BOTH ASBESTOS AND NON-ASBESTOS) PRESENT ABOVE SUSPENDED CEILING SYSTEM AS WELL AS WITHIN EXPOSED ASBESTOS-CONTAINING SPRAY-ON FIREPROOFING ABATEMENT WORK AREAS.
13. ANY OPEN FLOOR, WALL, OR CEILING PENETRATIONS EXPOSED DURING THE SELECTIVE DEMOLITION AND ASBESTOS ABATEMENT WORK SHALL BE SEALED TO PREVENT POSSIBLE CONTAMINATION OF THE UPPER AND LOWER FLOORS.
14. THE ABATEMENT CONTRACTOR IS RESPONSIBLE FOR PROTECTING ALL SPRINKLER HEADS PRESENT WITHIN THE WORK AREAS. ABATEMENT CONTRACTOR SHALL SUBMIT PROPOSED PROTECTION METHODS FOR REVIEW AND APPROVAL PRIOR TO COMMENCEMENT OF ABATEMENT ACTIVITIES.
15. REFER TO TEMPORARY FACILITIES AND CONTROLS SPECIFICATION FOR FIRE ALARM AND DETECTION SYSTEM REQUIREMENTS AND MODIFICATIONS. SUBMITTALS AS PER SPECIFICATION, MUST BE APPROVED PRIOR TO ANY DEMOLITION WORK.
16. THE ABATEMENT CONTRACTOR IS RESPONSIBLE FOR PROTECTING ALL REMAINING SURFACE FINISHES (E.G., CARPET, FLOOR TILE, WOOD PANELING, SHEETROCK WALLBOARD, ETC.) FROM DAMAGE THROUGHOUT THE ABATEMENT PROJECT.
17. ON FIRST, SECOND, AND THIRD LEVELS OF THE MUSEUM REMOVE AND DISPOSE OF THE EXISTING WIRES/CABLES SERVING DATA/COMMUNICATION/PHONE THAT ARE AT AND/OR ABOVE THE EXISTING CEILING SYSTEMS OR EXPOSED DECK WITHIN THE WORK AREAS EXCEPT FOR WIRES/CABLES THAT ARE ACTIVE AND SERVE CRITICAL FUNCTIONS (E.G., ELEVATOR CALL BOXES) AS IDENTIFIED BY THE OWNER & OIT. COORDINATE WITH OWNER AND OIT 48-HOURS IN ADVANCE OF TERMINATION/CUTTING OF WIRES/CABES. WIRES/CABLES ON THE FOURTH AND FIFTH LEVELS OF THE MUSEUM SHALL REMAIN. EXISITNG WIRES/CABLES INDICATED TO REMAIN SHALL BE CLEANED AND SUSPENDED FROM THE DECK/BUILDING STRUCTURE UPON COMPLETION OF ABATEMENT. PROTECT AND TEMPORARILY SUSPEND WIRES/CABLES DURING ABATEMENT AS REQUIRED. EXISTING WIRES/CABLES SCHEDULED FOR DISPOSAL SHALL BE DISPOSED OF AS ASBESTOS-CONTAINING WASTE.
18. CEILING MOUNTED TOILET COMPARTMENTS AND FIXTURES IN RESTROOMS AFFECTED BY CEILING REMOVAL SHALL REMAIN IN PLACE DURING THE REMOVAL/DEMOLITION. THE ABATEMENT CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARILY SUPPORTING THE AFFECTED STALLS AND FIXTURES.

KEYED NOTES

1 REMOVE ALL MECHANICAL ITEMS ASSOCIATED WITH THE EXISTING AIR-HANDLING SYSTEM INCLUDING AIR-HANDLERS, DUCTS, CONTROLS, STEAM AND CONDENSATE RETURN PIPING, STEAM HEATING COILS, CHILLED WATER PIPING, SUPPORTS, HANGERS, CONTROL WIRING, AND PNEUMATIC TUBING. ALL MECHANICAL EQUIPMENT TO BE DECONTAMINATED PRIOR TO DEMOLITION. EQUIPMENT TO BE REMOVED FOR DISPOSAL OR RECYCLING BY THE ABATEMENT CONTRACTOR.

2 EQUIPMENT TO REMAIN IN PLACE WITHIN ROOM 416 – LEVEL FOUR MECHANICAL ROOM INCLUDES THE AIR COMPRESSOR PLUMBING PIPING & VENTS, ROOF DRAIN PIPING AND ASSOCIATED PIPING.

3 FOR PLUMBING CHASES ASSOCIATED WITH RESTROOMS AND JANITOR'S CLOSETS THAT ARE OPENED/EXPOSED DURING CEILING SYSTEM REMOVAL. OPENINGS SHALL BE CLEANED TO FACILITATE SEALING WITH TWO LAYERS OF SIX-MIL POLYETHYLENE (POLY) SHEETING

4 VERTICAL DUCT SHAFT, TO BE ABATED, ASSOCIATED VENTILATION DUCTS AND HYDRONIC PIPING REMOVED AND DISPOSED OF. WALL DEMOLITION MAY BE REQUIRED TO PROVIDE SUFFICIENT ACCESS TO THE SHAFT ON LEVELS 2, 3 AND 4.SEE ARCHITECTURAL DRAWINGS FOR AREAS TO BE DEMOLISHED AND INFILLED.

5 ACM PRESENT ABOVE CEILINGS IN EXHIBITS 2.02, 2.17 AND 2.18 SHALL BE ACCESSED THROUGH AN ACCESS DOOR IN EXHIBIT 2.02 ADJACENT TO KITCHEN DISPLAY. REFER TO A-001 FOR EXHIIBIT LEGEND. WORK IN THIS AREA SHALL BE COORDINATED WITH MUSEUM PERSONNEL. THE ABATEMENT CONTRACTOR WILL BE RESPONSIBLE FOR PROTECTING DISPLAY ITEMS PRESENT WITHIN THESE ROOMS DURING ABATEMENT WORK

6 PERMANENT, SOLID BARRIERS TO BE CONSTRUCTED FROM EXISTING CEILING SURFACES TO FLOOR DECK ABOVE TO ENCAPSULATE AREAS NOT INCLUDED IN THE WORK. SEE ARCHITECTURAL DRAWINGS FOR ADDITIONAL INFORMATION. IN ADDITION TO SOLID BARRIERS, AIR-TIGHT POLYETHYLENE (POLY) BARRIERS (COMPRISED OF A MINIMUM OF TWO LAYERS OF SIX-MIL POLY) SHALL BE INSTALLED. WARNING SIGNS (OSHA 1910.1001 (J)(4)(II)) SHALL BE POSTED AT EIGHT-FOOT INTERVALS ON THE EXPOSED SURFACE OF THE BARRIERS

7 PROVIDE TEMPORARY SUPPORT UP TO DECK WHERE EXHIBIT PARTITIONS ARE ATTACHED TO THE STRUCTURAL CEILING GRID SYSTEM BEING REMOVED AS PART OF ABATEMENT WORK

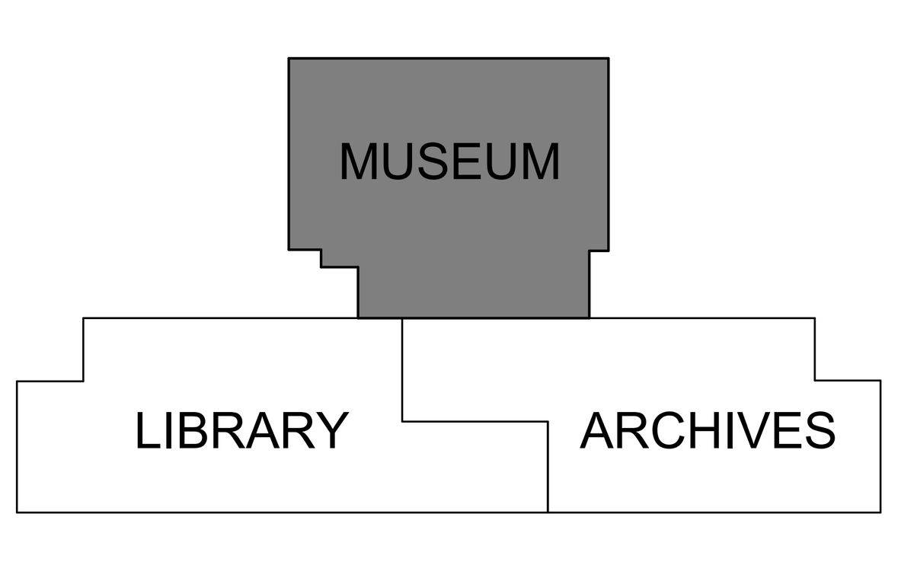
8 REMOVE EXISTING CEILING SYSTEM IN ITS ENTIRETY

9 SOFFITS PRESENT AROUND THE PERIMETER OF THE THIRD LEVEL TO BE REMOVED TO FACILITATE ABATEMENT OF ASBESTOS SPRAY ON FIREPROOFING PRESENT WITHIN THE SOFFITS. LIGHT FIXTURES ASSOCIATED WITH THE EXTERIOR SOFFITS ARE CONSIDERED TO BE ASBESTOS CONTAMINATED AND SHALL BE REMOVED AS PART OF THE ASBESTOS ABATEMENT WORK

10 NON-ASBESTOS SUSPENDED CEILING SYSTEM (NO ACM SPRAY ON FIREPROOFING TO BE REMOVED AND DISPOSED OF

11 REMOVE EXISTING SOFFIT IN ITS ENTIRETY

KEY PLAN



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CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7 , 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

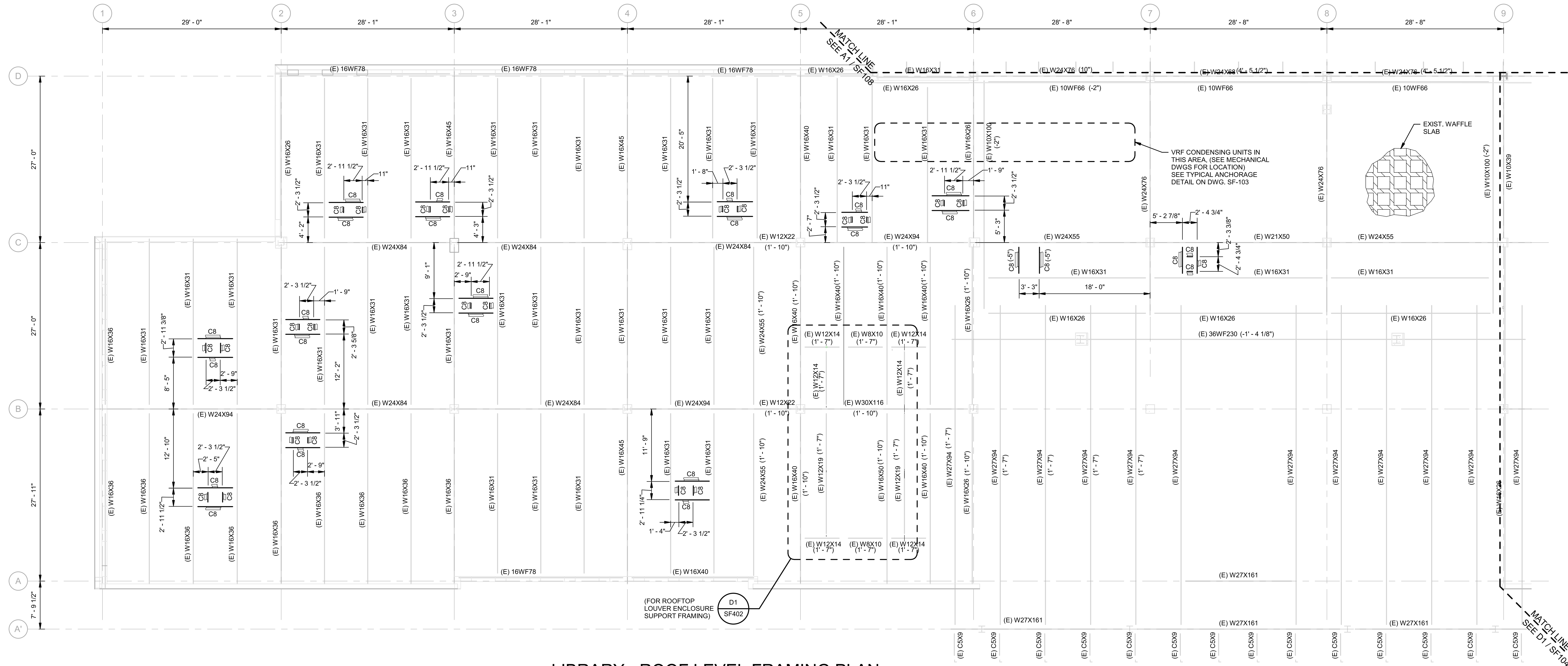
REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	DBK
DESIGNED BY:	DBK
DRAWN BY:	JNB

SHEET TITLE:
MUSEUM - FOURTH LEVEL HAZARDOUS ABATEMENT PLAN

SHEET ID:
HA108

NOT FOR CONSTRUCTION

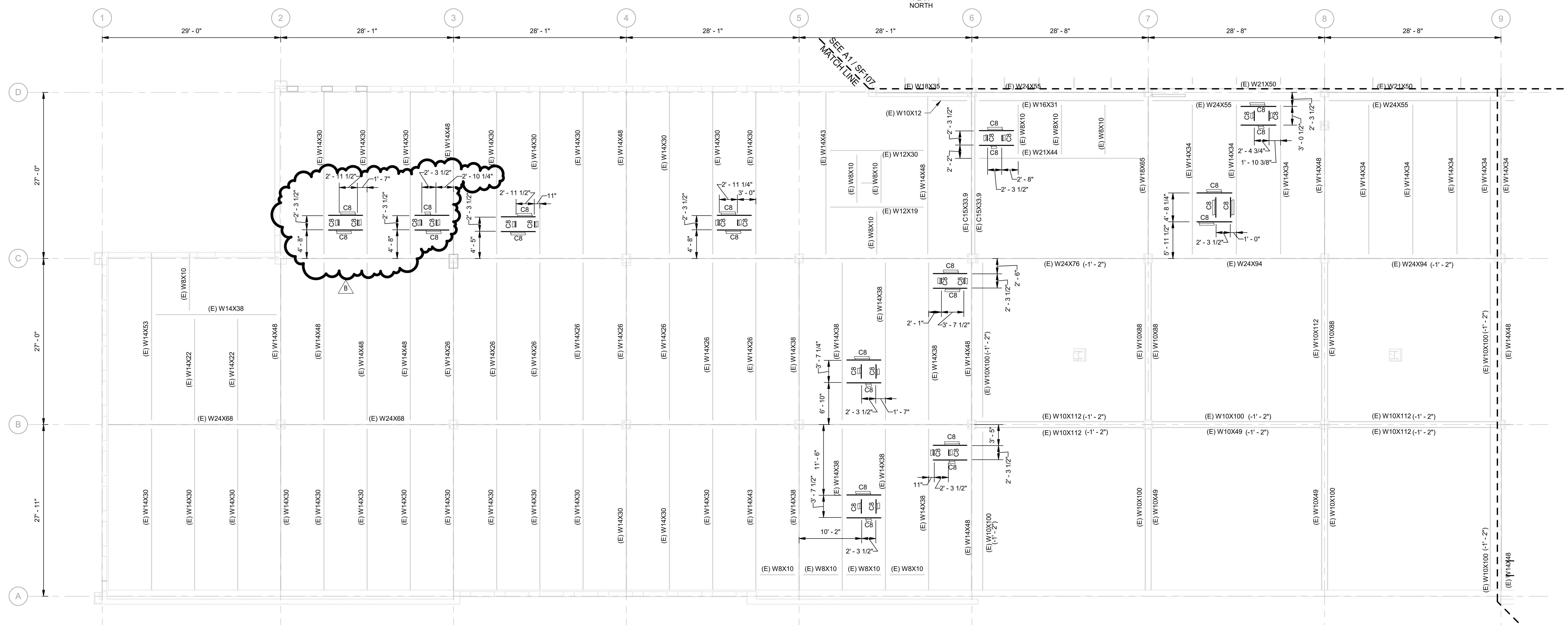


LIBRARY - ROOF LEVEL FRAMING PLAN
AT T.O.S. EL. 143'-8 1/2"(U.N.O.)

D1

1/8" = 1'-0"

PLAN NORTH



LIBRARY - THIRD LEVEL FLOOR FRAMING PLAN
AT T.O.S. EL. 131'-7" (U.N.O.)

A1

1/8" = 1'-0"

PLAN NORTH

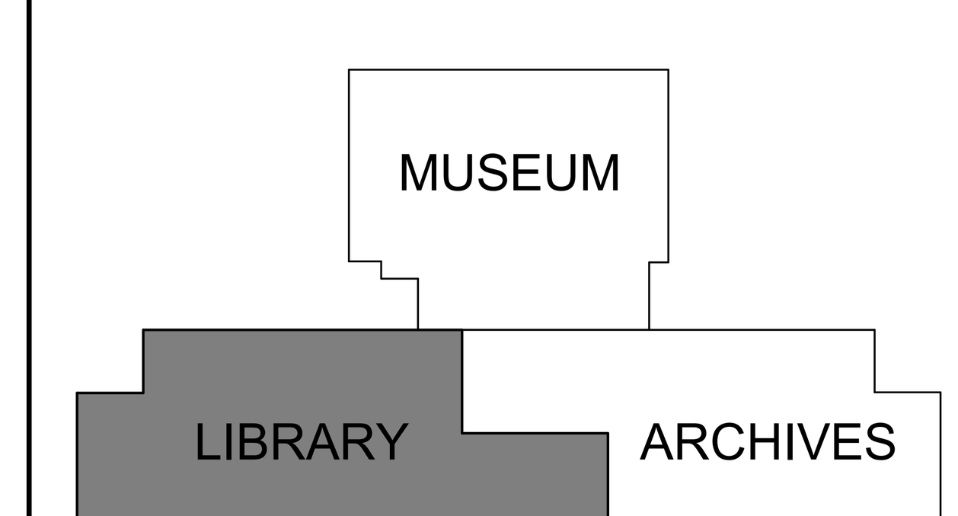
NOTES

1. FOR STRUCTURAL DESIGN CRITERIA AND GENERAL NOTES SEE DRAWINGS S-001.
2. SEE TYPICAL SUSPENSION ROD TO C8x11.5 CONNECTION DETAIL ON DRAWING S-503 FOR SUPPORTING OF NEW FAN COIL UNITS.
3. FOR TYPICAL STEEL DETAILS AND TYPICAL CONCRETE DETAILS SEE DRAWINGS SF502 AND SF503.

LEGEND

- C8 = C8x11.5 (-8") (U.N.O.)

KEY PLAN



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STATE OF MAINE
Senase G. Adande Kinti
13615
LICENSED PROFESSIONAL ENGINEER

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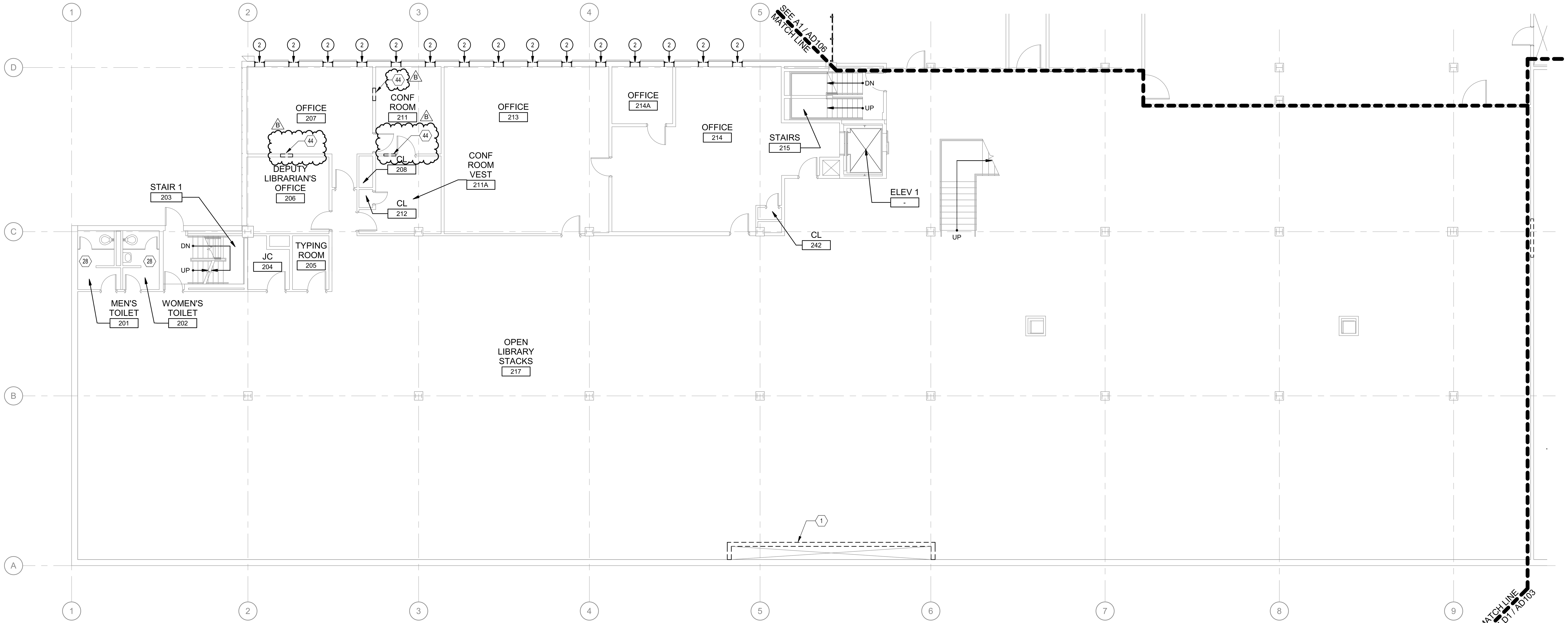
PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	SAK
DESIGNED BY:	JAS
DRAWN BY:	DGP

SHEET TITLE:
LIBRARY - THIRD LEVEL FRAMING PLAN & ROOF LEVEL FRAMING PLAN

SHEET ID:
SF102

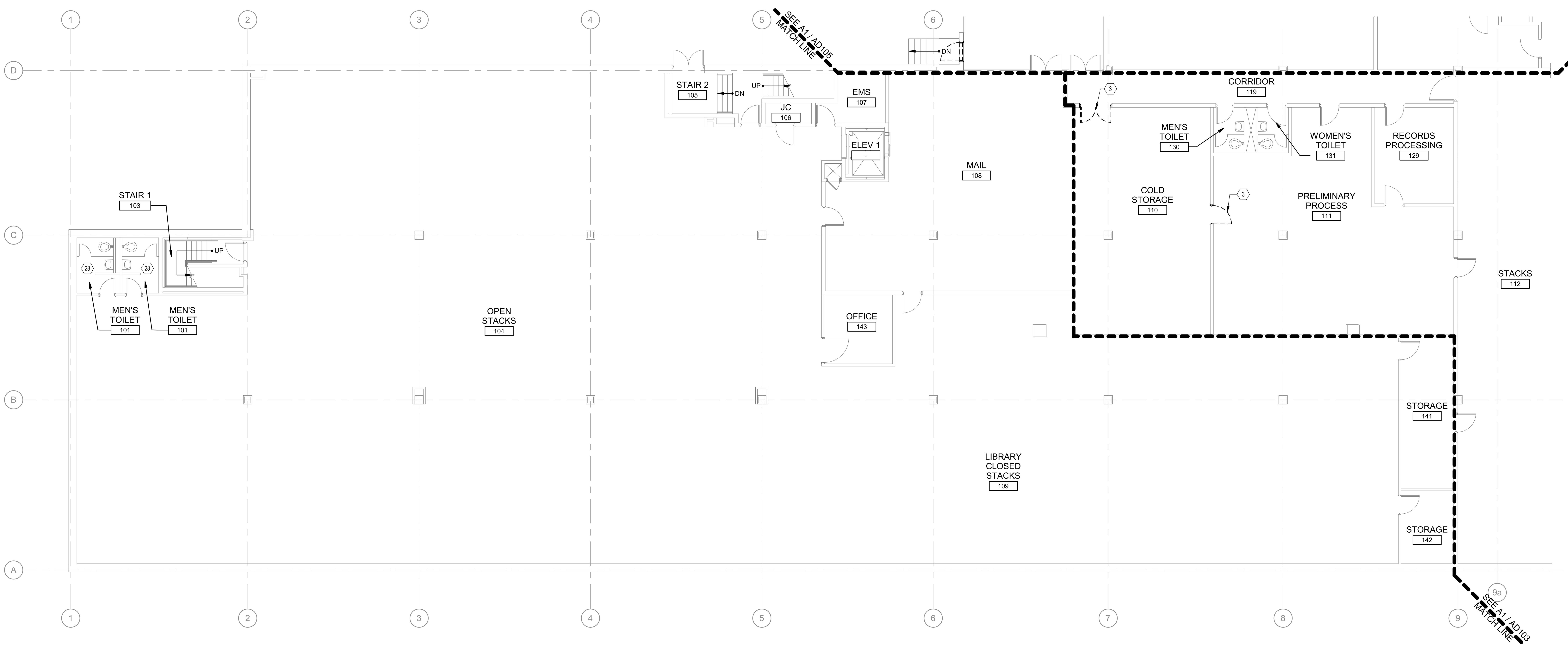
NOT FOR CONSTRUCTION



D1 LIBRARY - SECOND LEVEL DEMOLITION PLAN

1/8" = 1'-0"

PLAN NORTH



A1 LIBRARY - FIRST LEVEL DEMOLITION PLAN

1/8" = 1'-0"

PLAN NORTH

NOTES

1. SEE SHEET A-001 FOR DEMOLITION GENERAL NOTES AND LEGEND
2. THE CONTRACTOR SHALL MAINTAIN THE EXISTING STRUCTURAL AND FIREPROOFING INTEGRITY OF THE ENTIRE BUILDING EXCEPT WHERE OTHERWISE NOTED.
3. UPON DISCOVERY OF HAZARDOUS MATERIALS ENCOUNTERED DURING CONSTRUCTION OTHER THAN THAT IDENTIFIED IN THE PROJECT SCOPE, NOTIFY THE DESIGNER AND OWNER IMMEDIATELY AND AWAIT FURTHER INSTRUCTIONS. THE WORK AREA SHALL BE COMPLETELY SEALED OFF DURING ABATEMENT.
4. WORK INCLUDED IN THE CONTRACT IS ILLUSTRATED IN BOLD DASHED LINE-WORK. EXISTING CONDITIONS TO REMAIN IS ILLUSTRATED IN LIGHT LINE-WORK. UNLESS NOTED OTHERWISE, BOLD-DASHED ITEMS INDICATED SUCH AS: PARTITIONS, DOORS, WINDOWS, EQUIPMENT, ETC. ARE TO BE REMOVED.
5. WHERE THE TERM "REMOVE" IS USED, THE CONTRACTOR SHALL REMOVE FROM THE SITE AND LEGALLY DISPOSE OF.
6. WHERE THE TERM "SALVAGE IS USED, THE CONTRACTOR SHALL REUSE THE EQUIPMENT ON THIS PROJECT OR RETURN TO THE OWNER. STORE SALVAGEABLE MATERIALS IN A LOCATION AS DIRECTED BY THE OWNER.
7. WHERE THE TERM "REMOVE AND REINSTALL" IS USED, THE CONTRACTOR IS TO DETACH ITEMS FROM EXISTING CONSTRUCTION, PREPARE THEM FOR REUSE, AND REINSTALL THEM WHERE INDICATED.
8. WHERE THE TERM "EXISTING TO REMAIN" IS USED, THE EXISTING ITEMS OF CONSTRUCTION ARE NOT TO BE REMOVED.
9. SEE HAZ-MAT REFLECTED CEILING DEMOLITION PLANS (HD1XXX) FOR CEILING DEMOLITION WORK.
10. SEE ENGINEERING DRAWINGS FOR THE REMOVAL OF SPECIFIC STRUCTURAL, MECHANICAL, ELECTRICAL, PLUMBING AND FIRE ALARM SYSTEMS.
11. REINSTALLED EQUIPMENT AND DEVICES ARE TO BE CLEANED OF ALL FOREIGN MATERIAL. REPLACE EQUIPMENT OR DEVICES WHICH ARE DEFECTIVE OR DAMAGED DURING RELOCATION.
12. WHEREVER MECHANICAL, ELECTRICAL, AND PLUMBING DEVICES ARE REMOVED, ALL PIPING AND/OR CONDUITS THAT ARE ABANDONED SHALL BE CAPPED OFF BELOW THE FLOOR, INSIDE THE WALLS, OR ABOVE THE CEILINGS EXCEPT WHERE NOTED OTHERWISE. MECHANICAL/ELECTRICAL CONTRACTOR TO REMOVE ALL UNUSED WIRING TO PANEL BOXES. PATCH AND REPAIR FINISHES TO MATCH SURROUNDING FINISHES.
13. REMOVE WALL BASE IN AREAS WHERE FLOORING IS BEING REMOVED.
14. FLOORS AND WALLS: WHERE WALLS OR PARTITIONS THAT ARE REMOVED EXTEND ONE FINISHED AREA INTO ANOTHER, PATCH AND REPAIR FLOOR AND WALL SURFACES IN THE NEW SPACE TO PROVIDE AN EVEN SURFACE OF UNIFORM FINISH, COLOR, TEXTURE, AND APPEARANCE.
15. PATCH FLOOR/FINISH AT LOCATIONS WHERE RADIATOR PIPING HAS BEEN REMOVED.

KEYED NOTES

1	REMOVE WALLS ENCLOSING CHASE AND ACCESS PANEL
3	REMOVE DOOR, FRAME, AND HARDWARE
28	TEMPORARILY SUPPORT TOILET COMPARTMENTS FOR ABATEMENT ACTIVITY.
44	REMOVE PORTION OF WALL ABOVE LINE OF CEILING FOR MECHANICAL SYSTEM AIR TRANSFER, APPROX. 1 SF, OR 1 CMU BLOCK WHERE OCCURS

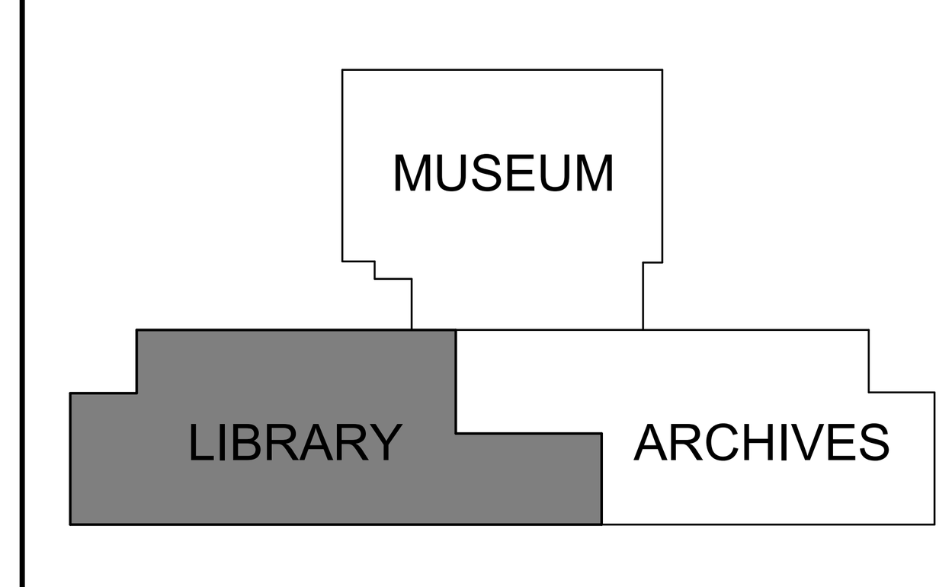
B

ADDITIVE BID ALTS

SEE SHEET GI004B FOR FURTHER BID ALTERNATE INFORMATION

2. BID ALTERNATE 2: REPLACE EXTERIOR DOORS, WINDOWS AND GLAZING SYSTEMS

KEY PLAN



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LICENSED ARCHITECT
ELIZABETH HUCKINS
No. 4338
STATE OF MAINE
2/8/2022

CURRENT ISSUE STATUS:
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JANUARY 7, 2022

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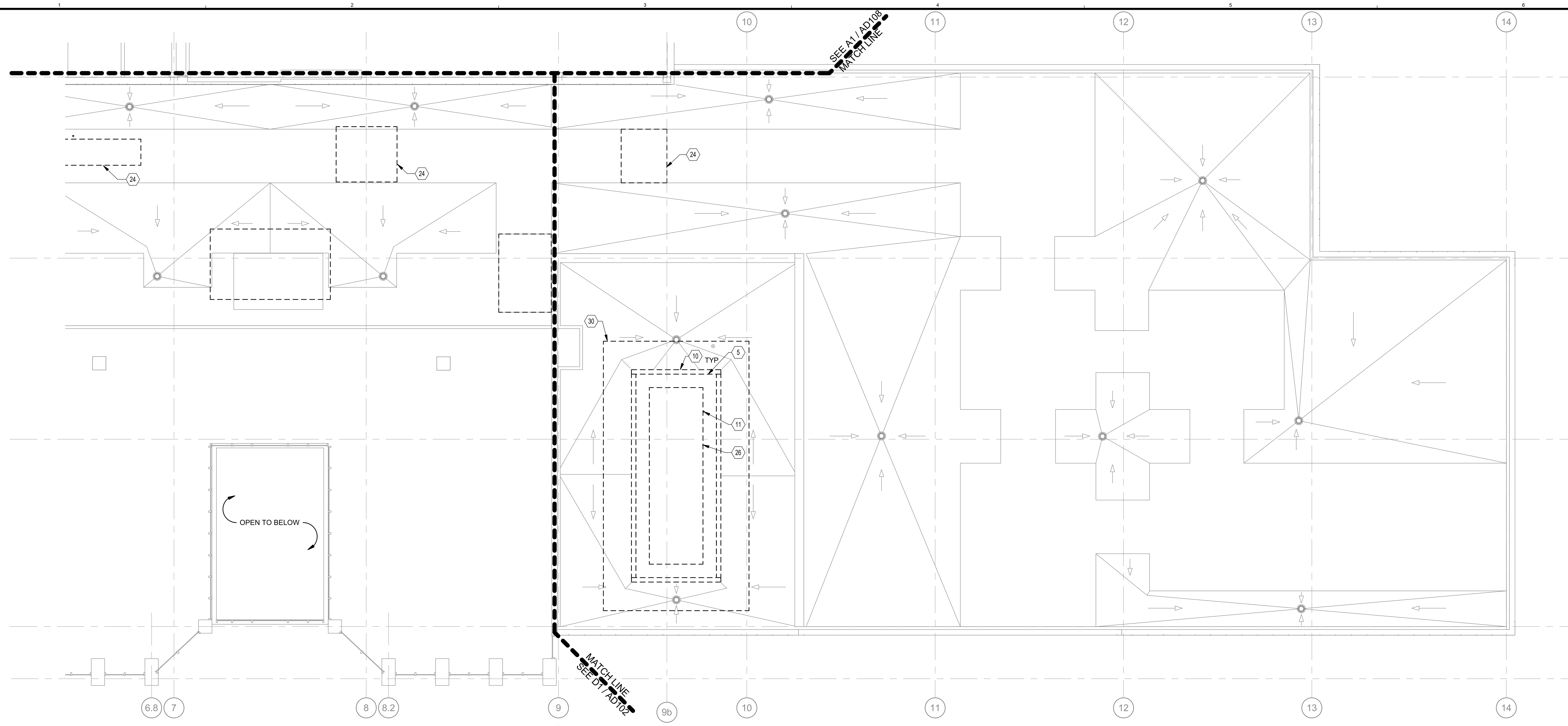
PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	EAH
DESIGNED BY:	TCM
DRAWN BY:	JLR

SHEET TITLE:
LIBRARY - FIRST AND SECOND LEVEL DEMOLITION PLANS

SHEET ID:
AD101

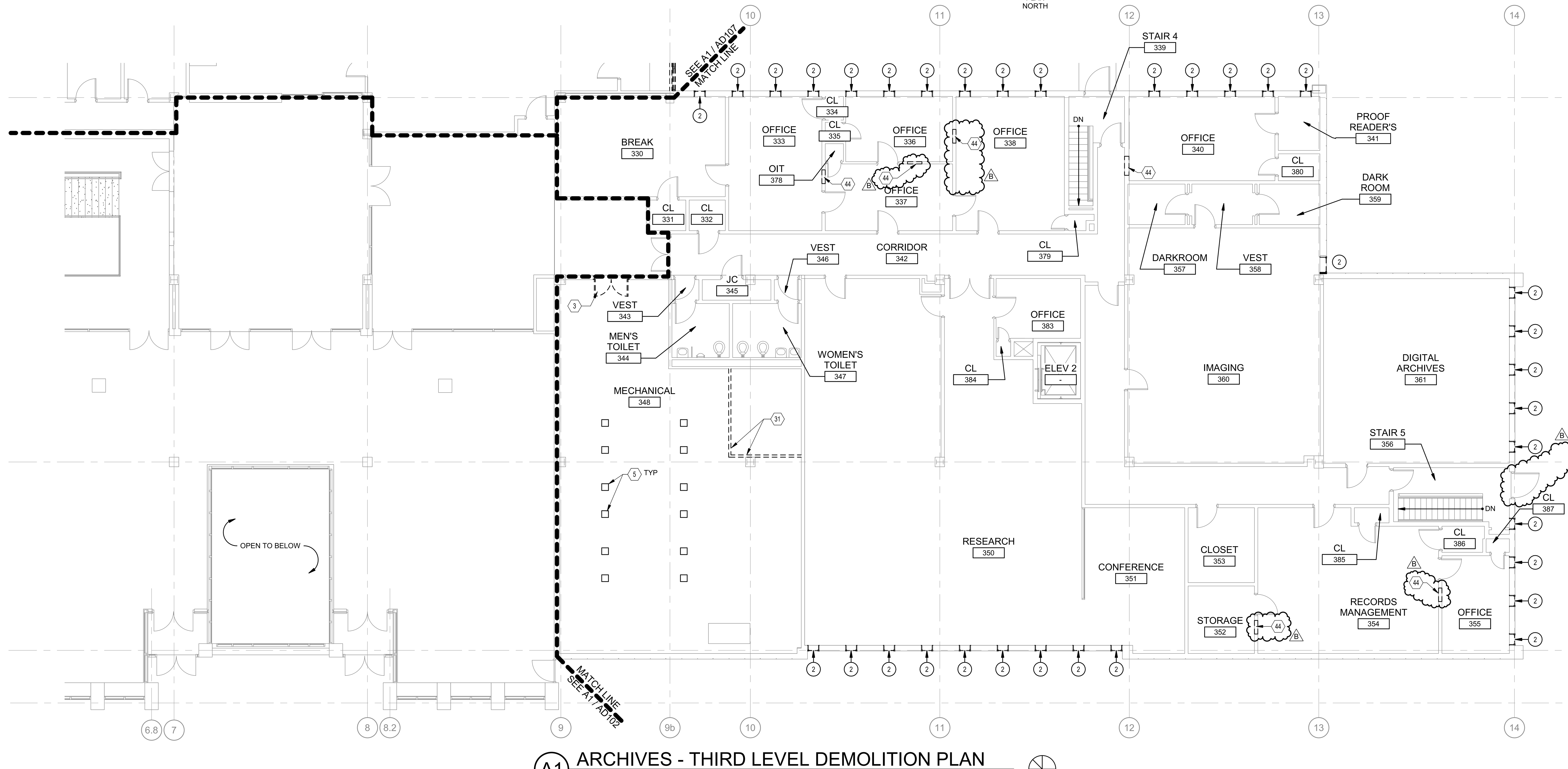
NOT FOR CONSTRUCTION



D1 ARCHIVES - DEMOLITION ROOF PLAN

1/8" = 1'-0"

PLAN NORTH



A1 ARCHIVES - THIRD LEVEL DEMOLITION PLAN

1/8" = 1'-0"

PLAN NORTH

NOTES

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9. SEE HAZ-MAT REFLECTED CEILING DEMOLITION PLANS (HD1XXX) FOR CEILING DEMOLITION WORK.
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13. REMOVE WALL BASE IN AREAS WHERE FLOORING IS BEING REMOVED.
14. FLOORS AND WALLS: WHERE WALLS OR PARTITIONS THAT ARE REMOVED EXTEND ONE FINISHED AREA INTO ANOTHER, PATCH AND REPAIR FLOOR AND WALL SURFACES IN THE NEW SPACE TO PROVIDE AN EVEN SURFACE OF UNIFORM FINISH, COLOR, TEXTURE, AND APPEARANCE.
15. PATCH FLOOR/FINISH AT LOCATIONS WHERE RADIATOR PIPING HAS BEEN REMOVED.

KEYED NOTES

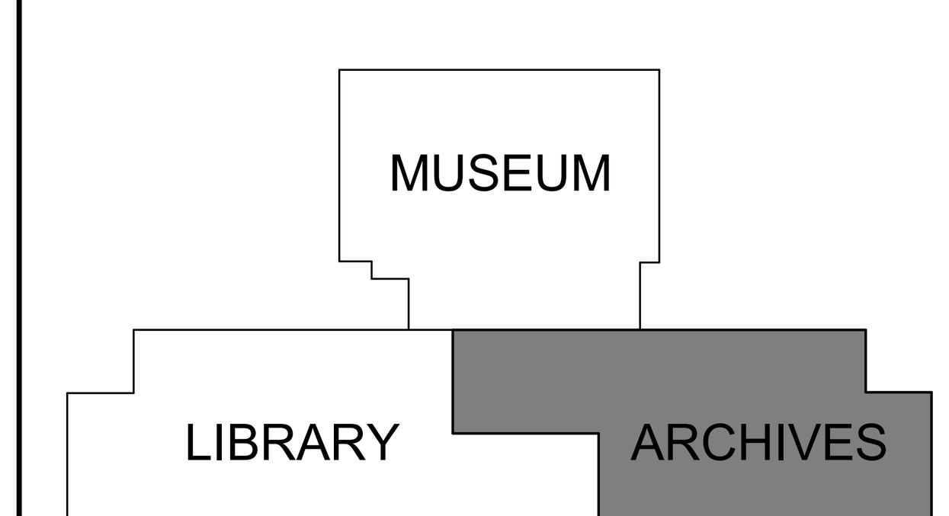
3	REMOVE DOOR, FRAME, AND HARDWARE
5	REMOVE CONCRETE CURB/PEDESTAL IN ITS ENTIRETY. REPAIR SURFACE WHERE CURB IS REMOVED TO BE SMOOTH AND FLUSH WITH ADJACENT FLOOR SURFACE
10	REMOVE PRECAST KNEE WALL
11	LINE OF EXISTING OPENING IN CONCRETE DECK. REMOVE PORTION OF CONCRETE DECK AND CURB TO ENLARGE OPENING TO ALIGN WITH INSIDE EDGE OF NEW STRUCTURAL FRAMING. SEE STRUCTURAL DRAWINGS FOR NEW STEEL LOCATIONS.
24	APPROXIMATE LIMIT LINE: REMOVE PORTION OF ROOFING TO INSTALL EQUIPMENT SUPPORTS DIRECTLY TO DECK
26	REMOVE EXHAUST ENCLOSURE COMPLETE
30	APPROXIMATE LIMIT LINE OF ROOFING WORK: REMOVE EXISTING ROOFING SYSTEM TO THE EXTENT REQUIRED FOR MODIFICATION OF EXISTING STRUCTURE AND TO CONSTRUCT NEW VENTILATION ENCLOSURE. SEE SHEET AE410 FOR ADDITIONAL INFORMATION.
31	REMOVE MECHANICAL CONTROL ENCLOSURE IN ITS ENTIRETY. SEE MECHANICAL FOR ADDITIONAL INFO.
44	REMOVE PORTION OF WALL ABOVE LINE OF CEILING FOR MECHANICAL SYSTEM AIR TRANSFER, APPROX. 1 SF, OR 1 CMU BLOCK WHERE OCCURS

ADDITIVE BID ALTS

SEE SHEET GI004B FOR FURTHER BID ALTERNATE INFORMATION

2. BID ALTERNATE 2:
REPLACE EXTERIOR DOORS, WINDOWS AND GLAZING SYSTEMS

KEY PLAN



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LICENSED ARCHITECT
ELIZABETH HUCKINS
No. 4338
STATE OF MAINE
2/8/2022

CURRENT ISSUE STATUS:
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STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

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B	ADDENDUM NO. 2	02-08-2022
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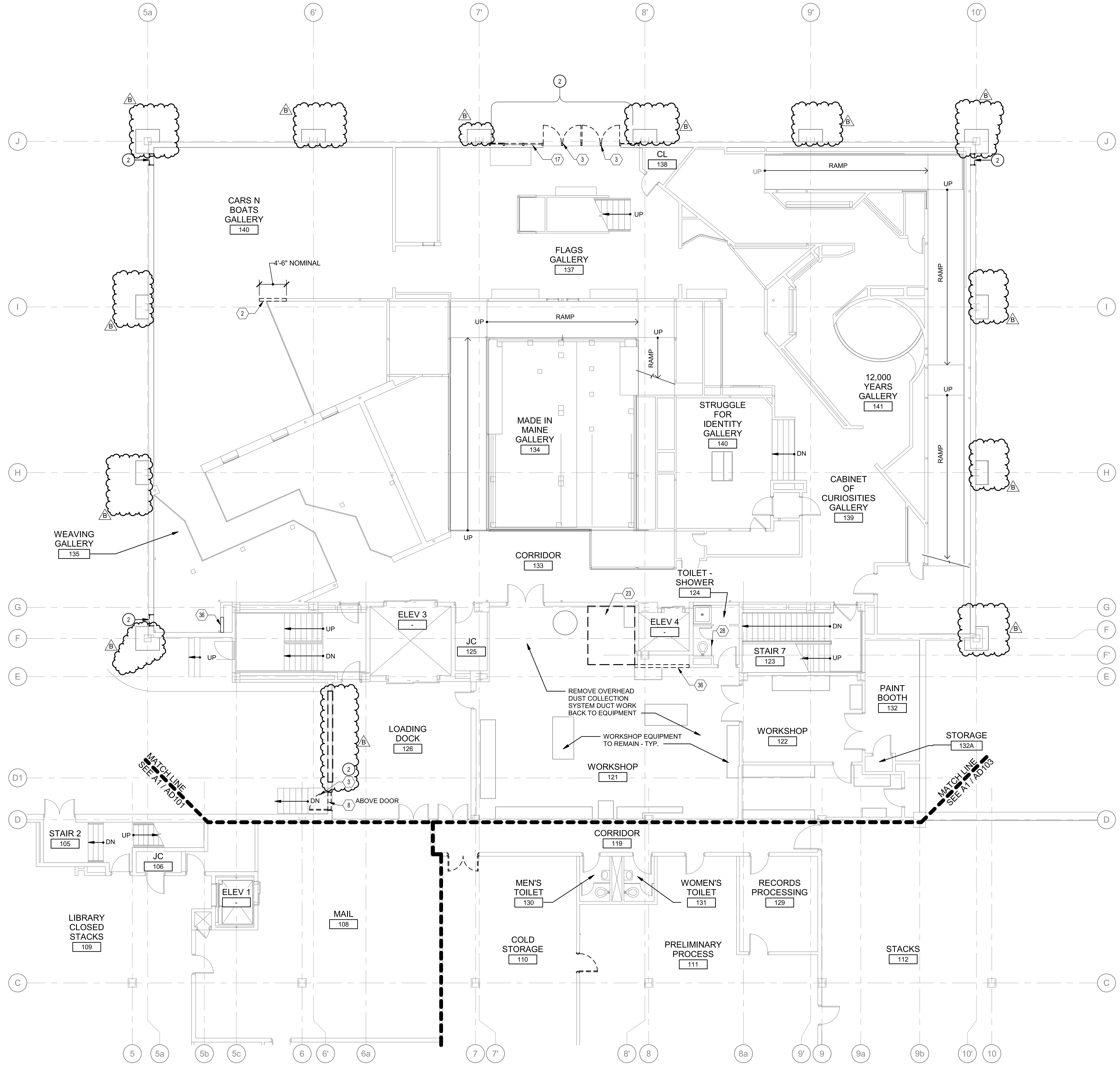
PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	EAH
DESIGNED BY:	TCM
DRAWN BY:	JLR

SHEET TITLE:
ARCHIVES - THIRD LEVEL AND ROOF DEMOLITION PLANS

SHEET ID:
AD104

NOT FOR CONSTRUCTION



A1 MUSEUM - FIRST LEVEL DEMOLITION PLAN

1/8" = 1'-0"

PLAN NORTH

NOTES

1. SEE SHEET A-001 FOR DEMOLITION GENERAL NOTES AND LEGEND
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15. PATCH FLOOR/FINISH AT LOCATIONS WHERE RADIATOR PIPING HAS BEEN REMOVED.

KEYED NOTES

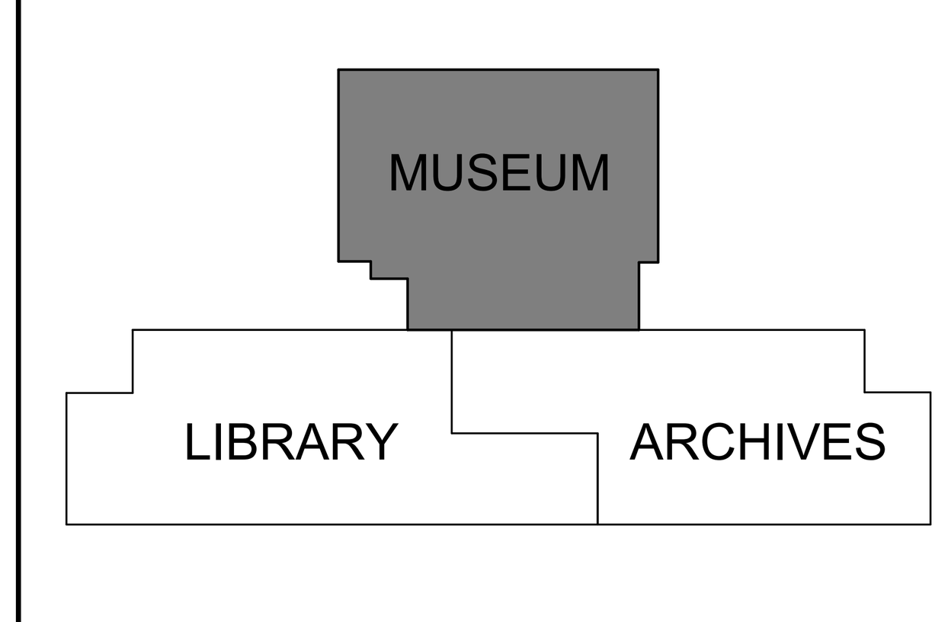
2	REMOVE PORTION OF WALL
3	REMOVE DOOR, FRAME, AND HARDWARE
8	REMOVE EXISTING LOUVER AND EXISTING SCREEN, WHERE OCCURS
17	REMOVE FRAMED GLAZING SYSTEM. REMOVE GWB AND FRAMING AT SPANDREL LOCATION
23	REMOVE LUMBER RACK
28	TEMPORARILY SUPPORT TOILET COMPARTMENTS FOR ABATEMENT ACTIVITY.
36	REMOVE PORTION OF WALL AS REQUIRED FOR ACCESS TO MECHANICAL DUCTS AND PIPING

ADDITIVE BID ALTS

SEE SHEET GI004B FOR FURTHER BID ALTERNATE INFORMATION

2. BID ALTERNATE 2:
REPLACE EXTERIOR DOORS, WINDOWS AND GLAZING SYSTEMS

KEY PLAN



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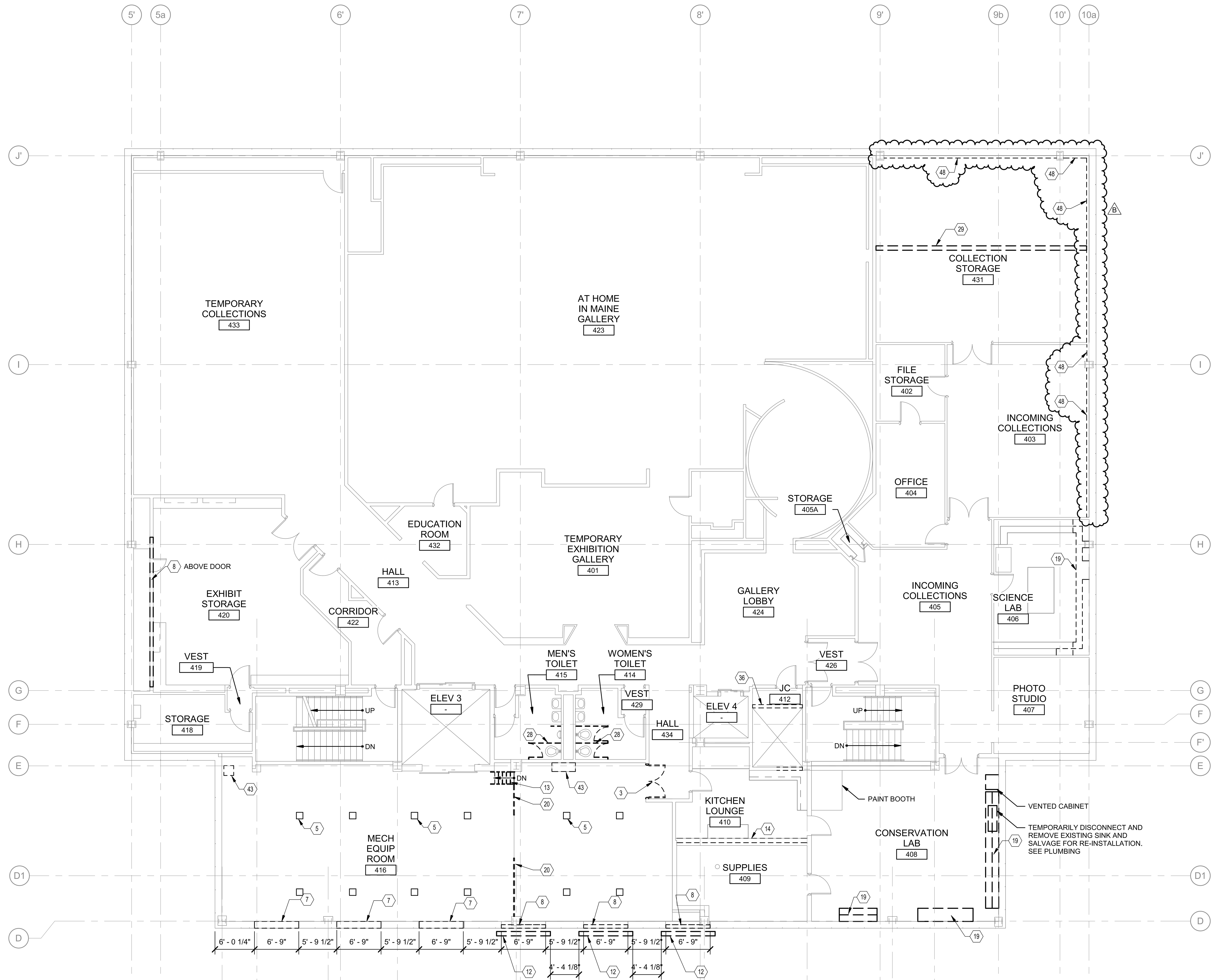
PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	EAH
DESIGNED BY:	TCM
DRAWN BY:	JLR

SHEET TITLE:
MUSEUM - FIRST LEVEL DEMOLITION PLAN

SHEET ID:
AD105

NOT FOR CONSTRUCTION



A1 MUSEUM - FOURTH LEVEL DEMOLITION PLAN

1/8" = 1'-0"

NOTES

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12. WHEREVER MECHANICAL, ELECTRICAL, AND PLUMBING DEVICES ARE REMOVED, ALL PIPING AND/OR CONDUITS THAT ARE ABANDONED SHALL BE CAPPED OFF BELOW THE FLOOR, INSIDE THE WALLS, OR ABOVE THE CEILINGS EXCEPT WHERE NOTED OTHERWISE. MECHANICAL/ELECTRICAL CONTRACTOR TO REMOVE ALL UNUSED WIRING TO PANEL BOXES. PATCH AND REPAIR FINISHES TO MATCH SURROUNDING FINISHES.
13. REMOVE WALL BASE IN AREAS WHERE FLOORING IS BEING REMOVED.
14. FLOORS AND WALLS: WHERE WALLS OR PARTITIONS THAT ARE REMOVED EXTEND ONE FINISHED AREA INTO ANOTHER, PATCH AND REPAIR FLOOR AND WALL SURFACES IN THE NEW SPACE TO PROVIDE AN EVEN SURFACE OF UNIFORM FINISH, COLOR, TEXTURE, AND APPEARANCE.
15. PATCH FLOOR/FINISH AT LOCATIONS WHERE RADIATOR PIPING HAS BEEN REMOVED.

KEYED NOTES

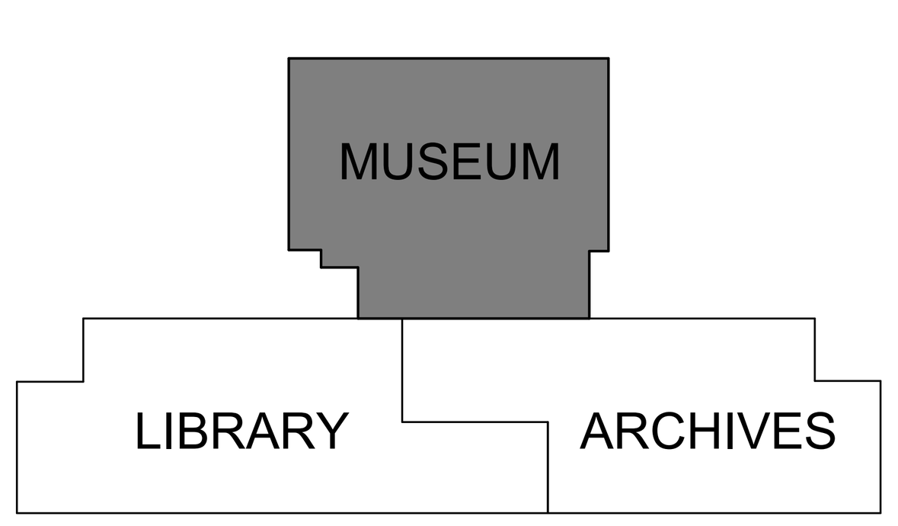
3	REMOVE DOOR, FRAME, AND HARDWARE
5	REMOVE CONCRETE CURB/PEDESTAL IN ITS ENTIRETY. REPAIR SURFACE WHERE CURB IS REMOVED TO BE SMOOTH AND FLUSH WITH ADJACENT FLOOR SURFACE
7	REMOVE EXISTING CMU FOR LOUVER OPENING
8	REMOVE EXISTING LOUVER AND EXISTING SCREEN, WHERE OCCURS
12	REMOVE EXISTING LIMESTONE PLAQUE AND ASSOCIATED SUPPORT FRAMING
13	REMOVE SHIPS LADDER AND SALVAGE FOR REINSTALLATION
14	REMOVE PORTION OF WALL FROM ABOVE THE SUPPLIES ROOM CEILING TO UNDERSIDE OF DECK ABOVE
19	REMOVE & SALVAGE CASEWORK AND COUNTERTOP. PROTECT DURING CONSTRUCTION UNTIL RE-INSTALLED
20	REMOVE EXISTING GUARD RAIL
28	TEMPORARILY SUPPORT TOILET COMPARTMENTS FOR ABATEMENT ACTIVITY.
29	CAREFULLY DISMANTLE SPECIALIZED PAINTING RACK SYSTEM AND ASSOCIATED HARDWARE IN ITS ENTIRETY. SALVAGE FOR REINSTALLATION AND STORE WITHIN LIMITS OF WORK IN AREAS OF LOW TRAFFIC. PROVIDE PROTECTIVE COVERING TO PROTECT FROM DAMAGE.
36	REMOVE PORTION OF WALL AS REQUIRED FOR ACCESS TO MECHANICAL DUCTS AND PIPING
43	REMOVE PORTION OF FLOOR FOR MECHANICAL PENETRATION
48	REMOVE EXISTING DRYWALL FOR INSTALLATION OF INSULATION. EXISTING FRAMING TO REMAIN. (B)

ADDITIVE BID ALTS

SEE SHEET GI004B FOR FURTHER BID ALTERNATE INFORMATION

2. BID ALTERNATE 2:
   REPLACE EXTERIOR DOORS, WINDOWS AND GLAZING SYSTEMS

KEY PLAN



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LICENSED ARCHITECT ELIZABETH HUCKINS No. 4338 STATE OF MAINE
2/8/2022

CURRENT ISSUE STATUS: PHASE 2 - ISSUED FOR BID JANUARY 7, 2022

PROJECT: STATE OF MAINE CULTURAL BUILDING ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

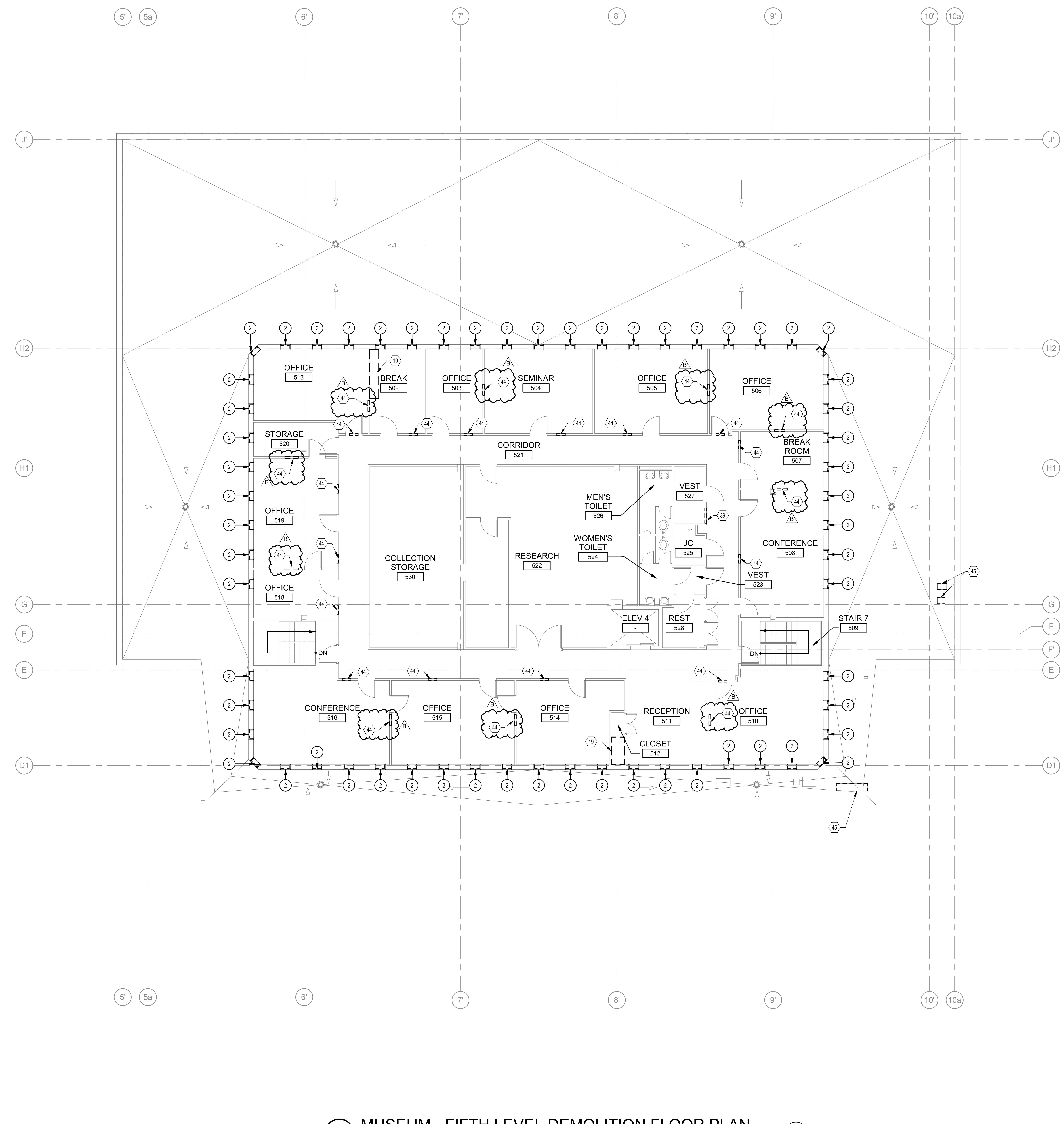
REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	EAH
DESIGNED BY:	TCM
DRAWN BY:	JLR

SHEET TITLE: MUSEUM - FOURTH LEVEL DEMOLITION PLAN

SHEET ID: AD108

NOT FOR CONSTRUCTION



A1 MUSEUM - FIFTH LEVEL DEMOLITION FLOOR PLAN

1/8" = 1'-0"

PLAN NORTH

NOTES

1. SEE SHEET A-001 FOR DEMOLITION GENERAL NOTES AND LEGEND
2. THE CONTRACTOR SHALL MAINTAIN THE EXISTING STRUCTURAL AND FIREPROOFING INTEGRITY OF THE ENTIRE BUILDING EXCEPT WHERE OTHERWISE NOTED.
3. UPON DISCOVERY OF HAZARDOUS MATERIALS ENCOUNTERED DURING CONSTRUCTION OTHER THAN THAT IDENTIFIED IN THE PROJECT SCOPE, NOTIFY THE DESIGNER AND OWNER IMMEDIATELY AND AWAIT FURTHER INSTRUCTIONS. THE WORK AREA SHALL BE COMPLETELY SEALED OFF DURING ABATEMENT.
4. WORK INCLUDED IN THE CONTRACT IS ILLUSTRATED IN BOLD DASHED LINE-WORK. EXISTING CONDITIONS TO REMAIN IS ILLUSTRATED IN LIGHT LINE-WORK. UNLESS NOTED OTHERWISE, BOLD-DASHED ITEMS INDICATED SUCH AS: PARTITIONS, DOORS, WINDOWS, EQUIPMENT, ETC. ARE TO BE REMOVED.
5. WHERE THE TERM "REMOVE" IS USED, THE CONTRACTOR SHALL REMOVE FROM THE SITE AND LEGALLY DISPOSE OF.
6. WHERE THE TERM "SALVAGE IS USED, THE CONTRACTOR SHALL REUSE THE EQUIPMENT ON THIS PROJECT OR RETURN TO THE OWNER. STORE SALVAGEABLE MATERIALS IN A LOCATION AS DIRECTED BY THE OWNER.
7. WHERE THE TERM "REMOVE AND REINSTALL" IS USED, THE CONTRACTOR IS TO DETACH ITEMS FROM EXISTING CONSTRUCTION, PREPARE THEM FOR REUSE, AND REINSTALL THEM WHERE INDICATED.
8. WHERE THE TERM "EXISTING TO REMAIN" IS USED, THE EXISTING ITEMS OF CONSTRUCTION ARE NOT TO BE REMOVED.
9. SEE HAZ-MAT REFLECTED CEILING DEMOLITION PLANS (HD1XXX) FOR CEILING DEMOLITION WORK.
10. SEE ENGINEERING DRAWINGS FOR THE REMOVAL OF SPECIFIC STRUCTURAL, MECHANICAL, ELECTRICAL, PLUMBING AND FIRE ALARM SYSTEMS.
11. REINSTALLED EQUIPMENT AND DEVICES ARE TO BE CLEANED OF ALL FOREIGN MATERIAL. REPLACE EQUIPMENT OR DEVICES WHICH ARE DEFECTIVE OR DAMAGED DURING RELOCATION.
12. WHEREVER MECHANICAL, ELECTRICAL, AND PLUMBING DEVICES ARE REMOVED, ALL PIPING AND/OR CONDUITS THAT ARE ABANDONED SHALL BE CAPPED OFF BELOW THE FLOOR, INSIDE THE WALLS, OR ABOVE THE CEILINGS EXCEPT WHERE NOTED OTHERWISE. MECHANICAL/ELECTRICAL CONTRACTOR TO REMOVE ALL UNUSED WIRING TO PANEL BOXES. PATCH AND REPAIR FINISHES TO MATCH SURROUNDING FINISHES.
13. REMOVE WALL BASE IN AREAS WHERE FLOORING IS BEING REMOVED.
14. FLOORS AND WALLS: WHERE WALLS OR PARTITIONS THAT ARE REMOVED EXTEND ONE FINISHED AREA INTO ANOTHER, PATCH AND REPAIR FLOOR AND WALL SURFACES IN THE NEW SPACE TO PROVIDE AN EVEN SURFACE OF UNIFORM FINISH, COLOR, TEXTURE, AND APPEARANCE.
15. PATCH FLOOR/FINISH AT LOCATIONS WHERE RADIATOR PIPING HAS BEEN REMOVED.

KEYED NOTES

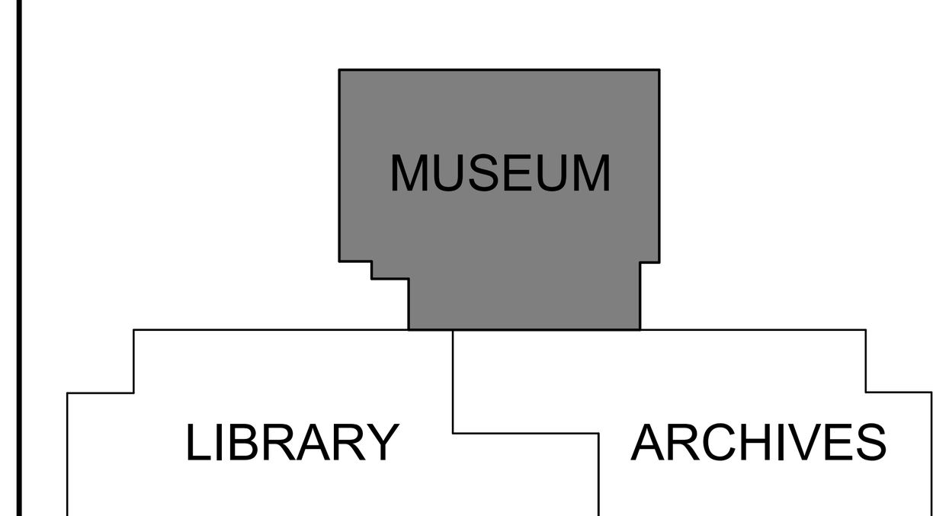
19	REMOVE & SALVAGE CASEWORK AND COUNTERTOP. PROTECT DURING CONSTRUCTION UNTIL RE-INSTALLED
39	REMOVE ACCESS DOOR TO CHASE
44	REMOVE PORTION OF WALL ABOVE LINE OF CEILING FOR MECHANICAL SYSTEM AIR TRANSFER, APPROX. 1 SF, OR 1 CMU BLOCK WHERE OCCURS
45	REMOVE EXISTING MECHANICAL EQUIPMENT AND CURB FLUSH TO ROOF DECK. SEE MECHANICAL DRAWINGS.

ADDITIVE BID ALTS

SEE SHEET GI004B FOR FURTHER BID ALTERNATE INFORMATION

2. BID ALTERNATE 2:
REPLACE EXTERIOR DOORS, WINDOWS AND GLAZING SYSTEMS

KEY PLAN



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LICENSED ARCHITECT ELIZABETH HUCKINS No. 4338 STATE OF MAINE
2/8/2022

CURRENT ISSUE STATUS:
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JANUARY 7, 2022

PROJECT:
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ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

REV	REVISION ISSUE DESCRIPTION	DATE
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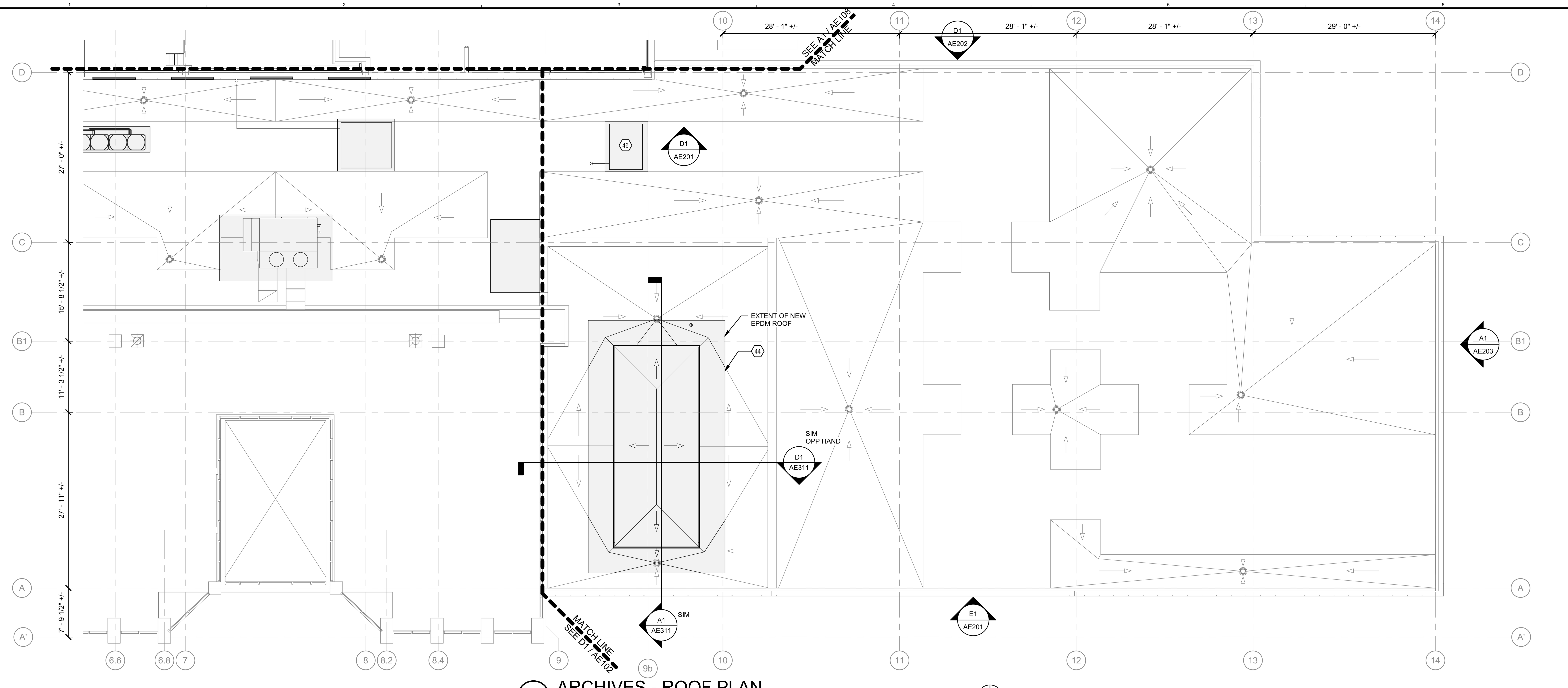
PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	EAH
DESIGNED BY:	TCM
DRAWN BY:	JLR

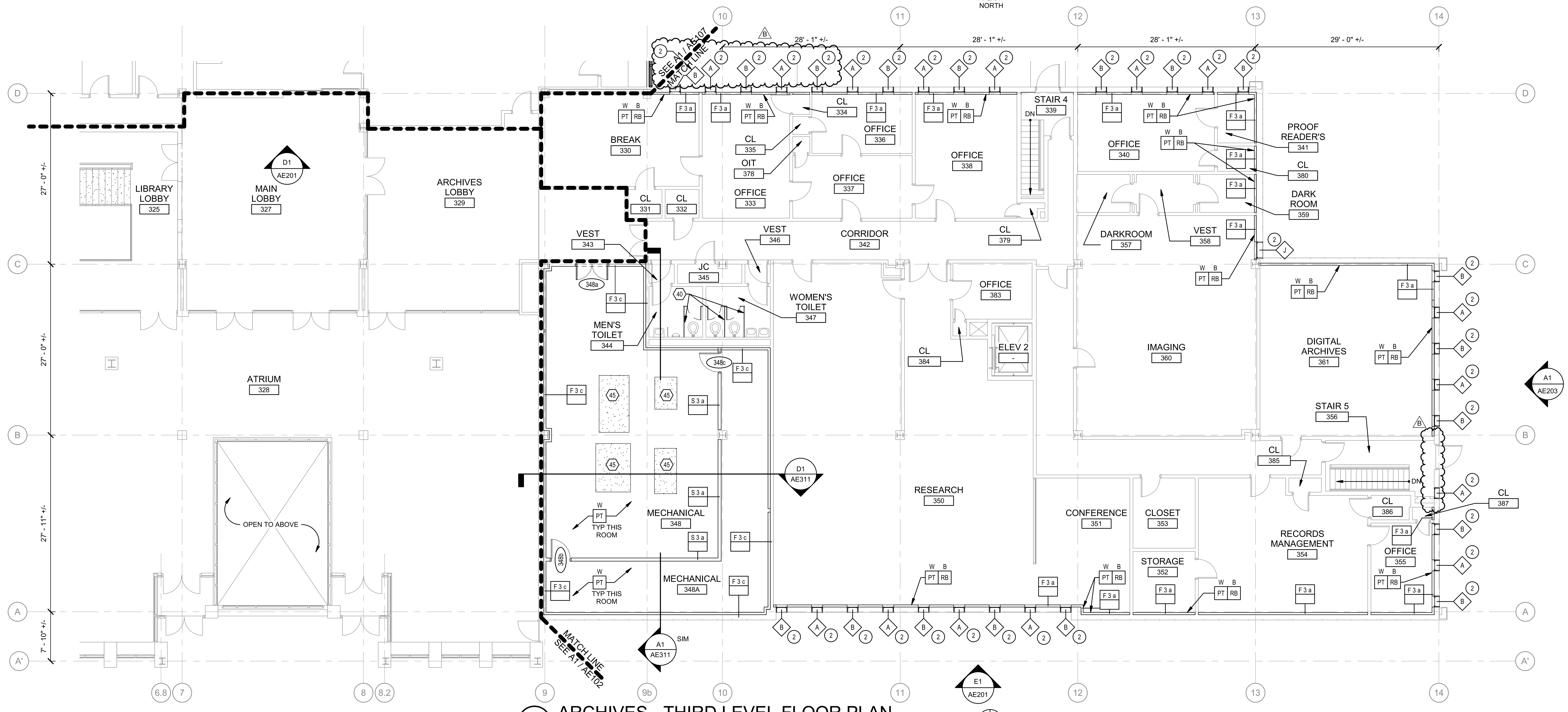
SHEET TITLE:
MUSEUM - FIFTH LEVEL DEMOLITION PLAN

SHEET ID:
AD109

NOT FOR CONSTRUCTION



D1 ARCHIVES - ROOF PLAN
1/8" = 1'-0"



A1 ARCHIVES - THIRD LEVEL FLOOR PLAN
1/8" = 1'-0"

NOTES

1. SEE SHEET A-001 FOR SYMBOLS, LEGENDS AND GENERAL NOTES.
2. SEE SHEET A-001 FOR EXHIBIT SCHEDULE.
3. SEE SHEET AE600s FOR DOOR AND WINDOW INFORMATION
4. SEE SHEET AE601 FOR PARTITION INFORMATION
5. PATCH EXISTING PENETRATIONS IN FIRE-RATED CONSTRUCTION NOT OTHERWISE NOTED OR REQUIRED FOR THE WORK TO BE REUSED OR INFILLED. PATCH SHALL MAINTAIN INTEGRITY OF EXISTING PASSIVE FIRE PROTECTION FEATURES. REFER TO SPECIFICATIONS FOR ALLOWANCE.
6. TEMPORARY EXHIBIT PROTECTION IN MUSEUM GALLERIES SHALL BE PROVIDED PRIOR TO ASBESTOS ABATEMENT ACTIVITIES AND REMAIN IN PLACE FOR THE DURATION OF RENOVATION ACTIVITIES. PROVIDE VIEWING PORTS AS SPECIFIED, MINIMUM ONE PER EXHIBIT. REMOVE TEMPORARY EXHIBIT PROTECTION UPON COMPLETION OF WORK.
7. REFERENCE MECHANICAL AND ELECTRICAL DRAWINGS FOR COORDINATION.
8. DIMENSIONS ARE CENTER OF STUD TO CENTER OF STUD AND FACE OF MASONRY TO FACE OF MASONRY.

6. WHERE AN EXISTING WALL IS PATCHED, PATCH EXISTING CONSTRUCTION TO MATCH ADJACENT EXISTING IN MATERIAL AND FINISH.

7. WHERE AN EXISTING WALL IS PATCHED OR A PORTION OF A WALL IS REPLACED, PAINT PATCHED AND NEW WALLS AND EXISTING CO-PLANAR WALLS TO THE NEAREST CORNER. PATCH AND PAINT OTHER EXISTING WALLS IF DAMAGED DURING WORK.

8. WHERE A PORTION OF A WALL IS REPLACED OR INFILLED, PROVIDE NEW WALL BASE FULL LENGTH OF NEW WALL OR EXISTING WALL WITH INFILLED OPENING. TIE INTO EXISTING WALL BASE ON ADJACENT EXISTING WALLS.

KEYED NOTES

40 REINSTALL SALVAGED OR TEMPORARILY SUPPORTED TOILET PARTITON. PROVIDE BLOCKING FOR TOILET COMPARTMENTS MOUNTING

44 APPROXIMATE LIMIT LINE OF ROOFING WORK: RESTORE EXISTING ROOFING SYSTEM AROUND NEW VENTILATION ENCLOSURE. PROVIDE CRICKETS AT A MINIMUM 1/4" PER FOOT SLOPE TO DIVERT RUN OFF AROUND THE NEW CURBS AND TOWARD ROOF DRAINS. COORDINATE NEW SLOPES WITH EXISTING TO ENSURE PROPER DRAINAGE.

45 CONCRETE HOUSEKEEPING PAD. COORDINATE EXACT SIZE AND LOCATION WITH MECHANICAL EQUIPMENT. SEE STRUCTURAL

46 APPROXIMATE LIMIT LINE OF ROOFING WORK: RESTORE EXISTING ROOFING SYSTEM AROUND NEW EQUIPMENT CURBS. PROVIDE CRICKETS AT A MINIMUM 1/4" PER FOOT SLOPE TO DIVERT RUN OFF AROUND THE NEW CURBS AND TOWARD ROOF DRAINS. COORDINATE NEW SLOPES WITH EXISTING TO ENSURE PROPER DRAINAGE.

LEGEND

W PT — WALL FINISH = PAINT

B RB — WALL BASE = RESILIENT BASE

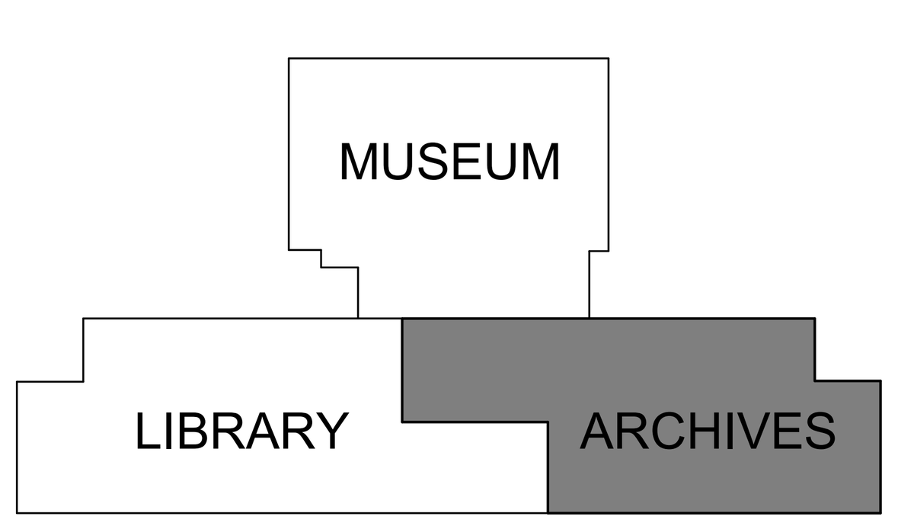
GRAY SHADING INDICATES AREAS OF EXISTING ROOF INFILL AND/OR PATCH - BACK TO FACILITATE MECHANICAL

ADDITIVE BID ALTS

SEE SHEET GI004B FOR FURTHER BID ALTERNATE INFORMATION

2. BID ALTERNATE 2:
REPLACE EXTERIOR DOORS, WINDOWS AND GLAZING SYSTEMS

KEY PLAN



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LICENSED ARCHITECT ELIZABETH HUCKINS No. 4338 STATE OF MAINE
2/8/2022

CURRENT ISSUE STATUS: PHASE 2 - ISSUED FOR BID JANUARY 7, 2022

PROJECT: STATE OF MAINE CULTURAL BUILDING ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

REV	REVISION ISSUE DESCRIPTION	DATE
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PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	EAH
DESIGNED BY:	TCM
DRAWN BY:	JLR

SHEET TITLE: ARCHIVES - THIRD LEVEL FLOOR PLAN AND ROOF PLAN

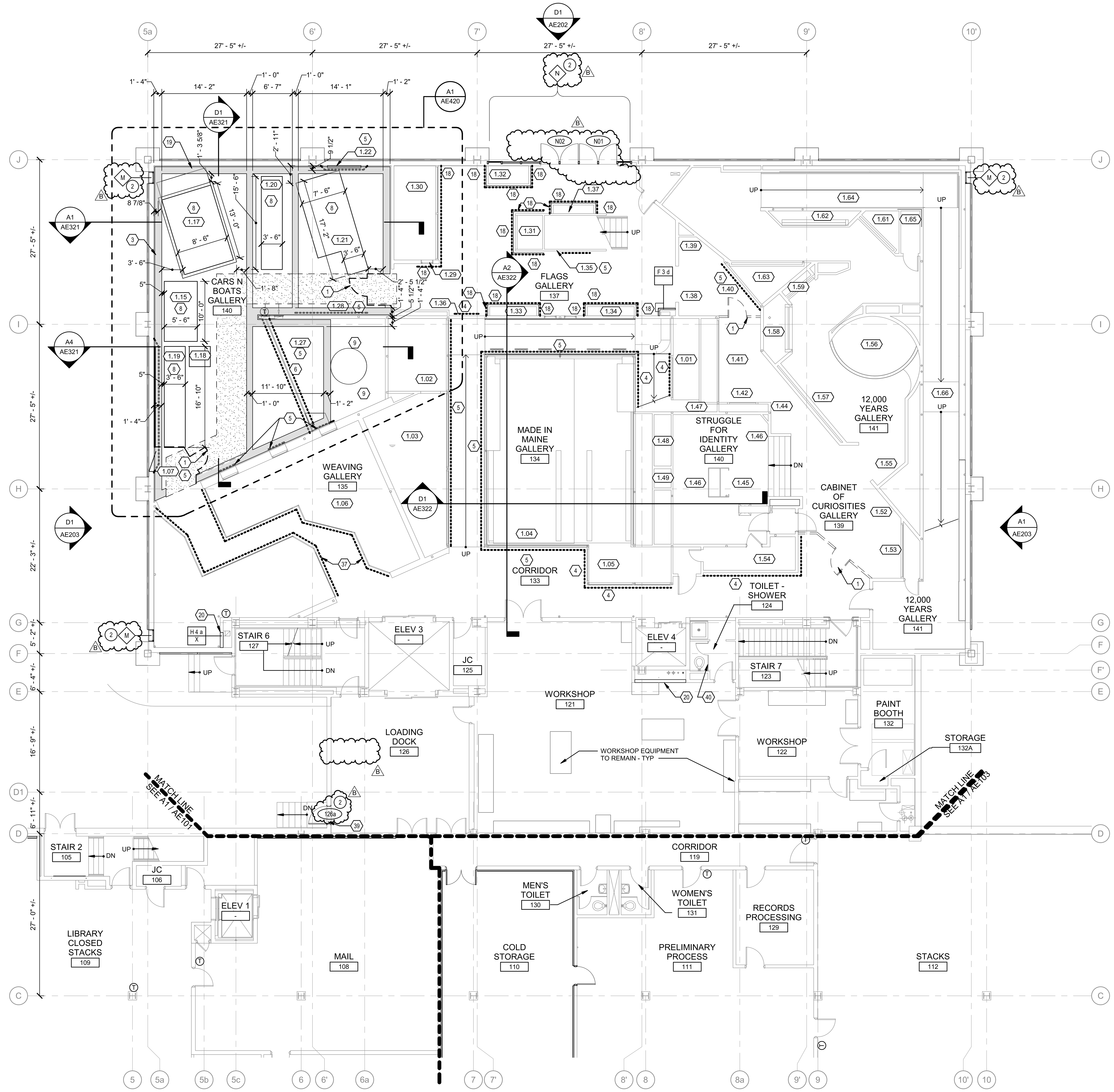
SHEET ID: AE104

NOT FOR CONSTRUCTION

CONTRACTOR TO PROVIDE OWNER THE FOLLOWING MATERIALS FOR REPLACEMENT OF LUMBER RACK
(30) 8' 2' X 4'
(8) ¾" CDX PLYWOOD SHEETS
(1) 10LBS BOX OF 2 1/2" CONSTRUCTION SCREWS

CONTRACTOR TO PROVIDE OWNER THE FOLLOWING MATERIALS FOR REPLACEMENT OF DUST COLLECTION SYSTEM DUCT WORK

(1) 80' OF 4" GALVANIZED DUCT
(5) 4" GALV ELBOWS
(1) 50' OF 6" GALV DUCT
(5) 6" GALV ELBOWS
(1) 30' OF 8" GALV DUCT
(5) 8" GALV ELBOWS
(5) ROLLS OF ALUMINUM FOIL VENT TAPE.
(1) LARGE BOX OF 3/4 " SELF TAP SHEET METAL SCREWS



A1 MUSEUM - FIRST LEVEL FLOOR PLAN
1/8" = 1'-0"

NOTES

1. SEE SHEET A-001 FOR SYMBOLS, LEGENDS AND GENERAL NOTES.
2. SEE SHEET A-001 FOR EXHIBIT SCHEDULE.
3. SEE SHEET AE600s FOR DOOR AND WINDOW INFORMATION
4. SEE SHEET AE601 FOR PARTITION INFORMATION
5. PATCH EXISTING PENETRATIONS IN FIRE-RATED CONSTRUCTION NOT OTHERWISE NOTED OR REQUIRED FOR THE WORK TO BE REUSED OR INFILLED. PATCH SHALL MAINTAIN INTEGRITY OF EXISTING PASSIVE FIRE PROTECTION FEATURES. REFER TO SPECIFICATIONS FOR ALLOWANCE.
6. TEMPORARY EXHIBIT PROTECTION IN MUSEUM GALLERIES SHALL BE PROVIDED PRIOR TO ASBESTOS ABATEMENT ACTIVITIES AND REMAIN IN PLACE FOR THE DURATION OF RENOVATION ACTIVITIES. PROVIDE VIEWING PORTS AS SPECIFIED, MINIMUM ONE PER EXHIBIT. REMOVE TEMPORARY EXHIBIT PROTECTION UPON COMPLETION OF WORK.
7. REFERENCE MECHANICAL AND ELECTRICAL DRAWINGS FOR COORDINATION.
8. DIMENSIONS ARE CENTER OF STUD TO CENTER OF STUD AND FACE OF MASONRY TO FACE OF MASONRY.
6. WHERE AN EXISTING WALL IS PATCHED, PATCH EXISTING CONSTRUCTION TO MATCH ADJACENT EXISTING IN MATERIAL AND FINISH.
7. WHERE AN EXISTING WALL IS PATCHED OR A PORTION OF A WALL IS REPLACED, PAINT PATCHED AND NEW WALLS AND EXISTING CO-PLANAR WALLS TO THE NEAREST CORNER. PATCH AND PAINT OTHER EXISTING WALLS IF DAMAGED DURING WORK.
8. WHERE A PORTION OF A WALL IS REPLACED OR INFILLED, PROVIDE NEW WALL BASE FULL LENGTH OF NEW WALL OR EXISTING WALL WITH INFILLED OPENING. TIE INTO EXISTING WALL BASE ON ADJACENT EXISTING WALLS.

KEYED NOTES

1 PROVIDE TEMPORARY CONSTRUCTION PARTITION FROM FLOOR TO UNDERSIDE OF CEILING OR EXHIBIT PROTECTION PLATFORM WITH 6 MIL PLASTIC SHEETING ON SCOPE OF WORK SIDE. PROVIDE A 3'-0"X7'-0" HOLLOW CORE WOOD DOOR ASSEMBLY WITH AN OFFICE FUNCTION LOCKSET. OWNER TO PROVIDE LOCKSET CORE.

2 EXHIBIT ITEM WILL BE REMOVED BY OWNER PRIOR TO CONTRACTOR ACCESS TO SPACE

3 ASSUMED KEEP OUT AREA SHADED FOR PLATFORM SUPPORT SYSTEM

4 PROVIDE LAYER OF 1" THICK HONEYCOMB CARDBOARD PAD AND 6 MIL PLASTIC SHEETING OVER ENTIRE SURFACE OF DISPLAY GLASS

5 PROVIDE LAYER OF 6 MIL PLASTIC SHEETING OVER ENTIRE SURFACE OF DISPLAY

6 PROVIDE LAYER OF TEXTILE FILLER PAD AND 6 MIL PLASTIC SHEETING OVER ENTIRE SURFACE OF GLASS GUARDRAIL, EACH SIDE.

8 EXHIBIT ITEM SHALL NOT BE MOVED - DO NOT DISTURB

9 PROVIDE TEMPORARY STRUCTURAL SHORING FROM SLAB BELOW TO UNDERSIDE OF PLATFORM AS REQUIRED. ORNAMENTAL SURFACING ON SLAB BELOW TO BE REMOVED AS NEEDED FOR SUPPORTS TO BEAR ON SLAB. PATCH SLAB UPON COMPLETION OF WORK

18 PROVIDE 2 1/2" METAL FRAMING WITH 1/2" PLYWOOD AND 6 MIL PLASTIC SHEETING OVER ENTIRE SURFACE OF DISPLAY GLASS

19 PROTECTIVE PLATFORM OVER TOP OF EXHIBIT ITEM TO REMAIN IN PLACE. REFER TO DELEGATED DESIGN SCOPE OF WORK ON GI004B.

20 PATCH WALL TO MATCH ADJACENT

37 PROVIDE FREESTANDING FRAMED WALLS W/ 6 MIL PLASTIC SHEETING TO 6'-8" AFF. PROVIDE HORIZONTAL LAYER OF PLASTIC SHEETING AT TOP OF WALLS TO CREATE A 3-SIDED TUNNEL. 3'-0" MINIMUM WIDTH. DO NOT ATTACH TO CEILING OF EXHIBIT

39 INFILL WALL WHERE LOUVER REMOVED ABOVE DOOR. MATCH ADJACENT EXISTING CONSTRUCTION

40 REINSTALL SALVAGED OR TEMPORARILY SUPPORTED TOILET PARTITON. PROVIDE BLOCKING FOR TOILET COMPARTMENTS MOUNTING

ADDITIVE BID ALTS

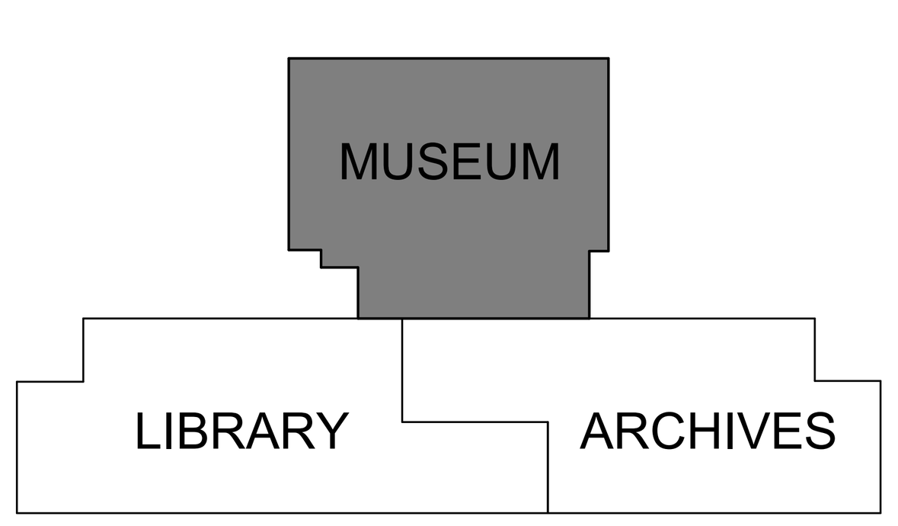
SEE SHEET GI004B FOR FURTHER BID ALTERNATE INFORMATION

2. BID ALTERNATE 2:
REPLACE EXTERIOR DOORS, WINDOWS AND GLAZING SYSTEMS

LEGEND

1.01	EXHIBIT IDENTIFICATION
	ABOVE CEILING ENCAPSULATION WALL
	CLEAR PATH WALKWAY
	RIGID ENCLOSURE PROTECTION (DELEGATED DESIGN)PROVIDE 6 MIL PLASTIC SHEATHING OVER TOP SURFACE
	ABOVE EXHIBIT CEILING SURFACE APPLIED PROTECTION
	RIGID PROTECTION WALL: FREE STANDING STUD FRAMING W/ 1/2" PLYWOOD AND/OR PLASTIC SHEET COVERING, TAPED AT ALL SEAMS AND EDGES
	SOFT PROTECTION WALL: AS NOTED CARDBOARD AND/OR PLASTIC SHEET COVERING, TAPED AT ALL SEAMS AND EDGES
	TEMPORARY PARTITIONS FOR ACCESS CONTROL
	KEEP OUT AREA FOR OVERHEAD PLATFORM SUPPORT SYSTEM
W PT	WALL FINISH = PAINT
B RB	WALL BASE = RESILIENT BASE

KEY PLAN



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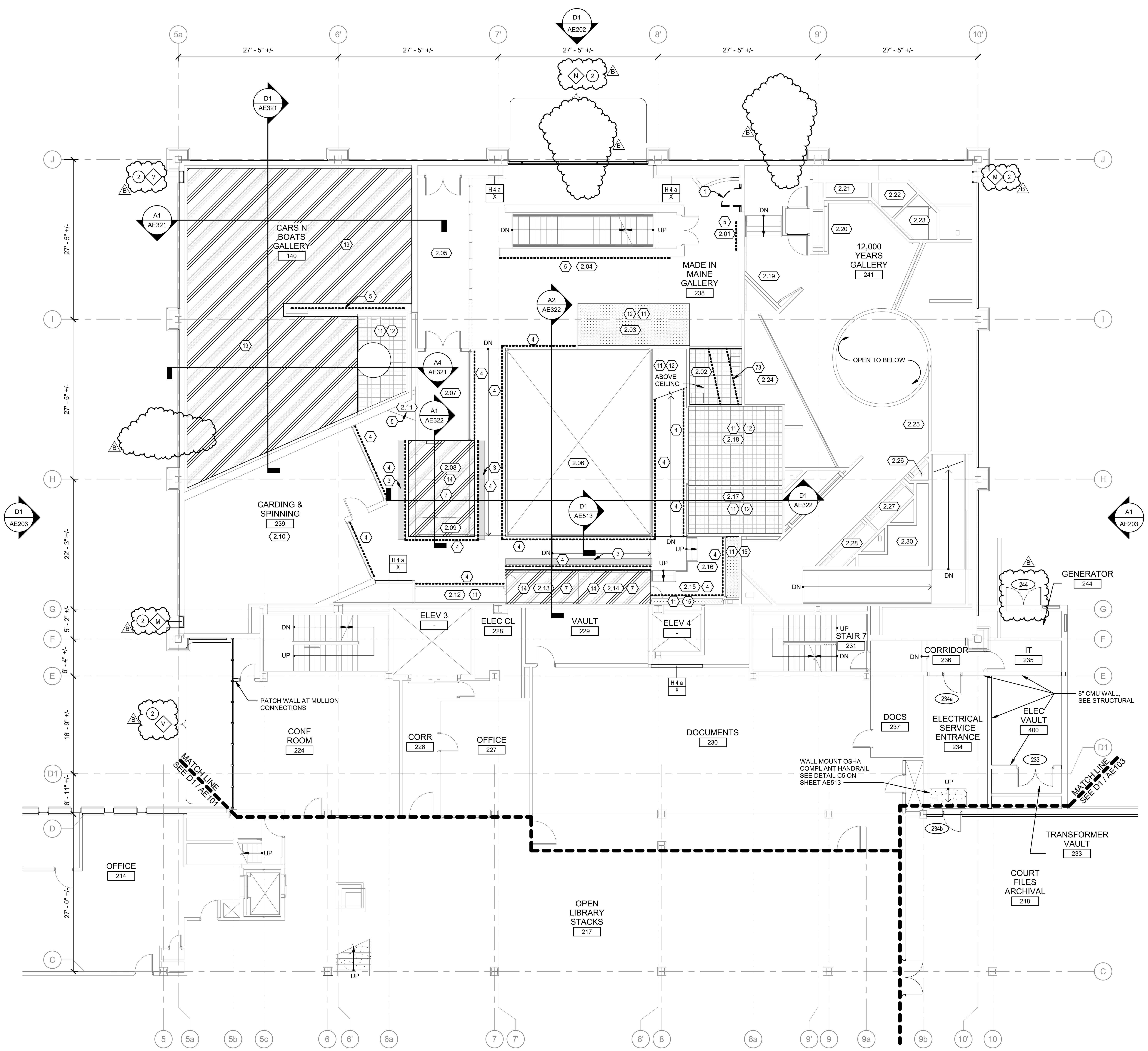
PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	EAH
DESIGNED BY:	TCM
DRAWN BY:	JLR

SHEET TITLE:
MUSEUM - FIRST LEVEL FLOOR PLAN

SHEET ID:
AE105

NOT FOR CONSTRUCTION



A1 MUSEUM - SECOND LEVEL FLOOR PLAN

1/8" = 1'-0"

PLAN NORTH

NOTES

1. SEE SHEET A-001 FOR SYMBOLS, LEGENDS AND GENERAL NOTES.
2. SEE SHEET A-001 FOR EXHIBIT SCHEDULE.
3. SEE SHEET AE600s FOR DOOR AND WINDOW INFORMATION
4. SEE SHEET AE601 FOR PARTITION INFORMATION
5. PATCH EXISTING PENETRATIONS IN FIRE-RATED CONSTRUCTION NOT OTHERWISE NOTED OR REQUIRED FOR THE WORK TO BE REUSED OR INFILLED. PATCH SHALL MAINTAIN INTEGRITY OF EXISTING PASSIVE FIRE PROTECTION FEATURES. REFER TO SPECIFICATIONS FOR ALLOWANCE.
6. TEMPORARY EXHIBIT PROTECTION IN MUSEUM GALLERIES SHALL BE PROVIDED PRIOR TO ASBESTOS ABATEMENT ACTIVITIES AND REMAIN IN PLACE FOR THE DURATION OF RENOVATION ACTIVITIES. PROVIDE VIEWING PORTS AS SPECIFIED, MINIMUM ONE PER EXHIBIT. REMOVE TEMPORARY EXHIBIT PROTECTION UPON COMPLETION OF WORK.
7. REFERENCE MECHANICAL AND ELECTRICAL DRAWINGS FOR COORDINATION.
8. DIMENSIONS ARE CENTER OF STUD TO CENTER OF STUD AND FACE OF MASONRY TO FACE OF MASONRY.
6. WHERE AN EXISTING WALL IS PATCHED, PATCH EXISTING CONSTRUCTION TO MATCH ADJACENT EXISTING IN MATERIAL AND FINISH.
7. WHERE AN EXISTING WALL IS PATCHED OR A PORTION OF A WALL IS REPLACED, PAINT PATCHED AND NEW WALLS AND EXISTING CO-PLANAR WALLS TO THE NEAREST CORNER. PATCH AND PAINT OTHER EXISTING WALLS IF DAMAGED DURING WORK.
8. WHERE A PORTION OF A WALL IS REPLACED OR INFILLED, PROVIDE NEW WALL BASE FULL LENGTH OF NEW WALL OR EXISTING WALL WITH INFILLED OPENING. TIE INTO EXISTING WALL BASE ON ADJACENT EXISTING WALLS.

KEYED NOTES

3. ASSUMED KEEP OUT AREA SHADED FOR PLATFORM SUPPORT SYSTEM
4. PROVIDE LAYER OF 1" THICK HONEYCOMB CARDBOARD PAD AND 6 MIL PLASTIC SHEETING OVER ENTIRE SURFACE OF DISPLAY GLASS
5. PROVIDE LAYER OF 6 MIL PLASTIC SHEETING OVER ENTIRE SURFACE OF DISPLAY
7. PROVIDE A PROTECTIVE HORIZONTAL WORK SURFACE OVER DISPLAY AND/OR DISPLAY CASE(S). REFER TO DELEGATED DESIGN SCOPE ON GI004B FOR ADDITIONAL REQUIREMENTS.
11. PROVIDE WATERTIGHT MEMBRANE OVER THE ENTIRE TOP OF EXHIBIT CASE. MEMBRANE TO LAP OVER VERTICAL SURFACE PROTECTION
12. THE WOOD PLATFORM SURFACE SHALL PROTECTED, BUT BE ABLE TO BE WORKED ON DURING CONSTRUCTION.
14. PROVIDE 6 MIL PLASTIC SHEETING OVER TOP SURFACE OF ENTIRE DISPLAY PRIOR TO ERECTION OF PROTECTION ENCLOSURE OVER DISPLAY.
15. BACK WALL DOES NOT HAVE GWB UP TO DECK ABOVE, PROVIDE POLY PROTECTION UP TO DECK.
19. PROTECTIVE PLATFORM OVER TOP OF EXHIBIT ITEM TO REMAIN IN PLACE. REFER TO DELEGATED DESIGN SCOPE OF WORK ON GI004B.
73. ACCESS SHALL BE THROUGH EXHIBIT 2.02 FOR WORK OVERHEAD EXHIBITS 2.02, 2.17, AND 2.18. PROVIDE 6 MIL PLASTIC SHEETING OVER WALLS, FLOOR, AND CEILING SURFACES OF EXHIBIT 2.02

ADDITIVE BID ALTS

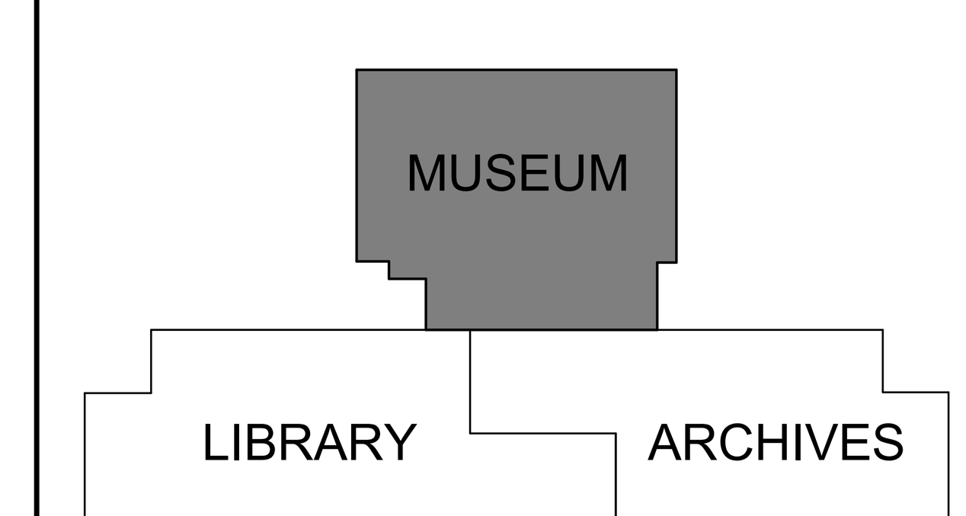
SEE SHEET GI004B FOR FURTHER BID ALTERNATE INFORMATION

2. BID ALTERNATE 2: REPLACE EXTERIOR DOORS, WINDOWS AND GLAZING SYSTEMS

LEGEND

- 1.01 — EXHIBIT IDENTIFICATION
- ABOVE CEILING ENCAPSULATION WALL
- CLEAR PATH WALKWAY
- RIGID ENCLOSURE PROTECTION (DELEGATED DESIGN)PROVIDE 6 MIL PLASTIC SHEATHING OVER TOP SURFACE
- ABOVE EXHIBIT CEILING SURFACE APPLIED PROTECTION
- RIGID PROTECTION WALL: FREE STANDING STUD FRAMING W/ 1/2" PLYWOOD AND/OR PLASTIC SHEET COVERING, TAPED AT ALL SEAMS AND EDGES
- SOFT PROTECTION WALL: AS NOTED CARDBOARD AND/OR PLASTIC SHEET COVERING, TAPED AT ALL SEAMS AND EDGES
- TEMPORARY PARTITIONS FOR ACCESS CONTROL
- KEEP OUT AREA FOR OVERHEAD PLATFORM SUPPORT SYSTEM
- W PT — WALL FINISH = PAINT
- B RB — WALL BASE = RESILIENT BASE

KEY PLAN



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LICENSED ARCHITECT ELIZABETH HUCKINS No. 4338 STATE OF MAINE
2/8/2022

CURRENT ISSUE STATUS: PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT: STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

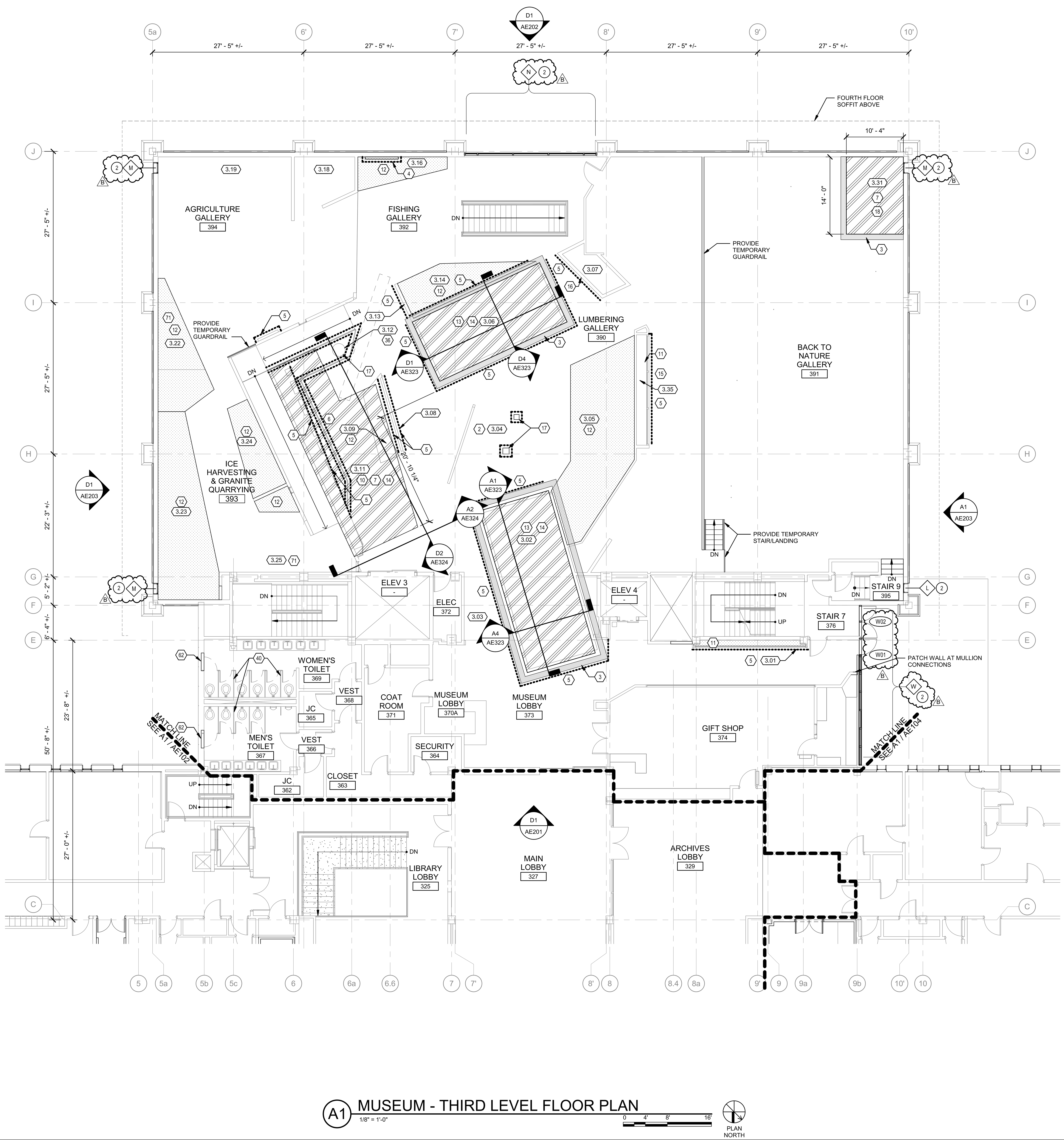
REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	EAH
DESIGNED BY:	TCM
DRAWN BY:	JLR

SHEET TITLE: MUSEUM - SECOND LEVEL FLOOR PLAN

SHEET ID: AE106

NOT FOR CONSTRUCTION



A1 MUSEUM - THIRD LEVEL FLOOR PLAN
1/8" = 1'-0"

PLAN NORTH

NOTES

1. SEE SHEET A-001 FOR SYMBOLS, LEGENDS AND GENERAL NOTES.
2. SEE SHEET A-001 FOR EXHIBIT SCHEDULE.
3. SEE SHEET AE600s FOR DOOR AND WINDOW INFORMATION
4. SEE SHEET AE601 FOR PARTITION INFORMATION
5. PATCH EXISTING PENETRATIONS IN FIRE-RATED CONSTRUCTION NOT OTHERWISE NOTED OR REQUIRED FOR THE WORK TO BE REUSED OR INFILLED. PATCH SHALL MAINTAIN INTEGRITY OF EXISTING PASSIVE FIRE PROTECTION FEATURES. REFER TO SPECIFICATIONS FOR ALLOWANCE.
6. TEMPORARY EXHIBIT PROTECTION IN MUSEUM GALLERIES SHALL BE PROVIDED PRIOR TO ASBESTOS ABATEMENT ACTIVITIES AND REMAIN IN PLACE FOR THE DURATION OF RENOVATION ACTIVITIES. PROVIDE VIEWING PORTS AS SPECIFIED, MINIMUM ONE PER EXHIBIT. REMOVE TEMPORARY EXHIBIT PROTECTION UPON COMPLETION OF WORK.
7. REFERENCE MECHANICAL AND ELECTRICAL DRAWINGS FOR COORDINATION.
8. DIMENSIONS ARE CENTER OF STUD TO CENTER OF STUD AND FACE OF MASONRY TO FACE OF MASONRY.
6. WHERE AN EXISTING WALL IS PATCHED, PATCH EXISTING CONSTRUCTION TO MATCH ADJACENT EXISTING IN MATERIAL AND FINISH.
7. WHERE AN EXISTING WALL IS PATCHED OR A PORTION OF A WALL IS REPLACED, PAINT PATCHED AND NEW WALLS AND EXISTING CO-PLANAR WALLS TO THE NEAREST CORNER. PATCH AND PAINT OTHER EXISTING WALLS IF DAMAGED DURING WORK.
8. WHERE A PORTION OF A WALL IS REPLACED OR INFILLED, PROVIDE NEW WALL BASE FULL LENGTH OF NEW WALL OR EXISTING WALL WITH INFILLED OPENING. TIE INTO EXISTING WALL BASE ON ADJACENT EXISTING WALLS.

KEYED NOTES

3 ASSUMED KEEP OUT AREA SHADED FOR PLATFORM SUPPORT SYSTEM
4 PROVIDE LAYER OF 1" THICK HONEYCOMB CARDBOARD PAD AND 6 MIL PLASTIC SHEETING OVER ENTIRE SURFACE OF DISPLAY GLASS
5 PROVIDE LAYER OF 6 MIL PLASTIC SHEETING OVER ENTIRE SURFACE OF DISPLAY
6 PROVIDE LAYER OF TEXTILE FILLER PAD AND 6 MIL PLASTIC SHEETING OVER ENTIRE SURFACE OF GLASS GUARDRAIL, EACH SIDE.
7 PROVIDE A PROTECTIVE HORIZONTAL WORK SURFACE OVER DISPLAY AND/OR DISPLAY CASE(S). REFER TO DELEGATED DESIGN SCOPE ON GI004B FOR ADDITIONAL REQUIREMENTS.
10 TEMPORARY STRUCTURAL SHORING FROM SLAB BELOW TO UNDERSIDE OF HORIZONTAL ELEMENTS OF EXHIBIT AS REQUIRED. CONSTRUCT PROTECTIVE PLATFORM ON TOP OF HORIZONTAL ELEMENTS OF EXHIBIT SUPPORTED BY SHORING BELOW. REFER TO DELEGATED DESIGN SCOPE ON GI-004B FOR ADDITIONAL REQUIREMENTS. PROVIDE WATERTIGHT MEMBRANE OVER ELEMENTS OF DISPLAY THAT EXTEND ABOVE PLATFORM TOP SURFACE.
11 PROVIDE WATERTIGHT MEMBRANE OVER THE ENTIRE TOP OF EXHIBIT CASE. MEMBRANE TO LAP OVER VERTICAL SURFACE PROTECTION
12 THE WOOD PLATFORM SURFACE SHALL PROTECTED, BUT BE ABLE TO BE WORKED ON DURING CONSTRUCTION.
13 PROVIDE A PROTECTIVE ENCLOSURE AROUND AND OVER EXHIBIT ITEMS. REFER TO DELEGATED DESIGN SCOPE ON GI-004B FOR ADDITIONAL REQUIREMENTS.
14 PROVIDE 6 MIL PLASTIC SHEETING OVER TOP SURFACE OF ENTIRE DISPLAY PRIOR TO ERECTION OF PROTECTION ENCLOSURE OVER DISPLAY.
15 BACK WALL DOES NOT HAVE GWB UP TO DECK ABOVE, PROVIDE POLY PROTECTION UP TO DECK.
16 PROVIDE 6 MIL PLASTIC SHEETING OVER OPENING
17 PROVIDE 6 MIL PLASTIC SHEETING WRAP AROUND TIMBER ELEMENTS TIMBER POSTS TO BE REMOVED BY OWNER AFTER ABATEMENT AND PRIOR TO RENOVATION ACTIVITIES; COORDINATE WITH OWNER
18 PROVIDE 2 1/2" METAL FRAMING WITH 1/2" PLYWOOD AND 6 MIL PLASTIC SHEETING OVER ENTIRE SURFACE OF DISPLAY GLASS
36 PROVIDE 6 MIL PASTIC SHEETING TO CREATE A PROTECTIVE WRAP AROUND EXISTING MAST, YARDARM AND FABRIC SAIL.
40 REINSTALL SALVAGED OR TEMPORARILY SUPPORTED TOILET PARTITON. PROVIDE BLOCKING FOR TOILET COMPARTMENTS MOUNTING
62 INFILL WALL AT REMOVED CONVECTOR, MATCH ADJACENT FINISHES
71 PROVIDE 6 MIL PASTIC SHEETING TO CREATE A PROTECTIVE WRAP AROUND EXISTING COLLECTION ITEM PENETRATING EXISTING CEILING. ITEM TO BE REMOVED BY OWNER AFTER ABATEMENT AND PRIOR TO RENOVATION ACTIVITIES; COORDINATE WITH OWNER.

ADDITIVE BID ALTS

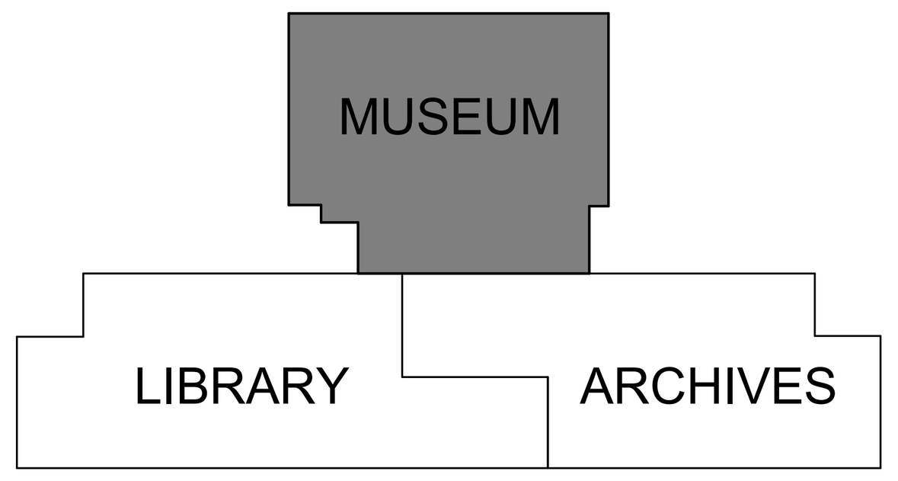
SEE SHEET GI004B FOR FURTHER BID ALTERNATE INFORMATION

2. BID ALTERNATE 2: REPLACE EXTERIOR DOORS, WINDOWS AND GLAZING SYSTEMS

LEGEND

1.01	EXHIBIT IDENTIFICATION
	ABOVE CEILING ENCAPSULATION WALL
	CLEAR PATH WALKWAY
	RIGID ENCLOSURE PROTECTION (DELEGATED DESIGN)PROVIDE 6 MIL PLASTIC SHEATHING OVER TOP SURFACE
	ABOVE EXHIBIT CEILING SURFACE APPLIED PROTECTION
	RIGID PROTECTION WALL: FREE STANDING STUD FRAMING W/ 1/2" PLYWOOD AND/OR PLASTIC SHEET COVERING, TAPED AT ALL SEAMS AND EDGES
	SOFT PROTECTION WALL: AS NOTED CARDBOARD AND/OR PLASTIC SHEET COVERING, TAPED AT ALL SEAMS AND EDGES
	TEMPORARY PARTITIONS FOR ACCESS CONTROL
	KEEP OUT AREA FOR OVERHEAD PLATFORM SUPPORT SYSTEM
W PT	WALL FINISH = PAINT
B RB	WALL BASE = RESILIENT BASE

KEY PLAN



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LICENSED ARCHITECT ELIZABETH HUCKINS No. 4338 STATE OF MAINE
2/8/2022

PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

CURRENT ISSUE STATUS:

PROJECT: STATE OF MAINE CULTURAL BUILDING ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

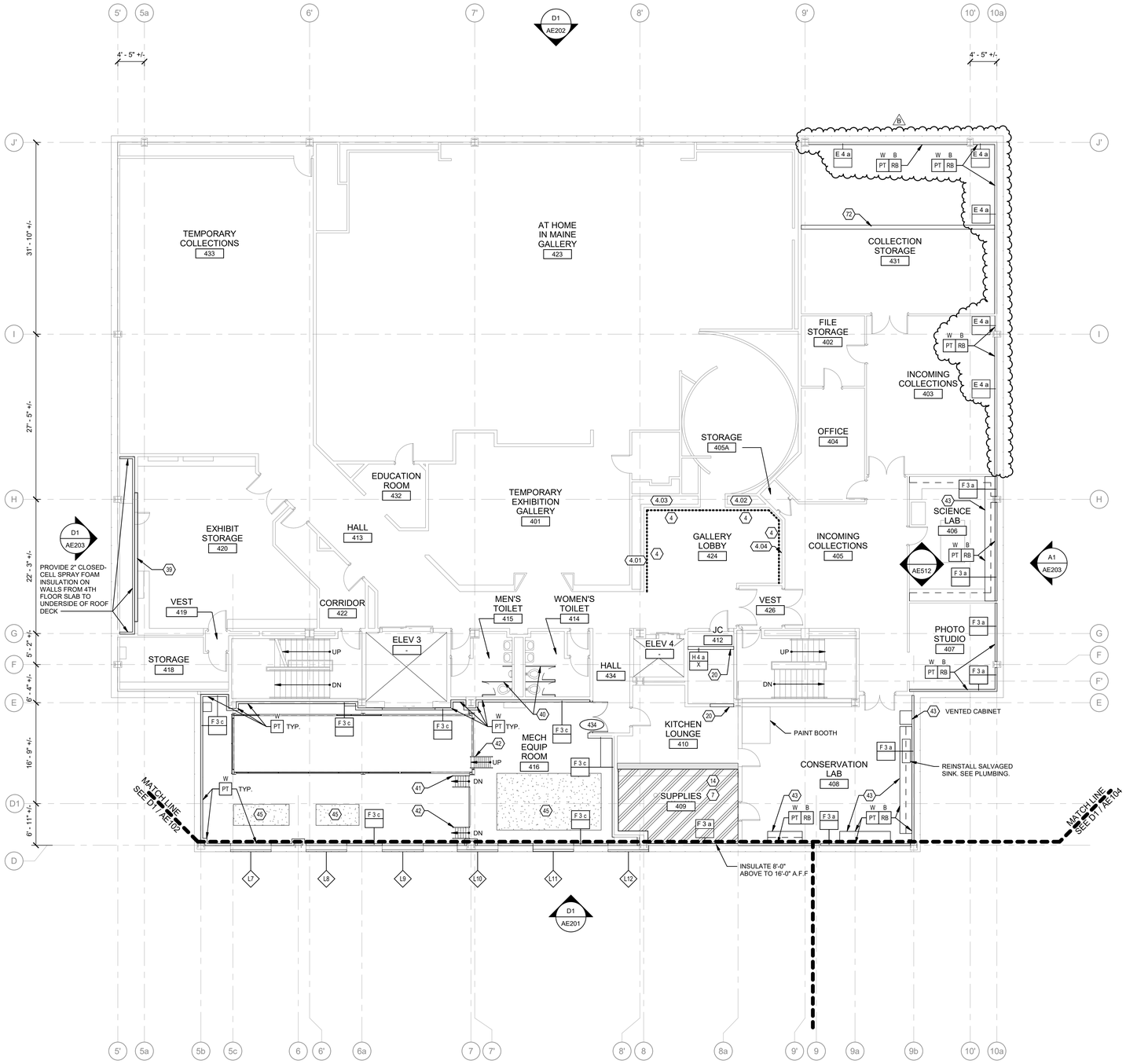
REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	EAH
DESIGNED BY:	TCM
DRAWN BY:	JLR

SHEET TITLE: MUSEUM - THIRD LEVEL FLOOR PLAN

SHEET ID: AE107

NOT FOR CONSTRUCTION



A1 MUSEUM - FOURTH LEVEL FLOOR PLAN

1/8" = 1'-0"

0 4' 8' 16'

PLAN NORTH

NOTES

1. SEE SHEET A-001 FOR SYMBOLS, LEGENDS AND GENERAL NOTES.
2. SEE SHEET A-001 FOR EXHIBIT SCHEDULE.
3. SEE SHEET AE600s FOR DOOR AND WINDOW INFORMATION
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5. PATCH EXISTING PENETRATIONS IN FIRE-RATED CONSTRUCTION NOT OTHERWISE NOTED OR REQUIRED FOR THE WORK TO BE REUSED OR INFILLED. PATCH SHALL MAINTAIN INTEGRITY OF EXISTING PASSIVE FIRE PROTECTION FEATURES. REFER TO SPECIFICATIONS FOR ALLOWANCE.
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8. WHERE A PORTION OF A WALL IS REPLACED OR INFILLED, PROVIDE NEW WALL BASE FULL LENGTH OF NEW WALL OR EXISTING WALL WITH INFILLED OPENING. TIE INTO EXISTING WALL BASE ON ADJACENT EXISTING WALLS.

KEYED NOTES

4 PROVIDE LAYER OF 1" THICK HONEYCOMB CARDBOARD PAD AND 6 MIL PLASTIC SHEETING OVER ENTIRE SURFACE OF DISPLAY GLASS

7 PROVIDE A PROTECTIVE HORIZONTAL WORK SURFACE OVER DISPLAY AND/OR DISPLAY CASE(S). REFER TO DELEGATED DESIGN SCOPE ON GI004B FOR ADDITIONAL REQUIREMENTS.

14 PROVIDE 6 MIL PLASTIC SHEETING OVER TOP SURFACE OF ENTIRE DISPLAY PRIOR TO ERECTION OF PROTECTION ENCLOSURE OVER DISPLAY.

39 INFILL WALL WHERE LOUVER REMOVED ABOVE DOOR. MATCH ADJACENT EXISTING CONSTRUCTION

40 REINSTALL SALVAGED OR TEMPORARILY SUPPORTED TOILET PARTITON. PROVIDE BLOCKING FOR TOILET COMPARTMENTS MOUNTING

41 REINSTALL SALVAGED SHIPS LADDER

42 PROVIDE OSHA COMPLIANT METAL GRATING SHIPS LADDER WITH GUARD RAILS AND HANDRAILS. PROVIDE SLOPE BETWEEN 50 AND 70 DEGREES OR AS NOTED

43 REINSTALL SALVAGED CASEWORK AND COUNTERTOP AT SCIENCE LAB 406 & 408, TRIM REMAINING COUNTERTOP TO FIT REINSTALLED COUNTERTOP; SEAL JOINT

45 CONCRETE HOUSEKEEPING PAD. COORDINATE EXACT SIZE AND LOCATION WITH MECHANICAL EQUIPMENT. SEE STRUCTURAL

72 RE-INSTALL PAINT RACK SYSTEM

ADDITIVE BID ALTS

SEE SHEET GI004B FOR FURTHER BID ALTERNATE INFORMATION

2. BID ALTERNATE 2:
REPLACE EXTERIOR DOORS, WINDOWS AND GLAZING SYSTEMS

LEGEND

- 1.01 EXHIBIT IDENTIFICATION
- ABOVE CEILING ENCAPSULATION WALL
- CLEAR PATH WALKWAY
- RIGID ENCLOSURE PROTECTION (DELEGATED DESIGN)PROVIDE 6 MIL PLASTIC SHEATHING OVER TOP SURFACE
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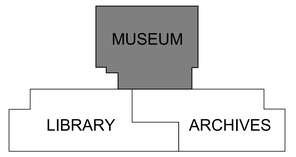
KEY PLAN



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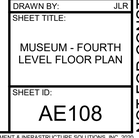


CURRENT ISSUE STATUS: PHASE 2 - ISSUED FOR BID JANUARY 7, 2022

PROJECT: STATE OF MAINE CULTURAL BUILDING ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

REV	ISSUED FOR BID / REVISION ISSUE DESCRIPTION	DATE
A.	ISSUED FOR BID	01-07-2022
B.	ADDENDUM NO. 2	02-08-2022

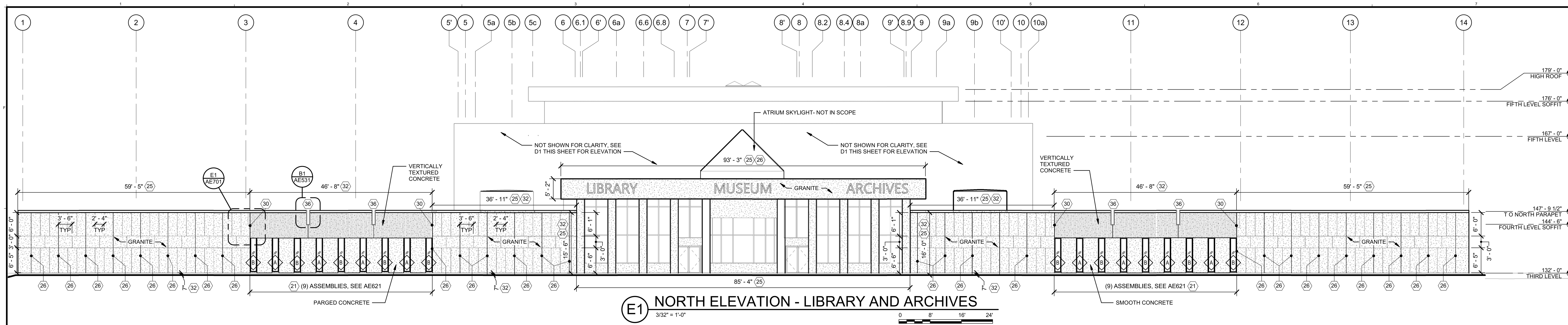
PROJECT NO.	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	EAH
DESIGNED BY:	TCM
DRAWN BY:	JLR

SHEET TITLE: MUSEUM - FOURTH LEVEL FLOOR PLAN

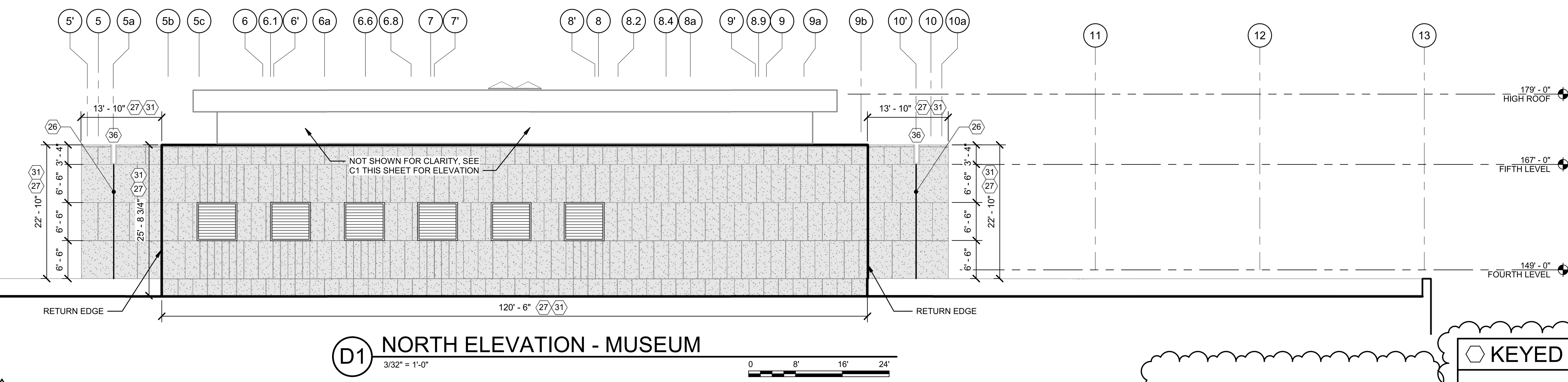
SHEET ID: AE108

NOT FOR CONSTRUCTION

BIM 360://618208720 - ME Cultural Building Mechanical Upgrades/618208720_AECH-R20.rvt



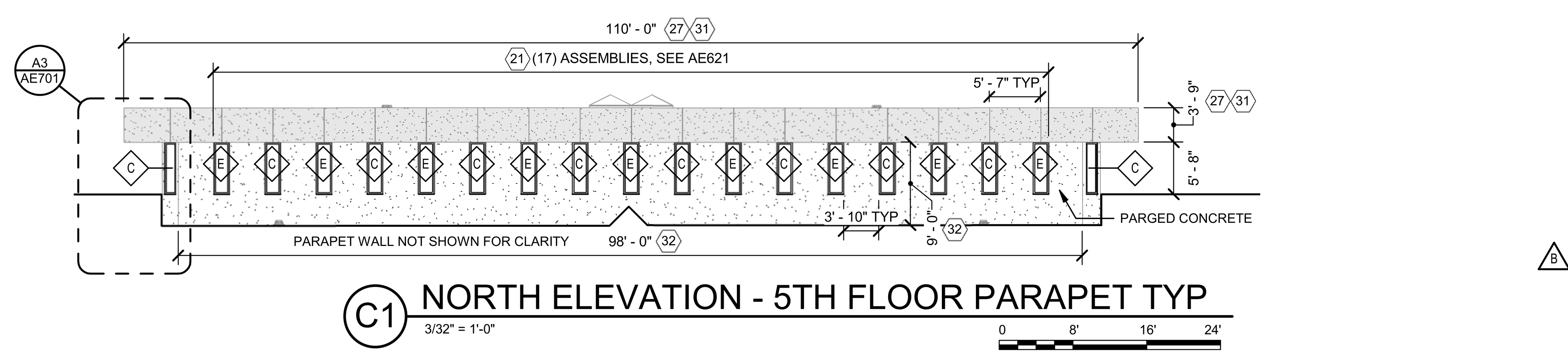
E1 NORTH ELEVATION - LIBRARY AND ARCHIVES
3/32" = 1'-0"



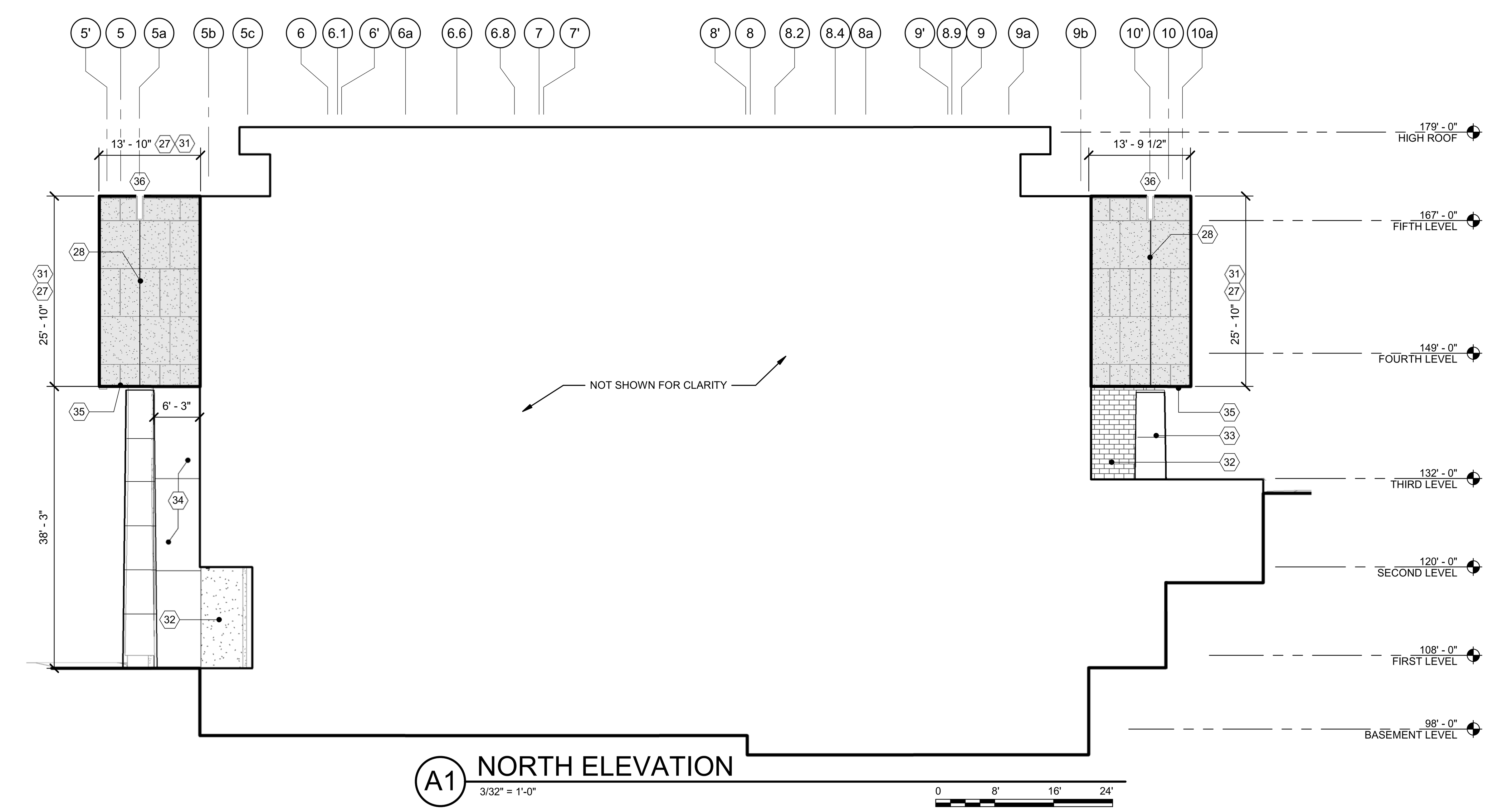
D1 NORTH ELEVATION - MUSEUM
3/32" = 1'-0"

GENERAL ENVELOPE NOTES

1. CONTRACTOR TO VERIFY ALL DIMENSIONS, RELATIVE DATUMS, QUANTITIES, SIZES AND CONTEXT OF DESIGN TO FIELD CONDITIONS. NOTIFY A/E OF ANY CONFLICTS.
2. ENCLOSURE BASIS OF DESIGN – RENOVATION /SCOPE OF ADAPTION BASED ON INFORMATION REFERENCED FROM ORIGINAL DRAWINGS, PROVIDED BY OWNER, TITLED " MAINE STATE CULTURAL BUILDING" BY WALKER O. CAIN ASSOCIATES, DATED APRIL 2, 1969, REV 6-18-1971 "AS-BUILTS".
3. SCOPE OF WORK - BASIS OF DESIGN WITHIN DETAILING BASED ON LIMITED ACCESS / INFORMATION PROVIDED - CONTRACTOR TO EXPOSE WORK AREA - NOTIFY A/E OF RECORD OF EXPANDED ACCESS FOR REVIEW / REVISIONS TO DETAILS
4. CONTRACTOR TO FIELD VERIFY QUANTITIES, SIZES, EXTENTS, MATERIALS DEPICTED ON PLANS.
5. ELEVATIONS PRESENT CONDITIONS AS "VISIBLE IN PLANE" IN SELECT LOCATIONS, NOTED IN KEYNOTES, TRANSITIONS OCCUR BETWEEN VARYING MATERIALS AT RIGHT-ANGLES / PERPENDICULAR TO VIEW – REFER TO KEYNOTE 30.
6. A/E OF RECORD TO APPROVE REMOVAL OF ALL STRUCTURAL ELEMENTS PRIOR TO DEMOLITION. CONTRACTOR TO NOTIFY A/E OF RECORD WHEN WORK AREA IS EXPOSED FOR REVIEW.
7. ORIGINAL DRAWINGS DEPICT STRUCTURAL STEEL IN CONJUNCTION WITH FENESTRATION, A/E TO CONFIRM EXTENTS OF "FUNCTION" PRIOR TO REMOVAL. CONTRACTOR TO HAVE WRITTEN APPROVAL FROM A/E PRIOR TO REMOVAL.
8. CONTRACTOR TO USE CARE AND CONTROL DURING SELECT DEMOLITION OF THE WORK AREA LIMITING IMPACT TO ADJACENT SURFACES, SUBSTRATES, ANCHORING / CONNECTIONS RELATED TO CUTTING / PATCHING / MATCHING TO EXISTING AND REATTACHMENTS, IN SO FAR AS PRACTICAL.
9. ALL DEMOLISHED AREA SURFACES TO REMAIN – SUBSTRATE TO BE CLEAN / CLEAR / PLUMB / LEVEL / FLAT, ETC. IN SO FAR AS PRACTICAL, AND FREE OF ANY OBSTRUCTIONS, AND INSPECTED BY A/E PRIOR TO RECEIVING NEW WORK.
10. EXISTING SURFACES PREPARATION TO RECEIVE NEW WORK TO BE IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS FOR PROPER SUBSTRATE / ANCHORING ATTACHMENT
11. CONTRACTOR TO PROTECT ALL EXISTING MATERIALS REMOVED FOR PLANNED REINSTALLATION, WITH SAFE STORAGE AGAINST THEFT / VANDALISM/ UNDUE WEATHERING/ ACCIDENTAL DROP / COLLISION ETC.
12. EXISTING STONE AND CONCRETE RETAINING WALLS, CAPS ETC..ARE NOT IN THE SCOPE OF ENCLOSURE WORK. NOTIFY A/E OF RECORD SHOULD THIS AREA BE IN CONFLICT WITH FAÇADE / ENCLOSURE SCOPE OF WORK.



C1 NORTH ELEVATION - 5TH FLOOR PARAPET TYP
3/32" = 1'-0"



A1 NORTH ELEVATION
3/32" = 1'-0"

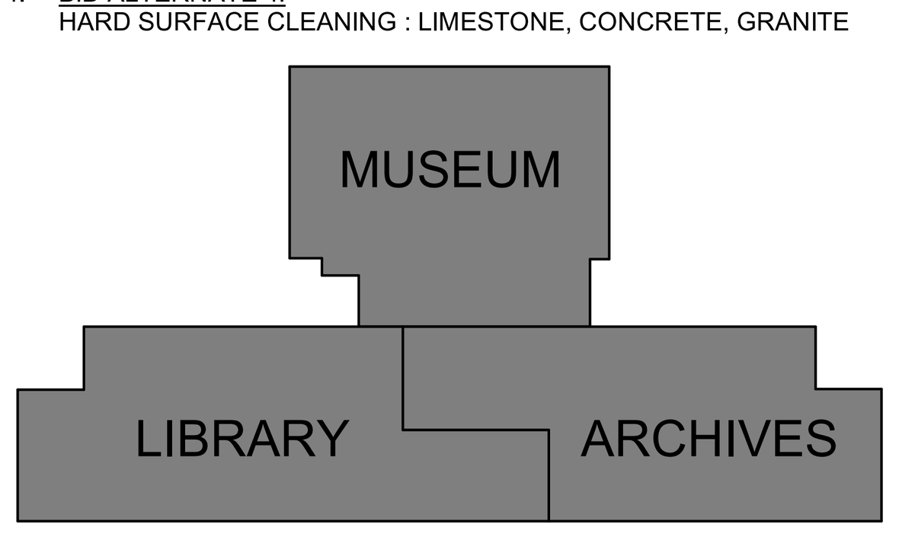
KEYED NOTES

21. BID ALT 2 - REPLACEMENT OF NON-THERMALLY BROKEN WINDOW / WINDOW WALL ASSEMBLIES WITH THERMALLY BROKEN STOREFRONT ASSEMBLIES. SEE SHEET AE621.
22. BID ALT 2 -REPLACEMENT OF NON-THERMALLY BROKEN WINDOW / WINDOW WALL ASSEMBLIES WITH THERMALLY BROKEN CURTAINWALL ASSEMBLIES. SEE SHEET AE622.
23. PENNISULA LOCATION - REMOVE EXISTING PANEL AND ADJACENT PANELS INTERSECTING WITH BEVELED EDGES – RESET ALL 3 SIDES, SO AS TO RESET/ REALIGN MITTERED EDGE AND ANCHORING. SEE E1/AE701.
24. REMOVE EXISTING PANELS – USE CARE REMOVING EXISTING PANELS SO AS TO PRESERVE FOR OTHER AS NEEDED CONDITIONS – RETAIN BY OWNER. CLEAN / CLEAR EXPOSED AREAS, PREP TO RECEIVE NEW PANEL(S). RESET / REALIGN, SET AND ANCHOR, IN SO FAR AS PRACTICAL WITH ADJACENT EDGES OF UNDISTURBED PANELS. MATCH EXISTING MORTAR /SEALANT & ROD JOINTS, RAKE AND REPOINT – SEE E5 & D5 /AE531. AS ADDITIONAL REFERENCE SEE E1/AE701.
25. RAKE OUT AND REPOINT GRANITE PANEL 1/4" MORTAR JOINTS – REFER TO DETAIL E5/AE531
26. RAKE OUT AND REPOINT GRANITE PANEL 3/4" ROD AND SEALANT JOINTS – SEE F5/AE531
27. RAKE OUT AND REPOINT LIMESTONE PANEL 1/4" MORTAR JOINTS – SEE E5/AE351
28. RAKE OUT AND REPOINT LIMESTONE PANEL 3/4" ROD AND SEALANT JOINTS – SEE F5/AE531
29. RAKE OUT AND REPOINT CONCRETE PANEL ROD AND SEALANT JOINTS – SEE D5/AE531
30. RAKE OUT AND REPOINT SURFACE MATERIAL TRANSITIONS (REFER TO GENERAL NOTE #5 AND PHOTO DETAIL # E1/AE701)
31. CLEAN LIMESTONE PANELS, IN SO FAR AS PRACTICAL AND CARE, REMOVE ANY AND ALL STAINING.
32. PATCH AND REPAIR CRACKED AND DAMAGED CEMENTITIOUS COATING ON CONCRETE SURFACES - PAINT FINISH
33. REMOVE DAMAGED PANEL – REPLACE WITH NEW PANEL – SET / MATCH ALIGN WITH EXISTING AND REPOINT.
34. NEW EIFS WALL SYSTEM – SEE ELEVATIONS FOR CONTROL JOINTS
35. NEW SOFFIT – MATCH EXISTING COLOR/TEXTURE AND JOINERY – SEE WALL SECTION A4/AE301.
36. RAKE AND REPOINT ROD AND SEALANT JOINTS AT SCUPPERS – SEE B1/AE531
37. RESERVED

BID ALTERNATES

SEE SHEET GI004B FOR FURTHER BID ALTERNATE INFORMATION

2. BID ALTERNATE 2:
REPLACE EXTERIOR FENESTRATION
3. BID ALTERNATE 3:
HARD SURFACE REPAIR : LIMESTONE, CONCRETE, GRANITE
4. BID ALTERNATE 4:
HARD SURFACE CLEANING : LIMESTONE, CONCRETE, GRANITE



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LICENSED ARCHITECT
DANIEL C. MORENO
No. 2409
STATE OF MAINE
02/08/2022

CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	DCM
DESIGNED BY:	PDG
DRAWN BY:	GJN

SHEET TITLE:
EXTERIOR ELEVATIONS

SHEET ID:
AE201

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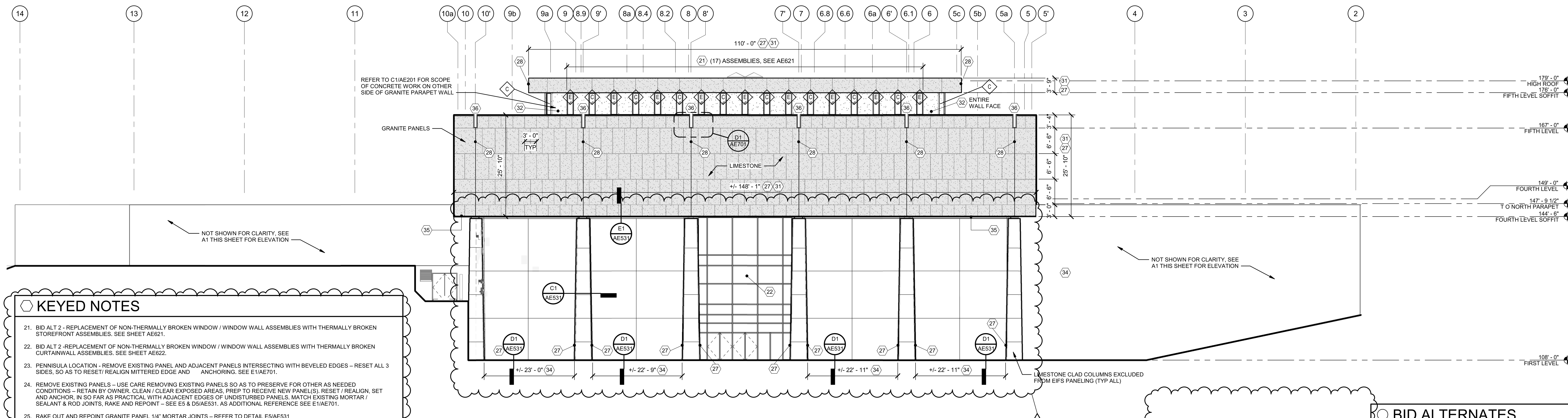

D1 SOUTH ELEVATION - MUSEUM
3/32" = 1'-0"

KEYED NOTES

21. BID ALT 2 - REPLACEMENT OF NON-THERMALLY BROKEN WINDOW / WINDOW WALL ASSEMBLIES WITH THERMALLY BROKEN STOREFRONT ASSEMBLIES. SEE SHEET AE621.
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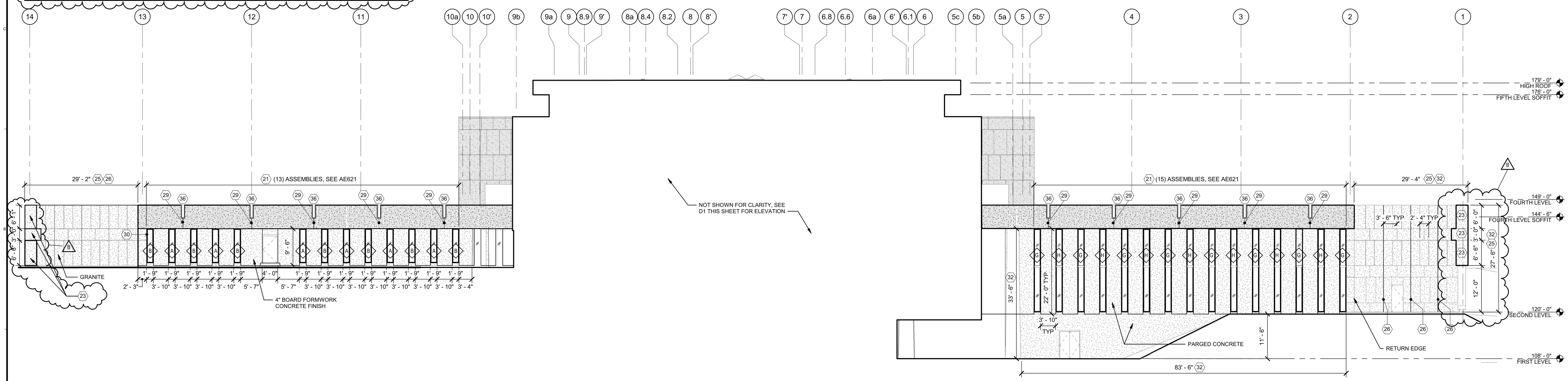
23. PENNISULA LOCATION - REMOVE EXISTING PANEL AND ADJACENT PANELS INTERSECTING WITH BEVELED EDGES – RESET ALL 3 SIDES, SO AS TO RESET/ REALIGN MITTERED EDGE AND ANCHORING. SEE E1/AE701.
24. REMOVE EXISTING PANELS – USE CARE REMOVING EXISTING PANELS SO AS TO PRESERVE FOR OTHER AS NEEDED CONDITIONS – RETAIN BY OWNER. CLEAN / CLEAR EXPOSED AREAS, PREP TO RECEIVE NEW PANEL(S). RESET / REALIGN, SET AND ANCHOR, IN SO FAR AS PRACTICAL WITH ADJACENT EDGES OF UNDISTURBED PANELS. MATCH EXISTING MORTAR / SEALANT & ROD JOINTS, RAKE AND REPOINT – SEE E5 & D5/AE531. AS ADDITIONAL REFERENCE SEE E1/AE701.
25. RAKE OUT AND REPOINT GRANITE PANEL 1/4" MORTAR JOINTS – REFER TO DETAIL E5/AE531
26. RAKE OUT AND REPOINT GRANITE PANEL 3/4" ROD AND SEALANT JOINTS – SEE F5/AE531
27. RAKE OUT AND REPOINT LIMESTONE PANEL 1/4" MORTAR JOINTS – SEE E5/AE351
28. RAKE OUT AND REPOINT LIMESTONE PANEL 3/4" ROD AND SEALANT JOINTS – SEE F5/AE531
29. RAKE OUT AND REPOINT CONCRETE PANEL ROD AND SEALANT JOINTS – SEE D5/AE531
30. RAKE OUT AND REPOINT SURFACE MATERIAL TRANSITIONS (REFER TO GENERAL NOTE #5 AND PHOTO DETAIL # E1/AE701)
31. CLEAN LIMESTONE PANELS, IN SO FAR AS PRACTICAL AND CARE, REMOVE ANY AND ALL STAINING.
32. PATCH AND REPAIR CRACKED AND DAMAGED CEMENTITIOUS COATING ON CONCRETE SURFACES - PAINT FINISH
33. REMOVE DAMAGED PANEL – REPLACE WITH NEW PANEL – SET / MATCH ALIGN WITH EXISTING AND REPOINT.
34. NEW EIFS WALL SYSTEM – SEE ELEVATIONS FOR CONTROL JOINTS
35. NEW SOFFIT – MATCH EXISTING COLOR/TEXTURE AND JOINERY – SEE WALL SECTION A4/AE301.
36. RAKE AND REPOINT ROD AND SEALANT JOINTS AT SCUPPERS – SEE B1/AE531
37. RESERVED

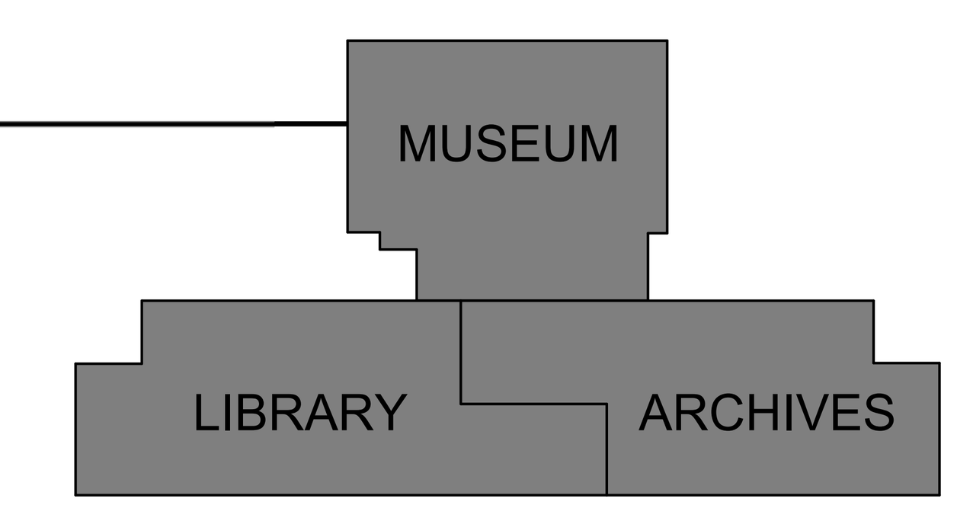
BID ALTERNATES

SEE SHEET G1004B FOR FURTHER BID ALTERNATE INFORMATION

2. BID ALTERNATE 2: REPLACE EXTERIOR FENESTRATION
3. BID ALTERNATE 3: HARD SURFACE REPAIR : LIMESTONE, CONCRETE, GRANITE
4. BID ALTERNATE 4: HARD SURFACE CLEANING : LIMESTONE, CONCRETE, GRANITE



A1 SOUTH ELEVATION LIBRARY & ARCHIVES
3/32" = 1'-0"



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(207) 624-7314

LICENSED ARCHITECT
DANIEL C. MORENO
No. 2409
STATE OF MAINE
02/08/2022

CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

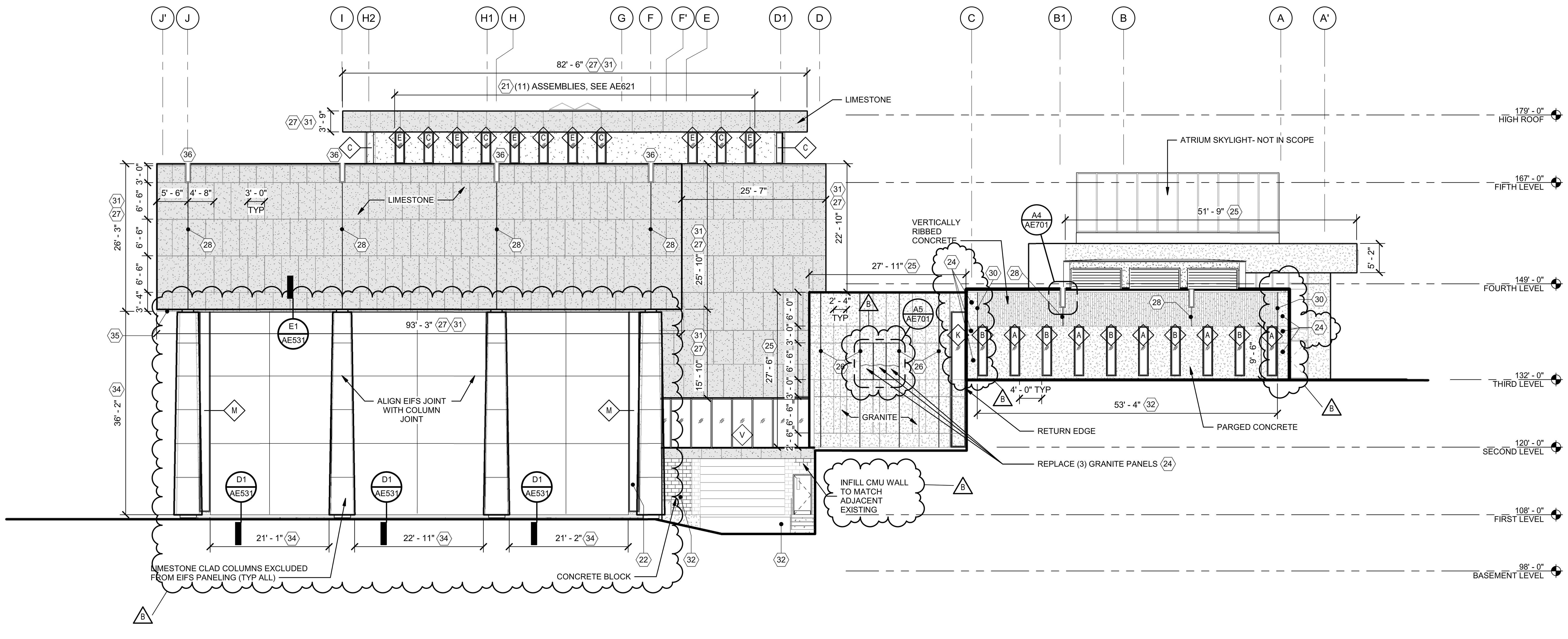
PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	DCM
DESIGNED BY:	PDG
DRAWN BY:	GJN

SHEET TITLE:
EXTERIOR ELEVATIONS

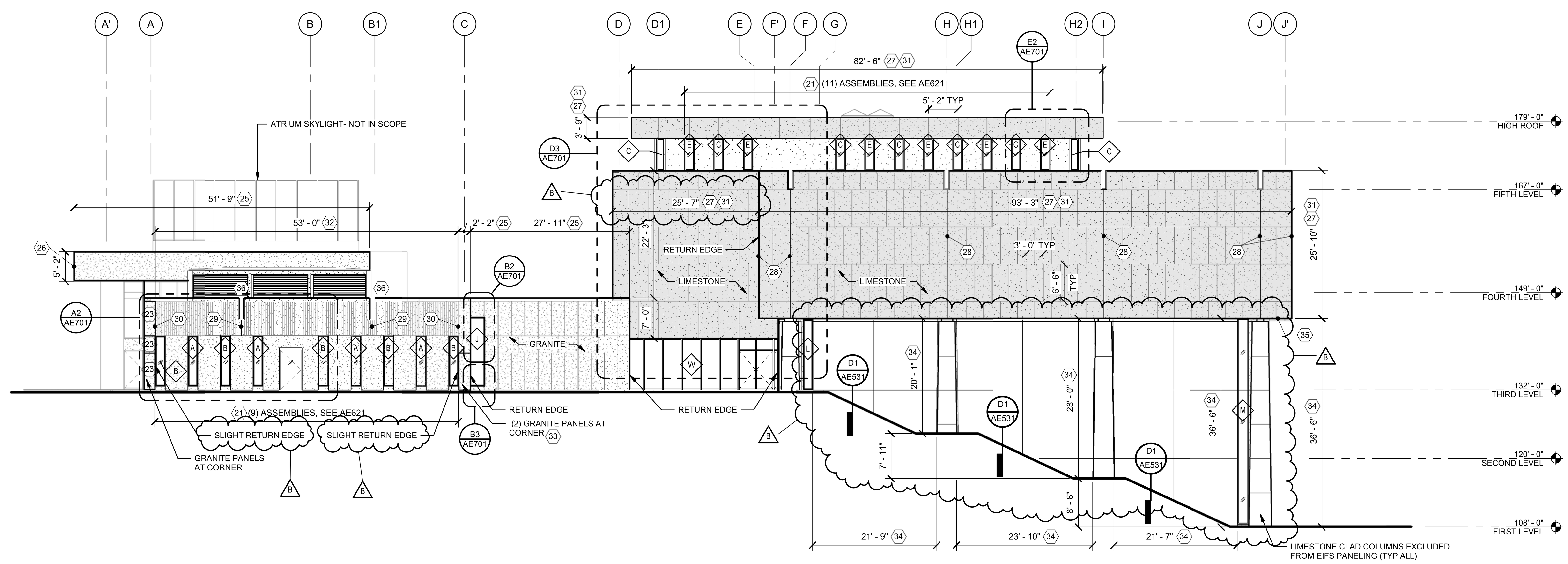
SHEET ID:
AE202

NOT FOR CONSTRUCTION

NOTES



D1 EAST ELEVATION
3/32" = 1'-0"



A1 WEST ELEVATION
3/32" = 1'-0"

KEYED NOTES

21. BID ALT 2 - REPLACEMENT OF NON-THERMALLY BROKEN WINDOW / WINDOW WALL ASSEMBLIES WITH THERMALLY BROKEN STOREFRONT ASSEMBLIES. SEE SHEET AE621.
22. BID ALT 2 -REPLACEMENT OF NON-THERMALLY BROKEN WINDOW / WINDOW WALL ASSEMBLIES WITH THERMALLY BROKEN CURTAINWALL ASSEMBLIES. SEE SHEET AE622.
23. PENNISULA LOCATION - REMOVE EXISTING PANEL AND ADJACENT PANELS INTERSECTING WITH BEVELED EDGES – RESET ALL 3 SIDES, SO AS TO RESET/ REALIGN MITTERED EDGE AND ANCHORING. SEE E1/AE701.
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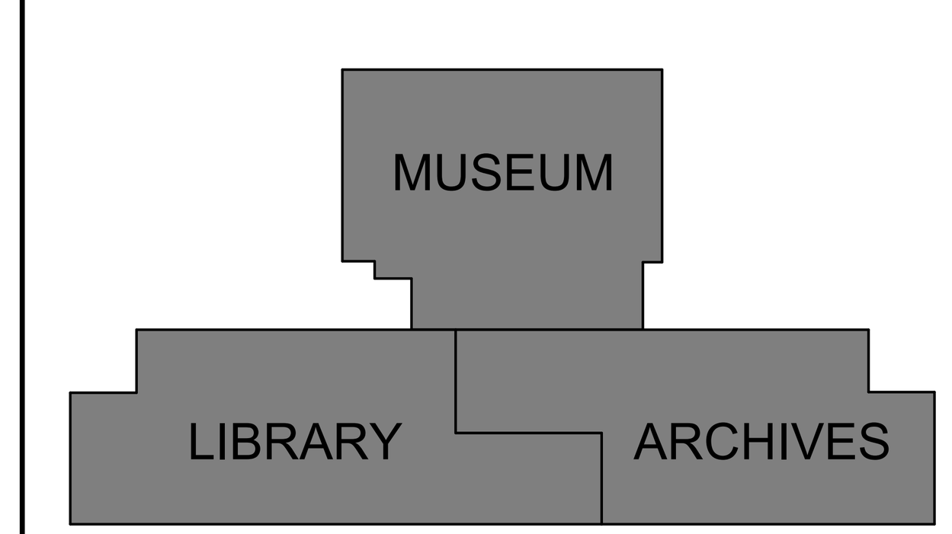
35. NEW SOFFIT – MATCH EXISTING COLOR/TEXTURE AND JOINERY – SEE WALL SECTION A4/AE301.
36. RAKE AND REPOINT ROD AND SEALANT JOINTS AT SCUPPERS – SEE B1/AE531
37. RESERVED

BID ALTERNATES

SEE SHEET GI004B FOR FURTHER BID ALTERNATE INFORMATION

2. BID ALTERNATE 2:
   REPLACE EXTERIOR FENESTRATION
3. BID ALTERNATE 3:
   HARD SURFACE REPAIR : LIMESTONE, CONCRETE, GRANITE
4. BID ALTERNATE 4:
   HARD SURFACE CLEANING : LIMESTONE, CONCRETE, GRANITE



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LICENSED ARCHITECT DANIEL C. MORENO No. 2409 STATE OF MAINE
02/08/2022

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ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

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PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	DCM
DESIGNED BY:	PDG
DRAWN BY:	GJN

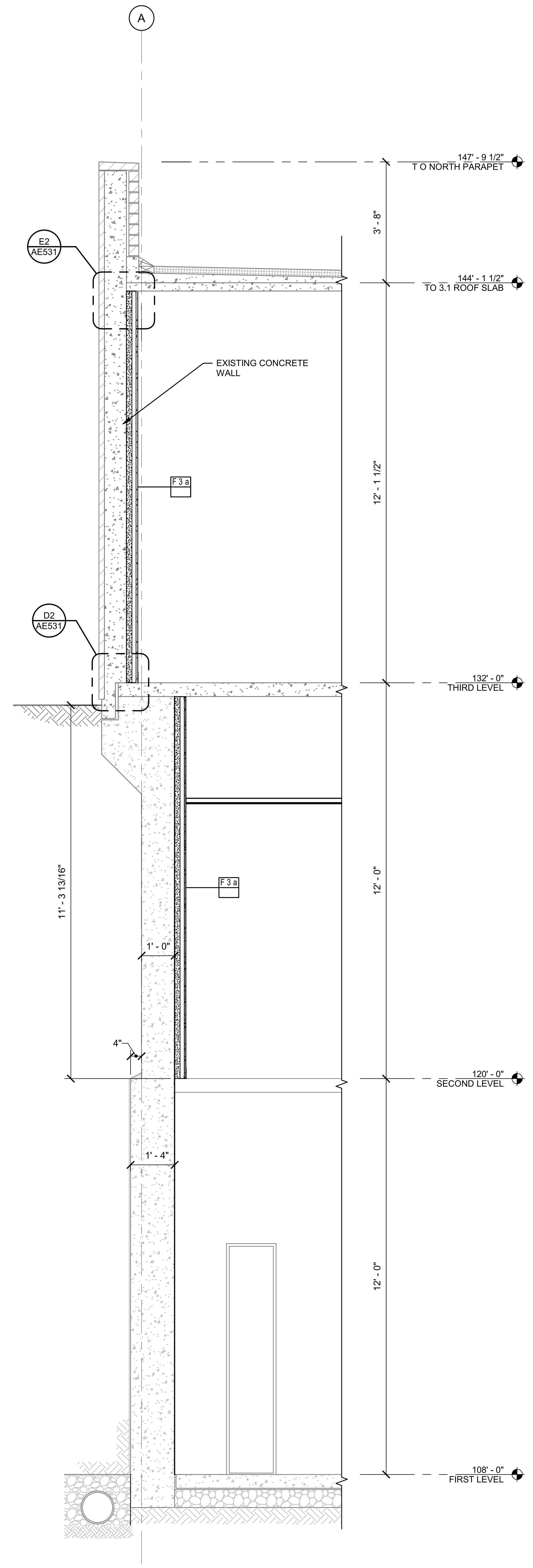
SHEET TITLE:
EXTERIOR ELEVATIONS

SHEET ID:
AE203

NOT FOR CONSTRUCTION

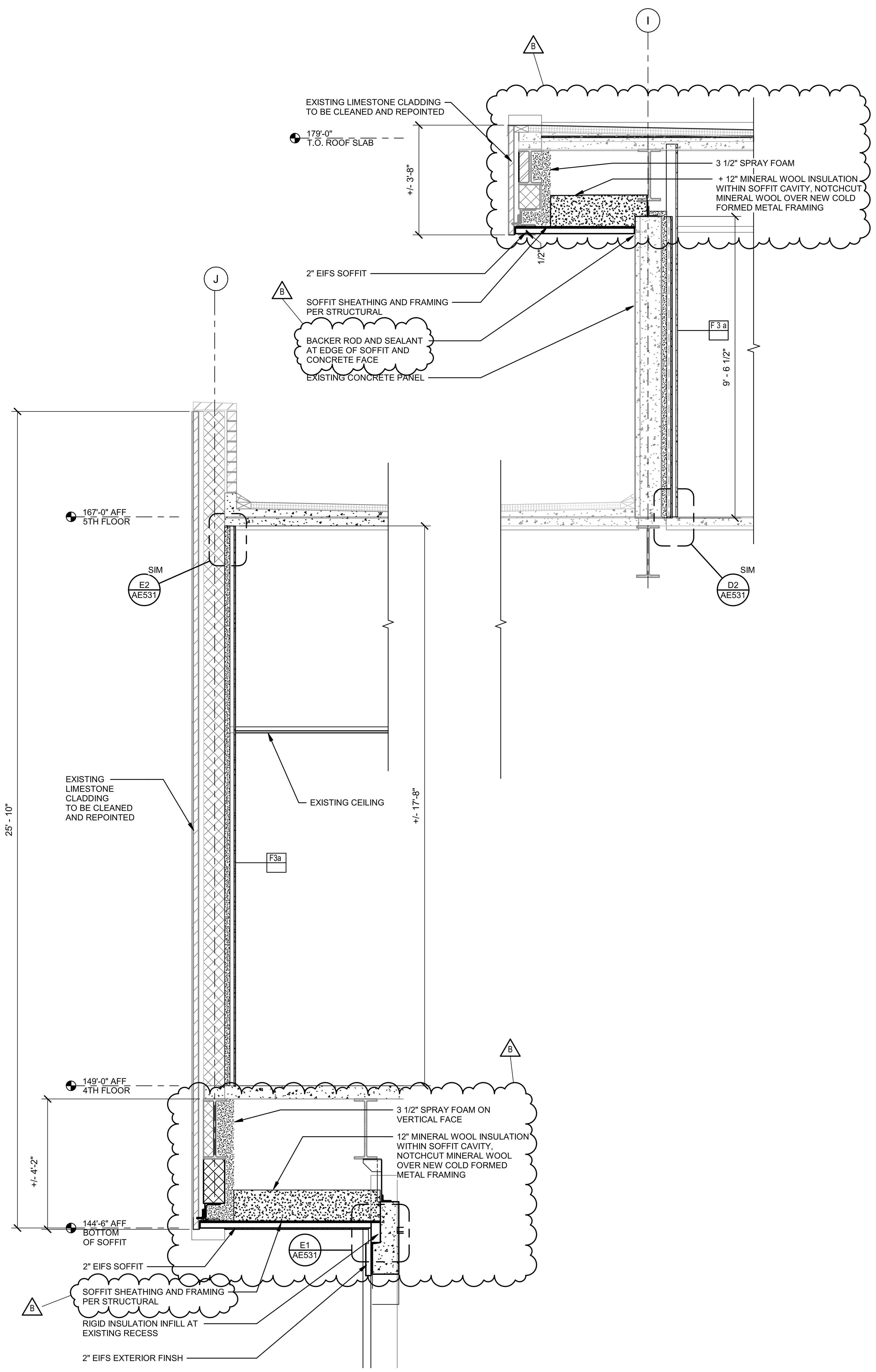
NOTES

1. SEE SHEET AE001 FOR SYMBOLS, LEGENDS AND GENERAL NOTES.
2. COORDINATE INTERIOR AND EXTERIOR INSULATION EXTENTS WITH PLANS.



A1 EXTERIOR WALL SECTION AT LIBRARY

1/2" = 1'-0"



A4 WALL SECTION

1/2" = 1'-0"

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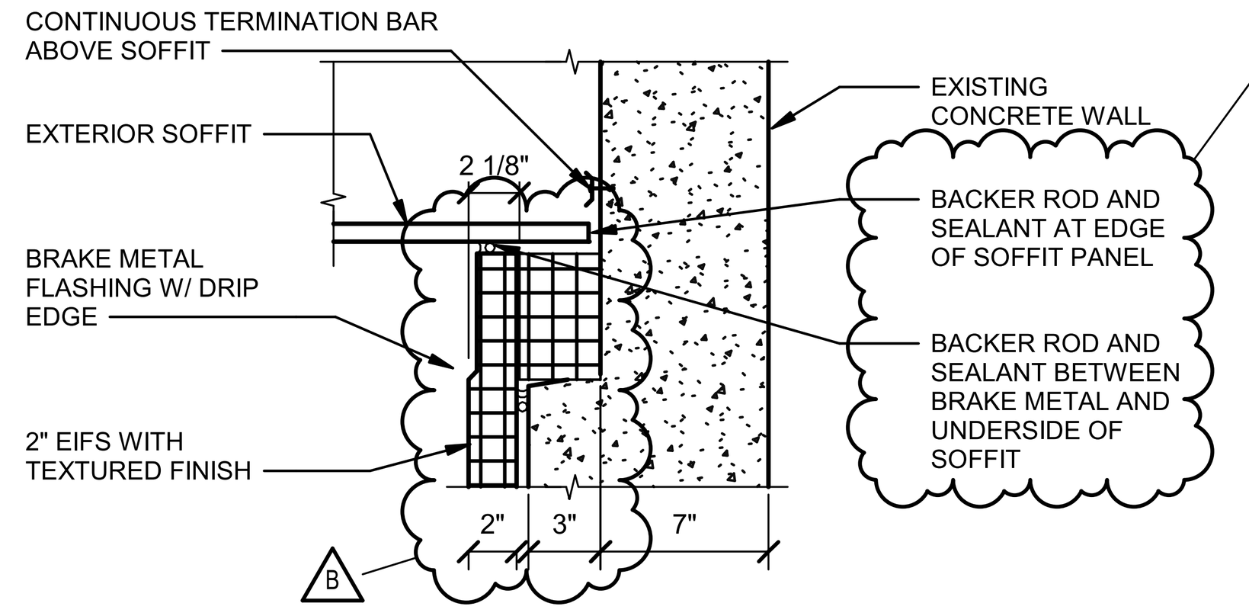
A/E OF RECORD:	DCM
DESIGNED BY:	PDG
DRAWN BY:	GJN

SHEET TITLE:
EXTERIOR WALL SECTIONS

SHEET ID:
AE301

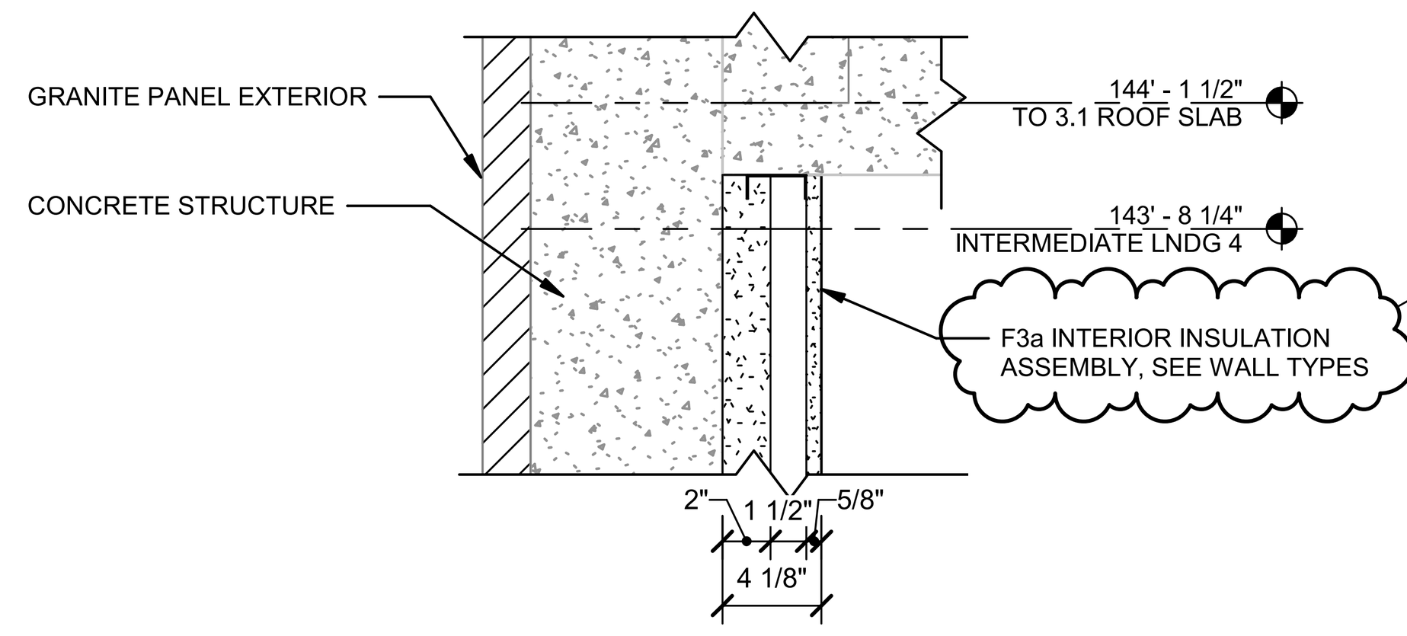
NOT FOR CONSTRUCTION



E1 EIFS AT TOP OF WALL

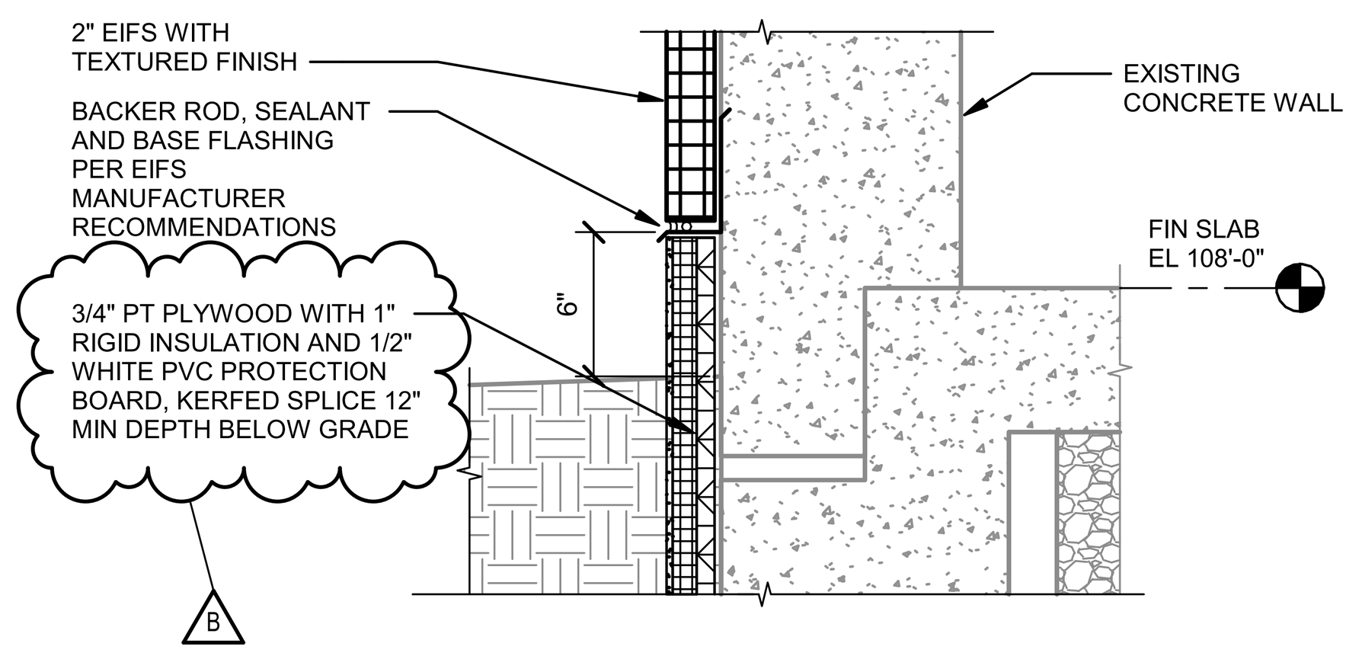
1 1/2" = 1'-0"

NOTE: INTENT IS TO STILL PROVIDE PROFILE OF ORIGINAL CONCRETE AT SOFFIT EDGE, BUT ADD INSULATION AND DRAINAGE STRATEGY



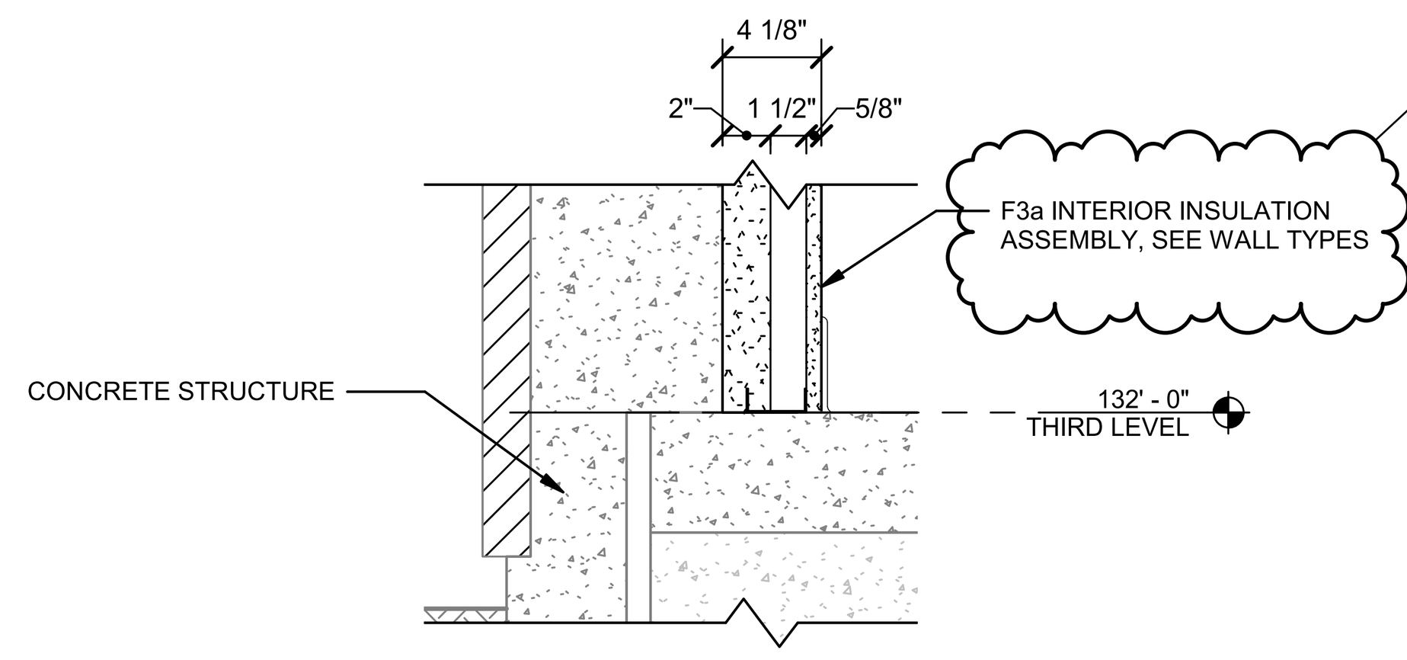
E2 DETAIL OF F3A ASSEMBLY AT UNDERSIDE OF ROOF SLAB

1 1/2" = 1'-0"



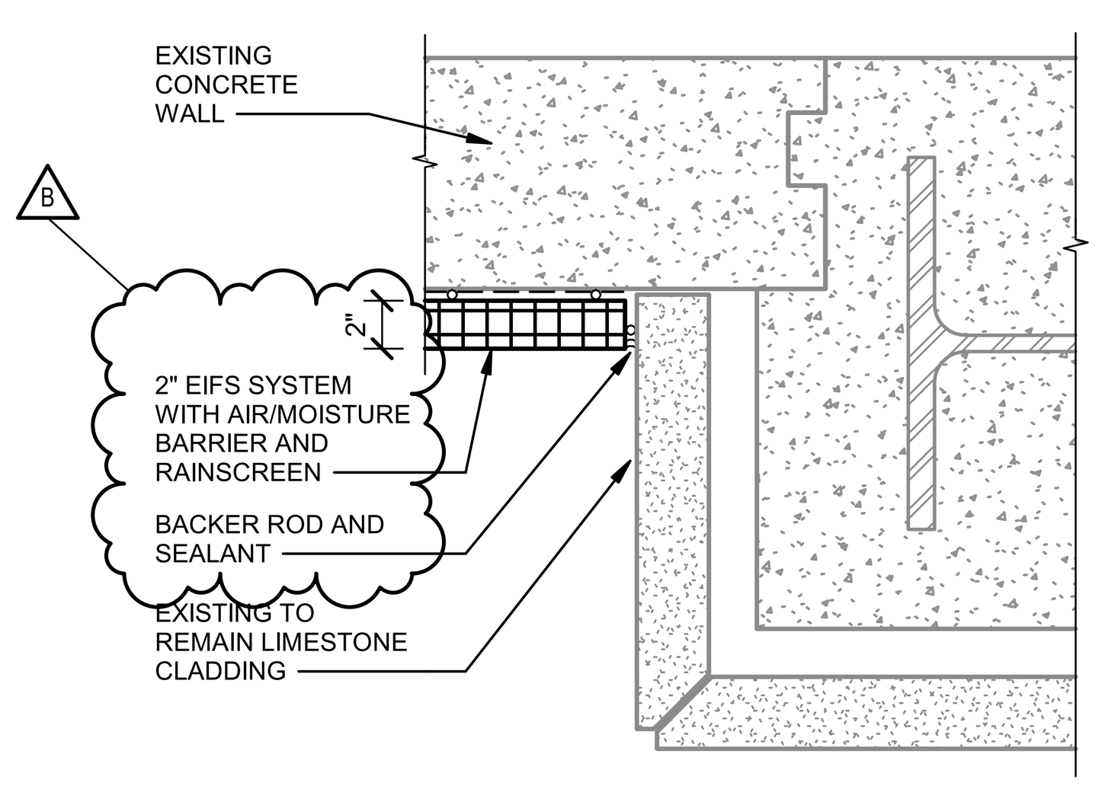
D1 EIFS AT BASE OF WALL (TYP)

1 1/2" = 1'-0"



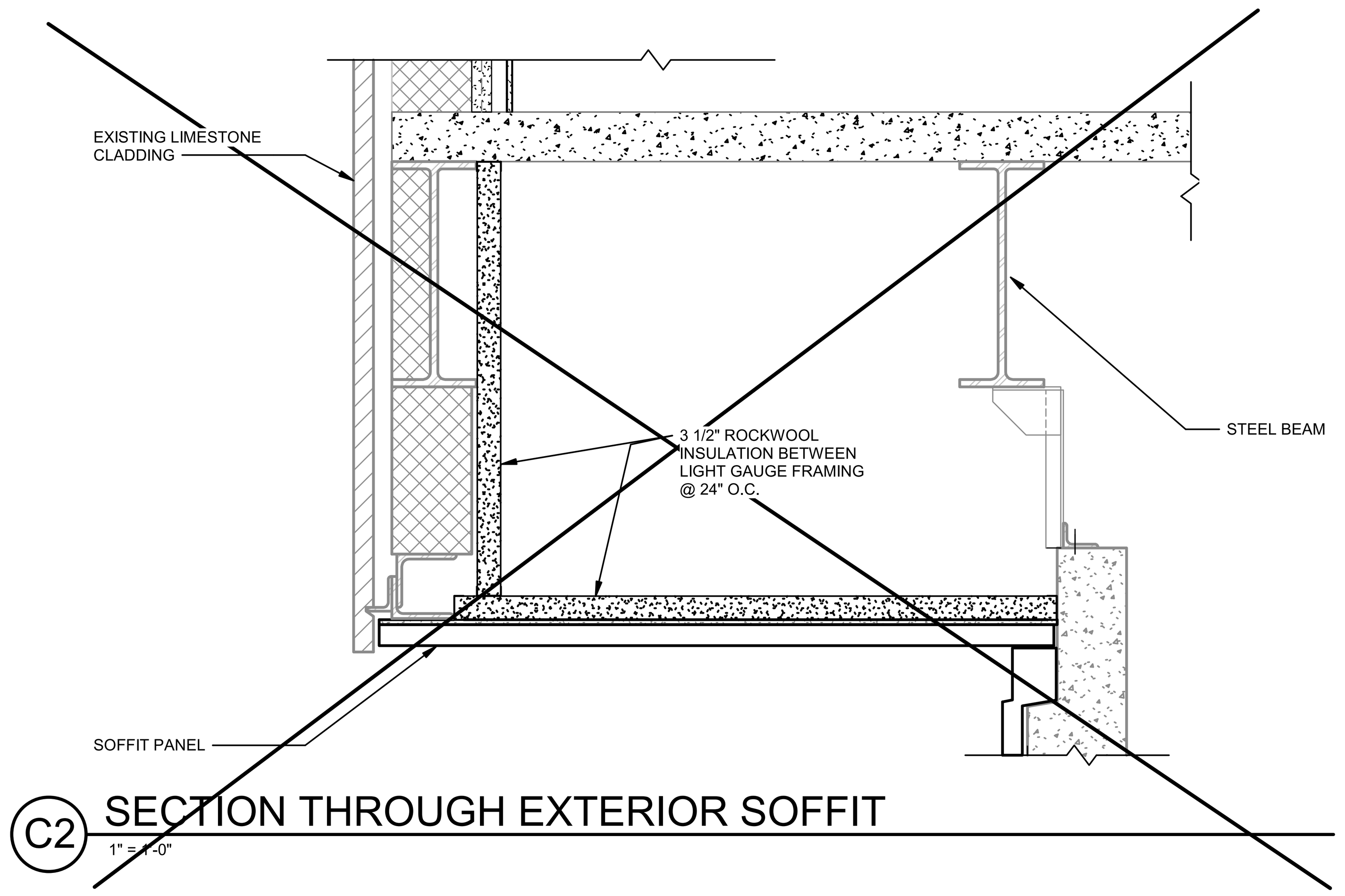
D2 F3A ASSEMBLY AT FLOOR SLAB

1 1/2" = 1'-0"



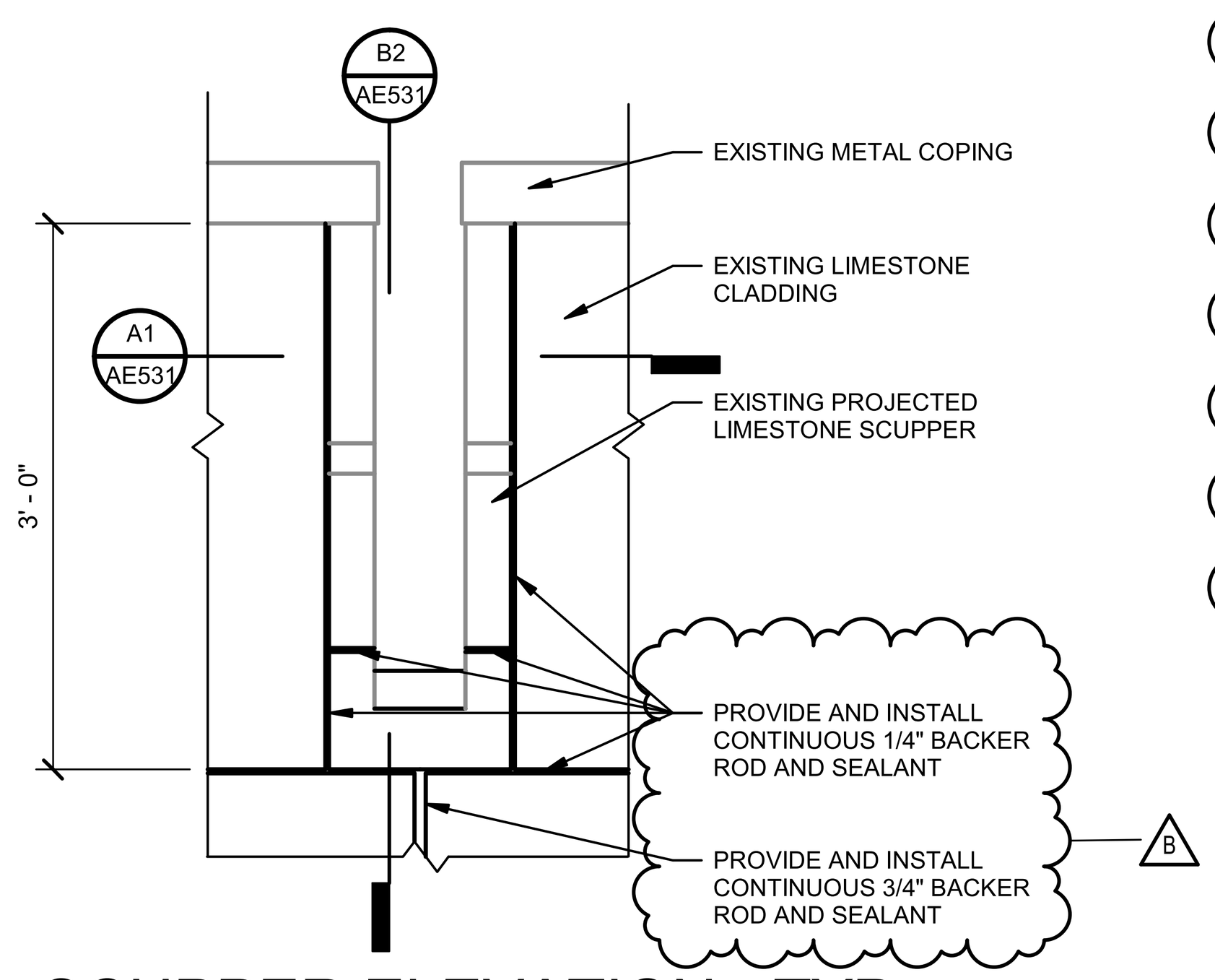
C1 EIFS AT COLUMN EDGE

1 1/2" = 1'-0"



C2 SECTION THROUGH EXTERIOR SOFFIT

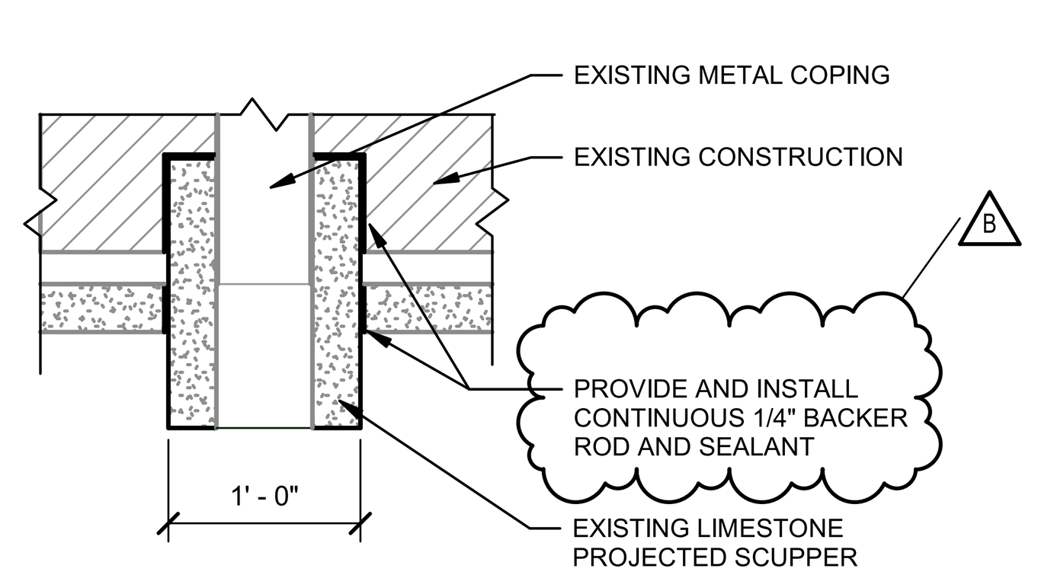
1" = 1'-0"



B1 SCUPPER ELEVATION - TYP

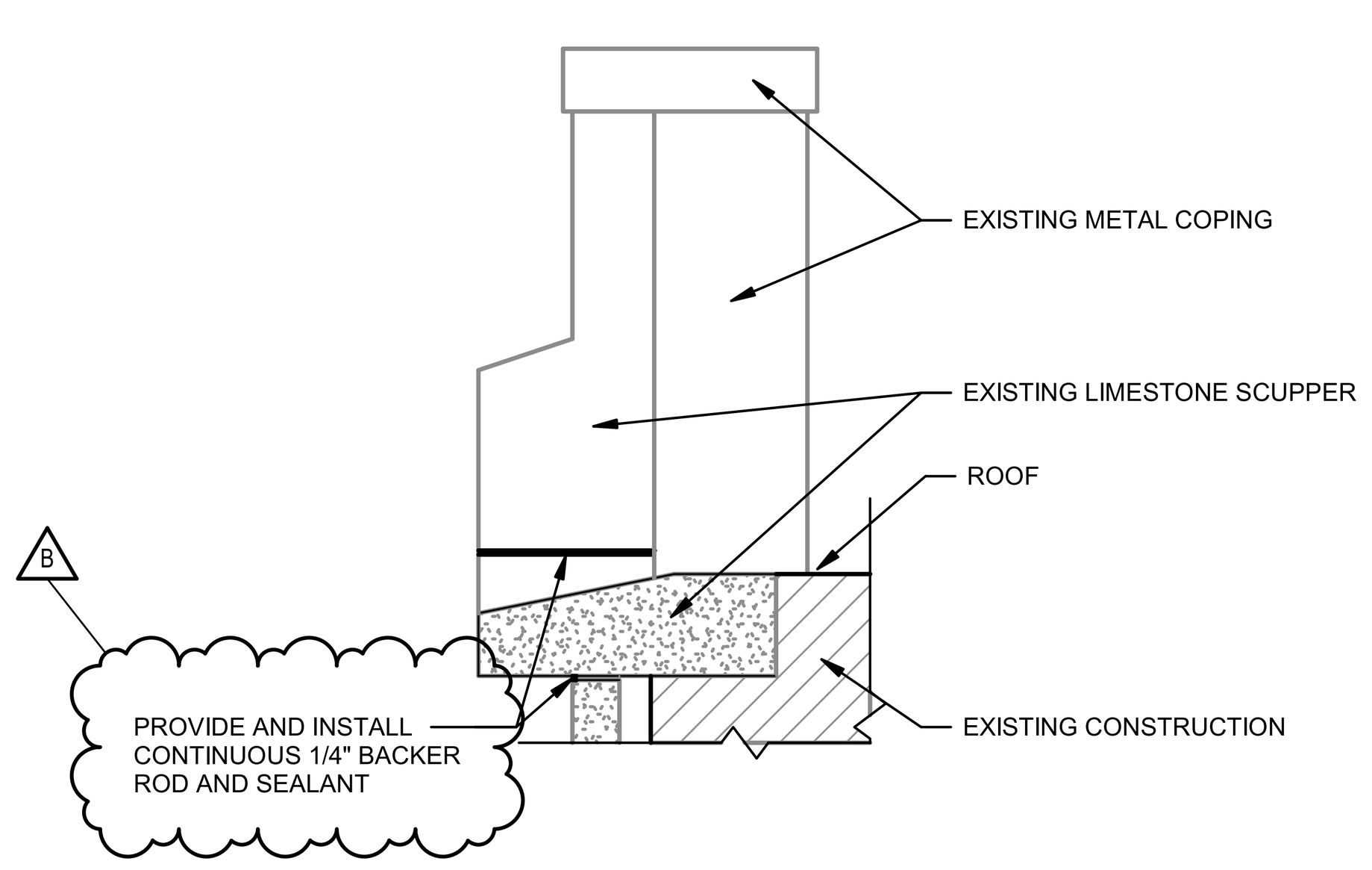
1" = 1'-0"

DETAIL NOTE: XXXXXXXX



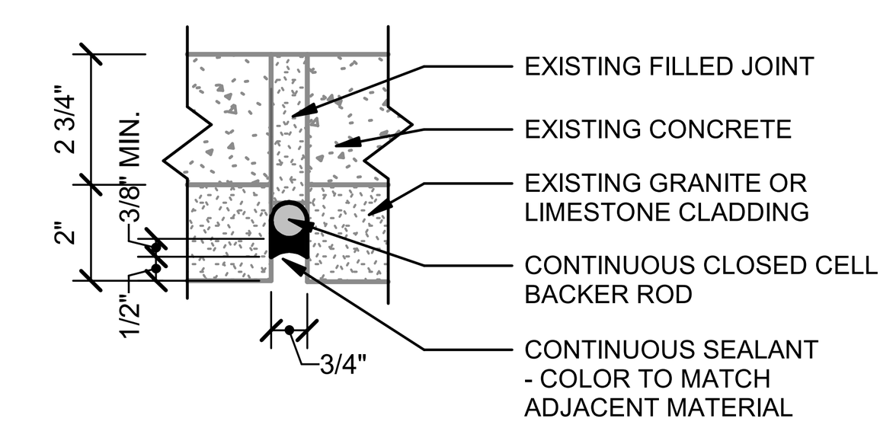
A1 SCUPPER PLAN SECTION - TYP

1" = 1'-0"



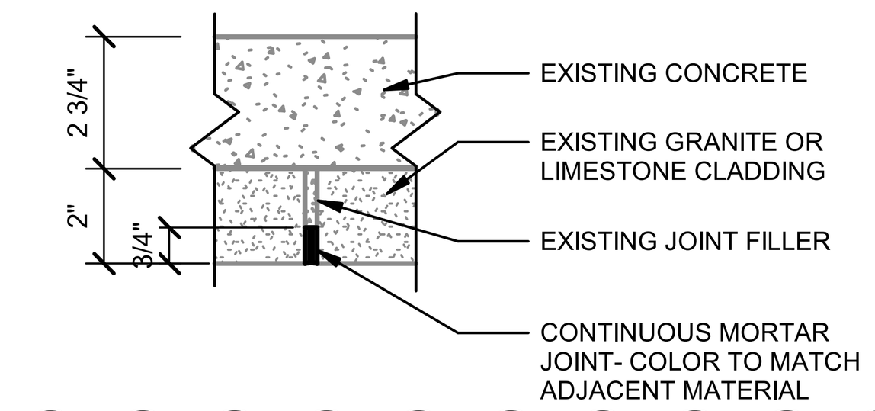
B2 SCUPPER SECTION - TYP

1" = 1'-0"



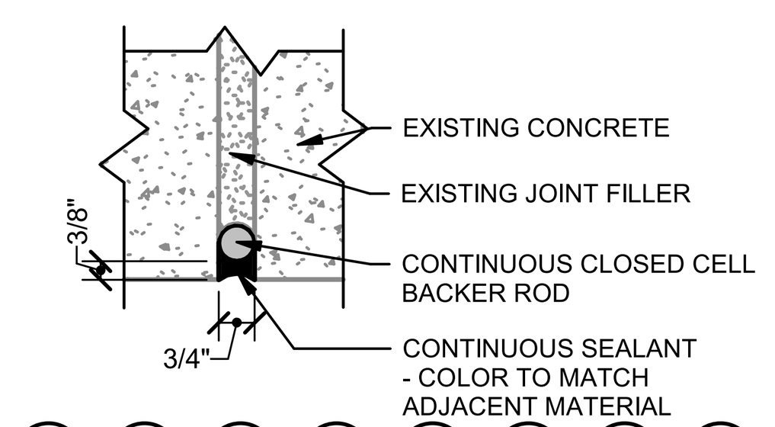
F5 3/4" JOINT DETAIL AT GRANITE AND LIMESTONE

3" = 1'-0"



E5 1/4" JOINT DETAIL AT GRANITE AND LIMESTONE

3" = 1'-0"



D5 3/4" JOINT DETAIL AT CONCRETE

3" = 1'-0"

NOTES

1. SEE SHEET AE001 FOR SYMBOLS, LEGENDS AND GENERAL NOTES.
2. COORDINATE INTERIOR AND EXTERIOR INSULATION EXTENTS WITH PLANS.

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LICENSED ARCHITECT DANIEL C. MORENO No. 2409 STATE OF MAINE
02/08/2022

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ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
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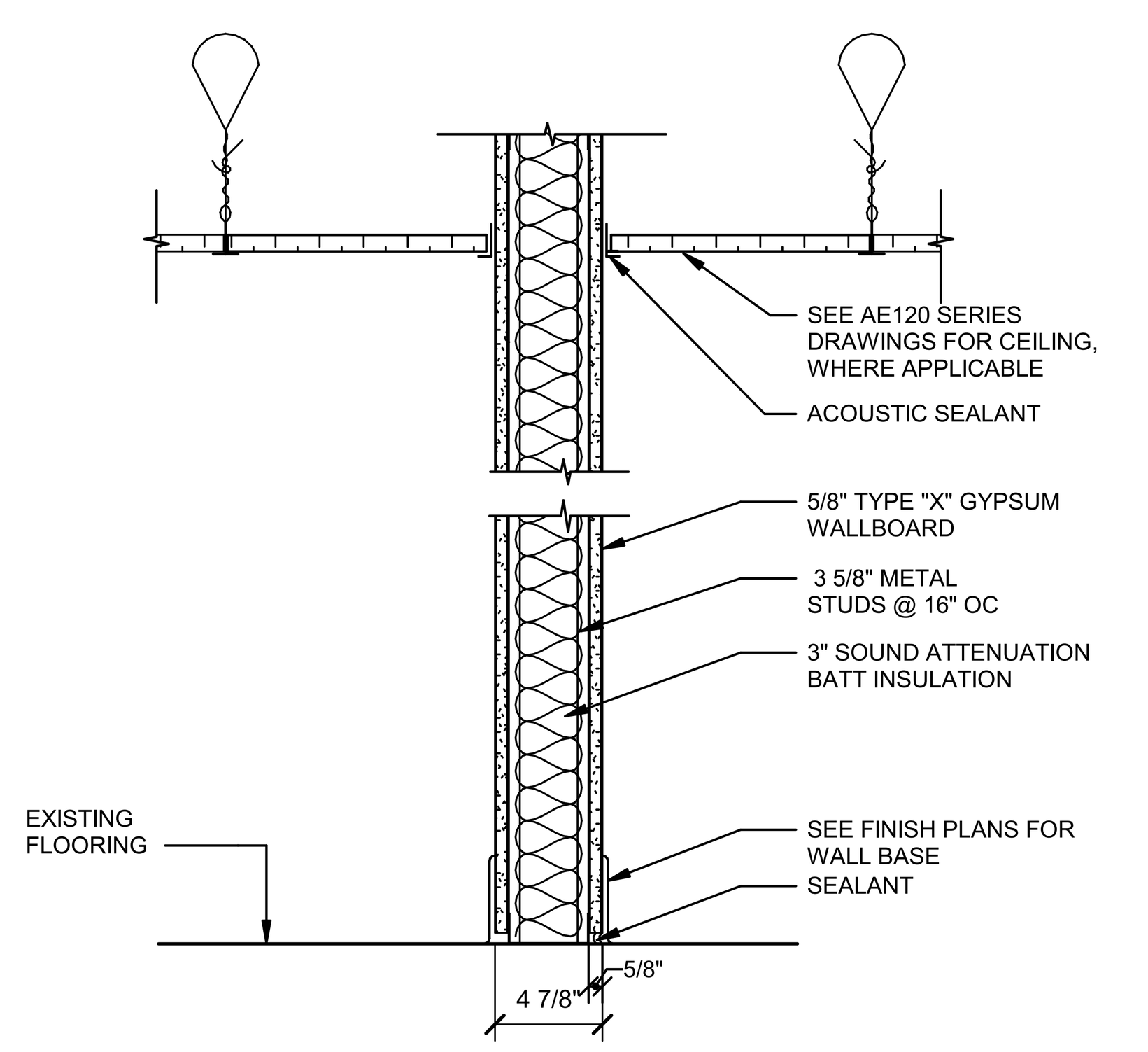
PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	DCM
DESIGNED BY:	PDG
DRAWN BY:	GJN

SHEET TITLE: EXTERIOR DETAILS

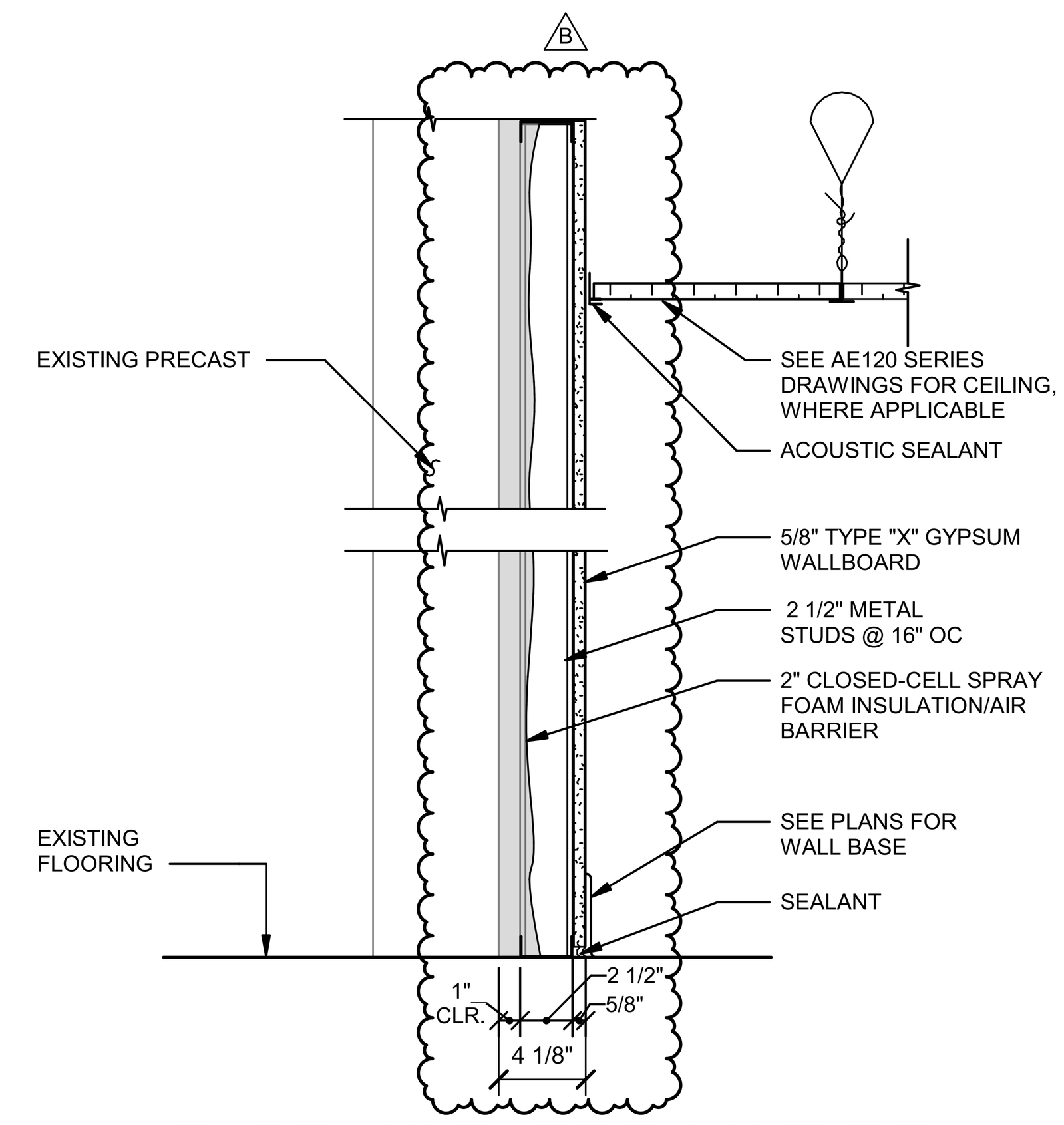
SHEET ID: AE531

NOT FOR CONSTRUCTION



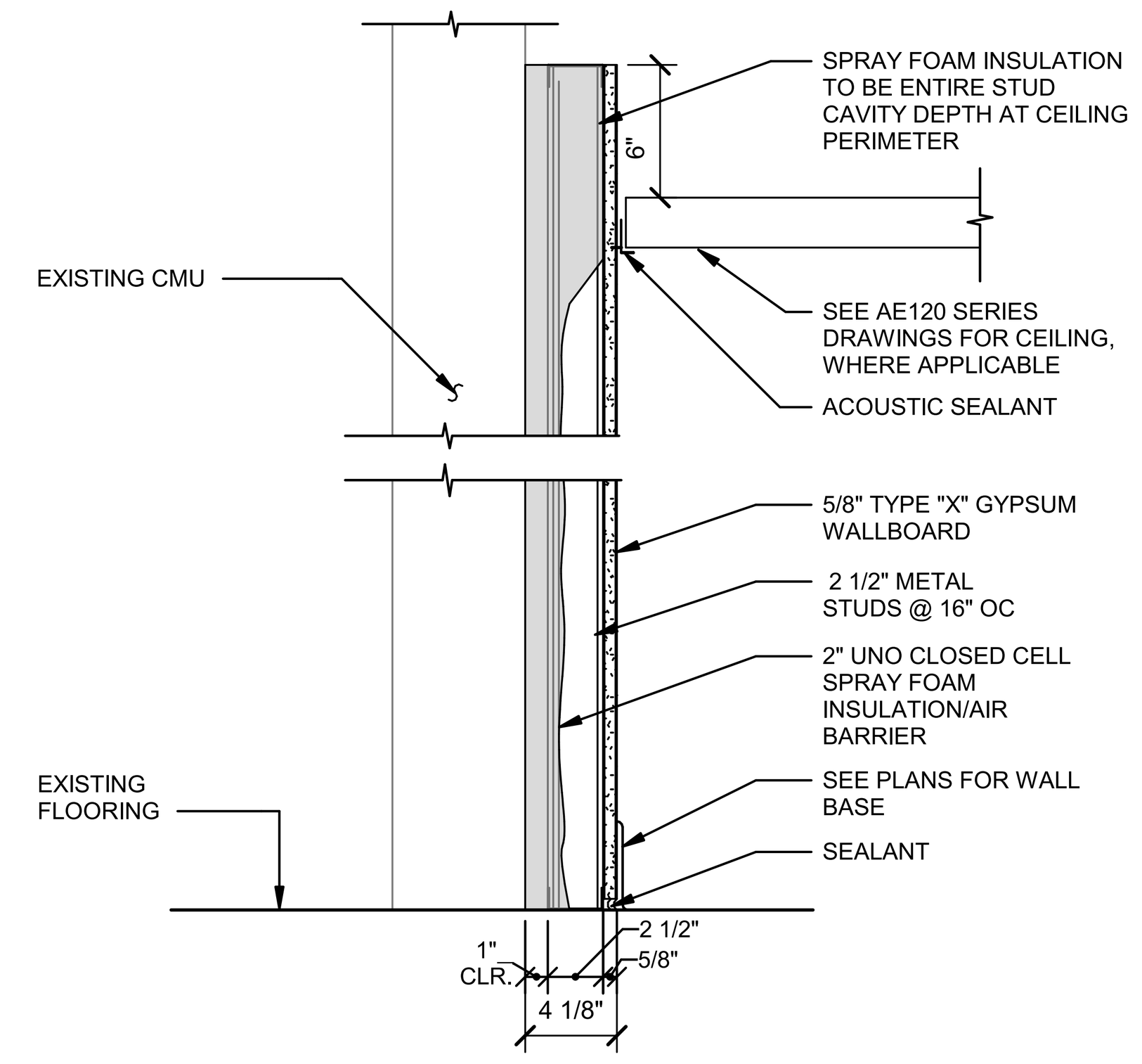
STUD PARTITION TYPE NON RATED

TAG	DESCRIPTION
S3a	STUDS @ 16" OC, EXTEND TO DECK; GWB BOTH SIDES, EXTEND TO DECK



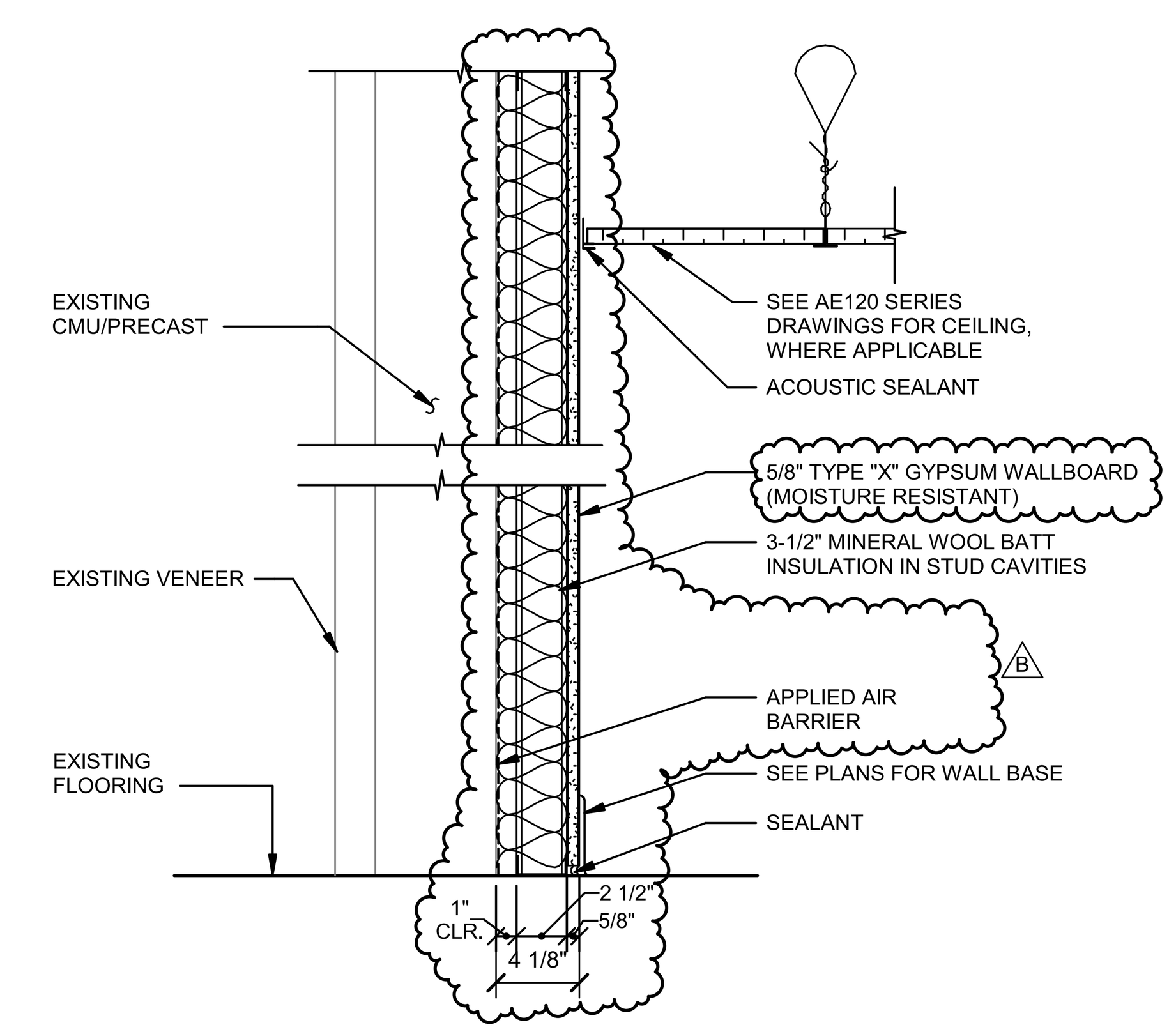
FURRING PARTITION TYPE NON RATED

TAG	DESCRIPTION
F3a	STUDS @ 16" OC, EXTEND TO DECK, SPACED 1" OFF WALL, WITH CLIPS BACK TO WALL AT 4'-0" MAX. SPACING. GWB TAGGED SIDE, EXTEND TO DECK



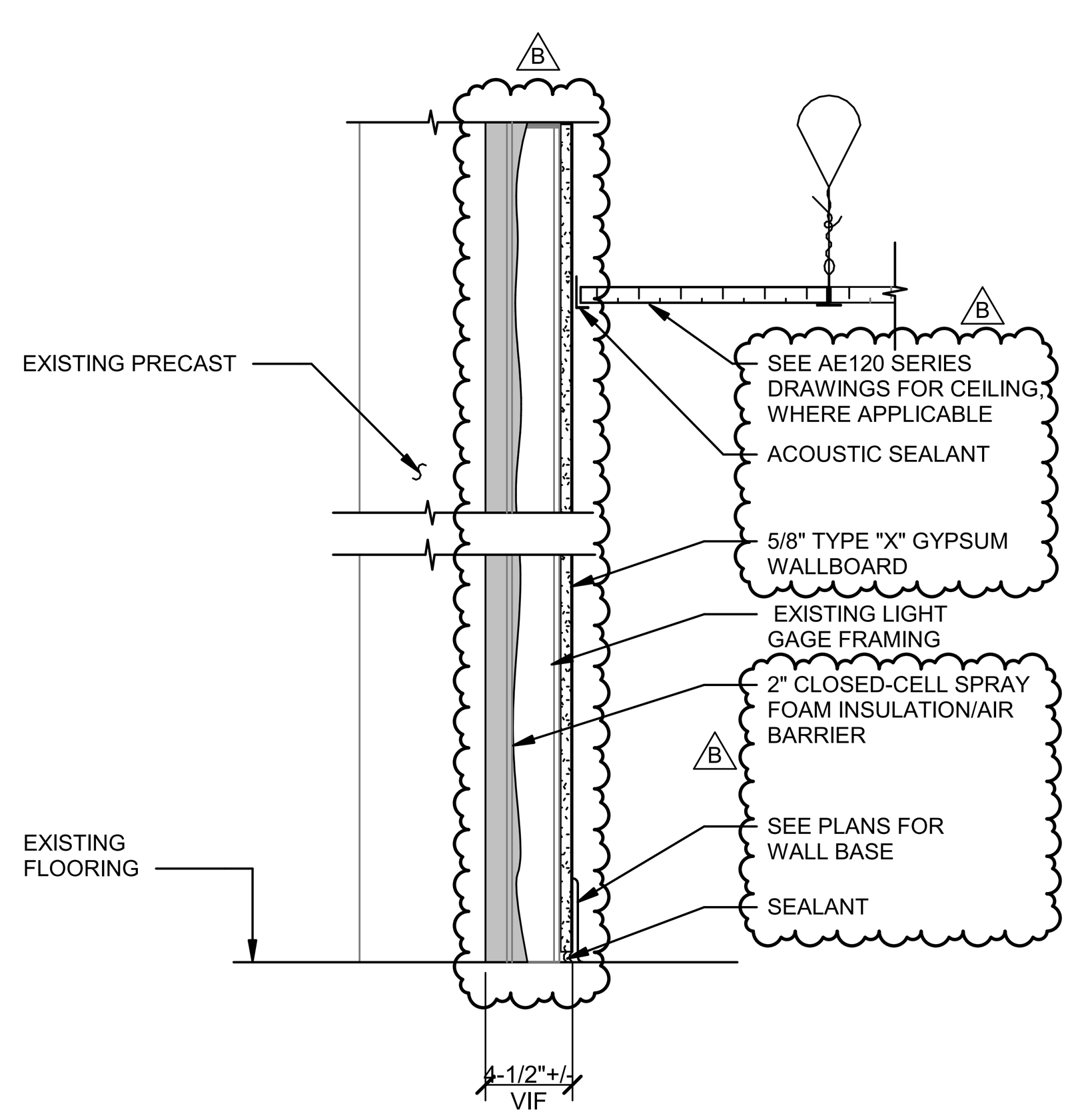
FURRING PARTITION TYPE NON RATED

TAG	DESCRIPTION
F3b	STUDS @ 16" OC, EXTEND TO 6" ABOVE CEILING, SPACED 1" OFF WALL WITH CLIPS BACK TO WALL AT 4'-0" MAX SPACING. GWB TAGGED SIDE, EXTEND TO 6" ABOVE CEILING



FURRING PARTITION TYPE NON RATED

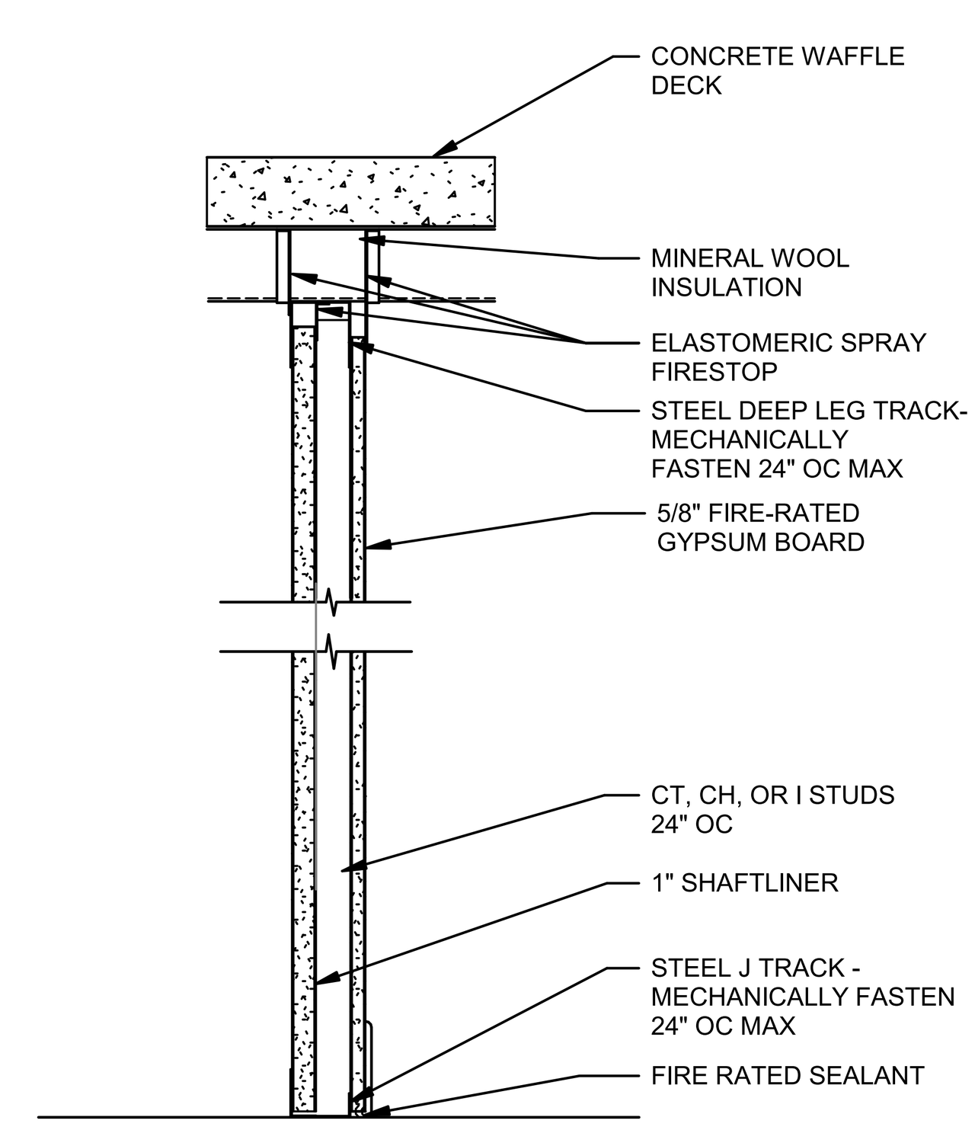
TAG	DESCRIPTION
F3c	STUDS @ 16" OC, SPACED 1" OFF WALL, EXTEND TO DECK WITH CLIPS BACK TO WALL AT 4'-0" MAX. SPACING. GWB TAGGED SIDE, EXTEND TO DECK.



FURRING PARTITION TYPE NON RATED

TAG	DESCRIPTION
E4a	EXISTING WALL FRAMING, GWB TAGGED SIDE, EXTEND TO DECK

B



1 HOUR SHAFT WALL FIRE RATED

TAG	DESCRIPTION
H4A X	1-HOUR FIRE RATED UL U499 PROVIDE ASSEMBLY AS INFILL WHERE PORTIONS OF CHASE WALL REMOVED FOR ACCESS FOR MECHANICAL WORK EXTEND ASSEMBLY FULL HEIGHT TO DECK WHERE REQUIRED FOR LARGER AREA OF INFILL OR PARTIAL OR FULL WALL REPLACEMENT AND PROVIDE TOP OF WALL SIM TO UL HW-D-0569

NOTES

1. SEE SHEET A-001 FOR SYMBOLS, LEGENDS AND GENERAL NOTES.
2. SEE AE602 FOR TOP OF WALL CONDITIONS.
3. ALL BATT INSULATION IS TO BE FULL THICKNESS AND FULL HEIGHT UNO.
4. REFER TO FINISH PLAN FOR EXTENT OF FINISHES APPLIED TO WALLS.
5. BRACE WALLS WHICH DO NOT EXTEND FULL HEIGHT TO STRUCTURE FOR ALL WALL LENGTHS GREATER THAN 8'-0" BETWEEN CORNERS. BRACE WITH 45 STUD TO STRUCTURE AT 8'-0" ON CENTER MAX.
6. REFER TO STRUCTURAL FOR REQUIRED REINFORCING OF MASONRY WALLS.

PARTITION TAG LEGEND

PARTITION MATERIAL — S3a — STUD/CMU WIDTH; PARTITION TYPE MODIFIER; RATING TYPE — X

PARTITION MATERIAL	MATERIAL DESCRIPTION
S	INTERIOR STUD PARTITION
M	INTERIOR MASONRY PARTITION
C	CONCRETE WALL SYSTEM
H	CHASE WALL SYSTEM
F	FURRED WALL SYSTEM
L	WIRE MESH PARTITION

RATING TYPE	RATING DESCRIPTION
X	FIRE RATED PARTITION -
Y	SMOKE RATED PARTITION
Z	SOUND RATED PARTITION

STUD/CMU WIDTH

NUMERIC CHARACTER	STUD WIDTH	CMU WIDTH
1	1 5/8"	
2	2 1/2"	
3	3 5/8"	
4	4"	3 5/8"
6	6"	5 5/8
8	8"	7 5/8"
10	9 1/4"	10'
12	12	11 5/8"

○ ADDITIVE BID ALTS

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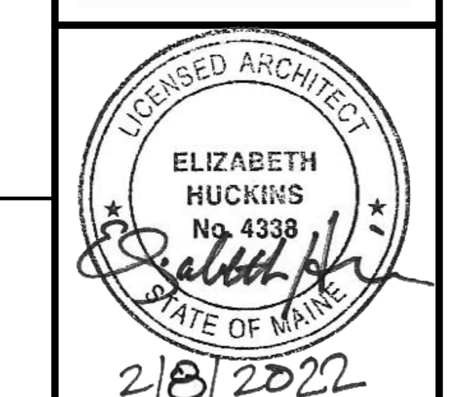

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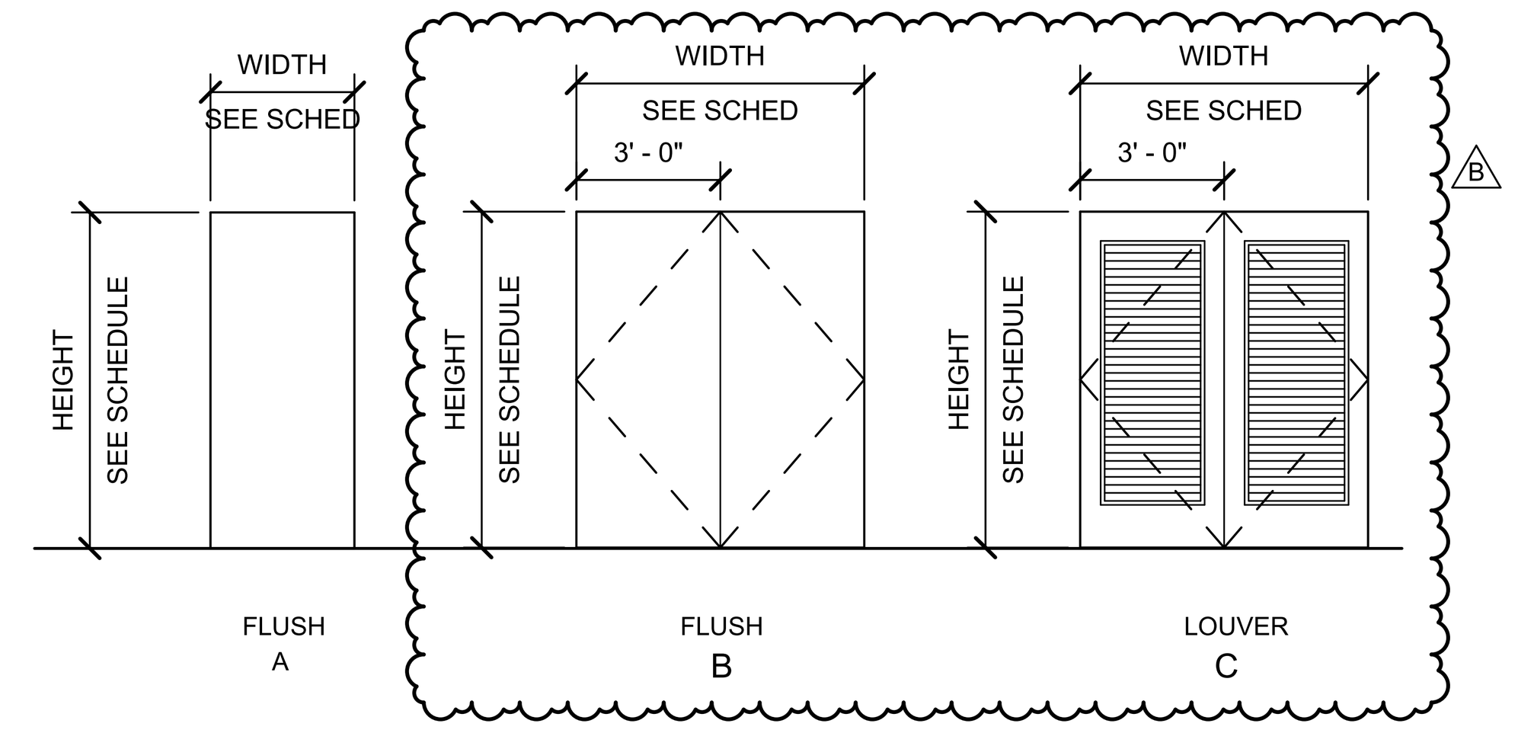
PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	EAH
DESIGNED BY:	TCM
DRAWN BY:	JLR

SHEET TITLE:
PARTITION INFORMATION

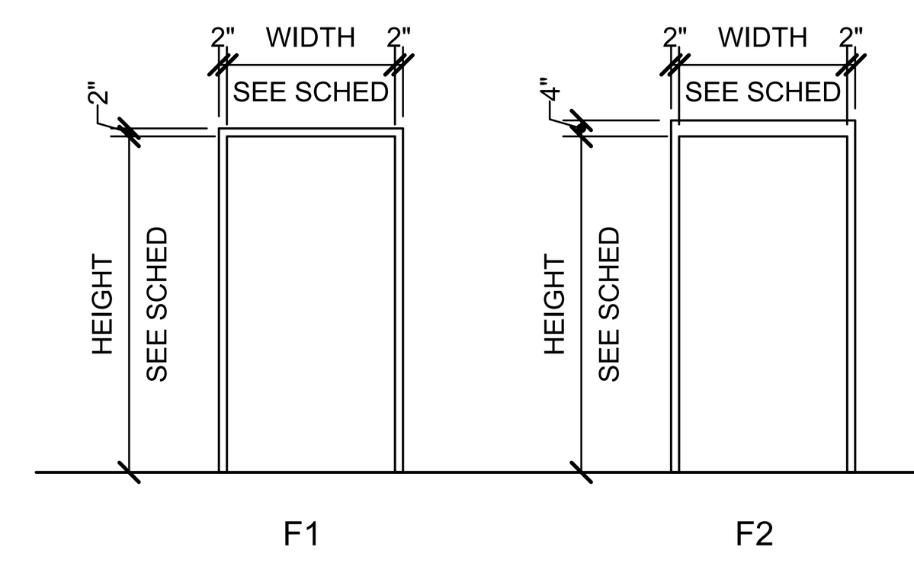
SHEET ID:
AE601

NOT FOR CONSTRUCTION



F1 DOOR TYPES

1/4" = 1'-0"



F2 FRAME TYPES

1/4" = 1'-0"

SCHEDULE - DOOR													
	DOOR					FIRE RATING	HWS	FRAME					COMMENTS
NO.	WIDTH	HT	THK	TYPE	MAT'L			TYPE	MAT'L	HEAD	JAMB	SILL	
110	5' - 0"	7' - 0"	1 3/4"	B	HM		5	F2	HM	H4	J4		INSULATED DOOR/FRAME. 3'-0" ACTIVE LEAF
111	3' - 0"	7' - 0"	1 3/4"	A	HM		4	F2	HM	H4	J4		INSULATED DOOR/FRAME
126a	3' - 0"	7' - 0"	1 3/4"	A	HM			F2	HM	H2	J2		INSULATED DOOR/FRAME
218	6' - 0"	7' - 0"	1 3/4"	B	HM		2	F2	HM	H2	J2		
233	6' - 0"	6' - 8"	1 3/4"	C	HM		1	F2	HM	H2	J2		
234a	3' - 0"	7' - 0"	1 3/4"	A	HM	45 MIN	3	F1	HM	H2	J2		
234b	3' - 0"	7' - 0"	1 3/4"	A	HM	45 MIN	3	F1	HM	H3	J3		
244	6' - 0"	7' - 0"	1 3/4"	B	HM		5	F2	HM	H3	J3		INSULATED DOOR/FRAME
315	5' - 0"	7' - 0"	1 3/4"	B	HM	90 MIN	1	F2	HM	H4	J4		INSULATED DOOR/FRAME. 3'-0" ACTIVE LEAF
348a	5' - 0"	7' - 0"	1 3/4"	B	HM	90 MIN	1	F2	HM	H4	J4		INSULATED DOOR/FRAME. 3'-0" ACTIVE LEAF
348b	3' - 0"	7' - 0"	1 3/4"	A	HM		1	F1	HM	H1	J1		INSULATED DOOR/FRAME
348c	3' - 0"	7' - 0"	1 3/4"	A	HM		1	F1	HM	H1	J1		INSULATED DOOR/FRAME
434	5' - 0"	7' - 0"	1 3/4"	B	HM	90 MIN	1	F2	HM	H4	J4		INSULATED DOOR/FRAME. 3'-0" ACTIVE LEAF

NOTE: VERIFY ROUGH OPENING SIZE FOR NEW DOORS AND FRAMES IN EXISTING OPENINGS

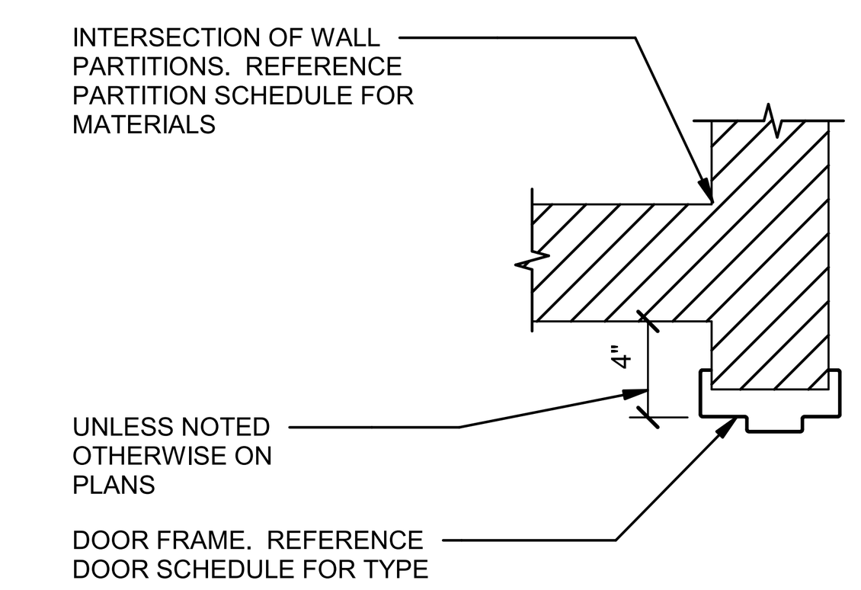
NOTES

1. SEE SHEET A-001 FOR SYMBOLS, ABBREVIATIONS AND GENERAL NOTES.
2. SEE SHEET AE101 FOR DOOR LOCATIONS

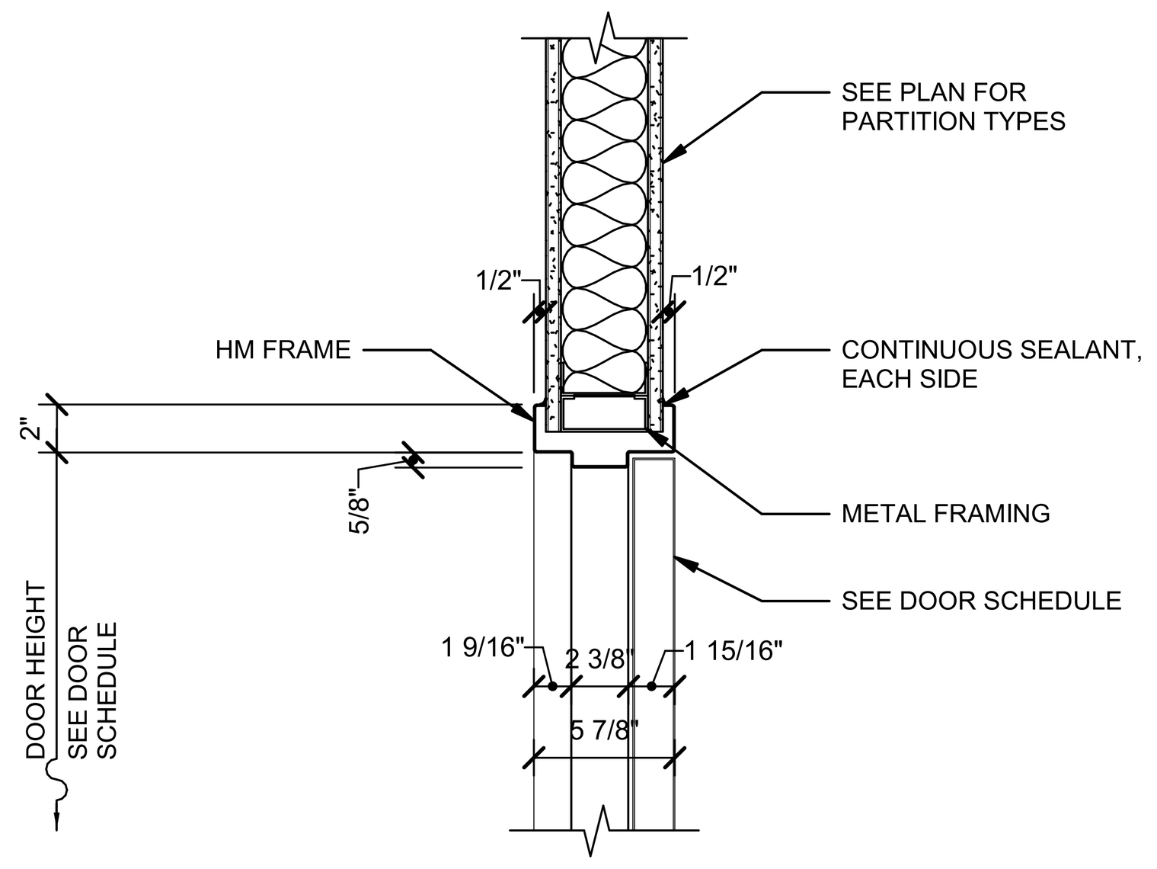
ABBREVIATIONS

EQ	EQUAL
FF	FACTORY FINISH
HM	HOLLOW METAL
HR	HOUR
HRDWR	HARDWARE
HT	HEIGHT
INSUL	INSULATED
MAT'L	MATERIAL
MTL	METAL
NO	NUMBER
PTD	PAINTED
THK	THICK
TYP	TYPICAL
WD	WOOD

LEGEND

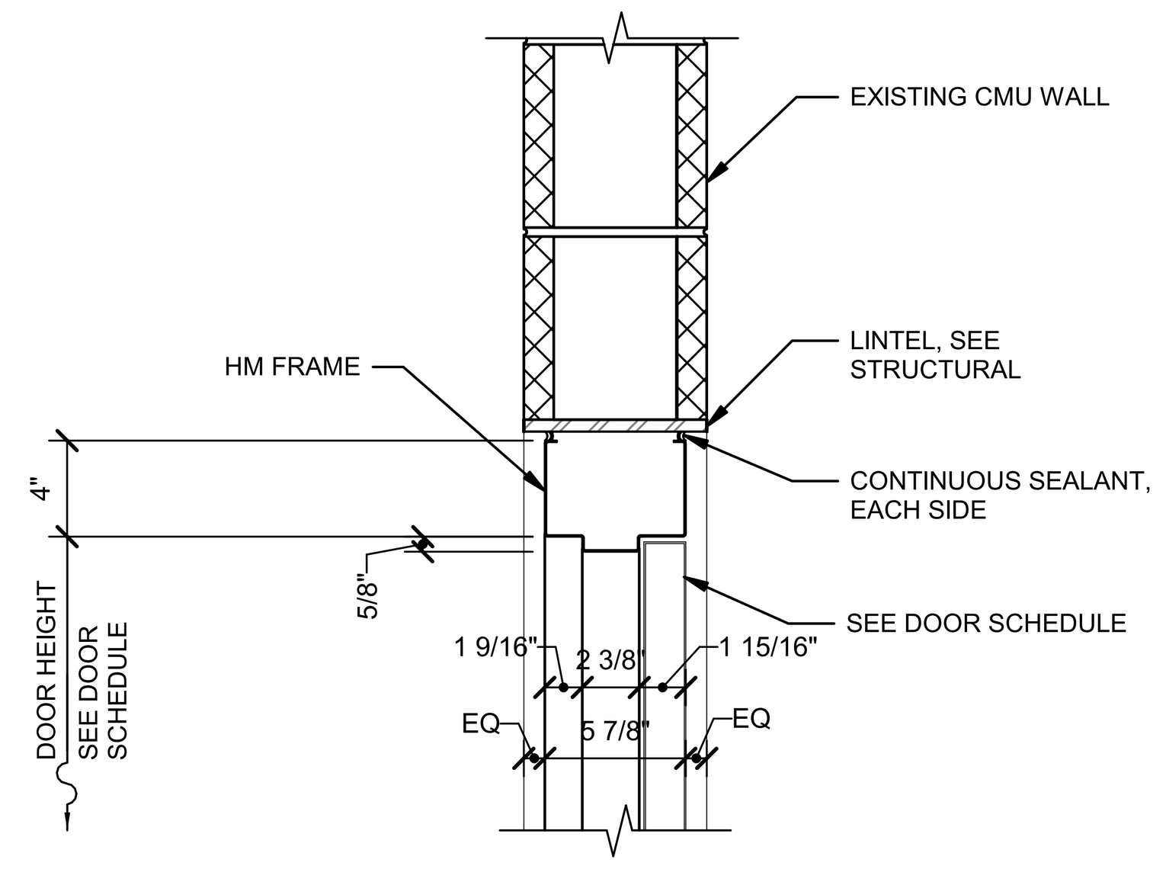


TYP DOOR LOCATION



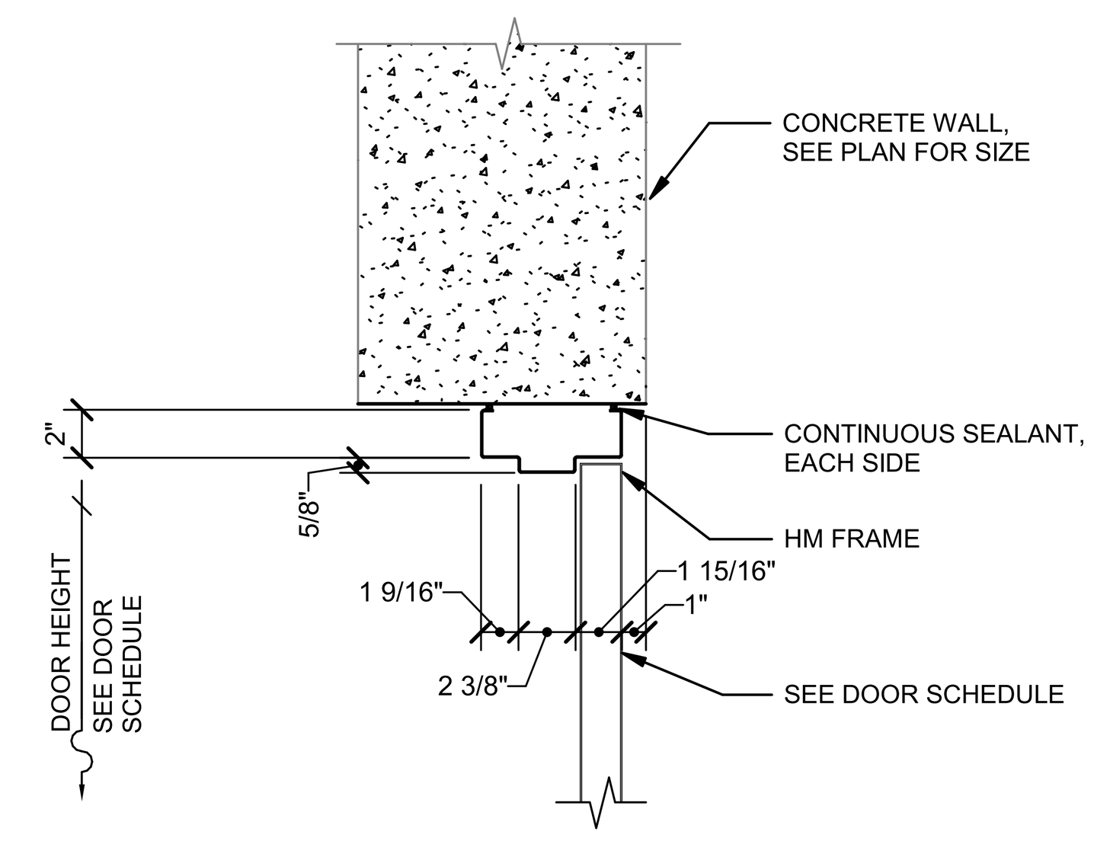
H1 DOOR HEAD

1 1/2" = 1'-0"



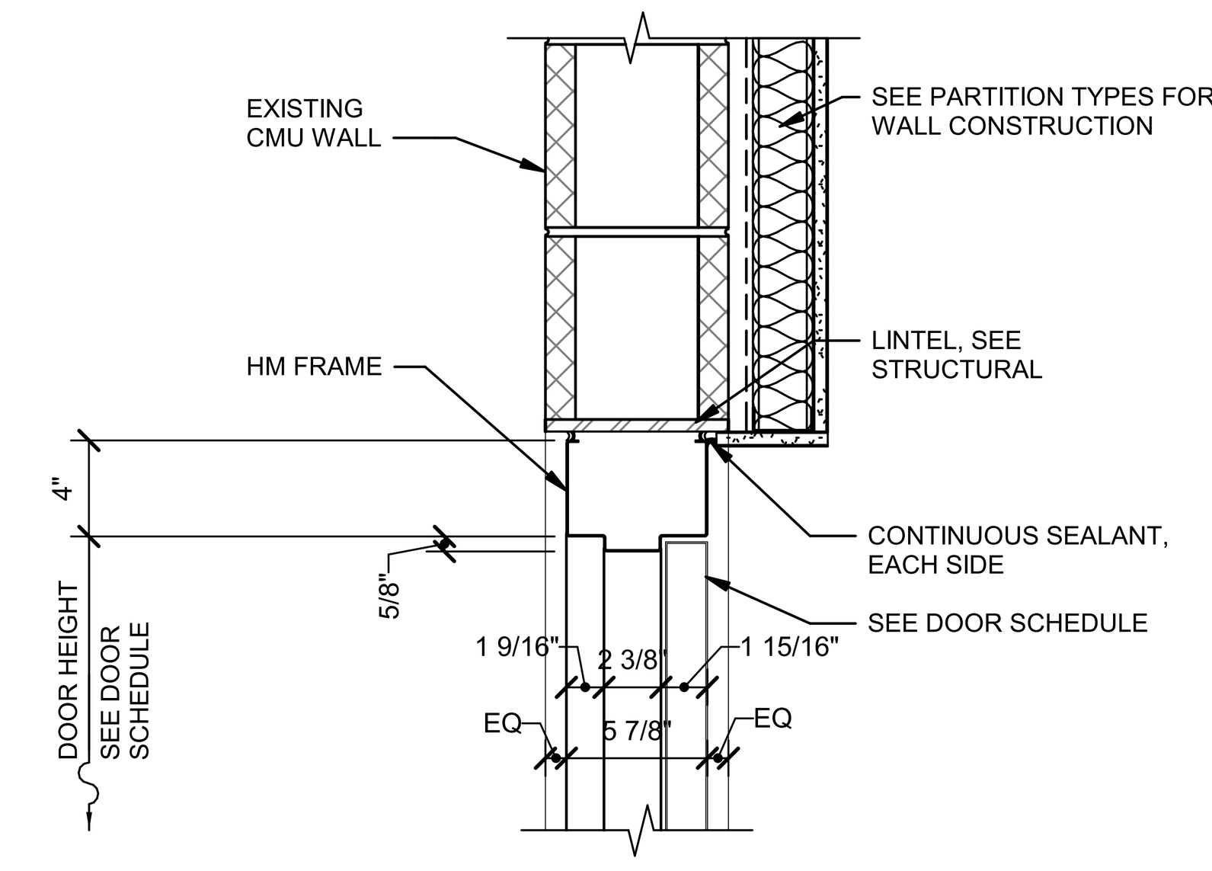
H2 DOOR HEAD

1 1/2" = 1'-0"



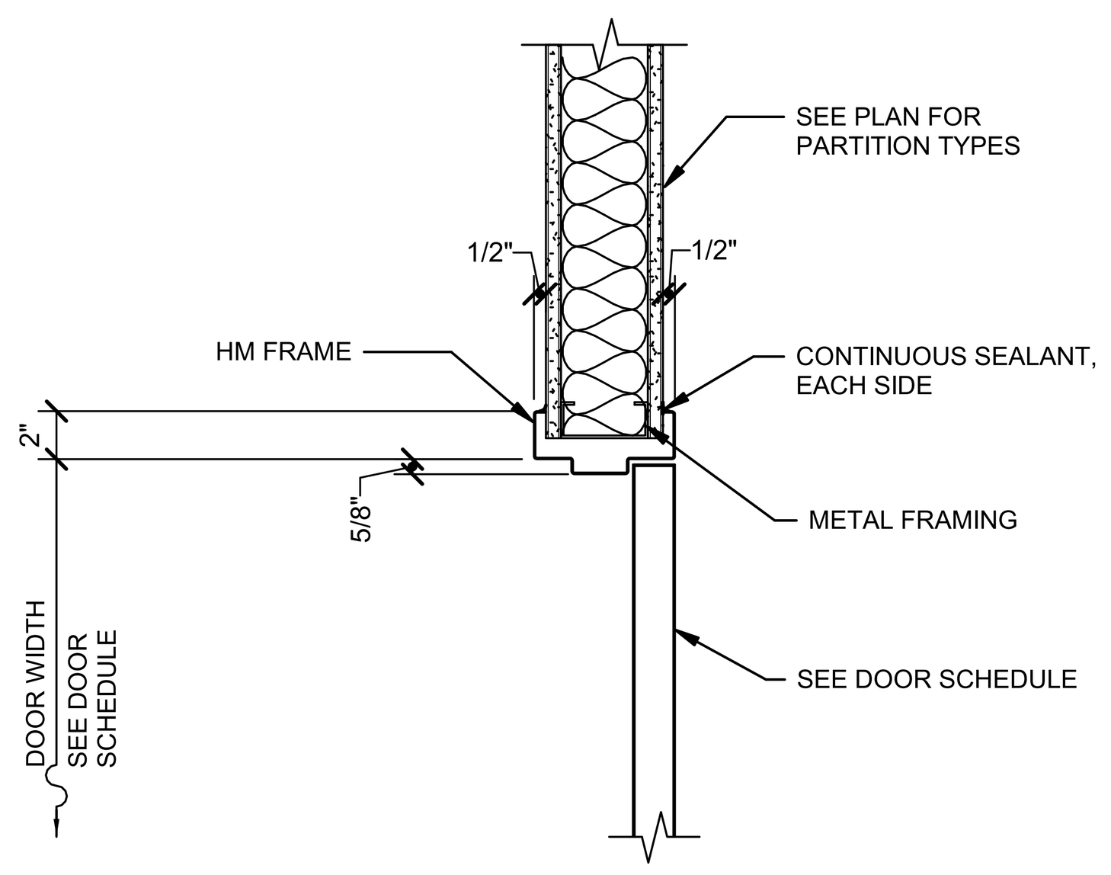
H3 DOOR HEAD

1 1/2" = 1'-0"



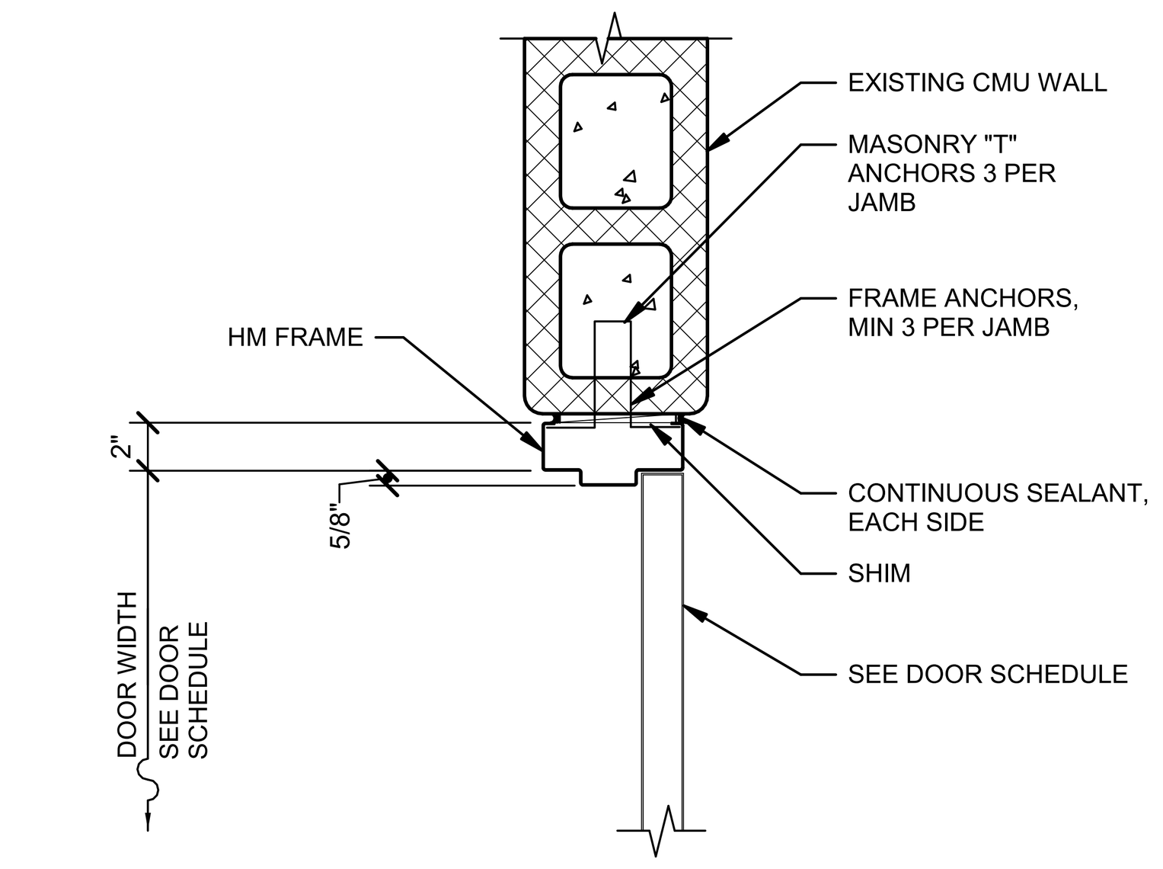
H4 DOOR HEAD

1 1/2" = 1'-0"



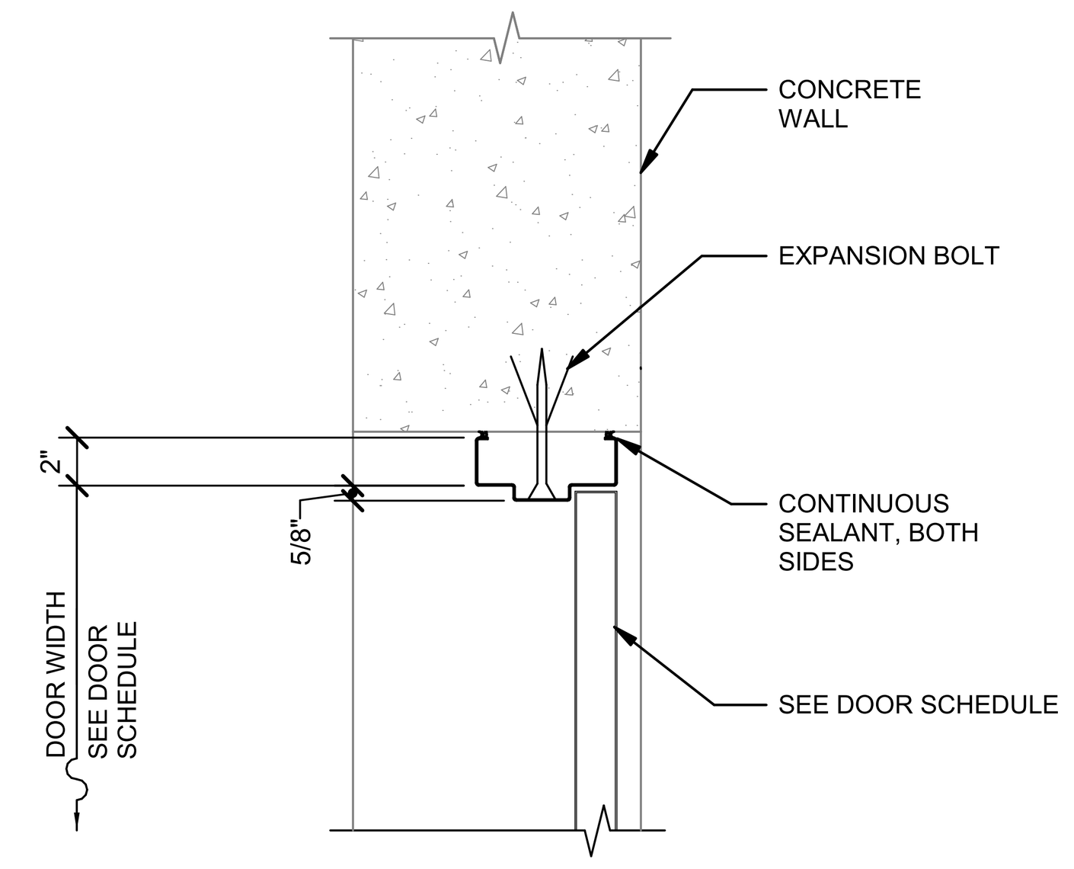
J1 DOOR JAMB

1 1/2" = 1'-0"



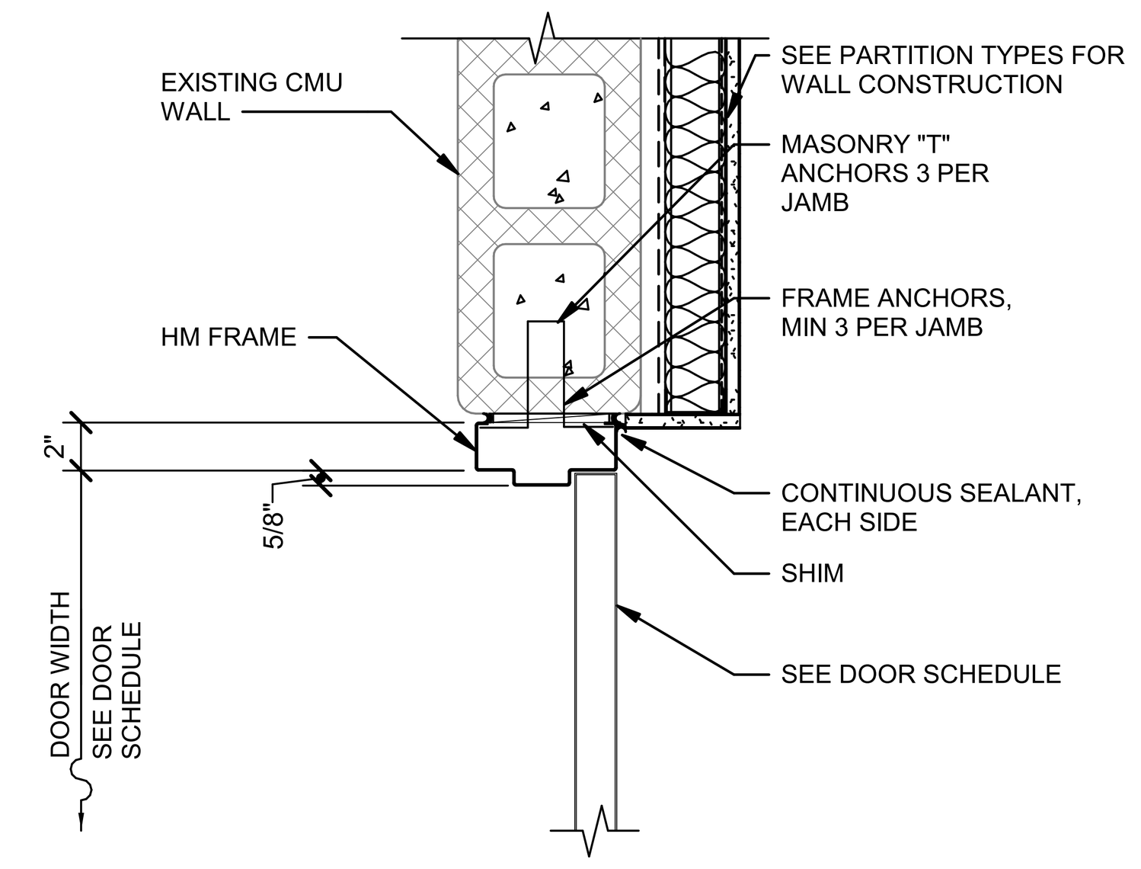
J2 DOOR JAMB

1 1/2" = 1'-0"



J3 DOOR JAMB

1 1/2" = 1'-0"



J4 DOOR JAMB

1 1/2" = 1'-0"

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AUGUSTA, MAINE 04333-0077
(207) 624-7314

LICENSED ARCHITECT ELIZABETH HUCKINS No. 4338 STATE OF MAINE
2/8/2022

CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

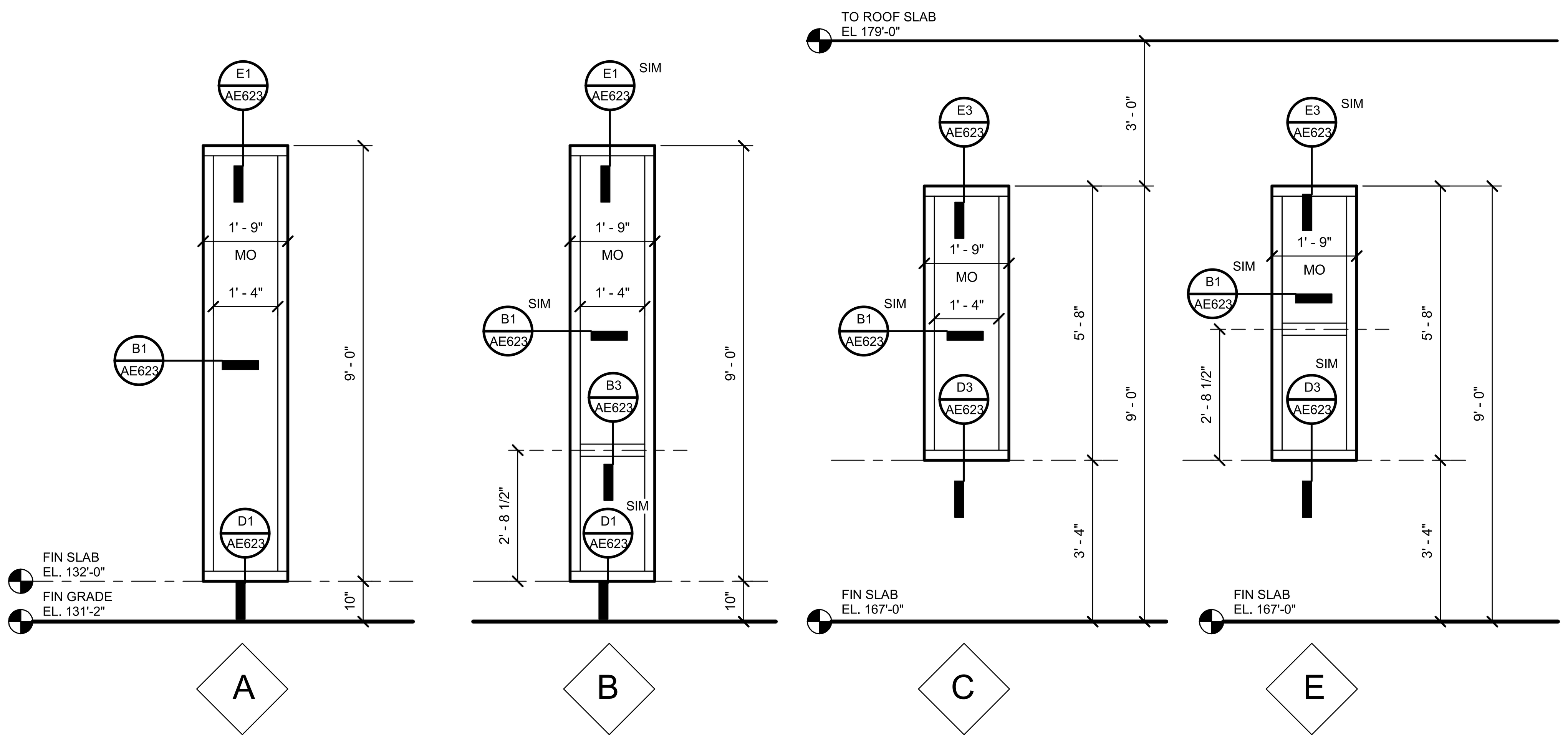
REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	EAH
DESIGNED BY:	TCM
DRAWN BY:	JLR

SHEET TITLE:
DOOR TYPES AND DETAILS

SHEET ID:
AE611

NOT FOR CONSTRUCTION



STOREFRONT AND CURTAINWALL SCHEDULE (BID SET #2)					
ID	WIDTH	HEIGHT	TEMPERED	BoD PRODUCT	NOTES
A	1' - 9"	9' - 0"		Kawneer 601T Thermal Break Storefront	
B	1' - 9"	9' - 0"		Kawneer 601T Thermal Break Storefront	
C	1' - 9"	5' - 8"		Kawneer 601T Thermal Break Storefront	
E	1' - 9"	5' - 8"		Kawneer 601T Thermal Break Storefront	
G	1' - 9"	21' - 0"		Kawneer 1620UT Thermal Break Curtainwall	
H	1' - 9"	21' - 0"		Kawneer 1620UT Thermal Break Curtainwall	
J	2' - 8"	12' - 2 1/2"		Kawneer 1620UT Thermal Break Curtainwall	
K	2' - 8"	24' - 2 1/2"		Kawneer 1620UT Thermal Break Curtainwall	
L	VARIES	12' - 8 1/2"		Kawneer 1620UT Thermal Break Curtainwall	WIDTH VARIES DUE TO JAMB BEING PARALLEL TO TAPERED COLUMN
M	VARIES	36' - 8 1/2"		Kawneer 1620UT Thermal Break Curtainwall	WIDTH VARIES DUE TO JAMB BEING PARALLEL TO TAPERED COLUMN
N	VARIES	36' - 6"	AS NOTED	Kawneer 1620UT Thermal Break Curtainwall	WIDTH VARIES DUE TO JAMB BEING PARALLEL TO TAPERED COLUMN
V	29' - 2"	9' - 0"	YES	Kawneer 601T Thermal Break Storefront	
W	29' - 2"	9' - 0"	YES	Kawneer 601T Thermal Break Storefront	

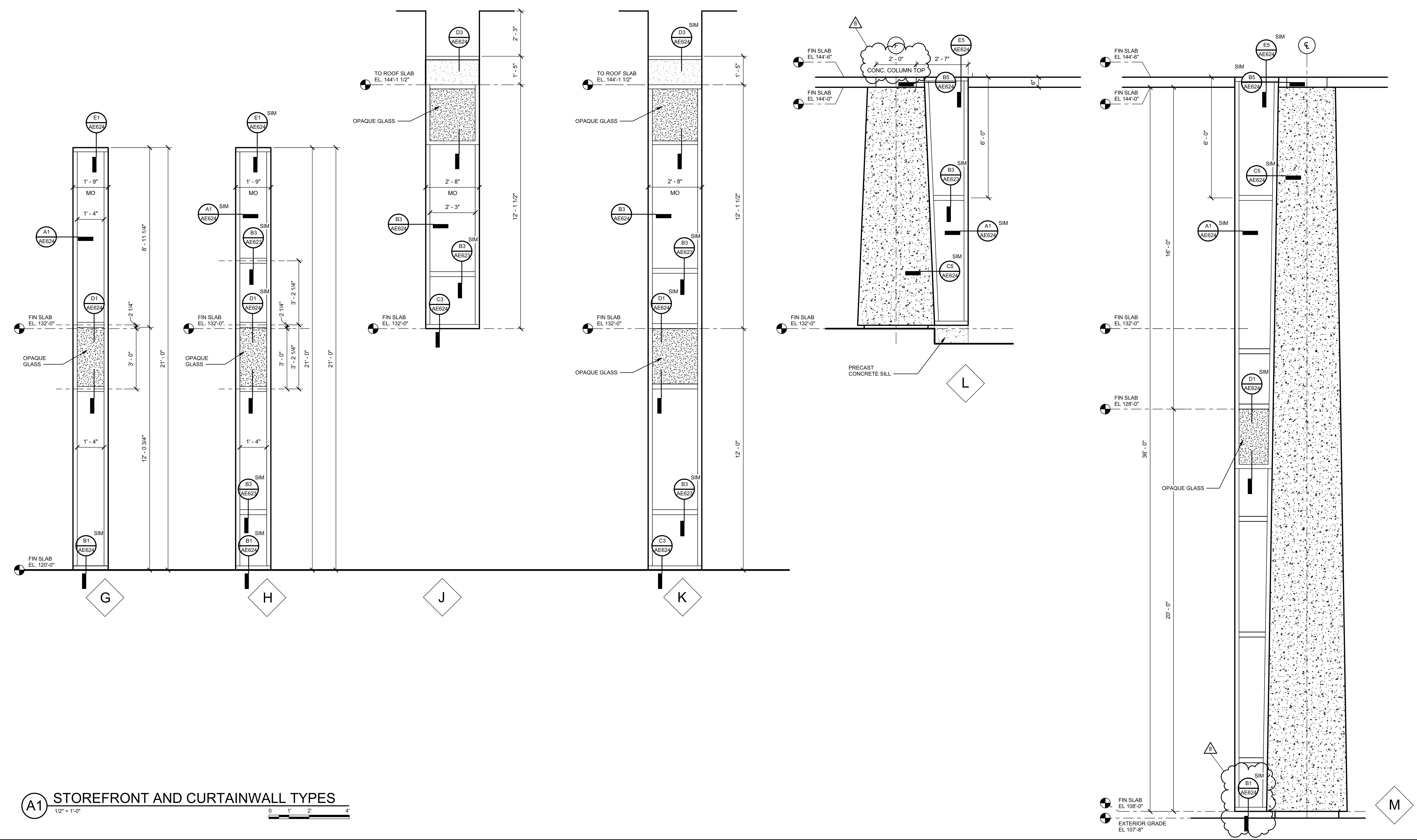
SCHEDULE NOTES

1. ALL R.O. / M.O. DIMENSIONS ARE TO BE VIF TO ENSURE ASSEMBLIES ARE COMPATABILE WITH EXISTING TO REMAIN OPENINGS.
2. STOREFRONT AND CURTAINWALL TO CONSIST OF DOUBLE-GLAZED ASSEMBLY, 1" THICK TOTAL.
   A. NORTH FACE: 1/4" CLEAR - 1/2" GAP - 1/4" CLEAR
   B. SOUTH / EAST / WEST FACES: 1/4" LOW E - 1/2" GAP - 1/4" CLEAR
3. MAINTAINING THE ORIGINAL DESIGN INTENT AND EXISTING CHARACTERISTICS OF THE ENCLOSURE FOR THIS PROJECT IS ESSENTIAL. MATCH EXISTING IN SO FAR AS PRACTICAL OR POSSIBLE.

B

NOTES

1. ALL WINDOWS / STOREFRONT / CURTAINWALL WITH ASSOCIATED DOORS ARE PART OF BID ALT #2
2. ALL NEW WINDOWS ARE TO BE FIXED TYPE, WITH HORIZONTAL MUNTINS MATCHING EXISTING HEIGHTS AND PROFILE DIMENSIONS, TO MAXIMUM EXTENT POSSIBLE.
3. ALL MASONRY OPENINGS DIMENSIONS, AND ANY HISTORICAL WINDOW ELEMENTS BEING REPRESENTED IN NEW WINDOW ASSEMBLIES, ARE TO BE VERIFED IN THE FIELD PRIOR TO NEW ASSEMBLY FABRICATION. VERIFIED DIMENSIONS TO BE REPRESENTED ON SHOP DRAWINGS FOR A/E REVIEW, PRIOR TO FABRICATION.
4. EXISTING BIRD NETTING AT UPPER EXTENTS OF EXTERIOR SOUTH WALL TO REMAIN, REMOVAL TO BE CONFIRMED BY A/E IN THE FIELD.



A1 STOREFRONT AND CURTAINWALL TYPES
1/2" = 1'-0"

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(207) 624-7314

LICENSED ARCHITECT DANIEL C. MORENO No. 2409 STATE OF MAINE
02/08/2022

CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

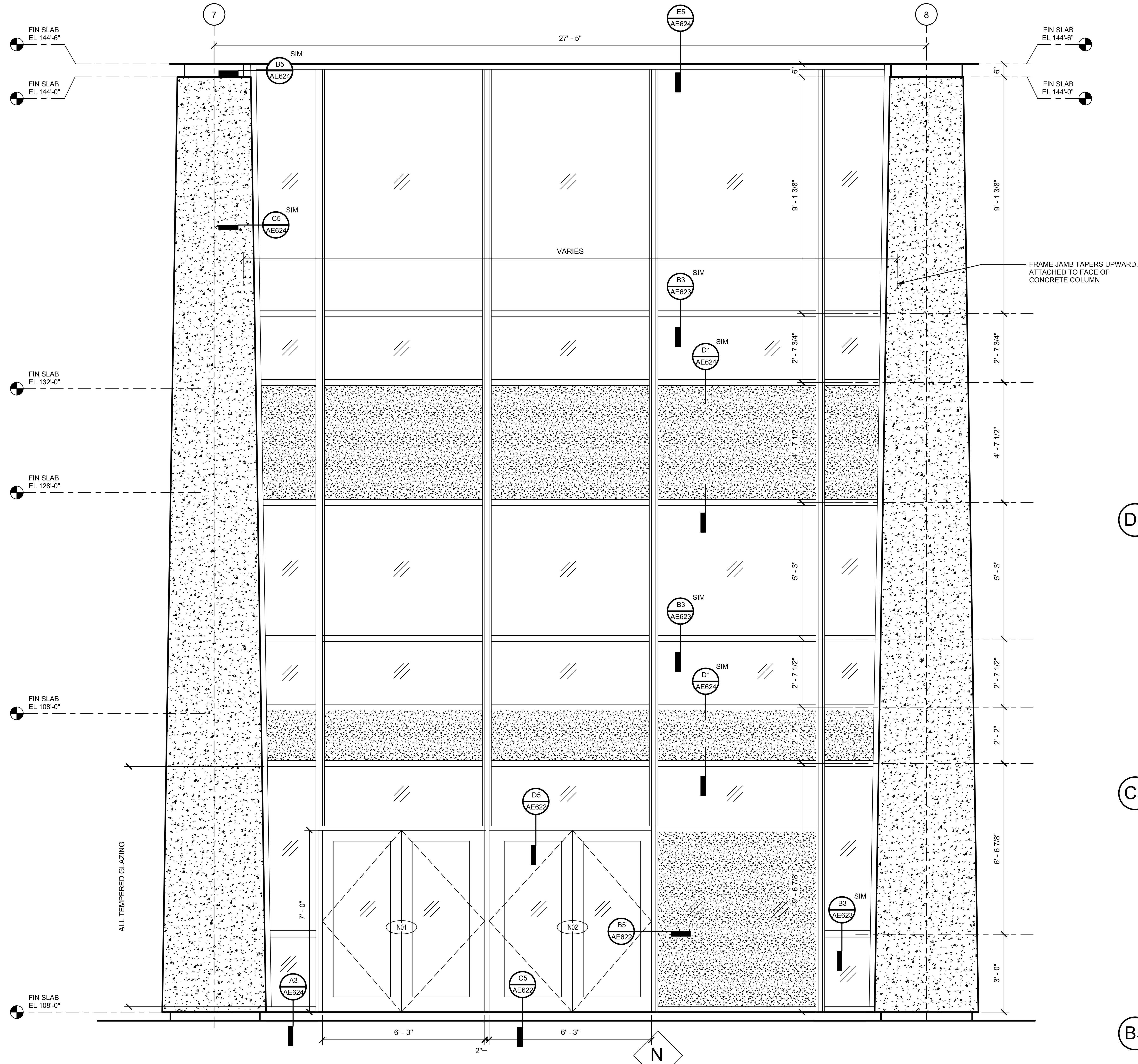
REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	DCM
DESIGNED BY:	PDG
DRAWN BY:	GJN

SHEET TITLE:
STOREFRONT AND CURTAIN WALL INFORMATION

SHEET ID:
AE621

NOT FOR CONSTRUCTION



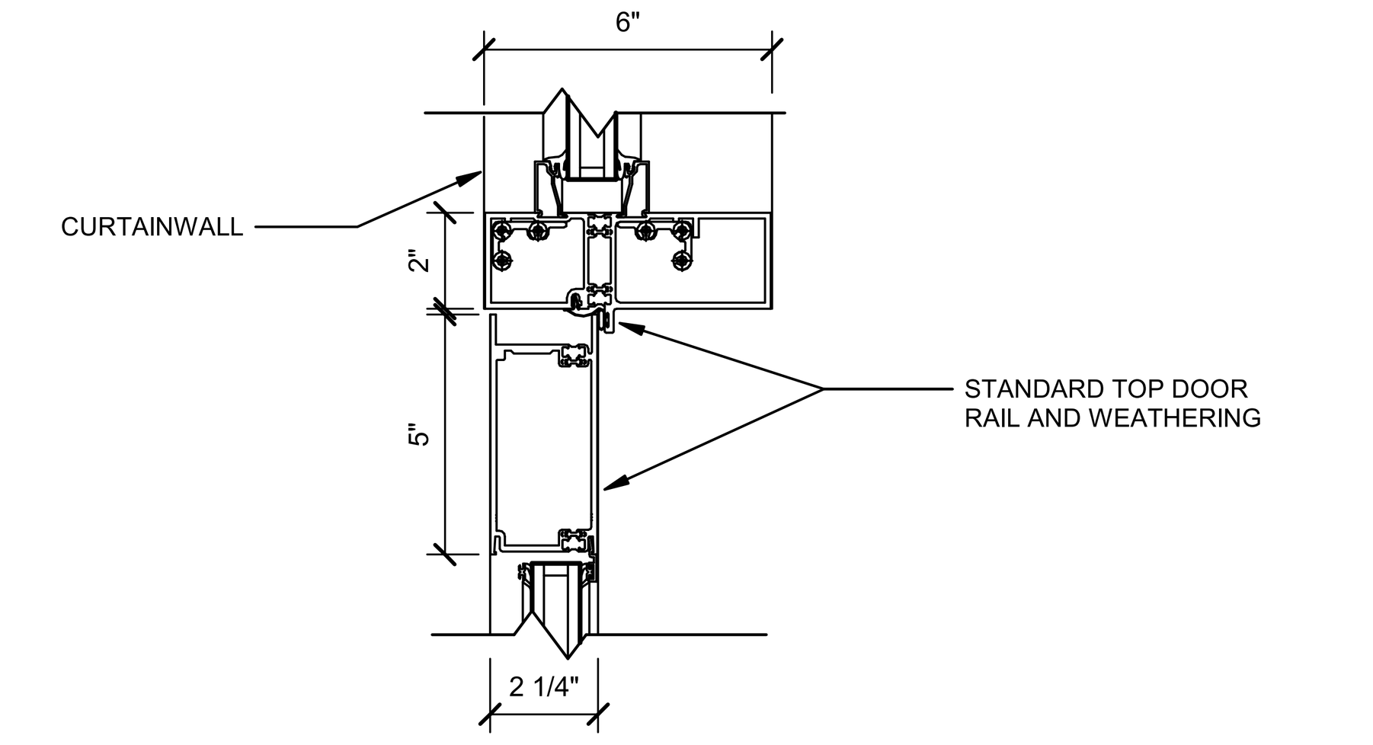
DOOR SCHEDULE (BID SET #2)					
ID	D.O. WIDTH	D.O. HEIGHT	TEMPERED	BoD	NOTES
NO1	6' - 3"	7' - 0"	YES	Kawneer 500T Insulpour Thermal Entrances	EGRESS DOUBLE DOOR
NO2	6' - 3"	7' - 0"	YES	Kawneer 500T Insulpour Thermal Entrances	EGRESS DOUBLE DOOR
W01	3' - 0"	9' - 0"	YES	Kawneer 500T Insulpour Thermal Entrances	CUSTOM HEIGHT
W02	5' - 11"	7' - 0"	YES	Kawneer 500T Insulpour Thermal Entrances	EGRESS DOUBLE DOOR

SCHEDULE NOTES

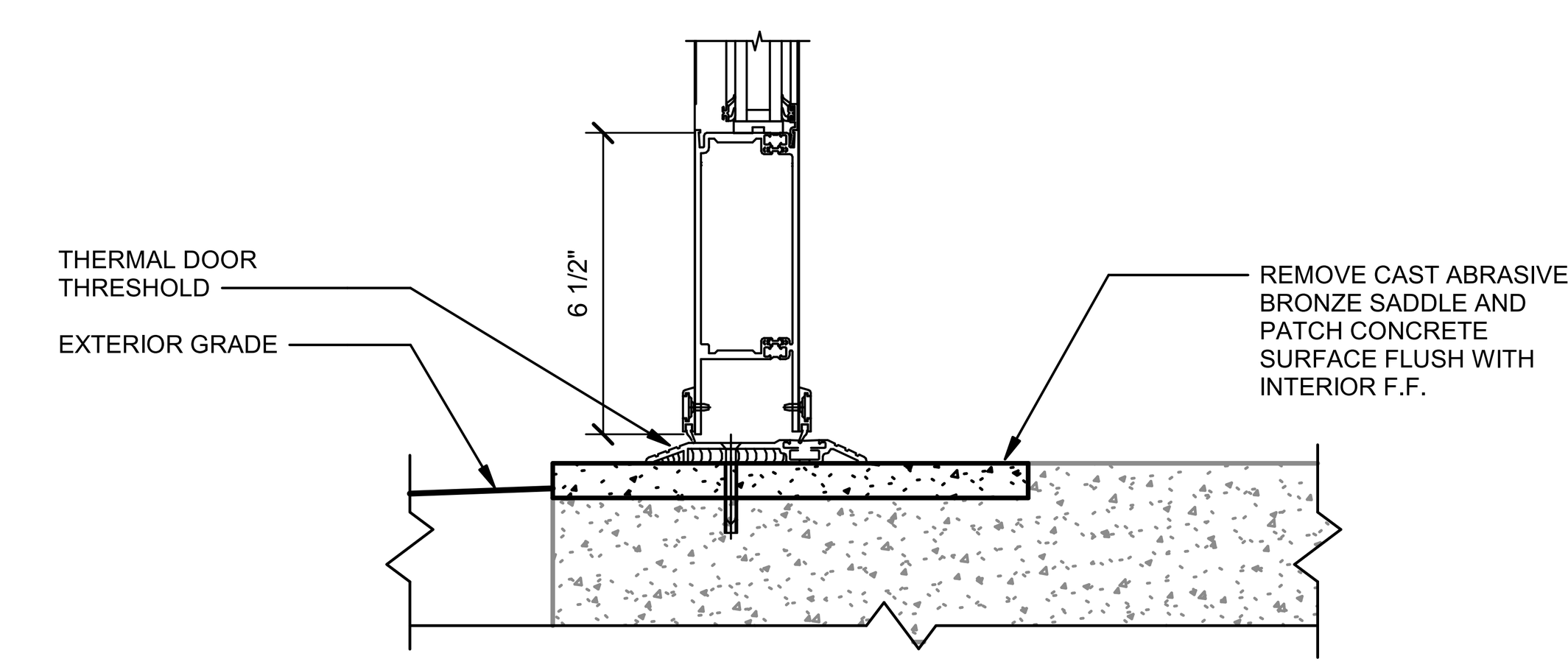
1. ALL DOORS TO HAVE ADJUSTABLE BUTT HINGES, SURFACE APPLIED CLOSERS, CONCEALED DOOR STOP, RIM EXIT DEVICE AND SINGLE ACTING HARDWARE.
2. DOOR ASSEMBLIES ARE TO BE THERMALLY BROKEN TYPE.
3. ALL DOORS TO HAVE BUTT HUNG THRESHOLD DOOR SWEEPS, AND STANDARD WEATHERSTRIPPING.
4. DOOR GLAZING TO MATCH DOUBLE-PANED TYPE OF STOREFRONT AND CURTAINWALL SYSTEMS.
5. PROVIDE REMOVABLE CORES, KEYING BY OTHERS

NOTES

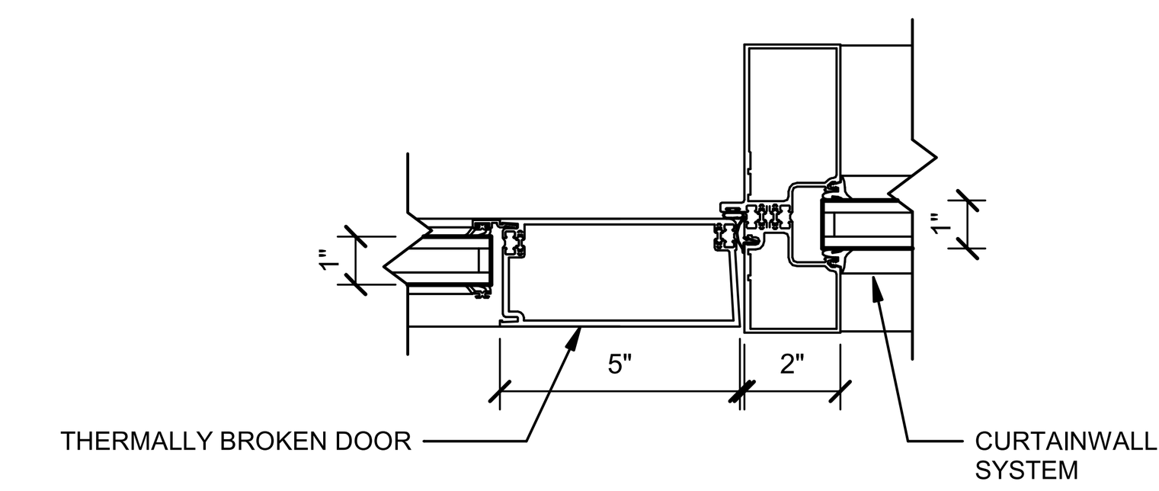
1. ALL WINDOWS / STOREFRONT / CURTAINWALL WITH ASSOCIATED DOORS ARE PART OF BID ALT #2
2. ALL NEW WINDOWS ARE TO BE FIXED TYPE, WITH HORIZONTAL MUNTINS MATCHING EXISTING HEIGHTS AND PROFILE DIMENSIONS, TO MAXIMUM EXTENT POSSIBLE.
3. ALL MASONRY OPENINGS DIMENSIONS, AND ANY HISTORICAL WINDOW ELEMENTS BEING REPRESENTED IN NEW WINDOW ASSEMBLIES, ARE TO BE VERIFED IN THE FIELD PRIOR TO NEW ASSEMBLY FABRICATION. VERIFIED DIMENSIONS TO BE REPRESENTED ON SHOP DRAWINGS FOR A/E REVIEW, PRIOR TO FABRICATION.
4. EXISTING BIRD NETTING AT UPPER EXTENTS OF EXTERIOR SOUTH WALL TO REMAIN, REMOVAL TO BE CONFIRMED BY A/E IN THE FIELD.



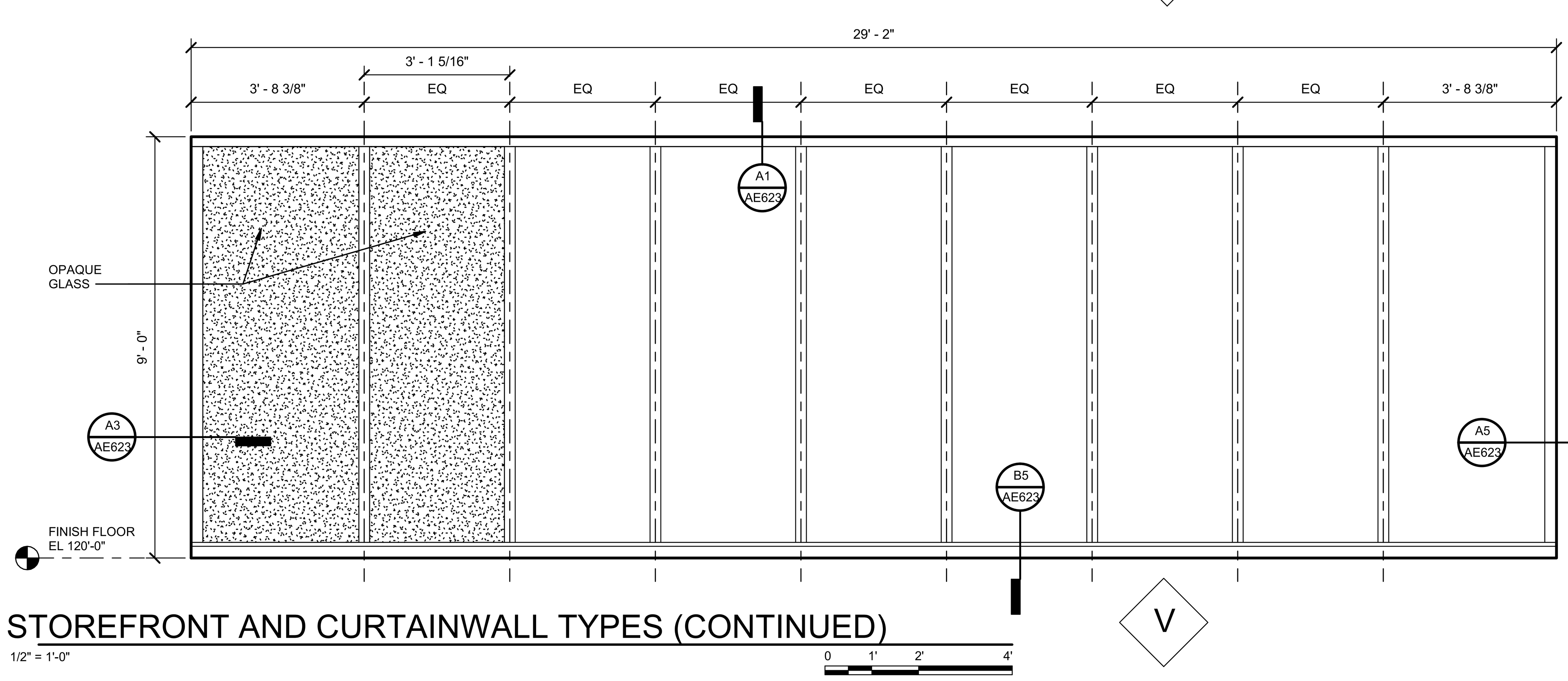
D5 CURTAINWALL TO DOOR HEAD
3" = 1'-0"

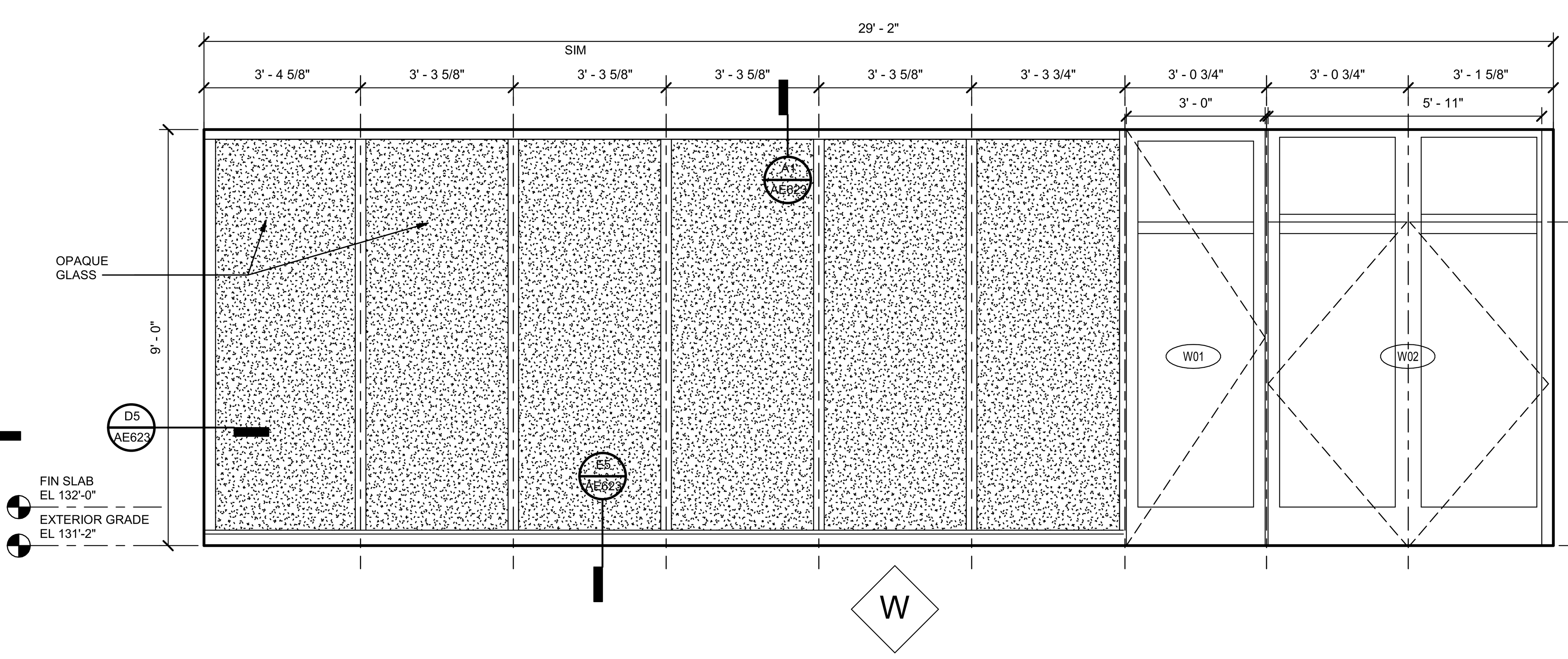


C5 CURTAINWALL DOOR SILL (N)
3" = 1'-0"



B5 CURTAINWALL DOOR JAMB TO CURTAINWALL
3" = 1'-0"





A1 STOREFRONT AND CURTAINWALL TYPES (CONTINUED)
1/2" = 1'-0"

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LICENSED ARCHITECT
DANIEL C. MORENO
No. 2409
STATE OF MAINE
02/08/2022

CURRENT ISSUE STATUS:
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JANUARY 7, 2022

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STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

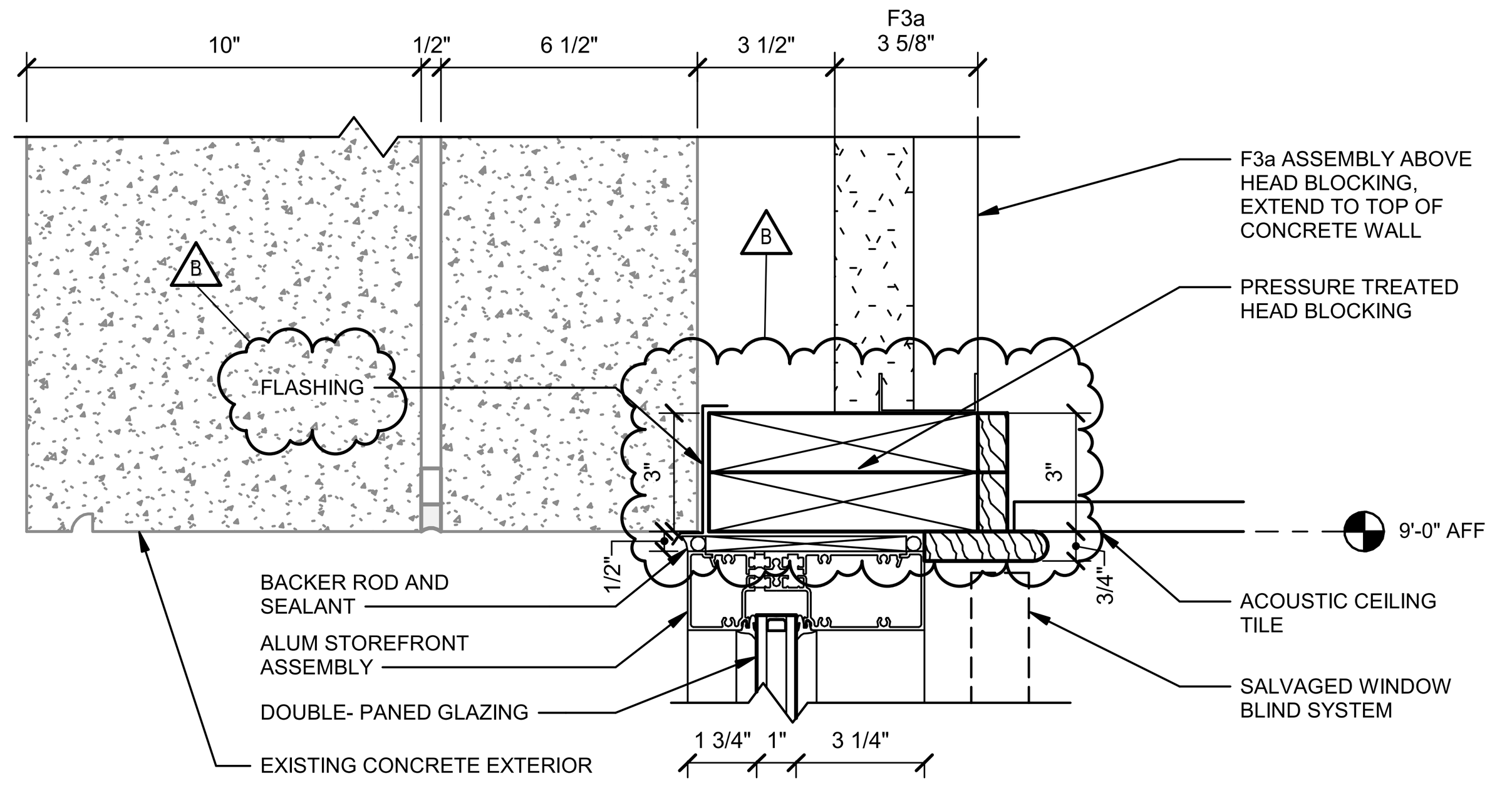
REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	DCM
DESIGNED BY:	PDG
DRAWN BY:	GJN

SHEET TITLE:
STOREFRONT AND CURTAIN WALL INFORMATION

SHEET ID:
AE622

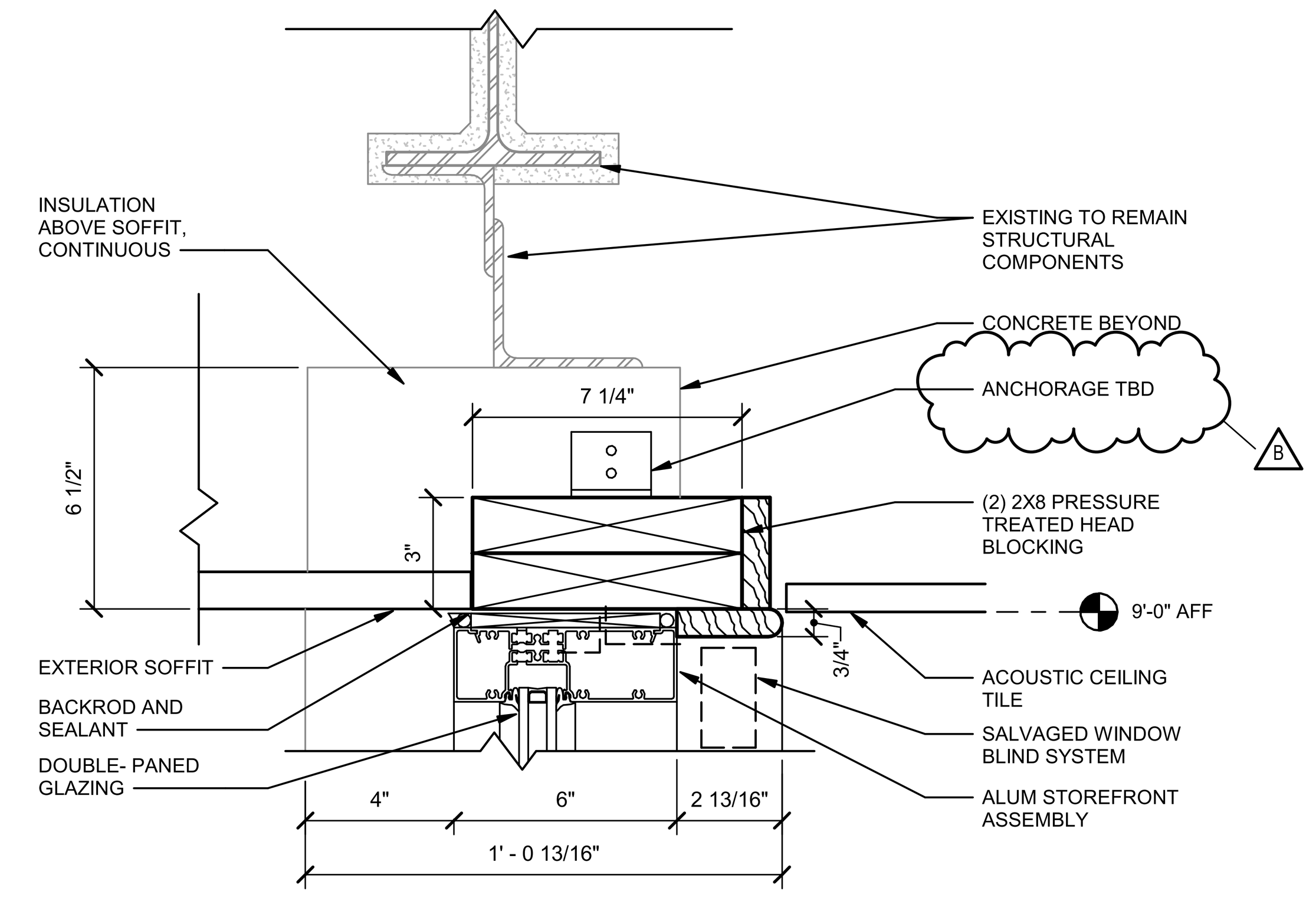
NOT FOR CONSTRUCTION



E1 STOREFRONT HEAD DETAIL (A)

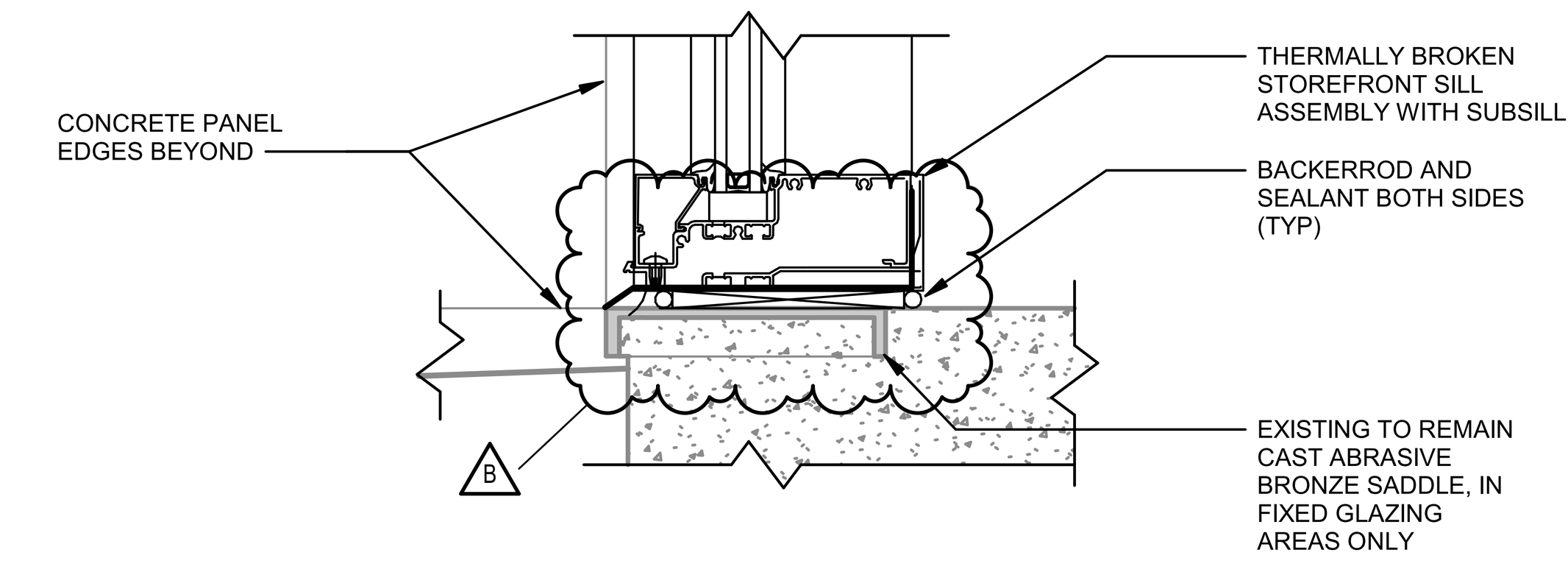
3" = 1'-0"

NOTE: ENSURE THAT ALUMINUM FRAME IS MINIMUM 3/4" PROUD OF EXISTING CONCRETE / NEW PT BLOCKING SEAM TO ENSURE BLOCKING IS NON-VISIBLE FROM EXTERIOR SIDE.



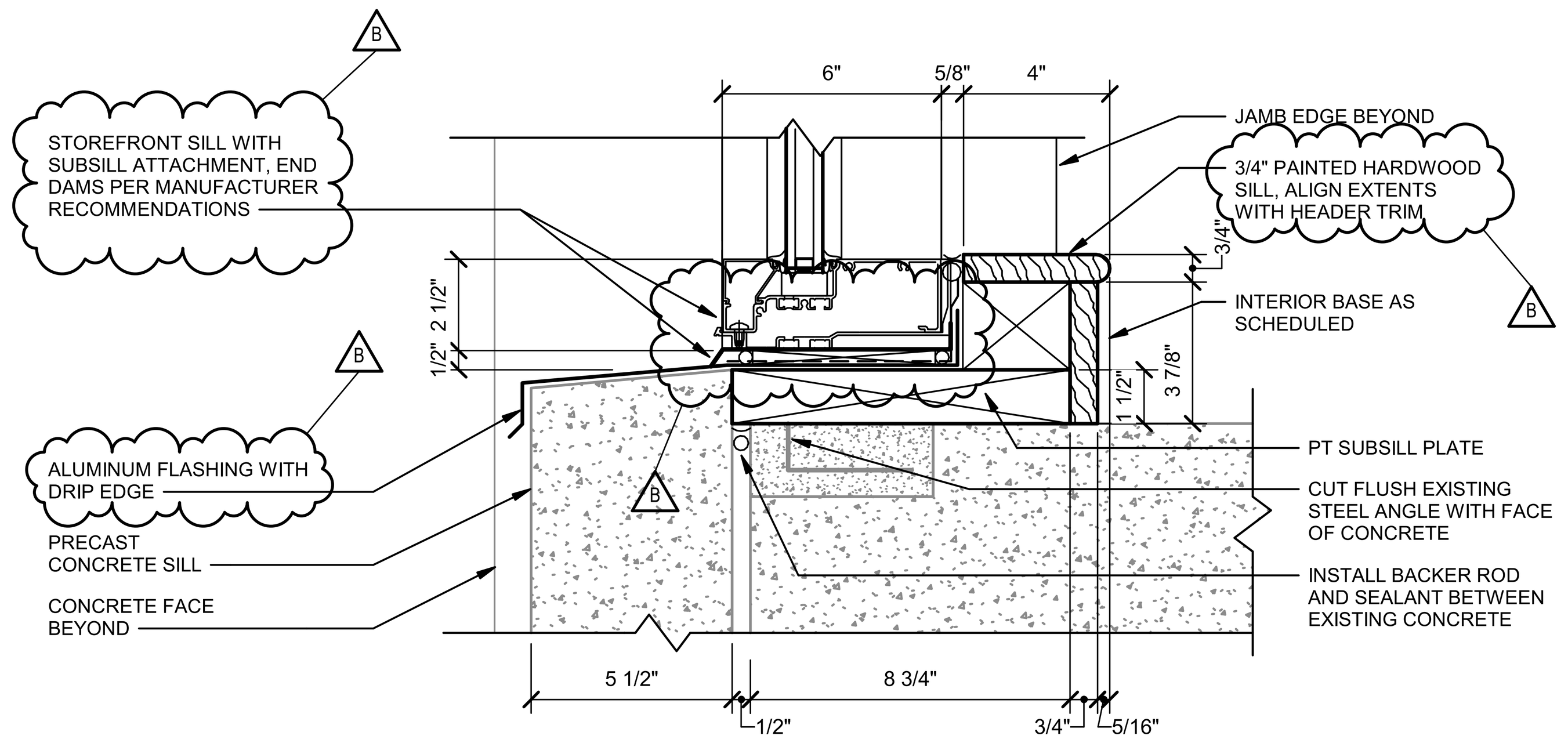
E3 STOREFRONT HEAD DETAIL (C)

3" = 1'-0"



E5 STOREFRONT SILL (W)

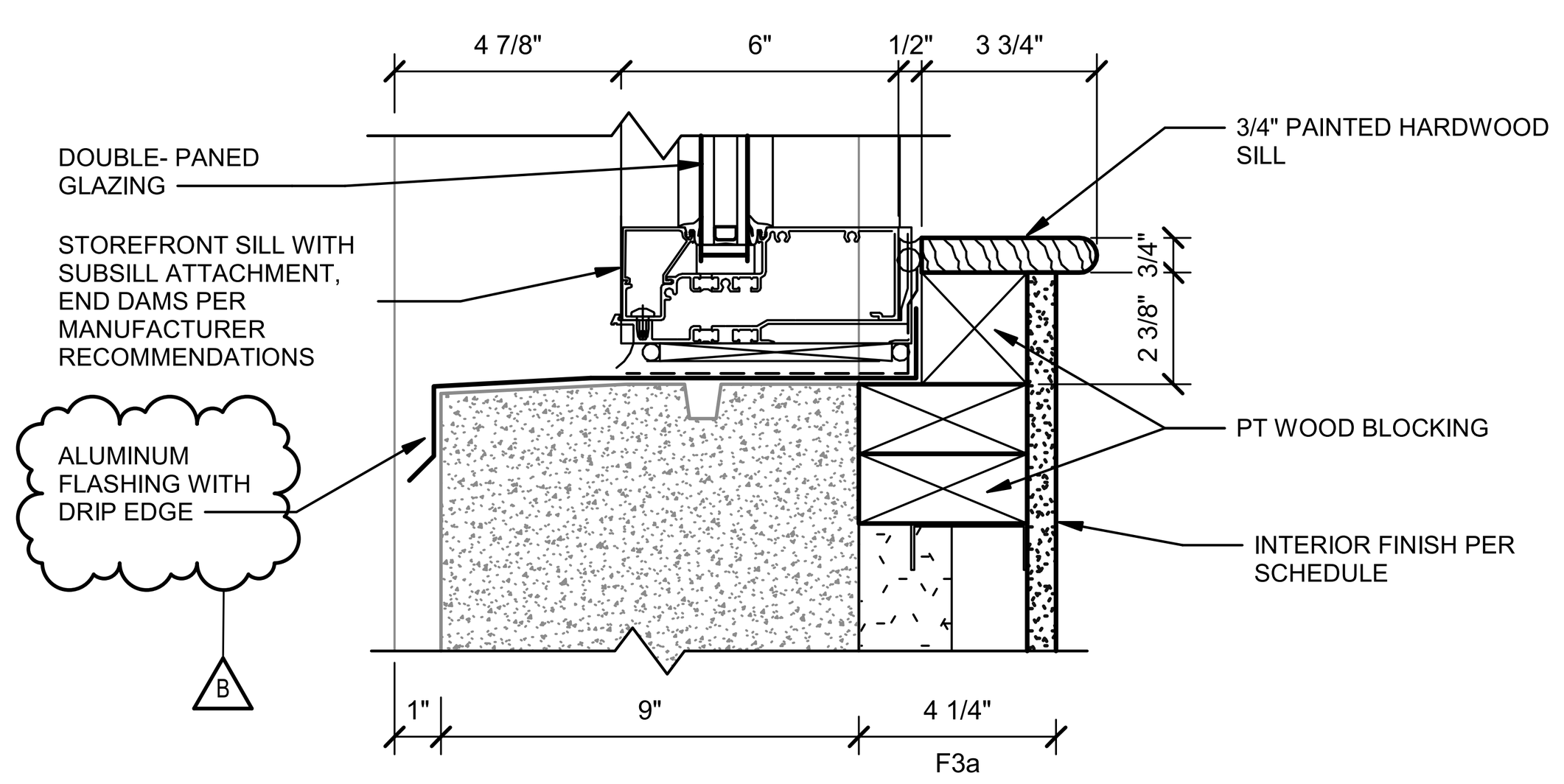
3" = 1'-0"



D1 STOREFRONT SILL DETAIL (A)

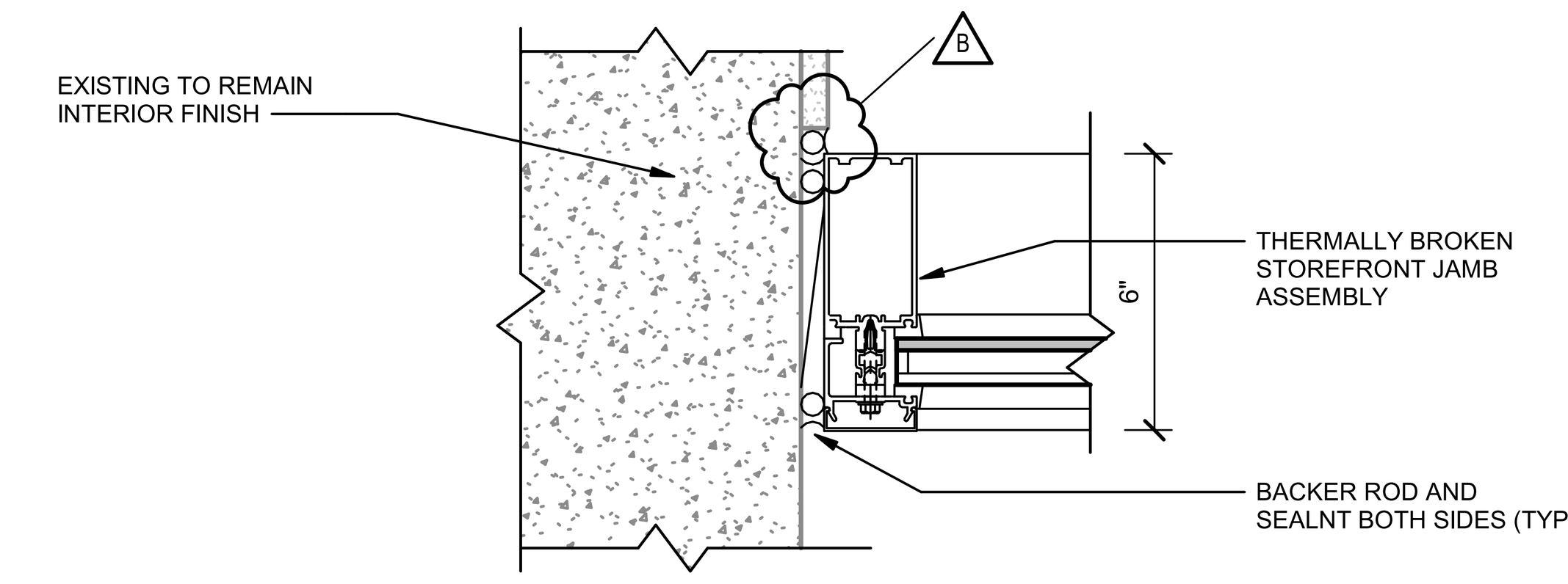
3" = 1'-0"

NOTE: REFERENCE ORIGINAL 1969 AS-BUILTS TO UNDERSTAND EXTENT OF STEEL CUTTING AND PREPPING BEFORE INSTALLATION OF BLOCKING AND ALUMINUM FRAME.



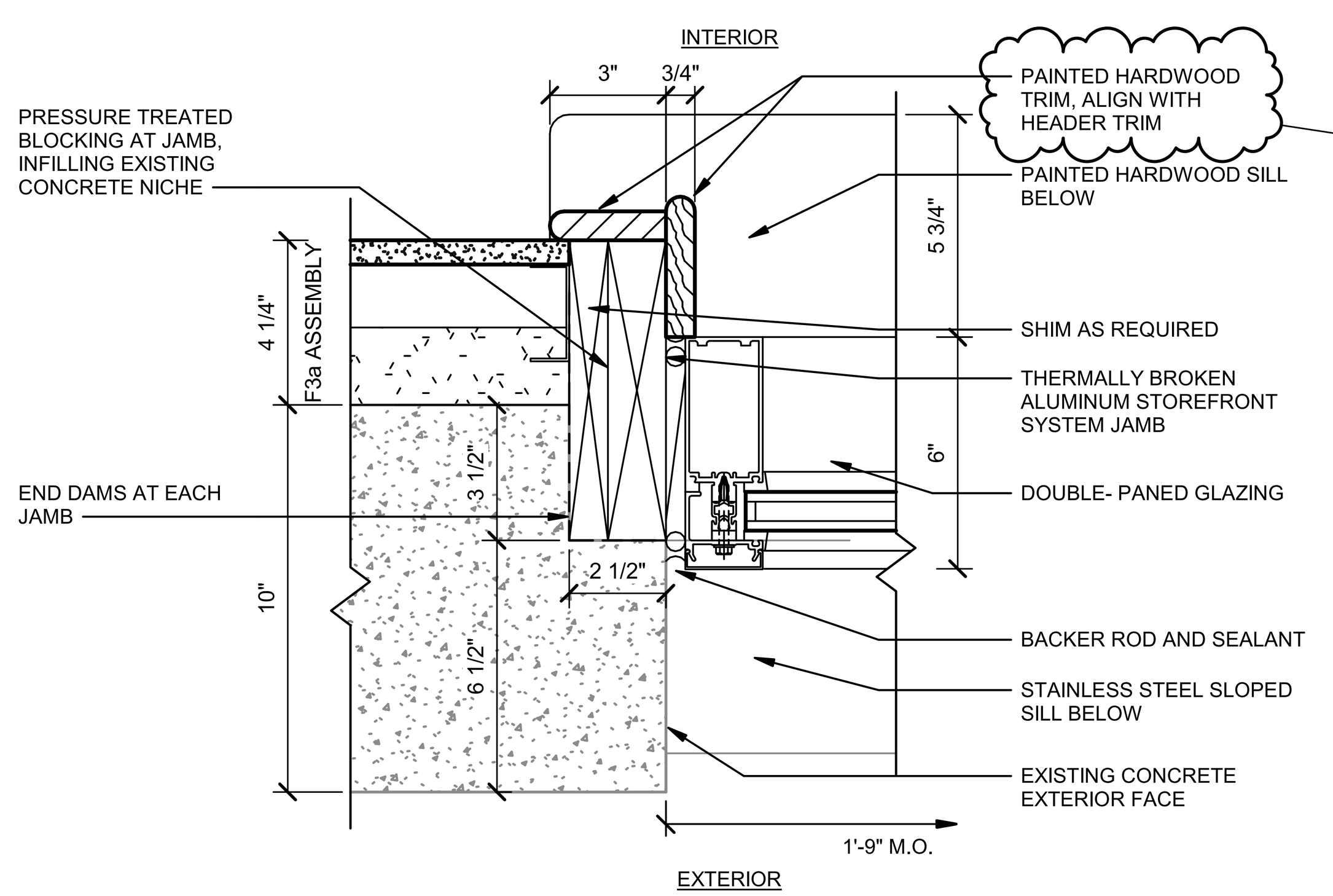
D3 STOREFRONT SILL DETAIL (C)

3" = 1'-0"



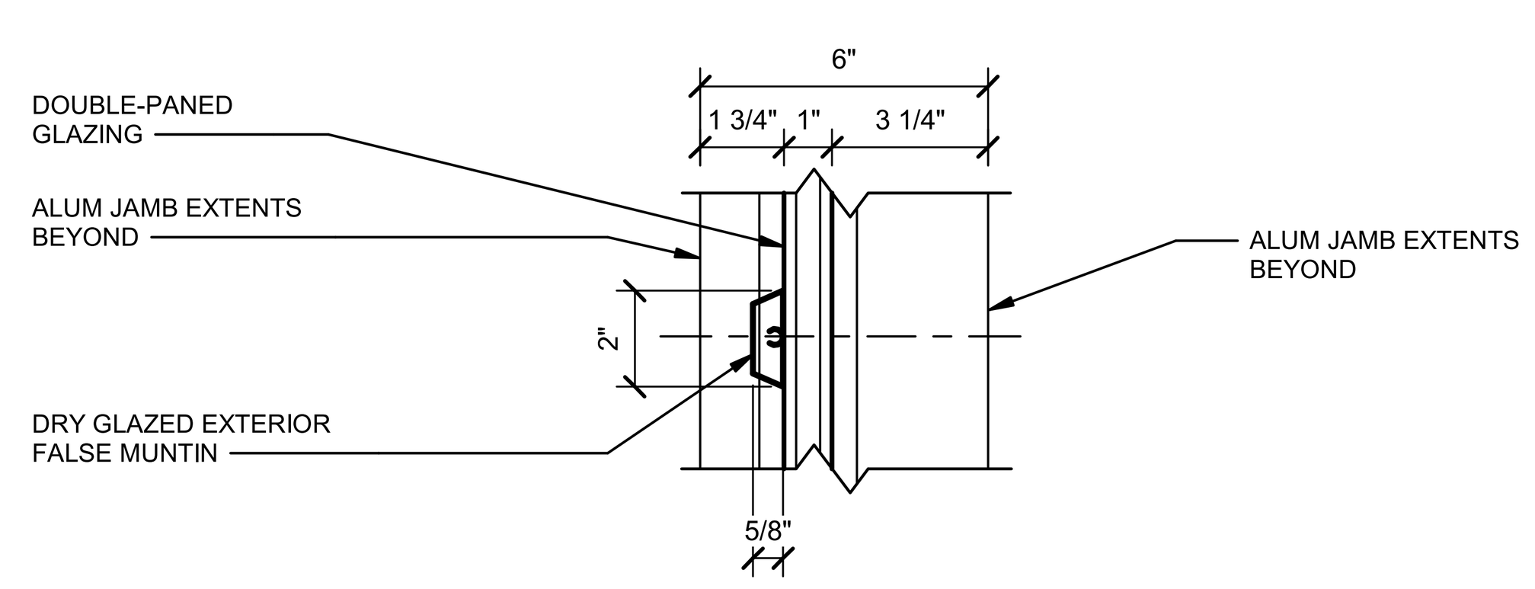
D5 STOREFRONT NORTH JAMB (W)

3" = 1'-0"



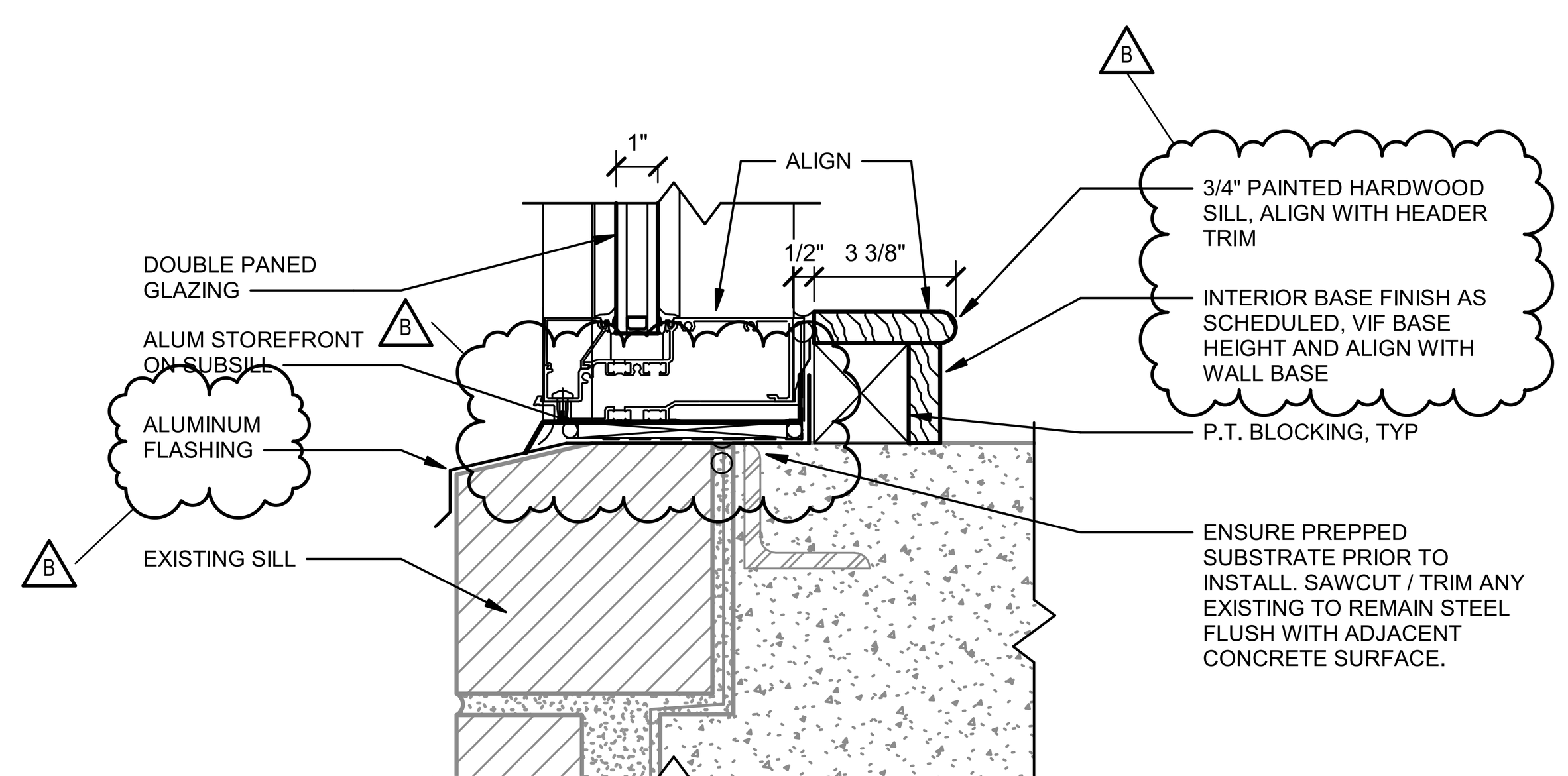
B1 STOREFRONT JAMB DETAIL (A)

3" = 1'-0"



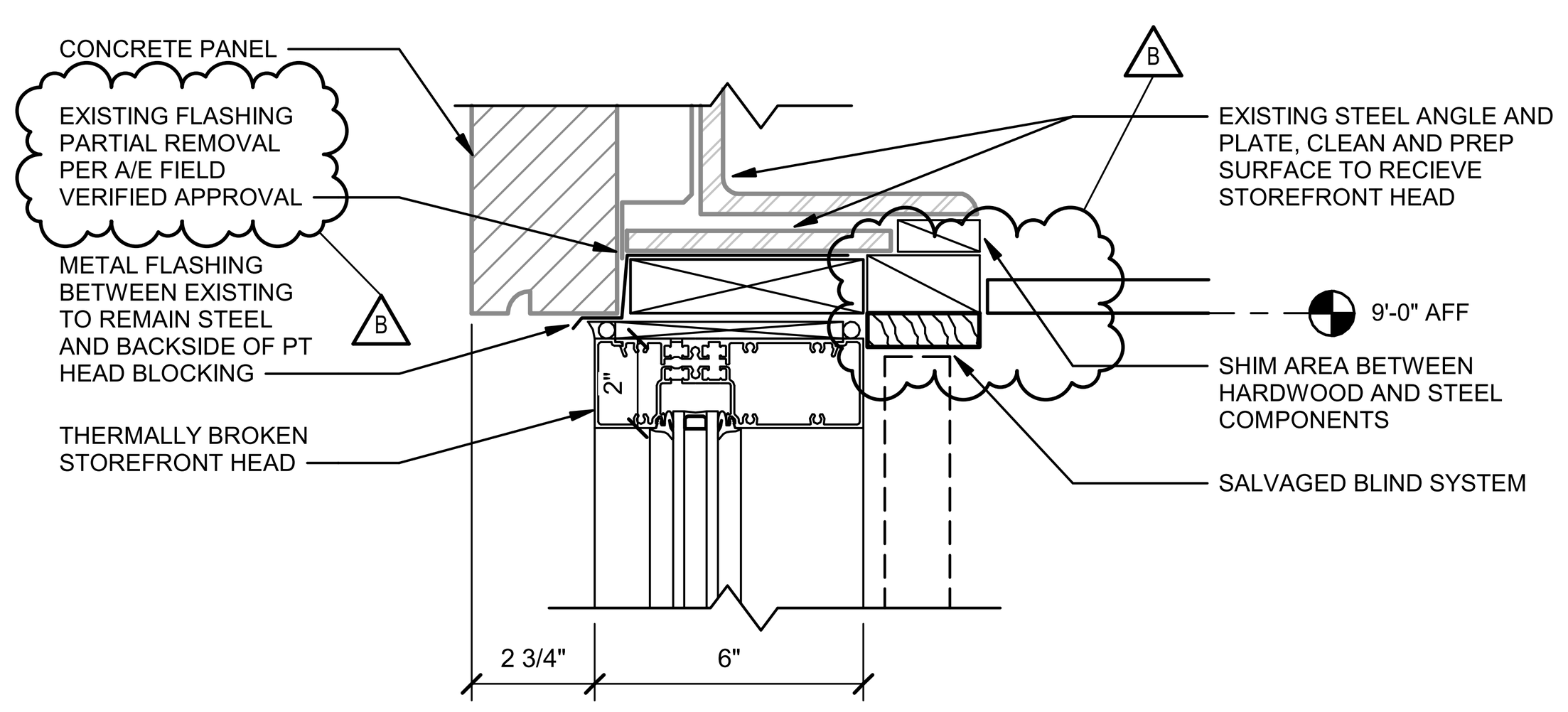
B3 STOREFRONT AND CURTAINWALL TYPICAL FALSE MUNTIN

3" = 1'-0"



B5 STOREFRONT SILL DETAIL (V)

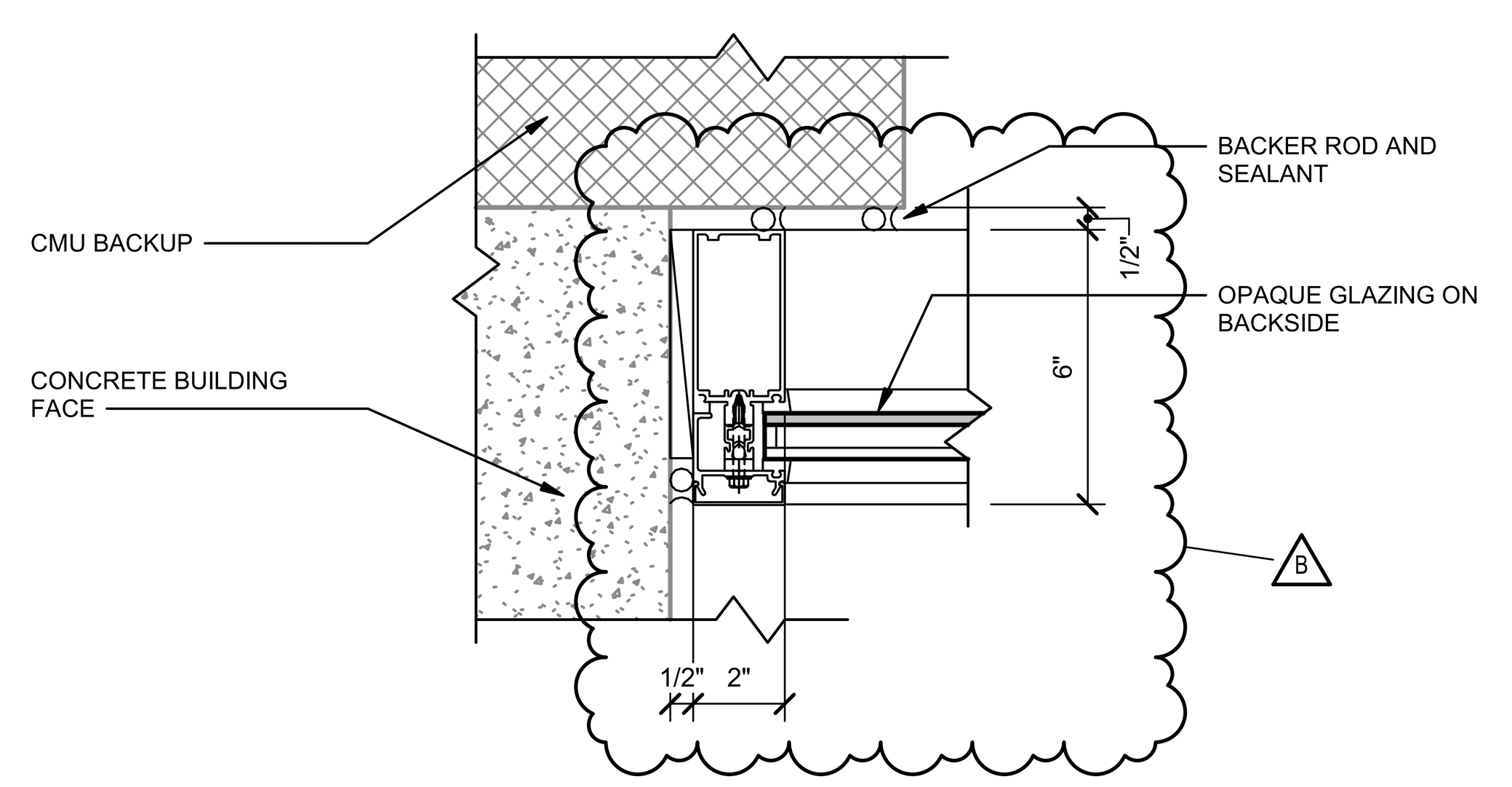
3" = 1'-0"



A1 STOREFRONT HEAD (V) AND (W)

3" = 1'-0"

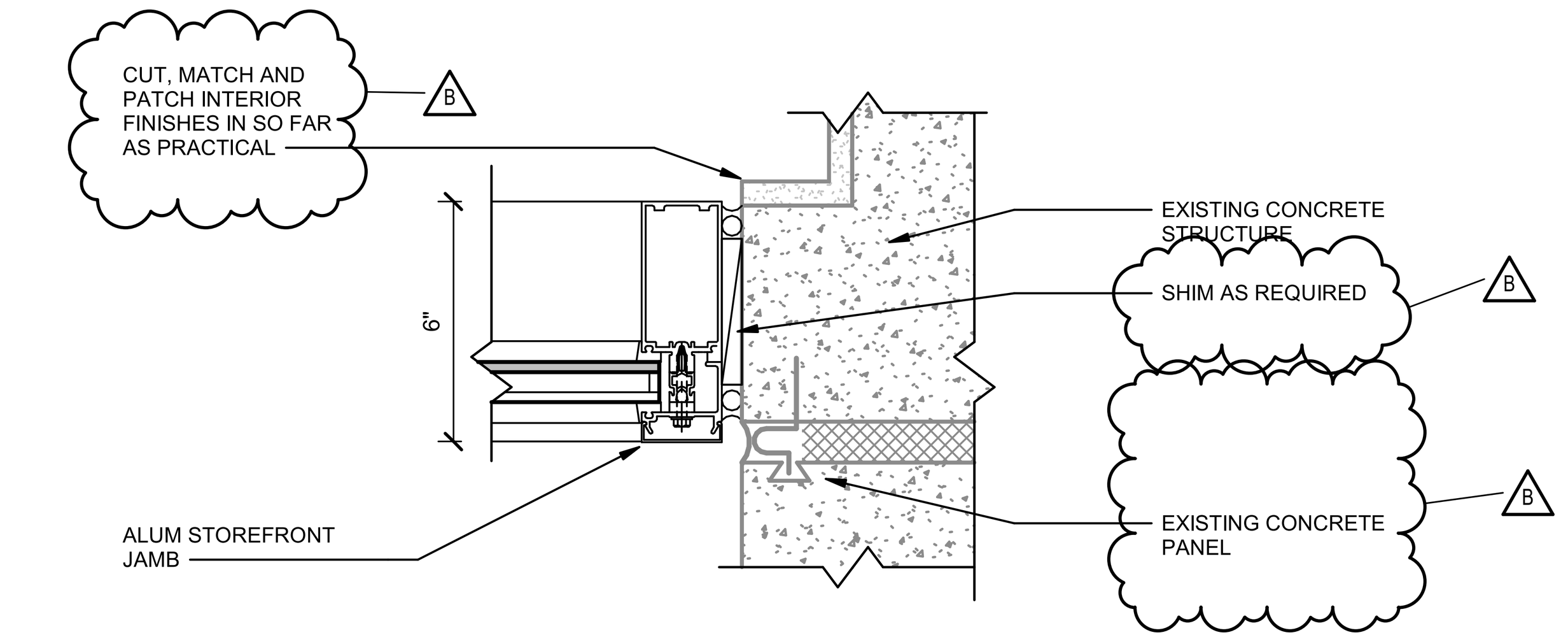
NOTE: REFERENCE ORIGINAL 1969 AS-BUILTS TO UNDERSTAND EXTENT OF STEEL CUTTING AND PREPPING BEFORE INSTALLATION OF BLOCKING AND ALUMINUM FRAME. CLEAN EXPOSED PLATE STEEL TO MINIMUM SSPC-SP 2 LEVEL PRIOR TO INSTALLATION OF ALUMINUM FRAME AND AFFILIATED COMPONENTS.



A3 STOREFRONT NORTH JAMB DETAIL (V)

3" = 1'-0"

NOTE: FIELD VERIFY CLEARANCES PRIOR TO SHOP DRAWING FINAL SUBMISSION



A5 STOREFRONT SOUTH JAMB DETAIL (V)

3" = 1'-0"

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LICENSED ARCHITECT
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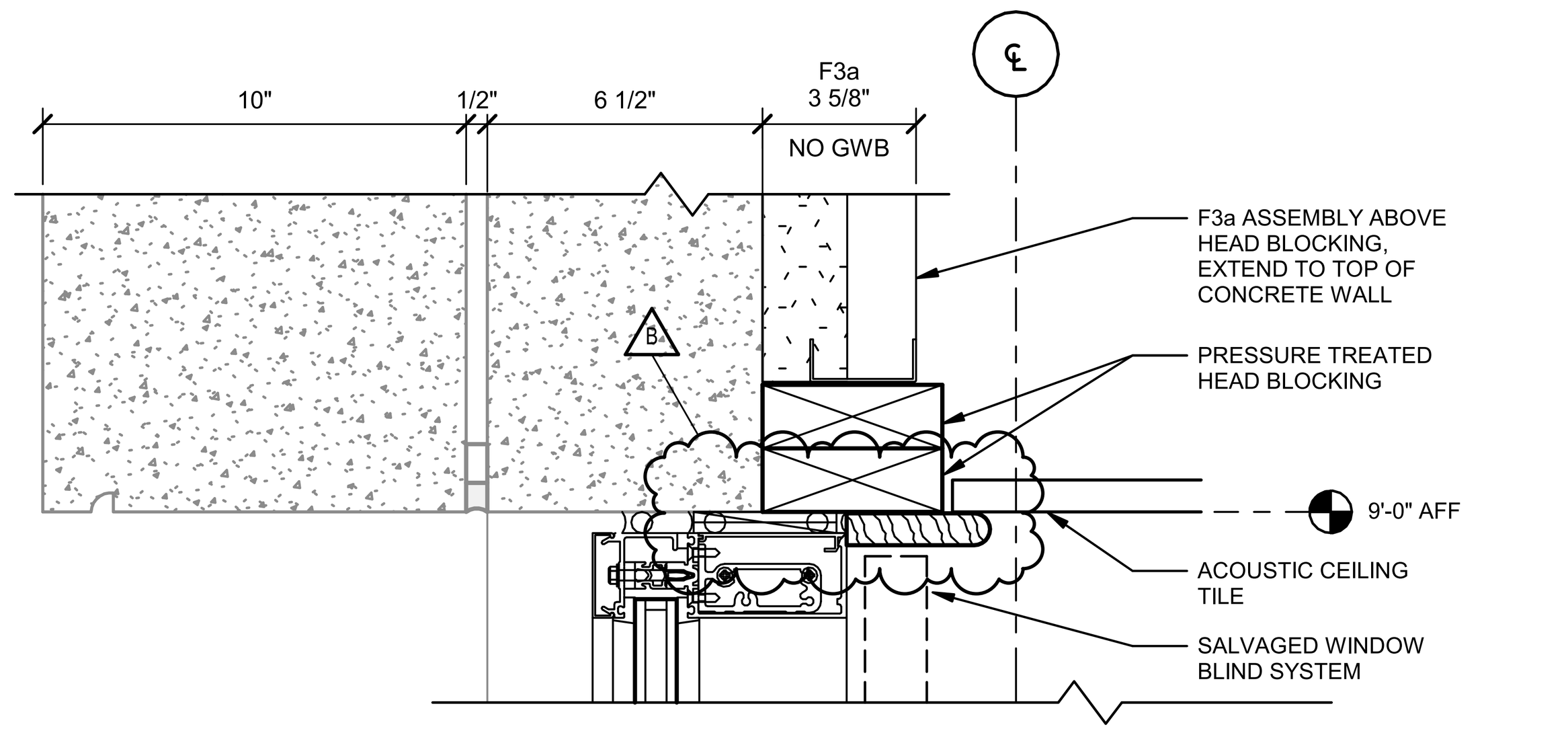
PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	DCM
DESIGNED BY:	PDG
DRAWN BY:	GJN

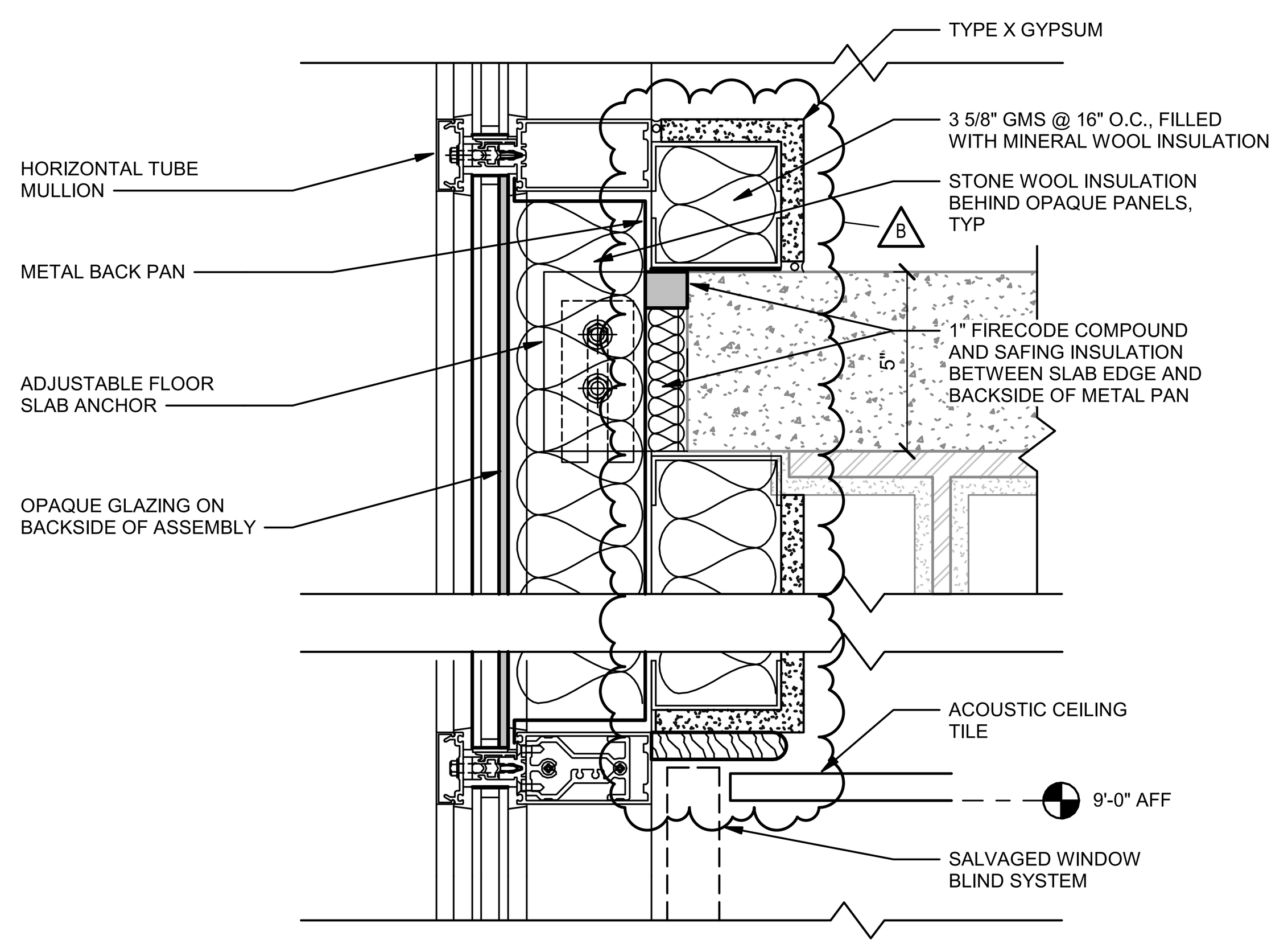
SHEET TITLE:
STOREFRONT DETAILS

SHEET ID:
AE623

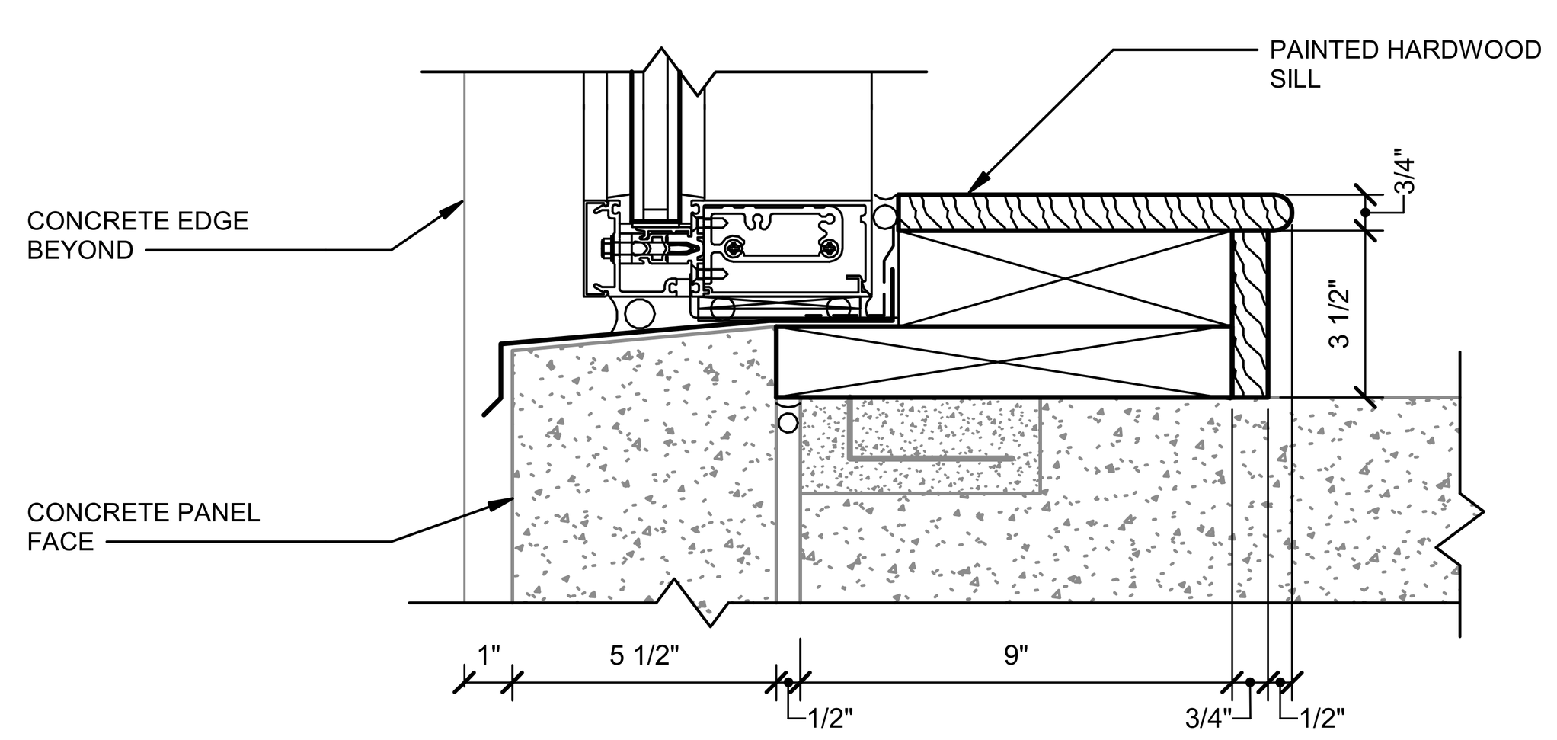
NOT FOR CONSTRUCTION



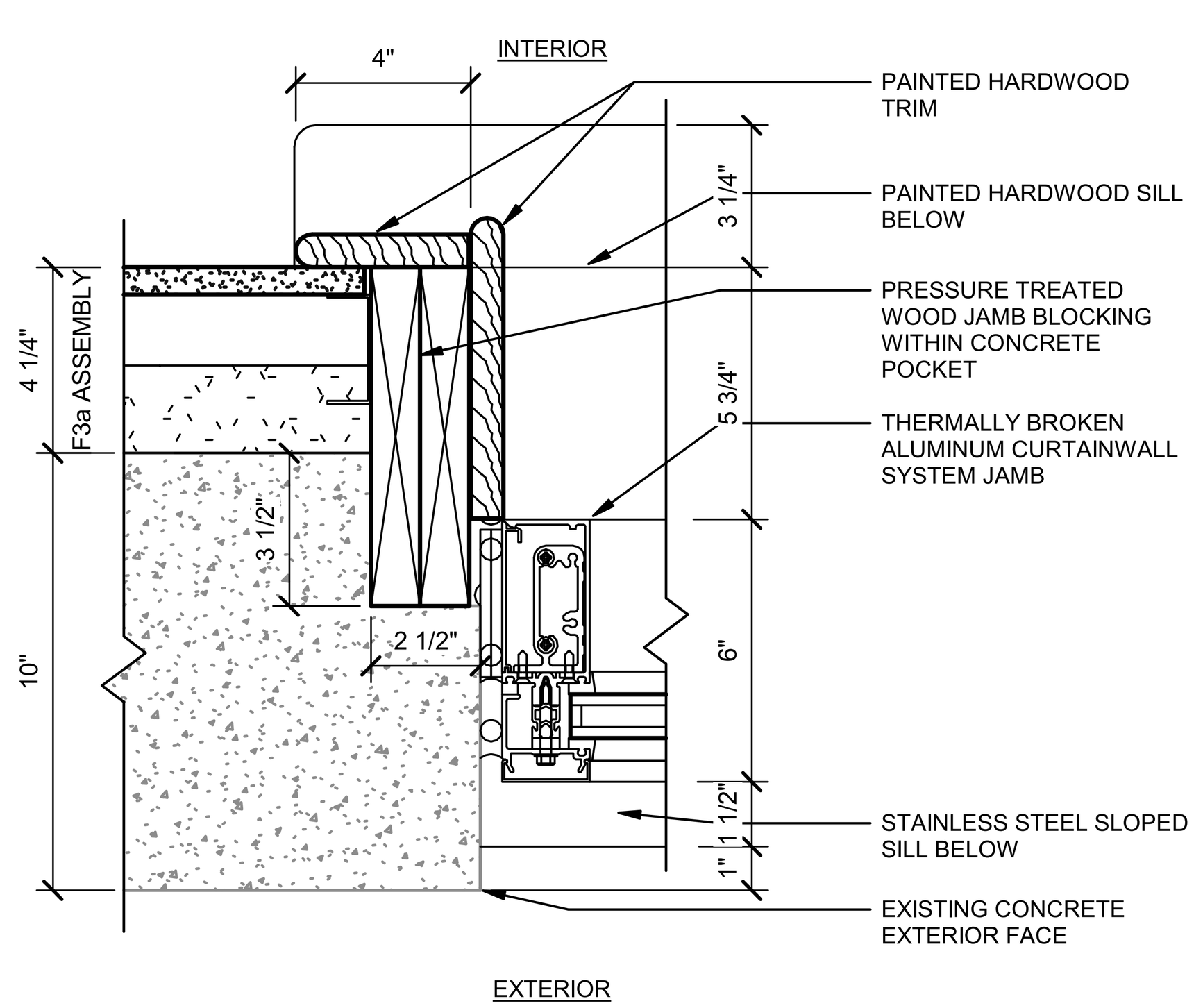
E1 CURTAINWALL HEAD DETAIL (G)
3" = 1'-0"



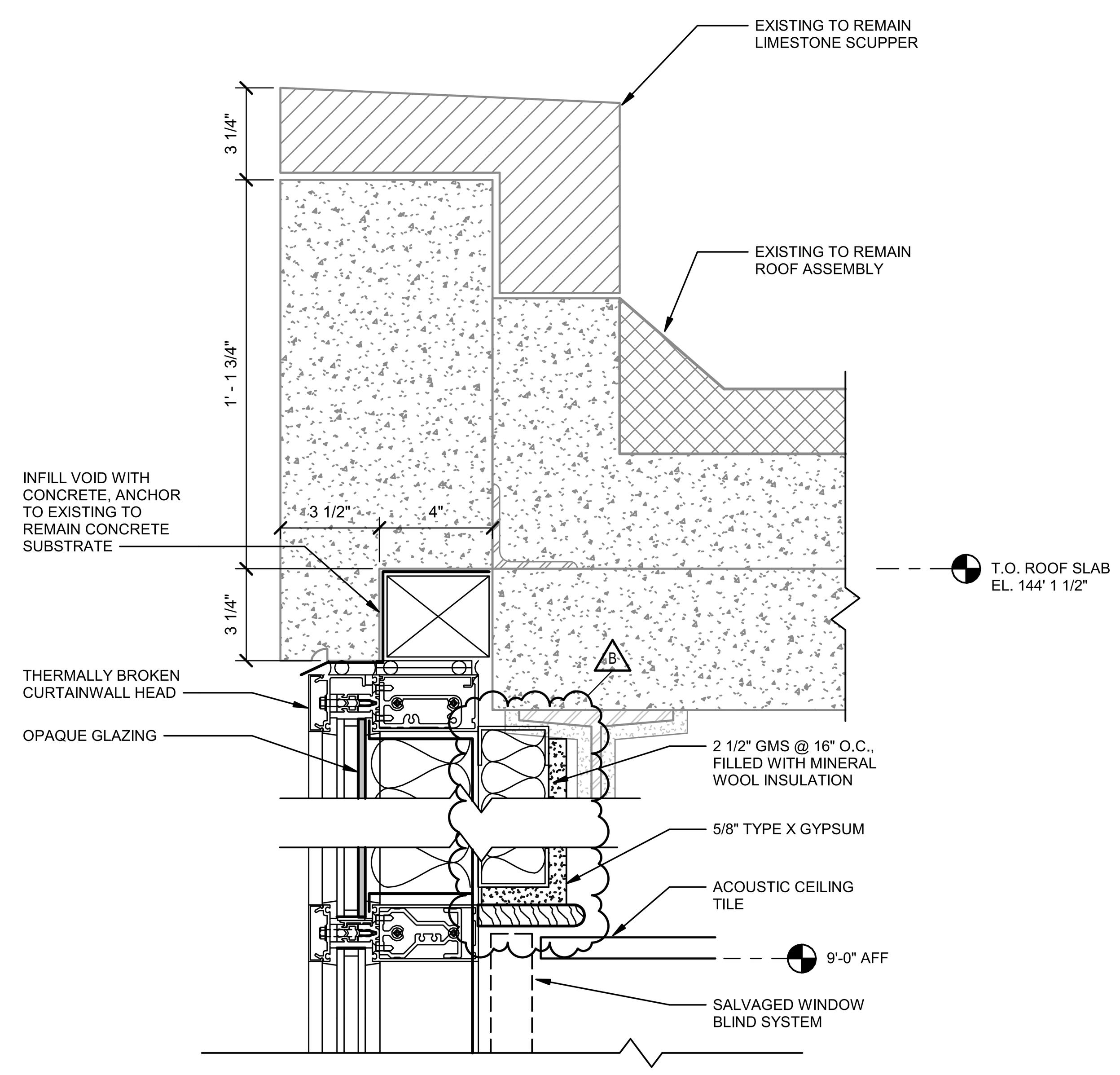
D1 CURTAINWALL CONNECTION AT FLOOR SLAB
3" = 1'-0"



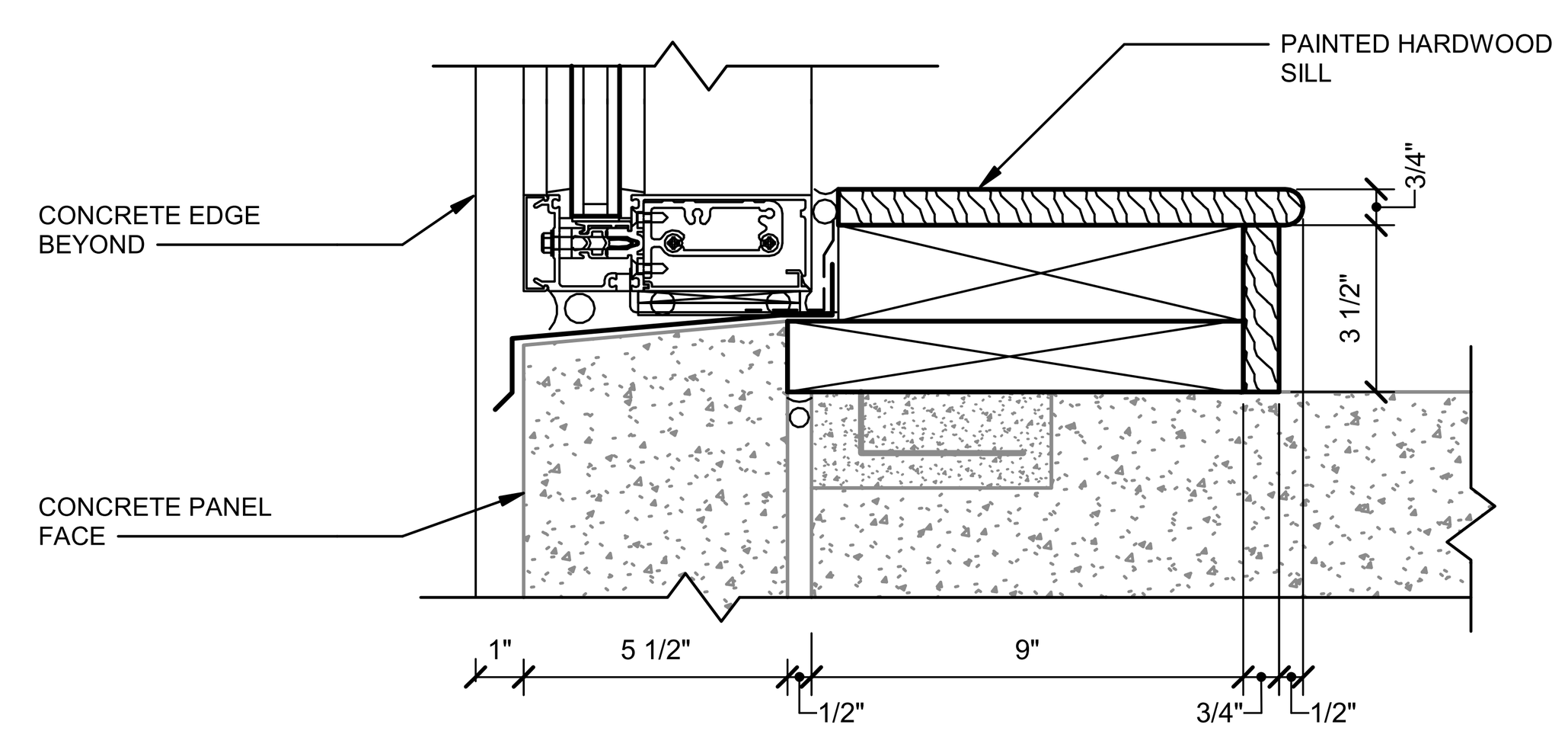
B1 CURTAINWALL SILL (G)
3" = 1'-0"



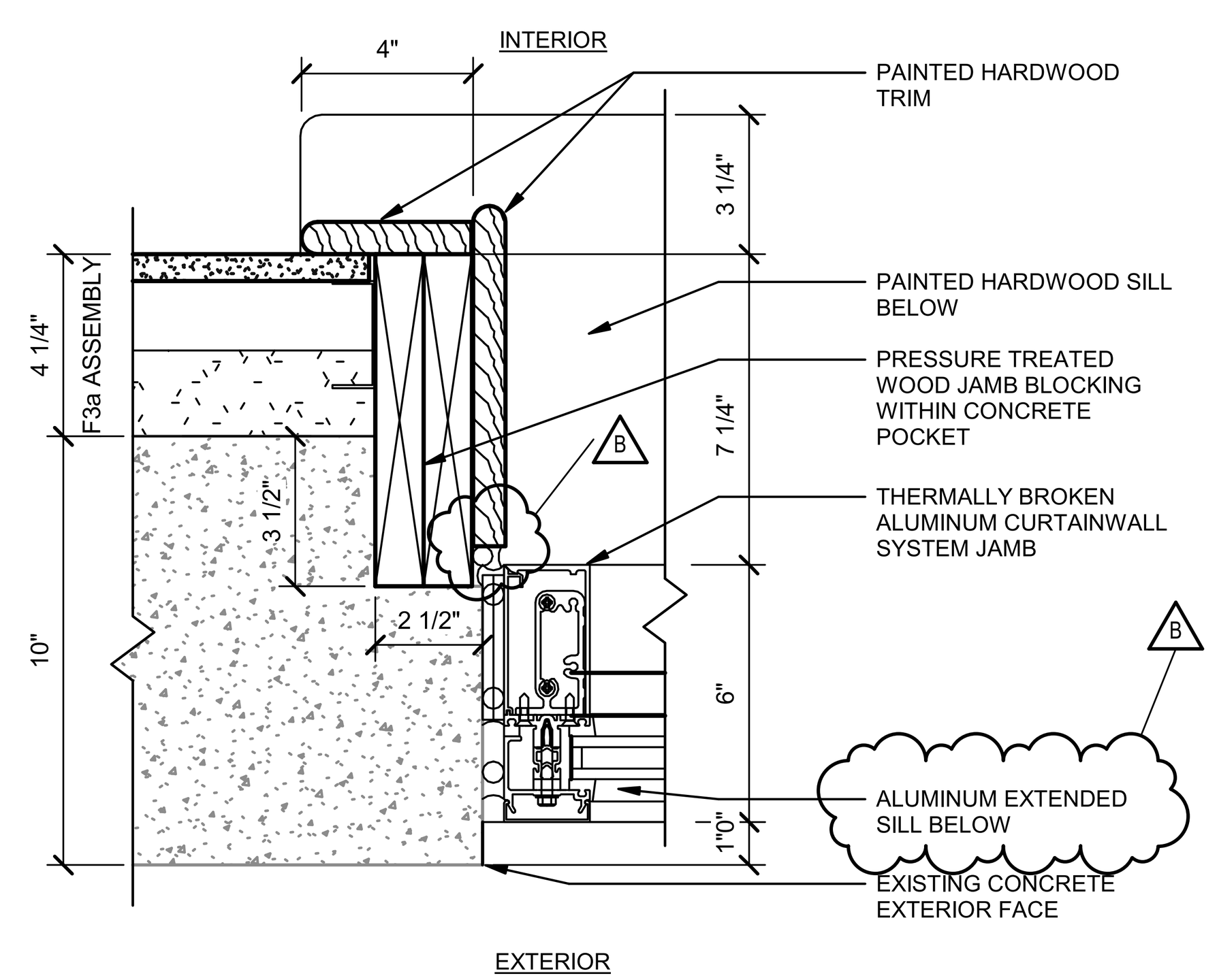
A1 CURTAINWALL JAMB DETAIL (G)
3" = 1'-0"



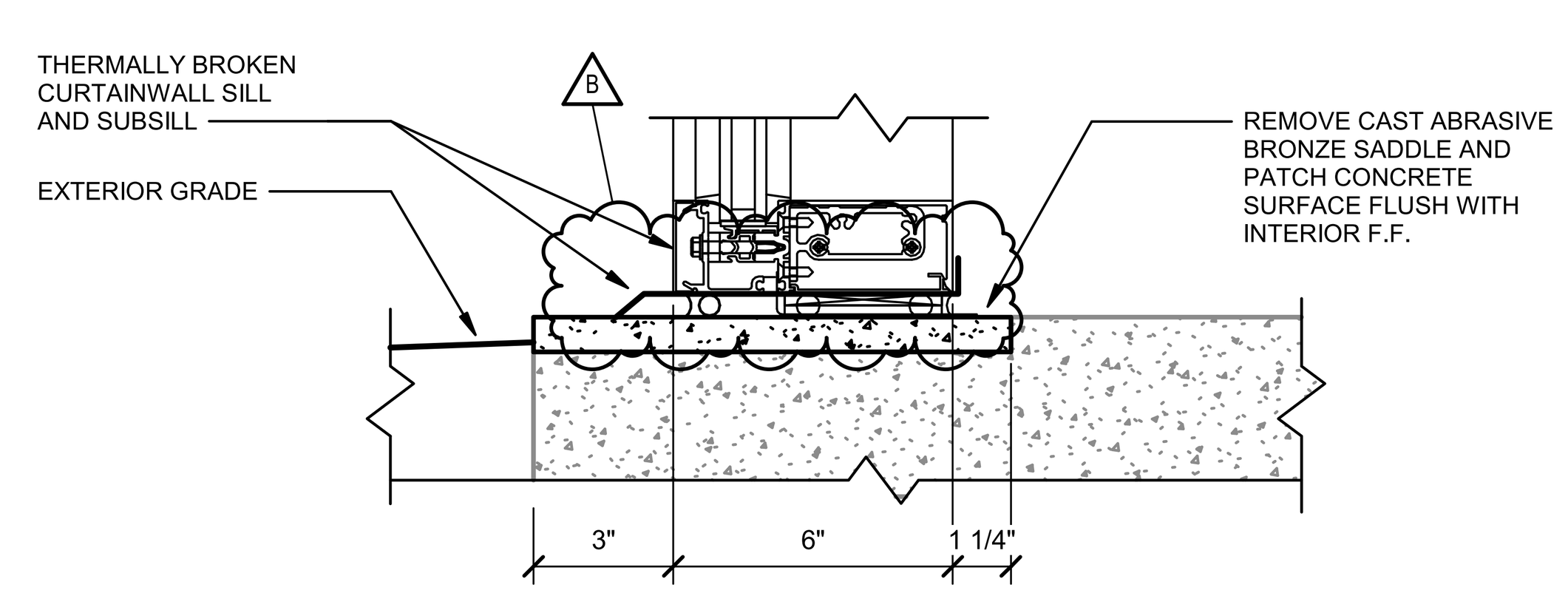
D3 CURTAINWALL HEAD DETAIL (J) AND (K)
3" = 1'-0"



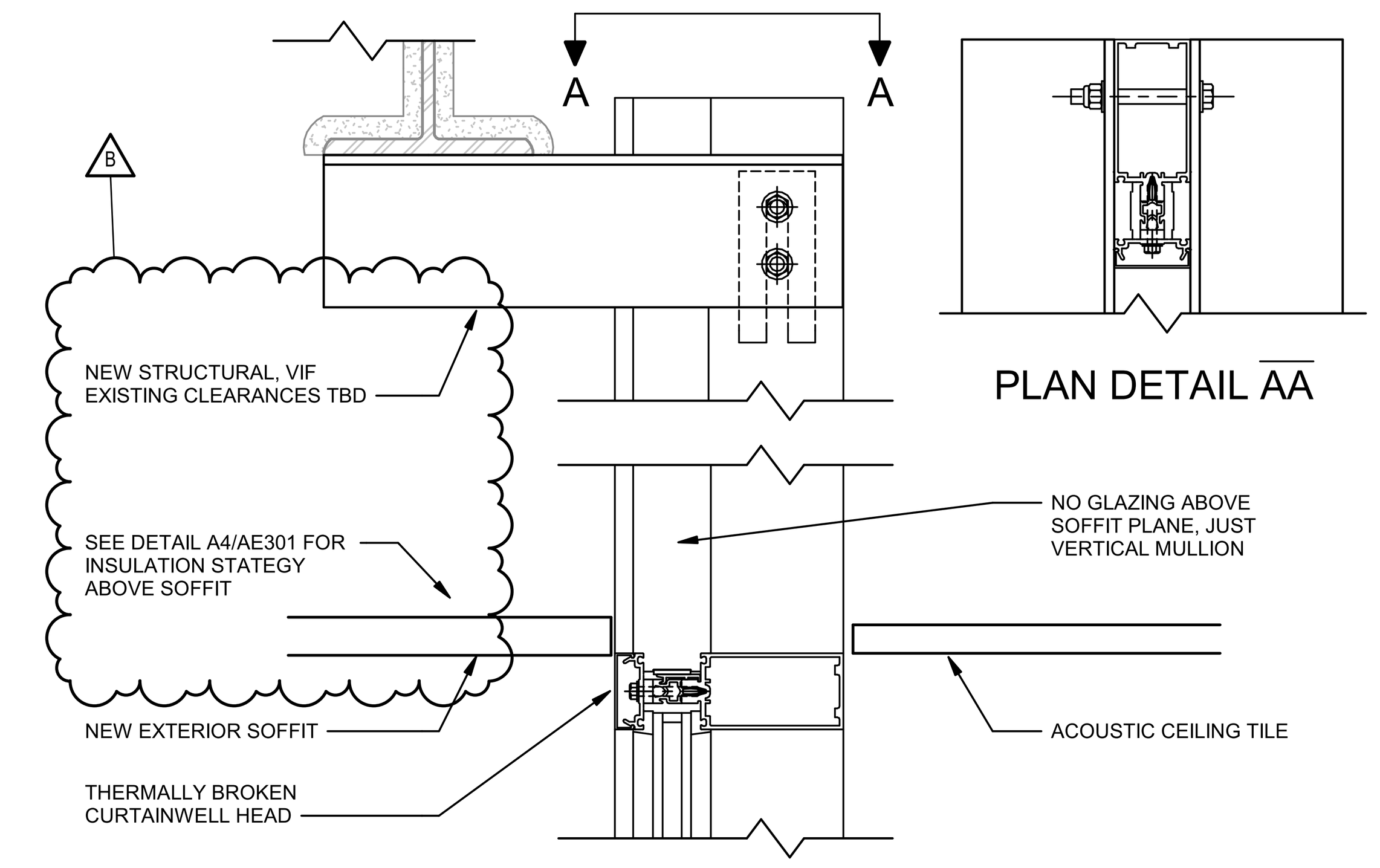
C3 CURTAINWALL SILL (J) AND (K)
3" = 1'-0"



B3 CURTAINWALL JAMB DETAIL (J) AND (K)
3" = 1'-0"

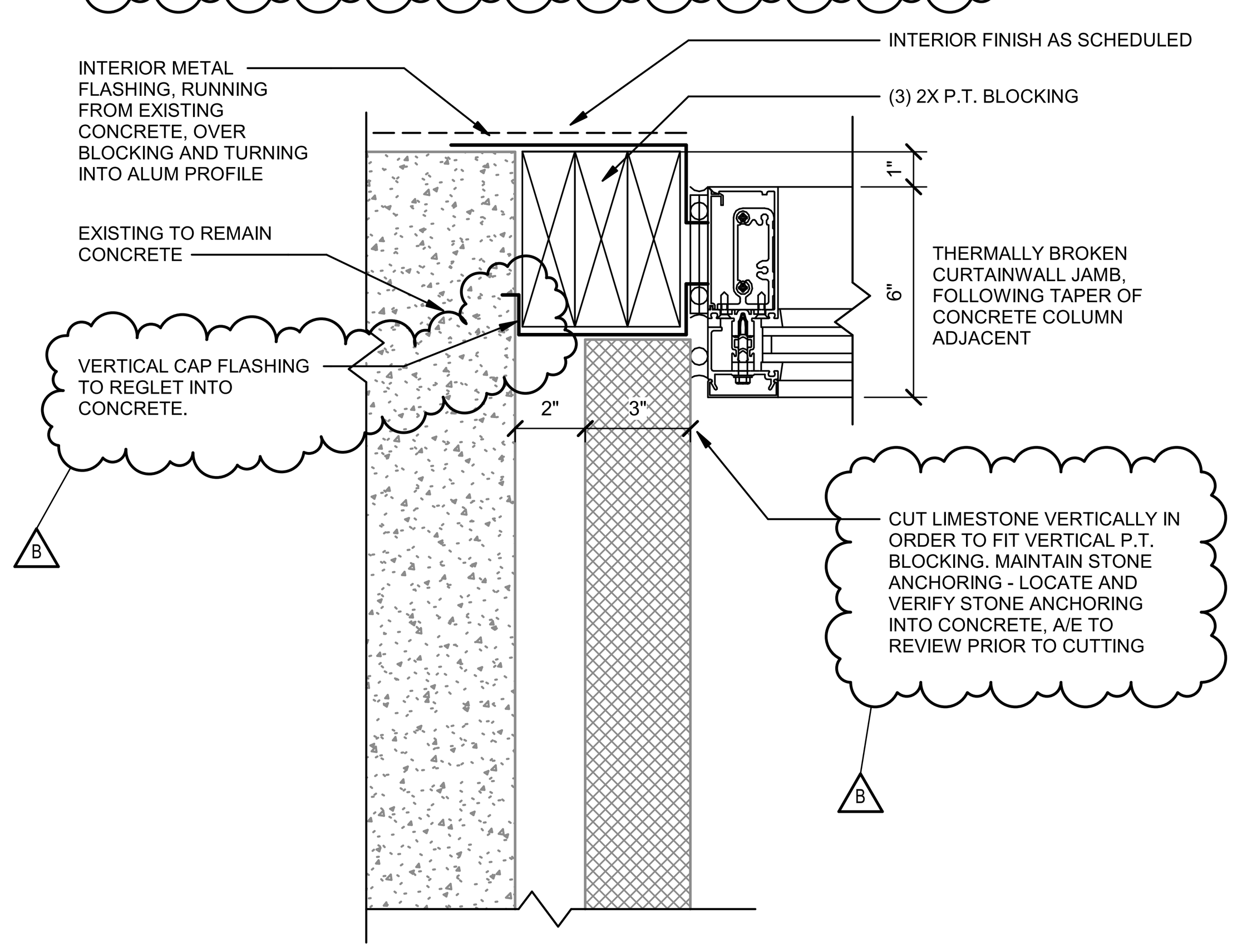


A3 CURTAINWALL SILL (N)
3" = 1'-0"

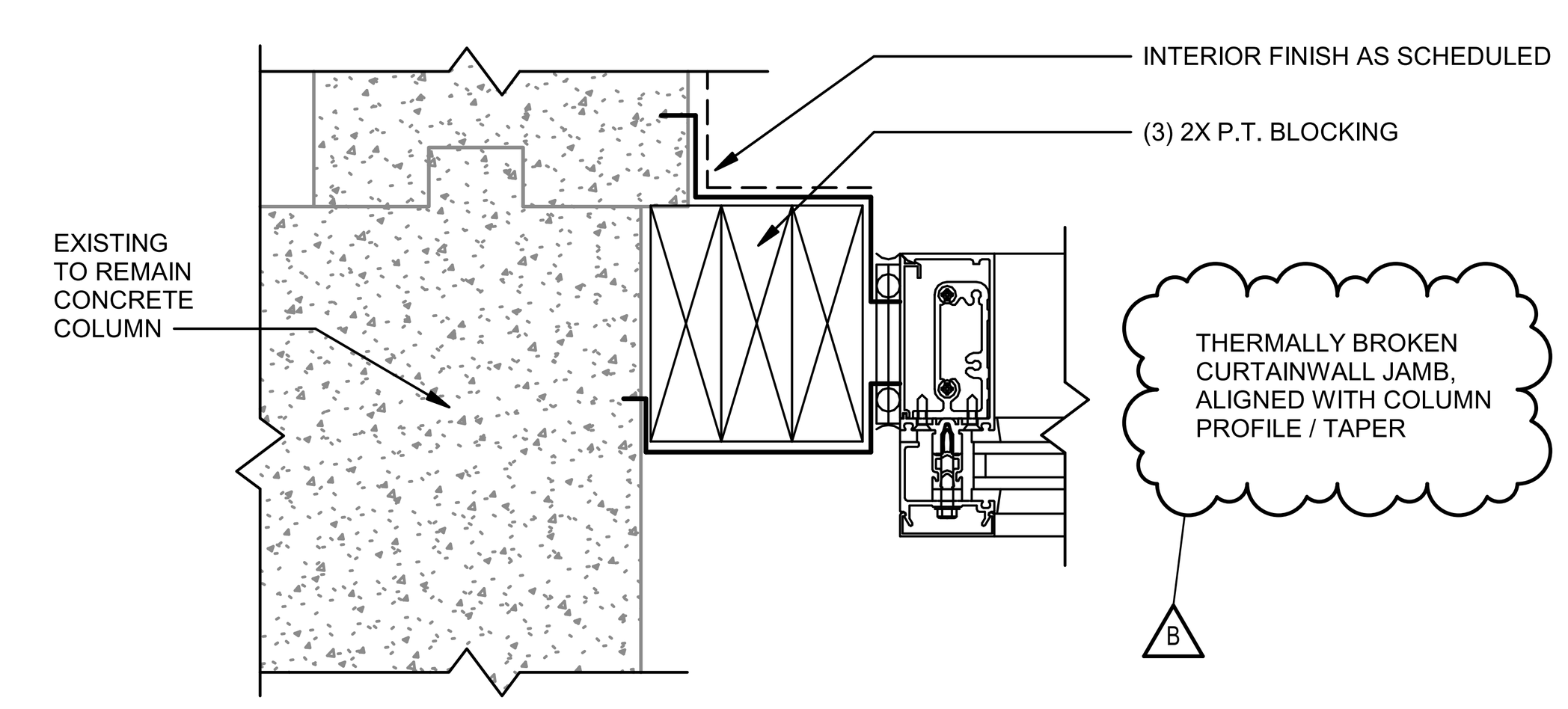


E5 CURTAINWALL HEAD (N)
3" = 1'-0"

NOTE: A/E TO REVIEW IN FIELD DURING SELECTIVE DEMOLITION, CURRENT DESIGN IS BASED ON LIMITED VISUAL INSPECTIONS, SEE NOTE 3 ON AE622, TYP. ALL FENESTRATION DETAILS



C5 CURTAINWALL TAPERED JAMB AT LIMESTONE
3" = 1'-0"



B5 CURTAINWALL TAPERED JAMB AT TOP OF COLUMNS
3" = 1'-0"

NOTE: A/E TO REVIEW IN FIELD DURING SELECTIVE DEMOLITION, CURRENT DESIGN IS BASED ON LIMITED VISUAL INSPECTIONS, SEE NOTE 3 ON AE622, TYP. ALL FENESTRATION DETAILS

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STATE OF MAINE
BUREAU OF GENERAL SERVICES
111 SEWALL STREET, 4TH FLOOR
AUGUSTA, MAINE 04333-0077
(207) 624-7314

LICENSED ARCHITECT DANIEL C. MORENO No. 2409 STATE OF MAINE
02/08/2022

CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	DCM
DESIGNED BY:	PDG
DRAWN BY:	GJN

SHEET TITLE:
CURTAINWALL DETAILS

SHEET ID:
AE624

NOT FOR CONSTRUCTION

E1 MATERIAL JOINTS

12" = 1'-0"

NOTE THE MATERIAL TRANSITION WHERE THE GRANITE PANELING RETURNS INTO THE VERTICAL TEXTURED CONCRETE AND WINDOW TYPE BELOW. NOTE ALSO THE MULTIPLE VERTICAL JOINTS REQUIRING BACKER ROD AND SEALANT / RAKE AND REPOINTING.

E2 FIFTH FLOOR CORNER

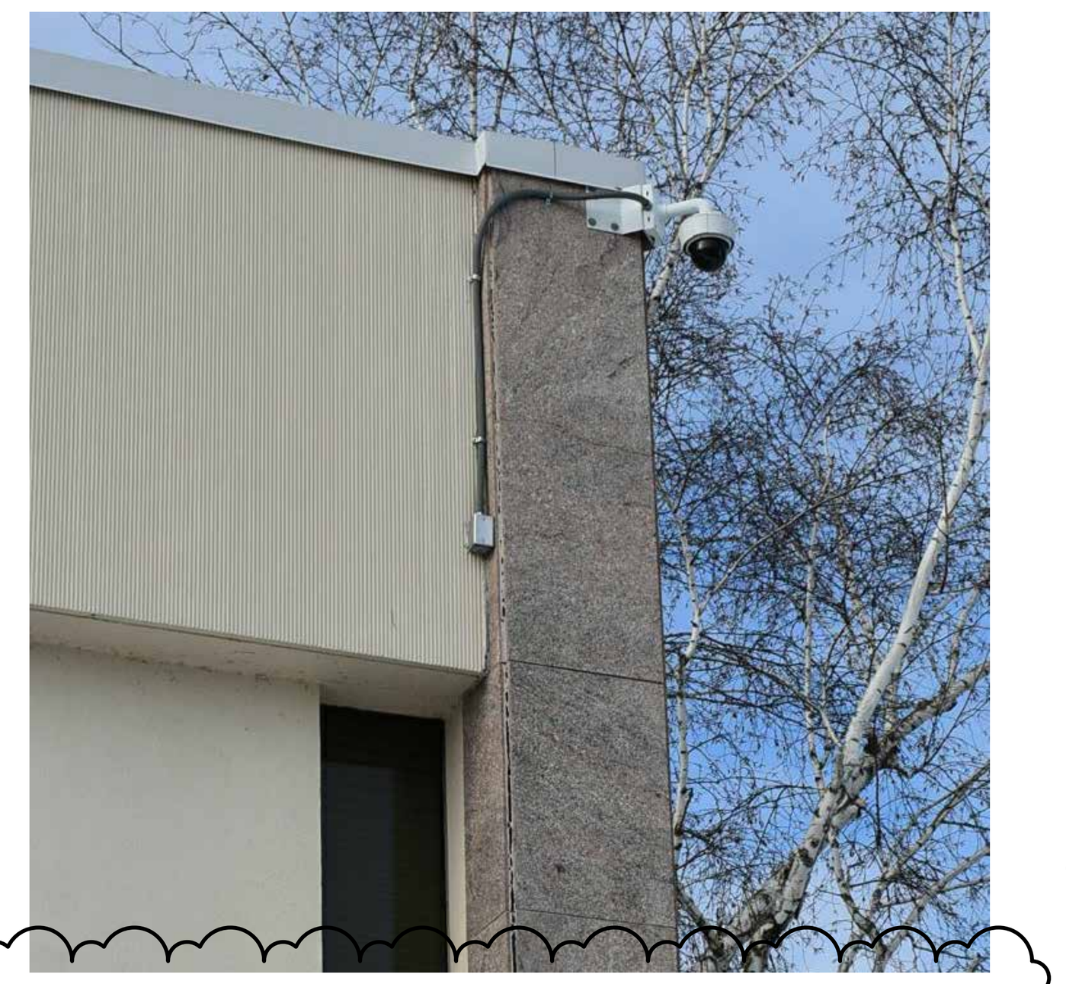
12" = 1'-0"

NOTE THE DIAGONALLY ORIENTED WINDOWS ON 5TH FLOOR (ALL SIDES), SOFFIT TO BE REPLACED, AND LIMESTONE PANELS ABOVE REQUIRING RAKE AND REPOINT AND SURFACE CLEANING.

D1 LIMESTONE SCUPPER

12" = 1'-0"

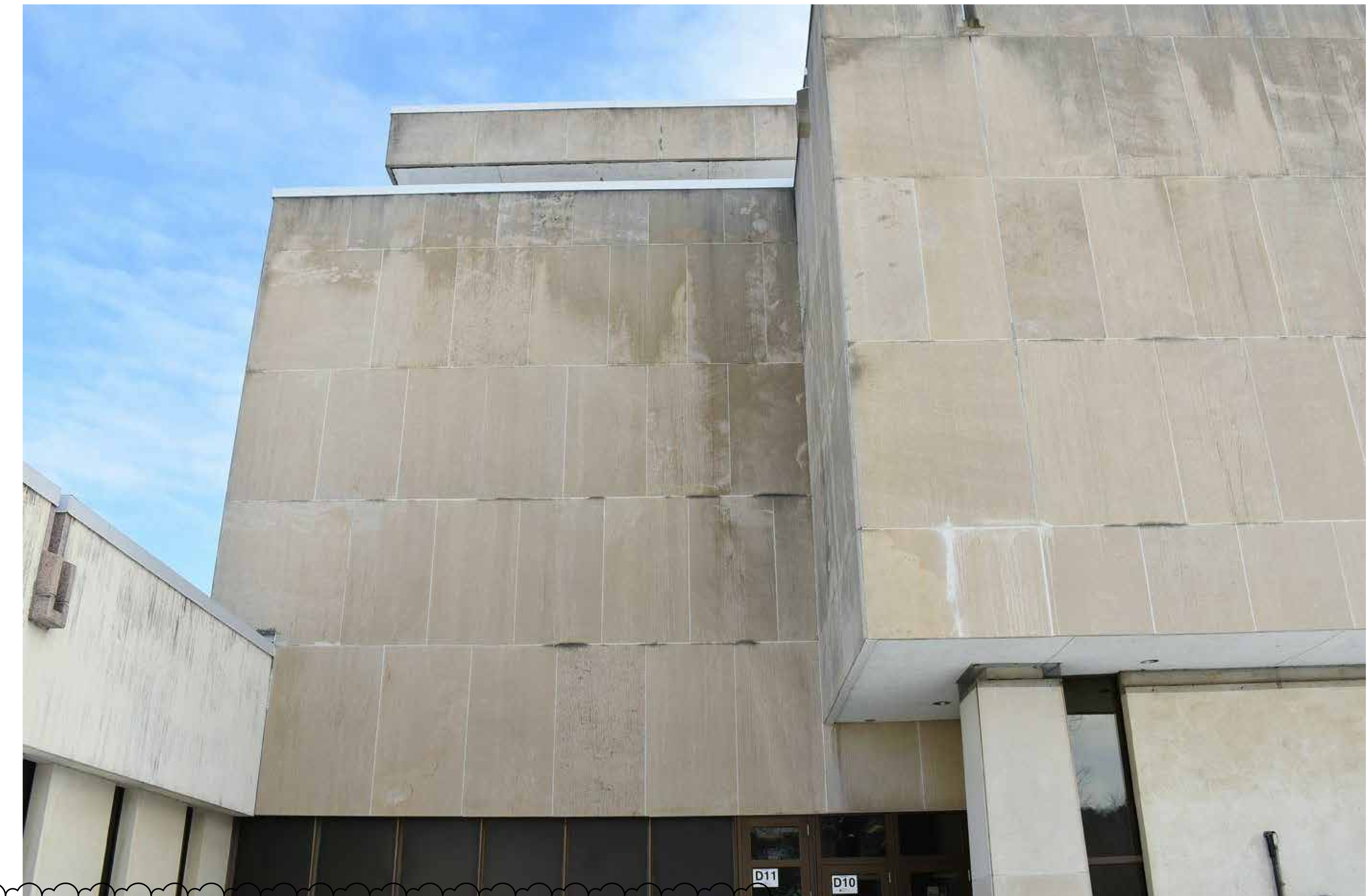
NOTE THE EXTRUDED SCUPPER PROFILE FROM THE FACE OF THE PRIMARY EXTERIOR SURFACE, THE DETERIORATION OF THE JOINTS, AND ADJACENT STAINING AROUND THE SCUPPER.



D2 GRANITE EDGE

12" = 1'-0"

NOTE THE SURFACE MOUNTED SECURITY CAMERA AND ASSOCIATED CONDUIT. NOTE ALSO THE FAILED CORNER JOINT AT THE GRANITE AND INTERSECTION BETWEEN VERTICALLY RIBBED CONCRETE AND GRANITE PANELING.



D3 GENERAL CONDITIONS ON WEST ELEVATION

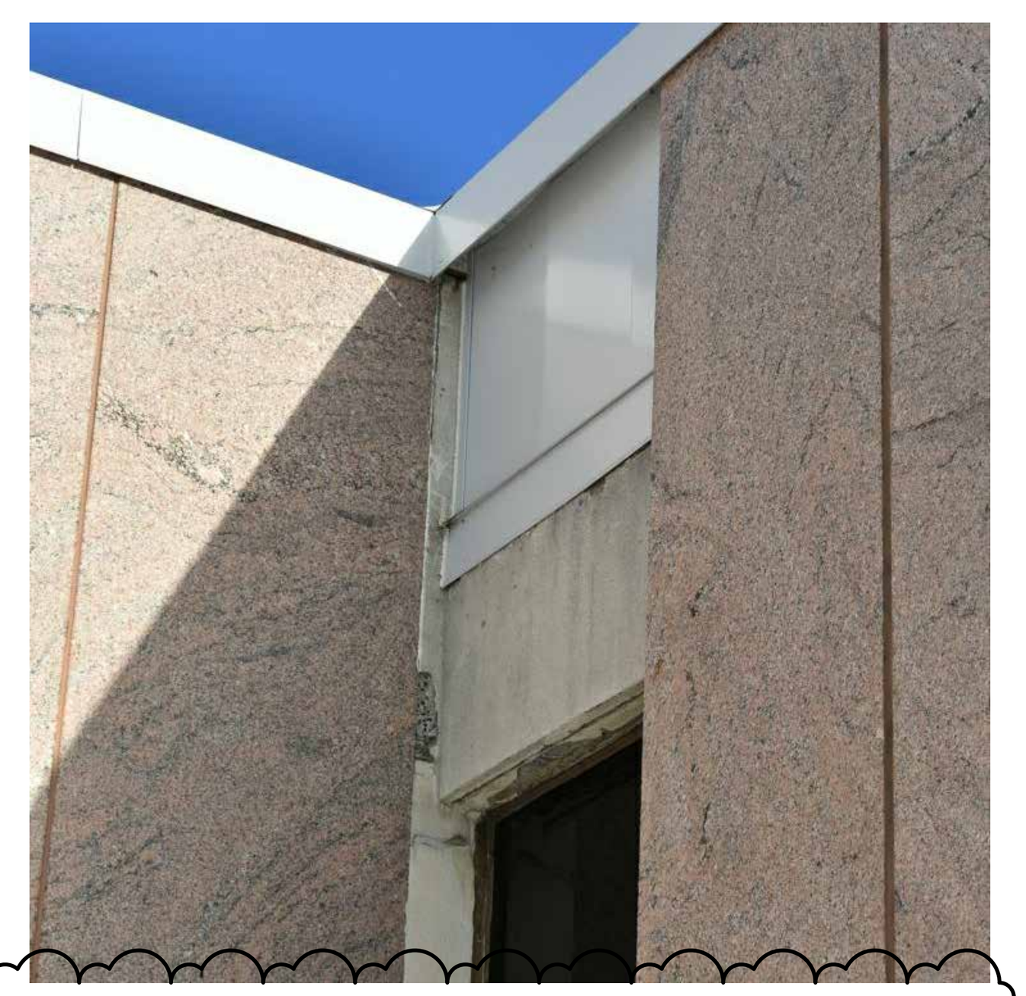
12" = 1'-0"

PHOTO NOTE: INTENT IS TO HELP CONVEY THE RETURN EDGES, MATERIAL CONDITIONS, AND SPACIAL CHARACTERISTICS OF THE BUILDING. NOTE THE POOR CONDITION OF MORTAR, EXPANSION JOINTS, CONCRETE FACES, SOFFIT PANELS, WINDOWS, DOORS, SCUPPERS, BIRD NETTING AND PATCHWORK FRAMING AT DRIP EDGE

B1 EXISTING SOUTH JAMB

12" = 1'-0"

NOTE THE HIDDEN WINDOW WALL JAMB, WEATHERED STEEL WINDOW WALL ASSEMBLY, ABRASIVE BRONZE SADDLE, LIMESTONE CLAD COLUMNS, AND EXPOSED CONCRETE.



B2 EXISTING TYPE J HEAD

12" = 1'-0"

NOTE THE DETERIORATED CONCRETE AT THE HEAD, THE SHEET METAL INFILL AT THE ROOF, AND TRANSITION FROM CONCRETE TO GRANITE PANEL.

B3 BROKEN PANEL

12" = 1'-0"

NOTE THE DETERIORATED EDGE, JOINT CONTROL AND BROKEN PANEL

B4 PARGED CONC BASE

12" = 1'-0"

NOTE THE DETERIORATING PARGING FINISH

B5 GRANITE BASE

12" = 1'-0"

NOTE THE DBROKEN GRANITE

A1 CRACKED SOFFIT

12" = 1'-0"

NOTE THE CRACKED SOFFIT, PANEL SEPERATION AT SOFFIT AND PANEL CORNERS, SURFACE CONDITIONS, STONE CORNERS AND BIRD NETTING

A2 TYP MATERIALS

12" = 1'-0"

NOTE THE DIFFERENT MATERIALS, THEIR DIFFERING FACE PLANES, SURFACE MOUNTED COMPONENTS, AND GRANITE SCUPPER WITHIN THE VERTICALLY RIBBED CONCRETE AT THE TOP.

A3 FIFTH FLOOR

12" = 1'-0"

NOTE THE POOR CONDITION AND DAMAGE TO SOFFIT, DRIP EDGE AND PANEL INTERSECTIONS

A4 GRANITE SCUPPER

12" = 1'-0"

NOTE THE POOR CONDITION OF MORTAR, EXPANSION JOINTS AND SURFACES

A5 CRACKED GRANITE

12" = 1'-0"

NOTE THE HORIZONTAL CRACK BETWEEN (3) GRANITE PANELS ON THE EAST ELEVATION.

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SHEET TITLE:
EXISTING CONDITIONS PHOTOS

SHEET ID:
AE701

NOT FOR CONSTRUCTION

BIM 360://3618208720 - ME Cultural Building Mechanical Upgrades/3618208720_ENV_R20.rvt

ABBREVIATIONS

@	AT	EXIST	EXISTING	NC	NORMALLY CLOSED, NOISE CRITERIA
A	AMP	EXT	EXPANSION TANK	NEC	NATIONAL ELECTRIC CODE NFPA 70
ABS	ACRYLONITRILE BUTADIENE STYRENE PLASTIC	EXP	EXPANSION	NG	NATURAL GAS
ABV	ABOVE	F	FAN, DEGREES FAHRENHEIT	NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
AC	AIR CONDITIONING, AIR COMPRESSOR	FA	FRESH AIR	NIC	NOT IN CONTRACT
AD	ACCESS DOOR	FAI	FRESH AIR INTAKE	NO	NORMALLY OPEN, NUMBER
ADA	AMERICANS WITH DISABILITIES ACT	FBG	FURNISHED BY GOVERNMENT	NO2	NITROGEN DIOXIDE
AF	AIR FILTER	FC	FLEX CONNECTION	NTS	NOT TO SCALE
AFF	ABOVE FINISHED FLOOR	FCO	FLOOR CLEANOUT	OA	OUTSIDE AIR
AFM	AIR FLOW MEASURING STATION	FD	FIRE DAMPER, FLOOR DRAIN	OAF	OUTSIDE AIR FILTER, OUTSIDE AIR FAN
AHU	AIR HANDLING UNIT	FF	FINISH FLOOR	OAI	OUTSIDE AIR INTAKE
AL	ACOUSTICAL LINER	FIX	FIXTURE	OAT	OUTSIDE AIR TEMPERATURE
AMB	AMBIENT	FLA	FULL LOAD AMPS	OBVD	OPPOSED BLADE VOLUME DAMPER
AP	ACCESS PANEL	FLR	FLOOR	OD	OUTSIDE DIAMETER
APD	AIR PRESSURE DROP	FOB	FLAT ON BOTTOM	OED	OPEN ENDED DUCT
APPROX	APPROXIMATELY	FOT	FLAT ON TOP	OS&Y	OUTSIDE STEM AND YOKE
AS	AIR SEPARATOR	FS	FLOAT SWITCH	P	PUMP, PITCH
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS	FSD	FIRE-SMOKE DAMPER	PC	PUMPED CONDENSATE
		FT	FEET	PD	PRESSURE DROP
ASSY	ASSEMBLY	FTR	FIN TUBE RADIATION	PLMB	PLUMBING
ATC	AUTOMATIC TEMPERATURE CONTROL	FZ	FREEZESTAT	PRESS	PRESSURE
ATT	ACOUSTICAL ATTENUATOR	G	GAS	PRV	PRESSURE REDUCING VALVE
AV	AUTOMATIC VENT	GA	GAUGE	PSI	POUNDS PER SQUARE INCH
BDD	BACKDRAFT DAMPER	GAL	GALLONS	PSIG	POUNDS PER SQUARE INCH GAUGE
BFP	BACKFLOW PREVENTER	GALV	GALVANIZED	PT	PRESSURE TREATED
BHP	BRAKE HORSEPOWER	GC	GENERAL CONTRACTOR	PVC	POLYVINYL CHLORIDE
BLDG	BUILDING	GMU	GLYCOL MAKEUP UNIT	QTY	QUANTITY
BOD	BOTTOM OF DUCT	GP	GENERAL PURPOSE	(R)	REMOVE
BTUH	BTU PER HOUR	GPH	GALLONS PER HOUR	R	RADIUS, RETURN
C	CENTERLINE	GPM	GALLONS PER MINUTE	RA	RETURN AIR
CA	COMPRESSED AIR	GR	GLYCOL RETURN	RAD	RADIATOR
CAP	CAPACITY	GRH	GRAVITY RELIEF HOOD	RAF, RF	RETURN AIR FAN
CC	COOLING COIL	GHWR	GLYCOL HOT WATER RETURN	RAT	RETURN AIR TEMPERATURE
CD	CONDENSATE DRAIN	GHWS	GLYCOL HOT WATER SUPPLY	REL	RELIEF
CF	CUBIC FEET	GV	GATE VALVE	REQD	REQUIRED
CFM	CUBIC FEET PER MINUTE	GSM	GALVANIZED SHEET METAL	RET	RETURN
CH	CHILLER	GYP	GYPSUM WALLBOARD	RH	RELATIVE HUMIDITY
CHWR	CHILLED WATER RETURN	HC	HEATING COIL	RL	REFRIGERANT LIQUID
CHWS	CHILLED WATER SUPPLY	HOA	HANDS-OFF-AUTOMATIC	RLA	RATED LOAD AMPS
CLG	CEILING	HOR	HORIZONTAL	RM	ROOM
CO	CLEAN OUT, CARBON MONOXIDE	HP	HORSEPOWER, HIGH PRESSURE	RPM	REVOLUTIONS PER MINUTE
COL	COLUMN	HR	HOUR	RS	REFRIGERANT SUCTION
CONC	CONCRETE	HT	HEIGHT	RTU	ROOFTOP UNIT
COND	CONDENSATE	HUMID	HUMIDIFIER, HUMIDITY	S	SUPPLY DIFFUSER
CONN	CONNECTION	HV	HEATING AND VENTILATINGUNITCONDITIONING	SA	SUPPLY AIR
CONT	CONTINUATION	HVAC	HEATING, VENTILATING AND AIR	SCH	SCHEDULE
CONV	CONVECTOR	HW	HOT WATER	SCR	SCREEN
CP	CONTROL PANEL, CONDENSATE PUMP	HWR	HOT WATER RETURN	SD	SMOKE DAMPER
CPT	CONDENSATE PUMP TRAP	HWS	HOT WATER SUPPLY	SF	SQUARE FOOT
CSA	CANADIAN STANDARDS ASSOCIATION	HX	HEAT EXCHANGER	SIM	SIMILAR
CU	CONDENSING UNIT	HZ	HERTZ	SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTOR'S NATIONAL ASSOCIATION
CUH	CABINET UNIT HEATER	IBR	HYDRONICS INSTITUTE		
CV	CONTROL VALVE	ID	INSIDE DIAMETER	SOV	SHUT OFF VALVE
Cv	CONTROL VALVE RATING	IN	INCHES	SP	STATIC PRESSURE
CVT	CONSTANT VOLUME AIR TERMINAL	INDIR	INDIRECT WASTE	SPH	STATIC PRESSURE HIGH LIMIT
CW	COLD WATER	KW	KILOWATT	SPL	STATIC PRESSURE LOW LIMIT
CWR	COLD WATER RETURN	L	LENGTH, LOUVER	SPS	STATIC PRESSURE SENSOR
CWS	COLD WATER SUPPLY	LAT	LEAVING AIR TEMPERATURE	SQ	SQUARE
D	DRAIN	LD	LIQUEFIED PETROLEUM	SS	STAINLESS STEEL
(D)	ITEMS TO BE DEMOLISHED	LDB	LEAVING DRY BULB	STL	STEEL
dB	DECIBELS	LF	LINEAR FEET	SUP	SUPPLY
DB	DRY BULB	LG	LONG	T	TEMPERATURE SENSOR, THERMOSTAT
DC	DRY COOLER	LOC	LOCATION, LOCATED	TC	TOTAL COOLING
DDC	DIRECT DIGITAL CONTROL	LP	LIQUEFIED PROPANE	TEMP	TEMPERATURE
Ø, DIA	DIAMETER	LPR	LOW PRESSURE RETURN	THK	THICK, THICKNESS
DIFF	DIFFERENTIAL, DIFFUSER	LPS	LOW PRESSURE STEAM (15 PSI OR LESS)	TG	TRANSFER GRILLE
DISCH	DISCHARGE	LRA	LOCKED ROTOR AMPS	TRANS	TRANSITION
DN	DOWN	LS	LINE SET (REFRIG)	TSP	TOTAL STATIC PRESSURE
DOM	DOMESTIC	LVG	LEAVING	TYP	TYPICAL
DP	DIFFERENTIAL PRESSURE	LWB	LEAVING WET BULB	UH	UNIT HEATER
DWG	DRAWING	LWT	LEAVING WATER TEMPERATURE	UNO	UNLESS NOTED OTHERWISE
DWGS	DRAWINGS	M	MECHANICAL	V	VENT
E	ELECTRICAL, EXHAUST	MANUF	MANUFACTURER	VAV	VARIABLE AIR VOLUME
(E)	EXISTING TO REMAIN	MAX	MAXIMUM	VD	VOLUME DAMPER
EA	EXHAUST AIR	MAX PD	MAXIMUM PRESSURE DROP	VEL	VELOCITY
EAT	ENTERING AIR TEMPERATURE	MBH	1000 BTU PER HOUR	VFD	VARIABLE FREQUENCY DRIVE
EC	ELECTRICAL CONTRACTOR	MBU	1000 BTU	VRF	VARIABLE REFRIGERANT FLOW
EDR	EQUIVALENT DIRECT RADIATION	MCA	MAXIMUM CIRCUIT AMPS	VTR	VENT THROUGH ROOF
EER	ENERGY EFFICIENT RATIO	MCC	MOTOR CONTROL CENTER	W	WIDTH, WATT
EF	EXHAUST FAN	MD	MOTORIZED DAMPER	W/	WITH
EFF	EFFICIENCY	MECH	MECHANICAL	WB	WET BULB
ELEC	ELECTRIC, ELECTRICAL	MEZZ	MEZZANINE	WC	WATER COLUMN
ELEV	ELEVATION	MFG	MANUFACTURER	WCO	WALL CLEANOUT
ENT	ENTERING	MIN	MINIMUM, MINUTES	WF	WALL FAN
EPDM	ETHYLENE PROPYLENE DIENE MEMBRANE	MLS	MAIN LINE SET (REFRIG)	WG	WATER GAUGE
EQUIP	EQUIPMENT	mm	MILLIMETERS	WH	WATER HEATER
ESP	EXTERNAL STATIC PRESSURE	MNTD	MOUNTED	WMS	WIRE MESH SCREEN
ET	EXPANSION TANK	MOCP	MAXIMUM OVERCURRENT PROTECTION	WPD	WATER PRESSURE DROP
EUH	ELECTRIC UNIT HEATER	MUA	MAKE-UP AIR		
EVAP	EVAPORATOR	MUW	MAKE-UP WATER		
EWC	ELECTRIC WATER COOLER	N/A	NOT APPLICABLE		
EWT	ENTERING WATER TEMPERATURE	NATL	NATURAL		
EXH	EXHAUST				

DUCTWORK SYMBOLS

- RETURN DUCT UP
- RETURN DUCT DOWN
- SUPPLY DUCT UP
- SUPPLY DUCT DOWN
- EXHAUST DUCT UP
- EXHAUST DUCT DOWN
- RISE(R) OR DROP(D)
- RETURN OR EXHAUST GRILLE, REGISTER
- SUPPLY DIFFUSER, REGISTER, GRILLE
- EXHAUST DIFFUSER, REGISTER, GRILLE
- AD — ACCESS DOOR
- FINTUBE BASEBOARD AND ENCLOSURE
- UNIT HEATER
- TERMINAL UNIT, VARIABLE VOLUME WITH HOT WATER COIL
- TERMINAL UNIT, VARIABLE VOLUME
- PROPELLER FAN
- CENTRIFUGAL FAN
- CO/NO2 — COMBINATION CARBON MONOXIDE / NITROGEN DIOXIDE SENSOR
- INLINE FAN
- DIRECTION OF AIR FLOW
- DIRECTION OF AIR FLOW EXHAUST
- DOOR UNDERCUT
- DOOR LOUVER
- VOLUME DAMPER
- SD — SMOKE DAMPER
- FD — FIRE DAMPER
- MOTORIZED DAMPER, PARALLEL BLADE
- MOTORIZED DAMPER, OPPOSED BLADE
- T — THERMOSTAT OR THERMISTOR
- H — HUMIDISTAT
- S — SWITCH
- SMOKE DETECTOR
- SQUARE ELBOW WITH TURNING VANES
- FLEXIBLE DUCT
- FLEXIBLE CONNECTOR
- ROOF VENTILATOR, EXHAUST
- STARTER/DISCONNECT
- PUMP
- CEILING SUPPLY DIFFUSER W/ THROW DIRECTION SHOWN BY ARROWS (FOR 4-WAY THROW ARROWS NOT SHOWN)
- CEILING PADDLE FAN
- WALL MOUNTED OSCILLATING FAN

PIPING SYMBOLS

- AFS — AIR FLOW SWITCH
- AIR SEPARATOR
- AUTOMATIC AIR VENT WITH ISOLATION VALVE
- BALL VALVE
- BALL VALVE IN VERTICAL
- BOILER DRAIN VALVE W/ HOSE BIB
- BUCKET TRAP
- BUTTERFLY VALVE
- CHECK VALVE
- TRIPLE DUTY VALVE
- COCK
- COMBINATION FLOW MEASURING/ BALANCING VALVE (CIRCUIT SETTER)
- DIRECTION OF FLOW OF PIPE
- DIRT LEG
- END SWITCH
- FLEXIBLE PIPE CONNECTION
- FLOW SWITCH (B)
- FLOAT AND THERMOSTATIC TRAP
- FUSOMATIC VALVE
- GATE VALVE
- THREE WAY VALVE
- GLOBE VALVE
- HOSE BIBB
- (B) LTD — LOW TEMPERATURE DETECTOR (FREEZESTAT)
- MANUAL AIR VENT
- M — METER
- NONELECTRIC ZONE VALVE
- OS&Y VALVE
- OS&Y VALVE IN VERTICAL (PLAN)
- ("PETE'S PLUG")
- PIPE DROP
- PIPE END CAP
- PIPE GUIDE
- DN — PIPE PITCH DOWN IN DIRECTION OF FLOW
- UP — PIPE PITCH UP IN DIRECTION OF FLOW
- PIPE RISE
- PIPE TEE FROM BOTTOM
- PIPE TEE FROM TOP
- PIPE UP TO FINTUBE RADIATION ON FLOOR ABOVE
- PLUG VALVE
- PRESSURE GAUGE W/BALL VALVE (GATE VALVE AND SIPHON FOR STEAM)
- PRESSURE REDUCING VALVE
- PRESSURE REGULATING VALVE
- PRESSURE SWITCH
- REDUCED PRESSURE BACKFLOW PREVENTER
- REDUCER (CONCENTRIC)
- REDUCER (ECCENTRIC-FOB OR FOT)
- SAFETY RELIEF VALVE
- SOLENOID VALVE
- STEAM MONITOR
- STRAINER W/BALL DRAIN VALVE, HOSE BIB AND CAP (GATE VALVE FOR STEAM)
- STRAINER W/ BLOW OFF
- S — TEMPERATURE SENSOR
- THERMOMETER
- TEMPERATURE/PRESSURE WELL
- STEAM TRAP: F&T - FLOATING AND THERMOSTATIC T - THERMOSTATIC
- THREE-WAY AUTOMATIC CONTROL VALVE (ELECTRIC OR DDC)
- TWO-WAY AUTOMATIC CONTROL VALVE (ELECTRIC OR DDC)
- UNION AS DICTATED BY PIPE SIZE
- FLANGE AS DICTATED BY PIPE SIZE
- VIBRATION ISOLATOR

GENERAL NOTES

1. GENERAL NOTES, SYMBOLS LIST AND DETAILS ARE APPLICABLE TO DRAWINGS MARKED M-XXX.
2. DRAWINGS ARE DIAGRAMMATIC. DETERMINE LOCATIONS OF SYSTEMS AND COMPONENTS IN FIELD.
3. COORDINATE WORK OF THIS SECTION WITH THAT OF OTHER SECTIONS.
4. DUCTWORK SHALL BE CONSTRUCTED AND INSTALLED ACCORDING TO LATEST SMACNA STANDARDS FOR STATIC PRESSURE RATING OF APPLICATION.
5. INSTALL THERMOSTATS 4'-6" ABOVE FINISHED FLOOR OR AS DIRECTED OTHERWISE.
6. WORK SHALL BE COORDINATED WITH TRADES INVOLVED. OFFSETS IN PIPING AND DUCTS (INCLUDING DIVIDED DUCTS) AND TRANSITIONS AROUND OBSTRUCTIONS SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.
7. VERIFY EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. VERIFY AND PROVIDE DUCT TRANSITIONS TO FURNISHED EQUIPMENT, FIELD VERIFY AND COORDINATE DIMENSIONS BEFORE FABRICATION.
8. ACCESS PANELS SHALL BE PROVIDED, WHERE REQUIRED, TO SERVICE DAMPERS, HEATERS, VALVES AND CONCEALED MECHANICAL EQUIPMENT. PROVIDE ACCESS PANELS UP STREAM OF ELBOWS WITH TURNING VANES.
9. INSTALL EQUIPMENT, PIPING AND DUCTWORK AS REQUIRED TO PROVIDE A VIBRATION-FREE INSTALLATION AND TO FACILITATE EQUIPMENT ACCESS AS REQUIRED BY EQUIPMENT MANUFACTURER.
10. CONTROL WIRE AND CONDUIT SHALL COMPLY WITH NFPA 70 AND PROJECT SPECIFICATIONS.
11. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR LOCATIONS OF AIR DEVICES WHERE APPLICABLE.
12. PROVIDE FLEXIBLE DUCT CONNECTIONS ON DUCTS CONNECTING TO FANS. DUCTS TO BE GROUNDED ACROSS FLEXIBLE CONNECTION WITH FLEXIBLE COPPER GROUNDING STRAPS.
13. INSULATE PIPING AS SPECIFIED. PERFORM PIPING SYSTEM TESTS SPECIFIED BEFORE INSULATING.
14. PROVIDE CLAMPS, OFFSETS, EXPANSION JOINTS, ANCHORS AND GUIDES AS NECESSARY TO PREVENT STRESS ON PIPING.
15. ALL MECHANICAL INSTALLATIONS AND WORK SHALL BE IN ACCORDANCE WITH MAINE UNIFORM BUILDING CODE & ENERGY CODES (MUBEC) INCLUDING IBC-2015, IMC-2015, MAINE PLUMBING CODE, AND ANY OTHER APPLICABLE CODES AND STANDARDS AS REQUIRED BY THE STATE OF MAINE.

GENERAL SYMBOLS

- C5 / M-501 — DETAIL NUMBER / DRAWING WHERE DETAIL IS DRAWN
- D1 — DETAIL NUMBER
- XXX-XXX (xxx) — SYMBOL PER ABBREVIATION LIST / EQUIPMENT SEQUENCE NUMBER / NOTE
- S- / ### / X3 — DIFFUSER, REGISTER OR GRILLE SEQUENCE NUMBER / CFM / NOTE
- FR-1 / 2.2 / 5 LF — FINTUBE DESIGNATION / MBH / LENGTH OF ACTIVE FIN TUBE
- GPM
- 22 — KEY NOTE (NUMBER)
- REVISION (LETTER)
- CONNECT TO EXISTING
- LIMIT OF DEMOLITION

MECHANICAL LINETYPE LEGEND

- ITEMS TO BE REMOVED
- EXIST ITEMS TO REMAIN
- NEW WORK
- HIDDEN ITEMS
- CONTROL WIRING

MODELED DUCTWORK LEGEND

24"Ø SA	SUPPLY AIR ROUND DUCT RISE
24"Ø RA	RETURN AIR ROUND DUCT RISE
24"Ø EA	EXHAUST AIR ROUND DUCT RISE
24"Ø SA	SUPPLY AIR ROUND DUCT DROP
24"Ø RA	RETURN AIR ROUND DUCT DROP
24"Ø EA	EXHAUST AIR ROUND DUCT DROP
24"x24" SA	SUPPLY AIR RADIUS ELBOW RISE
24"x24" RA	RETURN AIR RADIUS ELBOW RISE
24"x24" EA	EXHAUST AIR RADIUS ELBOW RISE
24"x24" SA	SUPPLY AIR RADIUS ELBOW DROP
24"x24" RA	RETURN AIR RADIUS ELBOW DROP
24"x24" EA	EXHAUST AIR RADIUS ELBOW DROP
24"x24" SA	SUPPLY AIR MITERED ELBOW RISE
24"x24" RA	RETURN AIR MITERED ELBOW RISE
24"x24" EA	EXHAUST AIR MITERED ELBOW RISE
24"x24" SA	SUPPLY AIR MITERED ELBOW DROP
24"x24" RA	RETURN AIR MITERED ELBOW DROP
24"x24" EA	EXHAUST AIR MITERED ELBOW DROP

- RECTANGULAR / ROUND VOLUME DAMPER
- RECTANGULAR / ROUND CONTROL DAMPER
- RECTANGULAR MANUAL CONTROL DAMPER
- RECTANGULAR MANUAL CONTROL DAMPER OPPOSED BLADES
- RECTANGULAR MANUAL CONTROL DAMPER PARALLEL BLADES
- ROUND OR SQUARE DUCT REDUCER
- DUCT END CAP
- FLEX DUCT
- SUPPY DIFFUSER
- RETURN GRILLE
- EXHAUST GRILLE

MODELED PIPING LEGEND

- GLOBE VALVE
- CHECK VALVE
- BALL VALVE
- PRESSURE RELIEF VALVE
- STRAINER W/BLOW OFF
- UNION
- BACKFLOW PREVENTER
- REDUCER (CENTRIC)
- PIPE ELBOW UP
- PIPE ELBOW DOWN
- PIPE TEE UP
- PIPE TEE DOWN
- BUTTERFLY VALVE
- GATE VALVE
- PIPE END CAP
- PIPE PITCH

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AUGUSTA, MAINE 04333-0077
(207) 624-7314

STATE OF MAINE — STEVEN M. MARTEL — 7148 — LICENSED — PROFESSIONAL ENGINEER — 2/7/2022

CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

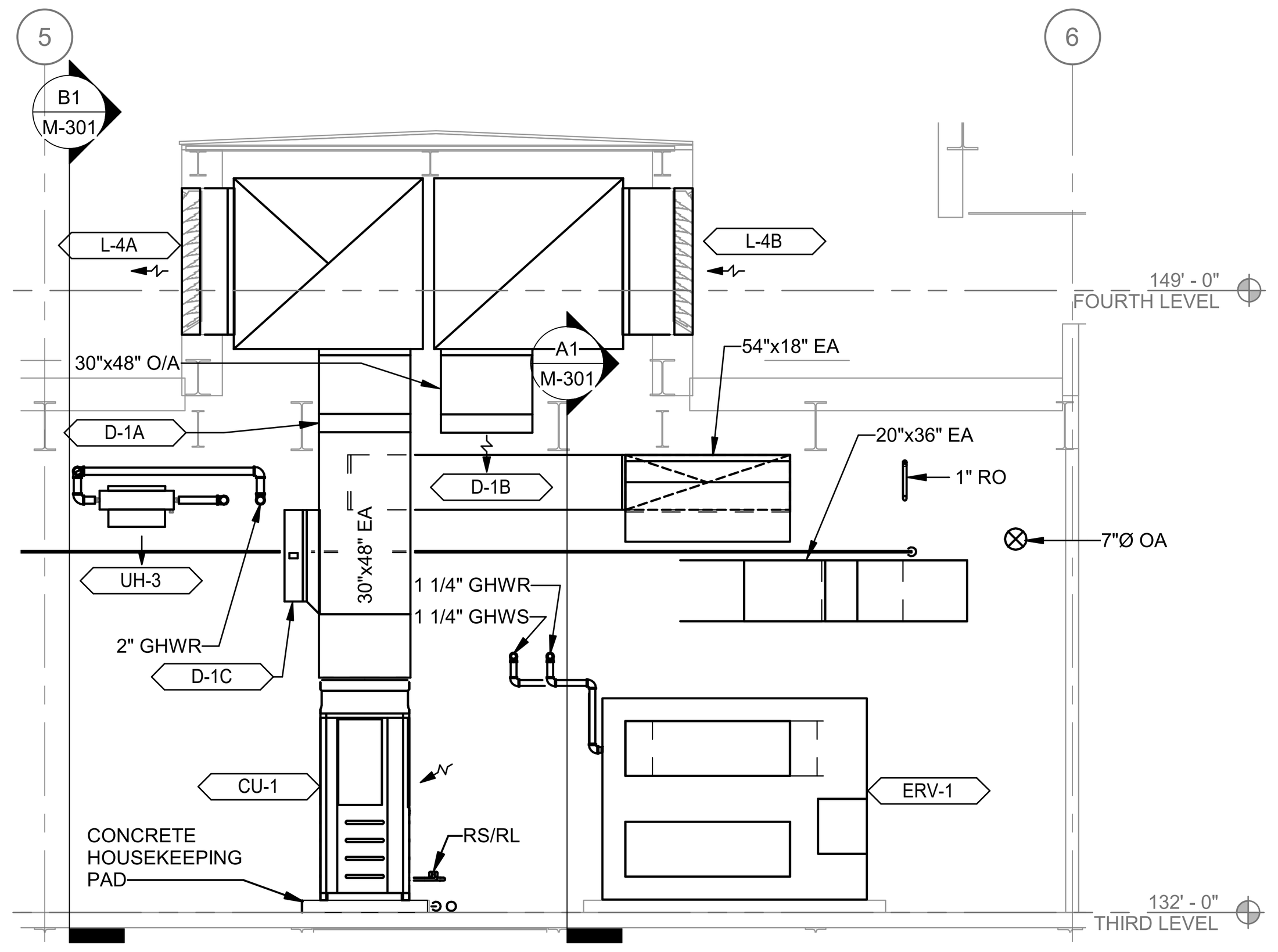
REV.	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	SMM
DESIGNED BY:	BAL
DRAWN BY:	BAL

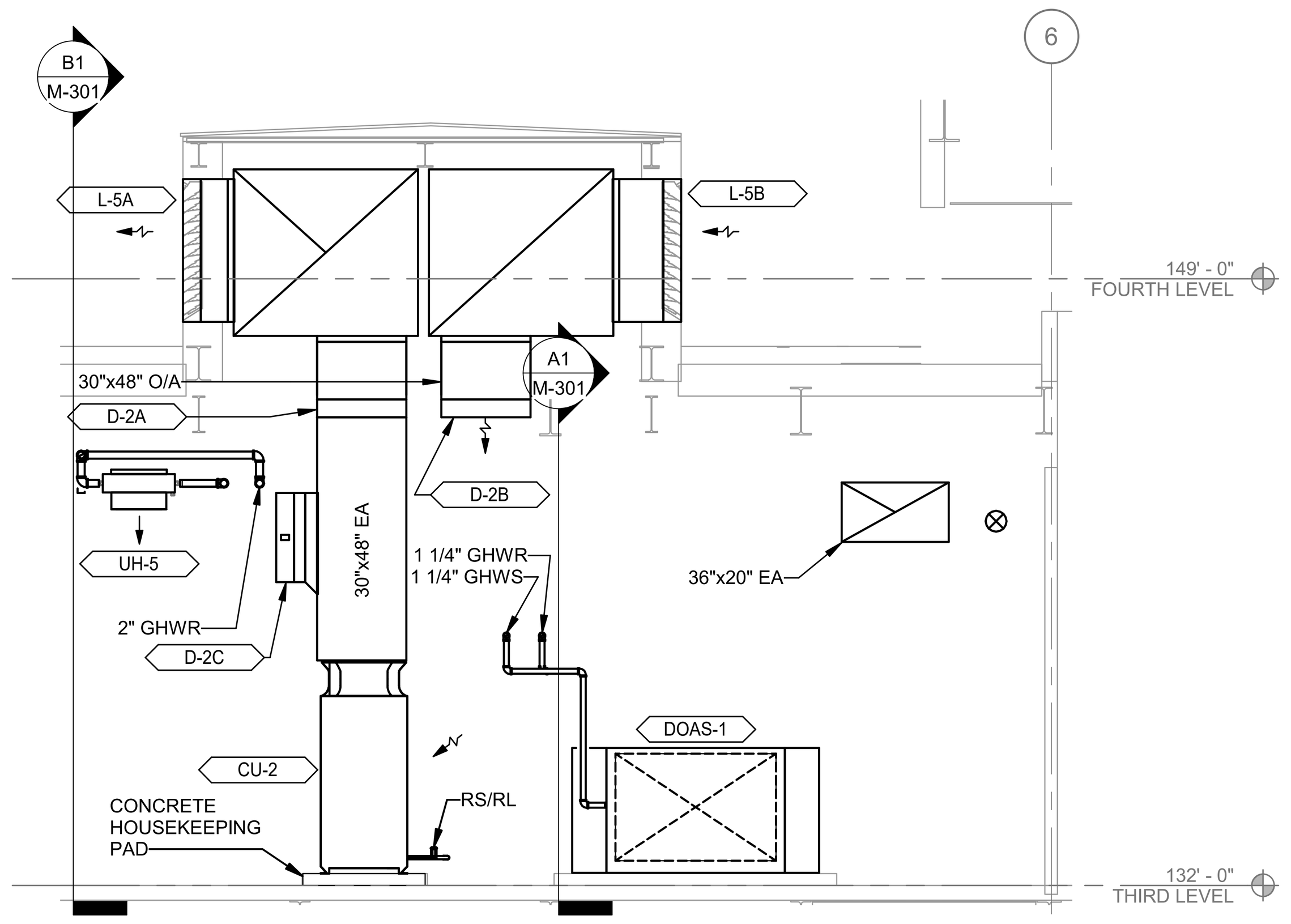
SHEET TITLE:
MECHANICAL LEGEND, ABBREVIATIONS AND GENERAL NOTES

SHEET ID:
M-001

NOT FOR CONSTRUCTION



D1 CU-1 SECTION
1/4" = 1'-0"
0 2' 4' 8'



D2 CU-2 SECTION
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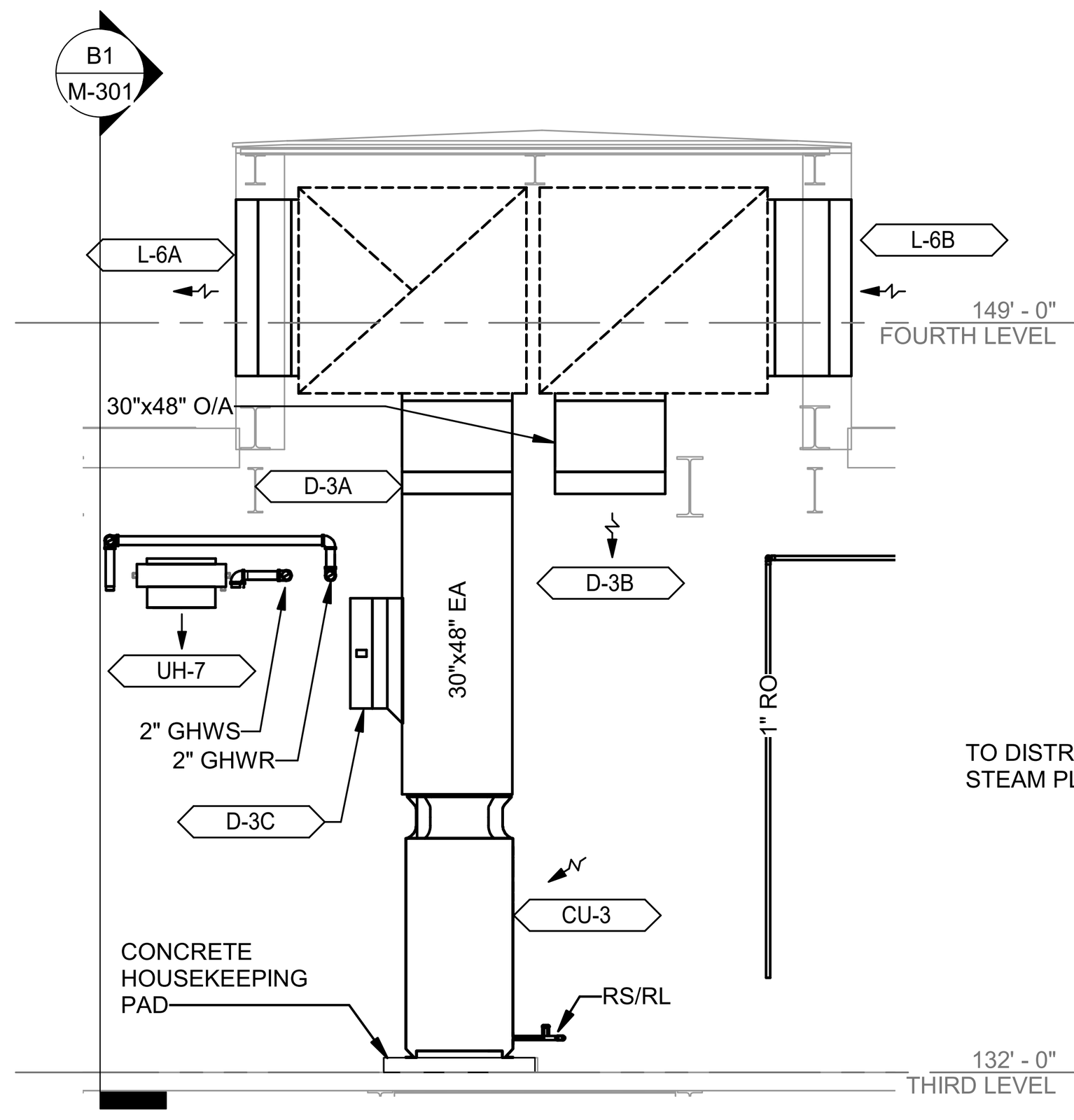

D3 CU-3 SECTION
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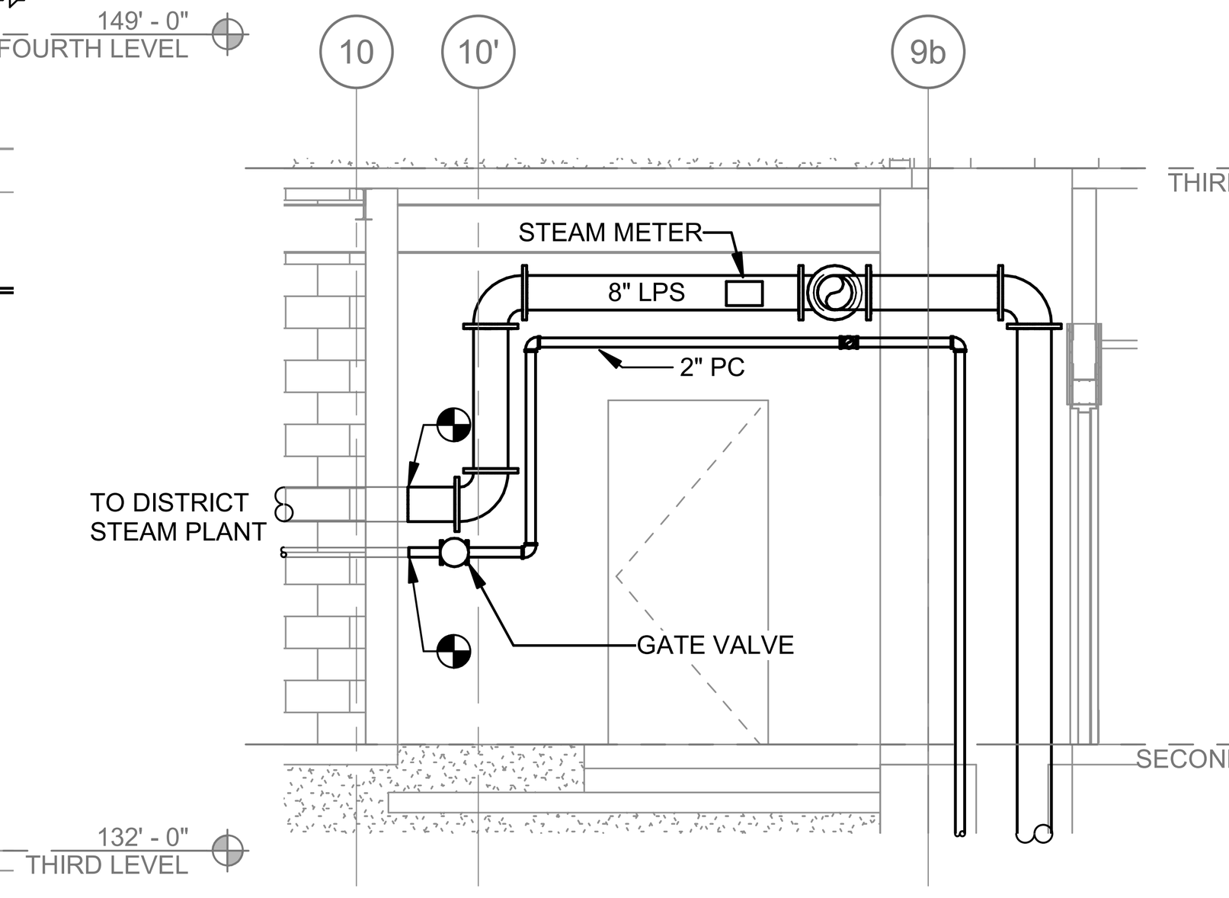
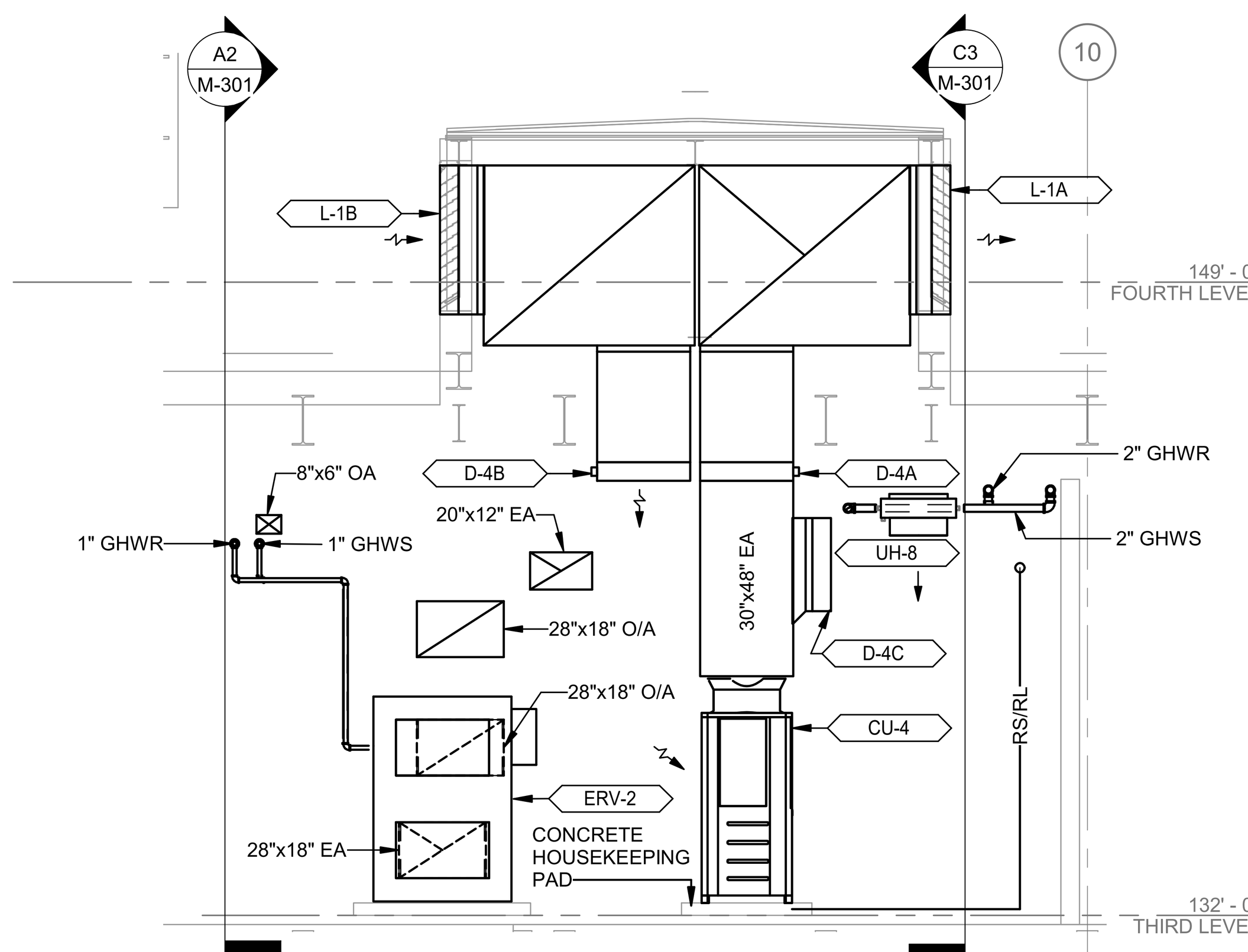
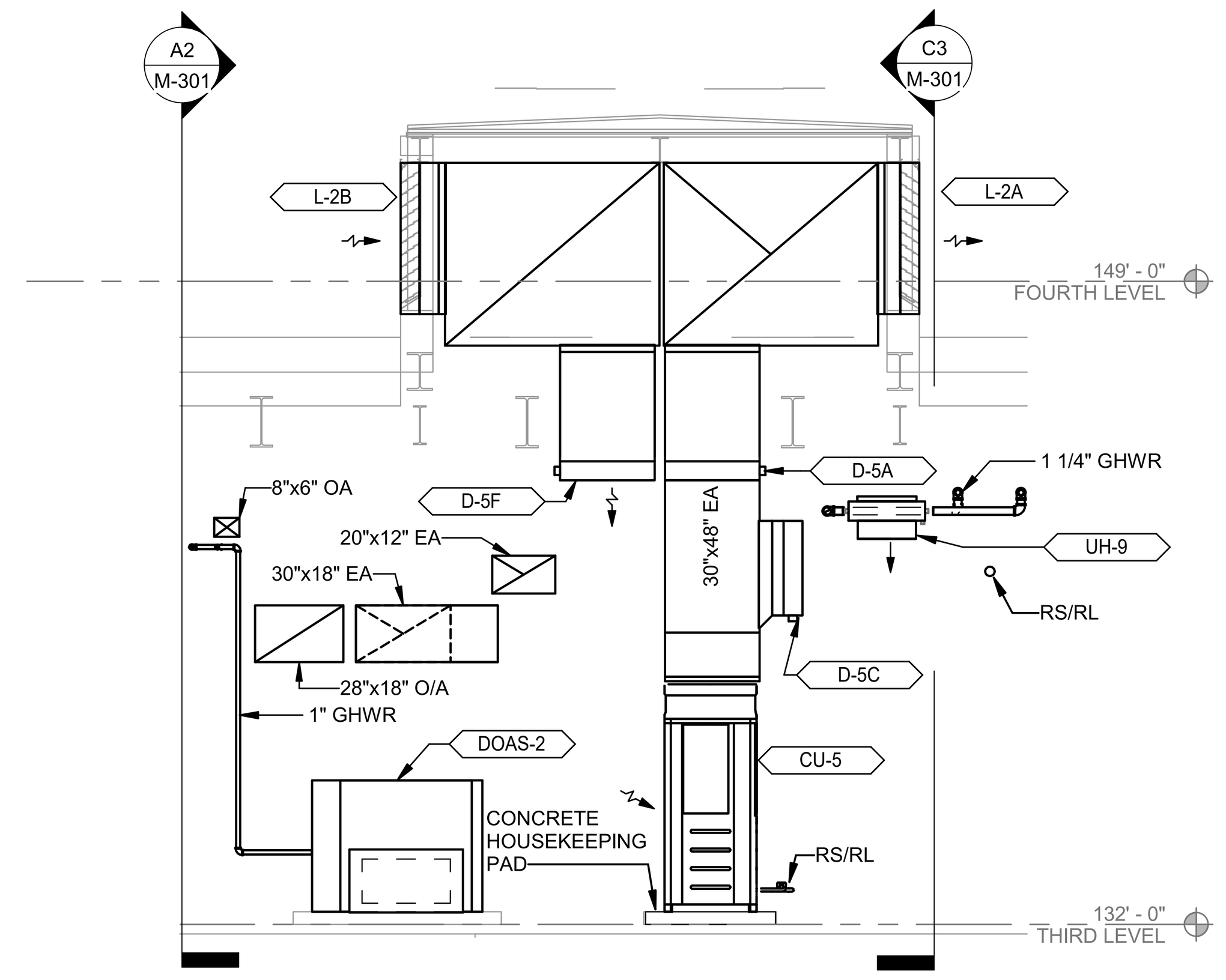


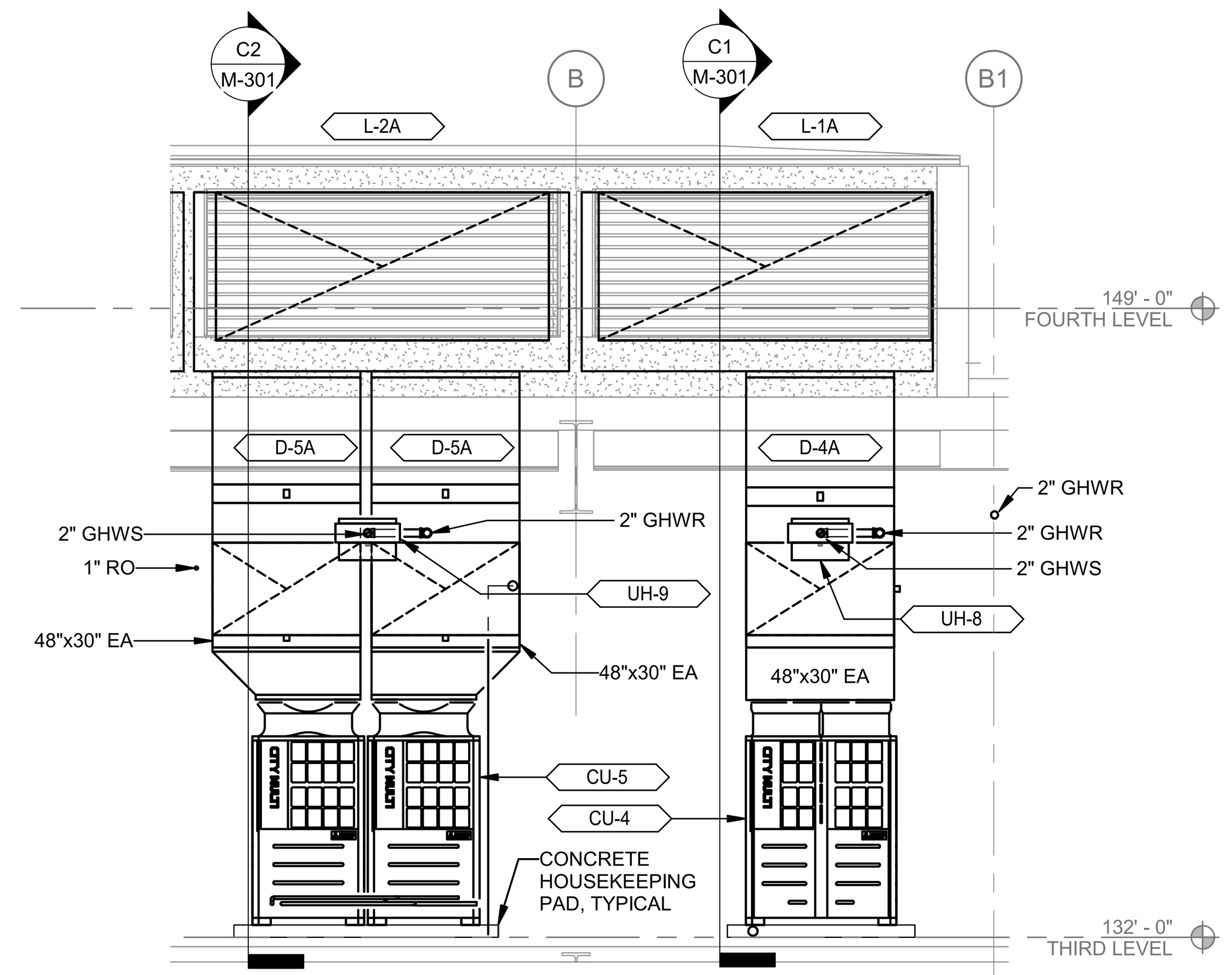
D4 STEAM PIPING SECTION
1/4" = 1'-0"
0 2' 4' 8'



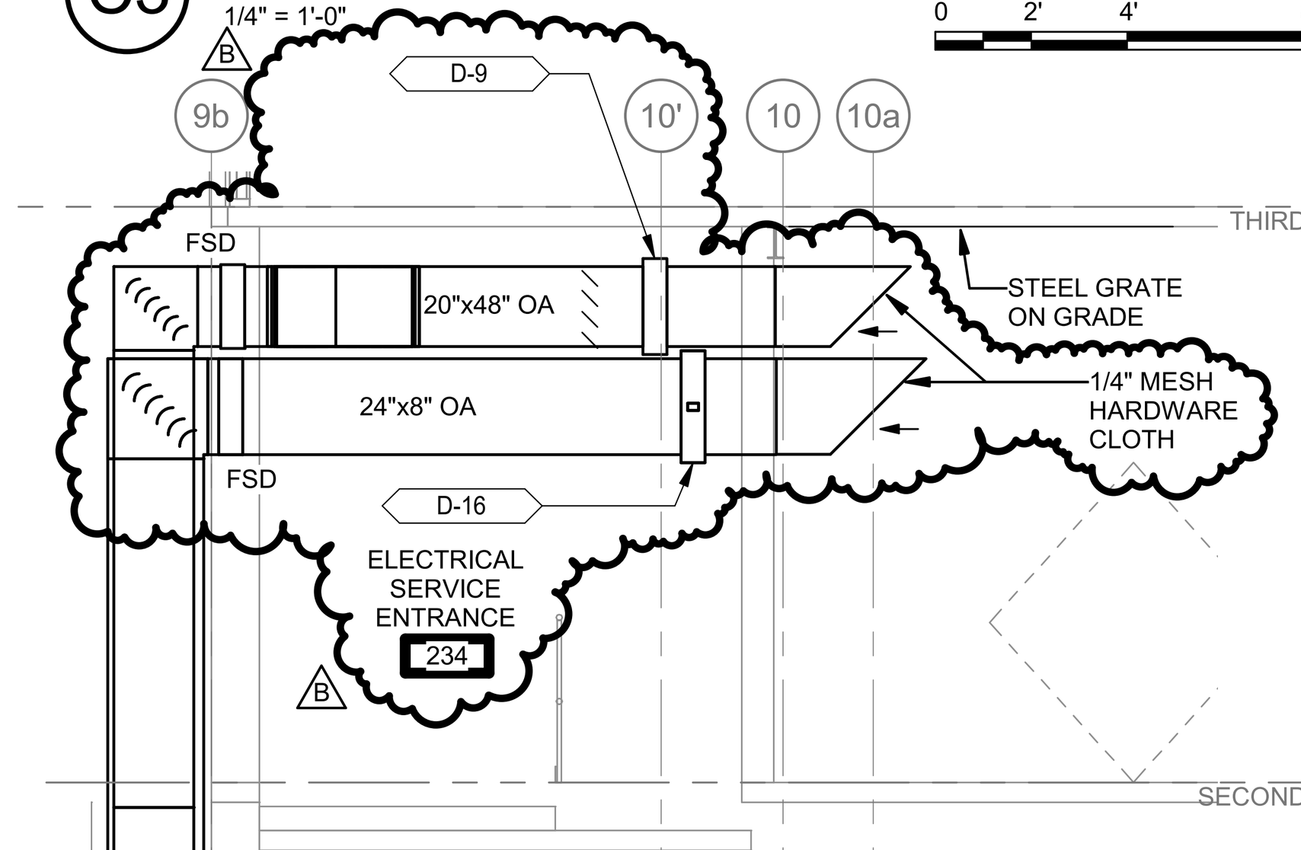
C1 CU-4 SECTION
1/4" = 1'-0"
0 2' 4' 8'



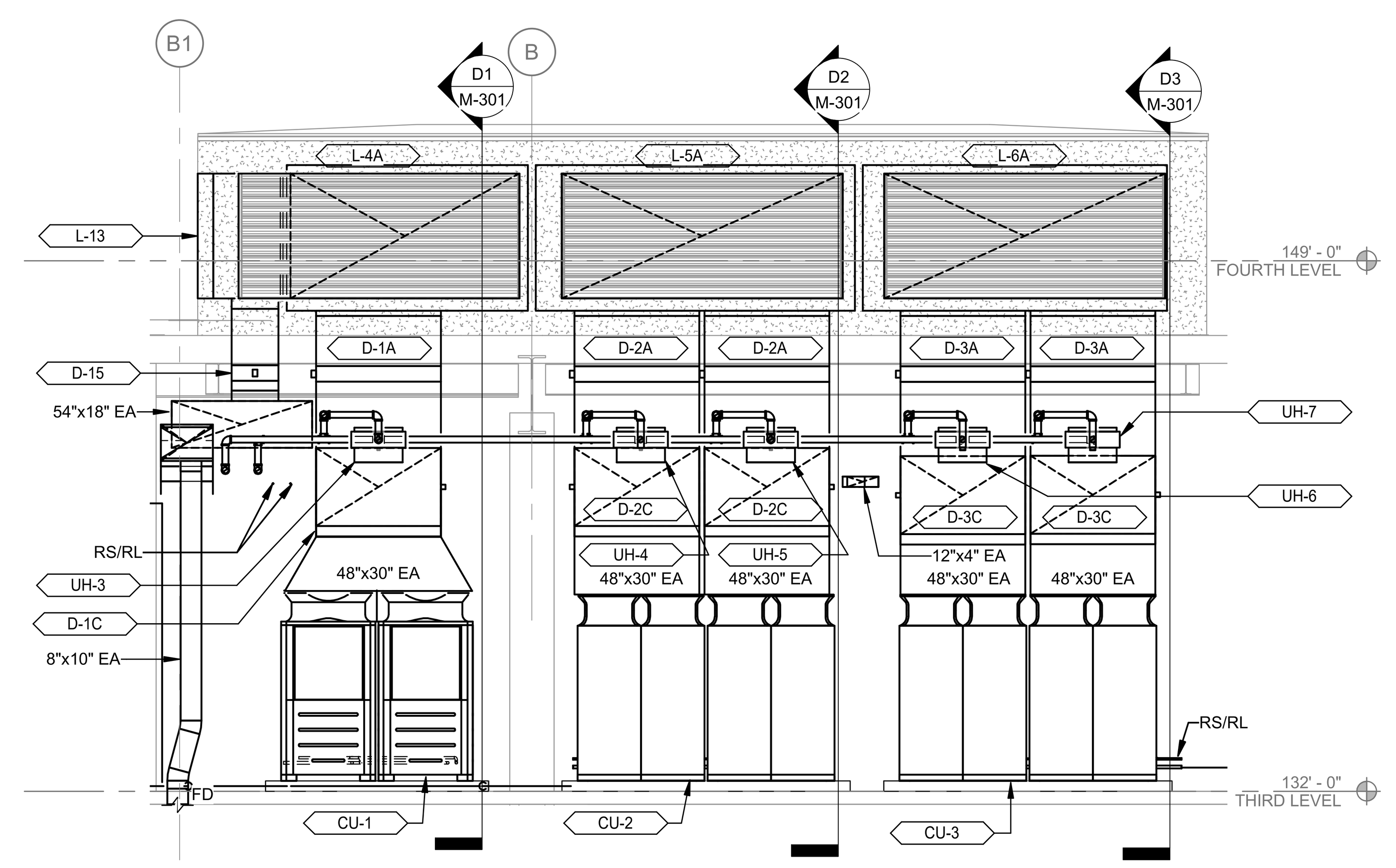
C2 CU-5 SECTION
1/4" = 1'-0"
0 2' 4' 8'



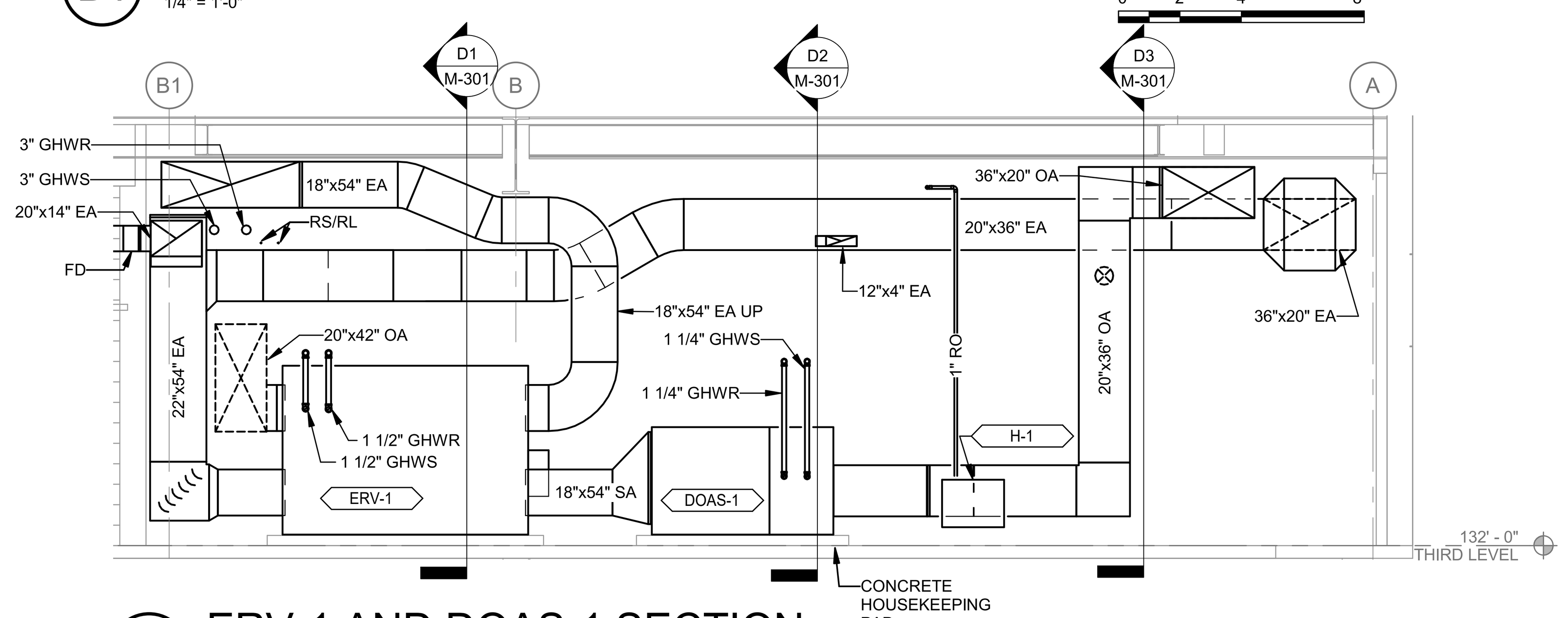
C3 CU-4,5 SECTION
1/4" = 1'-0"
0 2' 4' 8'



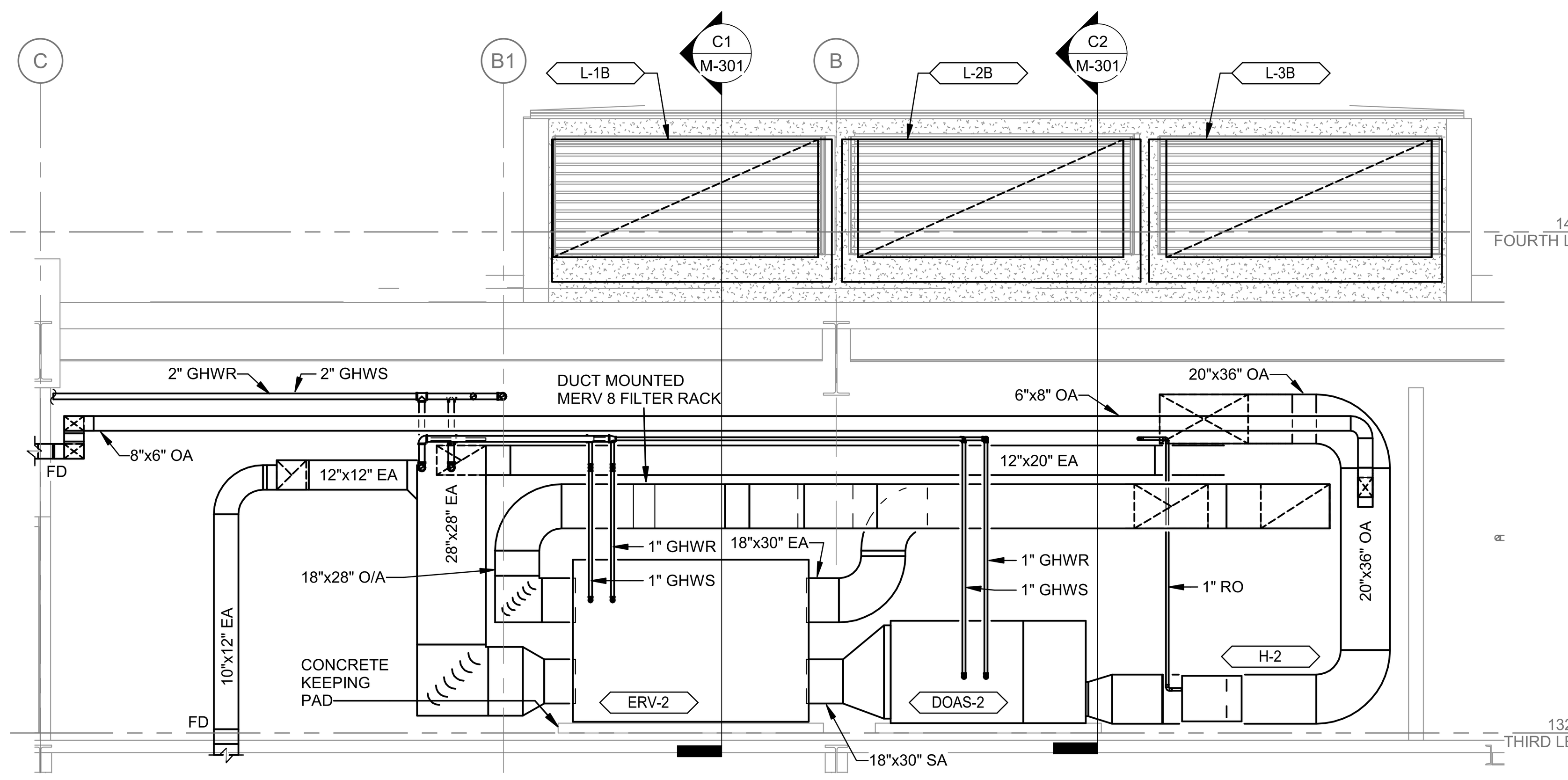
B4 OUTSIDE AIR INTAKE - SECTION
1/4" = 1'-0"
0 2' 4' 8'



B1 CU-1,2,3 SECTION
1/4" = 1'-0"
0 2' 4' 8'



A1 ERV-1 AND DOAS-1 SECTION
1/4" = 1'-0"
0 2' 4' 8'



A2 ERV-2 AND DOAS-2 SECTION
1/4" = 1'-0"
0 2' 4' 8'

NOTES

1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. DUCTWORK, PIPING, AND EQUIPMENT SHALL BE ROUTED TO PROVIDE MIN. 6'-8" CLEARANCE ALONG ACCESS PATHS IN MECHANICAL ROOMS.
3. SEE FLOW DIAGRAMS ON M-705 AND PIPING DETAILS ON M-502, M-503 AND M-504 FOR DETAILD PIPING CONNECTIONS, VALVES AND ACCESSORIES.
4. PROVIDE DRAIN PAN FOR CU's AND ROUTE 1" CONDENSATE TO NEAREST FLOOR DRAIN.

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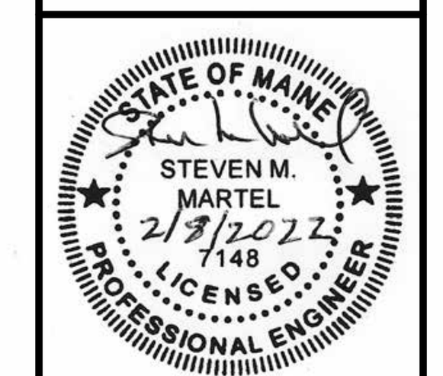


CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

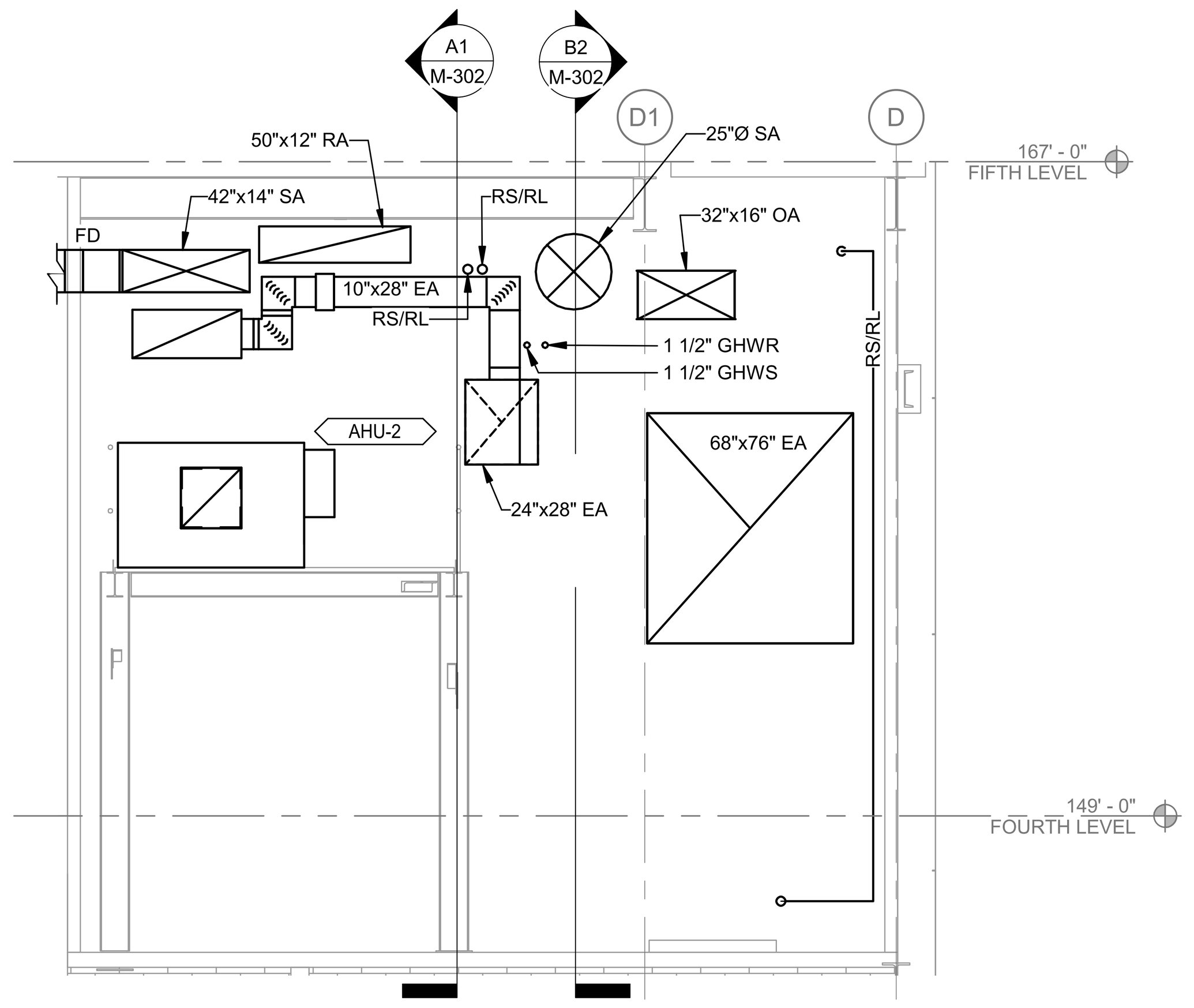
REV.	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO.:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	SMM
DESIGNED BY:	SMM
DRAWN BY:	BAL

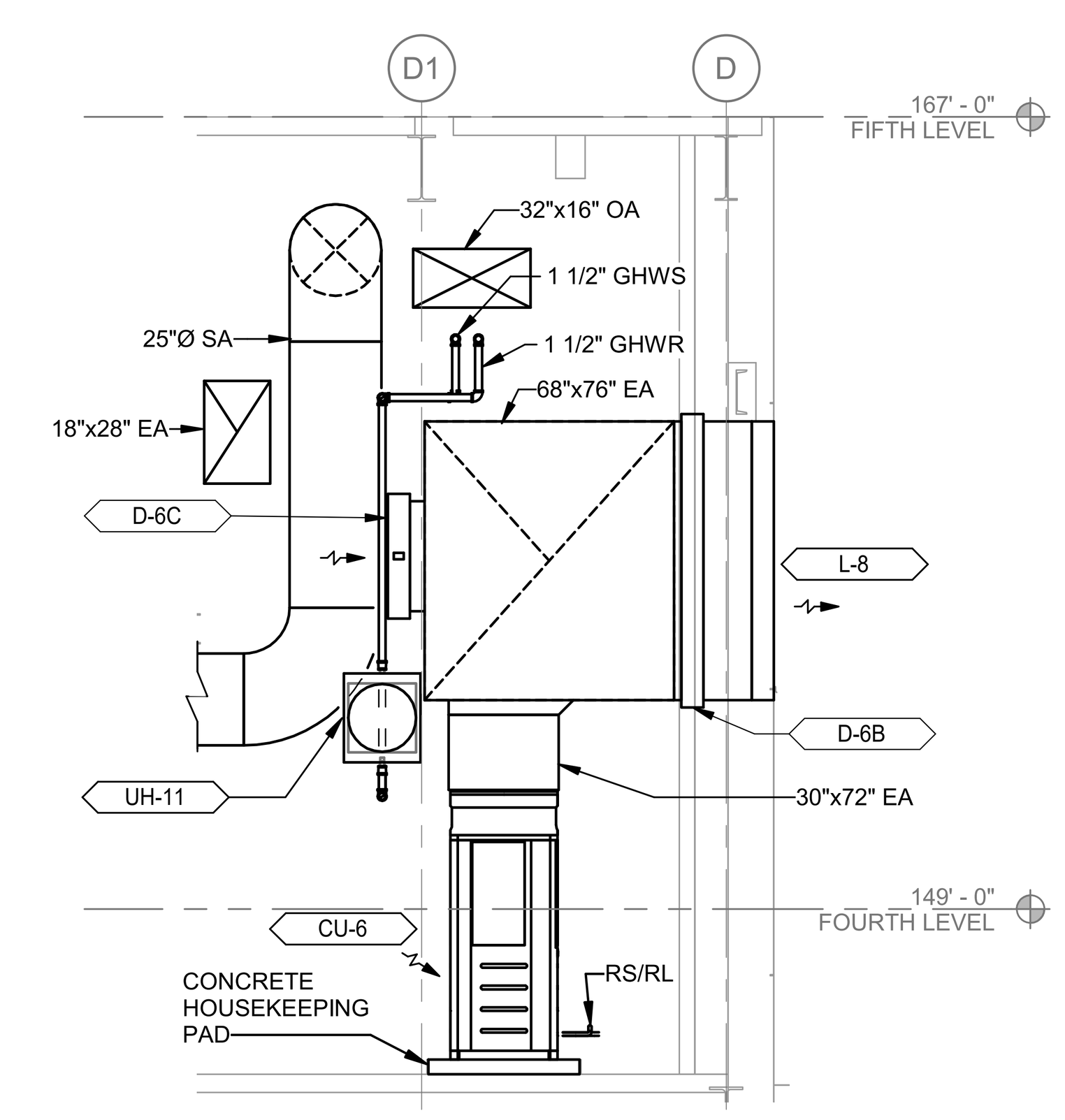
SHEET TITLE:
MECHANICAL SECTIONS

SHEET ID:
M-301

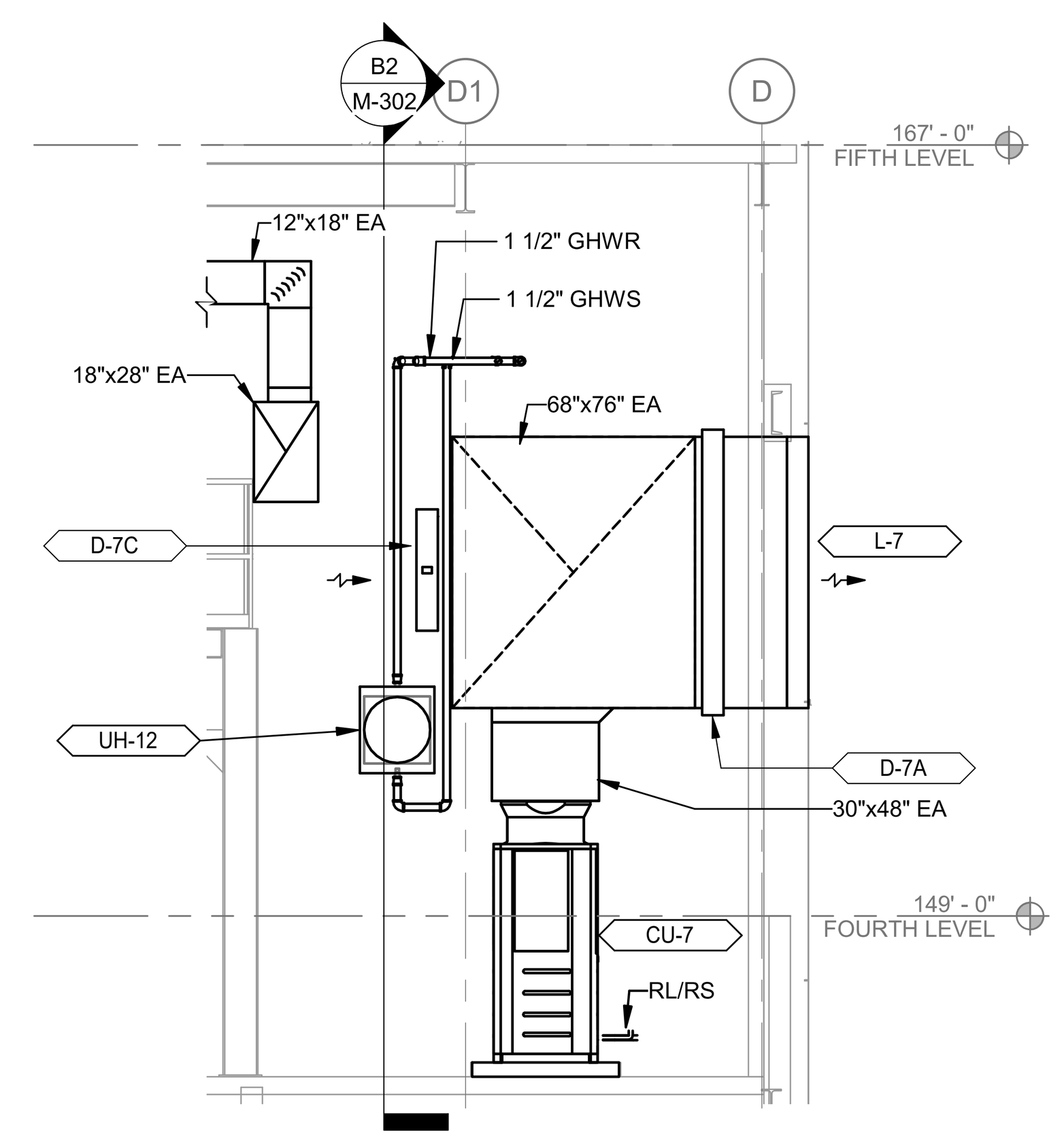
NOT FOR CONSTRUCTION



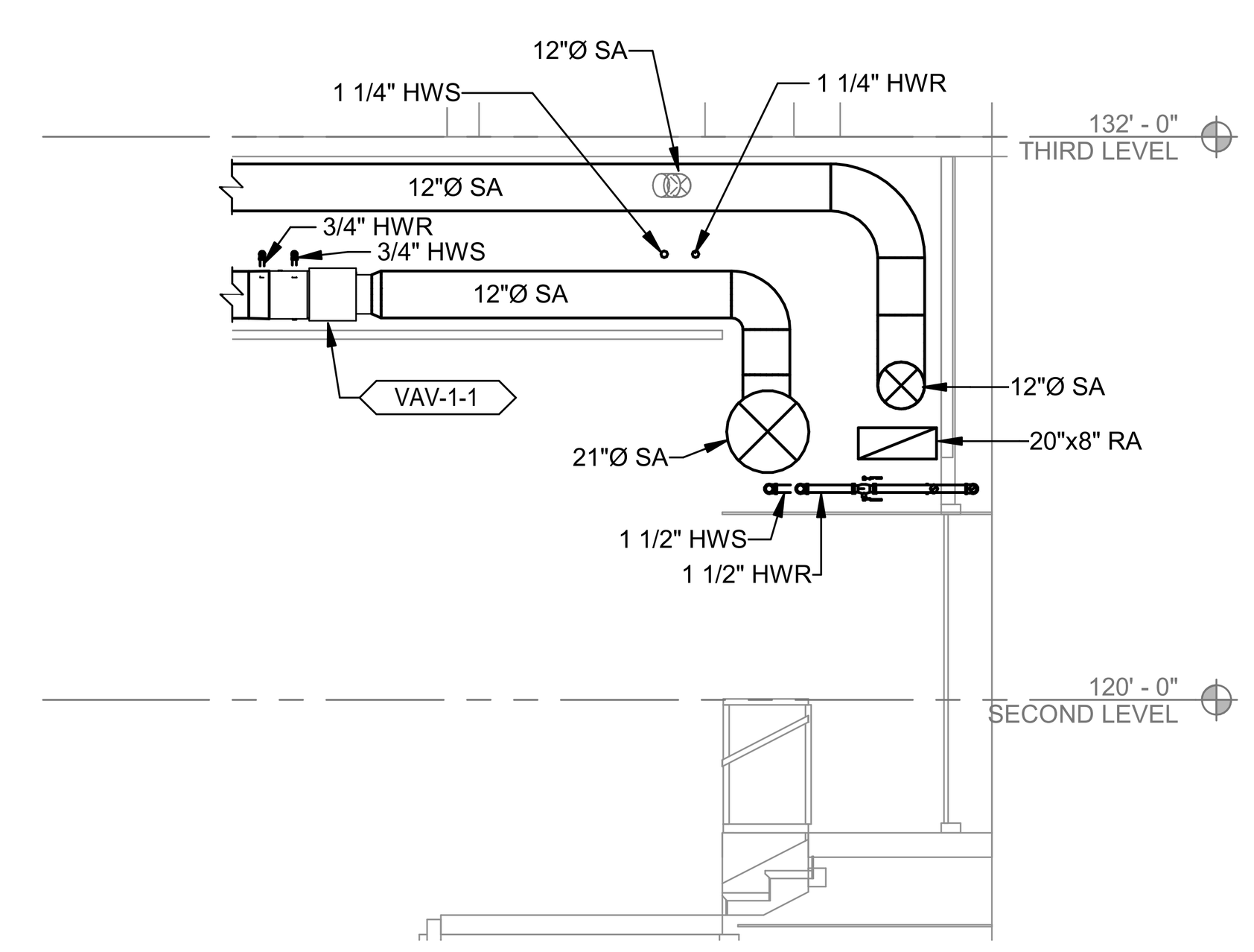
C1 AHU-2 SECTION
1/4" = 1'-0"



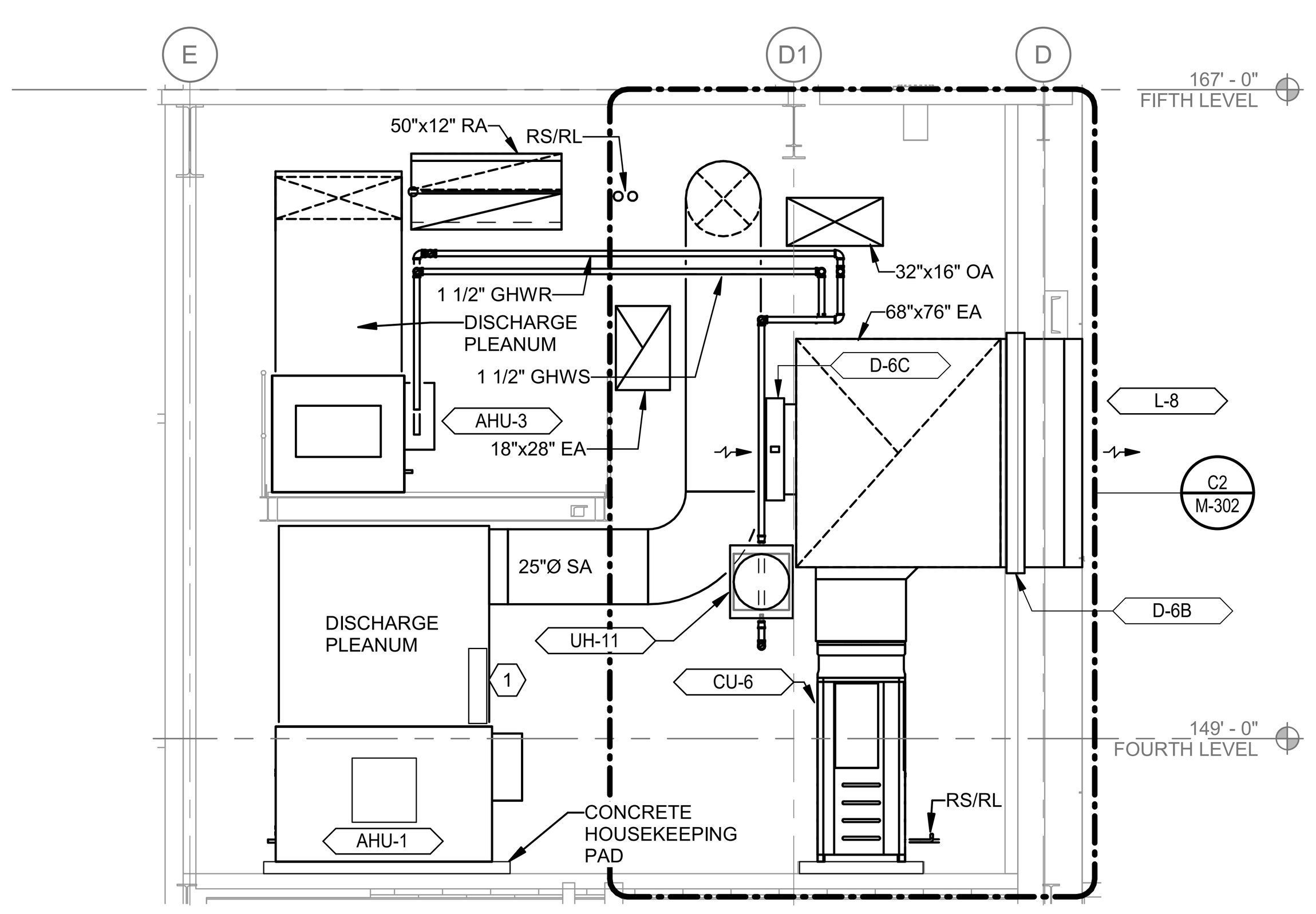
C2 CU-6 SECTION
1/4" = 1'-0"



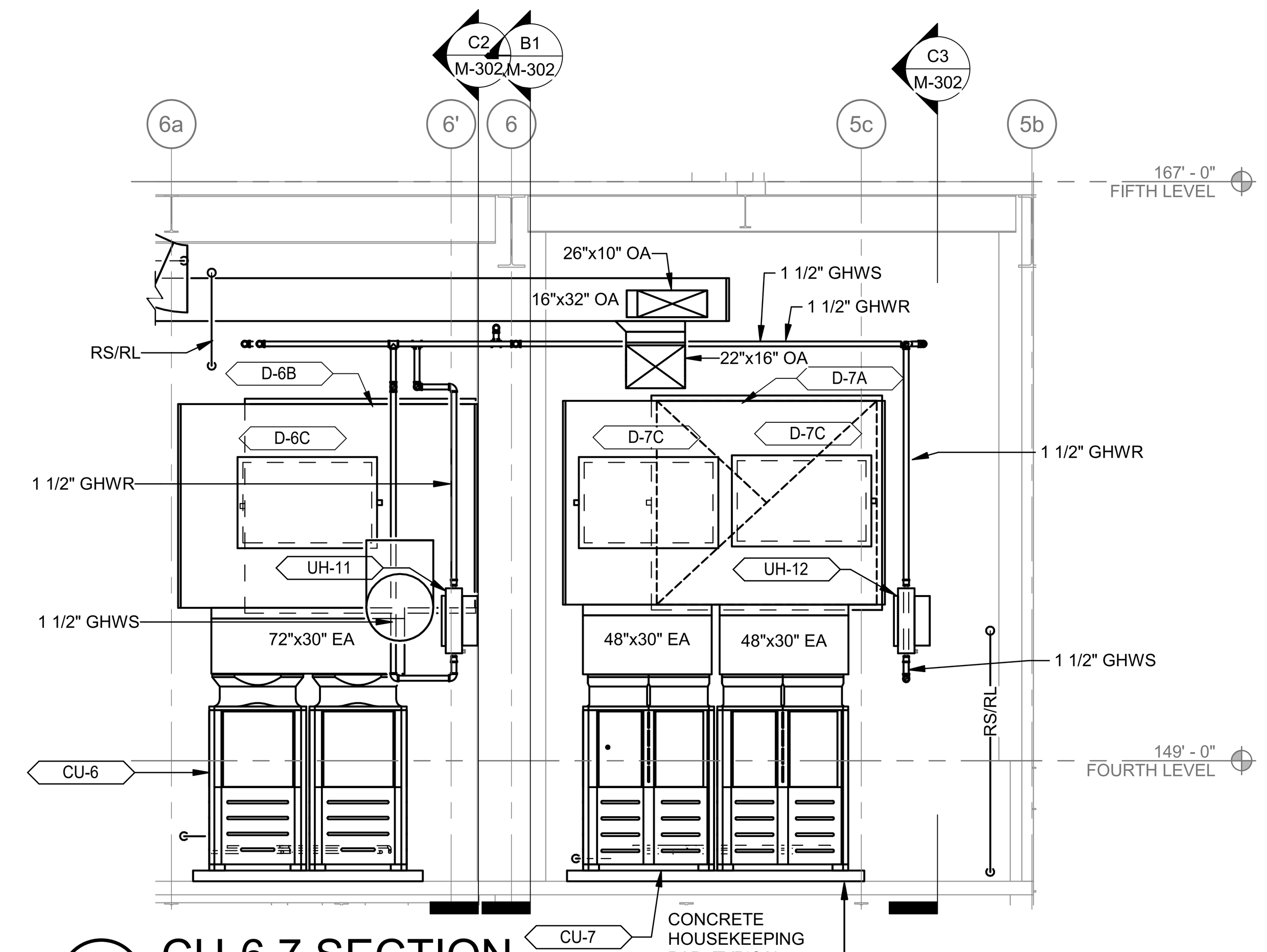
C3 CU-7 SECTION
1/4" = 1'-0"



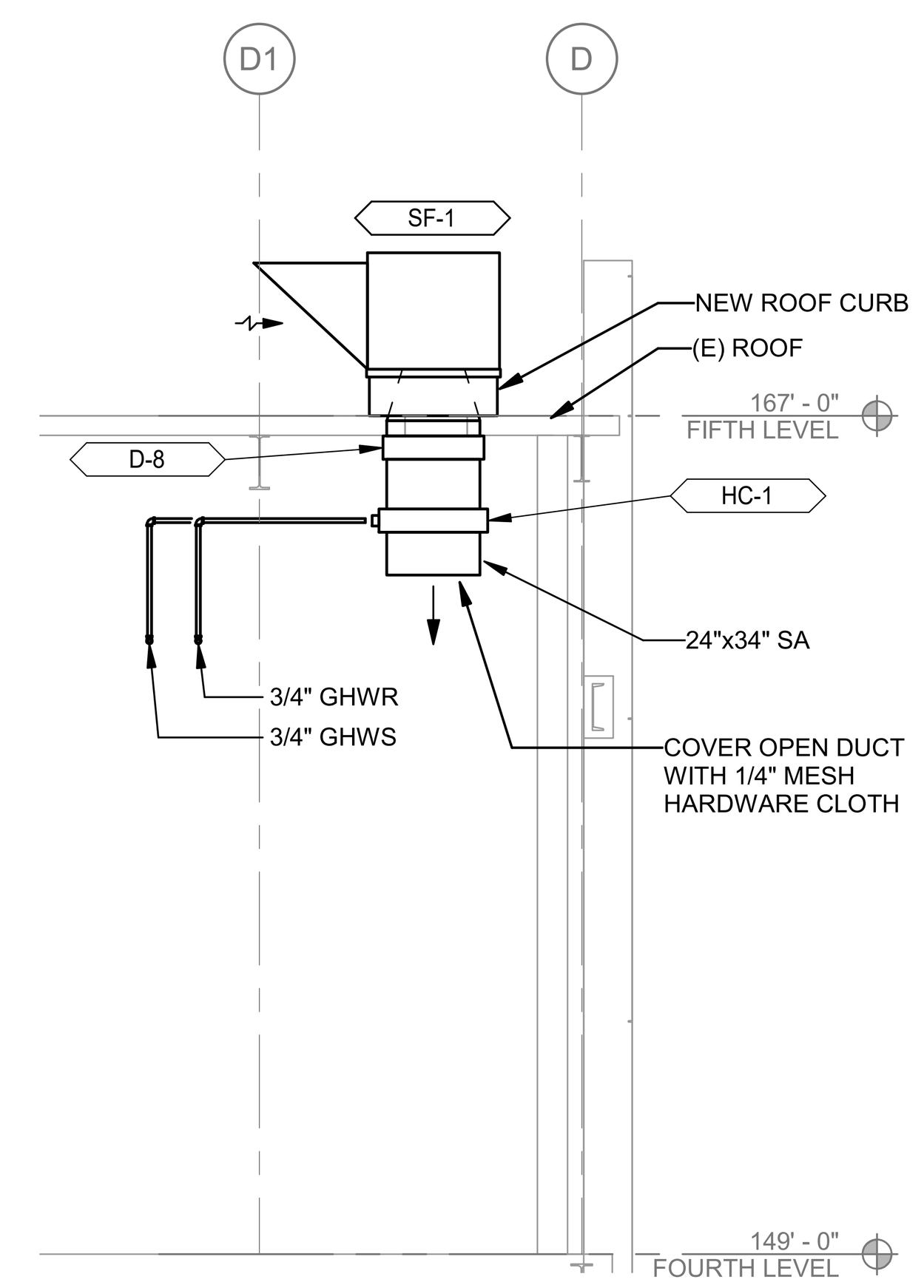
C4 VAV-1-1 SECTION
1/4" = 1'-0"



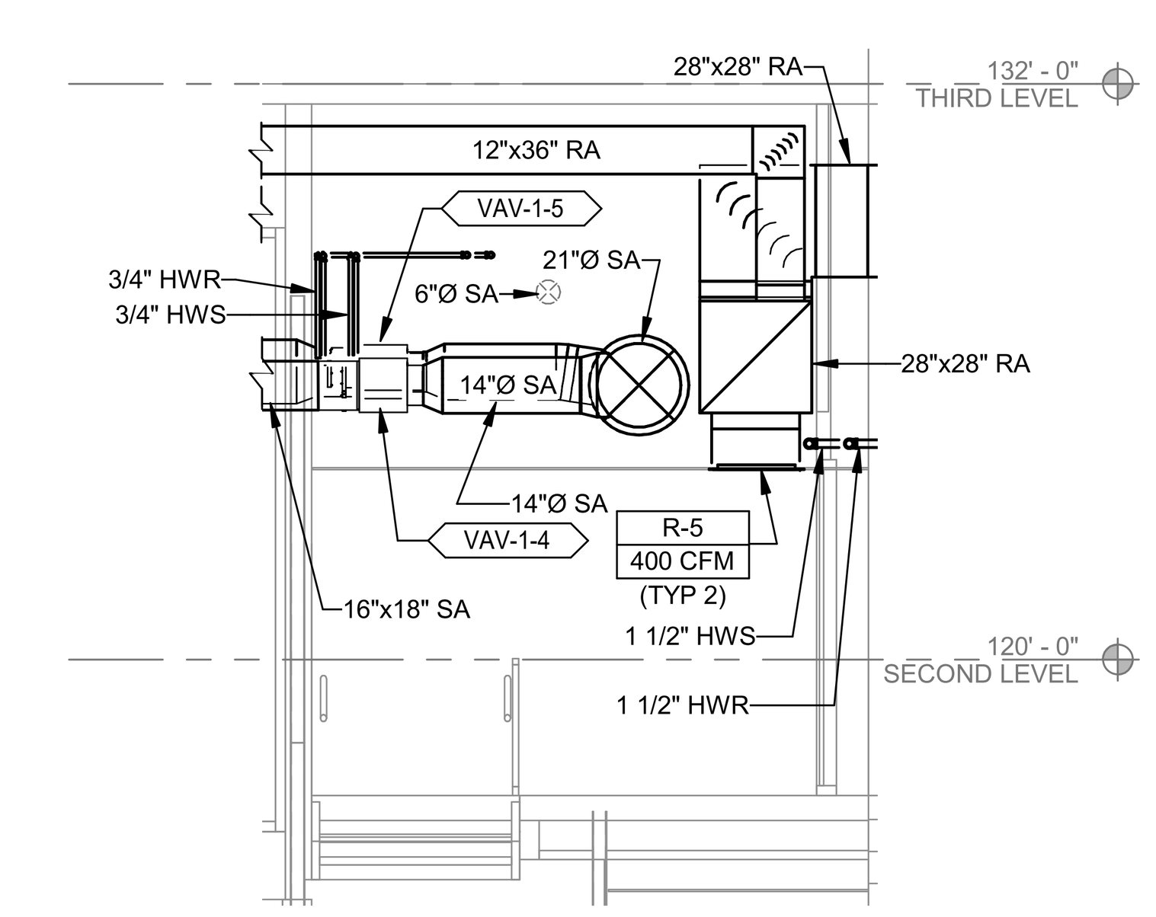
B1 AHU-1,3 SECTION
1/4" = 1'-0"



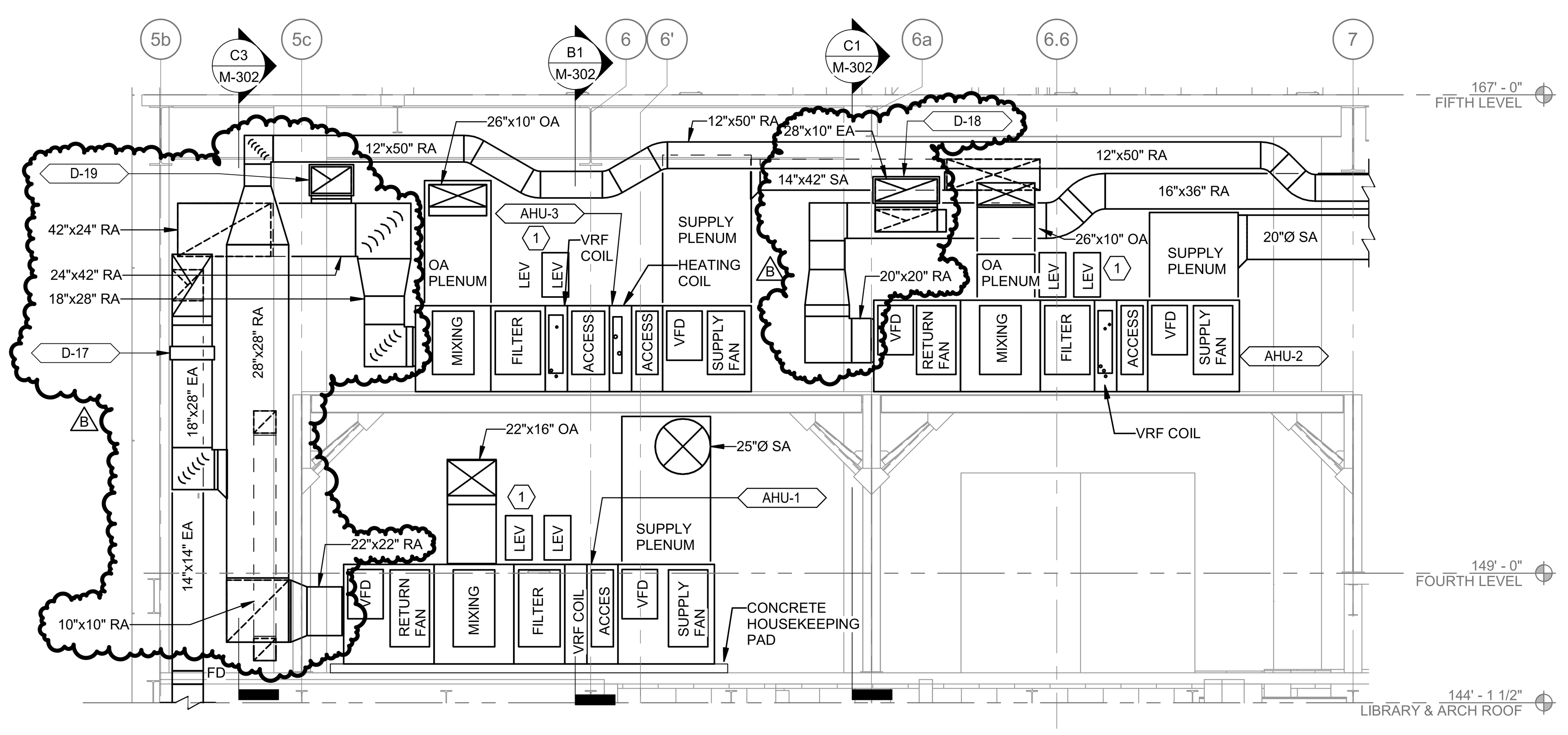
B2 CU-6,7 SECTION
1/4" = 1'-0"



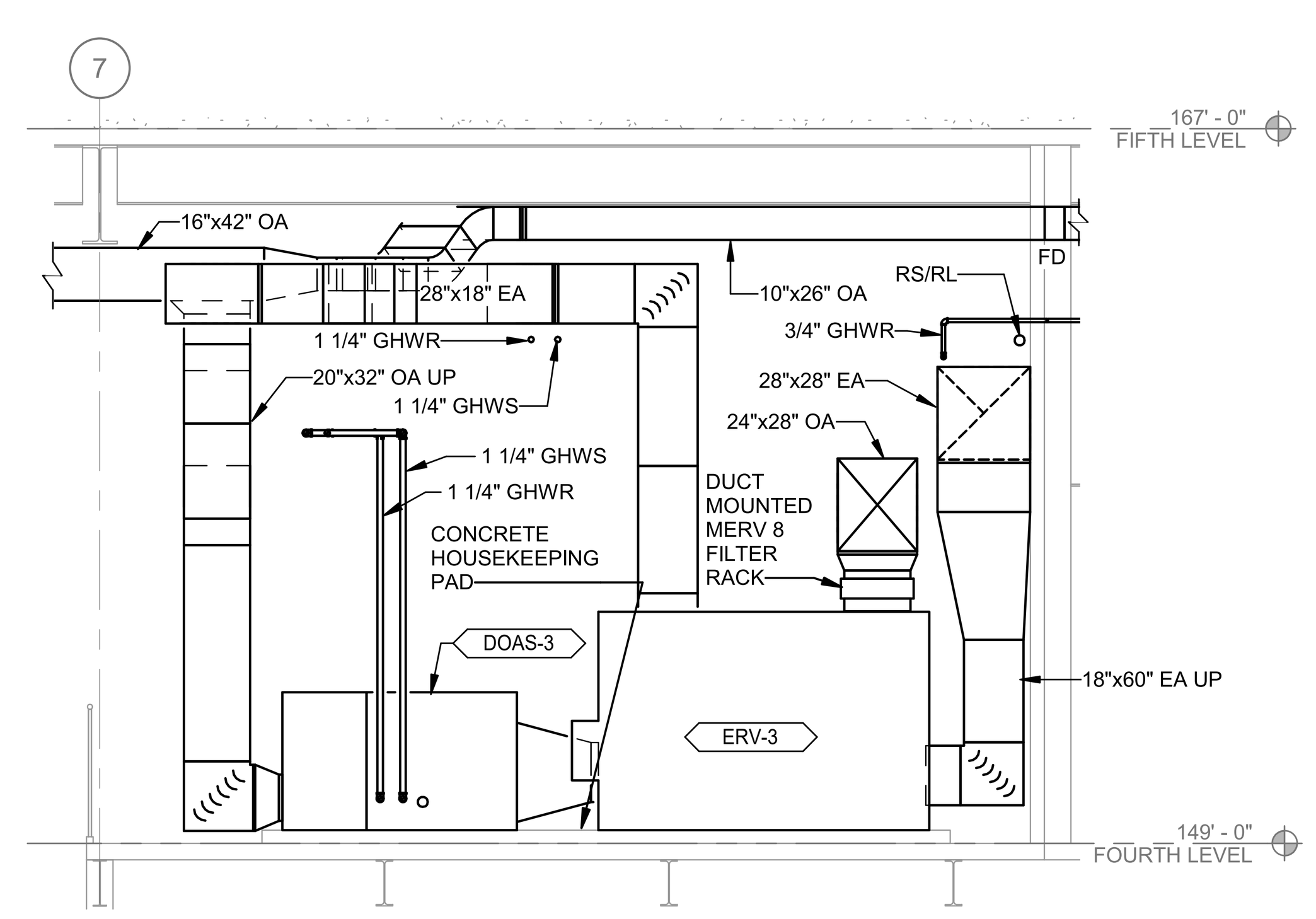
B3 SF-1 SECTION
1/4" = 1'-0"



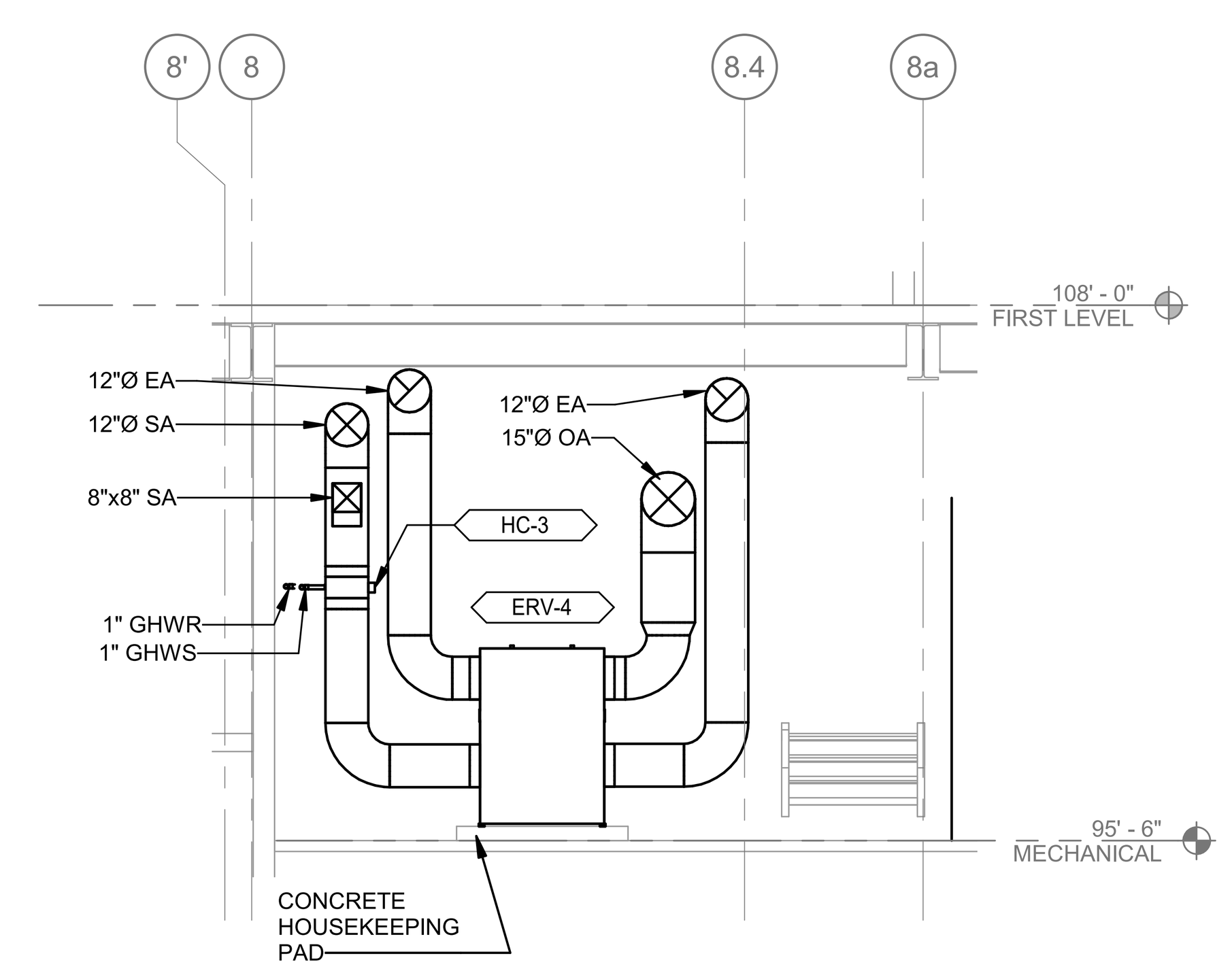
B4 VAV-1-4, 1-5 SECTION
1/4" = 1'-0"



A1 AHU-1,2,3 SECTION
1/4" = 1'-0"



A2 ERV-3 AND DOAS-3 SECTION
1/4" = 1'-0"



A3 ERV-4 SECTION
1/4" = 1'-0"

NOTES

1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. DUCTWORK, PIPING, AND EQUIPMENT SHALL BE ROUTED TO PROVIDE MIN. 6'-8" CLEARANCE ALONG ACCESS PATHS IN MECHANICAL ROOMS.
3. SEE FLOW DIAGRAMS ON M-705 AND PIPING DETAILS ON M-502, M-503 AND M-504 FOR DETAILD PIPING CONNECTIONS, VALVES AND ACCESSORIES.
4. PROVIDE DRAIN PAN FOR CU's AND ROUTE 1" CONDENSATE TO NEAREST FLOOR DRAIN.

KEYED NOTES

1 LEV CONTROL PANELS MOUNTED ON TOP OF AHU FILTER SECTION USING UNI-CHANNEL TYPE SUPPORTS.

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(207) 624-7314

STATE OF MAINE STEVEN M. MARTEL 2/8/2022 7148 LICENSED PROFESSIONAL ENGINEER

CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

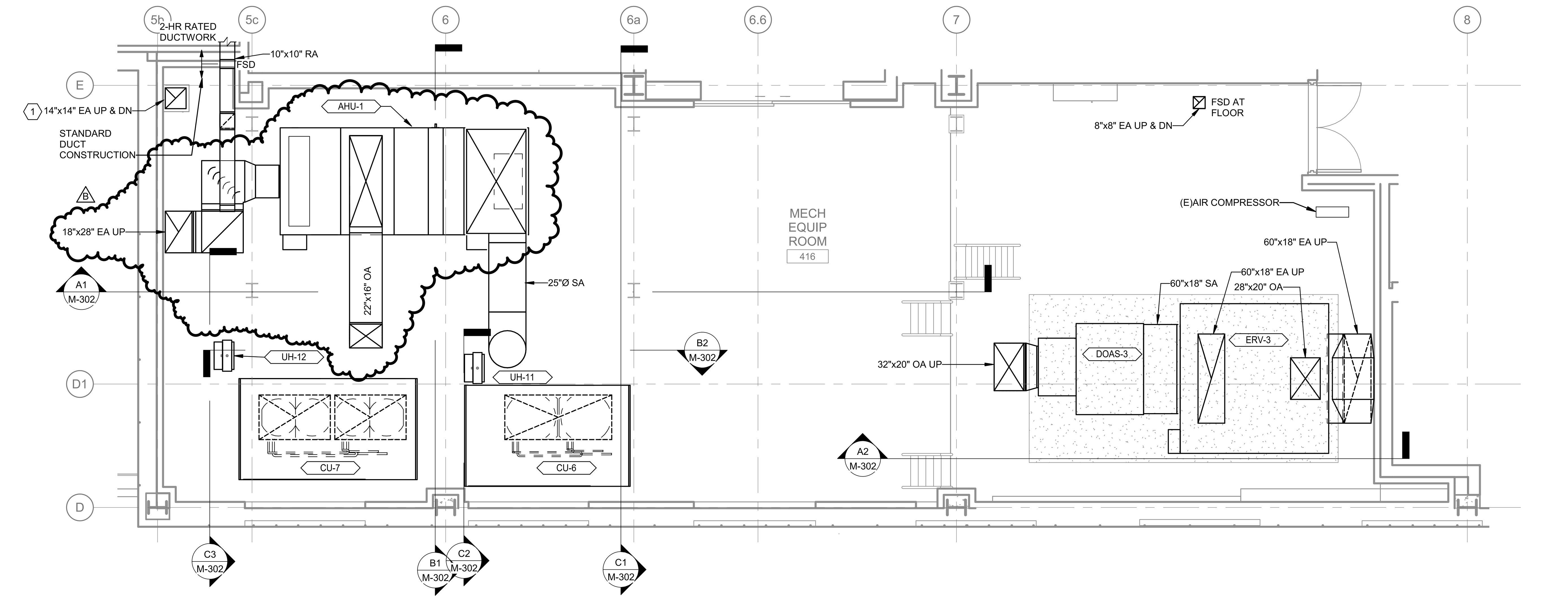
REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	SMM
DESIGNED BY:	SMM
DRAWN BY:	BAL

SHEET TITLE:
MECHANICAL SECTIONS

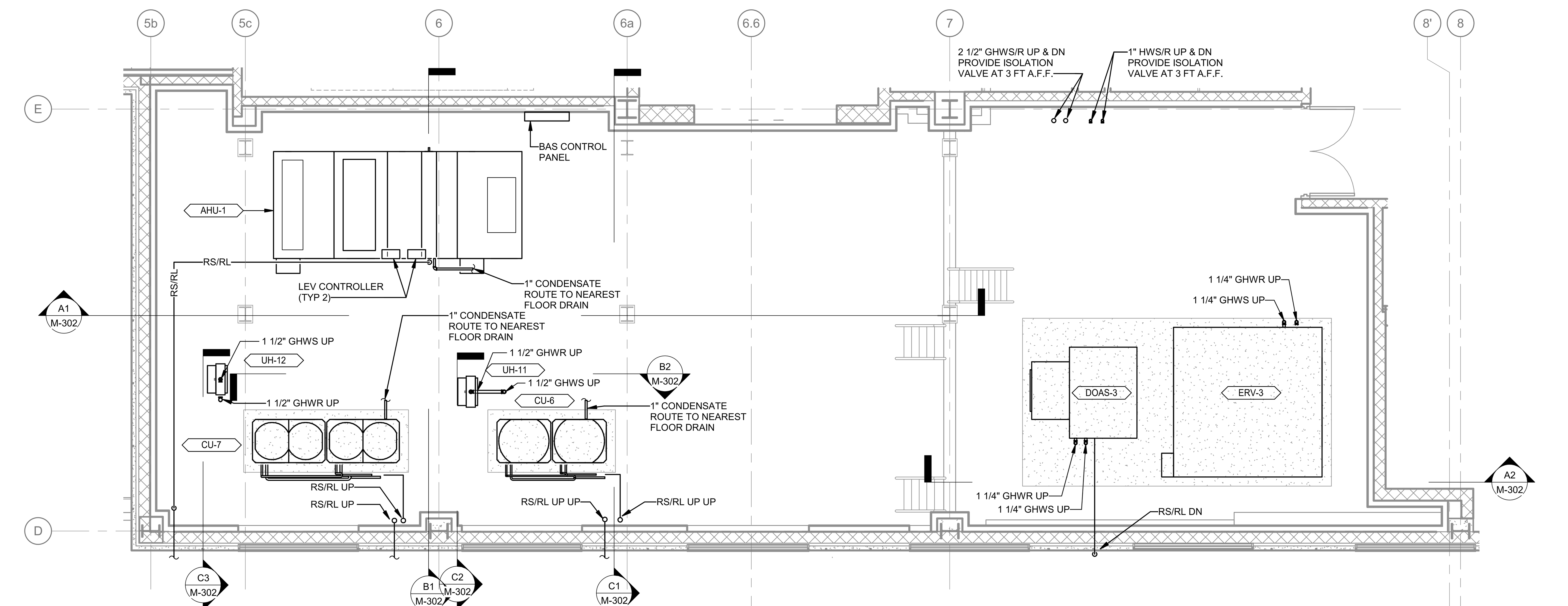
SHEET ID:
M-302

NOT FOR CONSTRUCTION



D2 MUSEUM - FOURTH LEVEL MECHANICAL 416 LOWER DUCTWORK PART PLAN

1/4" = 1'-0"



A3 MUSEUM - FOURTH LEVEL MECHANICAL 416 LOWER PIPING PART PLAN

1/4" = 1'-0"

NOTES

1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
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4. PROVIDE DRAIN PAN FOR CU's AND ROUTE 1" CONDENSATE TO NEAREST FLOOR DRAIN.

KEYED NOTES

1 FIRE DAMPER AT SLAB PENETRATION

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PROJECT MANAGER:	KFM
A/E OF RECORD:	SMM
DESIGNED BY:	SMM
DRAWN BY:	BAL

SHEET TITLE:
MECHANICAL PART PLANS

SHEET ID:
M-401

NOT FOR CONSTRUCTION

NOTES

1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. DUCTWORK, PIPING, AND EQUIPMENT SHALL BE ROUTED TO PROVIDE MIN. 6'-8" CLEARANCE ALONG ACCESS PATHS IN MECHANICAL ROOMS.
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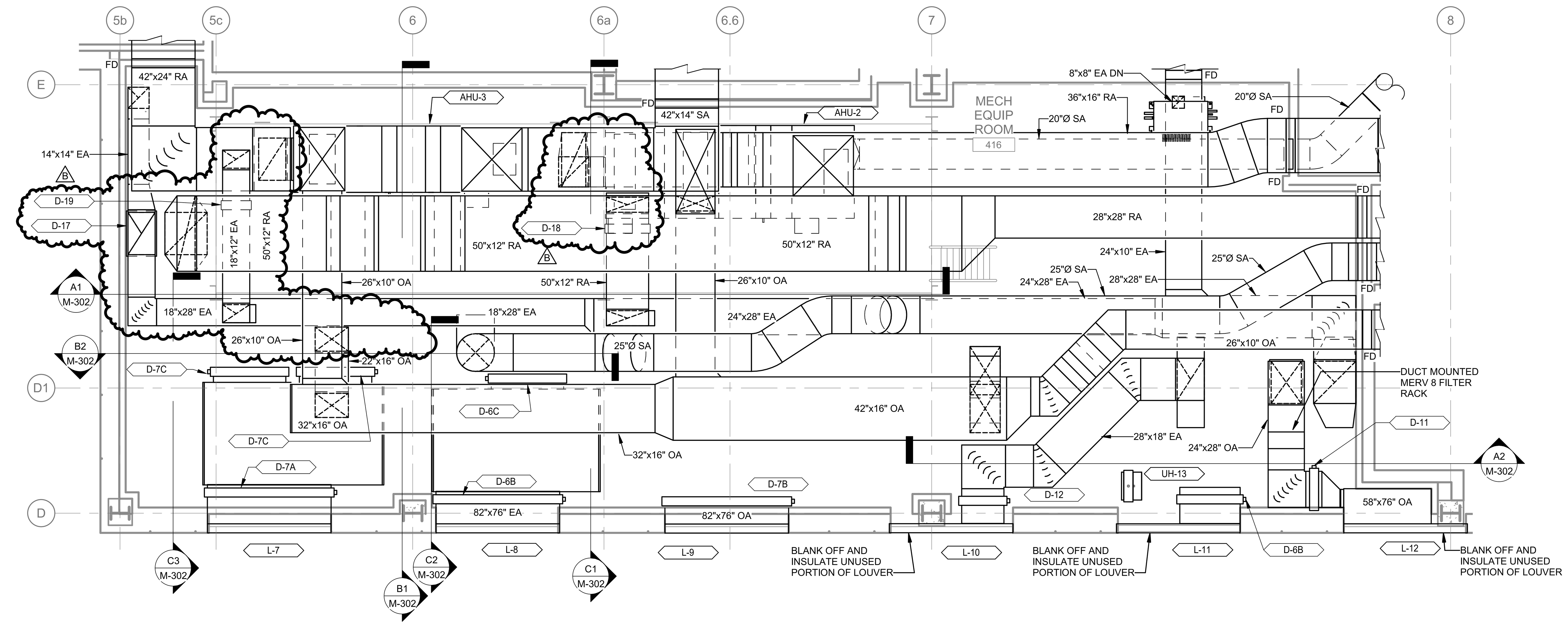
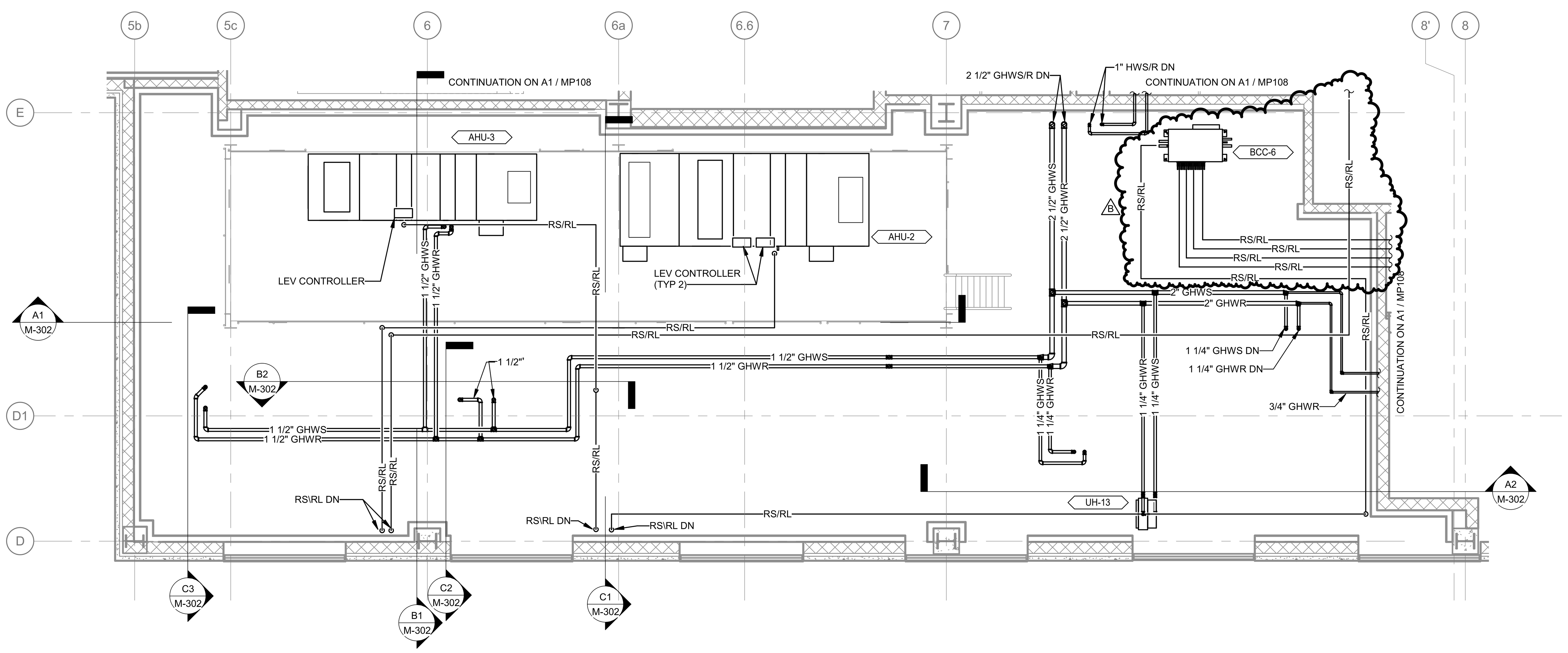


D2 MUSEUM - FOURTH LEVEL MECHANICAL 416 UPPER DUCTWORK PART PLAN

1/4" = 1'-0"



A1 MUSEUM - FOURTH LEVEL MECHANICAL 416 UPPER PIPING PART PLAN

1/4" = 1'-0"

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STATE OF MAINE
STEVEN M. MARTEL
2/8/2022
7148
LICENSED
PROFESSIONAL ENGINEER

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JANUARY 7, 2022

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ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

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B	ADDENUM NO. 2	02-08-2022
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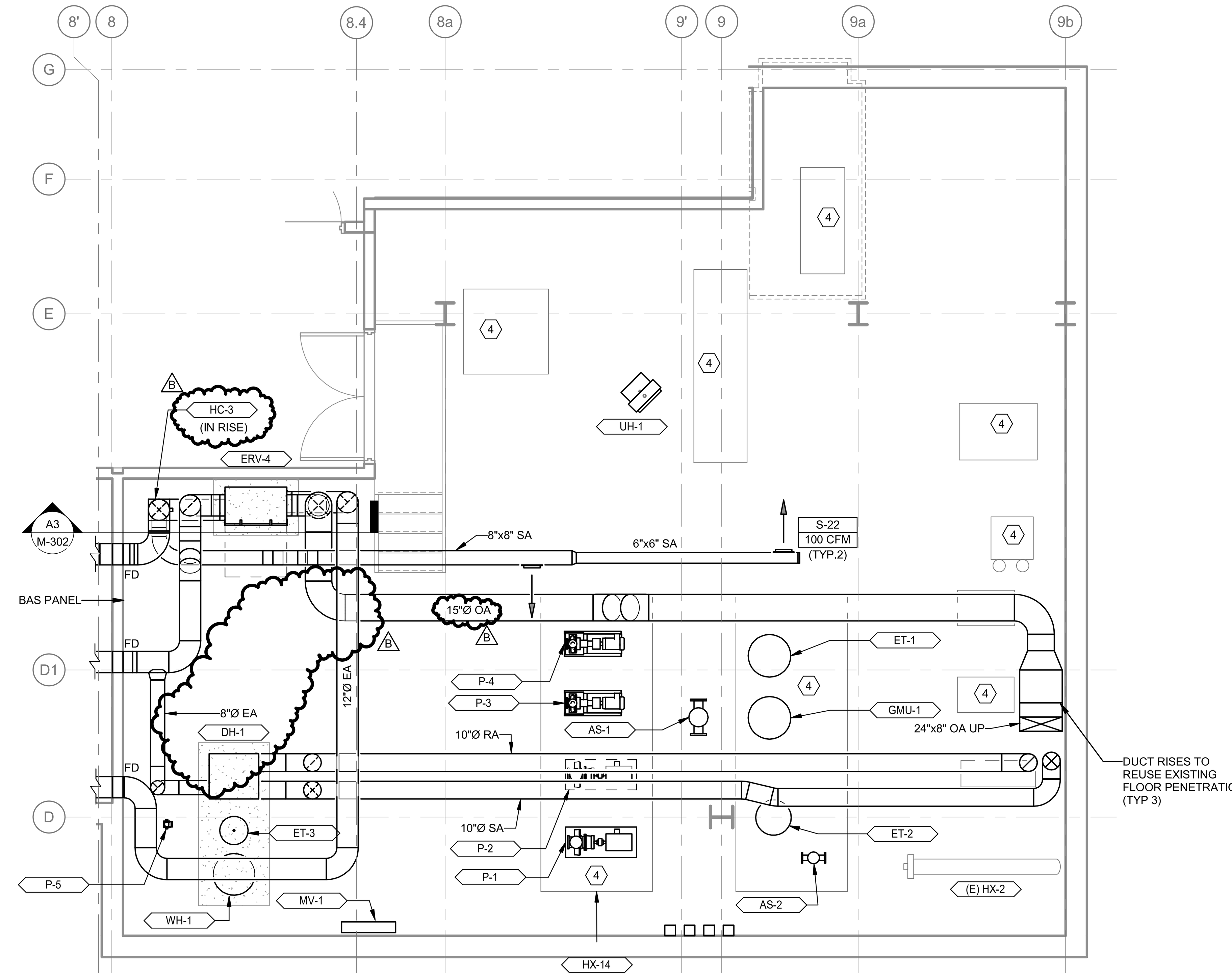
PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	SMM
DESIGNED BY:	SMM
DRAWN BY:	BAL

SHEET TITLE:
MECHANICAL PART PLANS

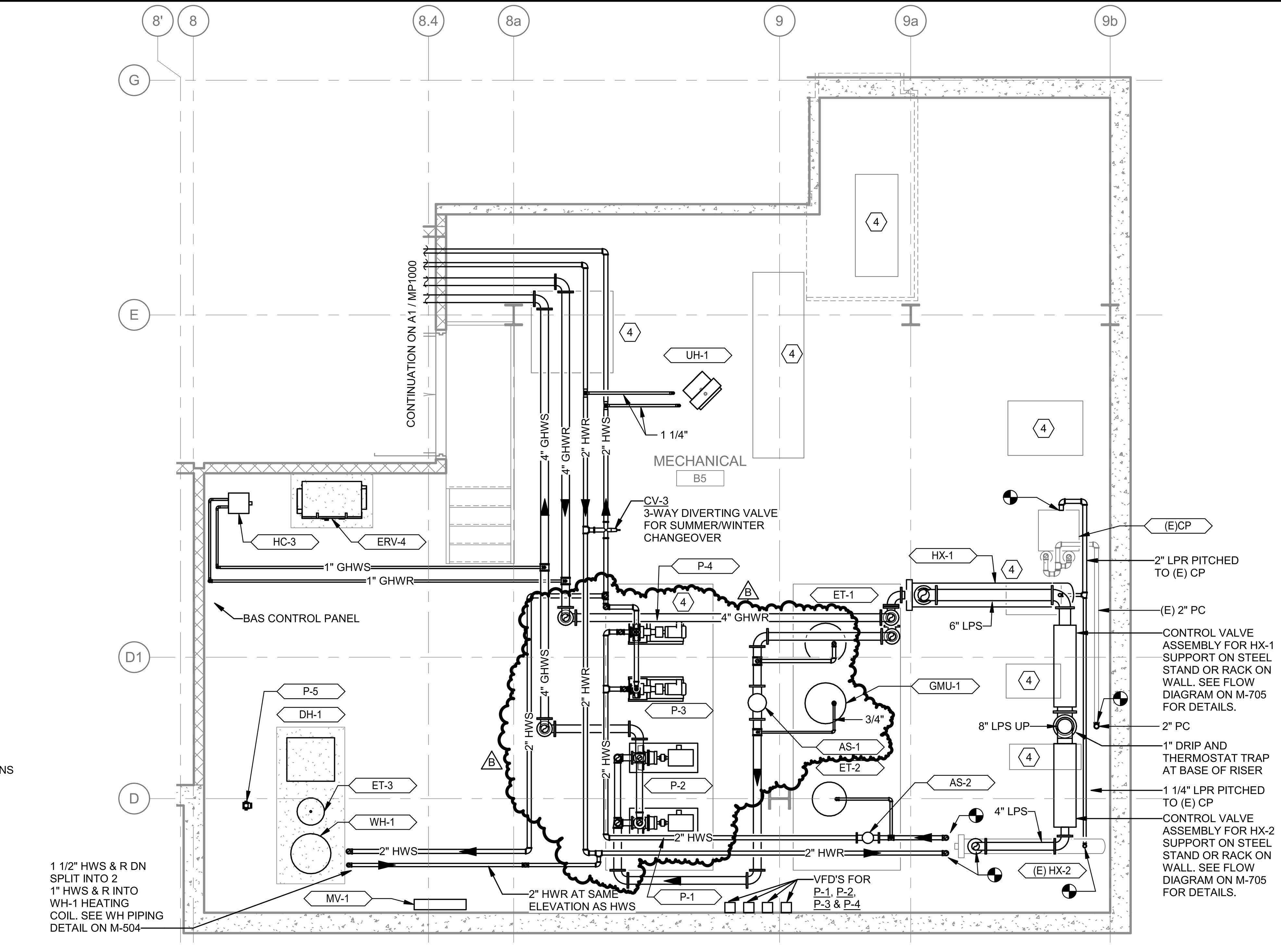
SHEET ID:
M-402

NOT FOR CONSTRUCTION



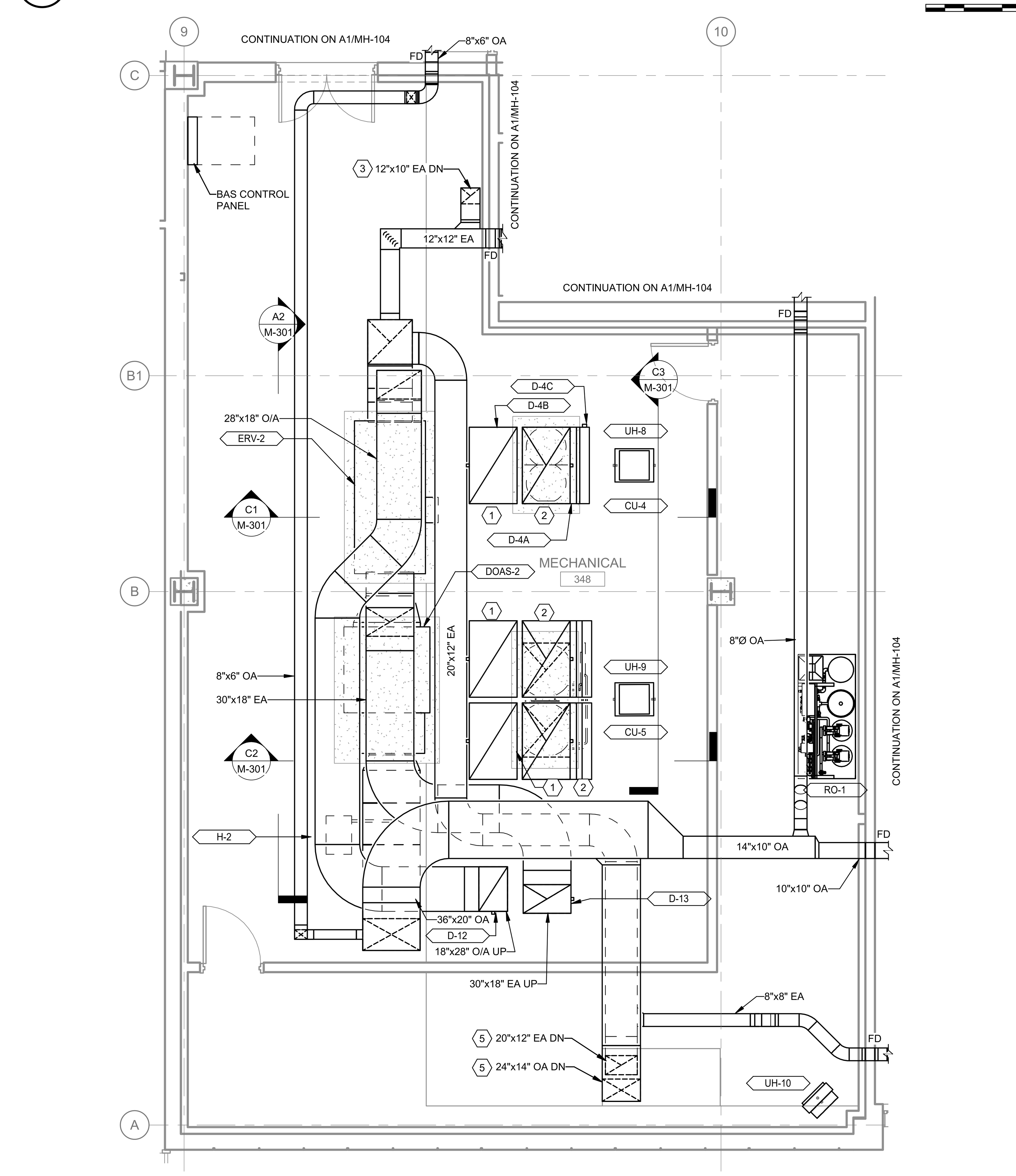
D1 MECHANICAL ROOM B5 DUCTWORK PLAN

1/4" = 1'-0"



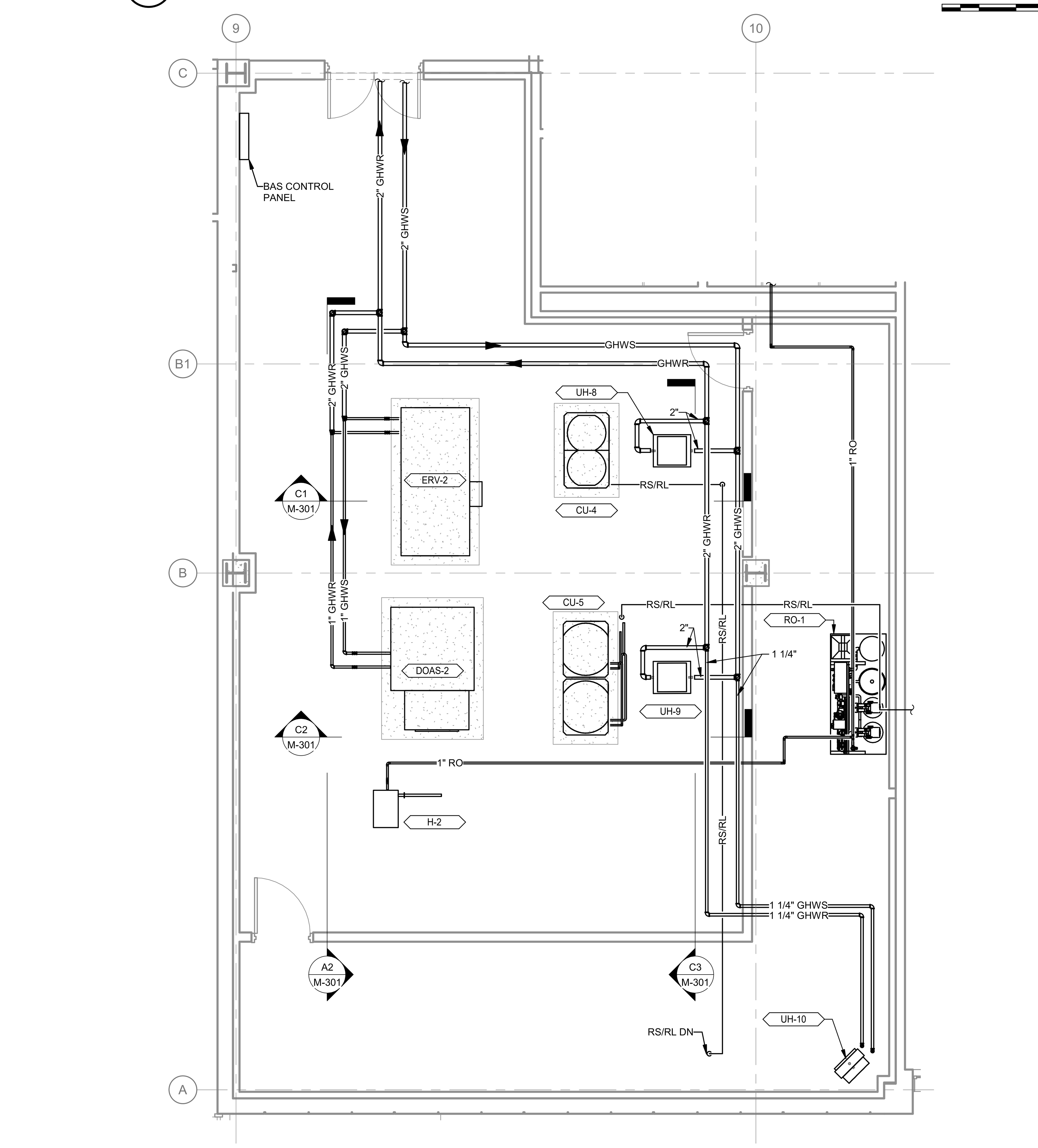
D4 MECHANICAL ROOM B5 PIPING PART PLAN

1/4" = 1'-0"



A1 ARCHIVES - THIRD LEVEL MECHANICAL 348 DUCTWORK PART PLAN

1/4" = 1'-0"



A4 ARCHIVE - THIRD LEVEL MECHANICAL 348 PIPING PART PLAN

1/4" = 1'-0"

NOTES

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4. PROVIDE DRAIN PAN FOR CU's AND ROUTE 1" CONDENSATE TO NEAREST FLOOR DRAIN.

KEYED NOTES

1 48"x30" OA UP
2 48"x30" EA UP
3 FIRE DAMPER AT SLAB PENETRATION
4 EXISTING CONCRETE PAD.
5 FIRE DAMPER AT FLOOR PENETRATION

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A/E OF RECORD:	SMM
DESIGNED BY:	SMM
DRAWN BY:	BAL

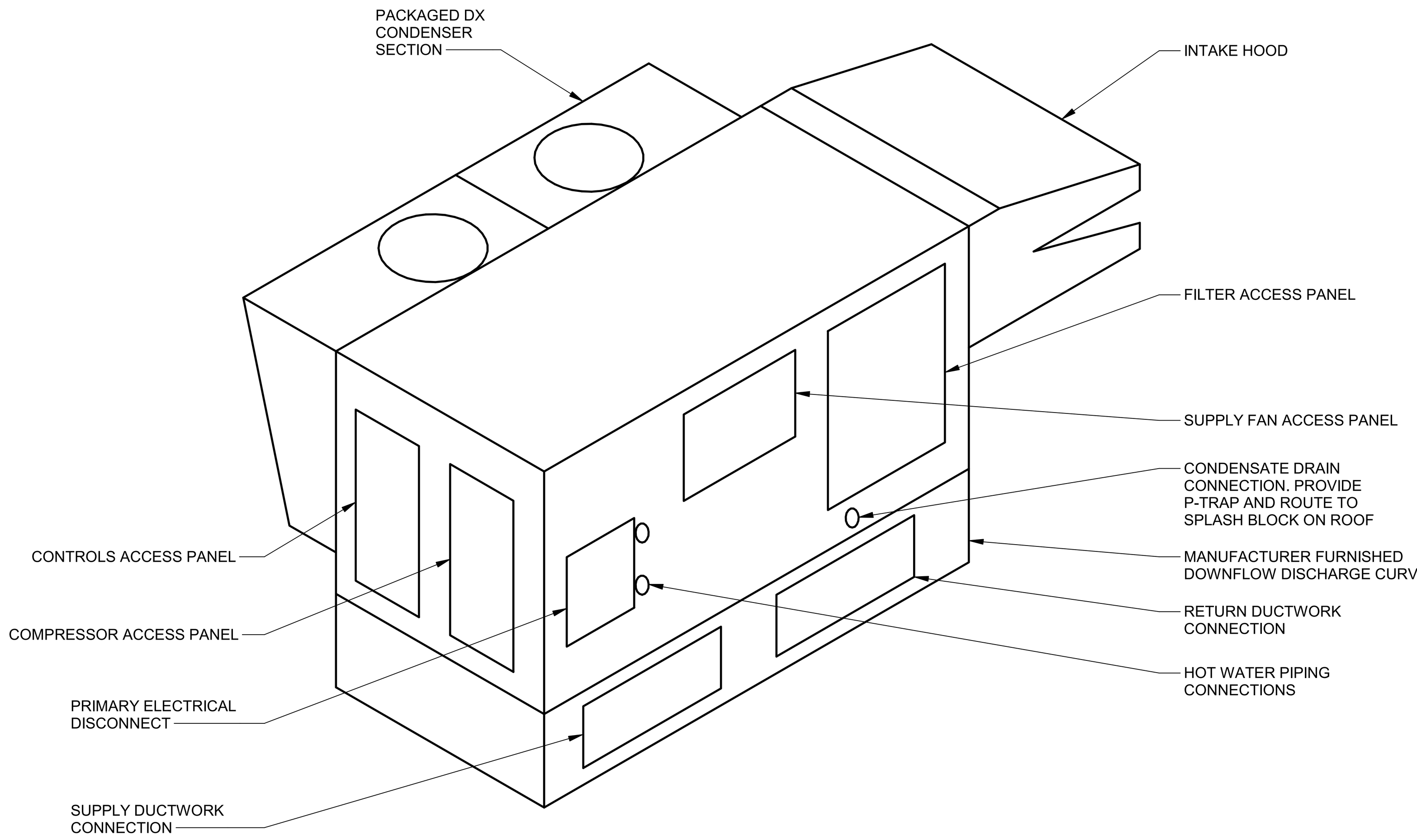
SHEET TITLE:
MECHANICAL PART PLANS

SHEET ID:
M-403

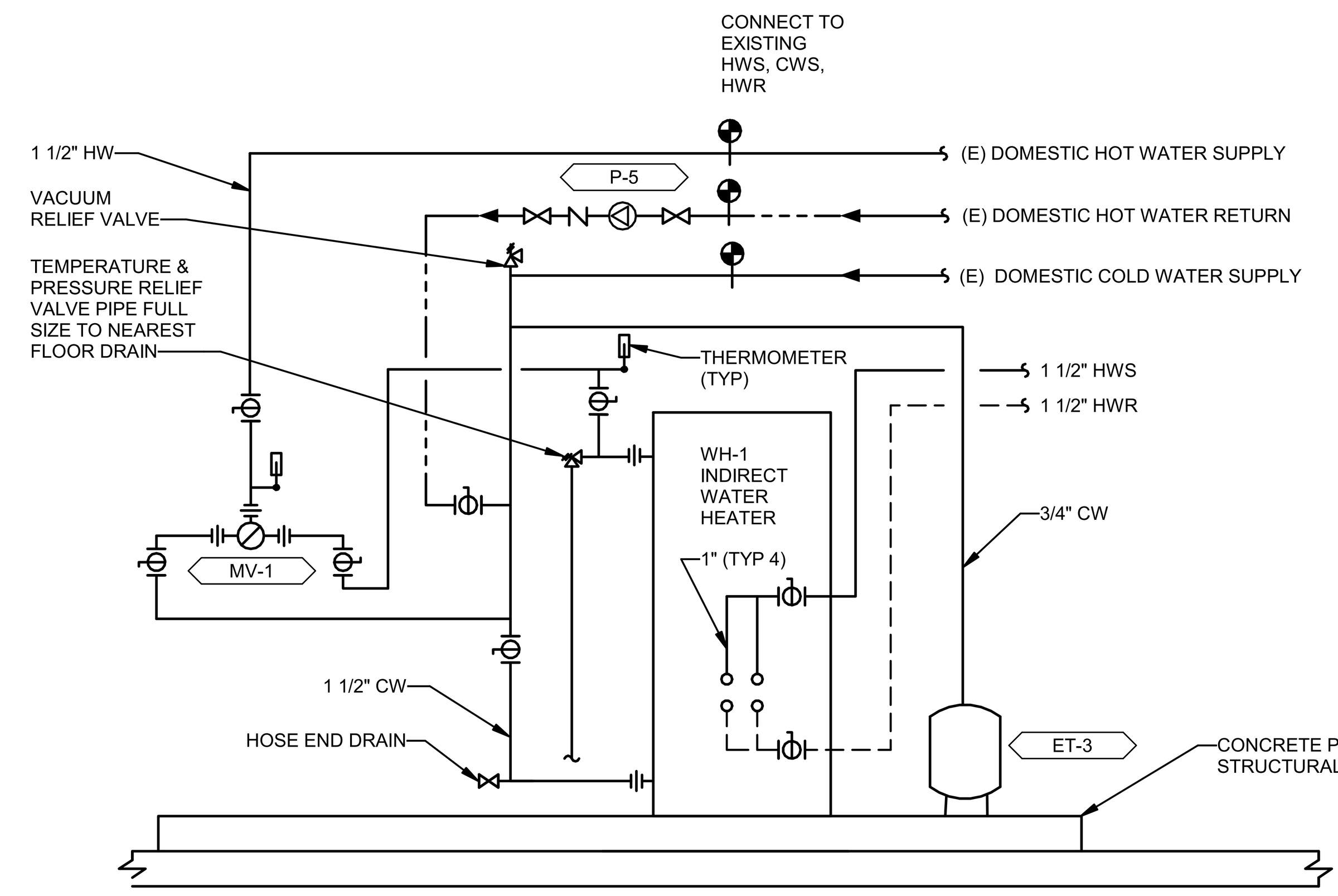
NOT FOR CONSTRUCTION

NOTES

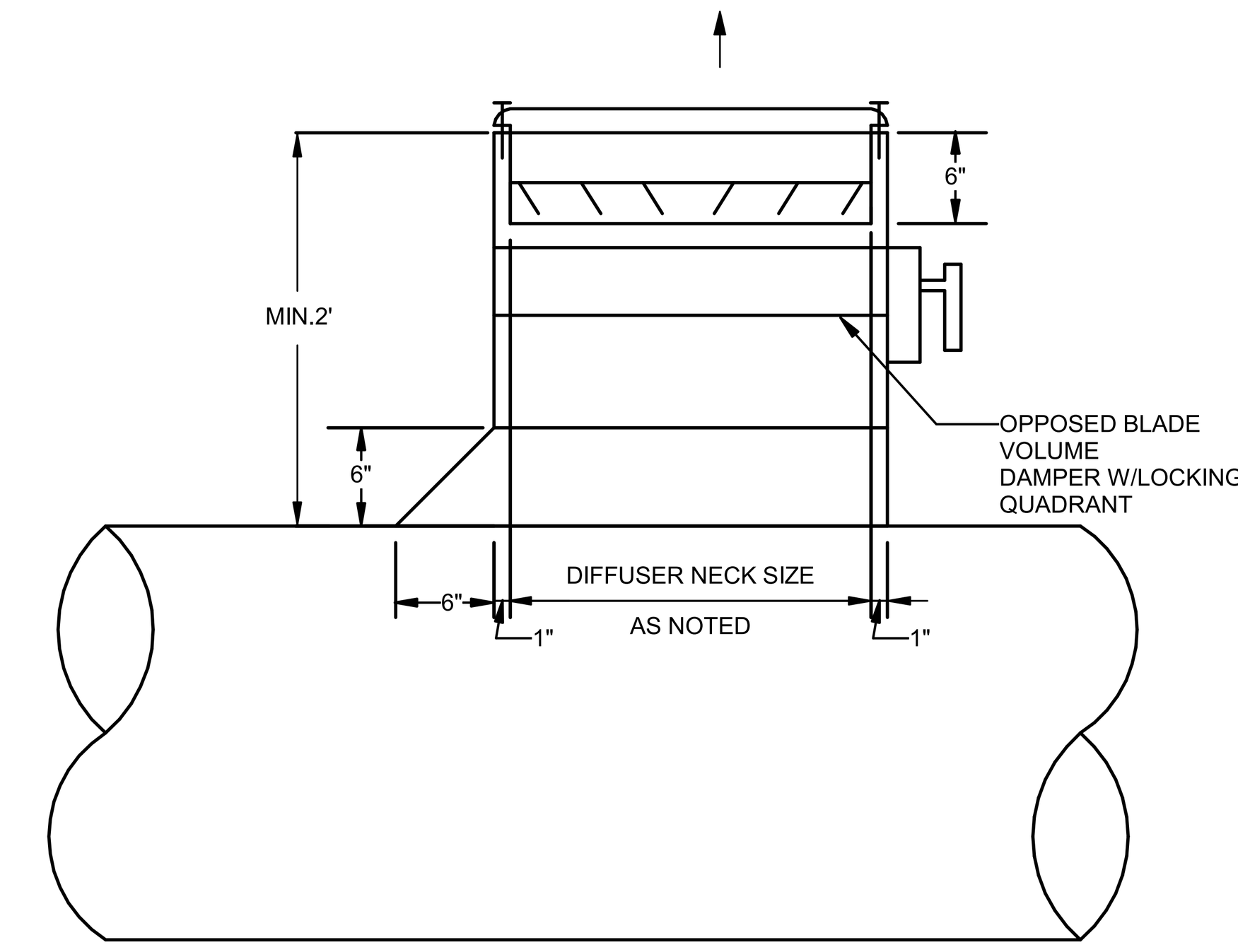
1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. REFER TO STRUCTURAL DRAWINGS FOR EQUIPMENT HANGING DETAILS AND SUPPORT.



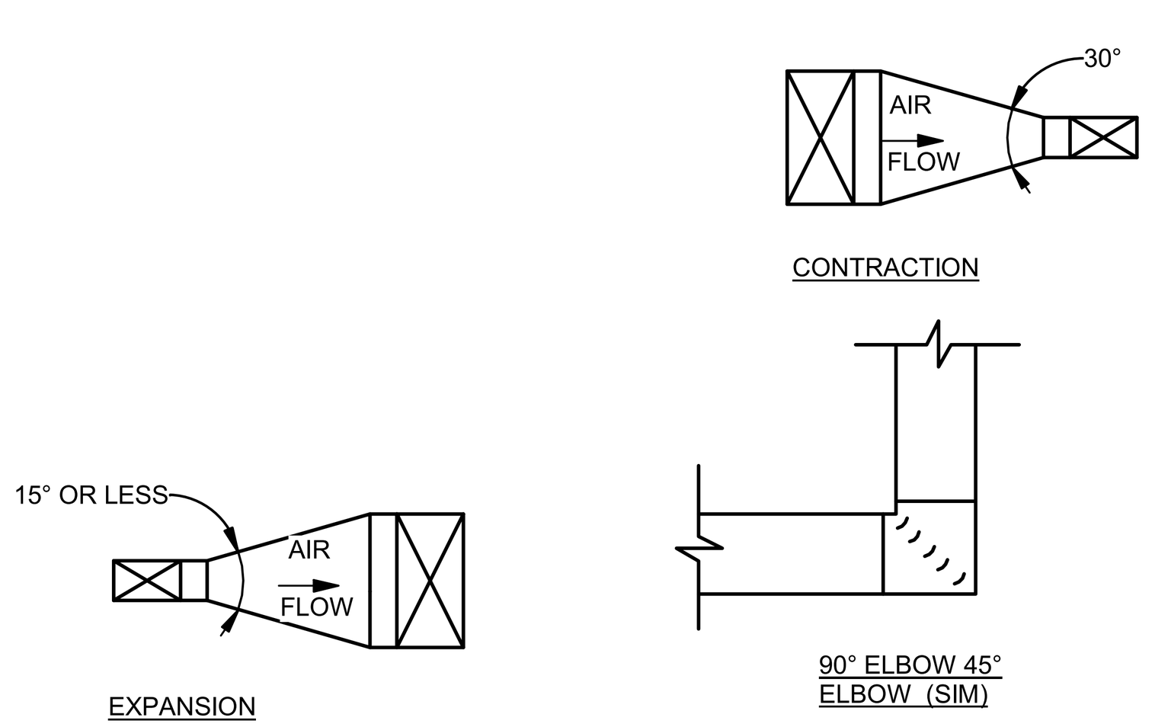
E1 AHU-4 DETAIL
NOT TO SCALE



E3 WATER HEATER DETAIL
NOT TO SCALE



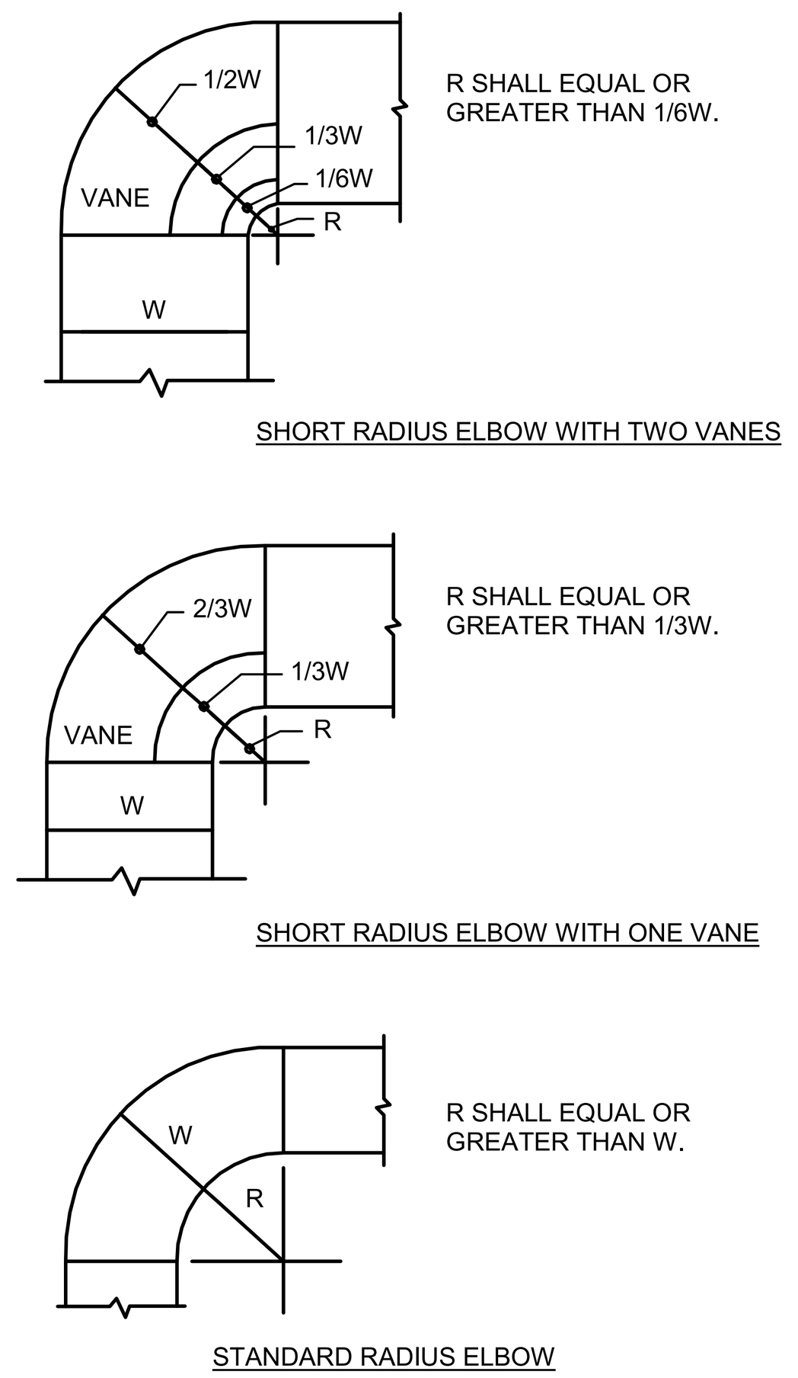
E5 DUCT MOUNTED SUPPLY AIR BOOT DETAIL
NOT TO SCALE



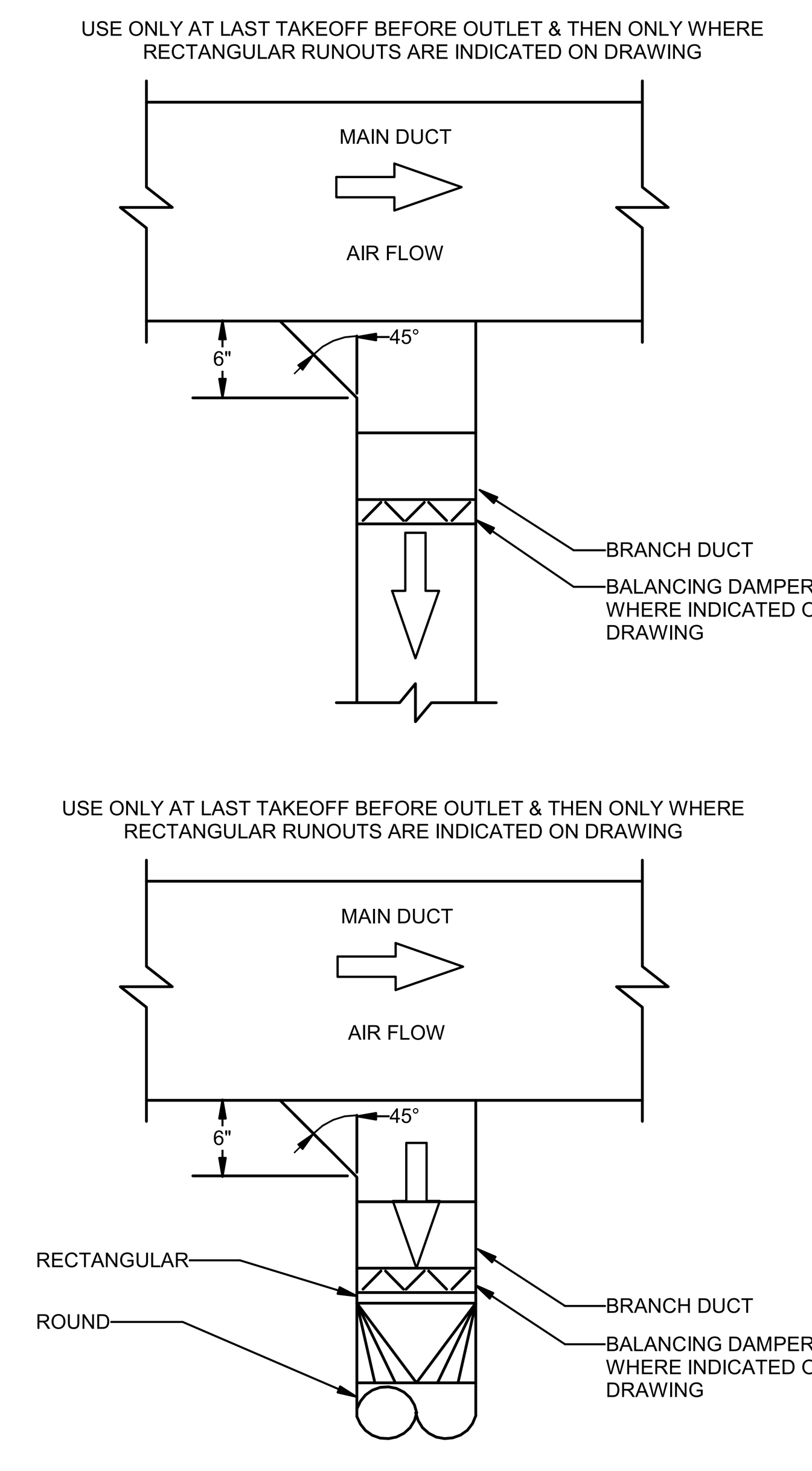
C1 TYPICAL LOW VELOCITY DUCT DETAILS
NOT TO SCALE

NOTES:

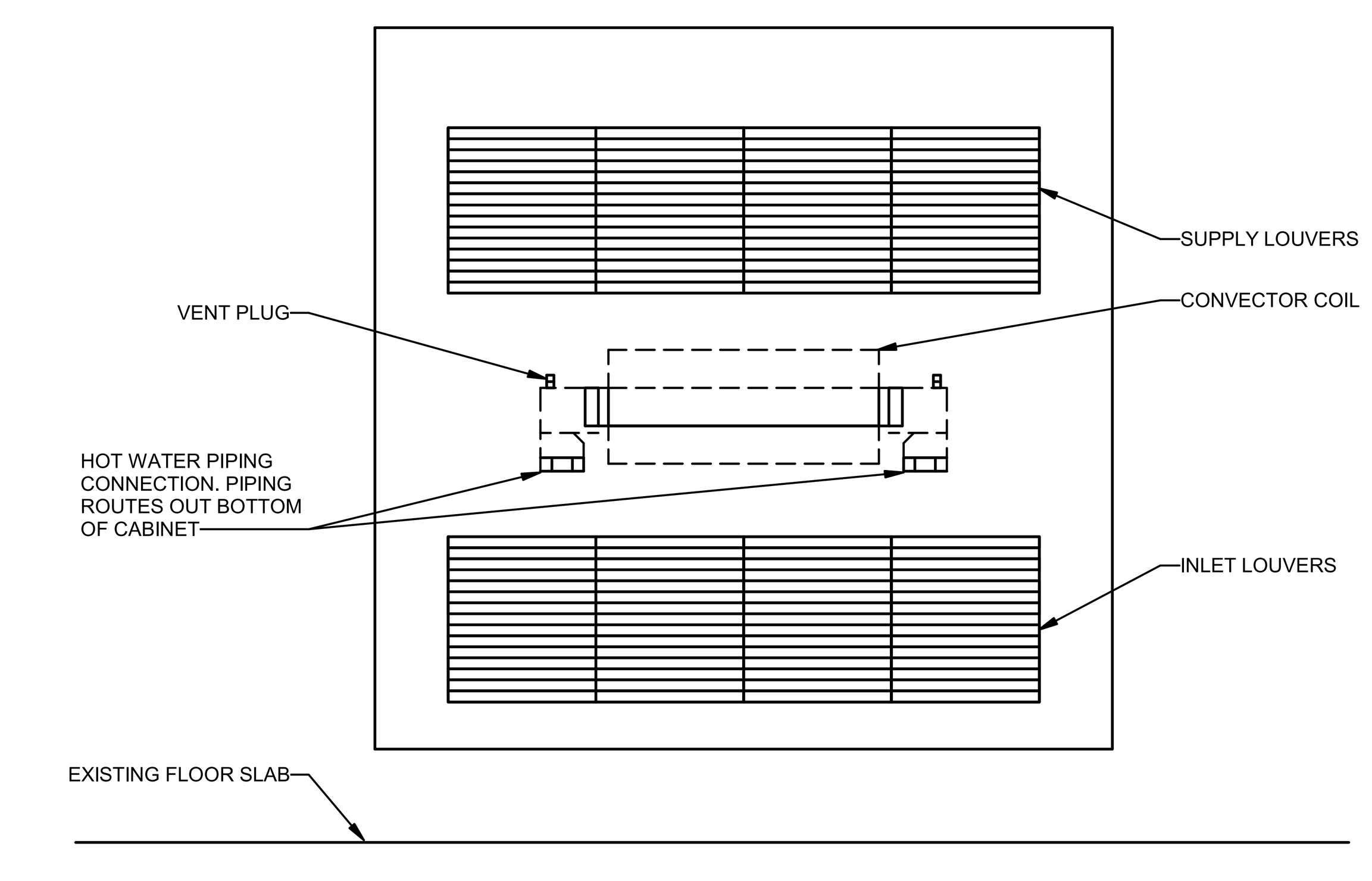
1. THE INTERIOR SURFACE OF ALL RADIUS ELBOWS SHALL BE MADE ROUND.
2. ALL STANDARD RADIUS ELBOWS SHOWN ON FLOOR PLANS MAY BE MADE SHORT RADIUS ELBOWS. ALL SHORT RADIUS ELBOWS SHALL HAVE VANES. VANES SHALL BE CONSTRUCTED, SUPPORTED AND FASTENED AS RECOMMENDED BY SMACNA.



C2 TYPICAL ROUND DUCT ELBOW DETAIL
NOT TO SCALE



C4 TYPICAL BRANCH DUCT CONNECTION
NOT TO SCALE

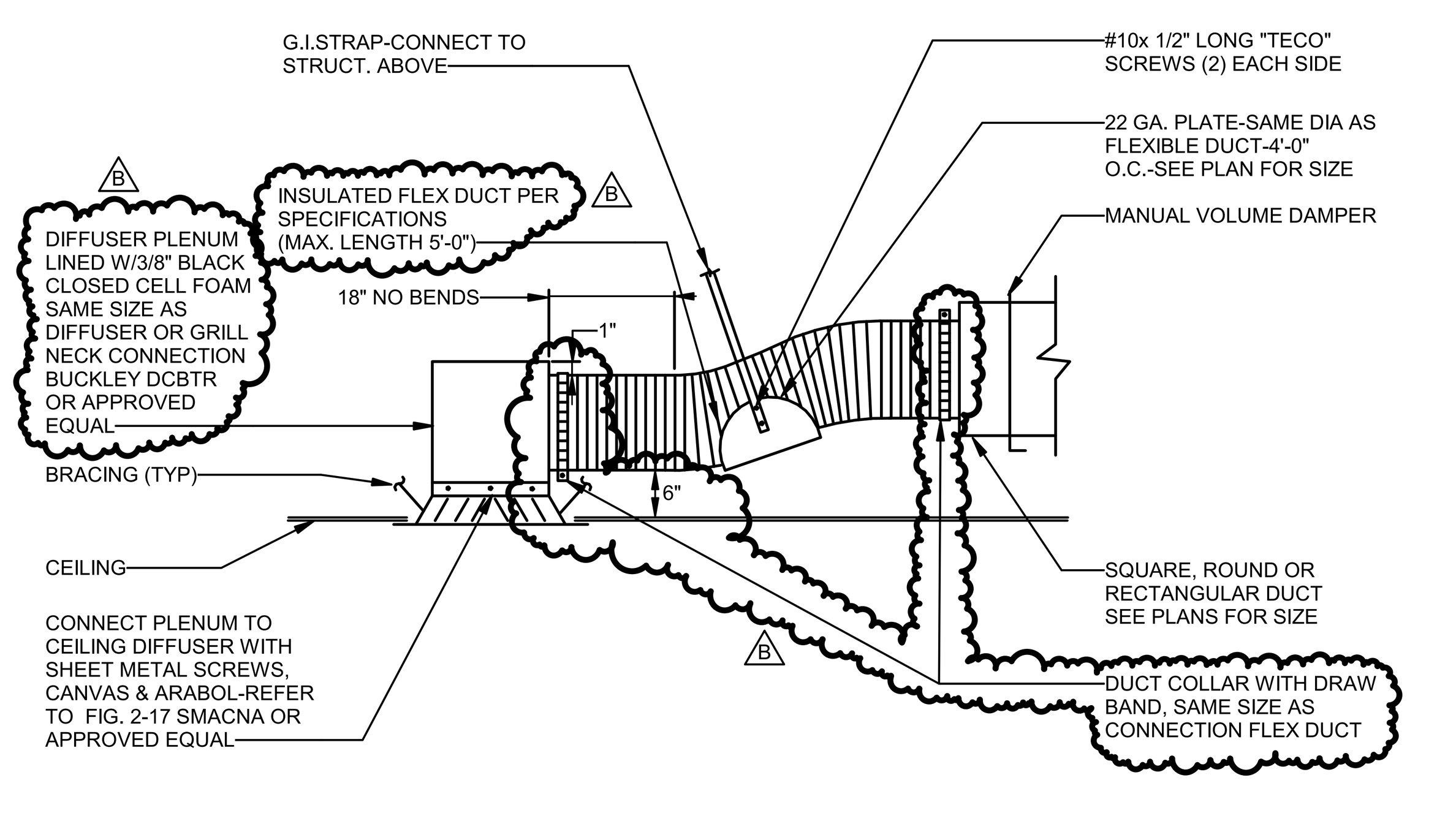


NOTE: CONTRACTOR TO CONFIRM NEW CONVECTOR AND ASSOCIATED PIPING WILL FIT WITHIN EXISTING RECESS PRIOR TO PURCHASE.

C5 WALL MOUNTED CONVECTOR DETAIL
NOT TO SCALE

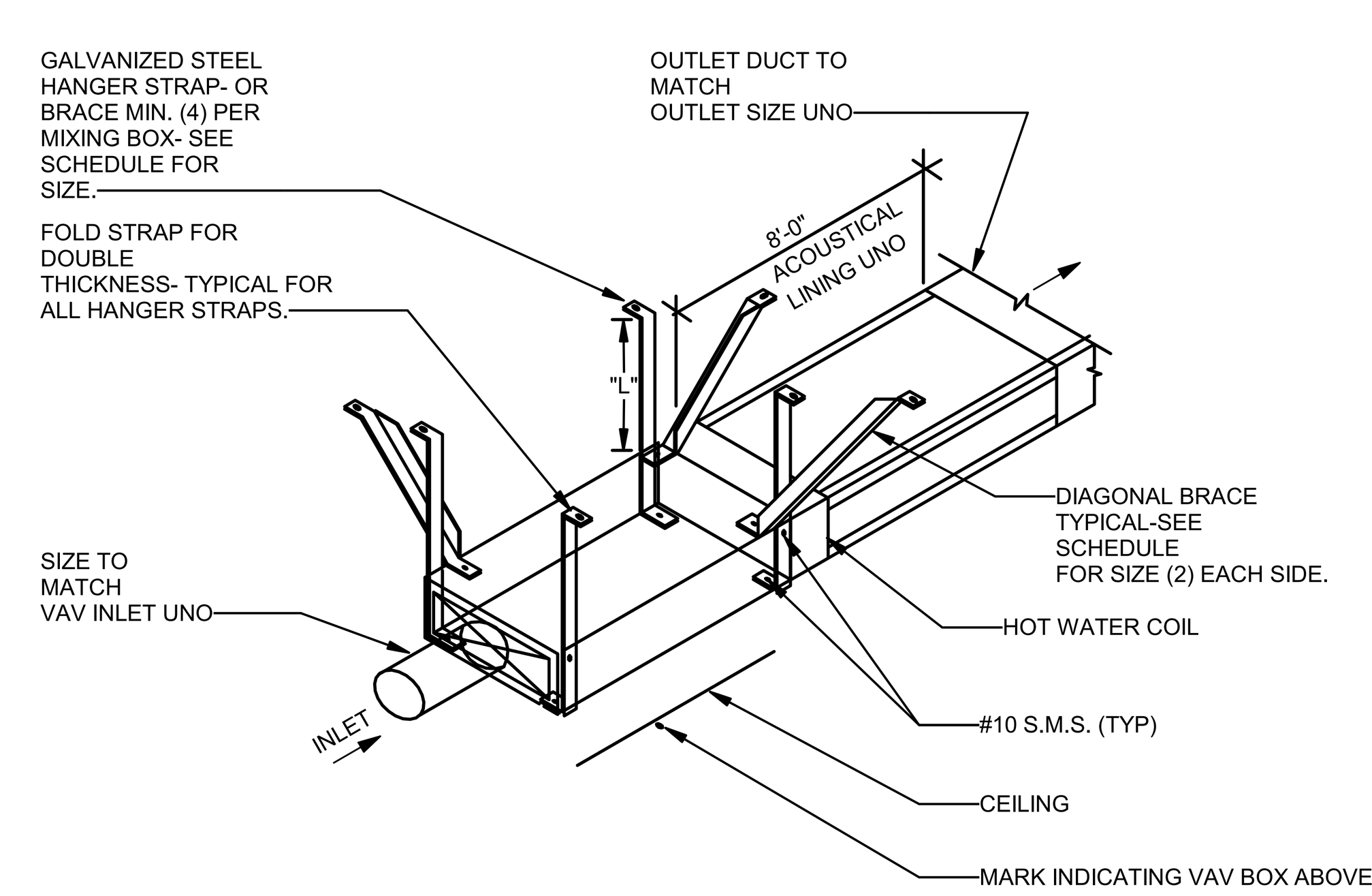
NOTES:

1. TYPICAL FOR RETURN AND EXHAUST REGISTERS.
2. MAXIMUM TWO AND MINIMUM ONE 90 DEGREE BEND FOR FLEX DUCT.

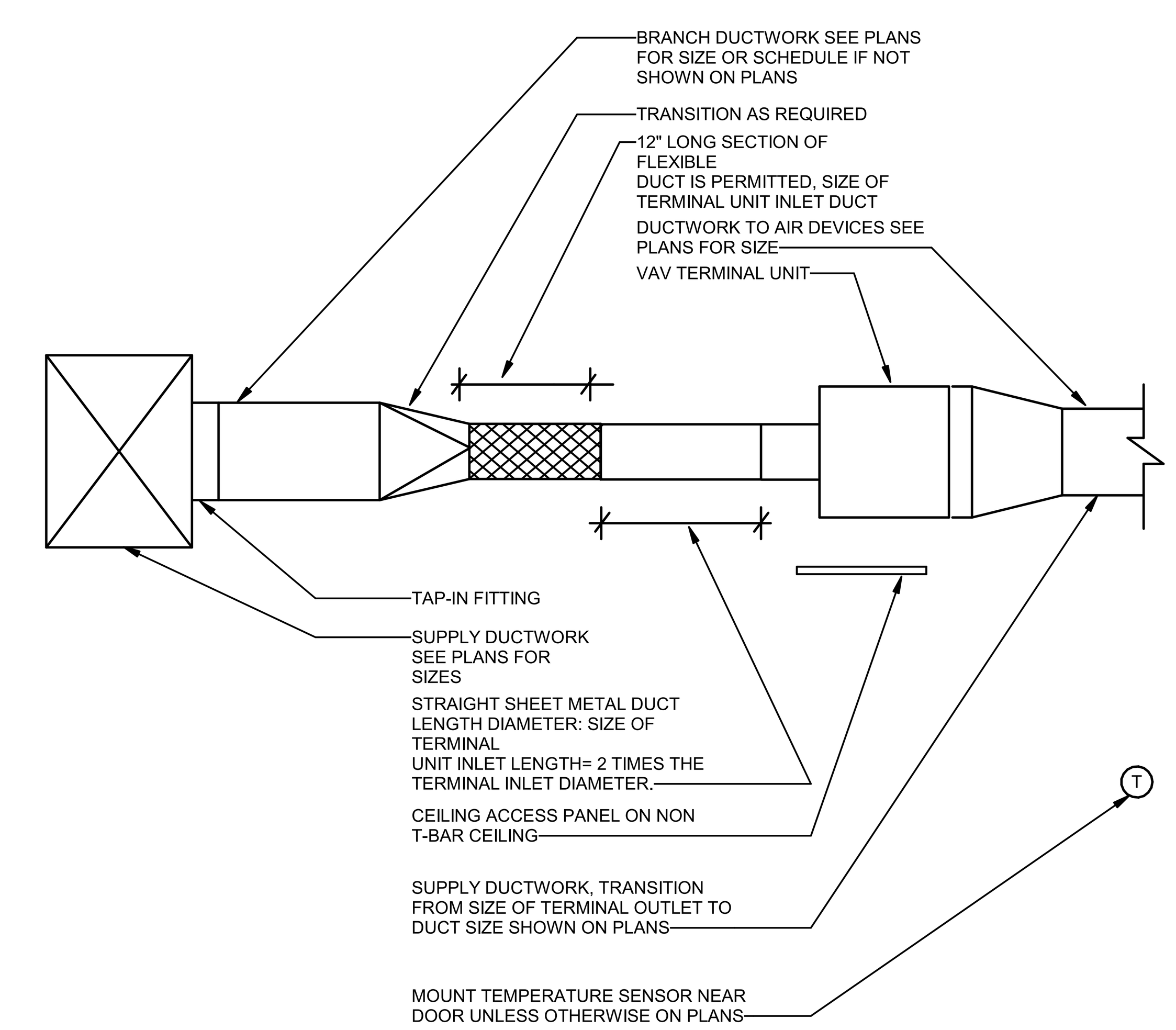


A1 CONNECTION TO CEILING DIFFUSER DETAIL
NOT TO SCALE

HANGER BRACE SIZE IF 1'-0"<"L"<4'-9"	HANGER AND BRACE SCHEDULE				
	MIXING BOX WEIGHT	MAX. LOAD EACH HANGER	HANGER STRAP SIZE IF "L"<1'-0"	HANGER STRAP SIZE IF 4'-9"<"L"<6'-6"	DIAGONAL BRACE SIZE
L 1 1/2"x1 1/2"x3/16"	UP TO 100#	72#/HANGER	1 1/2"x 18 GA.	L 2"x2"x3/16"	1 1/2"x1 1/2"x18 GA.
L 1 1/2"x1 1/2"x3/16"	101 TO 225#	160#/HANGER	1 1/2"x 16 GA.	L 2"x2"x3/16"	1 1/2"x1 1/2"x18 GA.



A3 VAV BOX DETAIL
NOT TO SCALE



NOTES:

1. PROVIDE IDENTIFICATION MARK ON CEILING TO INDICATE VAV BOX ABOVE.
2. VAV UNIT SHALL BE MOUNTED AT 11' ± AFF

A5 VAV CONNECTION DETAIL
NOT TO SCALE

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STATE OF MAINE — STEVEN M. MARTEL — 7148 — LICENSED — PROFESSIONAL ENGINEER — 2/8/2022

CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	SMM
DESIGNED BY:	SMM
DRAWN BY:	STR

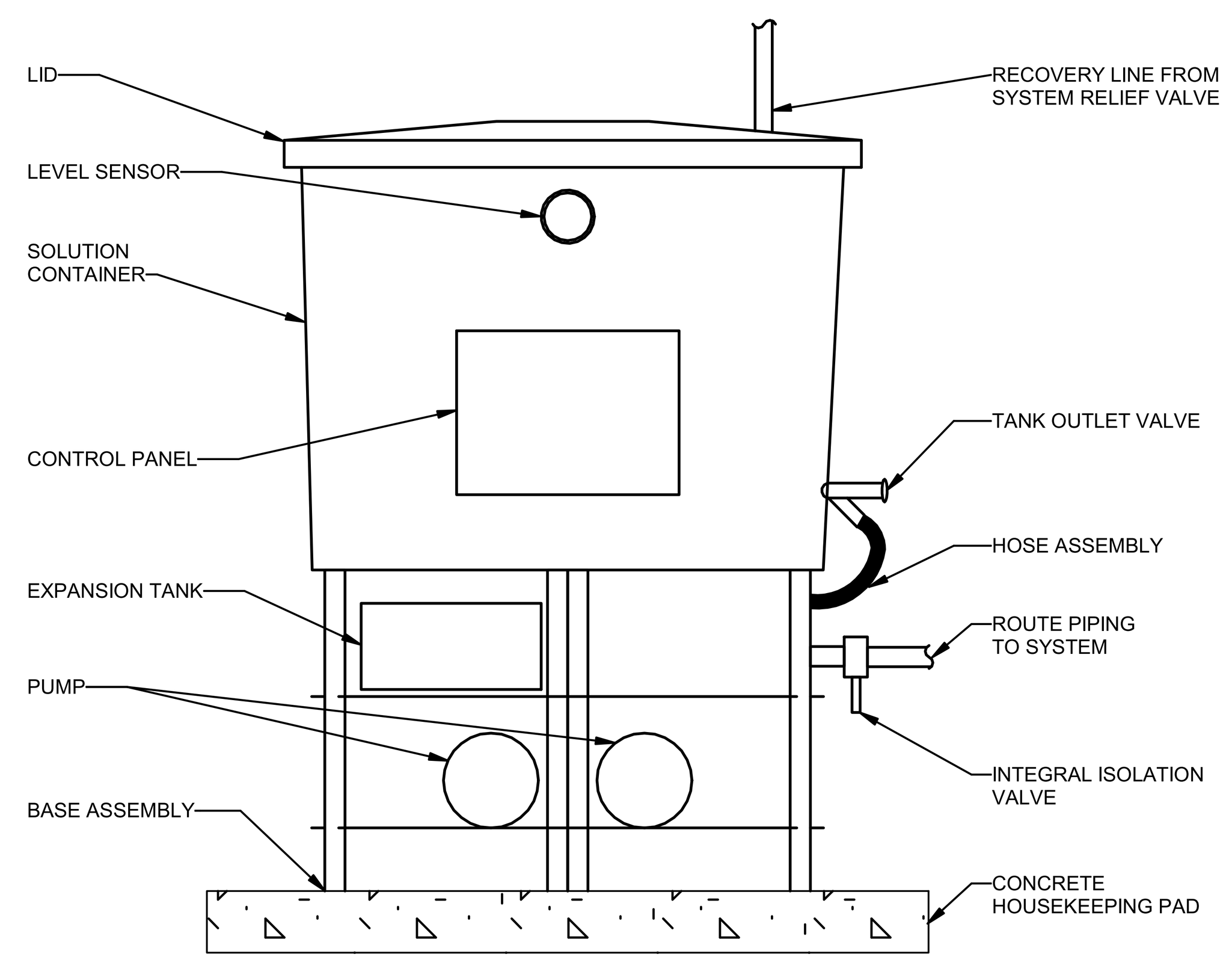
SHEET TITLE:
MECHANICAL DETAILS

SHEET ID:
M-501

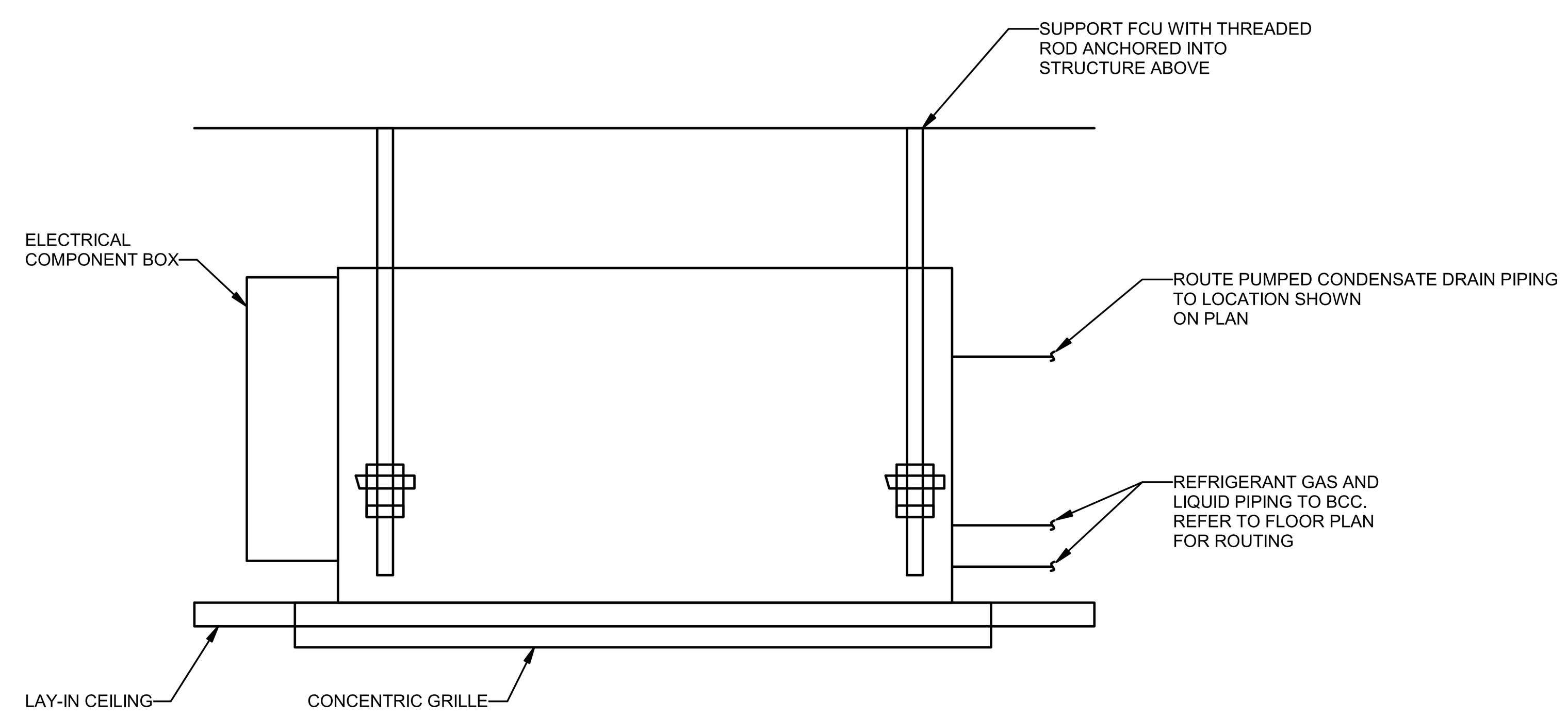
NOT FOR CONSTRUCTION

NOTES

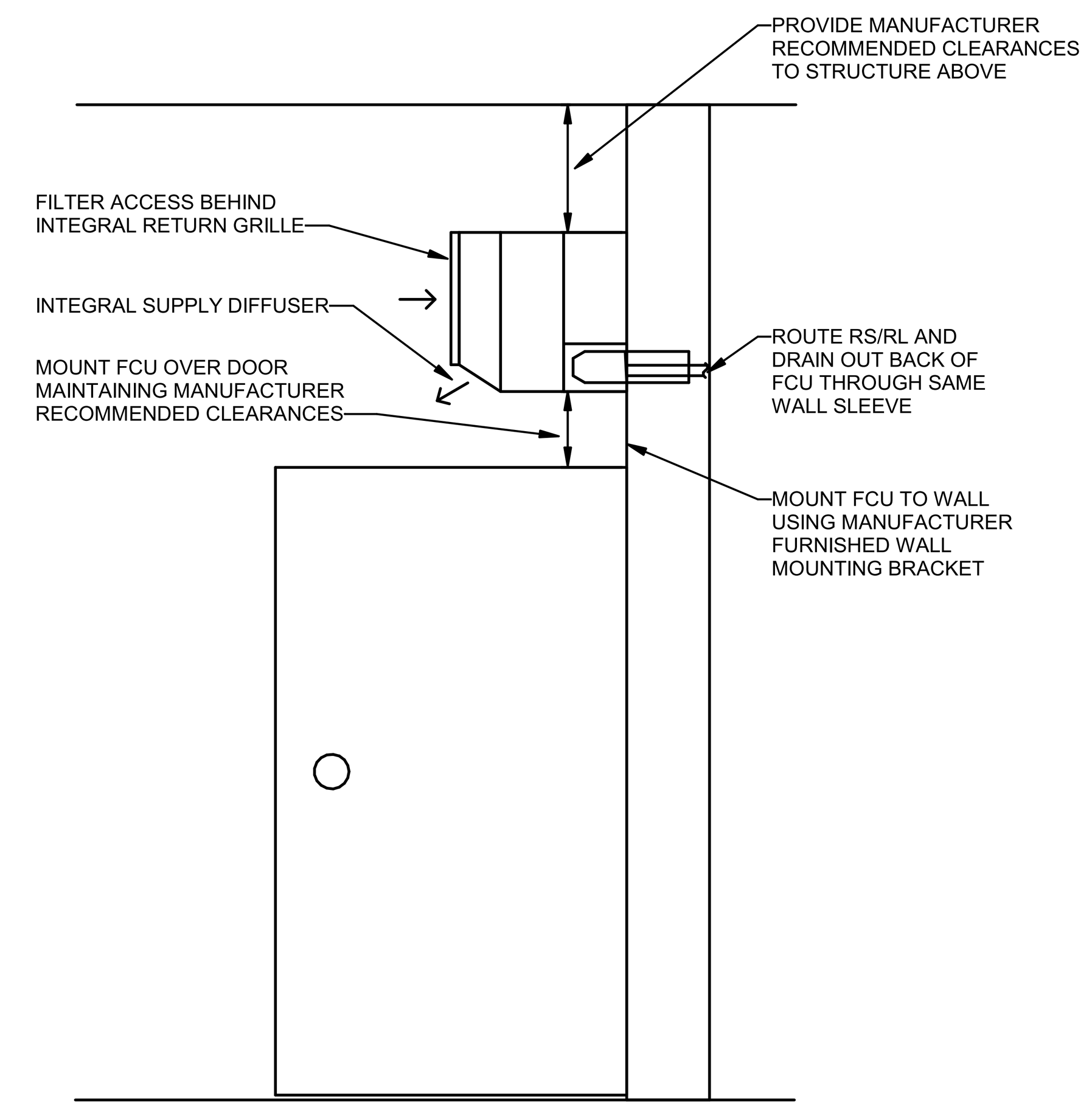
1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. REFER TO STRUCTURAL DRAWINGS FOR EQUIPMENT HANGING DETAILS AND SUPPORT.



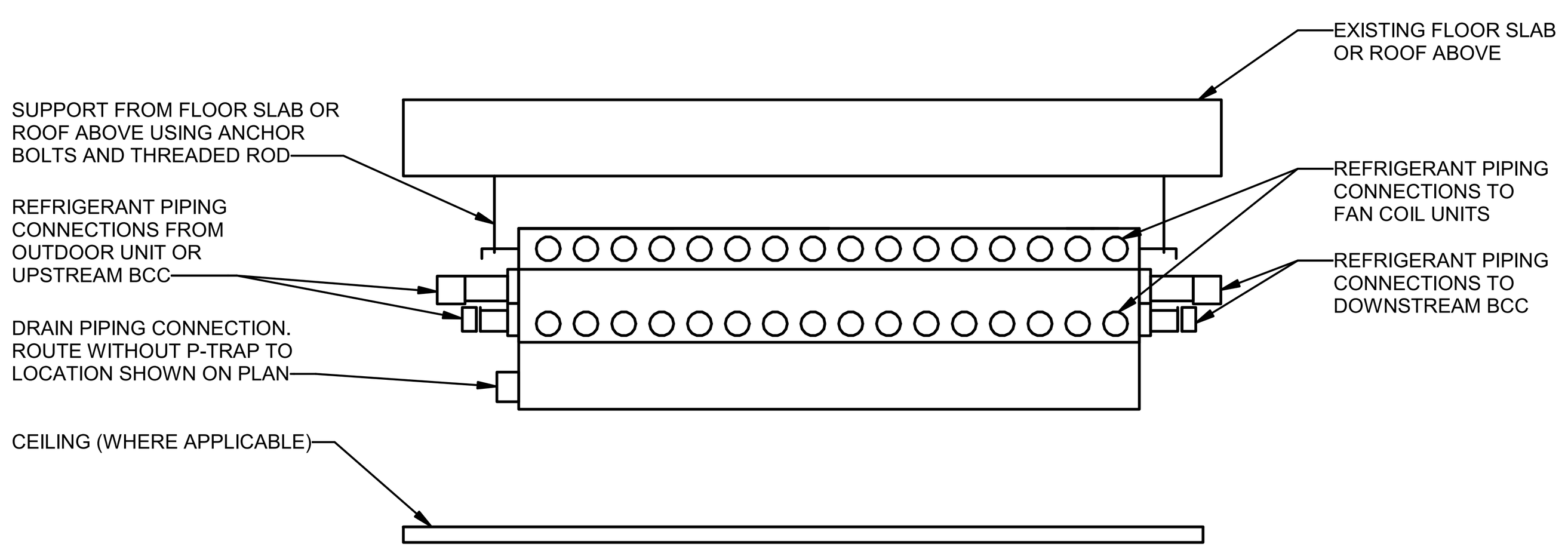
E1 DUPLEX GLYCOL MAKE UP UNIT DETAIL
NOT TO SCALE



E3 CASSETTE FAN COIL UNIT DETAIL
NOT TO SCALE

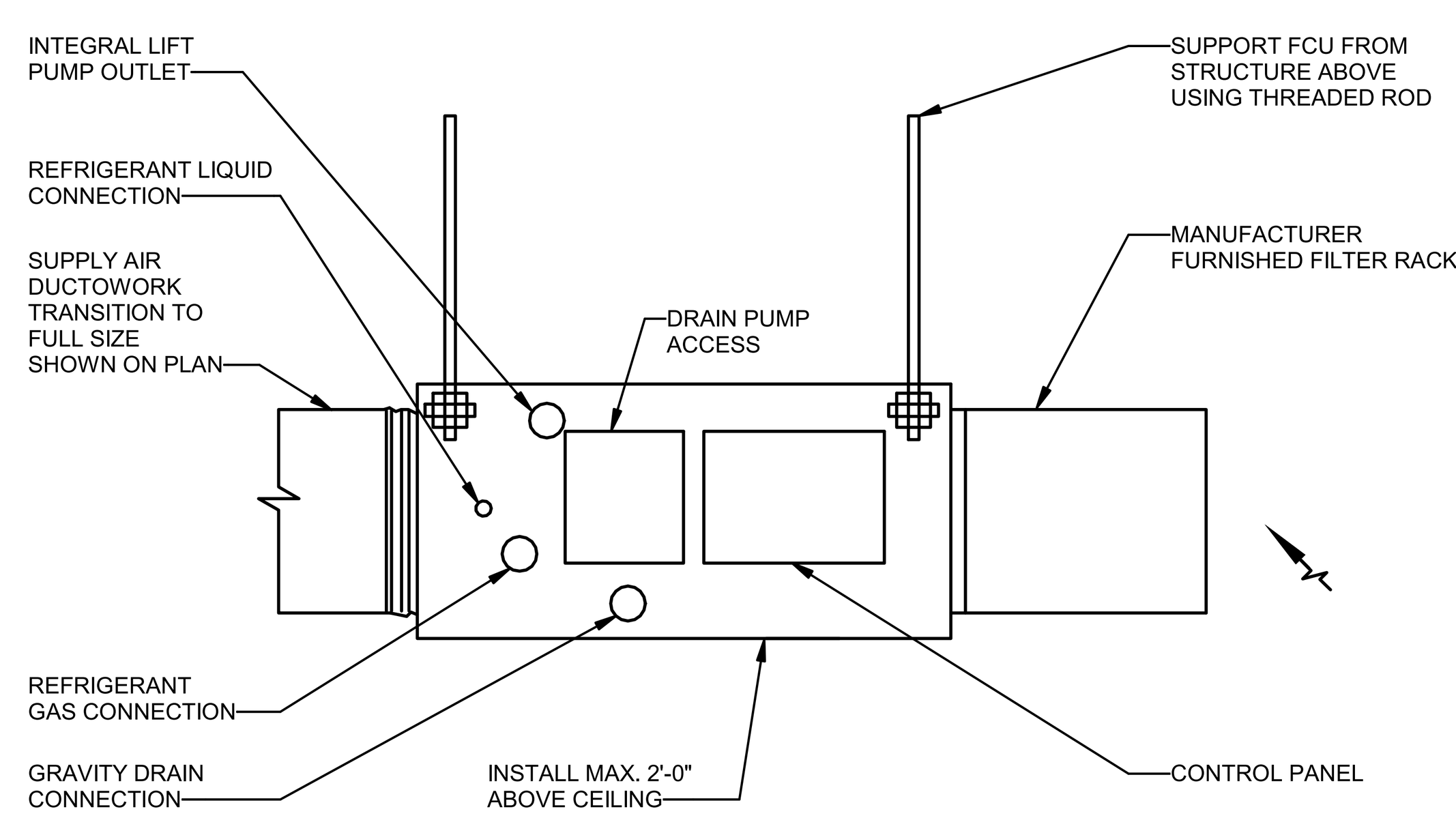


E5 WALL MOUNTED FAN COIL UNIT DETAIL
NOT TO SCALE



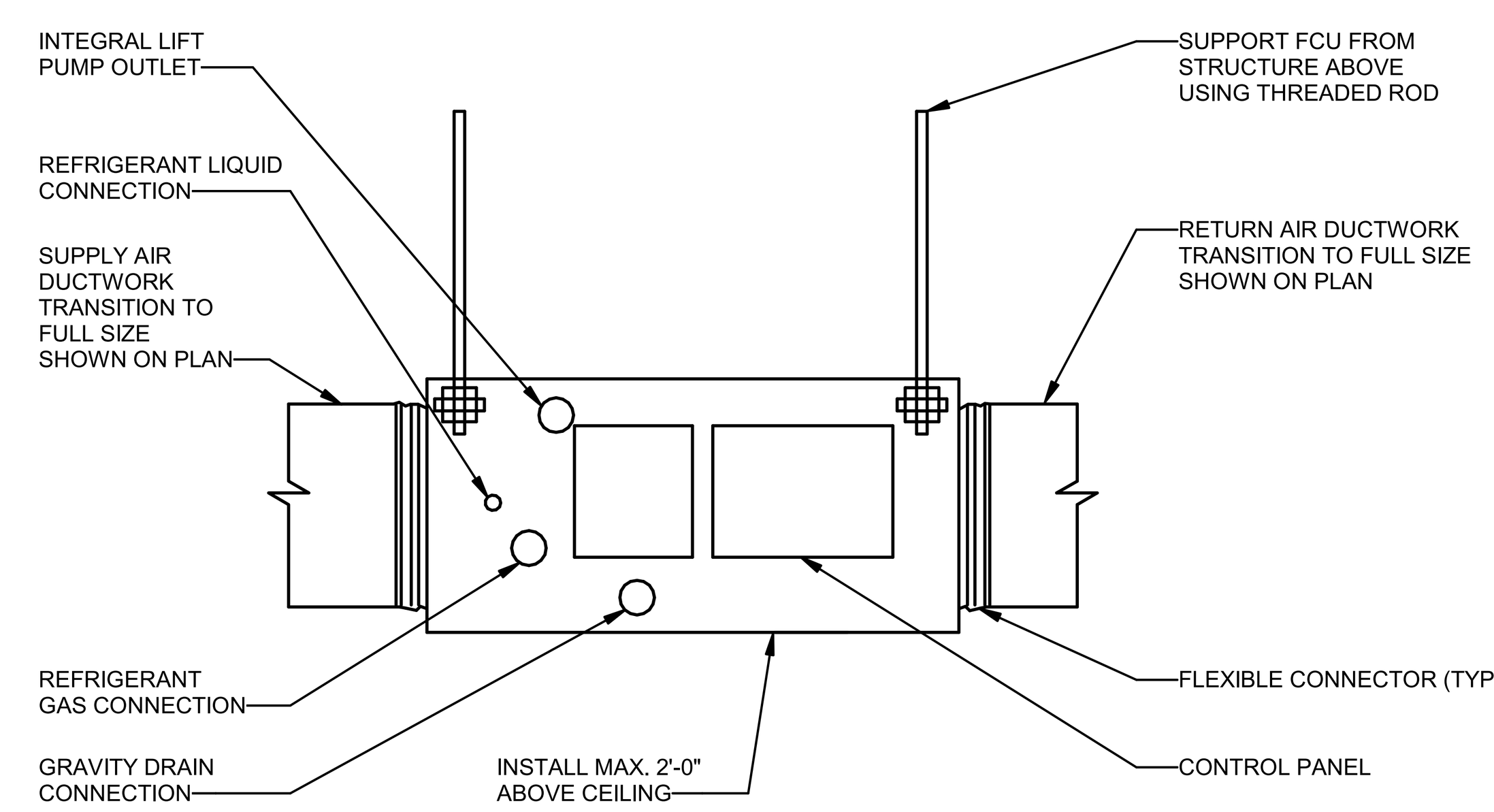
NOTES:
1. PROVIDE MINIMUM CLEARANCES TO CEILING BELOW AND FLOOR OR ROOF SLAB ABOVE PER MANUFACTURER RECOMMENDATIONS.
2. WHERE INSTALLED ABOVE A HARD CEILING, PROVIDE AN ACCESS PANEL.
3. INSTALL BCC UNIT LEVEL.
4. UNUSED PIPING CONNECTIONS SHOULD BE SEALED.

C1 BRANCH CIRCUIT CONTROLLER (BCC) DETAIL
NOT TO SCALE



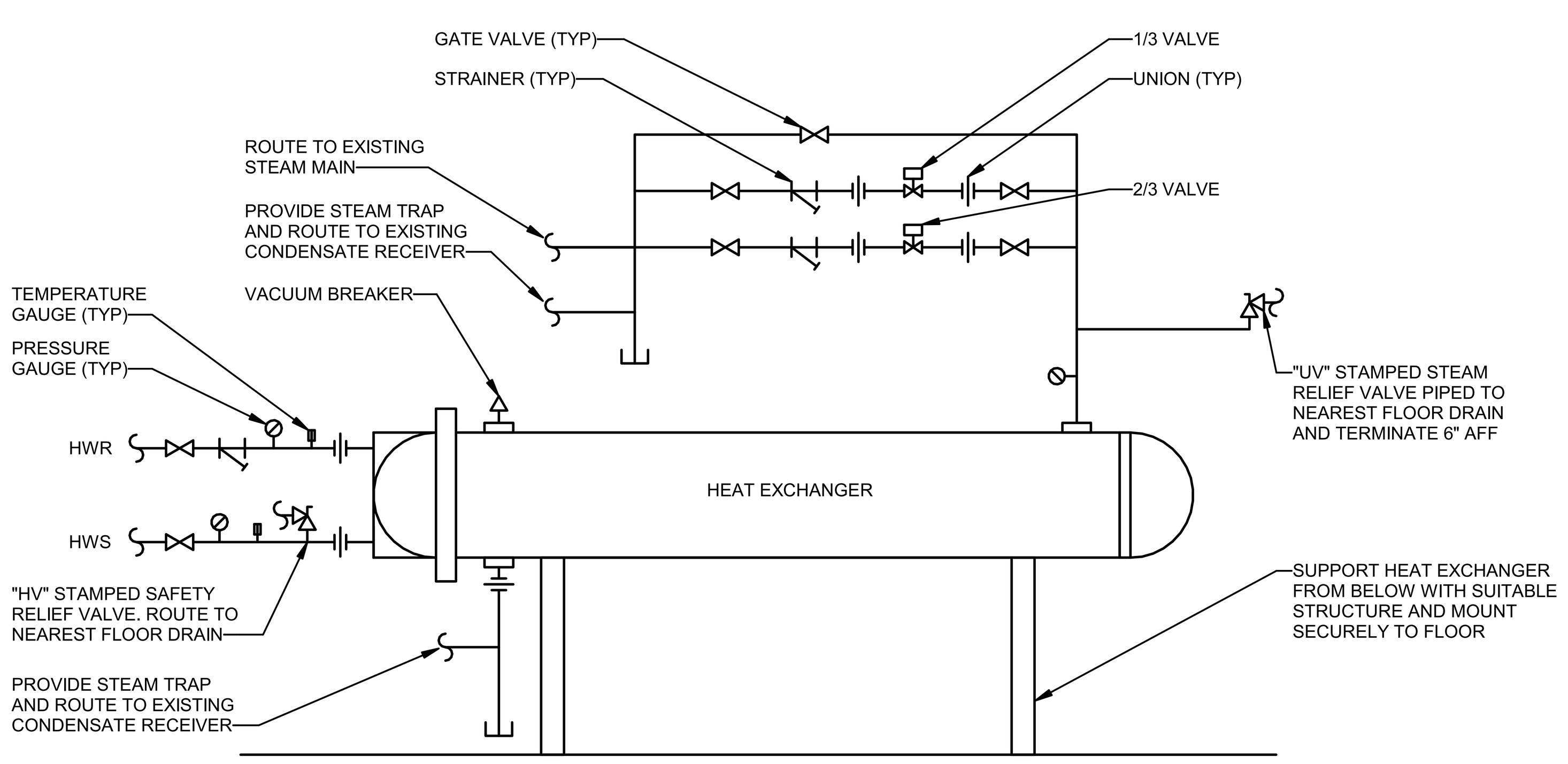
NOTES:
1. CONTRACTOR SHALL DETERMINE WHETHER TO USE INTEGRAL LIFT PUMP OUTLET OR GRAVITY DRAIN CONNECTION BASED ON FIELD CONDITIONS.
2. PROVIDE MIN. 6" CLEARANCE FROM FCU INLET TO ANY OBSTRUCTIONS.

C3 EXPOSED HORIZONTAL FAN COIL UNIT DETAIL
NOT TO SCALE

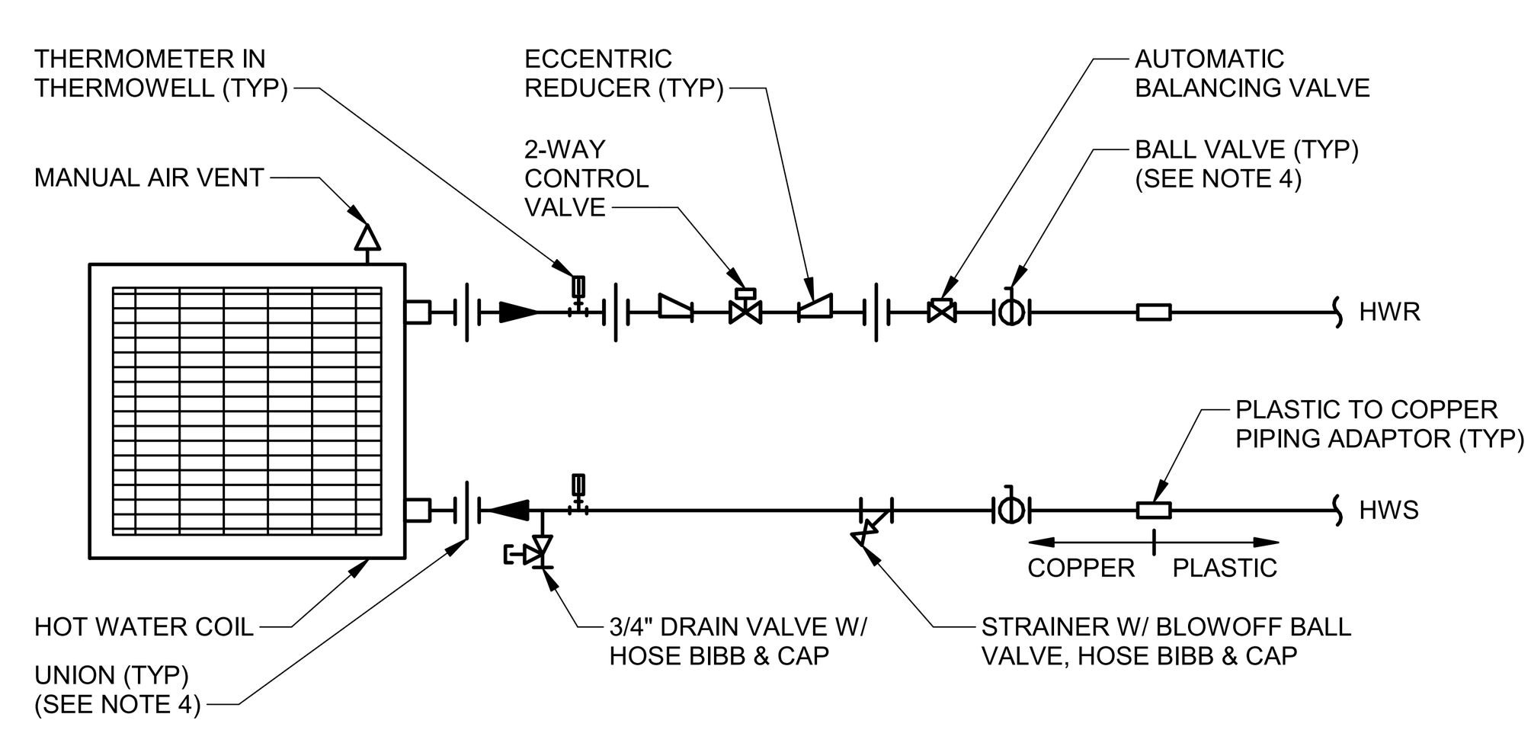


NOTES:
1. PROVIDE RETURN GRILLE WITH INTEGRAL FILTER FOR ALL CONCEALED HORIZONTAL FAN COIL UNITS.
2. WHERE INSTALLED ABOVE A HARD CEILING, PROVIDE AN ACCESS PANEL.
3. CONTRACTOR SHALL DETERMINE WHETHER TO USE INTEGRAL LIFT PUMP OUTLET OR GRAVITY DRAIN CONNECTION BASED ON FIELD CONDITIONS.

C5 CONCEALED HORIZONTAL FAN COIL UNIT DETAIL
NOT TO SCALE

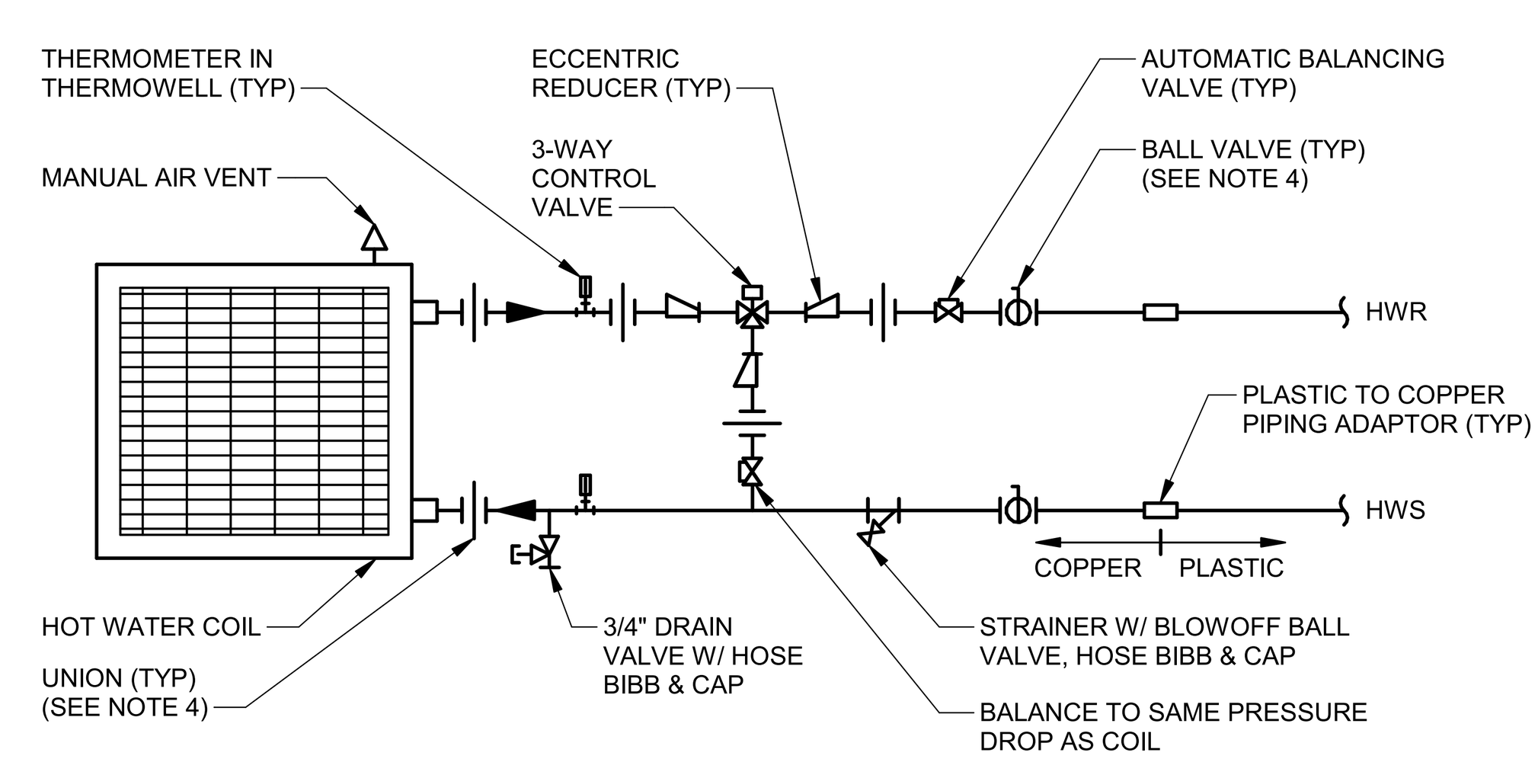


A1 STEAM TO LIQUID HEAT EXCHANGER DETAIL
NOT TO SCALE



NOTES:
1. REDUCERS SHALL BE ECCENTRIC TYPE.
2. LOCATE FLANGES OR UNIONS FOR COIL AND CONTROL VALVE REMOVAL.
3. PROVIDE THERMOMETERS FOR EACH WELL FOR COILS.
4. FOR PIPE SIZES 2-1/2" AND LARGER, PROVIDE BUTTERFLY VALVES AND FLANGES VERSUS BALL VALVES AND UNIONS.

A3 TWO WAY VALVE COIL CONNECTION DETAIL
NOT TO SCALE



NOTES:
1. REDUCERS SHALL BE ECCENTRIC TYPE.
2. LOCATE FLANGES OR UNIONS FOR COIL AND CONTROL VALVE REMOVAL.
3. PROVIDE THERMOMETERS FOR EACH WELL FOR COILS.
4. FOR PIPE SIZES 2-1/2" AND LARGER, PROVIDE BUTTERFLY VALVES AND FLANGES VERSUS BALL VALVES AND UNIONS.

A5 THREE WAY VALVE COIL CONNECTION DETAIL
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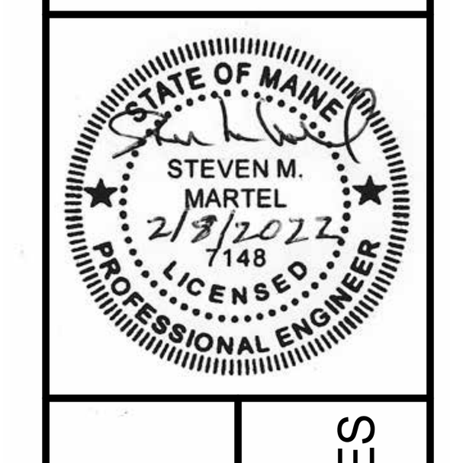

CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

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STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

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B	ADDENDUM NO. 2	02-08-2022
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A/E OF RECORD:	SMM
DESIGNED BY:	SMM
DRAWN BY:	STR

SHEET TITLE:
MECHANICAL DETAILS

SHEET ID:
M-502

NOT FOR CONSTRUCTION

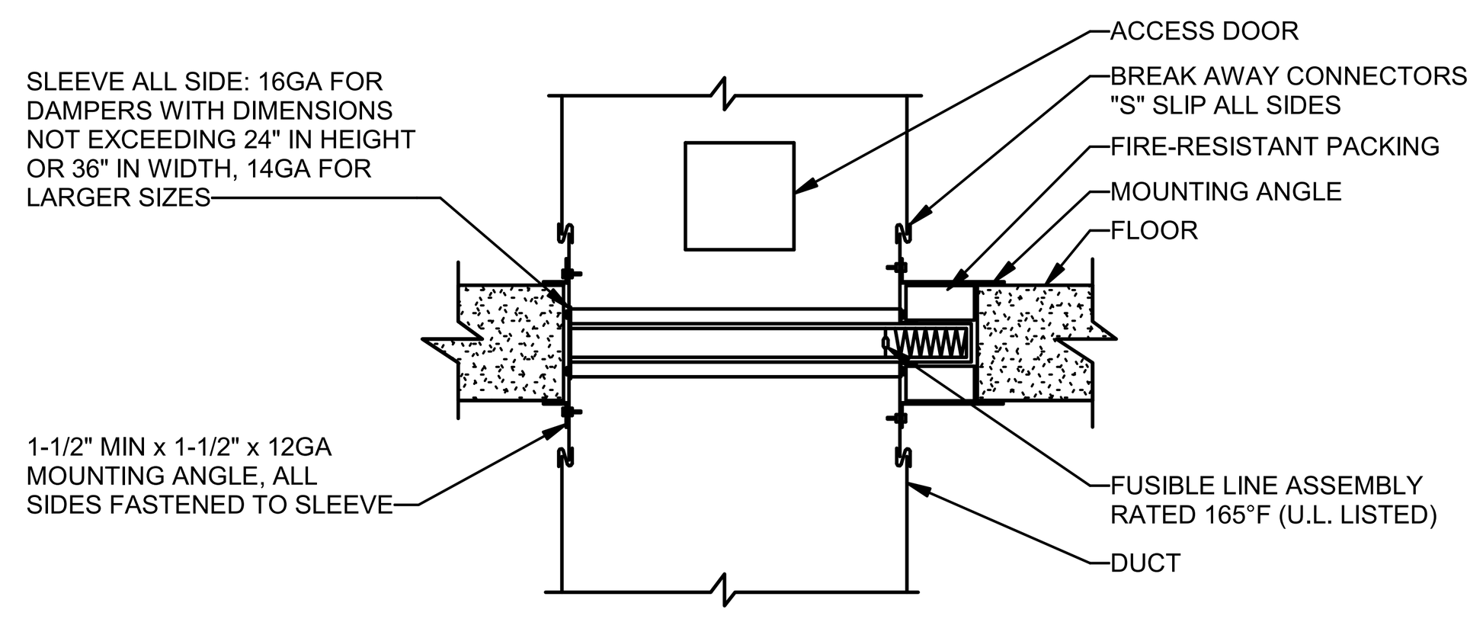
CONTROL SEQUENCE OF OPERATION FOR:
CHILLED WATER GLYCOL SOLUTION MAKE-UP UNIT

NOTE:
CONTROL COMPONENTS INDICATED IN THIS SEQUENCE OF OPERATION ARE AUTOMATIC AND ARE INTEGRAL TO THE GLYCOL SOLUTION MAKE-UP UNIT SCHEDULED AS XXX ON SHEET M-6XX.

WHEN THE SYSTEM PRESSURE DROPS TO THE MINIMUM FILL PRESSURE, A PRESSURE REDUCING VALVE SHALL OPEN. GLYCOL SOLUTION STORED IN THE MAKE-UP UNIT PRESSURE TANK WILL FLOW INTO THE SYSTEM. THE SYSTEM PRESSURE WILL CONTINUE TO DECREASE UNTIL THE SOLUTION PUMP P-X CUT-IN PRESSURE IS REACHED. THE PRESSURE SWITCH WILL START P-X TO MAINTAIN GLYCOL SOLUTION IN THE PRESSURE TANK.

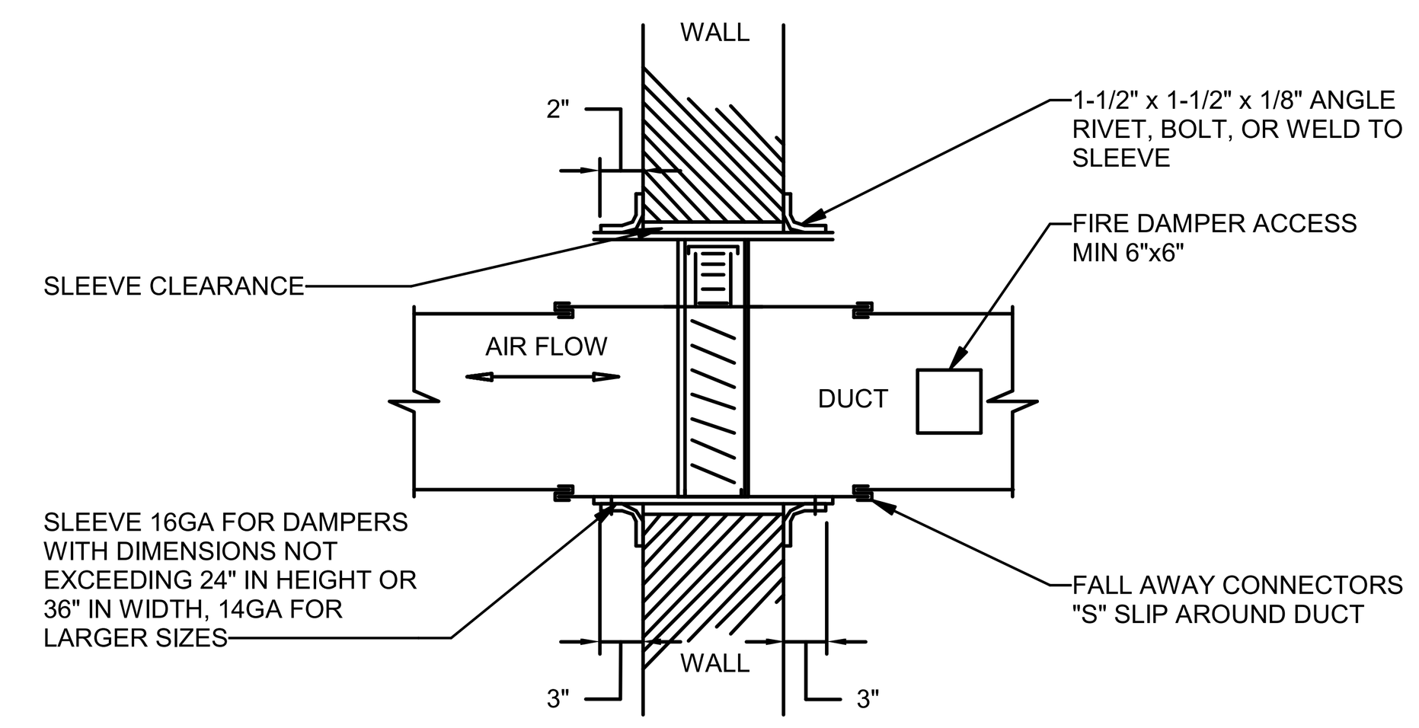
P-X WILL CONTINUE TO RUN UNTIL THE SYSTEM PRESSURE REACHES AND REMAINS ABOVE THE PRV SETTING OR THE PUMP CUT-OUT PRESSURE IS DETECTED BY THE PRESSURE SWITCH. IF THE GLYCOL SOLUTION TANK SHOULD RUNOUT OF SOLUTION A LOW-LEVEL CONTROL ALARM WILL CUT-OFF P-X AND ACTIVATE AN AUDIBLE ALARM.

F1 GLYCOL MAKE-UP SEQUENCE
NOT TO SCALE



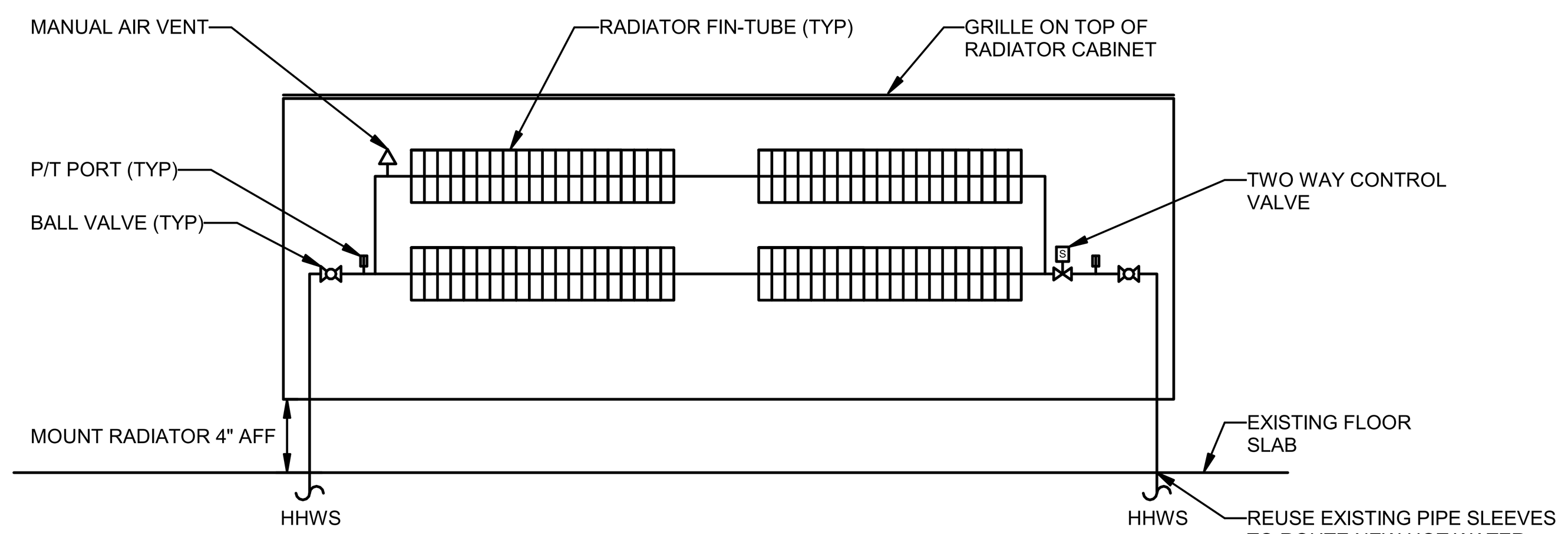
NOTES:
1. PROVIDE WITH SPRING LOADED DAMPER BLADES.
2. FASTEN DAMPER TO SLEEVE WITH SCREWS.
3. ANY CLEARANCE BETWEEN FIRE-RATED WALL, PARTITION OR FLOOR AND DAMPER SLEEVE OR DAMPER SHALL BE FILLED WITH FIRE-RESISTANT PACKING ON ALL SIDES TO MAINTAIN FIRE RATING.
4. USE GALVANIZED SHEET METAL DUCT ONLY.
5. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND UL LISTING CONDITIONS.

E3 FIRE DAMPER (HORIZONTAL THROUGH FLOOR) DETAIL
NOT TO SCALE



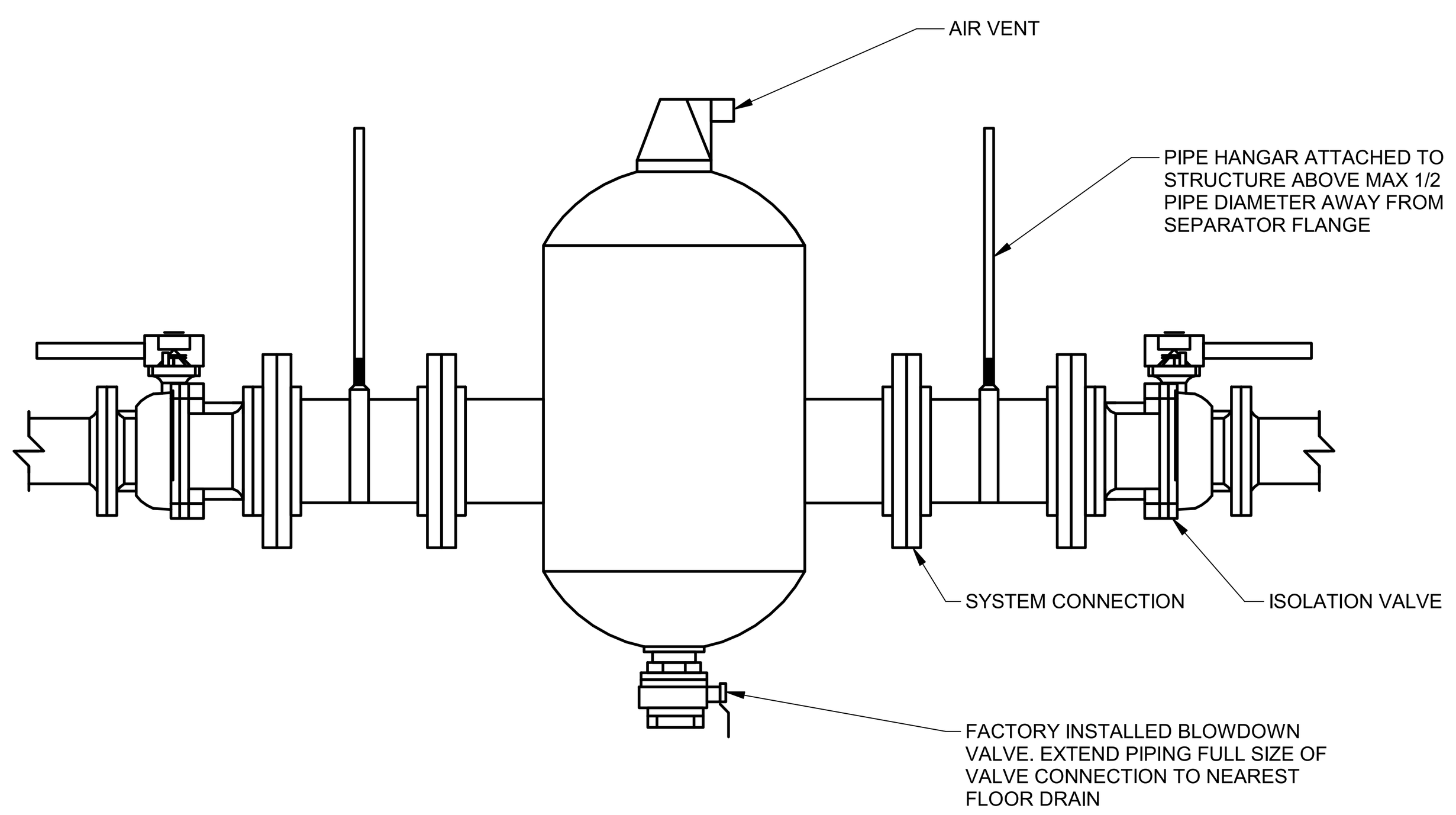
NOTES:
1. UL LISTED AND LABELED FIRE DAMPER.
2. FUSIBLE LINK RATED FOR 165°F (71.1°C).
3. ANY CLEARANCE BETWEEN FIRE-RATED WALL OR PARTITION AND DAMPER SLEEVE OR DAMPER SHALL BE FILLED WITH FIRE-RESISTANT PACKING ON ALL SIDES TO MAINTAIN FIRE RATING.
4. USE FOR GALVANIZED SHEET METAL DUCT ONLY.
5. FASTEN DAMPER TO SLEEVE IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.

E5 FIRE DAMPER (WALL) DETAIL
NOT TO SCALE



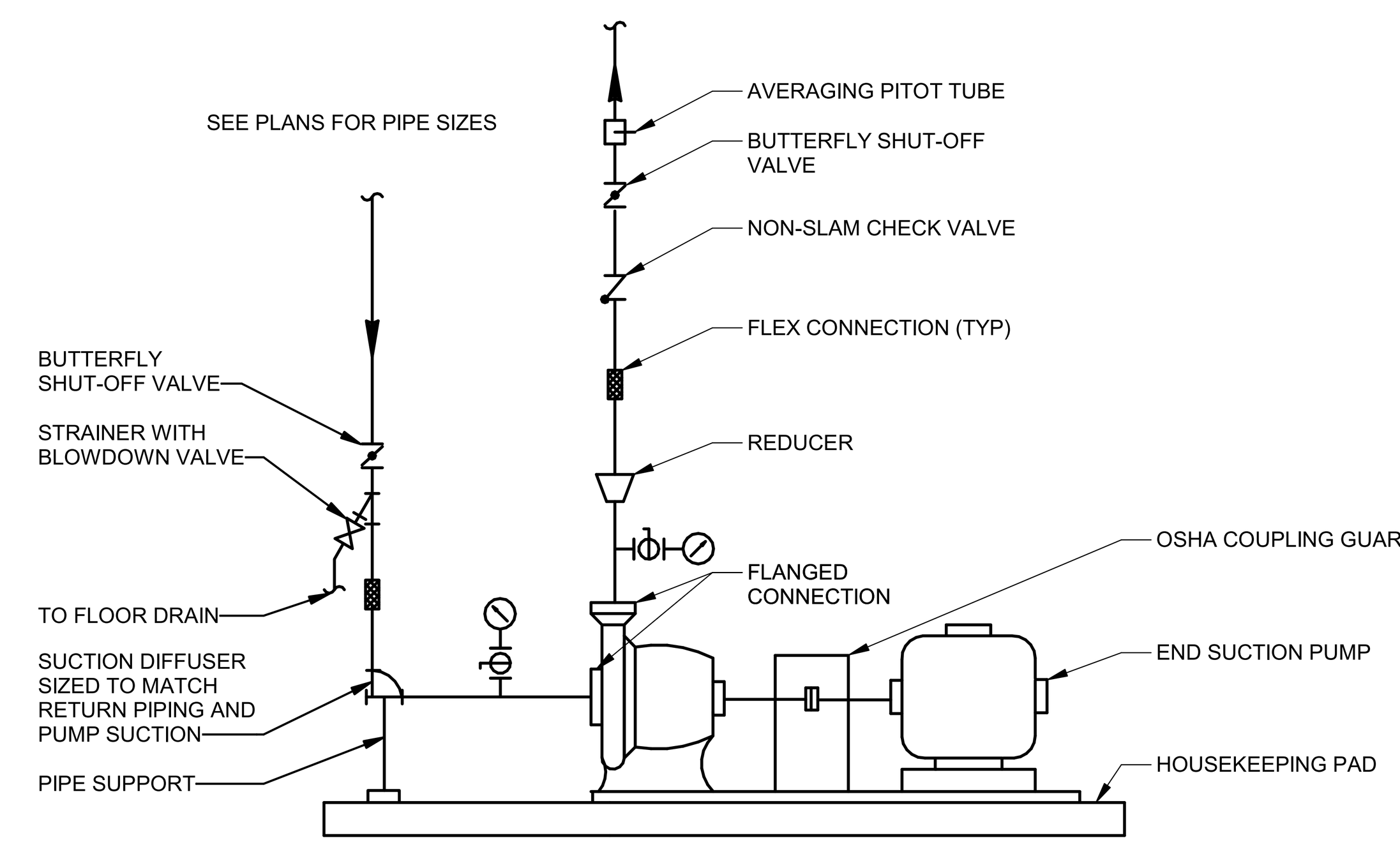
NOTES:
1. CONTRACTOR SHALL PROVIDE MANUFACTURER FURNISHED END CAP SECTIONS WITH ACCESS DOOR ON EACH END.
2. PROVIDE MANUFACTURER FURNISHED PEDESTALS TO SUPPORT RADIATOR OFF FLOOR.

D1 FIN TUBED RADIATOR DETAIL
NOT TO SCALE



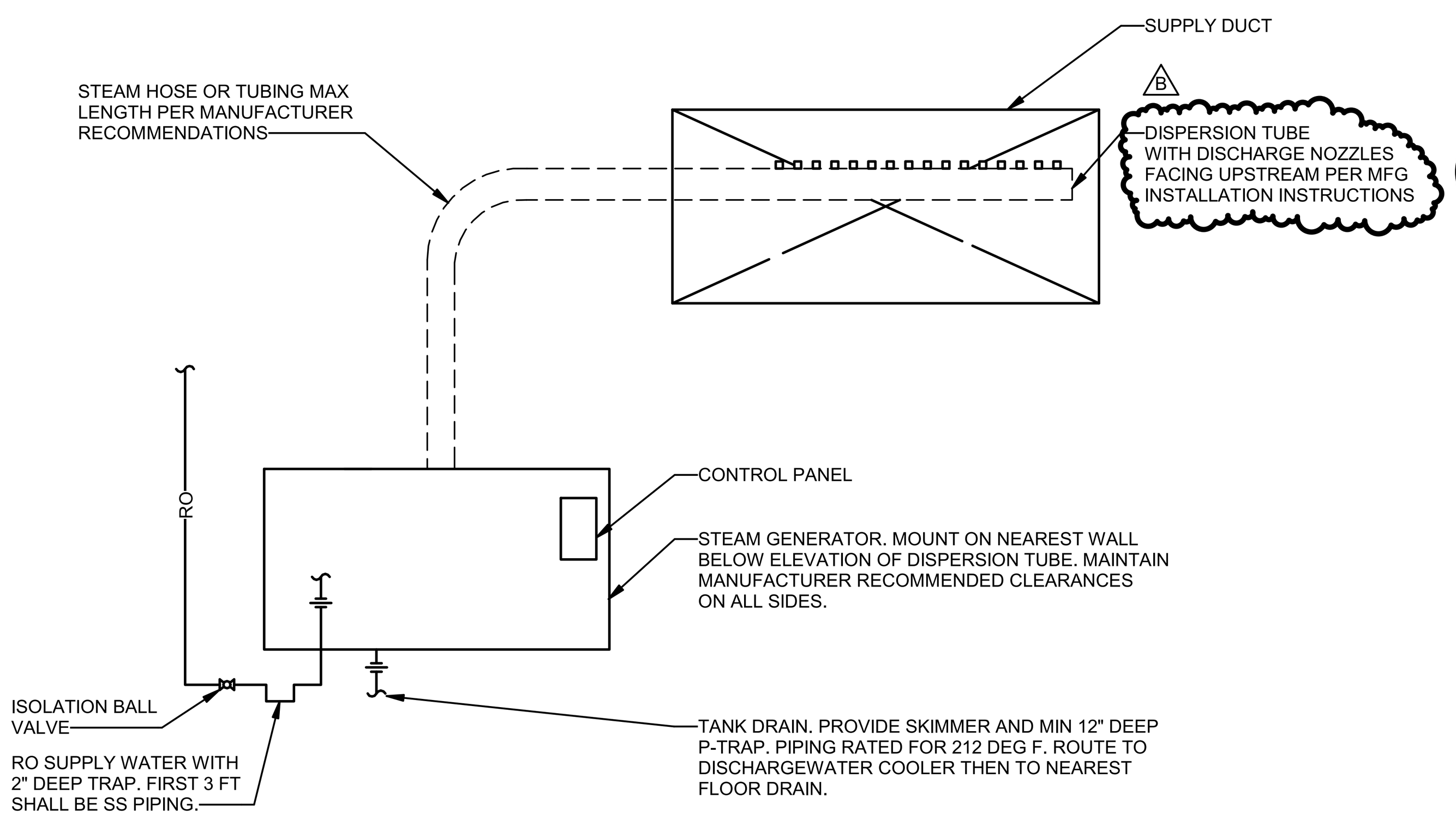
NOTES:
1. DESIGNED AND CONSTRUCTED PER ASME SECTION VIII, DIV 1
2. TACO 4900 UNITS ARE DESIGNED TO BE SELF SUPPORTING IN THE PIPING SYSTEM
3. AIR VENT SUITABLE FOR UP TO 50% GLYCOL

D3 AIR AND DIRT SEPARATOR DETAIL
NOT TO SCALE

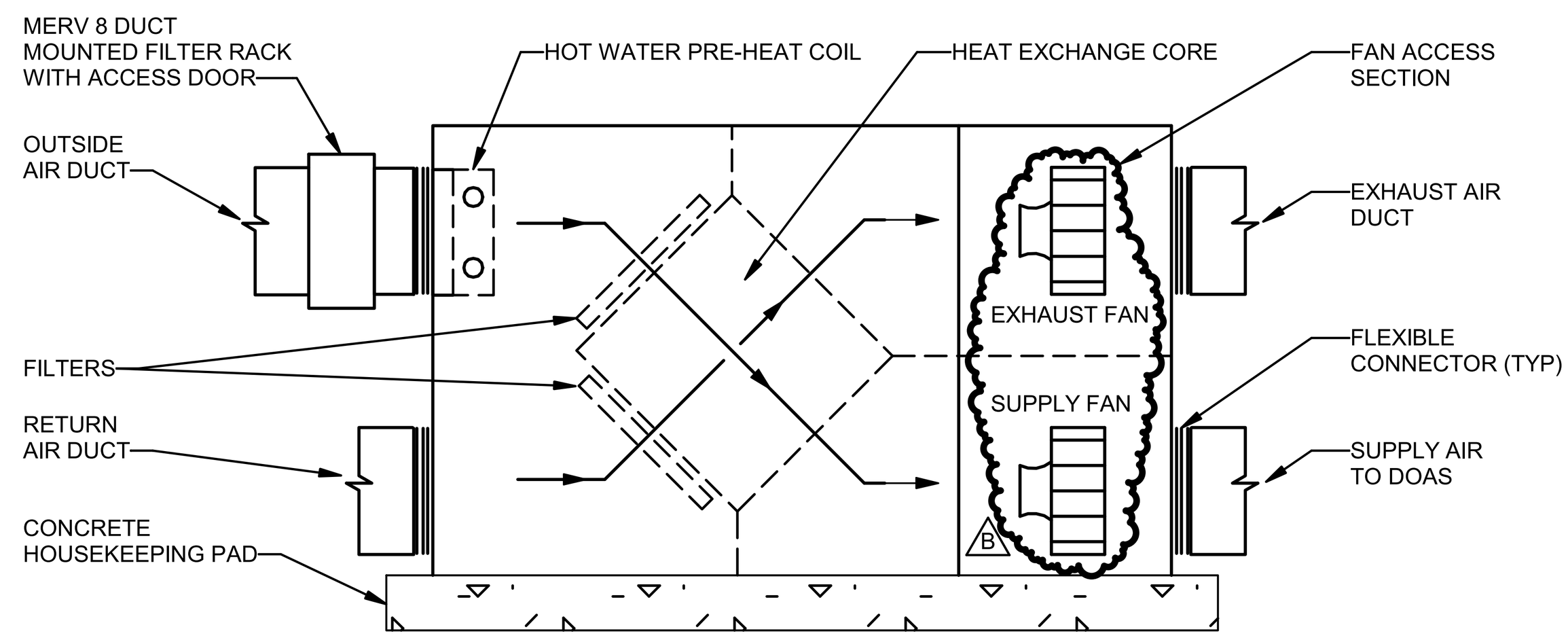


NOTE: WHERE DISSIMILAR PIPE MATERIALS CONNECT, PROVIDE DIELECTRIC UNION OR FLANGE.

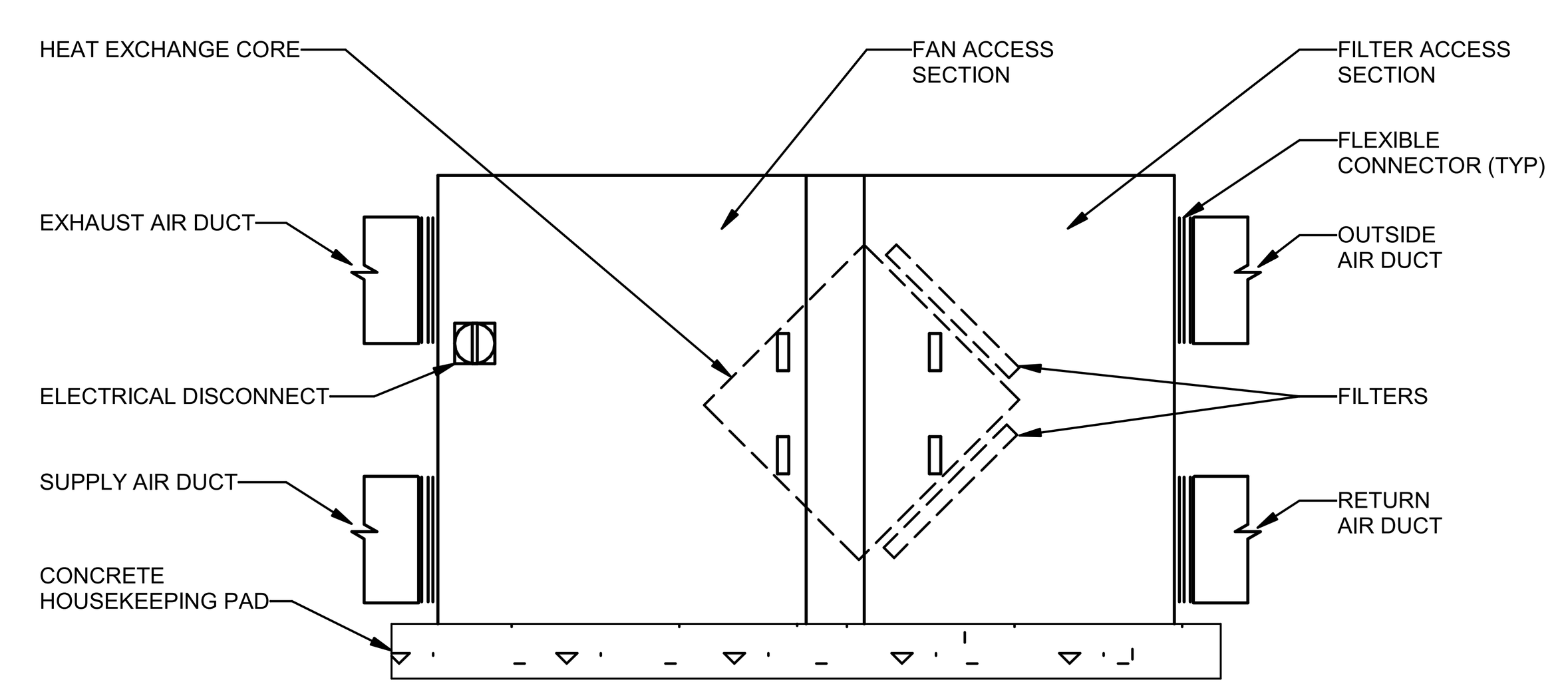
D5 BASE MOUNTED END SUCTION PUMP DETAIL
NOT TO SCALE



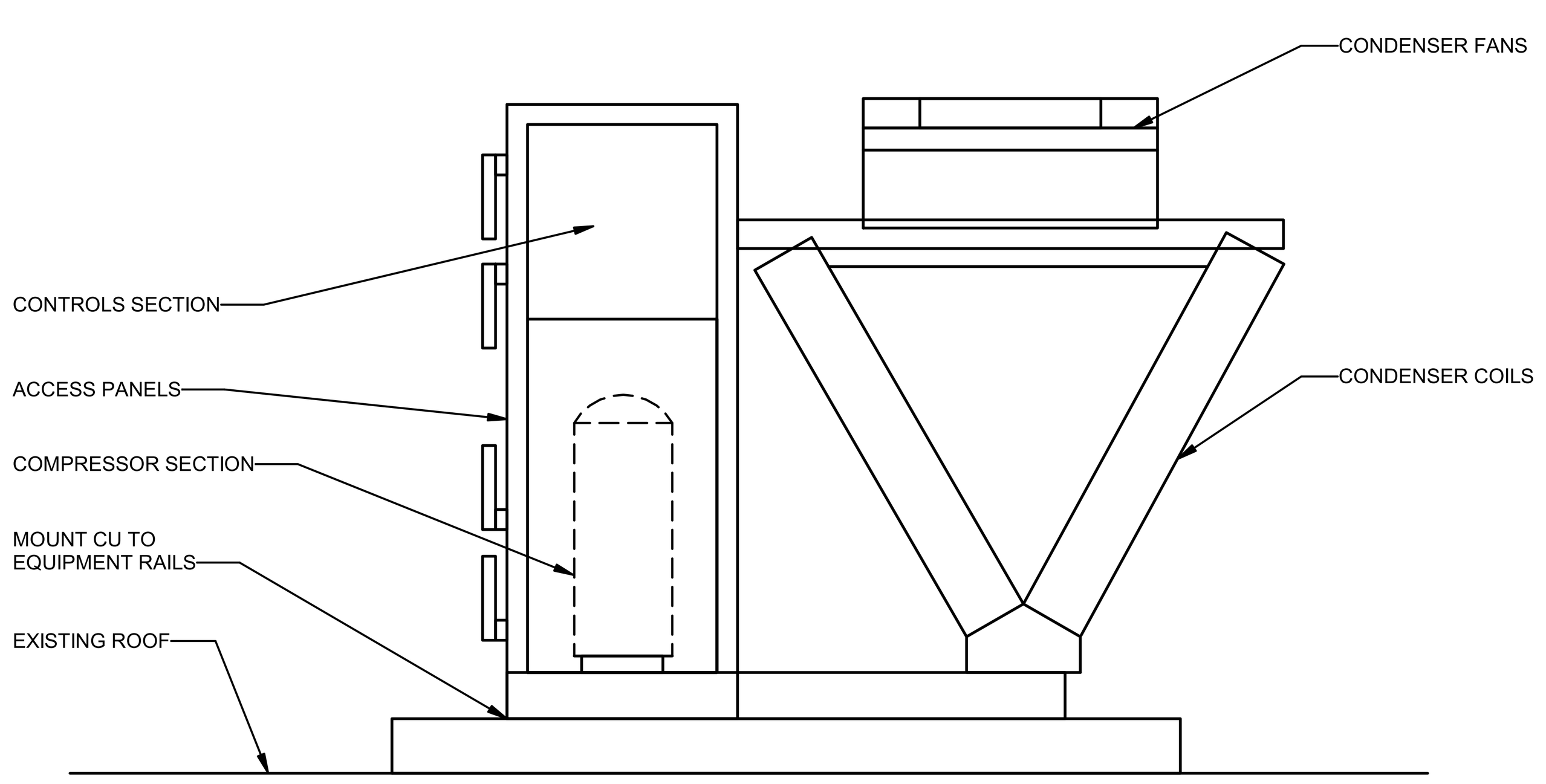
B1 DUCT MOUNTED HUMIDIFIER DETAIL
NOT TO SCALE



B3 ERV-1,2,3 DETAIL
NOT TO SCALE

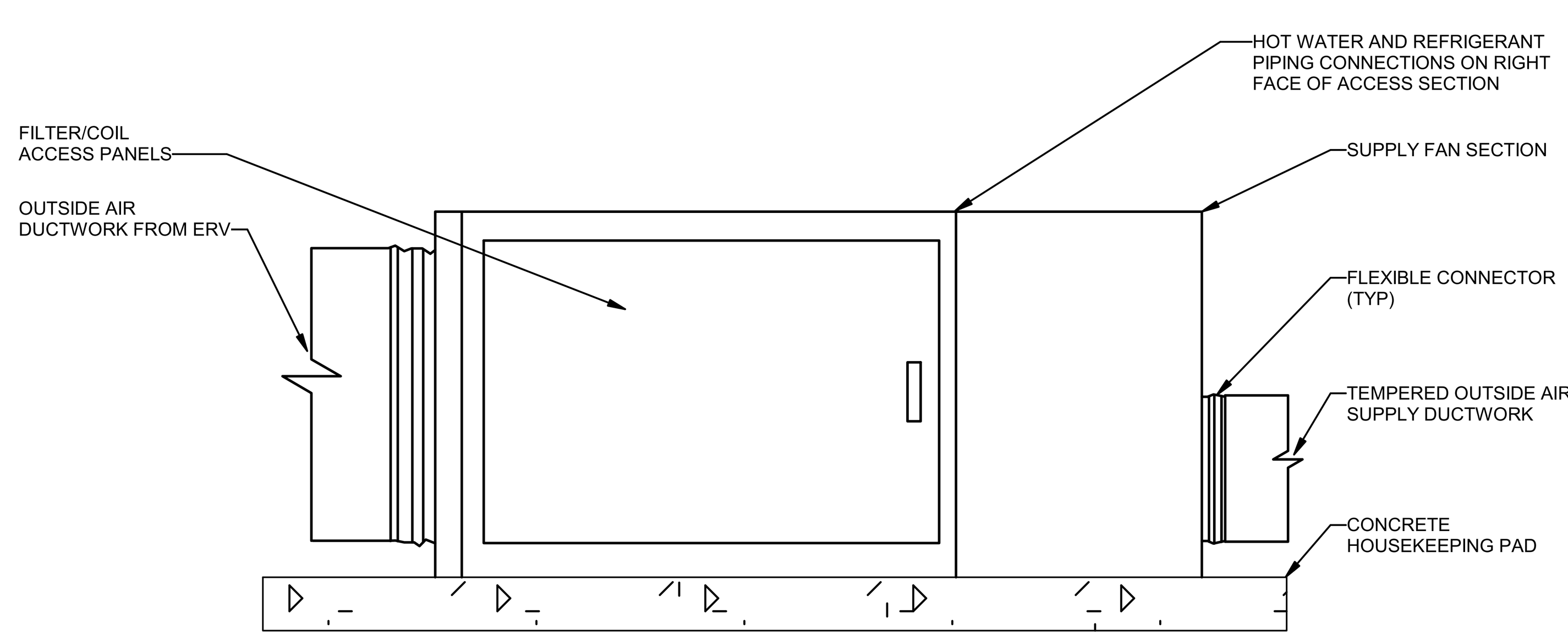


B5 ERV-4 DETAIL
NOT TO SCALE



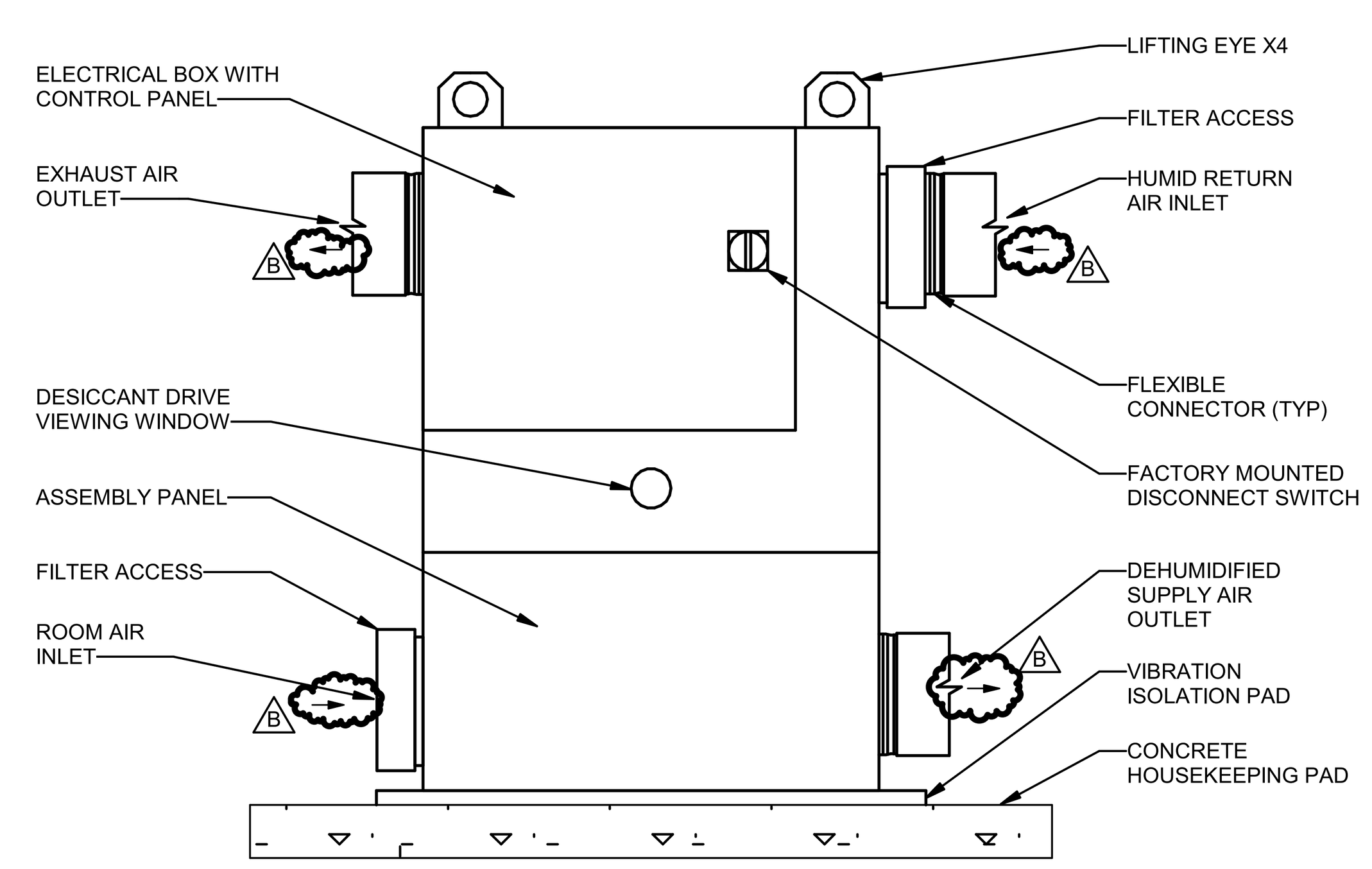
NOTE: ROUTE REFRIGERANT LIQUID, REFRIGERANT SUCTION, AND HOT GAS REHEAT PIPING TO DOAS AIR HANDLING UNIT. SIZE PIPING PER MANUFACTURER'S RECOMMENDATIONS.

A1 DOAS CU DETAIL
NOT TO SCALE



NOTE: ROUTE REFRIGERANT LIQUID, REFRIGERANT SUCTION, AND HOT GAS REHEAT PIPING TO DOAS CONDENSING UNIT. SIZE PIPING PER MANUFACTURER'S RECOMMENDATIONS.

A3 DOAS AHU DETAIL
NOT TO SCALE



A5 DEHUMIDIFIER DETAIL
NOT TO SCALE

NOTES
1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
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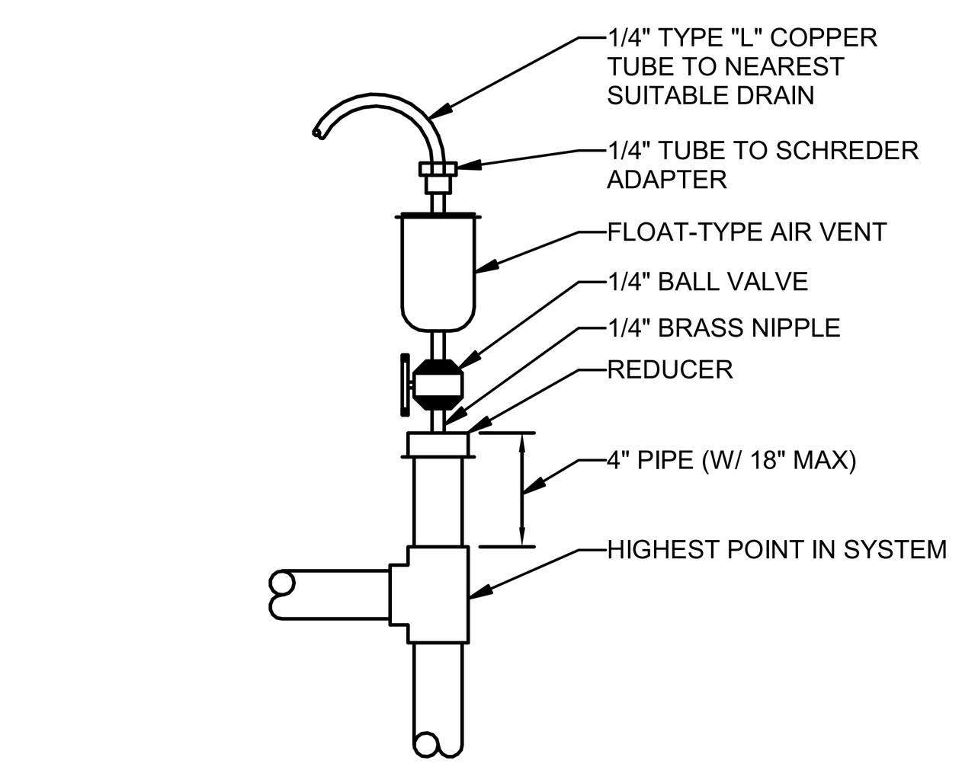
DRAWN BY:	STR

SHEET TITLE:
MECHANICAL DETAILS

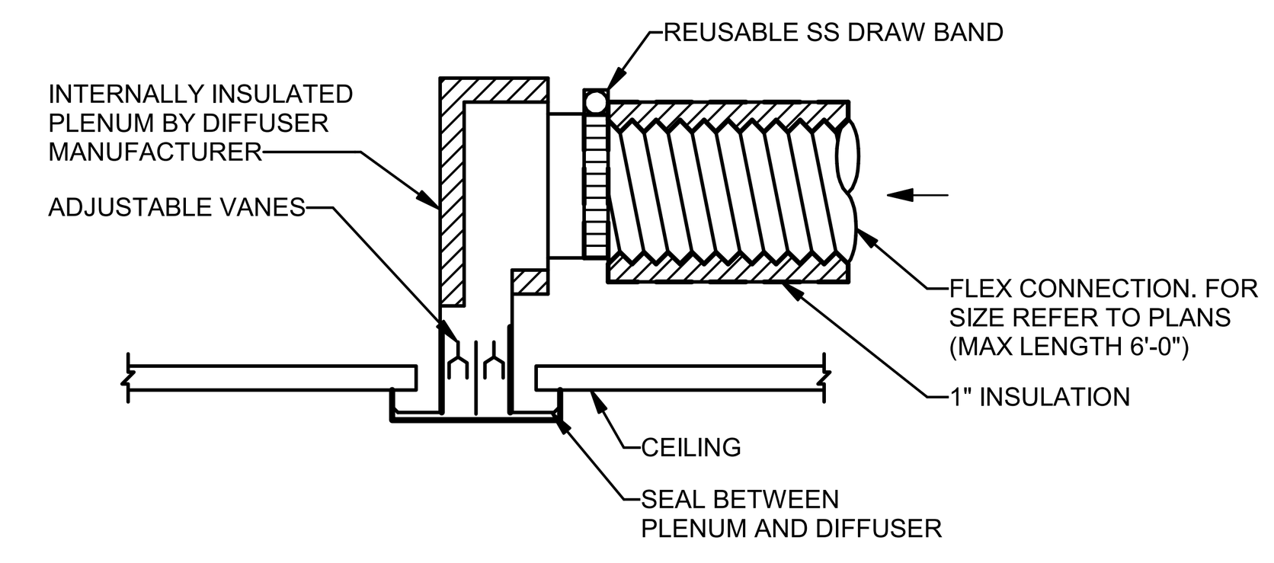
SHEET ID:
M-503

NOT FOR CONSTRUCTION



F1 AUTOMATIC AIR VENT ASSEMBLY DETAIL

NOT TO SCALE

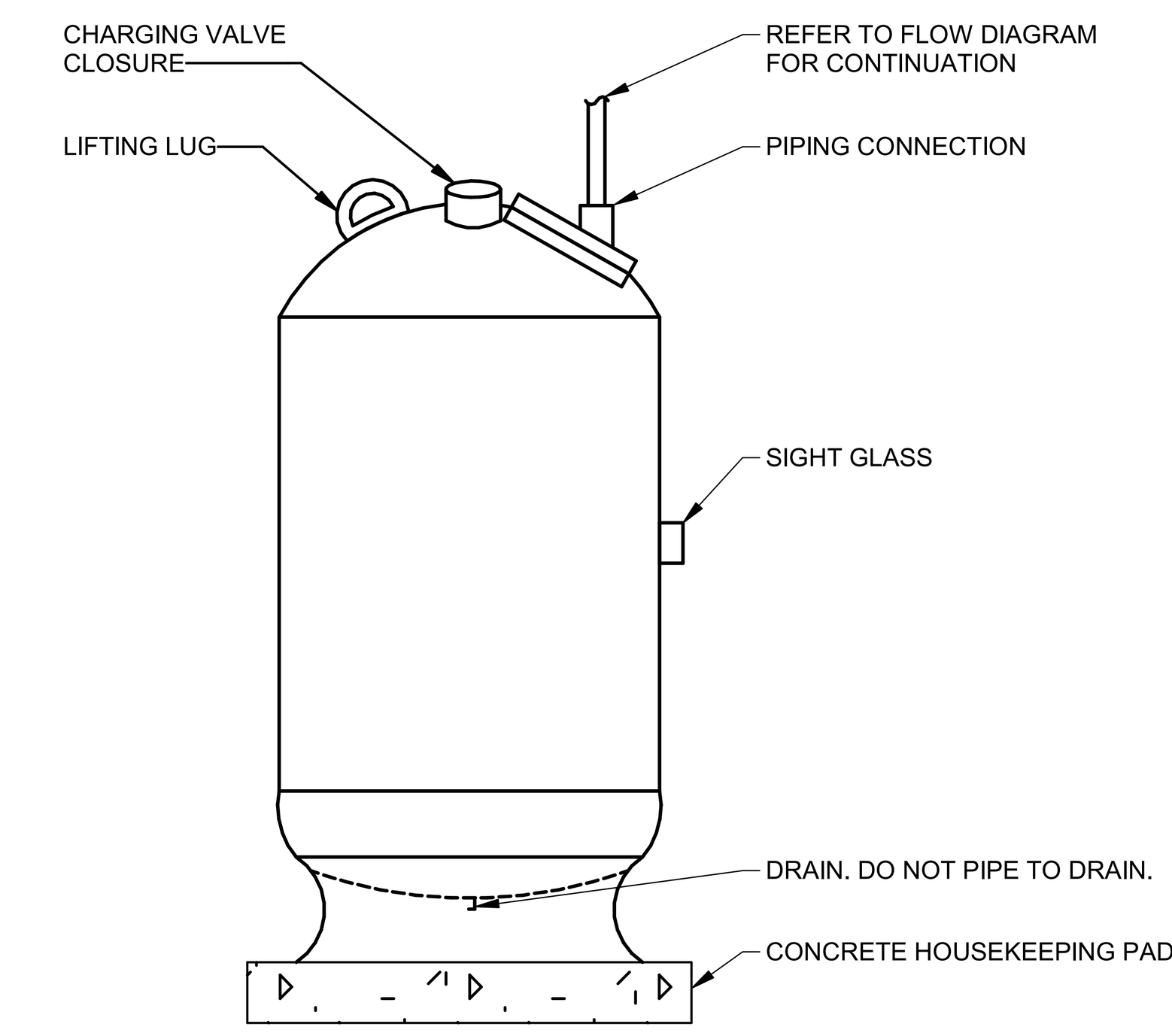


NOTES:

1. OFFSETS W/ FLEX DUCT SHALL NOT EXCEED 30° & SHALL BE GRADUAL. OFFSETS IN EXCESS OF 30° SHALL BE HARD DUCTED.
2. FLEX DUCT SHALL NOT HAVE MORE THAN 1/3" SAG/FT.
3. FOR PLENUM LENGTH REFER TO PLANS.

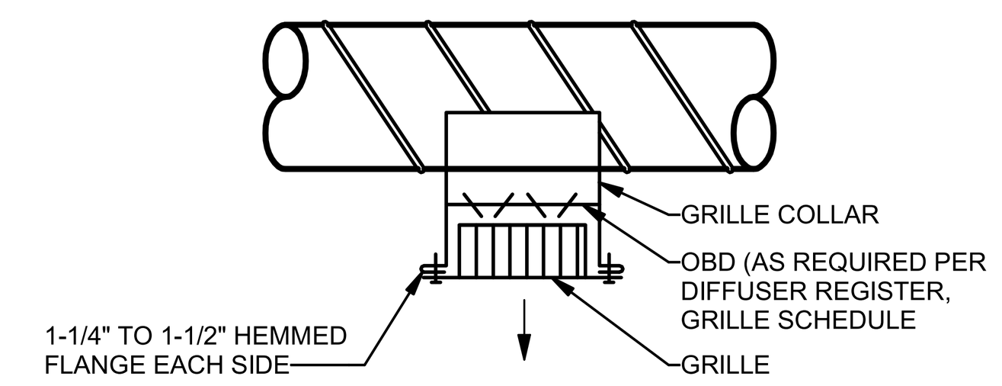
F4 LINEAR DIFFUSER PLENUM DETAIL

NOT TO SCALE



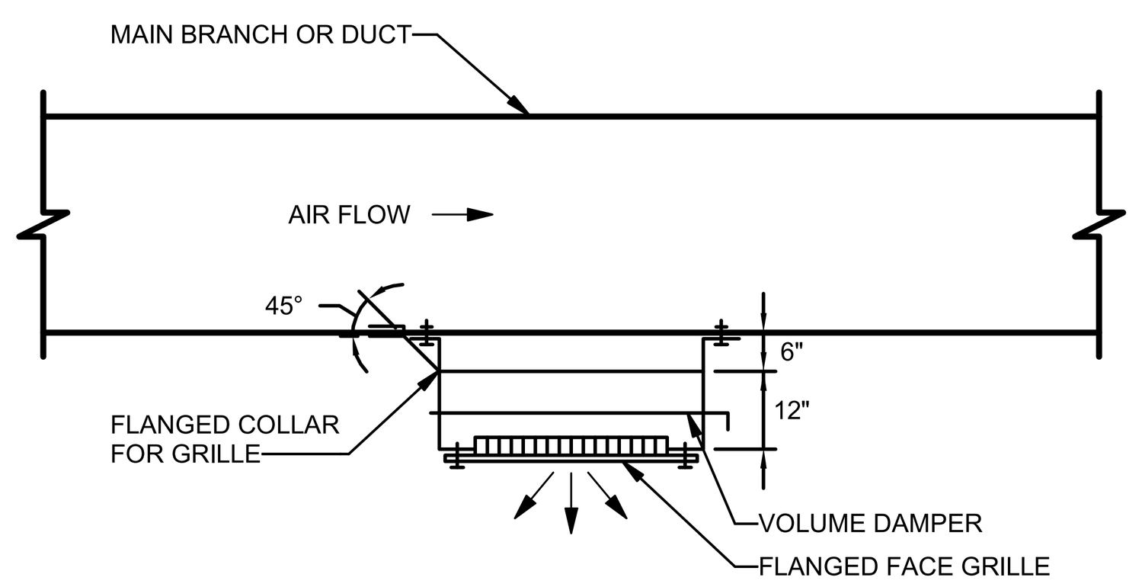
E5 BLADDER TYPE EXPANSION TANK DETAIL

NOT TO SCALE



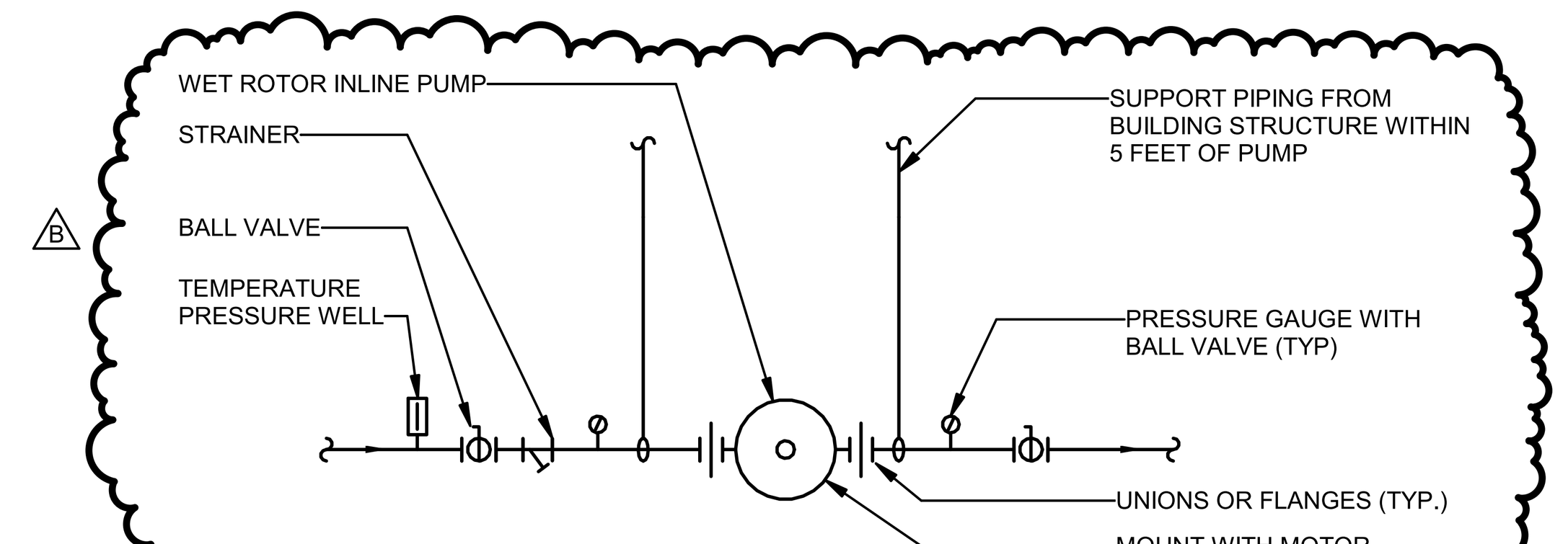
E4 ROUND DUCT WITH SIDEWALL GRILLE DETAIL

NOT TO SCALE



D1 DUCT SUPPLY GRILLE TAKE OFF DETAIL

NOT TO SCALE

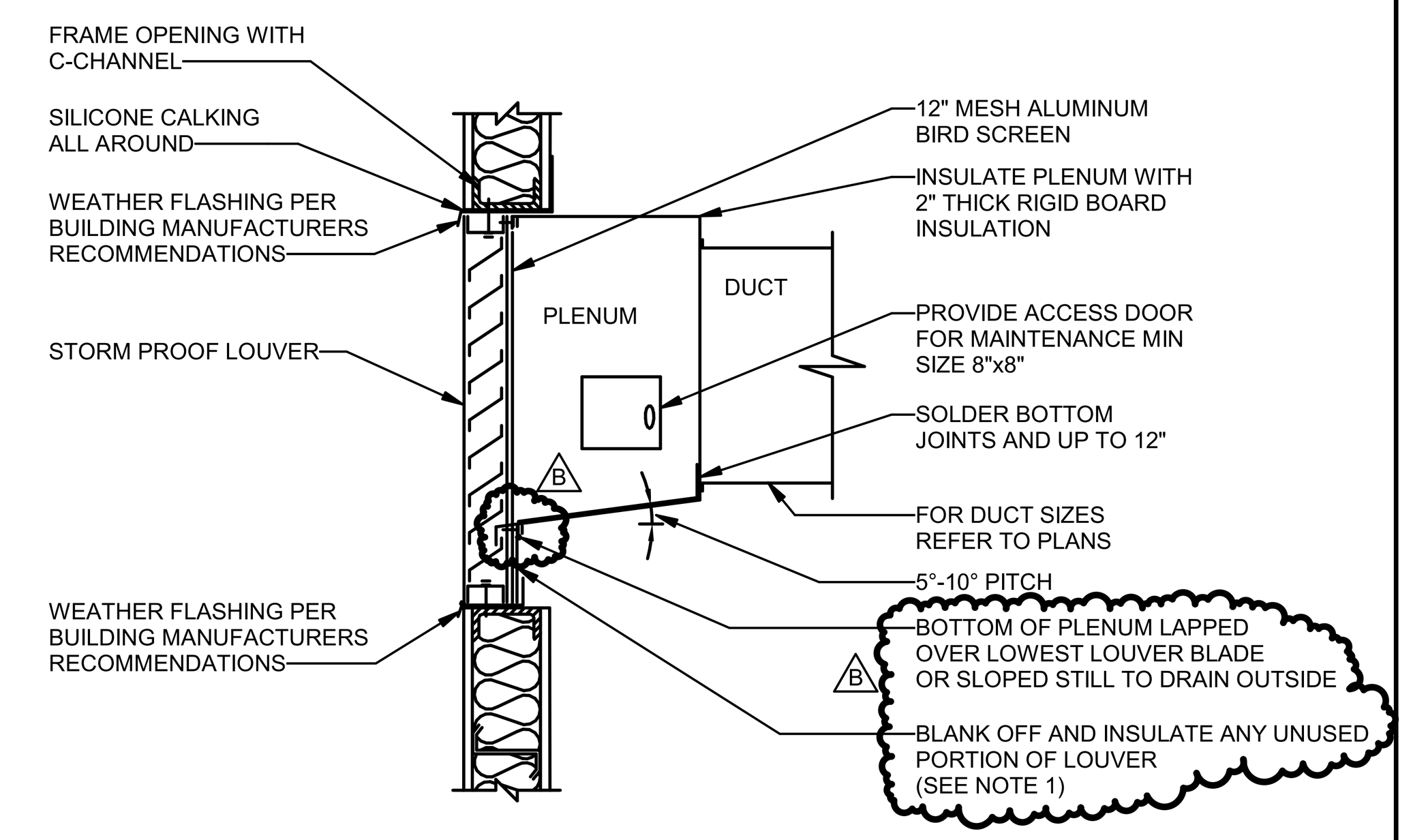


NOTES:

1. VALVES SHALL BE SAME SIZE AS PIPE

D4 WET ROTOR INLINE PUMP PIPING SCHEMATIC DETAIL

NOT TO SCALE

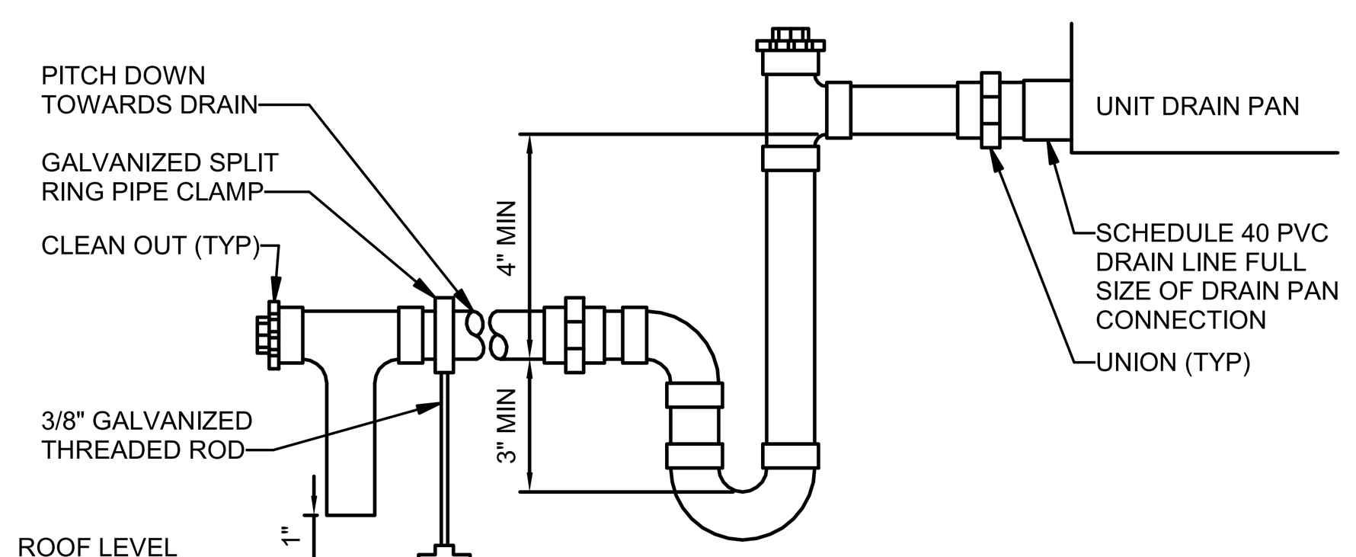


NOTE:

1. LOUVER PLENUM SHALL BE FULL SIZE OF LOUVER UNLESS NOTED OTHERWISE

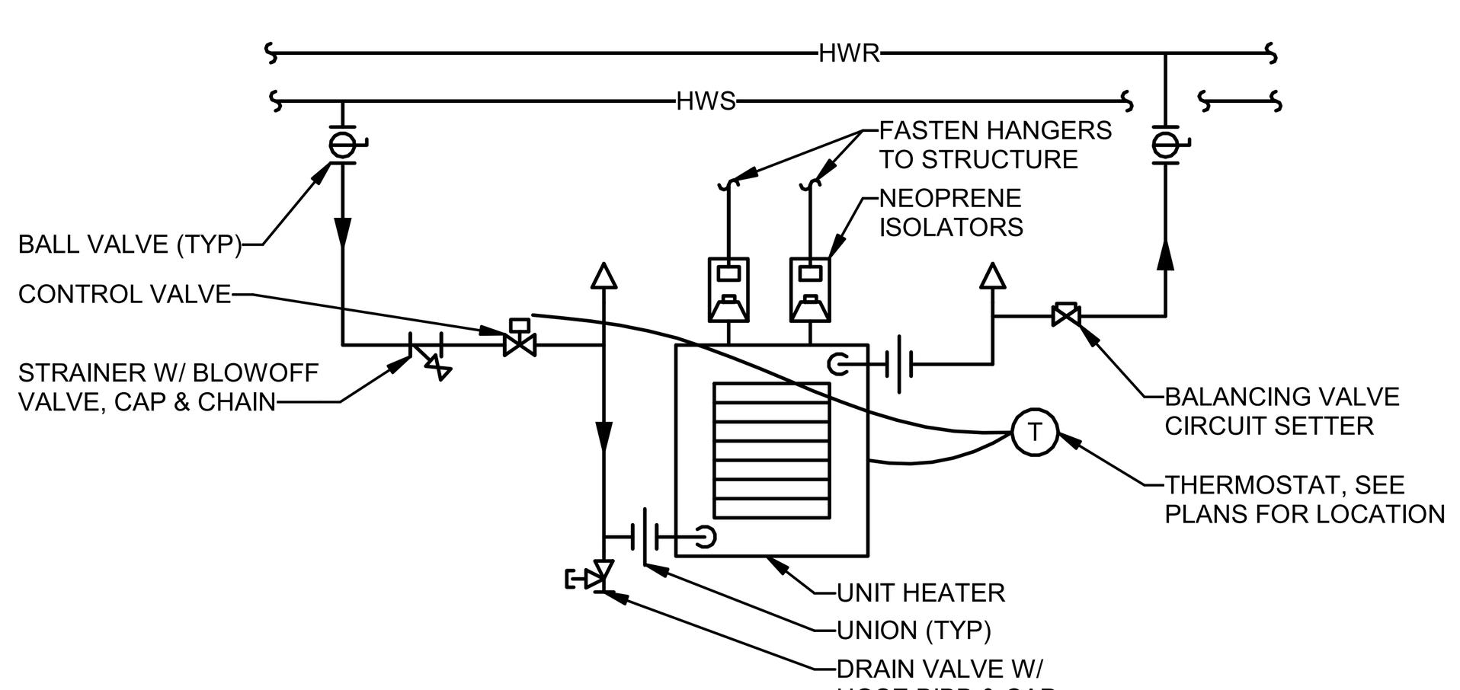
D5 LOUVER CONNECTION DETAIL

NOT TO SCALE



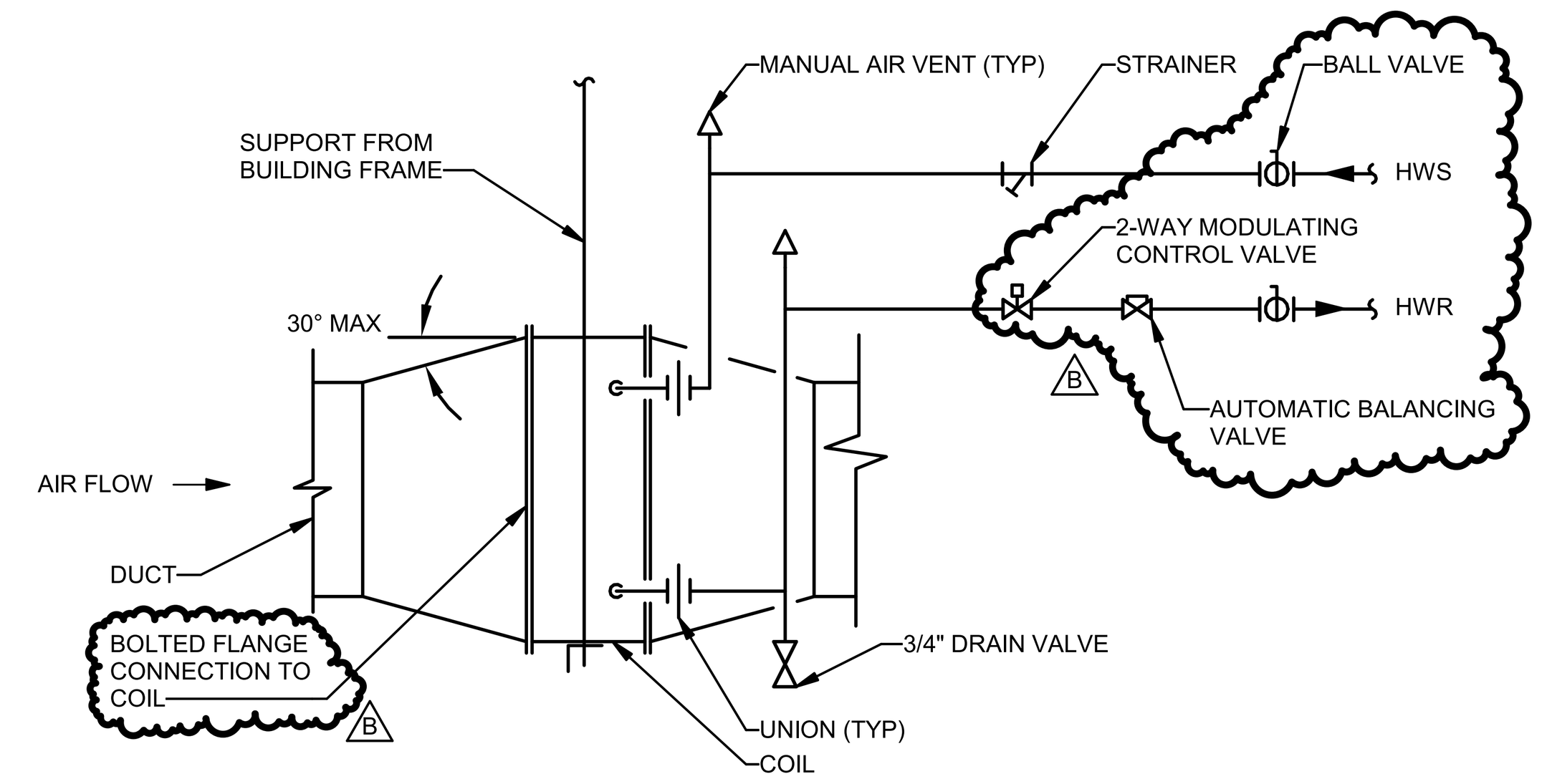
C1 CONDENSATE DRAIN ABOVE ROOF DETAIL

NOT TO SCALE



B1 HORIZONTAL UNIT HEATER PIPING DETAIL

NOT TO SCALE

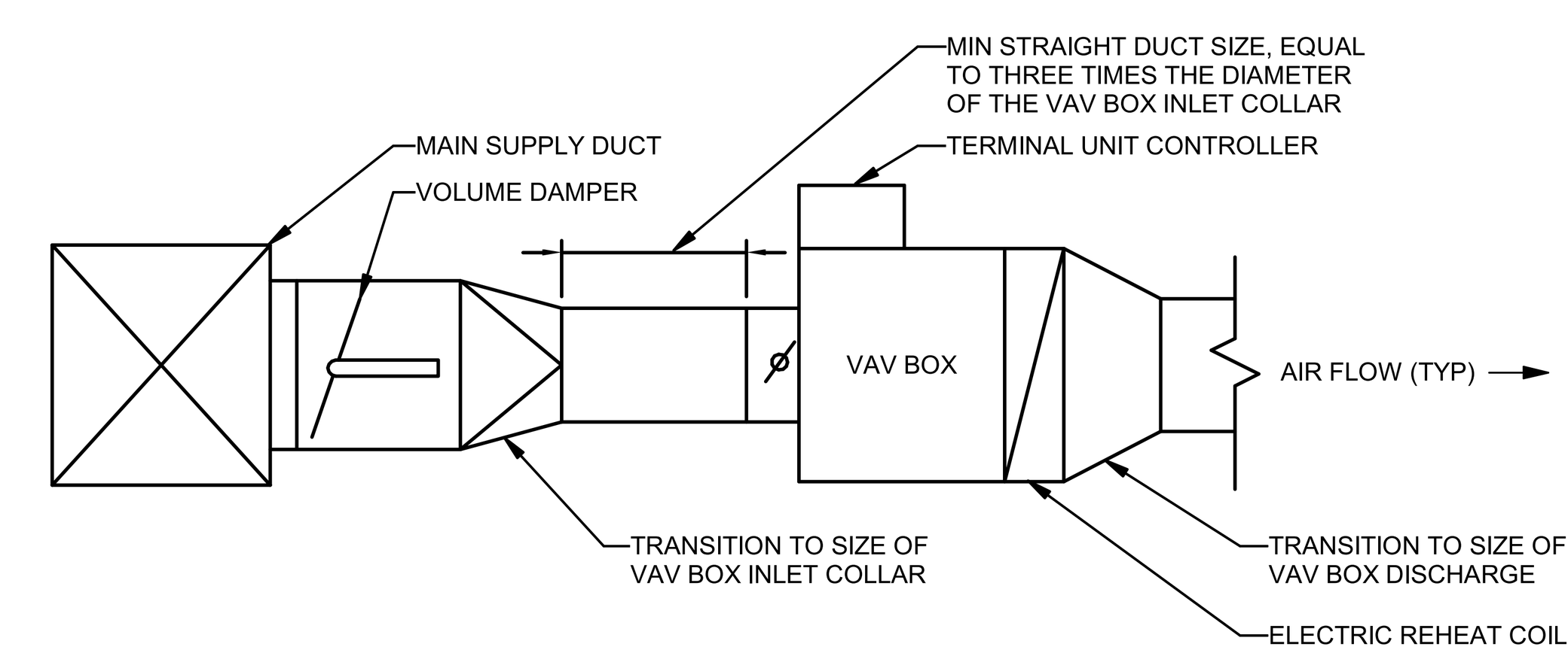


NOTES:

1. SUPPORT PIPE INDEPENDENT OF COIL
2. SUPPORT DUCT INDEPENDENT OF COIL
3. BRANCH RUN OUTS SHALL BE

B3 HOT WATER REHEAT COIL DETAIL

NOT TO SCALE

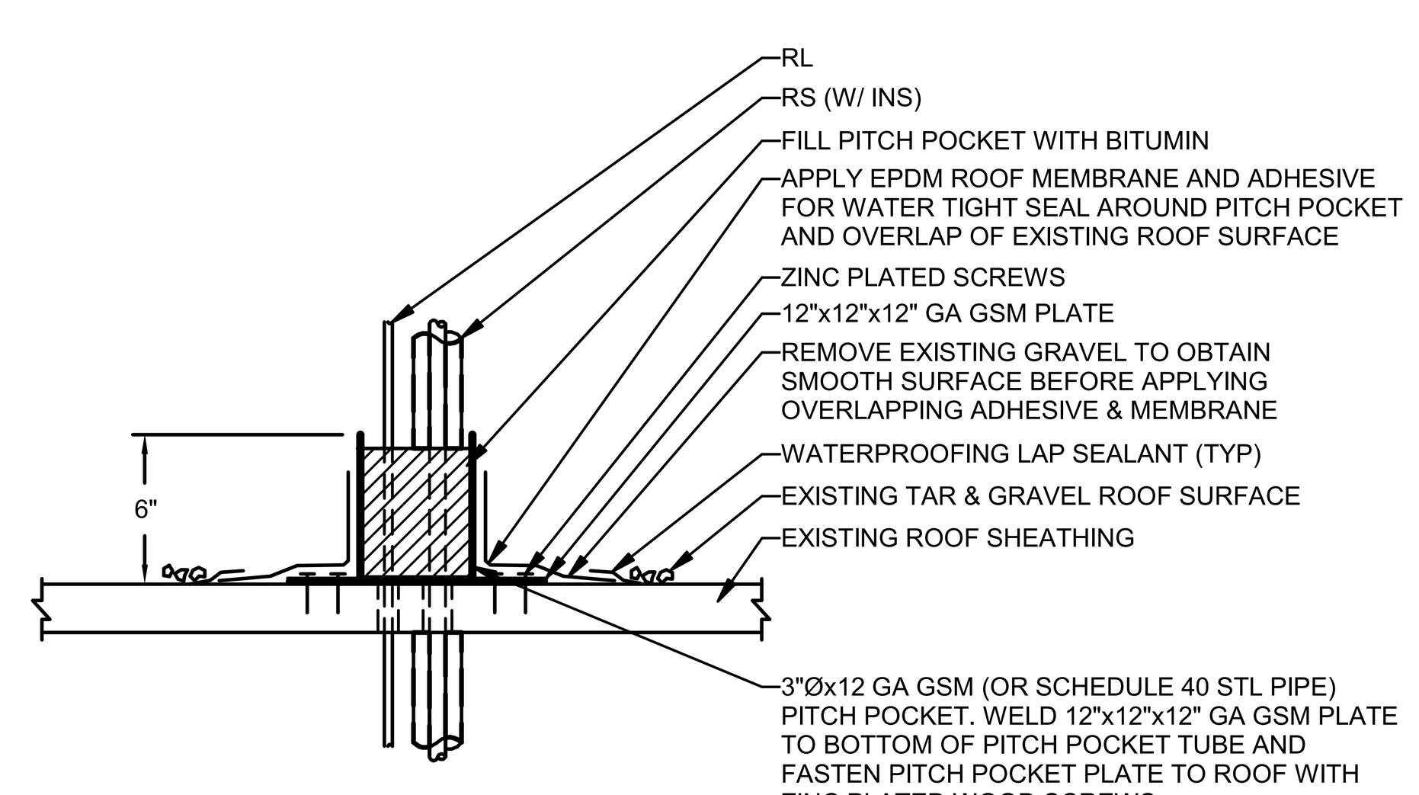


NOTES:

1. HEIGHT OF BRANCH TAKE OFF SHALL BE MINIMUM 2" LESS THAN HEIGHT OF MAIN DUCT. PROVIDE TRANSITION FROM BRANCH DUCT TO MAIN PER DETAIL.
2. VAV BOX WITH REHEAT COIL SHOWN - DETAIL MINUS COIL SECTION SECTION SHALL BE APPLICABLE FOR VAV BOX INSTALLATION

B5 VAV BOX CONNECTION WITH REHEAT DETAIL

NOT TO SCALE

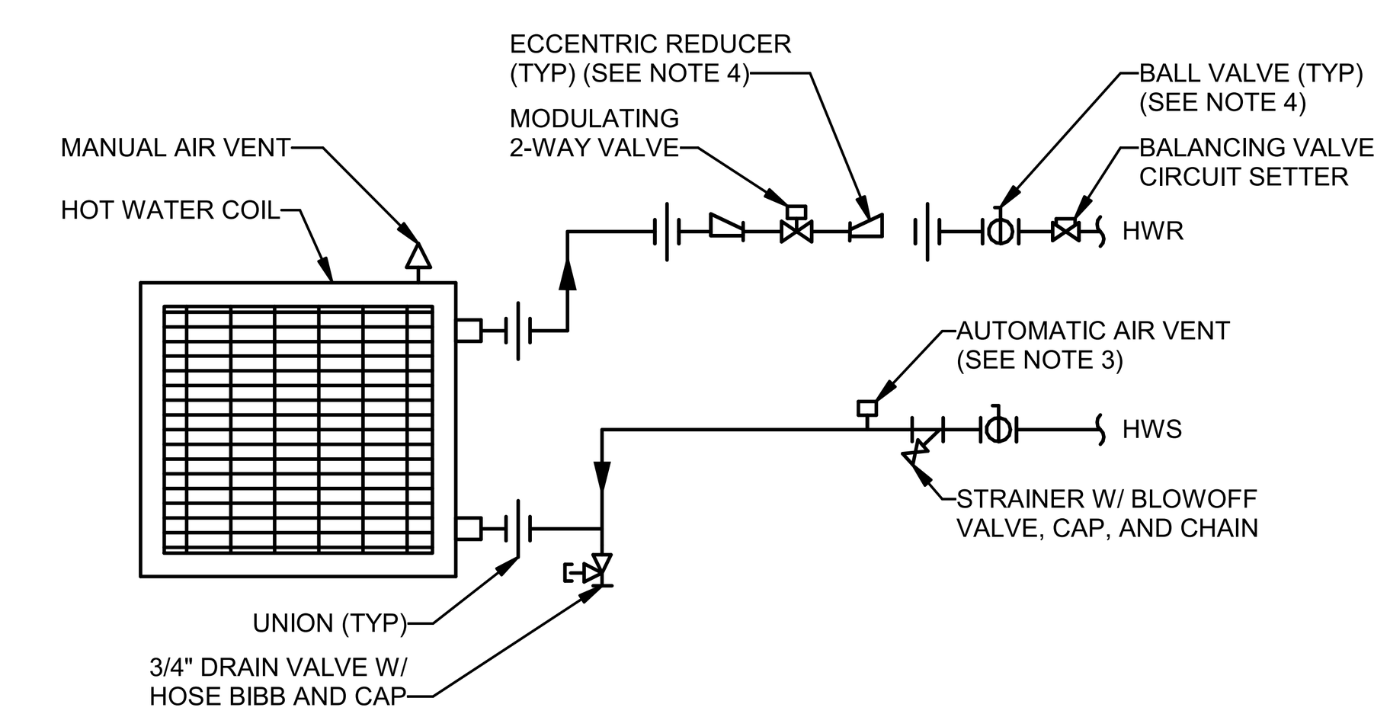


NOTES:

1. BORE OPENINGS IN EXIST ROOF FOR REFRIGERANT PIPES. REPAIR ANY DAMAGE TO EXIST ROOF SURFACE AROUND PENETRATION WITH EPDM MEMBRANE AND ADHESIVE FOR WATER TIGHT SEAL. ROOF REPAIRS SHALL BE MADE IN ACCORDANCE WITH STANDARD PROCEDURES FOR EXISTING ROOFING SYSTEM TYPE.

A3 REFRIGERANT PIPING PITCH POCKET DETAIL

NOT TO SCALE



NOTES:

1. PROVIDE (2) 90° ELBOWS ON SUPPLY AND RETURN AT COIL CONNECTION.
2. FOR PIPE SIZES 2-1/2" AND LARGER PROVIDE BUTTERFLY VALVES AND FLANGES VERSUS BALL VALVES AND UNIONS.
3. IF COIL HAS A HEADER LOCATE AUTOMATIC AIR VENT ON TOP OF COIL HEADER AND ELIMINATE MANUAL AIR VENT ON TOP OF COIL.
4. REDUCERS SHALL BE ECCENTRIC TYPE.

A5 VAV BOX HOT WATER COIL PIPING SCHEMATIC DETAIL

NOT TO SCALE

NOTES

1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. REFER TO STRUCTURAL DRAWINGS FOR EQUIPMENT HANGING DETAILS AND SUPPORT.

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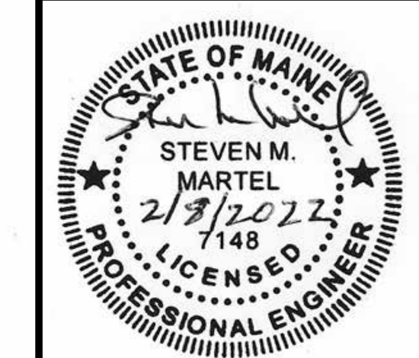

CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	SMM
DESIGNED BY:	AF
DRAWN BY:	STR

SHEET TITLE:
MECHANICAL DETAILS

SHEET ID:
M-504

NOT FOR CONSTRUCTION

GRAVITY VENTILATOR SCHEDULE

TAG	SERVICE	AIRFLOW (CFM)	THROAT VELOCITY (FPM)	PRESSURE DROP (IN. WG)	DUCT CONNECTION SIZE (IN)	BASIS OF DESIGN	NOTES
						MFG & MODEL	
GV-1	INTAKE; ERV-1	7550	839	0.1	36X36	GREENHECK FGI-36X36	1, 2

NOTES
1. PROVIDE WITH INTEGRAL BIRDSCREEN.
2. PROVIDE WITH MIN. 12" TALL MANUFACTURER FURNISHED ROOF CURB.
3. INSTALL CONTROL DAMPER, D-14, IN ROOF CURB.
4. 12" BASE.

GLYCOL MAKE-UP UNIT SCHEDULE

TAG	LOCATION	SERVES	TANK MATERIAL	TANK SIZE (GALLONS)	PUMP TYPE	FLUID	FLOW (GPM)	HEAD (PSIG)	PUMP			POWER			BASIS OF DESIGN			NOTES
									CONTROL	MHP	RPM	VOLTS	PHASE	HZ	MANUFACTURER	MODEL	WEIGHT (LB)	
GMU-1	MECHANICAL B-5	GLYCOL SYSTEM	HDPE	50	ROTARY VANE	30% PG	1.8	70	BMS	1/3	1,760	110	1	60	WESSELS	GMPD-23050	153	1, 2, 3, 4

NOTES:

1. PROVIDE TWIN PUMP UNIT WITH PRESSURE SWITCH AND ALTERNATING CONTROL
2. PROVIDE RELAY CONTACT FOR CONTROL THROUGH BMS SYSTEM
3. PROVIDE PRESSURE REDUCING VALVE SET TO MINIMUM SYSTEM PRESSURE
4. PROVIDE HOA CONTROL

FAN SCHEDULE

TAG	LOCATION	FAN TYPE	SYSTEM TYPE	DRIVE TYPE	AIRFLOW (CFM)	ESP (IN WG)	MOTOR SIZE (HP)	SPEED (RPM)	ELECTRICAL		MFR	MODEL NUMBER	WEIGHT (LBS)	NOTES
									V/Ph/Hz	FLA (A)				
SF-1	4TH FLOOR ROOF	FILTERED ROOF SUPPLY	SUPPLY	BELT	4,000	0.50	2	775	460/3/60	3.4	GREENHECK	SAF-115	260	1, 2

NOTES:
1. PROVIDE MANUFACTURER FURNISHED MIN 18 INCH HIGH ROOF CURB
2. NEMA 1 DISCONNECT SWITCH LOCATED WITHIN FAN HOUSING

VALVE SCHEDULE

TAG	SERVICE	TYPE	DOMESTIC CONNECTION SIZE (INCH)		MAX. FLOW RATE (GPM)	MAX. OPERATING PRESSURE (PSI)	TEMPERATURE (°F)		BASIS OF DESIGN		NOTES
			INLET	OUTLET			FROM WH	TO PLUMBING FIXTURES	MFG	MODEL	
MV-1	DOMESTIC WATER	THERMOSTATIC MIXING VALVE	1.5	1.5	24	125	140	105	WATTS	LFN SERIES	1, 2

NOTES:
1. LEAD FREE BRASS BODY CONSTRUCTION
2. RATED FOR POTABLE HOT WATER SERVICE

BRANCH CIRCUIT CONTROLLER SCHEDULE

TAG	SERVES	NUMBER OF PORTS	CONNECTED CAPACITY TO BC (MBH)	ELECTRICAL			BASIS OF DESIGN	NOTES
				VOLTS	PHASE	HZ	MITSUBISHI MODEL	
BCC-1	CU-1	12	153	208	1	60	TCMBM1012JA11N4	1, 2
BCC-2	CU-2	16	311	208	1	60	TCMBM1016JA11N4	1, 2
BCC-3	CU-3	16	195	208	1	60	TCMBM1016JA11N4	1, 2
BCC-5	CU-5	16	175	208	1	60	TCMBM1016JA11N4	1, 2
BCC-6	CU-6	8	74	208	1	60	TCMBM0108JA11N4	1, 2
BCC-7	CU-7	16	191	208	1	60	TCMBM1016KA11N4	1, 2
BCC-7-1	CU-7	8	84	208	1	60	TCMBS0108KB11N4	1, 2

NOTES:
1. PROVIDE WITH DIAMONDBACK BALL VALVES BV-SERIES, 700 PSIG WORKING PRESSURE, FULL PORT, 410A RATED.
2. COORDINATE WITH MANUFACTURER FOR MAXIMUM ALLOWABLE INDOOR UNIT CAPACITY FOR SUB BC CONTROLLER.

LOUVER SCHEDULE

TAG	LOCATION	SERVES	AIRFLOW		DEPTH (INCH)	WIDTH (INCH)	HEIGHT (INCH)	FACE AREA		FREE AREA		BLADE		APD (IN WC)	BASIS OF DESIGN		NOTES
			DIRECTION	CFM				SQ FT	FPM	SQ FT	FPM	TYPE	ANGLE		MFG	MODEL	
L-1A	ARCHIVES MECH RM	CU-4	EXHAUST	9,200	6	108	48	36.00	256	21.72	424	DRAINABLE	35	0.02	GREENHECK	ESD-635	1. 2
L-1B	ARCHIVES MECH RM	CU-4	INTAKE	9,200	6	108	48	36.00	256	21.72	424	DRAINABLE	35	0.02	GREENHECK	ESD-635	1, 2
L-2A	ARCHIVES MECH RM	CU-5	EXHAUST	14,850	6	108	48	36.00	413	21.72	684	DRAINABLE	35	0.06	GREENHECK	ESD-635	1, 2
L-2B	ARCHIVES MECH RM	CU-5	INTAKE	14,850	6	108	48	36.00	413	21.72	684	DRAINABLE	35	0.06	GREENHECK	ESD-635	1, 2
L-3A	ARCHIVES MECH RM	ERV-2	EXHAUST	3,105	6	108	48	36.00	86	21.72	143	DRAINABLE	35	0.00	GREENHECK	ESD-635	1, 2
L-3B	ARCHIVES MECH RM	ERV-2	INTAKE	3,450	6	108	48	36.00	96	21.72	159	DRAINABLE	35	0.00	GREENHECK	ESD-635	1, 2
L-4A	LIBRARY MECH RM	CU-1 &...	EXHAUST	14,150	6	108	48	36.00	393	21.72	651	DRAINABLE	35	0.06	GREENHECK	ESD-635	1, 2
L-4B	LIBRARY MECH RM	CU-1 &...	INTAKE	14,150	6	108	48	36.00	393	21.72	651	DRAINABLE	35	0.06	GREENHECK	ESD-635	1, 2
L-5A	LIBRARY MECH RM	CU-2	EXHAUST	14,150	6	108	48	36.00	393	21.72	651	DRAINABLE	35	0.06	GREENHECK	ESD-635	1, 2
L-5B	LIBRARY MECH RM	CU-2	INTAKE	14,150	6	108	48	36.00	393	21.72	651	DRAINABLE	35	0.06	GREENHECK	ESD-635	1, 2
L-6A	LIBRARY MECH RM	CU-3	EXHAUST	14,800	6	108	48	36.00	411	21.72	681	DRAINABLE	35	0.06	GREENHECK	ESD-635	1, 2
L-6B	LIBRARY MECH RM	CU-3	INTAKE	14,800	6	108	48	36.00	411	21.72	681	DRAINABLE	35	0.06	GREENHECK	ESD-635	1, 2
L-7	MUSEUM MECH RM	CU-7	EXHAUST	14,850	6	82	76	43.28	343	38.76	383	DRAINABLE	35	0.02	GREENHECK	ESD-635	1, 2
L-8	MUSEUM MECH RM	CU-6	EXHAUST	6,000	6	82	76	43.28	139	21.56	278	DRAINABLE	35	0.01	GREENHECK	ESD-635	1, 2
L-9	MUSEUM MECH RM	CU-7	INTAKE	14,850	6	82	76	43.28	343	38.76	383	DRAINABLE	35	0.02	GREENHECK	ESD-635	1, 2
L-10	MUSEUM MECH RM	CU-6	INTAKE	6,000	6	82	76	43.28	139	21.56	278	DRAINABLE	35	0.01	GREENHECK	ESD-635	1, 2
L-11	MUSEUM MECH RM	ERV-3	INTAKE	5,600	6	82	76	43.28	129	38.76	144	DRAINABLE	35	0.02	GREENHECK	ESD-635	1, 2
L-12	MUSEUM MECH RM	--	--	--	--	82	76	43.28	--	--	--	DRAINABLE	35	--	GREENHECK	ESD-635	1, 2, 3
L-13	LIBRARY MECH RM	ERV-1	EXHAUST	6,795	6	120	48	40.00	170	23.75	286	DRAINABLE	35	0.02	GREENHECK	ESD-635	1, 2

NOTES:
1. FABRICATE LOUVER OF EXTRUDED ALUMINUM BLADES AND FRAME WITH KYNAR FINISH.
2. PROVIDE LOUVER WITH 1/2 INCH MESH STAINLESS STEEL BIRD SCREEN.
3. BLANK OFF AND INSULATE LOUVER FROM THE INSIDE.

AIR SEPARATOR SCHEDULE

TAG	SERVICE	TYPE	CASING MATERIAL	CONNECTION SIZE (INCH)	FLUID	FLOW RATE (GPM)	PRESSURE DROP (FT WC)	BASIS OF DESIGN			NOTES
								MFG & MODEL	DRY WEIGHT (LBS)	FLOODED WEIGHT (LBS)	
AS-1	GLYCOL LOOP	AIR & DIRT SEPARATOR	CARBON STEEL	4.00	30% GLYCOL	220	3.74	TACO 4904AD-125	90	122	1 - 5
AS-2	HOT WATER LOOP	AIR & DIRT SEPARATOR	CARBON STEEL	2.00	WATER	39	1.54	TACO 4902AD-125	45	63	1 - 5

NOTES
1. PROVIDE WITH INTEGRAL STRAINER.
2. PROVIDE WITH FLANGED PIPE CONNECTIONS.
3. DESIGNED AND CONSTRUCTED PER ASME.
4. PROVIDE WITH HIGH CAPACITY AUTOMATIC AIR VENT.
5. ROUTE DRAIN LINE TO NEAREST FLOOR DRAIN.

FAN COIL UNIT SCHEDULE

TAG	COND. UNIT	LOCATION	UNIT				AIR FLOW				FAN		AIR					ELECTRICAL					BASIS OF DESIGN		NOTES
			TYPE	INLET	DISCH.	FILTERS	SUPPLY AIR (CFM)	OUTSIDE AIR		ESP	DRIVE		MODE	ENTERING	LEAVING	TMBH	SMBH	VOLTS	PHASE	HZ	MCA	MOCP	MITSUBISHI MODEL	WEIGHT (LBS)	
								CFM	% OF SA	(IN WC)	TYPE	CONTROL		DB/WB (°F)	DB/WB (°F)										
FCU-01-01	CU-1	OPEN STACKS 101	CEILING CONCEALED	HORI	HORI	--	1342	645	48%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	55/52.7	40.4	30.2	208	1	60	4.2	15	TPEFYP048MH142A	86	1 - 4
													HEATING	66.0	95.0	35.5	-								
FCU-01-02	CU-1	LIBRARY CLOSED STACKS 109	CEILING CONCEALED	HORI	HORI	--	777	610	39%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	54.4/52.4	23.7	17.5	208	1	60	2.4	15	TPEFYP027MH142A	124	1 - 4
													HEATING	66.0	92.9	22.0	-								
FCU-01-03	CU-1	MAIL 108	CEILING CONCEALED	HORI	HORI	MERV13	600	118	10%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	55/45.4	15.8	12.9	208	1	60	1.6	15	TPEFYP018MA143A	58	1 - 4
													HEATING	66.0	95.0	14.7	-								
FCU-01-04	CU-1	PRELIMILARY PROCESS 111	CEILING CONCEALED	HORI	HORI	MERV13	494	127	13%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	55/52	13.2	10.7	208	1	60	1.5	15	TPEFYP015MA143A	58	1 - 4
													HEATING	66.0	95.0	12.5	-								
FCU-01-05	CU-1	CORRIDOR 119	CEILING CONCEALED	HORI	HORI	MERV13	300	24	4%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	55/54	5.3	5.3	208	1	60	1.1	15	TPEFYP006MA143A	49	1 - 4
													HEATING	66.0	95.0	4.9	-								
FCU-01-06	CU-1	WORKSHOP 121	CEILING CONCEALED	HORI	HORI	MERV13	300	351	59%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	51.7/50.1	5.3	5.3	208	1	60	1.1	15	TPEFYP006MA143A	49	1 - 4
													HEATING	66.0	68.3	4.9	-								
FCU-01-07	CU-1	WORKSHOP 122	CEILING CONCEALED	HORI	HORI	MERV13	300	140	23%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	58/52.7	5.3	5.3	208	1	60	1.1	15	TPEFYP006MA143A	49	1 - 4
													HEATING	66.0	70.0	4.9	-								
FCU-01-08	CU-1	OPEN STACKS 101	CEILING CONCEALED	HORI	HORI	--	883	349	20%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	55/51.9	23.7	19.2	208	1	60	2.9	15	TPEFYP027MA144A	67	1 - 4
													HEATING	66.0	95.0	22.0	-								
FCU-02-01	CU-2	OPEN LIBRARY STACKS 217	CEILING CONCEALED	HORI	HORI	--	1,306	525	20%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	51.5/49.5	38.5	30.1	208	1	60	4.4	15	TPEFYP048MA144A	86	1 - 4
													HEATING	66.0	88.5	38.3	-								
FCU-02-02	CU-2	FL2, LIBRARY	CEILING CONCEALED	HORI	HORI	--	1,306	525	20%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	51.5/49.5	38.5	30.1	208	1	60	4.4	15	TPEFYP048MA144A	86	1 - 4
													HEATING	66.0	88.5	38.3	-								
FCU-02-03	CU-2	OPEN LIBRARY STACKS 217	CEILING CONCEALED	HORI	HORI	--	300	118	20%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	50/49	6.4	5.7	208	1	60	1.1	15	TPEFYP008MA143A	49	1 - 4
													HEATING	66.0	83.6	6.4	-								
FCU-02-05	CU-2	OPEN LIBRARY STACKS 217	CEILING CONCEALED	HORI	HORI	--	300	118	20%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	50/49	6.4	5.7	208	1	60	1.1	15	TPEFYP008MA143A	49	1 - 4
													HEATING	66.0	83.6	6.4	-								
FCU-02-06	CU-2	OPEN LIBRARY STACKS 217	CEILING CONCEALED	HORI	HORI	--	300	119	20%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	50/49	6.4	5.7	208	1	60	1.1	15	TPEFYP008MA143A	49	1 - 4
													HEATING	66.0	83.5	6.4	-								
FCU-02-07	CU-2	OPEN LIBRARY STACKS 217	CEILING CONCEALED	HORI	HORI	--	371	168	23%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	50/49	9.7	7.5	208	1	60	1.2	15	TPEFYP012MA143A	49	1 - 4
													HEATING	66.0	82.2	9.6	-								
FCU-02-08	CU-2	LIBRARY WEST	CEILING CONCEALED	HORI	HORI	--	1,271	606	24%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	50/49	28.8	25.3	208	1	60	4.3	15	TPEFYP036MA144A	84	1 - 4
													HEATING	66.0	78.9	28.4	-								
FCU-02-09	CU-2	OPEN STAIR	CEILING CONCEALED	HORI	HORI	--	300	136	23%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	55/51	6.4	5.7	208	1	60	1.1	15	TPEFYP008MA143A	49	1 - 4
													HEATING	68.0	89.4	6.4	-								
FCU-02-10	CU-2	CIRC OFFICE	CEILING CONCEALED	HORI	HORI	--	600	84	7%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	55/53.1	15.3	12.8	208	1	60	1.6	15	TPEFYP018MA143A	58	1 - 4
													HEATING	68.0	88.9	14.2	-								
FCU-02-11	CU-2	REF OFFICE	CEILING CONCEALED	HORI	HORI	--	600	68	6%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	55/52.7	15.3	12.8	208	1	60	2.9	15	TPEFYP018MA144A	58	1 - 4
													HEATING	68.0	90.4	14.2	-								
FCU-02-12	CU-2	CONFERENCE ROOM 211	CEILING CONCEALED	HORI	HORI	MERV13	371	75	10%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	54.8/52.3	10.2	7.8	208	1	60	1.2	15	TPEFYP012MA143A	49	1 - 4
													HEATING	68.0	84.3	9.6	-								
FCU-02-13	CU-2	LIBRARIAN	CEILING CONCEALED	HORI	HORI	MERV13	494	51	5%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	55/52.9	12.7	10.6	208	1	60	2.9	15	TPEFYP015MA144A	58	1 - 4
													HEATING	68.0	95.0	12.1	-								
FCU-02-14	CU-2	CONFERENCE ROOM 224	CEILING CONCEALED	HORI	HORI	--	1,412	265	9%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	55/52.9	40.7	33.2	208	1	60	3.5	15	TPEFYP048MA143A	86	1 - 4
													HEATING	68.0	80.1	38.4	-								
FCU-02-15	CU-2	OFFICE 227 (GENEOLOGY OFFICE)	CEILING CONCEALED	HORI	HORI	--	300	43	7%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	55/51.6	5.1	5.1	208	1	60	1.1	15	TPEFYP006MA143A	49	1 - 4
													HEATING	68.0	73.1	4.8	-								
FCU-02-16	CU-2	OFFICE 227 (DOCUMENTS)	CEILING CONCEALED	HORI	HORI	--	600	329	27%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	55/51.3	14.5	12.3	208	1	60	1.6	15	TPEFYP018MA143A	58	1 - 4
													HEATING	66.0	88.5	14.3	-								
FCU-03-01	CU-3	OFFICE 302	CEILING CONCEALED	HORI	HORI	--	600	84	7%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	55/53.5	15.8	13.0	208	1	60	2.9	15	TPEFYP018MA144A	58	1 - 4
													HEATING	68.0	95.0	16.0	-								
FCU-03-02	CU-3	OFFICE 302A	CEILING CONCEALED	HORI	HORI	--	494	58	6%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	55/53.3	13.2	10.8	208	1	60	2.9	15	TPEFYP015MA144A	58	1 - 4
													HEATING	68.0	94.3	13.6	-								
FCU-03-03	CU-3	STORAGE 303	CEILING CONCEALED	HORI	HORI	--	300	93	16%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	55/53.8	7.0	6.1	208	1	60	1.8	15	TPEFYP008MA144A	47	1 - 4
													HEATING	68.0	95.0	7.0	-								
FCU-03-04	CU-3	PROCESSING EXT	CEILING CONCEALED	HORI	HORI	--	494	66	7%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	55/53.7	13.2	10.8	208	1	60	2.9	15	TPEFYP015MA144A	58	1 - 4
													HEATING	68.0	95.0	13.6	-								
FCU-03-05	CU-3	PROCESSING 309	CEILING CONCEALED	HORI	HORI	--	600	190	16%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	55/53.5	15.8	13.0	208	1	60	1.6	15	TPEFYP018MA143A	58	1 - 4
													HEATING	68.0	77.7	16.0	-								
FCU-03-06	CU-3	CONFERENCE 305	CEILING CONCEALED	HORI	HORI	--	371	150	20%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	50/48.6	10.5	7.9	208	1	60	1.2	15	TPEFYP012MA143A	49	1 - 4
													HEATING	68.0	78.2	10.8	-								
FCU-03-07	CU-3	CORRIDOR	CEILING CONCEALED	HORI	HORI	--	300	70	12%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	55/54.2	5.3	5.3	208	1	60	1.1	15	TPEFYP006MA143A	49	1 - 4
													HEATING	68.0	85.9	5.4	-								
FCU-03-08	CU-3	MAKER SPACE 318	CEILING CONCEALED	HORI	HORI	--	494	63	6%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	55/53.2	13.2	10.8	208	1	60	2.9	15	TPEFYP015MA144A	58	1 - 4
													HEATING	68.0	95.0	13.6	-								
FCU-03-09	CU-3	MIMEO	CEILING CONCEALED	HORI	HORI	MERV13	600	70	6%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	55/53.4	15.8	13.0	208	1	60	2.9	15	TPEFYP018MA144A	58	1 - 4
													HEATING	68.0	88.3	16.0	-								
FCU-03-10	CU-3	OFFICE - STORAGE	CEILING CONCEALED	HORI	HORI	--	371	80	11%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	55/53.6	10.5	7.9	208	1	60	2.1	15	TPEFYP012MA144A	47	1 - 4
													HEATING	68.0	93.2	10.8	-								
FCU-03-11	CU-3	LIBRARY LOBBY 325	CEILING CONCEALED	HORI	HORI	--	494	138	14%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	53.8/52.1	13.2	10.8	208	1	60	2.9	15	TPEFYP015MA144A	58	1 - 4
													HEATING	68.0	78.9	13.6	-								
FCU-03-12	CU-3	MUSEUM RESTROOMS 367/369	CEILING CONCEALED	HORI	HORI	--	300	0	0%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	54.8/52.4	7.0	6.1	208	1	60	1.1	15	TPEFYP008MA143A	49	1 - 4
													HEATING	68.0	87.9	7.0	-								
FCU-03-13	CU-3	MUSEUM LOBBY 373	CEILING CONCEALED	HORI	HORI	--	494	250	25%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	51.5/50.9	13.2	10.8	208	1	60	2.9	15	TPEFYP015MA144A	58	1 - 4
													HEATING	68.0	79.9	13.6	-								
FCU-03-14	CU-3	GIFT SHOP 374	CEILING CONCEALED	HORI	HORI	--	371	308	42%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	52.4/52.3	10.5	7.9	208	1	60	2.1	15	TPEFYP012MA144A	47	1 - 4
													HEATING	68.0	85.4	10.8	-								
FCU-03-15	CU-3	MAIN LOBBY 327	CEILING CONCEALED	HORI	HORI	--	300	123	21%	0.6	DIRECT	VARIABLE SPEED	COOLING	74/62	55/53.4	7.0	6.1	208	1	60	1.1	15	TPEFYP008MA143A	49	1 - 4
													HEATING	68.0	79.6	7.0	-								
FCU-04-04	CU-4	STACKS 112 SOUTH	CEILING CONCEALED	HORI	HORI	MERV13	883	577	33%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	50.3/49.5	20.5	17.7	208	1	60	2.7	15	TPEFYP024MA143A	67	1 - 4
													HEATING	66.0	0.0	19.4	-								
FCU-04-05	CU-4	STACKS 112 NORTH	CEILING CONCEALED	HORI	HORI	MERV13	883	652	37%	0.6	DIRECT	VARIABLE SPEED	COOLING	70/58	50/48.8	25.7	20.6	208	1	60	2.9	15	TPEFYP030MA144A	67	1 - 4
													HEATING	66.0	0.0	24.4	-								

NOTES:
1. REFRIGERANT SHALL BE R-410A.
2. SEE MECHANICAL FLOOR PLANS FOR LOCATIONS
3. TAG NUMBERS INCLUDE ASSOCIATED CONDENSING UNIT: FCU - CONDENSING UNIT NUMBER - FAN COIL UNIT NUMBER
4. PROVIDE INTEGRAL CONDENSATE PUMP

NOTES

1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.

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STATE OF MAINE
BUREAU OF GENERAL SERVICES
111 SEWALL STREET, 4TH FLOOR
AUGUSTA, MAINE 04333-0077
(207) 624-7314

STATE OF MAINE
STEVEN M. MARTEL
2/8/2022
7148
LICENSED
PROFESSIONAL ENGINEER

CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO: 3618208720
PROJECT MANAGER: KFM
A/E OF RECORD: SMM
DESIGNED BY: SMM
DRAWN BY: STR

SHEET TITLE:
MECHANICAL SCHEDULES

SHEET ID:
M-602

NOT FOR CONSTRUCTION

AIR HANDLING UNIT SCHEDULE

TAG	SERVES	AIR FLOW: SUPPLY AIR MAX (CFM)	AIR FLOW: MINIMUM OUTSIDE AIR (CFM)	FAN: FAN SERVICE	FAN: STATIC PRESSURE ESP (IN WC)	FAN: STATIC PRESSURE TOTAL (IN WC)	FAN: DRIVE TYPE	FAN: DRIVE CONTROL	FAN: DRIVE DESIGN (HZ)	FAN: WHEEL TYPE	FAN: WHEEL NUMBER OF FANS	FAN: WHEEL DIAMETER (INCH)	FAN: WHEEL RPM	FAN: MOTOR BHP EACH	FAN: MOTOR MHP EACH	FAN: MOTOR NOMINAL RPM	FILTERS: FILTER TYPE	FILTERS: MERV	FILTERS: DEPTH (INCH)	FILTERS: APD (10) (IN WC)	FILTERS: AREA (SF)	COILS: COIL TYPE	AIR: EAT °F DB	AIR: EAT °F WB	AIR: LAT °F DB	AIR: LAT °F WB	AIR: APD (IN WC)	FLUID: FLUID	FLUID: EWT (°F)	FLUID: LWT (°F)	FLUID: FLOW (GPM)	FLUID: WPD (FT)	COIL: AREA (SF)	COIL: ROWS	COIL: FINS (FPF)	CAPACITY: TOTAL MBH	CAPACITY: SENS MBH
AHU-1	EXHIBIT LEVELS 1 & 2	6,600	2,110	RETURN	1.50	1.92	DIRECT	VFD	62	PLENUM AIRFOIL	1	20.00	1,455	3.9	5.0	1,800	PRE	8	2	0.65	13.44	VRF COOLING	72.0	62.0	54.0	52.7	0.42	R-410A	N/A	N/A	N/A	N/A	13.4	4	144	161	118
				SUPPLY	2.00	4.61	DIRECT	VFD	76	PLENUM AIRFOIL	1	20.00	2,248	7.6	10	1,800	FINAL	15	12	0.83	13.44	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
AHU-2	EXHIBIT LEVEL 3	4,700	1,230	RETURN	1.50	1.80	DIRECT	VFD	73	PLENUM AIRFOIL	1	18.25	2,140	3.0	5.0	1,800	PRE	8	2	0.67	8.67	VRF COOLING	72.0	62.0	55.0	53.5	0.70	R-410A	N/A	N/A	N/A	N/A	10	4	158	131	88
				SUPPLY	2.00	4.76	DIRECT	VFD	79	PLENUM AIRFOIL	1	18.25	2,341	5.6	7.5	1,800	FINAL	15	12	0.62	18.89	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
AHU-3	EXHIBIT LEVEL 4	4,400	980	SUPPLY	2.00	4.68	DIRECT	VFD	69	PLENUM AIRFOIL	1	22.25	2,026	9.5	10.0	1,800	PRE	8	2	0.63	18.89	VRF COOLING	72.0	63.0	55.0	53.5	0.76	R-410A	N/A	N/A	N/A	N/A	6.1	4	163	84	56
																	FINAL	14	12	0.80	18.89	HYDRONIC HEATING	65.0	N/A	89.8	N/A	0.02	30% GLYCOL	170	140	2.8	0.39	5.3	1	80	40	N/A
AHU-4	ATRIUM	7,500	770	SUPPLY	1.50	3.42	DIRECT	VFD	60	PLENUM AIRFOIL	1	20.00	2,042	6.3	7.5	1,800	PRE	8	2	0.01	-	DX COOLING	76.2	63.4	51.2	51.0	0.35	R-410A	N/A	N/A	N/A	N/A	17.4	4	15	209	191
																	FINAL	14	4	0.82	-	HYDRONIC HEATING	64.5	N/A	95.0	N/A	0.39	30% GLYCOL	170	140	16.3	0.50	17.4	2	12	233	N/A

AIR HANDLING UNIT SCHEDULE (CONTINUED)

TAG	SERVES	ARRANGEMENT: ACCESS SIDE	ARRANGEMENT: BASE RAIL HEIGHT (INCH)	POWER SUPPLY: LOAD	POWER SUPPLY: VOLTS	POWER SUPPLY: PHASE	HZ	CURRENT: FLA (AMPS)	CURRENT: MCA (AMPS)	CURRENT: MFS (AMPS)	BASIS OF DESIGN: MFG	BASIS OF DESIGN: MODEL	BASIS OF DESIGN: WEIGHT (LBS)	NOTES
AHU-1	EXHIBIT LEVELS 1& 2	LEFT	6	UNIT	480	3	60	22.20	25.70	35	TRANE	CSAA014	2,814	1, 2, 3, 4, 6, 7, 8, 9
				LIGHTS	120	1	60	2.61	3.26	15				
				RECEPTACLE	120	1	60	8.00	10.00	15				
				LEV	208	1	60	0.06	--	15				
				LEV	208	1	60	0.06	--	15				
AHU-2	EXHIBIT LEVEL 3	LEFT	6	UNIT	480	3	60	19.20	21.95	30	TRANE	CSAA010	2,449	1, 2, 3, 4, 6, 7, 8, 9
				LIGHTS	120	1	60	2.61	3.26	15				
				RECEPTACLE	120	1	60	8.00	10.00	15				
				LEV	208	1	60	0.06	--	15				
				LEV	208	1	60	0.06	--	15				
AHU-3	EXHIBIT LEVEL 4	LEFT	6	UNIT	480	3	60	8.20	10.25	30	TRANE	CSAA006	1,540	1, 2, 3, 4, 6, 7, 8, 9
				LIGHTS	120	1	60	2.61	3.26	15				
				RECEPTACLE	120	1	60	8.00	10.00	15				
				LEV	208	1	60	0.06	--	15				
AHU-4	ATRIUM	-	6	UNIT	480	3	60	40.80	44.00	50	TRANE	OADG017F3	3,130	1, 2, 3, 4, 5, 8, 9, 10, 11
				-	-	-	-	-	-	-		ANPA 20		

NOTES
1. PROVIDE FACTORY WIRED LED MARINE TYPE LIGHTS IN FAN SECTIONS WITH LIGHT SWITCH & CONVENIENCE OUTLET ON OUTSIDE OF UNIT CASING.
2. PROVIDE 115 VOLT - 15 AMP CIRCUIT FOR UNIT LIGHTS & CONVENIENCE OUTLET.
3. PROVIDE UNIT MOUNTED VFDS.
4. MID-LIFE FILTER PRESSURE DROP LISTED FOR FILTERS AND USED FOR FAN PERFORMANCE RATING.
5. ROOFTOP UNIT WITH INTEGRAL COOLING COMPRESSORS AND CONDENSERS.
6. PROVIDE INLET BELL AND PERFORATED PANELS ON FAN SECTIONS TO REDUCE NOISE.
7. PROVIDE LEV KIT AND REFRIGERANT CIRCUITING TO MATCH VRF CONDENSING UNIT. REQUIRES DEDICATED 208V/1PH CIRCUIT.
8. PROVIDE WITH DUCT MOUNTED SMOKE DETECTOR.
9. PROVIDE WITH CONDENSATE OVERFLOW SWITCH.
10. PROVIDE UNIT MANUFACTURER'S CURB WITH MINIMUM 21 INCH HIGH HORIZONTAL DISCHARGE CURB EXTENSION. CURBS SHALL BE GALVANIZED STEEL WITH 1 INCH THICK FOIL FACED INSULATION.
11. PROVIDE FULLY MODULATION OUTSIDE AIR DAMPER.

CONDENSING UNIT SCHEDULE

TAG	SERVES	# OF MODULES	CONDENSER AIR FLOW: # FANS	CONDENSER AIR FLOW: TOTAL CFM	CONDENSER AIR FLOW: ESP IN WC	CAPACITY: COOLING MBH	CAPACITY: HEATING MBH	COOLING EFFICIENCY IEER / EER	HEATING OUTDOOR TEMP DEG F	COOLING OUTDOOR TEMP DEG F	REFRIGERANT CHARGE PER MODULE: FACTORY LBS	REFRIGERANT CHARGE PER MODULE: FIELD ADDED LBS	REFRIGERANT CHARGE PER MODULE: TOTAL LBS	ELECTRICAL PER MODULE: VOLTS	ELECTRICAL PER MODULE: PHASE	ELECTRICAL PER MODULE: HZ	ELECTRICAL PER MODULE: MCA AMPS	ELECTRICAL PER MODULE: MOCP AMPS	BASIS OF DESIGN: MITSUBISHI MODEL	BASIS OF DESIGN: WEIGHT LBS	NOTES
CU-1	FIRST FLOOR LIBRARY	1	2	9,200	0.32	129	112	25.9 / 11.6	33.6	88.0	24	63.1	87	460	3	60	20	30	TURYP1444AN40AN	715	1 - 5
CU-2	SECOND FLOOR LIBRARY	2	4	19,100	0.32	254	247	24.25 / 10.55	33.6	88.0	24	95.8	120	460	3	60	20	30	TURYP2884BN40AN	1,364	1 - 5
CU-3	THIRD FLOOR LIBRARY	2	4	14,800	0.32	171	176	27.5 / 12.7	33.6	88.0	11	52.7	63	460	3	60	15	20	TURYP1924BN40AN	1,222	1 - 5
CU-4	FIRST/SECOND FLOOR ARCHIVES	1	2	9,200	0.32	128	121	27.5 / 12.9	33.6	88.0	23	40.1	63	460	3	60	21	35	TUHYE1444AN40AN	715	1 - 5
CU-5	THIRD FLOOR ARHIVES	1	2	14,850	0.32	151	133	23.55 / 10.8	33.6	88.0	24	57.0	81	460	3	60	28	40	TURYP1684AN40AN	774	1 - 5
CU-6	FOURTH FLOOR MUSEUM	1	1	6,000	0.32	56	62	26.5 / 13.9	33.6	88.0	11	42.5	54	460	3	60	11	15	TURYP0724AN40AN	552	1 - 5
CU-7	FIFTH FLOOR MUSEUM	1	2	14,850	0.32	144	132	23.55 / 110.8	33.6	88.0	24	69.7	93	460	3	60	28	40	TURYP1684AN40AN	774	1 - 5
CU-8	AHU-1	2	4	13,400	0	185	112	28.15 / 13	-7.5	95.0	22	20.0	42	460	3	60	15	20	TUHYP1924BN40AN	1,210	1 - 3, 5
CU-9	AHU-2	2	4	13,400	0	185	112	28.15 / 13	-7.5	95.0	22	20.0	42	460	3	60	15	20	TUHYP1924BN40AN	1,210	1 - 3, 5
CU-10	AHU-3	1	2	6,700	0	95	57	29.4 / 14	-7.5	95.0	22	8.7	30	460	3	60	15	20	TUHYP0964AN40AN	605	1 - 3, 5

NOTES:
1. TWO DIRECT DRIVE CONDENSER FANS SHALL BE INVERTER CONTROLLED AND BRUSHLESS DC MOTOR.
2. PROVIDE WITH PANEL HEATER KIT
3. USES R-410A AS REFRIGERANT.
4. PROVIDE WITH EXTERNAL STATIC PRESSURE OPTION.
5. DISCONNECT SWITCH(ES) BY DIV 26

CONTROL DAMPERS SCHEDULE

TAG	LOCATION	SERVES	MATERIAL	TYPE	BLADE ACTION	AIRFLOW: DIRECTION	AIRFLOW: AIRFLOW PER DAMPER (CFM)	AIRFLOW: TOTAL AIRFLOW (CFM)	NUMBER OF DAMPERS	DEPTH (INCH)	WIDTH (INCH)	HEIGHT (INCH)	APD (IN WC)	BASIS OF DESIGN: MFG	BASIS OF DESIGN: MODEL	NOTES
D-1A	LIBRARY MECH 315	CU-1	ALUMINUM	INSULATED AIRFOIL	PARALLEL	EXHAUST	9,200	9,200	1	5	48	30	0.07	GREENHECK	ICD-45	1, 2, 3, 4
D-1B	LIBRARY MECH 315	CU-1	ALUMINUM	INSULATED AIRFOIL	PARALLEL	INTAKE	9,200	9,200	1	5	48	30	0.07	GREENHECK	ICD-45	1, 2, 3
D-1C	LIBRARY MECH 315	CU-1	GALV STEEL	3V BLADE	PARALLEL	RETURN	9,200	9,200	1	5	48	30	0.02	GREENHECK	VCD-20	2, 3
D-2A	LIBRARY MECH 315	CU-2	ALUMINUM	INSULATED AIRFOIL	PARALLEL	EXHAUST	9,550	19,100	2	5	48	30	0.07	GREENHECK	ICD-45	1, 2, 3, 4
D-2B	LIBRARY MECH 315	CU-2	ALUMINUM	INSULATED AIRFOIL	PARALLEL	INTAKE	9,550	19,100	2	5	48	30	0.07	GREENHECK	ICD-45	1, 2, 3
D-2C	LIBRARY MECH 315	CU-2	GALV STEEL	3V BLADE	PARALLEL	RETURN	9,550	19,100	2	5	48	30	0.02	GREENHECK	VCD-20	2, 3
D-3A	LIBRARY MECH 315	CU-3	ALUMINUM	INSULATED AIRFOIL	PARALLEL	EXHAUST	7,400	14,800	2	5	48	30	0.04	GREENHECK	ICD-45	1, 2, 3, 4
D-3B	LIBRARY MECH 315	CU-3	ALUMINUM	INSULATED AIRFOIL	PARALLEL	INTAKE	7,400	14,800	2	5	48	30	0.04	GREENHECK	ICD-45	1, 2, 3
D-3C	LIBRARY MECH 315	CU-3	GALV STEEL	3V BLADE	PARALLEL	RELIEF	7,400	14,800	2	5	48	30	0.02	GREENHECK	VCD-20	2, 3
D-4A	ARCHIVES MECH 348	CU-4	ALUMINUM	INSULATED AIRFOIL	PARALLEL	EXHAUST	9,200	9,200	1	5	48	30	0.05	GREENHECK	ICD-45	1, 2, 3, 4
D-4B	ARCHIVES MECH 348	CU-4	ALUMINUM	INSULATED AIRFOIL	PARALLEL	INTAKE	9,200	9,200	1	5	48	30	0.05	GREENHECK	ICD-45	1, 2, 3
D-4C	ARCHIVES MECH 348	CU-4	GALV STEEL	3V BLADE	PARALLEL	RELIEF	9,200	9,200	1	5	48	30	0.02	GREENHECK	VCD-20	2, 3
D-5A	ARCHIVES MECH 348	CU-5	ALUMINUM	INSULATED AIRFOIL	PARALLEL	EXHAUST	7,425	14,850	2	5	48	30	0.07	GREENHECK	ICD-45	1, 2, 3, 4
D-5B	ARCHIVES MECH 348	CU-5	ALUMINUM	INSULATED AIRFOIL	PARALLEL	INTAKE	7,425	14,850	2	5	48	30	0.07	GREENHECK	ICD-45	1, 2, 3
D-5C	ARCHIVES MECH 348	CU-5	GALV STEEL	3V BLADE	PARALLEL	RELIEF	7,425	14,850	2	5	48	30	0.02	GREENHECK	VCD-20	2, 3
D-6A	MUSEUM MECH 416, L-8	CU-6	ALUMINUM	INSULATED AIRFOIL	PARALLEL	EXHAUST	6,000	6,000	1	5	82	76	0.04	GREENHECK	ICD-45	1, 2, 3, 4
D-6B	MUSEUM MECH 416, L-11	CU-6	ALUMINUM	INSULATED AIRFOIL	PARALLEL	INTAKE	6,000	6,000	1	5	40	76	0.04	GREENHECK	ICD-45	1, 2, 3
D-6C	MUSEUM MECH 416	CU-6	GALV STEEL	3V BLADE	PARALLEL	RELIEF	6,000	6,000	1	5	48	30	0.02	GREENHECK	VCD-20	2, 3
D-7A	MUSEUM MECH 416, L-7	CU-7	ALUMINUM	INSULATED AIRFOIL	PARALLEL	EXHAUST	14,850	14,850	1	5	82	76	0.07	GREENHECK	ICD-45	1, 2, 3, 4
D-7B	MUSEUM MECH 416, L-9	CU-7	ALUMINUM	INSULATED AIRFOIL	PARALLEL	INTAKE	14,850	14,850	1	5	82	76	0.07	GREENHECK	ICD-45	1, 2, 3
D-7C	MUSEUM MECH 416	CU-7	GALV STEEL	3V BLADE	PARALLEL	RELIEF	7,425	14,850	2	5	48	30	0.02	GREENHECK	VCD-20	2, 3
D-8	CONSERVATION LAB 408	SF-1	ALUMINUM	INSULATED AIRFOIL	PARALLEL	INTAKE	4,000	4,000	1	5	34	24	0.12	GREENHECK	ICD-45	1, 2, 3, 5
D-9	ELEC SERVICE ENTRANCE 234	PAINT BOOTH	ALUMINUM	INSULATED AIRFOIL	PARALLEL	INTAKE	7,000	7,000	1	5	48	20	0.25	GREENHECK	ICD-45	1, 2, 3, 6
D-10	MUSEUM MECH 416, L-12	ERV-3	ALUMINUM	INSULATED AIRFOIL	PARALLEL	INTAKE	5,600	5,600	1	5	24	28	0.20	GREENHECK	ICD-45	1, 2, 3
D-11	MUSEUM MECH 416, L-10	ERV-3	GALV STEEL	3V BLADE	PARALLEL	EXHAUST	5,040	5,040	1	5	28	24	0.20	GREENHECK	VCD-20	2, 3
D-12	ARCHIVES MECH 348	ERV-2	ALUMINUM	INSULATED AIRFOIL	PARALLEL	INTAKE	3,450	3,450	1	5	28	18	0.20	GREENHECK	ICD-45	1, 2, 3
D-13	ARCHIVES MECH 348	ERV-2	GALV STEEL	3V BLADE	PARALLEL	EXHAUST	3,105	3,105	1	5	30	18	0.20	GREENHECK	VCD-20	2, 3
D-14	LIBRARY MECH 315	ERV-1	ALUMINUM	INSULATED AIRFOIL	PARALLEL	INTAKE	7,550	7,550	1	5	36	36	0.20	GREENHECK	ICD-45	1, 2, 3
D-15	LIBRARY MECH 315	ERV-1	GALV STEEL	3V BLADE	PARALLEL	EXHAUST	6,795	6,795	1	5	54	18	0.20	GREENHECK	VCD-20	2, 3
D-16	ELEC SERVICE ENTRANCE 234	ERV-4	ALUMINUM	INSULATED AIRFOIL	PARALLEL	INTAKE	800	800	1	5	8	24	0.20	GREENHECK	ICD-45	1, 2, 3
D-17	MUSEUM MECH 416	AHU-1 EXHAUST	GALV STEEL	3V BLADE	PARALLEL	EXHAUST	1,900	1,900	1	5	28	16	0.20	GREENHECK	VCD-20	2, 3
D-18	MUSEUM MECH 416	AHU-2 EXHAUST	GALV STEEL	3V BLADE	PARALLEL	EXHAUST	1,110	1,110	1	5	28	10	0.20	GREENHECK	VCD-20	2, 3
D-19	MUSEUM MECH 416	AHU-3 EXHAUST	GALV STEEL	3V BLADE	PARALLEL	EXHAUST	880	880	1	5	18	12	0.20	GREENHECK	VCD-20	2, 3
D-20	BASEMENT STORAGE B11	ERV-4	ALUMINUM	INSULATED AIRFOIL	PARALLEL	INTAKE	800	800	1	5	36	24	0.20	GREENHECK	ICD-45	1, 2, 3

NOTES:
1. DAMPER TO BE LOW LEAKAGE THERMALLY INSULATED.
2. QUICK CONNECT FRAME.
3. CONTROL DAMPER SIZE TO BE SAME AS CONNECTED DUCT SIZE.
4. INTERLOCK DAMPER OPERATION WITH ASSOCIATED CONDENSING UNIT MODULE.
5. DAMPER SHALL OPEN WHEN SF-1 OPERATES.
6. DAMPER SHALL OPEN WHEN PAINT BOOTH EXHAUST FAN OPERATES

B

VAV BOX SCHEDULE

TAG	SERVES	DESCRIPTION	INLET DIAMETER (INCH)	DESIGN AIRFLOW: MAX (CFM)	DESIGN AIRFLOW: MIN (CFM)	MAX APD (IN WG)	# COIL ROWS	CAPACITY (MBH)	FLOW (GPM)	EAT (DEG F)	LAT (DEG F)	EWT (DEG F)	LWT (DEG F)	MAX WPD (FT HD)	BASIS OF DESIGN: MFG	BASIS OF DESIGN: MODEL	NOTES
VAV 1-1	AHU-1, FLOORS 1 & 2 INTERIOR	SINGLE DUCT VAV TERMINAL BOX	12	1,300	650	0.2	1	27.6	2.8	65	85.0	170	150	4.3	TRANE	VCWF	1,2,3,4,5,7
VAV 1-2	AHU-1, FLOORS 1 & 2 NORTHEAST	SINGLE DUCT VAV TERMINAL BOX	8	600	300	0.2	1	14.9	1.5	65	88.0	170	150	6	TRANE	VCWF	1,2,3,4,5,6,7
VAV 1-3	AHU-1, FLOORS 1 & 2 SOUTHEAST	SINGLE DUCT VAV TERMINAL BOX	10	800	400	0.2	2	23.6	2.4	65	92.3	170	150	2	TRANE	VCWF	1,2,3,4,5,6,7
VAV 1-4	AHU-1, FLOORS 1 & 2 SOUTH	SINGLE DUCT VAV TERMINAL BOX	14	2,050	1,030	0.2	1	31.7	3.2	65	79.3	170	150	4	TRANE	VCWF	1,2,3,4,5,6,7
VAV 1-5	AHU-1, FLOORS 1 & 2 WEST	SINGLE DUCT VAV TERMINAL BOX	14	1,850	930	0.2	1	48.0	4.8	65	89.0	170	150	6.5	TRANE	VCWF	1,2,3,4,5,6,7
VAV 2-1	AHU-2, FLOOR 3 INTERIOR	SINGLE DUCT VAV TERMINAL BOX	10	1,000	500	0.01	1	26.1	2.6	65	85.0	170	150	3.9	TRANE	VCWF	1,2,3,4,5,7
VAV 2-2	AHU-2, FLOOR 3 EAST	SINGLE DUCT VAV TERMINAL BOX	10	900	450	0.2	2	26.0	2.6	65	91.7	170	150	2	TRANE	VCWF	1,2,3,4,5,6,7
VAV 2-3	AHU-2, FLOOR 3 SOUTH	SINGLE DUCT VAV TERMINAL BOX	12	1,600	--	0.3	1	22.0	2.2	65	77.7	170	150	4	TRANE	VCWF	1,2,3,4,5,6,7
VAV 2-4	AHU-2, FLOOR 3 WEST	SINGLE DUCT VAV TERMINAL BOX	12	1,200	600	0.2	1	34.0	3.4	65	91.2	170	150	7	TRANE	VCWF	1,2,3,4,5,6,7

NOTES
1. PROVIDE WITH 3/8" CLOSED CELL INSULATION
2. CONTROLS ACTUATORS AND SENSORS BY MECHANICAL AND CONTROLS CONTRACTOR.
3. CONTRACTOR TO VERIFY "HAND" OF UNIT PRIOR TO ORDER.
4. REFER TO CONTROLS DRAWINGS FOR CONTROL POINTS AND EQUIPMENT.
5. PROVIDE UNIT-MOUNTED DISCONNECT.
6. REHEAT PROVIDED BY 100% HYDRONIC WATER.
7. BOXES SHALL BE SELECTED FOR MAX. NC OF 20

CONVECTOR SCHEDULE

TAG	SERVES	TYPE	HEATING: REQ. MBH	HOT WATER COIL: FLUID	HOT WATER COIL: EWT (°F)	HOT WATER COIL: LWT (°F)	HOT WATER COIL: FLOW (GPM)	HOT WATER COIL: WPD (FT OF H2O)	BASIS OF DESIGN: MFG	BASIS OF DESIGN: MODEL	DIMENSIONS (INCHES): L	DIMENSIONS (INCHES): D	DIMENSIONS (INCHES): H	NOTES
CONV-1	STAIR 2, FLOOR 1, LIB	RECESSED, WALL MOUNTED	8.47	WATER	170	150	0.85	0.2	STERLING	FWG-A	52	6	32	1,2,3,4,5,6,7,8,9
CONV-2	STAIR 6, FLOOR 1, EXHIBIT	RECESSED, WALL MOUNTED	8.40	30% PG	170	150	0.88	0.2	STERLING	FWG-A	52	6	32	1,2,3,4,5,6,7,8,9
CONV-3	STAIR 1, FLOOR 2, LIB	RECESSED, WALL MOUNTED	8.18	WATER	170	150	0.82	0.1	STERLING	FWG-A	44	8	32	1,2,3,4,5,6,7,8,9
CONV-4	STAIR 4, FLOOR 3, ARCHIVE	RECESSED, WALL MOUNTED	8.18	WATER	170	150	0.82	0.1	STERLING	FWG-A	44	8	32	1,2,3,4,5,6,7,8,9
CONV-5	STAIR 5, FLOOR 3, ARCHIVE	RECESSED, WALL MOUNTED	8.18	WATER	170	150	0.82	0.1	STERLING	FWG-A	44	8	32	1,2,3,4,5,6,7,8,9
CONV-6	STAIR 7, FLOOR 3, EXHIBIT	RECESSED, WALL MOUNTED	11.46	WATER	170	150	1.15	0.2	STERLING	FWG-A	60	8	32	1,2,3,4,5,6,7,8,9

NOTES:
1. STANDARD MFR CASING COLOR SELECTION TO BE APPROVED BY ARCHITECT.
2. UNIT SHALL HAVE A BOTTOM DISCHARGE.
3. PROVIDE INSULATION ON BACK OF CONVECTOR.
4. CABINET CASING: FRONT:18 GAUGE, SIDES AND BACK: 20 GAUGE.
5. HTG ELEMENT: 1/2" CU TUBE, 0.01" AL FINS.
6. UNIT SHALL HAVE OPPOSITE END CONNECTIONS.
7. UNIT SHALL HAVE LOUVERED AIR VENTS.
8. UNIT SHALL HAVE ACCESS DOORS, WITH ALLEN-KEY.
9. UNIT SHALL HAVE FACTORY APPLIED FINISH.

DUCT HEATING COIL SCHEDULE

TAG	SERVES	AIR FLOW: SUPPLY AIR (CFM)	AIR FLOW: OUTSIDE AIR CFM	AIR FLOW: OUTSIDE AIR % OF SA	CAPACITY (TOTAL MBH)	AIR: ENTERING (DB °F)	AIR: LEAVING (DB °F)	AIR: VELOCITY (FPM)	AIR: APD (IN WC)	FLUID: FLUID	FLUID: ENTERING (°F)	FLUID: LEAVING (°F)	FLUID: FLOW (GPM)	FLUID: WPD (FT)	COIL: WIDTH (INCH)	COIL: HEIGHT (INCH)	COIL: AREA (SF)	COIL: ROWS	COIL: FIN SPACING (FPF)	COIL: VOLUME (GAL)	BASIS OF DESIGN: MFG	BASIS OF DESIGN: MODEL	BASIS OF DESIGN: WEIGHT (LB)	NOTES
HC-1	FOURTH FLOOR CONSERVATION LAB	4,000	4,000	100%	308	-3	68	706	0.30	30% PG	170	140	21.5	1.1	34	24	5.7	2	125	2.5	TRANE	D5WB24034	90	1
HC-2	FIRST FLOOR PAINT BOOTH	7,000	7,000	100%	539	-3	68	500	0.13	30% PG	170	140	37.7	3.9	84	24	14.0	2	86	4.5	TRANE	D5WB24084	160	1
HC-3	ERV-4	800	800	100%	31	50	85	640	0.17	30% PG	170	140	2.1	2.4	15	12	1.3	1	150	0.2	TRANE	DSTB12015	15	1
HC-4	FOURTH FLOOR EXHIBIT	2,925	0	0%	46	85	99	557	0.08	WATER	170	140	3.2	0.6	42	18	5.3	1	80	1.0	TRANE	D5WB18042	45	1

NOTES:
1. PROVIDE FLANGED CONNECTION FOR INSTALLATION INTO DUCTWORK

NOTES

1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.

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STATE OF MAINE · STEVEN M. MARTEL · 2/8/2022 · 7148 · LICENSED · PROFESSIONAL ENGINEER

CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

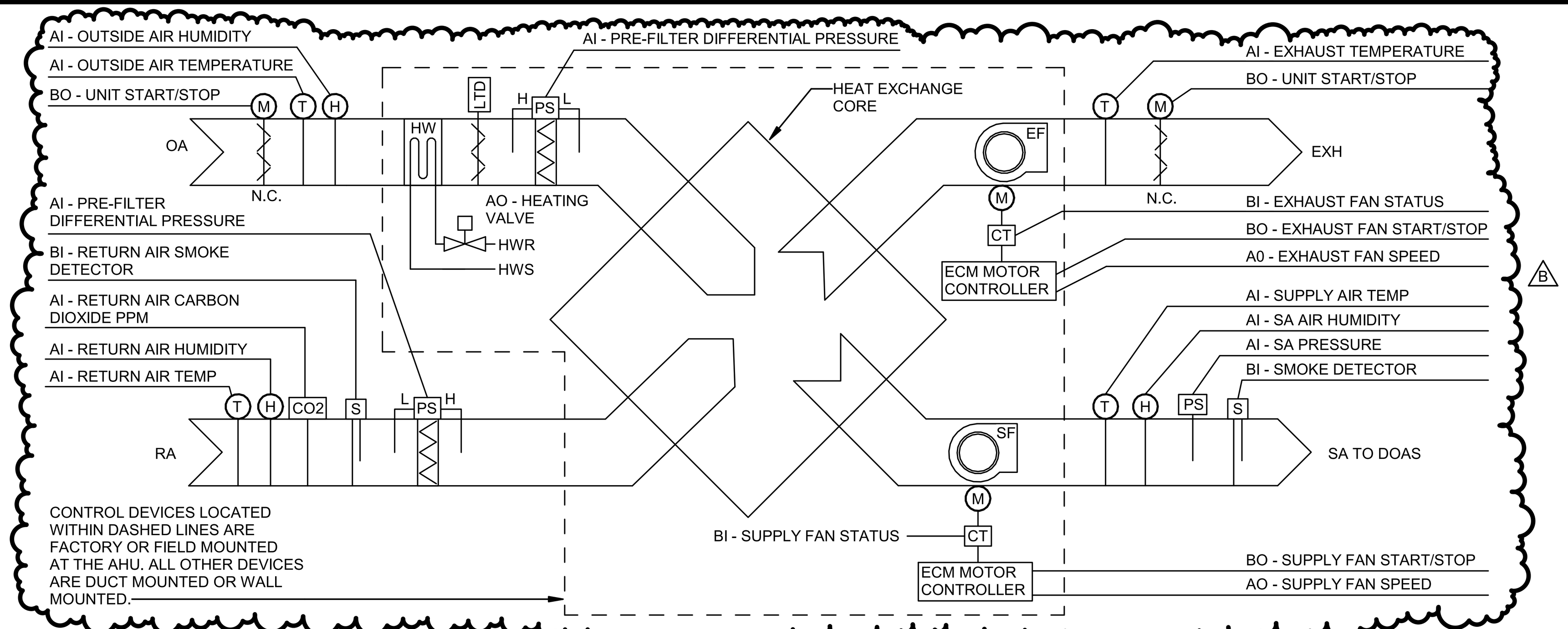
REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	SMM
DESIGNED BY:	SMM
DRAWN BY:	STR

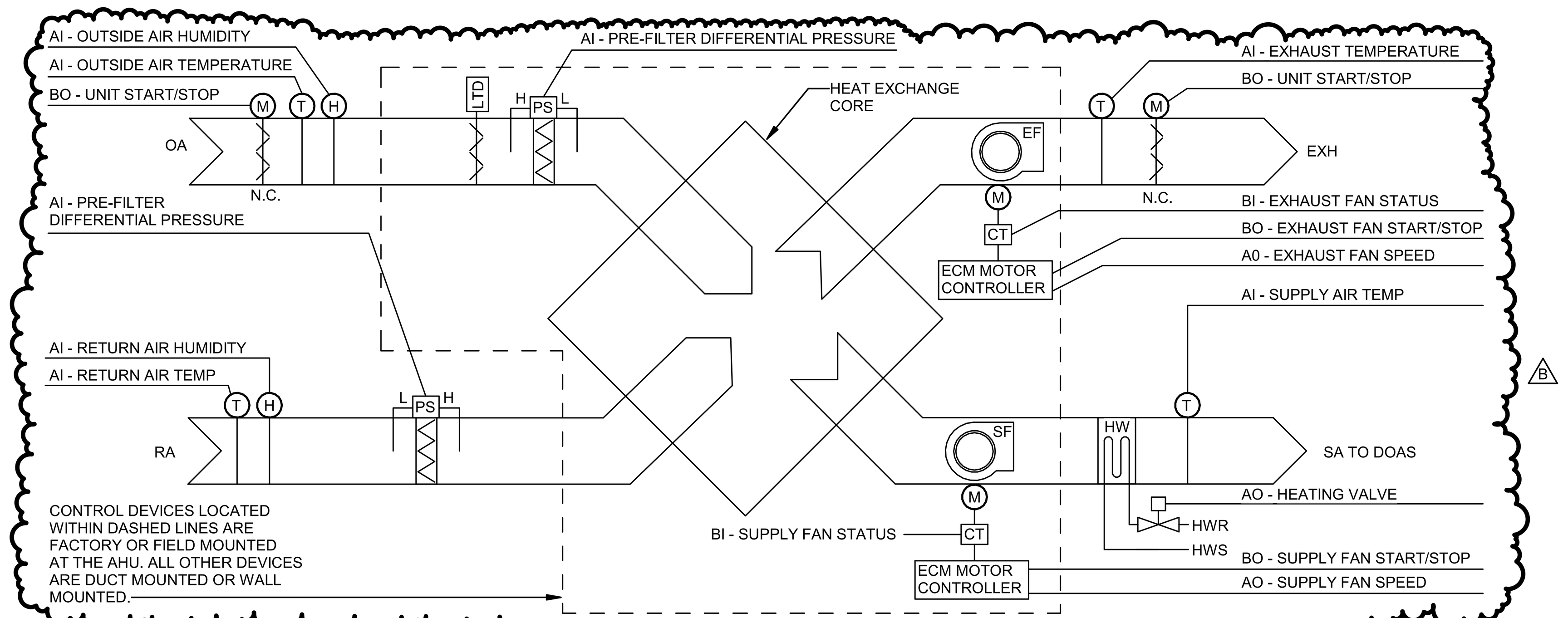
SHEET TITLE: MECHANICAL SCHEDULES

SHEET ID: M-605

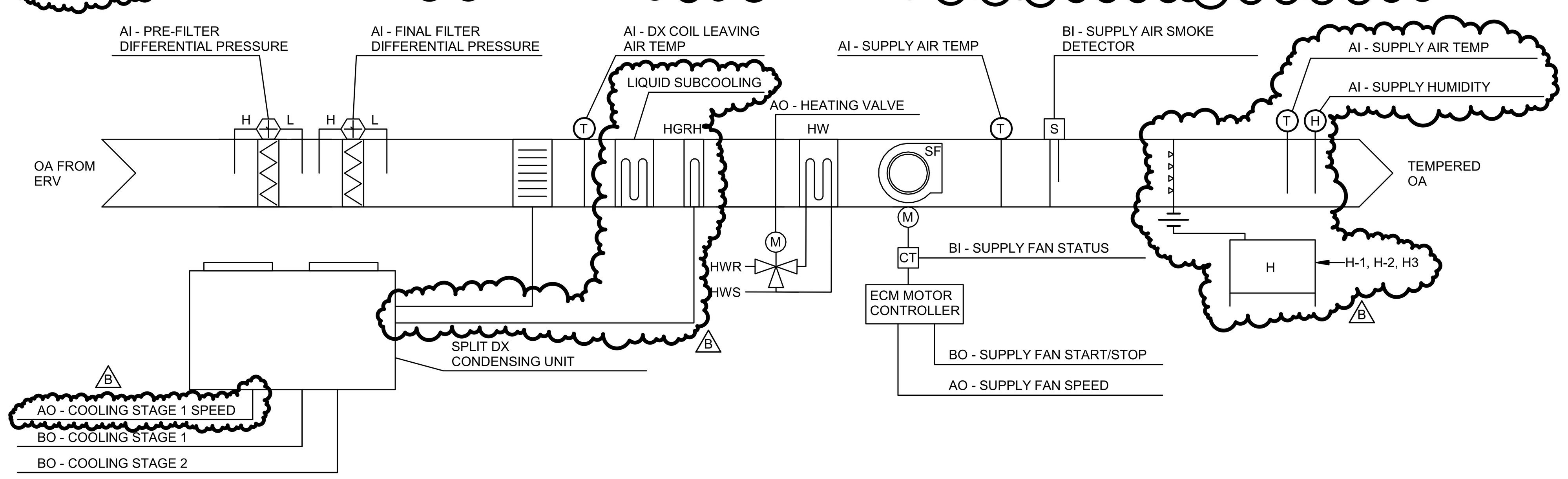
NOT FOR CONSTRUCTION



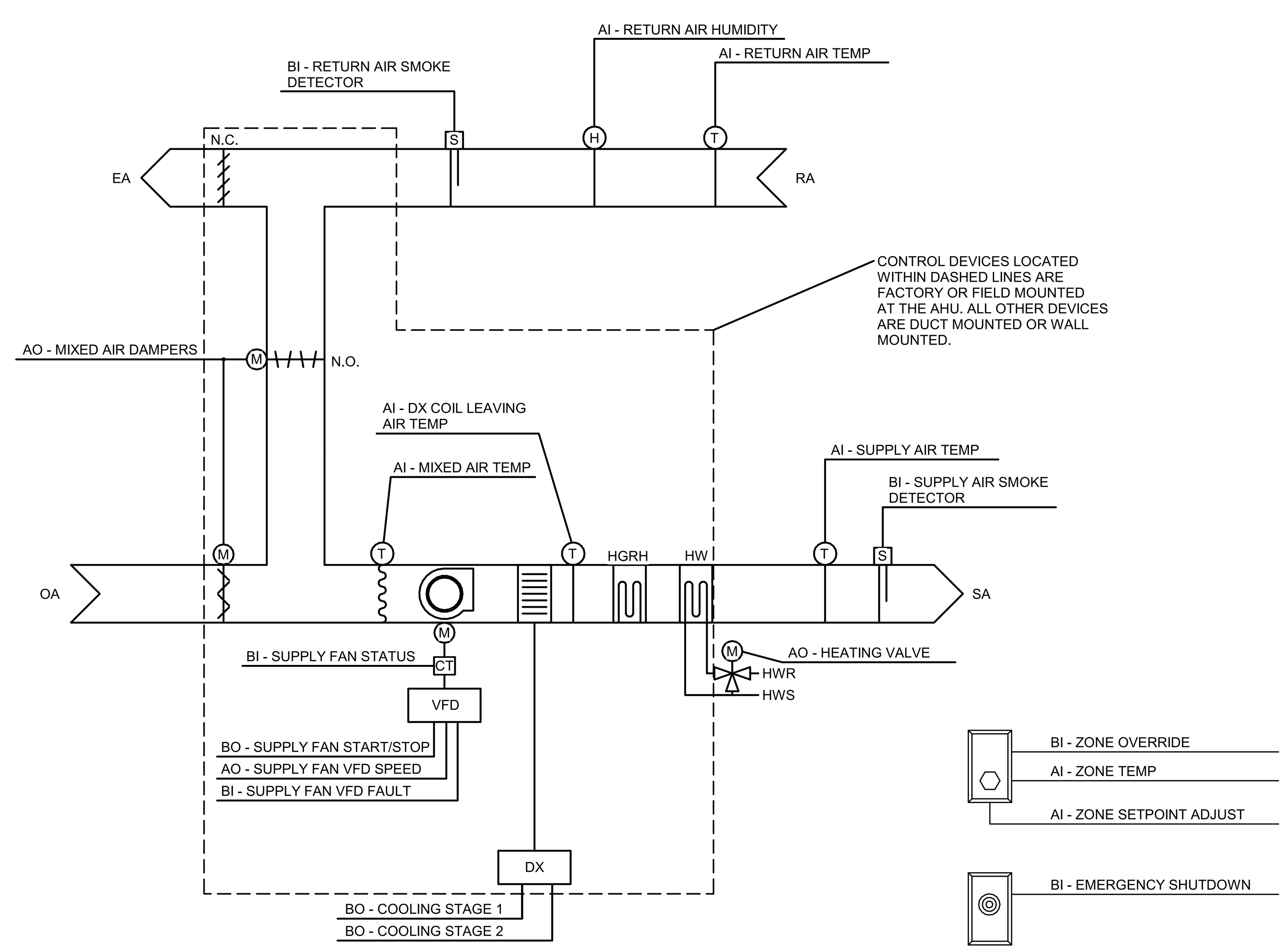
E1 ERV-1,2,3 CONTROL DIAGRAM
NOT TO SCALE



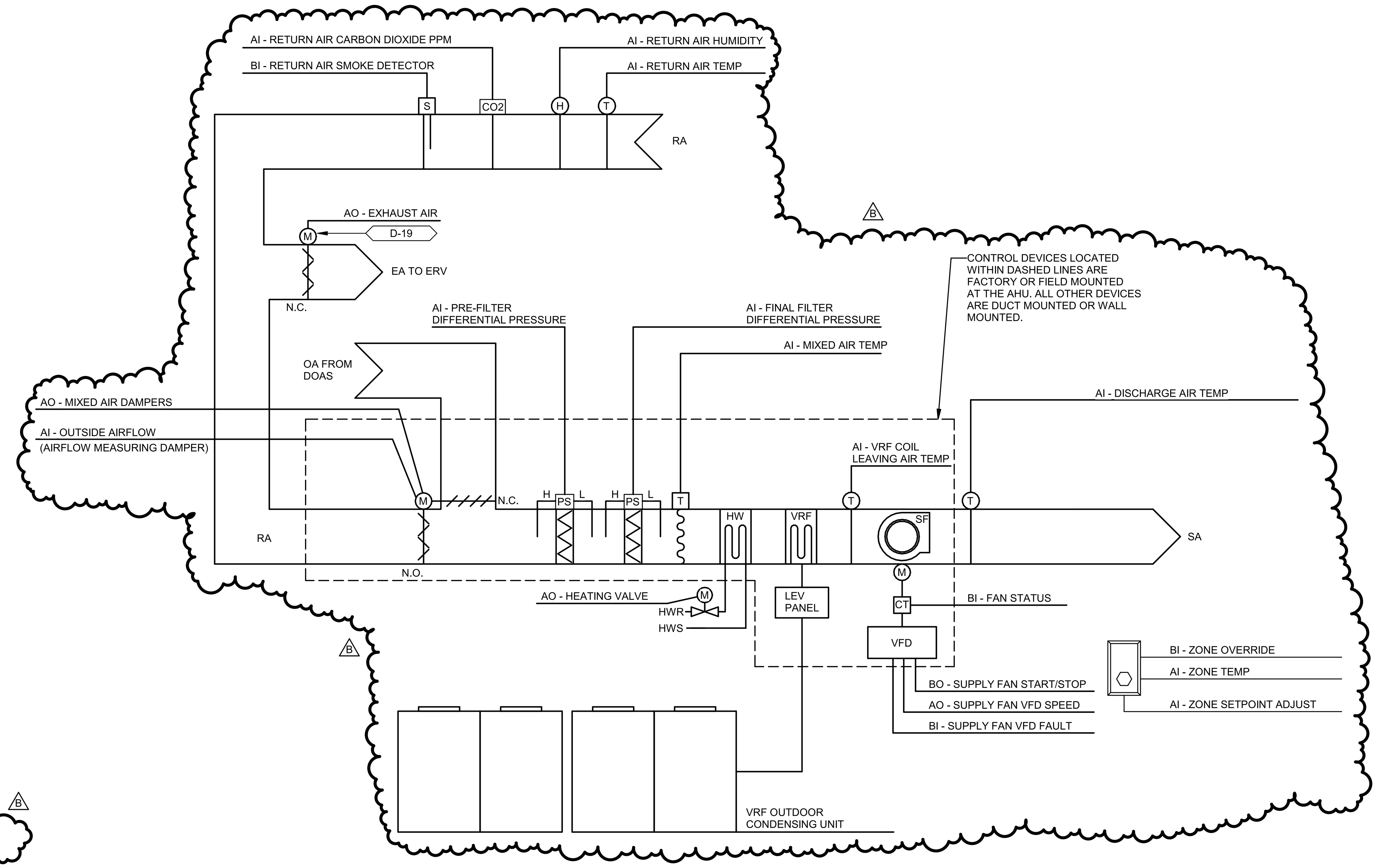
D1 ERV-4 CONTROL DIAGRAM
12" = 1'-0"



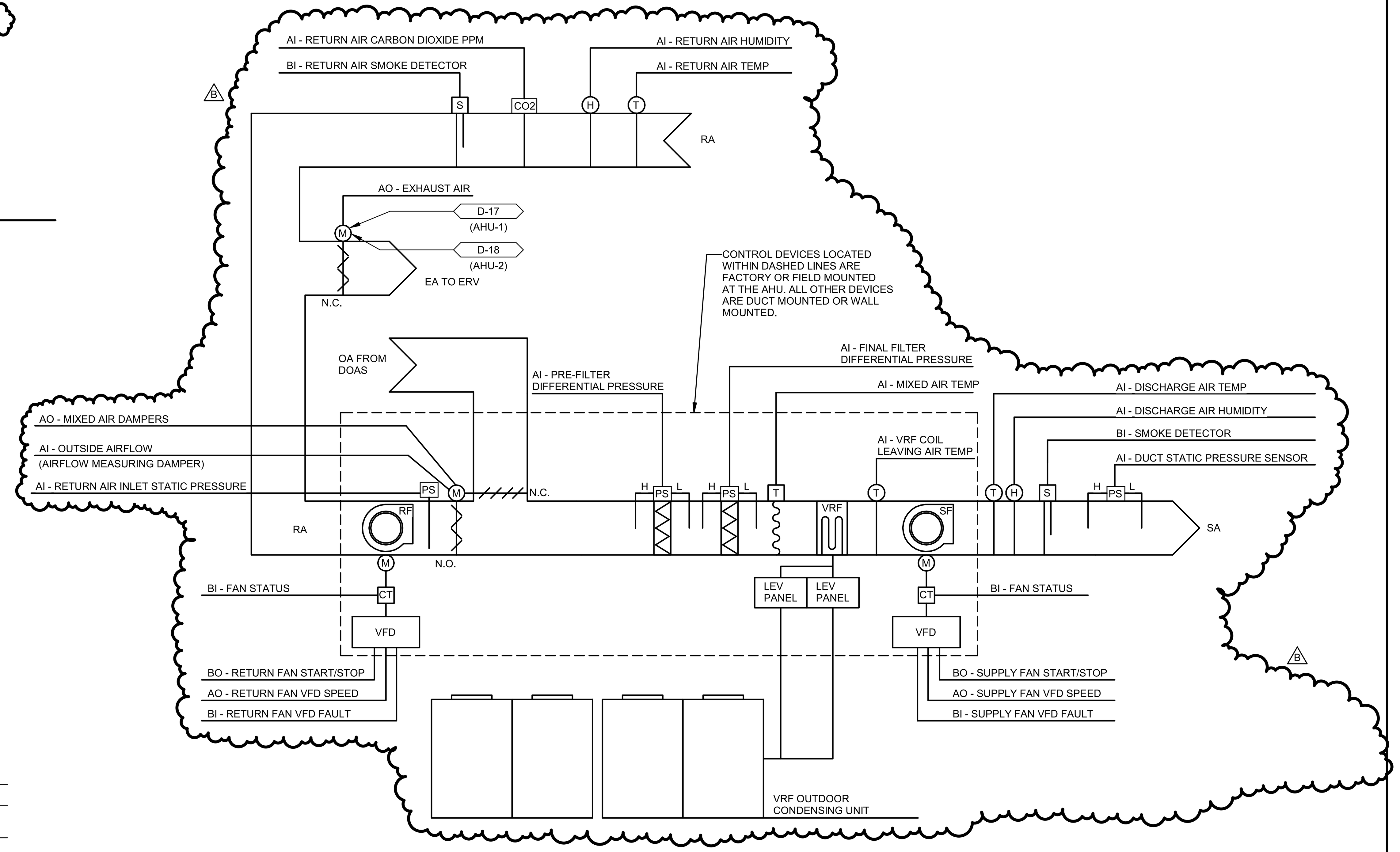
C1 DOAS CONTROL DIAGRAM
NOT TO SCALE



A1 AHU-4 CONTROL DIAGRAM
NOT TO SCALE



D4 AHU-3 CONTROL DIAGRAM
NOT TO SCALE



A4 AHU-1,2 CONTROL DIAGRAM
NOT TO SCALE

NOTES

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PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	SMM
DESIGNED BY:	AF
DRAWN BY:	STR

SHEET TITLE:
CONTROL DIAGRAMS

SHEET ID:
M-706

NOT FOR CONSTRUCTION

SEQUENCE OF OPERATION

1.1 GENERAL

A. THE BUILDING AUTOMATION SYSTEM (BAS) SHALL CONTROL ALL THE HVAC SYSTEMS IN ACCORDANCE WITH THE DRAWINGS AND POINTS LISTS.

B. REFER TO SPECIFICATION 230923 FOR DESCRIPTION OF CONTROL SYSTEM INTEGRATION WITH THE STATE OF MAINE BUILDING CONTROL CENTER (BCC) WHICH USES THE HONEYWELL ENTERPRIZE BUILDING INTEGRATOR (EBI) SYSTEM.

C. THE INTENT IS TO PROVIDE ALL NEW BAS SYSTEM COMPONENTS IN THE MAINE CULTURAL BUILDING TO INCLUDE SENSORS, CONTROL WIRING, CONDUIT, CONTROLLERS, ACTUATORS, ETC.

D. THE GRAPHIC SCREENS SHALL BE UPDATED TO INCORPORATE GRAPHIC CONTROL AND MONITORING OF ALL HVAC EQUIPMENT FOR A COMPLETE CONTROL SYSTEM.

E. THE HVAC SYSTEMS SHALL BE AVAILABLE 24 HOURS PER DAY, 7 DAYS PER WEEK.

F. PUMPS SHALL BE PROVEN ON USING A CURRENT TRANSFORMER (CT) ON THE POWER SUPPLY TO THE PUMP FROM THE VFD. CT SETPOINT SHALL BE 10% LESS THAN THE CURRENT MEASURED AT MINIMUM PUMP SPEED.

G. FAIL SAFE POSITIONS ARE POSITIONS THAT DEVICES WILL GO TO WHEN DE-ENERGIZED: NO = NORMALLY OPEN, NC = NORMALLY CLOSED.

H. ALL LISTED SETPOINTS SHALL BE ADJUSTABLE AT THE BAS WORKSTATION WITHOUT PROGRAMMING.

I. ALL TEMPERATURES LISTED ARE IN DEGREES FARENHEIT (°F).

J. ADJUSTABLE MEANS THAT THE SETPOINT OR SCHEDULE CAN BE CHANGED USING THE BAS WORKSTATION GRAPHICS WITHOUT PROGRAMMING.

1.2 SCHEDULES

A. PROVIDE AN ADJUSTABLE OCCUPANCY SCHEDULE IN THE GRAPHICS FOR EACH SYSTEM TO SWITCH HVAC EQUIPMENT BETWEEN OCCUPIED AND UNOCCUPIED MODES. SCHEDULES SHALL BE ADJUSTABLE WITHOUT PROGRAMMING USING THE BAS WORKSTATION.

1. OCCUPIED HOURS SHALL BE EASILY ADJUSTABLE AT THE BAS WORKSTATION. INITIAL SCHEDULE SHALL BE 7 DAYS A WEEK FROM 7 AM TO 5 PM, OR AS DIRECTED BY STATE OF MAINE PERSONNEL.

2. PROVIDE OPTIMUM START ALGORITHM TO SWITCH THE SYSTEM TO THE OCCUPIED SETPOINTS AT THE LATEST TIME POSSIBLE SO THAT SPACE TEMPERATURE REACHES THE OCCUPIED TEMPERATURE SETPOINT AT THE SCHEDULED OCCUPANCY TIME. VENTILATION SYSTEMS SHALL REMAIN OFF UNTIL THE SCHEDULED OCCUPIED HOURS.

3. PROVIDE THE CAPABILITY TO PROGRAM OR ADJUST OCCUPIED HOURS FOR SPECIAL EVENTS AT THE BAS WORKSTATION.

4. PROVIDE THE CAPABILITY TO PROGRAM OR ADJUST UNOCCUPIED HOURS FOR UP TO ONE YEAR FOR HOLIDAYS OR OTHER PERIODS WHEN THE BUILDING WILL BE CLOSED.

1.3 USER PERMISSIONS AND REMOTE ACCESS

A. PROVIDE MULTIPLE LEVELS OF USER ACCESS WITH THE FOLLOWING ACCESS LEVELS AS A MINIMUM:

1. FULL ACCESS: OPERATOR CAN ASSIGN USERNAMES, PASSWORDS, ADJUST ALL SETPOINTS AND SCHEDULES, AND OVERRIDE CONTROL POINTS.

2. NORMAL USER ACCESS: OPERATOR CAN ADJUST ALL SETPOINTS AND SCHEDULES.

3. LOW LEVEL ACCESS: OPERATOR CAN SEE THE GRAPHICS DISPLAY AND OBSERVE SYSTEM OPERATION BUT DOES NOT HAVE ACCESS TO MAKE ANY CHANGES.

B. PROVIDE THE CAPABILITY FOR AUTHORIZED USERS TO LOG IN TO THE BAS SYSTEM FROM A REMOTE COMPUTER USING THEIR USERNAME AND PASSWORD. REMOTE ACCESS SHALL SHOW THE GRAPHICS DISPLAY AND ALLOW MODIFICATIONS TO SETPOINTS AND SCHEDULED FOR USERS WITH NORMAL OR FULL ACCESS.

1.4 THERMOSTATS

A. THE OCCUPIED SPACE TEMPERATURE SETPOINT SHALL BE BASED ON THE DESIGN CONDITIONS SCHEDULE IN THE DRAWINGS. WHERE THE SPACE TEMPERATURE SETPOINT IS NOT OTHERWISE INDICATED, THE INITIAL SETPOINT SHALL BE 75°F COOLING (ADJUSTABLE). HEATING SETPOINT SHALL BE 5°F LOWER (ADJUSTABLE), FOR A 5°F DEADBAND.

B. OCCUPIED SETPOINT SHALL BE OCCUPANT ADJUSTABLE, EXCEPT WHERE NOTED OTHERWISE. LIMIT ADJUSTMENT TO A MINIMUM OF 70°F AND A MAXIMUM OF 76°F COOLING. OCCUPIED SETPOINT SHALL NOT BE OCCUPANT ADJUSTABLE IN THE LEVEL 1 AND 2 ARCHIVES SPACES.

C. UNOCCUPIED SETPOINT SHALL BE 62°F HEATING, 82°F COOLING (ADJUSTABLE AT THE BAS WORKSTATION). UNOCCUPIED SETPOINT SHALL BE THE SAME AS OCCUPIED SETPOINT IN THE LEVEL 1 AND 2 ARCHIVES SPACES.

D. OVERRIDE BUTTON ON THE THERMOSTAT SHALL OVERRIDE THE SYSTEM TO OCCUPIED MODE FOR 2 HOURS (ADJUSTABLE).

1.5 VARIABLE REFRIGERANT FLOW (VRF) SYSTEMS

A. GENERAL

1. EACH VARIABLE REFRIGERANT FLOW SYSTEM AND ITS VARIOUS COMPONENTS (FAN COILS, BRANCH CIRCUIT CONTROLLERS, LEV KITS, AND CONDENSING UNITS) SHALL BE CONTROLLED BY THE VRF SYSTEM VENDOR'S CONTROL SYSTEM USING ITS OWN INTERNAL SAFETIES AND CONTROL SEQUENCES TO MAINTAIN SPACE TEMPERATURE SETPOINT.

2. VRF CONTROLLERS SHALL COMMUNICATE WITH THE BAS OVER BACNET TO MONITOR EQUIPMENT STATUS AND ADJUST SETPOINTS FROM THE BAS WORKSTATION.

3. SPACE TEMPERATURE AND SPACE TEMPERATURE SETPOINT SHALL BE INTEGRATED INTO THE BAS GRAPHICS. SETPOINT ADJUSTMENT SHALL BE AVAILABLE TO USER LEVEL 2 OR HIGHER AT THE BAS WORKSTATION.

B. VRF OUTDOOR UNITS INSTALLED INDOORS

1. WHERE VRF OUTDOOR UNITS ARE INSTALLED IN MECHANICAL ROOMS, EACH OUTDOOR UNIT SHALL HAVE ONE OR MORE OUTSIDE AIR DAMPERS, EXHAUST AIR DAMPERS, AND RETURN AIR DAMPERS.

2. WHEN OUTDOOR AIR TEMPERATURE IS AT OR ABOVE THE MECHANICAL ROOM TEMPERATURE SETPOINT (INITIALLY 40 DEG F +/- 5 DEG F, ADJUSTABLE), THE OUTSIDE AIR DAMPERS AND EXHAUST AIR DAMPERS SHALL BE OPEN WHILE THE RETURN AIR DAMPERS ARE CLOSED.

3. WHEN OUTDOOR AIR TEMPERATURE IS BELOW THE MECHANICAL ROOM TEMPERATURE SETPOINT, THE OUTDOOR AIR DAMPERS AND EXHAUST AIR DAMPERS SHALL BE CLOSED AND THE RETURN AIR DAMPERS SHALL OPEN.

1.6 VENTILATION SYSTEMS

A. SCHEDULE

1. VENTILATION SYSTEMS SHALL BE SET TO OCCUPIED MODE WHENEVER ANY OF THE SERVED VRF AND AHU SYSTEMS ARE IN OCCUPIED MODE.

2. VENTILATION SYSTEMS SHALL DEFAULT TO UNOCCUPIED MODE WHENEVER ALL OF THE SERVED VRF AND AHU SYSTEMS ARE IN UNOCCUPIED MODE.

B. ENERGY RECOVERY VENTILATOR (ERV): ERV-1, ERV-2, ERV-3

1. OCCUPIED MODE

a. THE OUTSIDE AIR DAMPER AND EXHAUST AIR DAMPER SHALL OPEN AND THE ERV SUPPLY AND EXHAUST FANS SHALL START AT LOW SPEED, THEN RAMP UP TO NORMAL FAN SPEED TO SUPPLY THE SAME AIRFLOW AS THE ASSOCIATED DOAS UNIT, AS MEASURED AND SET BY THE BALANCER. THE FANS SHALL RUN CONTINUOUSLY TO SUPPLY MINIMUM OUTSIDE AIR TO THE ASSOCIATED DOAS.

b. THE ERV 30% PROPYLENE GLYCOL / HOT WATER PRE-HEAT COIL CONTROL VALVE SHALL MODULATE TO MAINTAIN ENTERING AIR TEMPERATURE (EAT) TO THE HEAT EXCHANGER CORE OF 20 DEG F (ADJ).

2. UNOCCUPIED MODE

a. ERV FANS SHALL BE OFF AND THE OUTSIDE AIR DAMPER AND EXHAUST AIR DAMPER SHALL BE CLOSED. THE HEATING COIL CONTROL VALVE SHALL CLOSE.

b. WHEN OUTSIDE AIR IS COLDER THAN 10 DEG F, THE HEATING COIL CONTROL VALVE SHALL MODULATE TO MAINTAIN DUCT TEMPERATURE DOWNSTREAM OF THE HEATING COIL AT HX CORE EAT SETPOINT (20 DEG F).

3. ALARMS

A. LOW ENTERING AIR TEMPERATURE

1) IF ENTERING AIR TEMP TO THE HEAT EXCHANGER CORE DROPS BELOW 15 DEG F (ADJ) FOR 10 MINUTES (ADJ), GENERATE AN ALARM.

2) IF ENTERING AIR TEMP TO THE HEAT EXCHANGER CORE DROPS BELOW 15 DEG F (ADJ) FOR 30 MINUTES (ADJ), SHUT DOWN THE ERV, ASSOCIATED DOAS, AND CLOSE OUTSIDE AIR AND EXHAUST DAMPERS.

B. DIRTY FILTERS

1) PROVIDE FILTER DIFFERENTIAL PRESSURE (DP) SENSOR FOR ERV OUTSIDE AIR AND RETURN AIR FILTERS. STATUS OF FILTER DP SENSORS SHALL BE INDICATED ON THE GRAPHICS ON THE BAS WORKSTATION.

2) WHEN PRESSURE DROP ACROSS THE FILTER EXCEEDS 1.O IN WC (ADJUSTABLE) INDICATING FILTERS NEED TO BE CHANGED, GENERATE ALARM ON THE BAS WORKSTATION.

C. WIRE DUCT SMOKE DETECTORS TO SHUT DOWN THE ERV AND GENERATE AN ALARM ON THE BAS AND FIRE ALARM SYSTEM IF SMOKE IS DETECTED IN THE SUPPLY AIR OR RETURN AIR.

D. HIGH STATIC PRESSURE

1) WHEN SUPPLY FAN PRESSURE SENSOR DETECTS PRESSURE HIGHER THAN 1 INCH WC (ADJUSTABLE), SHUT DOWN ERV AND ASSOCIATED DOAS AND GENERATE AN ALARM ON THE BAS WORKSTATION.

C. ENERGY RECOVERY VENTILATOR: ERV-4

1. OCCUPIED MODE

a. THE OUTSIDE AIR DAMPER AND EXHAUST AIR DAMPER SHALL OPEN AND THE ERV-4 FANS SHALL START AT LOW SPEED, RAMP UP TO SPEED SET BY BALANCER, THEN RUN CONTINUOUSLY TO SUPPLY OUTSIDE AIR AND EXHAUST TO THE BASEMENT SPACES SERVED.

b. HEATING COIL HC-3 CONTROL VALVE SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE AT SETPOINT.

2. UNOCCUPIED MODE

a. ERV-4 FANS SHALL BE OFF AND THE OUTSIDE AIR DAMPER AND EXHAUST AIR DAMPER SHALL BE CLOSED. HC-3 SHALL BE OFF.

b. IF SPACE TEMPERATURE RISES OR FALLS MORE THAN 10 DEG F FROM SETPOINT, ERV-4 SHALL RUN IN OCCUPIED MODE AND HC-3 SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE AT SETPOINT ±5 DEG F.

3. ALARMS

a. FREEZE PROTECTION

1) IF THE DISCHARGE AIR TEMPERATURE IS BELOW 40 DEG F (ADJ) FOR MORE THAN 5 MINUTES, GENERATE ALARM, SHUT DOWN ERV-4, AND CLOSE ASSOCIATED OUTSIDE AIR DAMPER.

b. HIGH DISCHARGE AIR TEMPERATURE

1) IF THE DISCHARGE AIR TEMPERATURE IS ABOVE 100 DEG F (ADJ) FOR MORE THAN 5 MINUTES, GENERATE ALARM

D. DEDICATED OUTSIDE AIR SYSTEM (DOAS): DOAS-1, DOAS-2, DOAS-3

1. OCCUPIED MODE

a. EACH DOAS UNIT SHALL START AND RUN CONTINUOUSLY WHENEVER ITS ASSOCIATED ERV RUNS.

b. THE DOAS SUPPLY FAN SHALL START AT LOW SPEED THEN RAMP UP TO MAINTAIN DUCT STATIC PRESSURE AT SETPOINT OF 0.25 IN WC (ADJUSTABLE) THEN RUN CONTINUOUSLY TO SUPPLY MINIMUM OUTSIDE AIR TO AHU-1, AHU-2, AHU-3.

c. THE DOAS SHALL BE CONTROLLED BY ITS OWN INTEGRAL CONTROLLER SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROL SEQUENCES TO MAINTAIN A CONSTANT LEAVING AIR TEMPERATURE OF 70 DEG F (ADJ).

d. DEHUMIDIFICATION: THE DOAS CONTROLLER SHALL SEQUENCE TWO STAGES OF COOLING, MODULATE THE FIRST STAGE OF COOLING, PROVIDE LIQUID SUBCOOLING REHEAT, AND MODULATE HOT GAS REHEAT TO MAINTAIN LEAVING AIR TEMPERATURE OF 70 DEG F (ADJ) AT A DEWPOINT OF 51 DEG F.

e. HEATING: THE DOAS HEATING COIL CONTROL VALVE SHALL MODULATE TO MAINTAIN LEAVING AIR TEMPERATURE OF 68 DEG F (ADJUSTABLE). THE HEATING COIL SHALL BE LOCKED OUT WHEN EVER THE DX SYSTEM IS RUNNING.

f. HUMIDIFICATION: ELECTRIC HUMIDIFIER ASSOCIATED WITH EACH DOAS UNIT SHALL START AND MODULATE STEAM OUTPUT TO MAINTAIN SUPPLY AIR FROM DOAS UNIT AT 40% RELATIVE HUMIDITY (RH) (ADJUSTABLE). THE HUMIDIFIER SHALL BE LOCKED OUT WHENEVER THE DX COOLING SYSTEM IS RUNNING OR THE ASSOCIATED DOAS IS OFF.

2. UNOCCUPIED MODE

a. DOAS SUPPLY FAN, COMPRESSORS, CONDENSER FANS SHALL TURN OFF, THE HEATING COIL CONTROL VALVE SHALL CLOSE AND THE ASSOCIATED HUMIDIFIER SHALL BE OFF.

3. ALARMS

a. LOW ENTERING AIR TEMPERATURE

1) IF ENTERING AIR TEMP DROPS BELOW 40 DEG F (ADJ) FOR 10 MINUTES (ADJ), GENERATE ALARM AT THE BAS WORKSTATION.

b. HIGH LEAVING AIR TEMPERATURE

1) IF LEAVING AIR TEMPERATURE IS ABOVE 75 DEG F (ADJ) FOR 10 MINUTES (ADJ), GENERATE ALARM AT THE BAS WORKSTATION.

c. LOW LEAVING AIR TEMPERATURE

1) IF LEAVING AIR TEMPERATURE IS BELOW 60 DEG F (ADJ) FOR 10 MINUTES (ADJ), GENERATE ALARM AT THE BAS WORKSTATION.

d. LOW LEAVING AIR HUMIDITY

1) IF LEAVING AIR DEWPOINT IS LESS THAN 37 DEG F (ADJUSTABLE) FOR 10 MINUTES (ADJUSTABLE), GENERATE ALARM AT THE BAS WORKSTATION.

e. HIGH LEAVING AIR HUMIDITY

1) COOLING MODE: IF LEAVING AIR DEWPOINT EXCEEDS 55 DEG F (ADJUSTABLE) FOR 10 MINUTES (ADJUSTABLE), GENERATE ALARM AT THE BAS WORKSTATION.

2) HEATING MODE: IF LEAVING AIR HUMIDITY EXCEEDS 50% RH (ADJUSTABLE) FOR 10 MINUTES (ADJUSTABLE) SHUT OFF HUMIDIFIER AND GENERATE ALARM AT THE BAS WORKSTATION.

f. FILTER MONITORING

1) PROVIDE PRE-FILTER AND FINAL FILTER DIFFERENTIAL PRESSURE SENSORS. FILTER DIFFERENTIAL PRESSURES SHALL BE DISPLAYED AT THE BAS WORKSTATION.

2) GENERATE AN ALARM AT THE BAS WORKSTATION IF FILTER DP EXCEEDS 1.0 INCH WC (ADJUSTABLE) .

g. CONDENSATE OVERFLOW SWITCH

1) PROVIDE CONDENSATE OVERFLOW SWITCH OPTION WITH DOAS. RELAY STATUS OF CONDENSATE OVERFLOW SWITCH TO BAS WORKSTATION.

2) WHEN CONDENSATE OVERFLOW SWITCH TRIPS, GENERATE ALARM AT THE BAS WORKSTATION..

1.7 AIR HANDLING UNITS AHU-1 AND AHU-2

A. AHU-1 AND AHU-2 ARE VAV AIR HANDLING UNITS WITH A VRF COOLING COIL THAT SERVE MULTIPLE VAV TERMINAL UNITS WITH HEATING COILS.

B. OCCUPIED MODE

1. THE SUPPLY FAN AND RETURN FAN SHALL START AT LOW SPEED AND THEN RAMP UP TO MAIN DUCT STATIC PRESSURE AT SETPOINT.

a. SUPPLY FAN SPEED SHALL MODULATE TO MAINTAIN SUPPLY DUCT STATIC PRESSURE AT SETPOINT.

b. RETURN FAN SPEED SHALL MODULATE TO MAINTAIN RA STATIC PRESSURE AT THE RETURN AIR INLET TO THE MIXING BOX EQUAL TO THE DOAS SUPPLY STATIC PRESSURE – 0.10 IN WC (ADJUSTABLE) AS DETERMINED DURING BALANCING.

2. SUPPLY AIR STATIC PRESSURE RESET CONTROL

a. SUPPLY FAN MAXIMUM SPEED IS CONTROLLED TO MAINTAIN DUCT STATIC PRESSURE AT SETPOINT DETERMINED DURING BALANCING.

b. POLL THE STATUS OF THE ASSOCIATED VAV BOX DAMPERS. IF ALL VAV DAMPERS ARE LESS THAN 75% OPEN (ADJUSTABLE), FAN STATIC SETPOINT SHALL BE REDUCED 0.25 INCH WC (ADJUSTABLE). AFTER 10 MINUTES (ADJUSTABLE) REPEAT THIS PROCESS UNTIL AT LEAST ONE VAV BOX DAMPER IS 80% OPEN (ADJUSTABLE) OR MORE.

3. VENTILATION CONTROL

a. THE MIXING BOX MEASURING OUTSIDE AIR DAMPERS SHALL MODULATE TO MAINTAIN OUTSIDE AIR FLOW FROM DOAS-03 AT THE UNIT SCHEDULED OUTSIDE AIR CFM SETPOINT. THE RETURN AIR DAMPERS ARE MECHANICALLY LINKED TO MODULATE INVERSELY TO THE OUTSIDE AIR DAMPERS.

4. SUPPLY AIR TEMPERATURE CONTROL

a. DURING OCCUPIED MODE, THE VRF COOLING COIL AND THE ASSOCIATED CONDENSTING UNIT SHALL MODULATE TO MAINTAIN DISCHARGE AIR TEMPERATURE AT THE RESET SETPOINT (INITIALLY 55 DEG F, ADJUSTABLE).

5. SUPPLY AIR TEMPERATURE RESET

a. SUPPLY AIR TEMPERATURE SETPOINT SHALL INITIALLY BE SET TO 55 DEG F (ADJUSTABLE).

b. SUPPLY AIR TEMPERATURE SETPOINT SHALL BE RESET FROM 55 DEG F UP TO A MAXIMUM OF 65 DEG F (ADJUSTABLE) AS RETURN AIR TEMPERATURE VARIES FROM 75 DEG F (ADJUSTABLE) TO 70 DEF F (ADJUSTABLE) AS NEEDED TO MAINTAIN SPACE TEMPERATURE IN ALL SERVED VAV ZONES AT SETPOINT WITHOUT REHEAT.

C. UNOCCUPIED MODE

1. THE SUPPLY FAN AND THE RETURN FAN SHALL BE OFF, THE MIXING BOX OUTSIDE AIR DAMPER SHALL BE CLOSED AND THE RETURN AIR DAMPER FULLY OPEN.

2. IF ANY ASSOCIATED VAV ZONE DROPS BELOW ITS UNOCCUPIED HEATING TEMPERATURE SETPOINT, OR RISES ABOVE ITS UNOCCUPIED COOLING TEMPERATURE SETPOINT, THE SUPPLY AIR FAN SHALL START AND RAMP UP TO 75% SPEED (ADJUSTABLE) AND THE RETURN AIR FAN SHALL MODULATE TO MAINTAIN RA STATIC PRESSURE AT SETPOINT. THE OUTSIDE AIR DAMPERS SHALL REMAIN CLOSED AND THE RETURN AIR DAMPERS SHALL REMAIN OPEN.

a. THE ASSOCIATED VAV BOX DAMPERS AND HEATING COILS SHALL MODULATE ACCORDING TO THE VAV BOX CONTROL SEQUENCE TO COOL OR HEAT ALL SERVED SPACES TO THEIR UNOCCUPIED TEMPERATURE SETPOINT.

b. IF ALL SERVED SPACES ARE NOT AT THE UNOCCUPIED TEMPERATURE SETPOINT AFTER 20 MINUTES (ADJUSTABLE), THE SUPPLY FAN SPEED SHALL BE INCREASED TO MAXIMUM (AS SET DURING BALANCING, THE RETURN FAN SHALL CONTINUE TO MODULATE, AND THE OUTSIDE AIR DAMPERS SHALL REMAIN CLOSED UNTIL ALL SERVED SPACES ARE AT THE UNOCCUPIED SETPOINTS.

c. WHEN ALL SPACES ARE WITHIN THEIR UNOCCUPIED TEMPERATURE SETPOINTS, THE SUPPLY AIR FAN AND RETURN AIR FAN SHALL STOP.

3. UNOCCUPIED OVERRIDE

a. WHEN THE UNOCCUPIED OVERRIDE BUTTON ON ANY OF THE VAV BOX THERMOSTATS IS PRESSED FOR ONE SECOND OR MORE, AHU-1, AHU-2, AHU-3, AND DOAS-3 SHALL START AND RUN IN OCCUPIED MODE FOR 2 HOURS (ADJUSTABLE), THEN SWITCH BACK TO UNOCCUPIED MODE. PRESSING ANY OF THE OVERRIDE BUTTONS WHILE THE SYSTEM IS RUNNING IN OVERRIDE MODE SHALL RESET THE OCCUPIED MODE RUN TIME.

D. ALARMS

1. FAN STATUS-COMMAND

a. IF THE FAN STATUS DIFFERS FROM THE COMMAND FOR 15 SECONDS, GENERATE ALARM AT THE BAS WORKSTATION.

2. DIRTY FILTERS

a. IF THE DIFFERENTIAL PRESSURE SENSOR ACROSS THE PRE-FILTERS EXCEEDS 0.75 INCH (ADJUSTABLE) FOR 5 MINUTES WHEN AIRFLOW EXCEEDS 80%, GENERATE ALARM AT THE BAS WORKSTATION.

b. IF THE DIFFERENTIAL PRESSURE SENSOR ACROSS THE FINAL FILTERS EXCEEDS 1.0 IN WC (ADJUSTABLE) FOR 5 MINUTES WHEN AIRFLOW EXCEEDS 80%, GENERATE ALARM AT THE BAS WORKSTATION.

3. WIRE DUCT SMOKE DETECTORS TO SHUT DOWN THE ASSOCIATED AHU SUPPLY AND RETURN FANS AND DOAS-3 AND GENERATE AN ALARM ON THE BAS AND FIRE ALARM SYSTEM IF SMOKE IS DETECTED IN THE SUPPLY AIR OR RETURN AIR.

4. AUTOMATIC FAULT DETECTION AND DIAGNOSTICS (AFDD)

a. AFDD CONDITIONS ARE EVALUATED CONTINUOUSLY AND SEPARATELY FOR EACH OPERATING AHU.

b. THE FOLLOWING VALUES SHALL BE CONTINUOUSLY CALCULATED BY THE AFDD ROUTINES FOR EACH AHU:

1) FIVE MINUTE ROLLING AVERAGES WITH 1-MINUTE SAMPLING TIME OF THE FOLLOWING POINT VALUES; OPERATOR SHALL HAVE THE ABILITY TO ADJUST THE AVERAGING WINDOW AND SAMPLING PERIOD OF EACH POINT INDEPENDENTLY

a) SUPPLY AIR TEMPERATURE

b) MIXED AIR TEMPERATURE

c) RETURN AIR TEMPERATURE

d) OUTDOOR AIR TEMPERATURE

e) DUCT STATIC PRESSURE

f) COOLING COIL LEAVING AIR TEMPERATURE

c. THE INTERNAL AFDD VARIABLES SHOWN BELOW SHALL BE DEFINED FOR EACH AHU. ALL PARAMETERS ARE ADJUSTABLE BY THE OPERATOR WITH INITIAL VALUES AS FOLLOWS:

1) TEMP RISE ACROSS SUPPLY FAN = 2 DEG F

2) TEMP ERROR THRESHOLD FOR SUPPLY, RETURN, AND OUTSIDE AIR TEMP SENSOR = 2 DEG F

3) TEMP ERROR THRESHOLD FOR MIXED AIR TEMP SENSOR = 5 DEG F

4) AIRFLOW ERROR THRESHOLD = 30%

5) VFD SPEED ERROR THRESHOLD = 5%

6) DUCT STATIC PRESSURE ERROR THRESHOLD = 0.1"

7) COOLING COIL ENTERING/LEAVING TEMP SENSOR ERROR = 2 DEG F

8) TIME IN MINUTES THAT A FAULT MUST PERSIST BEFORE TRIGGERING AN ALARM = 30 MIN.

d. THE FOLLOWING FAULT CONDITIONS SHALL BE ANALYZED

1) DUCT STATIC PRESSURE TOO LOW WITH FAN AT FULL SPEED

2) MIXED AIR TEMP TOO LOW OR TOO HIGH; SHOULD BE BETWEEN RA TEMP AND DOAS OA SUPPLY TEMP

3) SUPPLY AIR TEMP TOO HIGH; SHOULD BE LESS THAN MIXED AIR TEMP

4) SUPPLY AIR TEMP TOO HIGH IN FULL COOLING

e. EVALUATION OF FAULT CONDITIONS SHALL BE SUSPENDED WHEN AHU IS NOT RUNNING OR FOR 30 MINUTES AFTER A CHANGE IN OPERATING MODE (I.E. UNOCCUPIED TO OCCUPIED MODE)

1.8 VAV TERMINAL UNITS WITH HEAT

A. REFER TO VAV BOX SCHEDULE FOR MINIMUM AND MAXIMUM AIRFLOW SETPOINTS.

B. IN COOLING MODE, THE VAV TERMINAL UNIT DAMPER SHALL MODULATE FROM MINIMUM TO MAXIMUM AIRFLOW TO MAINTAIN SPACE TEMPERATURE AT SETPOINT.

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PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
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ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

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C. IN HEATING MODE, UPON A CONTINUED DROP IN SPACE TEMPERATURE WHILE THE DAMPER IS AT MINIMUM POSITION, THE HEATING COIL SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE SETPOINT WHILE MAINTAINING A MAXIMUM LEAVING AIR TEMPERATURE OF 90 DEG F. HEATING MODE SHALL BE LOCKED OUT WHEN COOLING COIL IS RUNNING.

D. UPON A CONTINUED DROP IN SPACE TEMPERATURE, THE VAV BOX DAMPER SHALL MODULATE UP TO THE MAXIMUM AIRFLOW SETPOINT WHILE MAINTAINING 90 DEG F DISCHARGE AIR TEMPERATURE.

E. THE VAV DAMPER SHALL BE MODULATED BY A PID CONTROL LOOP TO MAINTAIN THE MEASURED AIRFLOW AT THE ACTIVE SETPOINT.

F. ALARMS

1. LOW AIRFLOW

a. IF MEASURED AIRFLOW IS LESS THAN 70% OF SETPOINT FOR 10 MINUTES WHILE SETPOINT IS GREATER THAN ZERO, GENERATE ALARM.

2. LOW DISCHARGE AIR TEMPERATURE

a. IF HEATING HOT WATER IS PROVEN ON, AND DISCHARGE AIR TEMPERATURE IS 15 DEG (ADJ) LESS THAN SETPOINT FOR 10 MINUTES, GENERATE ALARM.

3. AIRFLOW SENSOR CALIBRATION

a. IF THE FAN SERVING THE ZONE IS OFF AND AIRFLOW SENSOR READING IS ABOVE THE LARGER OF 10% OF THE COOLING MAXIMUM AIRFLOW SETPOINT OR 50 CFM FOR 30 MINUTES, GENERATE ALARM.

4. LEAKING VALVE

a. IF THE VALVE POSITION IS 0% FOR 15 MINUTES, DISCHARGE AIR TEMP IS ABOVE AHU SUPPLY TEMP FOR 5 DEG F AND THE FAN SERVING THE ZONE IS PROVEN ON, GENERATE ALARM

1.9 AIR HANDLING UNIT AHU-3

A. AHU-3 IS A SINGLE ZONE VAV AIR HANDLING UNIT WITH A 30% PROPYLENE GLYCOL HEATING COIL AND A VRF COOLING COIL.

B. OCCUPIED MODE

1. THE SUPPLY FAN SHALL RUN CONTINUOUSLY WHENEVER THE UNIT IS IN OCCUPIED MODE.

2. SUPPLY FAN SPEED CONTROL SETTINGS

a. PROVIDE RAMP FUNCTION TO PREVENT CHANGES IN FAN SPEED OF MORE THAN 10% PER MINUTE

b. MAXIMUM FAN SPEED SHALL BE THE SCHEDULED SUPPLY AIRFLOW.

c. MINIMUM FAN SPEED SHALL BE 40% OF MAXIMUM SPEED (ADJUSTABLE).

3. SUPPLY AIR TEMPERATURE AND SUPPLY FAN SPEED CONTROL

a. PROVIDE RAMP FUNCTION TO PREVENT CHANGES IN SUPPLY AIR TEMPERATURE OF MORE THAN 0.5 DEG PER MINUTE

b. AT MAX COOLING, FAN SPEED SHALL BE AT MAXIMUM AND VRF COOLING COIL SHALL MODULATE TO MAINTAIN DISCHARGE AIR TEMPERATURE OF 55 DEG F (ADJ)

c. UPON A DROP IN SPACE TEMPERATURE, FAN SPEED SHALL RAMP DOWN TOWARD MINIMUM FLOW.

d. UPON A CONTINUED DROP IN SPACE TEMPERATURE AFTER FAN IS AT MINIMUM FLOW, SUPPLY AIR TEMPERATURE SHALL BE RESET FROM A MINIMUM DISCHARGE AIR TEMPERATURE OF 55 DEG F (ADJ) UP TO A MAXIMUM OF 65 DEG F (ADJ).

e. UPON A CONTINUED DROP IN SPACE TEMPERATURE, FAN SHALL CONTINUE AT MINIMUM SPEED AND VRF COOLING COIL SHALL MODULATE OFF.

f. UPON A CONTINUED DROP IN SPACE TEMPERATURE BELOW HEATING SETPOINT, THE HEATING COIL CONTROL VALVE SHALL MODULATE OPEN TO MAINTAIN DISCHARGE AIR TEMPERATURE OF 80 DEG F (ADJ).

g. UPON A CONTINUED DROP IN SPACE TEMPERATURE AFTER FAN IS AT MINIMUM FLOW, SUPPLY AIR TEMPERATURE SHALL BE RESET FROM A MINIMUM DISCHARGE AIR TEMPERATURE OF 80 DEG F (ADJ) UP TO A MAXIMUM OF 90 DEG F (ADJ).

h. UPON A CONTINUED DROP IN SPACE TEMPERATURE AFTER DISCHARGE AIR TEMPERATURE IS AT MAXIMUM OF 90 DEG F (ADJ), THE FAN SPEED SHALL MODULATE TO MAXIMUM AIRFLOW.

4. VENTILATION CONTROL

a. DURING OCCUPIED MODE, THE AIR FLOW MEASURING OUTDOOR AIR DAMPER SHALL MODULATE TO MAINTAIN SCHEDULED MINIMUM OUTDOOR AIRFLOW AS MEASURED AT THE AIRFLOW MEASURING STATION. THE RETURN AIR DAMPER IS MECHANICALLY LINKED TO OPERATE INVERSELY TO THE OUTSIDE AIR DAMPER.

C. UNOCCUPIED MODE

1. THE SUPPLY FAN SHALL BE OFF, THE MIXING BOX OUTSIDE AIR DAMPER SHALL BE CLOSED AND THE RETURN AIR DAMPER FULLY OPEN.

2. IF SPACE TEMPERATURE DROPS BELOW ITS UNOCCUPIED HEATING TEMPERATURE SETPOINT, OR RISES ABOVE ITS UNOCCUPIED COOLING TEMPERATURE SETPOINT, THE SUPPLY AIR FAN SHALL START AND RAMP UP TO 75% SPEED (ADJUSTABLE). THE OUTSIDE AIR DAMPERS SHALL REMAIN CLOSED AND THE RETURN AIR DAMPERS SHALL REMAIN OPEN.

a. COOLING: THE UNIT VRF COOLING COIL SHALL MODULATE TO MAINTAIN SUPPLY AIR TEMPERATURE AT MINIMUM.

b. HEATING: THE UNIT HEATING COIL SHALL MODULATE TO MAINTAIN SUPPLY AIR TEMPERATURE AT MAXIMUM.

c. IF THE SPACE HAS NOT REACHED THE UNOCCUPIED TEMPERATURE SETPOINT AFTER 20 MINUTES (ADJUSTABLE), THE SUPPLY FAN SPEED SHALL BE INCREASED TO MAXIMUM (AS SET DURING BALANCING) UNTIL THE SPACE IS AT THE UNOCCUPIED SETPOINT. THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED

d. WHEN ALL SPACES ARE WITHIN THEIR UNOCCUPIED TEMPERATURE SETPOINTS, THE SUPPLY AIR FAN SHALL STOP.

3. UNOCCUPIED OVERRIDE

a. WHEN THE UNOCCUPIED OVERRIDE BUTTON ON THE SPACE THERMOSTAT IS PRESSED FOR ONE SECOND OR MORE, AHU-1, AHU-2, AHU-3, AND DOAS-3 SHALL START AND RUN IN OCCUPIED MODE FOR 2 HOURS (ADJUSTABLE), THEN SWITCH BACK TO UNOCCUPIED MODE. PRESSING THE OVERRIDE BUTTON WHILE THE SYSTEM IS RUNNING IN OVERRIDE MODE SHALL RESET THE OCCUPIED MODE RUN TIME.

D. ALARMS

1. FAN STATUS-COMMAND

a. IF THE FAN STATUS DIFFERS FROM THE COMMAND FOR 15 SECONDS, GENERATE ALARM.

2. DIRTY FILTER

a. IF THE DIFFERENTIAL PRESSURE SENSOR ACROSS THE PRE-FILTERS EXCEEDS 0.75 INCH (ADJUSTABLE) FOR 5 MINUTES WHEN AIRFLOW EXCEEDS 80%, GENERATE ALARM AT THE BAS WORKSTATION.

b. IF THE DIFFERENTIAL PRESSURE SENSOR ACROSS THE FINAL FILTERS EXCEEDS 1.0 IN WC (ADJUSTABLE) FOR 5 MINUTES WHEN AIRFLOW EXCEEDS 80%, GENERATE ALARM AT THE BAS WORKSTATION.

3. WIRE DUCT SMOKE DETECTORS TO SHUT DOWN THE AHU-3 SUPPLY FAN AND DOAS-3 AND GENERATE AN ALARM ON THE BAS AND FIRE ALARM SYSTEM IF SMOKE IS DETECTED IN THE RETURN AIR.

E. AUTOMATIC FAULT DETECTION AND DIAGNOSTICS (AFDD)

1. AFDD CONDITIONS ARE EVALUATED CONTINUOUSLY AND SEPARATELY FOR EACH OPERATING AHU.

2. THE FOLLOWING VALUES SHALL BE CONTINUOUSLY CALCULATED BY THE AFDD ROUTINES FOR EACH AHU:

a. FIVE MINUTE ROLLING AVERAGES WITH 1-MINUTE SAMPLING TIME OF THE FOLLOWING POINT VALUES; OPERATOR SHALL HAVE THE ABILITY TO ADJUST THE AVERAGING WINDOW AND SAMPLING PERIOD OF EACH POINT INDEPENDENTLY

1) SUPPLY AIR TEMPERATURE

2) MIXED AIR TEMPERATURE

3) RETURN AIR TEMPERATURE

4) OUTDOOR AIR TEMPERATURE

5) DUCT STATIC PRESSURE

6) COOLING COIL ENTERING AIR TEMPERATURE

7) COOLING COIL LEAVING AIR TEMPERATURE

3. THE INTERNAL AFDD VARIABLES SHOWN BELOW SHALL BE DEFINED FOR EACH AHU. ALL PARAMETERS ARE ADJUSTABLE BY THE OPERATOR WITH INITIAL VALUES AS FOLLOWS:

a. TEMP RISE ACROSS SUPPLY FAN = 2 DEG F

b. TEMP ERROR THRESHOLD FOR SUPPLY, RETURN, AND OUTSIDE AIR TEMP SENSOR = 2 DEG F

c. TEMP ERROR THRESHOLD FOR MIXED AIR TEMP SENSOR = 5 DEG F

d. AIRFLOW ERROR THRESHOLD = 30%

e. VFD SPEED ERROR THRESHOLD = 5%

f. DUCT STATIC PRESSURE ERROR THRESHOLD = 0.1"

g. COOLING COIL ENTERING/LEAVING TEMP SENSOR ERROR = 2 DEG F

h. TIME IN MINUTES THAT A FAULT MUST PERSIST BEFORE TRIGGERING AN ALARM = 30 MIN.

4. THE FOLLOWING FAULT CONDITIONS SHALL BE ANALYZED

a. DUCT STATIC PRESSURE TOO LOW WITH FAN AT FULL SPEED

b. MIXED AIR TEMP TOO LOW OR TOO HIGH; SHOULD BE BETWEEN RA TEMP AND OA TEMP

c. SUPPLY AIR TEMP TOO HIGH; SHOULD BE LESS THAN MIXED AIR TEMP

d. SUPPLY AIR TEMP TOO HIGH IN COOLING; SHOULD BE LOWER THAN MIXED AIR TEMP

e. SUPPLY AIR TEMP TOO LOW IN HEATING; SHOULD BE HIGHER THAN MIXED AIR TEMP

f. TEMPERATURE DROPS ACROSS INACTIVE COOLING COIL

g. TEMPERATURE RISE ACROSS INACTIVE HEATING COIL

5. EVALUATION OF FAULT CONDITIONS SHALL BE SUSPENDED WHEN AHU IS NOT RUNNING OR FOR 30 MINUTES AFTER A CHANGE IN OPERATING MODE (I.E. UNOCCUPIED TO OCCUPIED MODE)

1.10 ROOFTOP AIR HANDLING UNIT AHU-4

A. AHU-4 IS A SINGLE ZONE VAV AIR HANDLING UNIT WITH A 30% PROPYLENE GLYCOL HEATING COIL AND DX COOLING COIL.

B. OCCUPIED MODE

1. THE SUPPLY FAN SHALL RUN CONTINUOUSLY WHENEVER THE UNIT IS IN OCCUPIED MODE.

2. SUPPLY FAN SPEED CONTROL SETTINGS

a. PROVIDE RAMP FUNCTION TO PREVENT CHANGES IN FAN SPEED OF MORE THAN 10% PER MINUTE

b. MAXIMUM FAN SPEED SHALL BE THE SCHEDULED SUPPLY AIRFLOW.

c. MINIMUM FAN SPEED SHALL BE 40% OF MAXIMUM SPEED (ADJUSTABLE).

3. SUPPLY AIR TEMPERATURE AND SUPPLY FAN SPEED CONTROL

a. UNIT CONTROLLER SHALL MODULATE INTEGRAL DX COOLING, PROPYLENE GLYCOL COIL HEATING CONTROL VALVE, FAN SPEED, AND OUTSIDE AIR DAMPERS IN SEQUENCE TO MAINTAIN SPACE TEMPERATURE AT SETPOINT.

b. SUPPLY AIR TEMPERATURE SHALL BE RESET FROM A MINIMUM DISCHARGE AIR TEMPERATURE OF 55 DEG F (ADJUSTABLE) UP TO A MAXIMUM OF 95 DEG F (ADJUSTABLE).

c. IF RETURN AIR HUMIDITY RISES ABOVE 50% RELATIVE HUMIDITY AT 75 DEG F (ADJUSTABLE), COOLING COIL DISCHARGE TEMPERATURE SHALL BE SET TO 55 DEG F (ADJUSTABLE) AND THE INTEGRAL HOT GAS REHEAT COIL SHALL MODULATE TO MAINTAIN SUPPLY AIR TEMPERATURE AT THE RESET SETPOINT.

4. VENTILATION CONTROL

a. DURING OCCUPIED MODE, THE OUTDOOR AIR DAMPER SHALL MODULATE TO MINIMUM POSITION DETERMINED DURING BALANCING TO PROVIDE THE SCHEDULED MINIMUM OUTSIDE AIRFLOW. THE RETURN AIR DAMPER IS MECHANICALLY LINKED TO OPERATE INVERSELY TO THE OUTSIDE AIR DAMPER.

b. ECONOMIZER CONTROL: WHEN OUTSIDE AIR ENTHALPY IS LESS THAN RETURN AIR ENTHALPY, THE OUTSIDE AIR DAMPERS SHALL MODULATE OPEN TO HELP MAINTAIN SPACE HUMIDITY AT SETPOINT (FREE COOLING). DX COOLING SHALL BE AVAILABLE DURING ECONOMIZER OPERATION. EXHAUST AIR SHALL BE RELIEVED THROUGH THE UNIT BAROMETRIC RELIEF DAMPERS.

C. UNOCCUPIED MODE

1. THE SUPPLY FAN SHALL BE OFF, THE MIXING BOX OUTSIDE AIR DAMPER SHALL BE CLOSED AND THE RETURN AIR DAMPER FULLY OPEN.

2. IF SPACE TEMPERATURE DROPS BELOW ITS UNOCCUPIED HEATING TEMPERATURE SETPOINT, THE SUPPLY AIR FAN SHALL START AND RAMP UP TO 75% SPEED (ADJUSTABLE). THE OUTSIDE AIR DAMPERS SHALL REMAIN CLOSED AND THE RETURN AIR DAMPERS SHALL REMAIN OPEN.

a. THE UNIT HEATING COIL SHALL MODULATE TO MAINTAIN SUPPLY AIR TEMPERATURE AT MAXIMUM.

b. IF THE SPACE HAS NOT REACHED THE UNOCCUPIED TEMPERATURE SETPOINT AFTER 20 MINUTES (ADJUSTABLE), THE SUPPLY FAN SPEED SHALL BE INCREASED TO MAXIMUM (AS SET DURING BALANCING) UNTIL THE SPACE IS AT THE UNOCCUPIED SETPOINT. THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED

c. WHEN THE SPACE ARE WITHIN THEIR UNOCCUPIED TEMPERATURE SETPOINTS, THE SUPPLY AIR FAN SHALL STOP.

3. UNOCCUPIED OVERRIDE

a. WHEN THE UNOCCUPIED OVERRIDE BUTTON ON THE SPACE THERMOSTAT IS PRESSED FOR ONE SECOND OR MORE, AHU-4 SHALL START AND RUN IN OCCUPIED MODE FOR 2 HOURS (ADJUSTABLE), THEN SWITCH BACK TO UNOCCUPIED MODE. PRESSING THE OVERRIDE BUTTON WHILE THE SYSTEM IS RUNNING IN OVERRIDE MODE SHALL RESET THE OCCUPIED MODE RUN TIME.

D. ALARMS

1. FAN STATUS-COMMAND

a. IF THE FAN STATUS DIFFERS FROM THE COMMAND FOR 15 SECONDS, GENERATE ALARM.

2. DIRTY FILTER

a. IF THE DIFFERENTIAL PRESSURE SENSOR ACROSS THE PRE-FILTERS EXCEEDS 0.75 INCH (ADJUSTABLE) FOR 5 MINUTES WHEN AIRFLOW EXCEEDS 80%, GENERATE ALARM AT THE BAS WORKSTATION.

b. IF THE DIFFERENTIAL PRESSURE SENSOR ACROSS THE FINAL FILTERS EXCEEDS 1.0 IN WC (ADJUSTABLE) FOR 5 MINUTES WHEN AIRFLOW EXCEEDS 80%, GENERATE ALARM AT THE BAS WORKSTATION.

3. WIRE DUCT SMOKE DETECTORS TO SHUT DOWN THE AHU-4 SUPPLY FAN AND GENERATE AN ALARM ON THE BAS AND FIRE ALARM SYSTEM IF SMOKE IS DETECTED IN THE RETURN AIR.

1.11 STAIR CONVECTORS / FIN TUBED RADIATOR

A. HEATING COIL CONTROL VALVE SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE SETPOINT.

1.12 DEHUMIDIFIER

A. DH-1 SHALL OPERATE CONTINUOUSLY 24/7 SUBJECT TO ITS OWN CONTROLS TO MAINTAIN SPACE HUMIDITY AT 30% RH AT 50 DEG F (ADJUSTABLE).

1.13 4TH FLOOR CONSERVATION LAB PAINT BOOTH:

SF-1, HC-1, D-8

A. UPON A RELAY SIGNAL INDICATING THE PAINT BOOTH EXHAUST FAN IS ON, THE OUTSIDE AIR DAMPER SHALL OPEN AND THE SUPPLY FAN SHALL TURN ON IN SEQUENCE.

B. WHEN THE SUPPLY FAN IS ON, THE HEATING COIL CONTROL VALVE SHALL MODULATE TO MAINTAIN LEAVING AIR TEMPERATURE OF 68 DEG F (ADJ)

C. UPON A RELAY SIGNAL INDICATING THE PAINT BOOTH EXHAUST FAN IS OFF, THE SUPPLY FAN SHALL TURN OFF AND THE OUTSIDE AIR DAMPER SHALL CLOSE IN SEQUENCE.

D. WHEN THE SUPPLY FAN IS OFF, THE HEATING COIL CONTROL VALVE SHALL CLOSE.

E. ALARMS

1. FREEZE PROTECTION

a. IF THE DISCHARGE AIR TEMPERATURE IS BELOW 40 DEG F (ADJ) FOR MORE THAN 5 MINUTES, GENERATE ALARM, TURN OFF SUPPLY FAN, AND CLOSE OUTSIDE AIR DAMPER

2. HIGH DISCHARGE AIR TEMPERATURE

a. IF THE DISCHARGE AIR TEMPERATURE IS ABOVE 100 DEG F (ADJ) FOR MORE THAN 5 MINUTES, GENERATE ALARM.

3. HIGH STATIC PRESSURE

A. WHEN PRESSURE SWITCH DETECTS HIGH STATIC PRESSURE, SHUT DOWN SUPPLY FAN AND GENERATE AN ALARM.

4. FAN STATUS-COMMAND

a. IF THE FAN STATUS DIFFERS FROM THE COMMAND FOR 15 SECONDS, GENERATE ALARM

1.14 1ST FLOOR WORKSHOP PAINT BOOTH: HC-2, D-9

A. UPON A RELAY SIGNAL INDICATING THE PAINT BOOTH EXHAUST FAN IS ON, THE OUTSIDE AIR DAMPER SHALL OPEN.

B. WHEN THE OUTSIDE AIR DAMPER IS ON, THE HEATING COIL CONTROL VALVE SHALL MODULATE TO MAINTAIN LEAVING AIR TEMPERATURE OF 68 DEG F (ADJ)

C. UPON A RELAY SIGNAL INDICATING THE PAINT BOOTH EXHAUST FAN IS OFF, THE OUTSIDE AIR DAMPER SHALL CLOSE AND THE HEATING COIL CONTROL VALVE SHALL CLOSE.

D. ALARMS

1. FREEZE PROTECTION

a. IF THE DISCHARGE AIR TEMPERATURE IS BELOW 40 DEG F (ADJ) FOR MORE THAN 5 MINUTES, GENERATE ALARM AND CLOSE OUTSIDE AIR DAMPER

2. HIGH DISCHARGE AIR TEMPERATURE

a. IF THE DISCHARGE AIR TEMPERATURE IS ABOVE 100 DEG F (ADJ) FOR MORE THAN 5 MINUTES, GENERATE ALARM

3. DAMPER STATUS-COMMAND

a. IF THE FAN STATUS DIFFERS FROM THE COMMAND FOR 15 SECONDS, GENERATE ALARM

1.15 EXISTING PAINT BOOTH EXHAUST FANS

A. EXISTING EXHAUST FANS SERVING 1ST AND 4TH FLOOR PAINT BOOTHS HAVE MANUAL CONTROLS LOCATED IN THEIR RESPECTIVE SPACES.

B. PROVIDE GRAPHIC AND FAN STATUS MONITORING CAPABILITIES AT BAS WORKSTATION.

1.16 HEATING COIL, HC-4

A. HEATING COIL CONTROL VALVE SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE SETPOINT.

1. HIGH DISCHARGE AIR TEMPERATURE

a. IF THE DISCHARGE AIR TEMPERATURE IS ABOVE 100 DEG F (ADJ) FOR MORE THAN 5 MINUTES, GENERATE ALARM

1.17 UNIT HEATERS

A. THE HEATING COIL CONTROL VALVE SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE SETPOINT.

B. THE FAN SHALL RUN ANY TIME THE HEATING COIL CONTROL VALVE IS OPEN.

C. THE FAN SHALL CONTINUE TO RUN FOR 15 MINUTES (ADJ) AFTER THE HEATING COIL HAS CLOSED.

1.18 HOT WATER PLANT

A. BOTH INDEPENDENT HOT WATER PLANTS (100% WATER PLANT AND 30% PROPYLENE GLYCOL / WATER PLANT) SHALL USE THE SAME SEQUENCE OF OPERATION BUT HAVE SEPARATE TEMPERATURE RESET SETPOINTS.

B. PLANT ENABLE/DISABLE

1. THE DEFAULT SCHEDULE SHALL BE 24/7

2. ENABLE THE PLANT WHEN OUTSIDE AIR TEMPERATURE IS LESS THAN 65 DEG F (ADJ)

3. DISABLE THE PLANT WHEN OUTSIDE AIR TEMPERATURE IS GREATER THAN OR EQUAL TO 65 DEG F (ADJ)

4. WHEN THE PLANT IS ENABLED:

a. STAGE ON THE LEAD PRIMARY HW PUMP

b. ONCE THE LEAD PUMP HAS PROVEN ON, MODULATE THE 1/3 STEAM CONTROL VALVE OPEN TO MAINTAIN LEAVING WATER TEMPERATURE SETPOINT.

5. WHEN THE PLANT IS DISABLED

a. CLOSE BOTH STEAM CONTROL VALVES

b. CONTINUE TO RUN THE PRIMARY HW PUMP FOR 5 MINUTES (ADJ) AFTER STEAM CONTROL VALVE POSITIONS ARE BOTH AT 0%.

C. HOT WATER TEMPERATURE CONTROL:

1. HOT WATER SYSTEM ENABLE/DISABLE

a. HOT WATER SYSTEMS SHALL BE ENABLED WHEN THE OUTSIDE AIR TEMPERATURE IS LOWER THAN THE SYSTEM ENABLE SETPOINT, INITIALLY 65 DEG F (ADJUSTABLE). WHEN THE SYSTEM IS ENABLED, THE ASSOCIATED PUMP SHALL BE ENABLED.

1) THE THREE-WAY DIVERTING CONTROL VALVE CV-1 IN THE B-5 MECHANICAL ROOM SHALL SWITCH TO DIVERT HOT WATER TO CIRCULATE HEATING HOT WATER THROUGHOUT THE BUILDING.

b. WHEN OUTSIDE AIR TEMPERATURE IS WARMER THAN THE ENABLE SETPOINT, THE STEAM CONTROL VALVES SHALL BE CLOSED AND THE ASSOCIATED PUMPS SHALL BE OFF.

1) THE THREE-WAY DIVERTING CONTROL VALVE CV-1 IN THE B-5 MECHANICAL ROOM SHALL SWITCH TO DIVERT HOT WATER SUPPLY TO HOT WATER RETURN SO HEATING HOT WATER DOES NOT CIRCULATE THROUGH THE REST OF THE BUILDING.

2. HOT WATER RESET CONTROL

a. PROVIDE TEMPERATURE SENSOR IN THE HEATING HOT WATER SUPPLY PIPING AND OUTDOOR AIR. RESET THE HEATING HOT WATER SUPPLY TEMPERATURE FROM 170 DEG F (ADJ) AT 20 DEG F (ADJ) OUTDOOR AIR TEMPERATURE TO 130 DEG F (ADJ) HEATING HOT WATER SUPPLY TEMPERATURE AT 60 DEG F (ADJ) OUTDOOR AIR TEMPERATURE. ALL SETPOINTS SHALL BE ADJUSTABLE. LIMIT RESET FREQUENCY TO NO MORE THAN ONCE EVERY 15 MINUTES (ADJUSTABLE).

3. STEAM CONTROL

a. ONCE THE TEMPERATURE SETPOINT HAS BEEN ESTABLISHED BEGIN MODULATING THE 1/3 STEAM CONTROL VALVE TO MAINTAIN HOT WATER SUPPLY TEMPERATURE AT SETPOINT. OPEN THE 1/3 VALVE AS THE TEMPERATURE DECREASES AND MODULATE CLOSED AS THE TEMPERATURE INCREASES.

b. ONCE THE 1/3 VALVE HAS REACHED 100% FOR 5 MINUTES (ADJ), ENABLE THE 2/3 VALVE. ONCE THE 2/3 VALVE HAS BEEN ENABLED, REVERT PRIMARY CONTROL OVER TO THE 2/3 VALVE AND CLOSE THE 1/3 VALVE.

c. ONCE THE 2/3 VALVE HAS REACHED 100%, BEGIN MODULATING THE 1/3 VALVE OPEN TO MAINTAIN SUPPLY WATER TEMPERATURE SETPOINT.

d. REVERSE THE SEQUENCE AS THE DEMAND DECREASES. RE-ESTABLISH PRIMARY CONTROL OF THE 1/3 VALVE, ONCE THE 2/3 VALVE COMMAND HAS REACHED 15% (ADJ) OR LESS FOR 5 MINUTES (ADJ).

D. HEATING PUMP CONTROL

1. THE PUMPS FOR EACH WATER LOOP SHALL BE SELF-SENSING PUMPS WITH INTEGRAL VFD AND CONTROLLERS PROVIDED BY THE PUMP MANUFACTURER.

2. LEAD/LAG CONTROL

a. THE LEAD PUMP SHALL RUN CONTINUOUSLY WHENEVER THE HOT WATER SYSTEM IS ENABLED. THE LAG PUMP PROVIDES BACKUP. WHEN THE HOT WATER SYSTEM IS DISABLED, THE PUMPS SHALL BE OFF.

b. IF THE LEAD PUMP FAILS (AS INDICATED BY THE PUMP CONTROLLER), THE LAG PUMP SHALL BECOME THE LEAD PUMP AND RUN CONTINOUSLY. THE FAILED PUMP SHALL BE LOCKED OUT AND AN ALARM SHALL BE INDICATED ON THE BAS GRAPHIC.

c. THE LEAD AND BACKUP PUMPS SHALL BE SET TO AUTOMATICALLY ALTERNATE ONCE EACH MONTH (ADJUSTABLE).

3. PUMP SPEED CONTROL

a. MINIMUM PUMP SPEED SHALL BE THE GREATER OF 20% OF PUMP SPEED AT DESIGN FLOW OR THE MINIMUM PUMP SPEED THE VFD ALLOWS THE PUMP TO SAFELY OPERATE.

b. THE LEAD PUMP SHALL START AT MINIMUM SPEED AND SLOWLY RAMP UP TO THE SPEED REQUIRED TO MAINTAIN SYSTEM DIFFERENTIAL PRESSURE.

c. THE PUMP CONTROLLERS SHALL BE PROGRAMMED TO PROVIDE CONSTANT DIFFERENTIAL PRESSURE. THE PUMP PRESSURE SETTING SHALL BE INITIALLY SET TO THE SCHEDULED PUMP HEAD, THEN ADJUSTED IN

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CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

REV	REVISION ISSUE DESCRIPTION	DATE
B	ADDENUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

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DESIGNED BY:	SMM
DRAWN BY:	BAL

SHEET TITLE:
SEQUENCE OF OPERATIONS

SHEET ID:
M-708

NOT FOR CONSTRUCTION

COORDINATION WITH THE BALANCING CONTRACTOR TO THE LOWEST PRESSURE THAT PROVIDES THE SCHEDULED FLOW RATE TO EACH COIL. THE PUMP CONTROLLER SHALL MODULATE THE LEAD PUMP SPEED TO MAINTAIN SYSTEM DIFFERENTIAL PRESSURE AT SETPOINT.

E. DOMESTIC HOT WATER (DHW) CONTROL
   1. WHEN THERE IS A CALL FOR HEATING FROM WH-1, OPEN THE 2-POSITION DHW CONTROL VALVE. IF THE HOT WATER RESET TEMPERATURE IS LESS THAN 160 DEG F, OVERRIDE THE HOT WATER TEMPERATURE SETPOINT TO 160 DEG F (ADJUSTABLE). WHEN DHW TEMPERATURE IN WH-1 REACHES SETPOINT, CLOSE THE DHW CONTROL VALVE AND RELEASE THE HOT WATER RESET OVERRIDE.
   2. WHEN OUTSIDE AIR IS WARMER THAN THE HOT WATER SYSTEM ENABLE SETPOINT (SO THE HOT WATER SYSTEM IS OFF), OVERRIDE THE HOT WATER SYSTEM AND THE ASSOCIATED PUMPS AND STEAM CONTROL VALVES ON. DHW HEATING SHALL THEN FUNCTION NORMALLY.
   3. THE DHW RECIRCULATION PUMP P-5 SHALL RUN WHEN ANY ZONE IN THE BUILDING IS IN OCCUPIED MODE. WHEN ALL ZONES IN THE BUILDING ARE IN UNOCCUPIED MODE, P-5 SHALL BE OFF.

F. PERFORMANCE MONITORING
   1. ALL CALCULATIONS LISTED BELOW SHALL BE PERFORMED AT LEAST ONCE EVERY 30 SECONDS. TIME AVERAGED VALUES SHALL BE RECORDED AT LEAST ONCE EVERY 5 MIUTES. THE AVERAGING PERIOF SHALL EQUAL THE TRENDING INTERVAL.
   2. TOTAL PLANT LOAD. CALCULATE PLANT LOAD IN MBH BY MULTIPLYING 0.49 TIMES HOT WATER FLOWRATE AS MEASURED AT THE HOT WATER FLOW METER TIMES THE DIFFERENCE BETWEEN THE ENTERING AND LEAVING HOT WATER TEMPERATURES AT THE HEAT EXCHANGER.
   3. SUMMARY DATA
      a. FOR EACH HOT WATER PLANT, STATISTICS SHALL BE CALCULATED FOR RUNTIME, CUMULATIVE LOAD (BTU), AVERAGE DEMAND (BTU/H), AND PEAK DEMAND (BTU/H). ALL STATISTICS SHALL BE PRESENTED ON AN INSTANTANEOUS, YEAR-TO-DATE, AND PREVIOUS YEAR BASIS.

G. ALARMS
   1. LOW LEAVING HW TEMP
      a. WHEN LEAVING HOT WATER TEMP IS 15 DEG F (ADJ) BELOW SETPOINT FOR MORE THAN 15 MINUTES, GENERATE ALARM
   2. HIGH LEAVING HW TEMP
      a. WHEN LEAVING HOT WATER TEMP IS 10 DEG F (ADJ) ABOVE SETPOINT FOR MORE THAN 10 MINUTES, GENERATE ALARM AND CLOSE STEAM CONTROL VALVES.
   3. PUMP ALARM
      a. WHEN STATUS IS DIFFERENT FROM COMMAND FOR MORE THAN 15 MINUTES, GENERATE ALARM.
   4. SENSOR ALARM
      a. SENSOR SHALL BE DEEMED OUTSIDE ITS WIDEST POSSIBLE RANGE IF ANY OF THE FOLLOWING ARE TRUE:
         1) FEEDBACK LESS THAN 2 mA FROM ANY 4 TO 20 mA TRANSDUCER
         2) TEMPERATURE READING OF LESS THAN 0 DEG F FROM ANY TEMPERATURE SENSOR
      b. IF ANY SENSOR GOES OUTSIDE ITS WIDEST POSSIBLE OPERATING RANGE, GENERATE ALARM

H. AUTOMATIC FAULT DETECTION AND DIAGNOSTICS (AFDD)
   1. AFDD CONDITIONS ARE EVALUATED CONTINUOUSLY FOR THE PLANT.
   2. THE FOLLOWING VALUES MUST BE CONTINUOUSLY CALCULATED BY THE AFDD ROUTINES FOR EACH AHU:
      a. FIVE MINUTE ROLLING AVERAGES WITH 1-MINUTE SAMPLING TIME OF THE FOLLOWING POINT VALUES; OPERATOR SHALL HAVE THE ABILITY TO ADJ THE AVERAGING WINDOW AND SAMPLING PERIOD OF EACH POINT INDEPENDENTLY
         1) SUPPLY AIR TEMPERATURE
         2) MIXED AIR TEMPERATURE
         3) RETURN AIR TEMPERATURE
         4) OUTDOOR AIR TEMPERATURE
         5) DUCT STATIC PRESSURE
         6) COOLING COIL ENTERING AIR TEMPERATURE
         7) COOLING COIL LEAVING AIR TEMPERATURE
   3. THE INTERNAL AFDD VARIABLES SHOWN BELOW SHALL BE DEFINED FOR EACH AHU. ALL PARAMETERS ARE ADJUSTABLE BY THE OPERATOR WITH INITIAL VALUES AS FOLLOWS:
      a. TEMP RISE ACROSS SUPPLY FAN = 2 DEG F
      b. TEMP ERROR THRESHOLD FOR SUPPLY, RETURN, AND OUTSIDE AIR TEMP SENSOR = 2 DEG F
      c. TEMP ERROR THRESHOLD FOR MIXED AIR TEMP SENSOR = 5 DEG F
      d. AIRFLOW ERROR THRESHOLD = 30%
      e. VFD SPEED ERROR THRESHOLD = 5%
      f. DUCT STATIC PRESSURE ERROR THRESHOLD = 0.1"
      g. COOLING COIL ENTERING/LEAVING TEMP SENSOR ERROR = 2 DEG F
      h. TIME IN MINUTES THAT A FAULT MUST PERSIST BEFORE TRIGGERING AN ALARM = 30 MIN.
   4. THE FOLLOWING FAULT CONDITIONS SHALL BE ANALYZED
      a. DUCT STATIC PRESSURE TOO LOW WITH FAN AT FULL SPEED
      b. MIXED AIR TEMP TOO LOW OR TOO HIGH; SHOULD BE BETWEEN RA TEMP AND OA TEMP
      c. SUPPLY AIR TEMP TOO HIGH; SHOULD BE LESS THAN MIXED AIR TEMP
      d. SUPPLY AIR TEMP TOO HIGH IN COOLING; SHOULD BE LOWER THAN MIXED AIR TEMP
      e. SUPPLY AIR TEMP TOO LOW IN HEATING; SHOULD BE HIGHER THAN MIXED AIR TEMP
      f. TEMPERATURE DROPS ACROSS INACTIVE COOLING COIL
      g. TEMPERATURE RISE ACROSS INACTIVE HEATING COIL
   5. EVALUATION OF FAULT CONDITIONS SHALL BE SUSPENDED WHEN AHU IS NOT RUNNING OR FOR 30 MINUTES AFTER A CHANGE IN OPERATING MODE (I.E. UNOCCUPIED TO OCCUPIED MODE)

B

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ASBESTOS ABATEMENT & MECHANICAL UPGRADES
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REV	REVISION ISSUE DESCRIPTION	DATE
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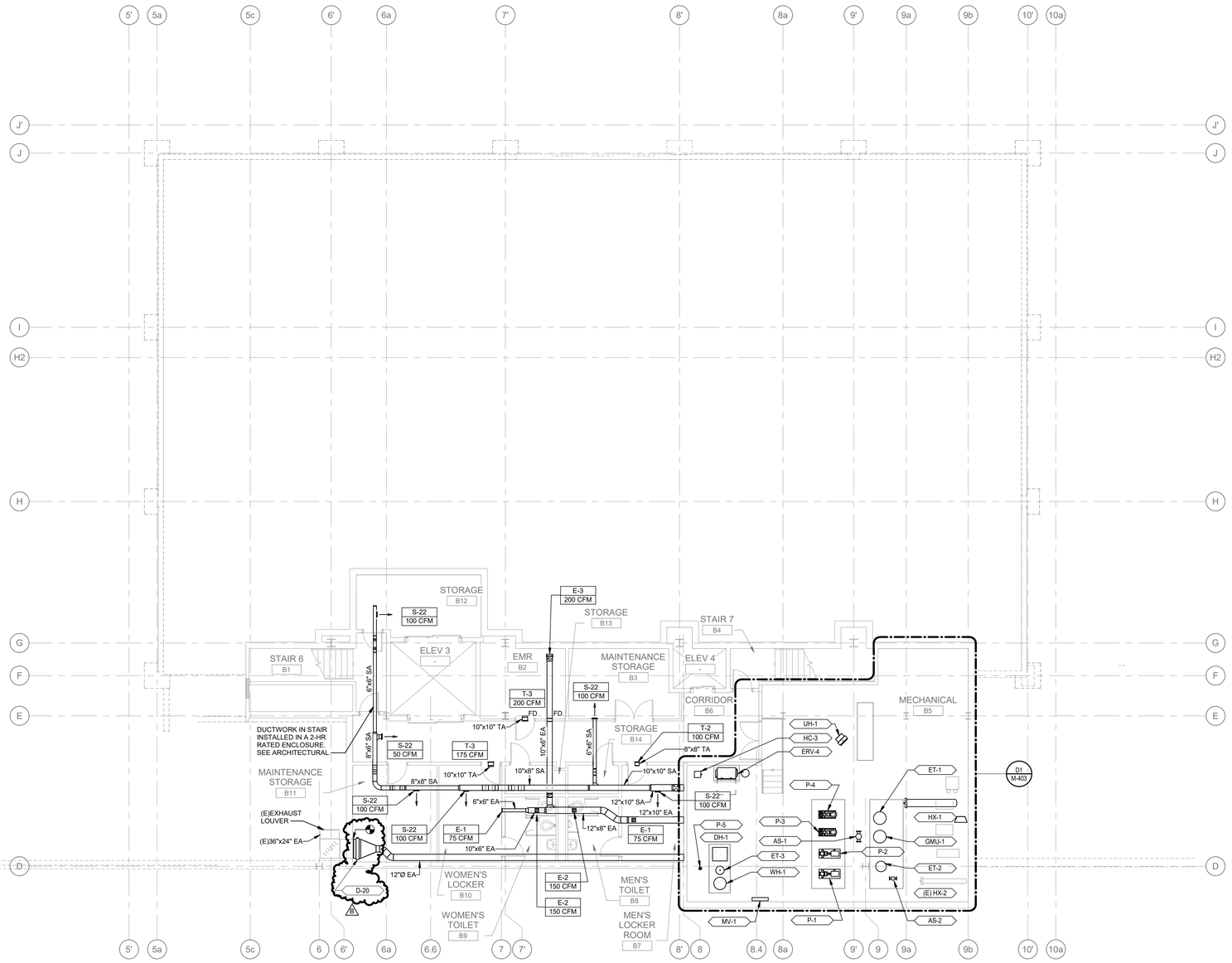


A1 OVERALL BASEMENT LEVEL DUCTWORK PLAN

1/8" = 1'-0"

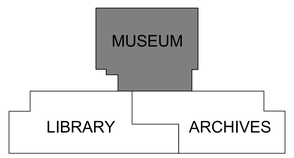
0 4' 8' 16'

PLAN NORTH

NOTES

1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.

KEY PLAN



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STATE OF MAINE CULTURAL BUILDING
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SHEET TITLE:
BASEMENT LEVEL DUCTWORK PLAN

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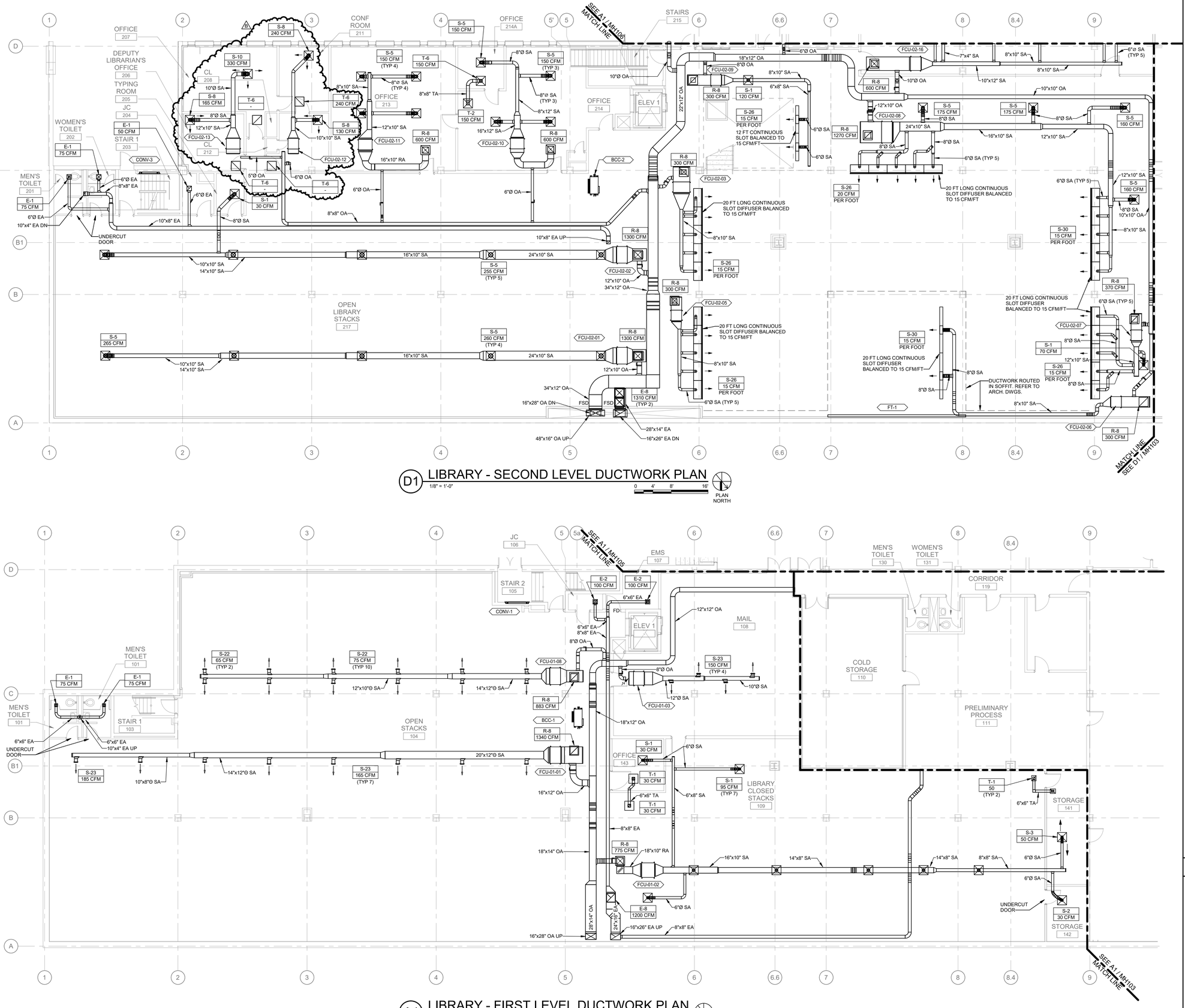
BIM 360://361820720_ME Cultural Building Mechanical Upgrades/361820720_MP_2020.rvt

NOTES

1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. WHERE DUCTWORK PASSES THROUGH A FLOOR SLAB, PROVIDE A FIRE DAMPER UNLESS OTHERWISE NOTED.
3. WHERE DUCTWORK IS EXPOSED, IT SHALL BE DOUBLE WALL, SPIRAL SEAMED FLAT OVAL OR ROUND.



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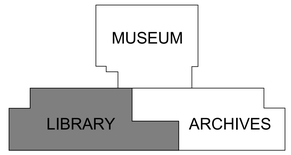

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Maine State Museum 230 State Street, Augusta ME 04333-0083

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SHEET TITLE: LIBRARY - FIRST AND SECOND LEVEL DUCTWORK PLANS

SHEET ID: MH101

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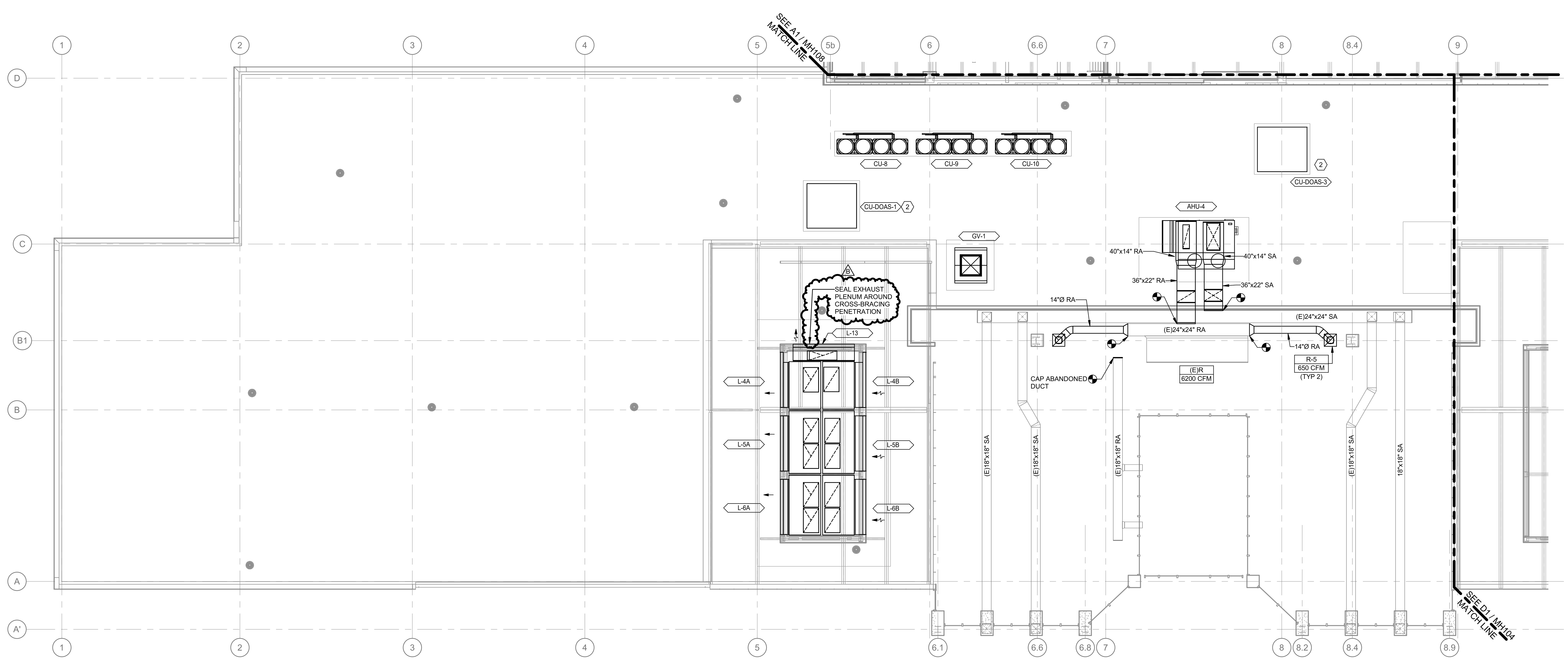
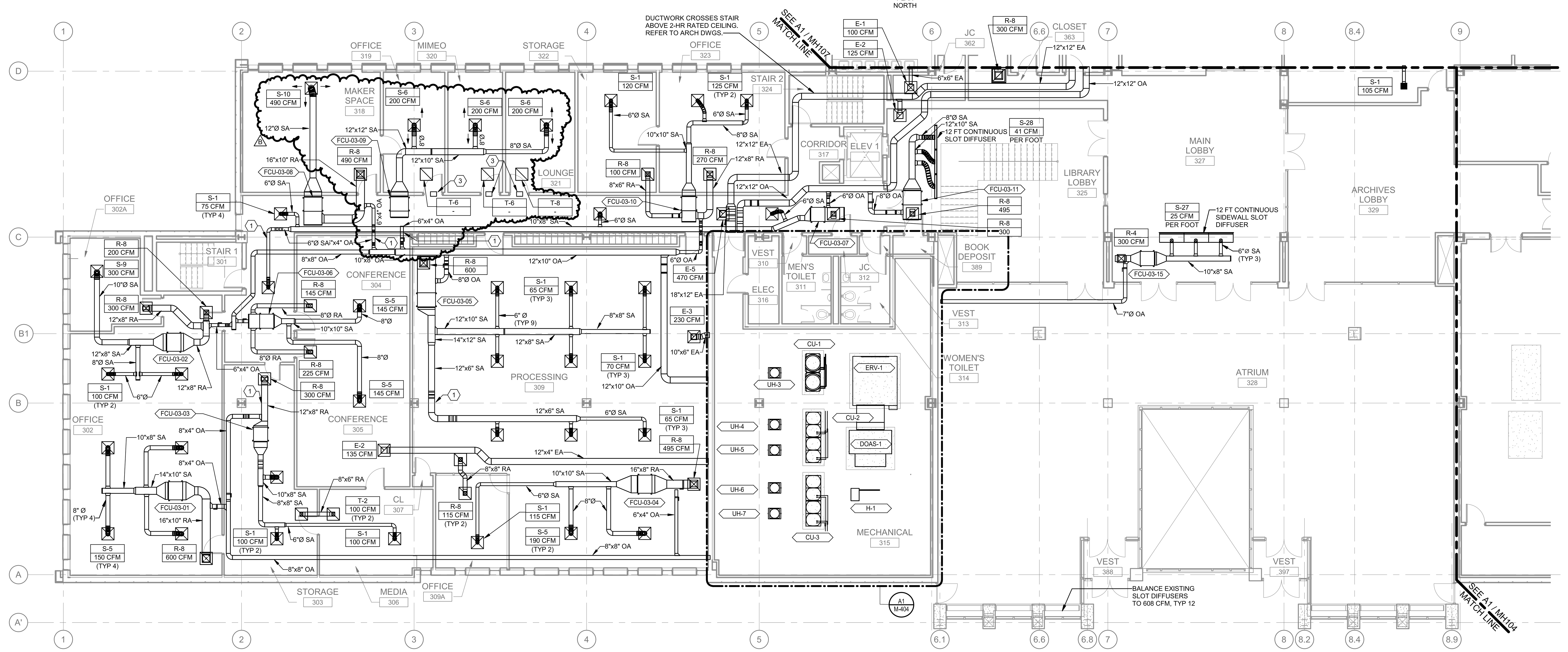


D1 LIBRARY - ROOF DUCTWORK PLAN
1/8" = 1'-0"
PLAN NORTH



A1 LIBRARY - THIRD LEVEL DUCTWORK PLAN
1/8" = 1'-0"
PLAN NORTH

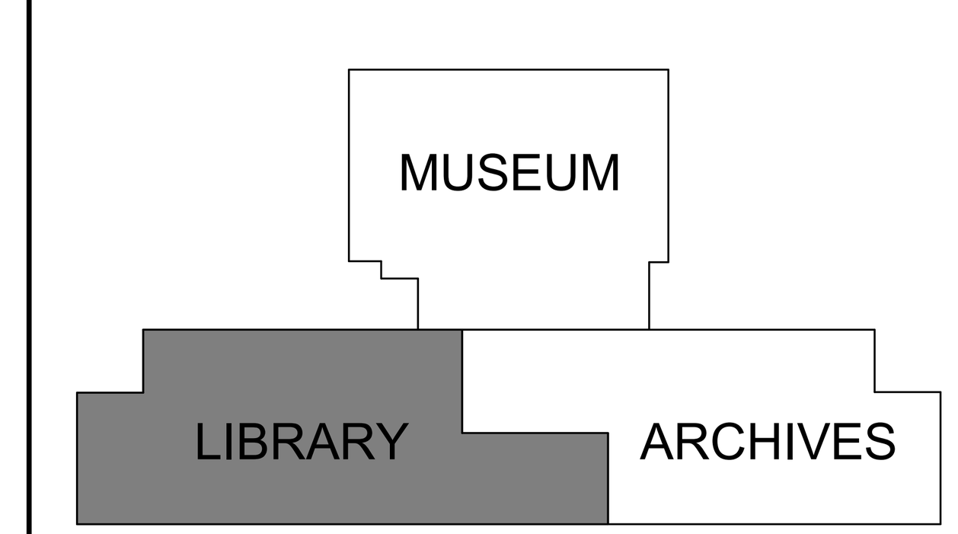
NOTES

1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.

KEYED NOTES

1 DUCT THROUGH (E) OPENING IN BEAM
2 ARCHITECTURAL TO PROVIDE CURBS
3 12"x8" OPENING IN WALL ABOVE CEILING. (B)

KEY PLAN



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ASBESTOS ABATEMENT & MECHANICAL UPGRADES
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LIBRARY THIRD LEVEL AND ROOF DUCTWORK PLAN

SHEET ID:
MH102

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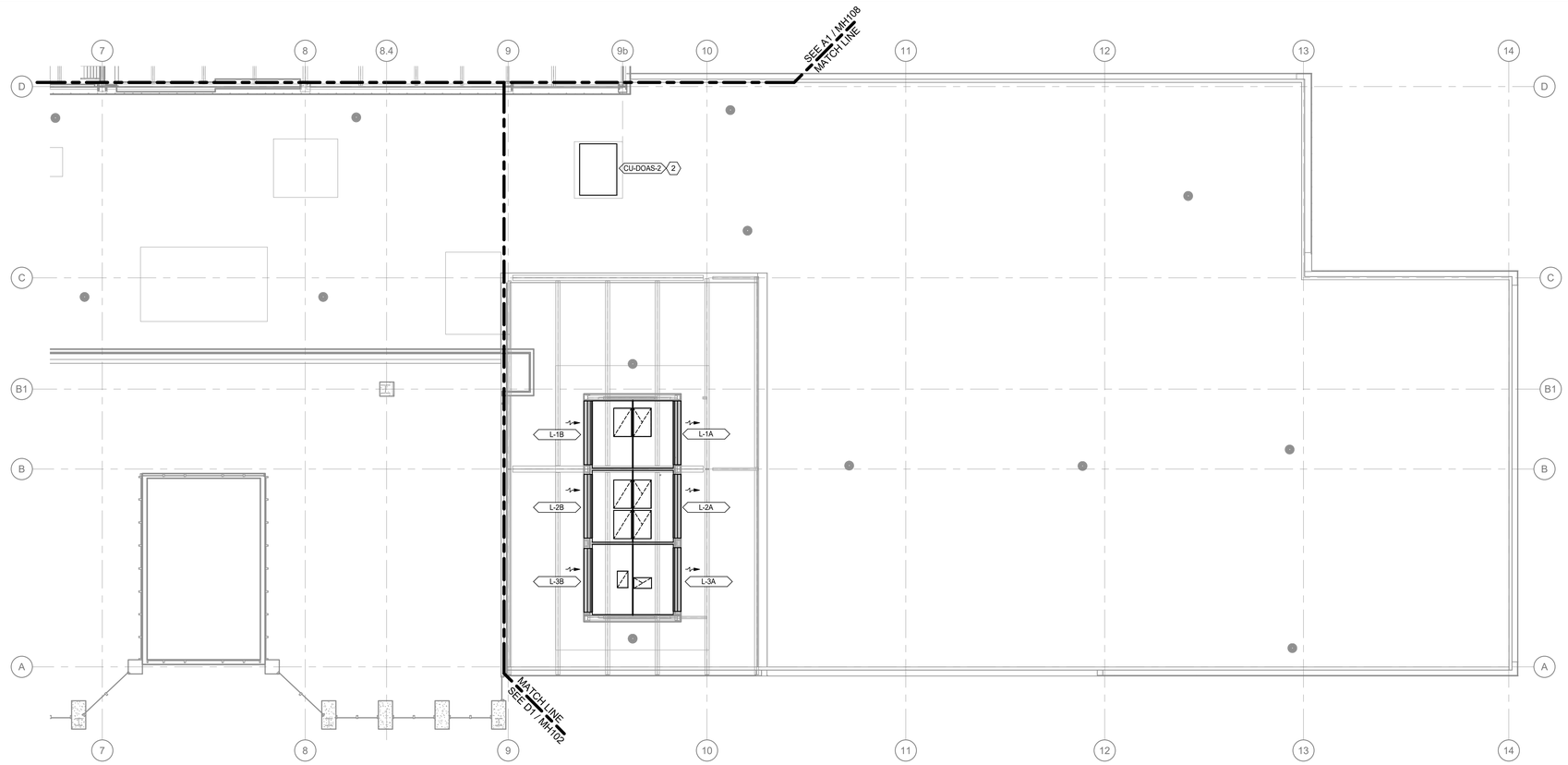


D1 ARCHIVES - ROOF DUCTWORK PLAN
1/8" = 1'-0"
0 4' 8' 16'
PLAN NORTH

A1 ARCHIVES - THIRD LEVEL DUCTWORK PLAN
1/8" = 1'-0"
0 4' 8' 16'
PLAN NORTH

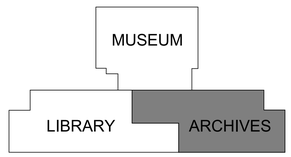
NOTES

1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.

KEYED NOTES

1 DUCT THROUGH (E) OPENING IN BEAM
2 ARCHITECTURAL TO PROVIDE CURBS

KEY PLAN



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2/3/2022
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ASBESTOS ABATEMENT & MECHANICAL UPGRADES
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ARCHIVES - THIRD LEVEL AND ROOF DUCTWORK PLAN

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MH104

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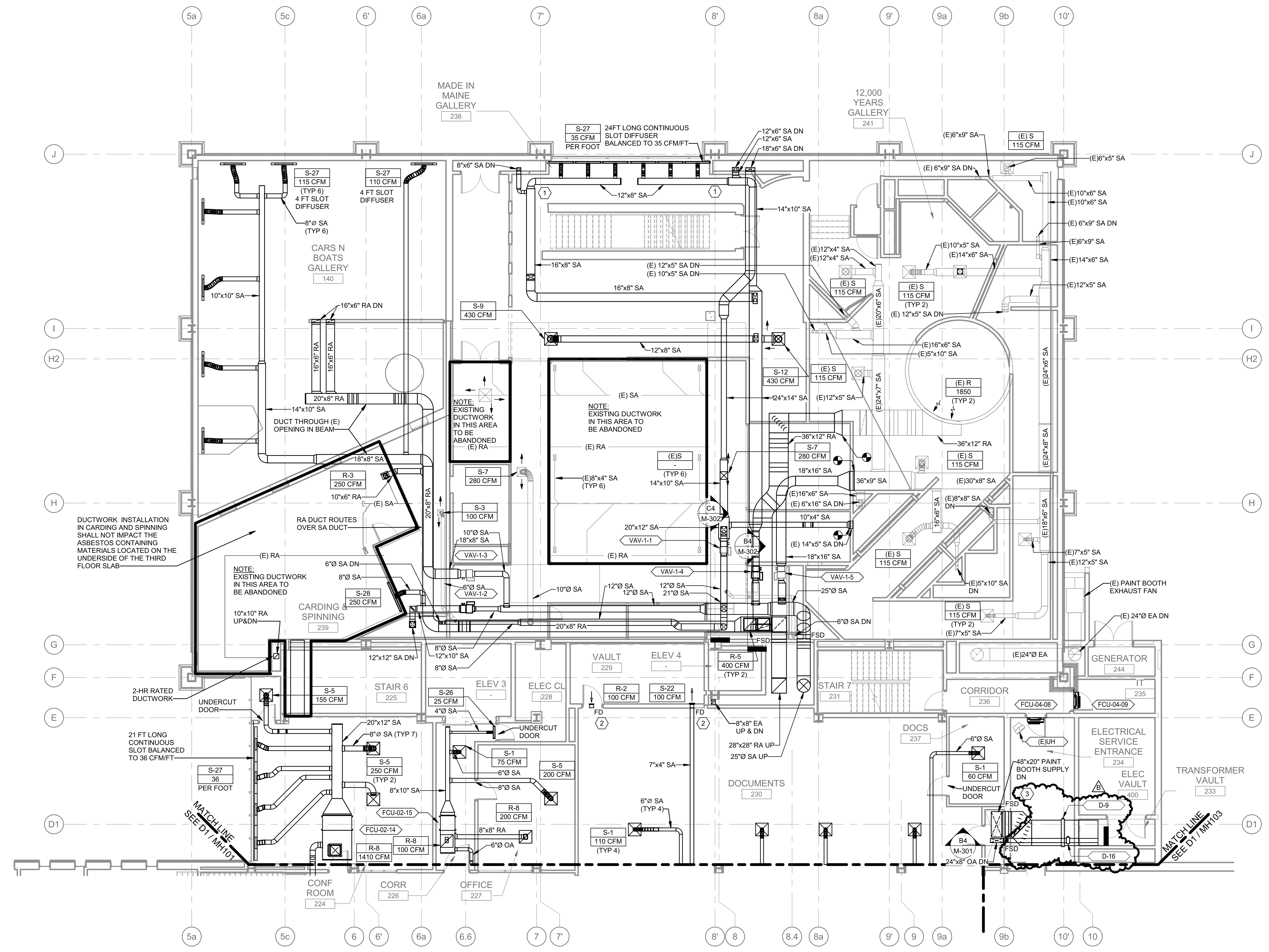
NOTES

1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. COORDINATE LOCATION OF SLOT DIFFUSERS IN CARS AND BOATS GALLERY WITH EXHIBIT ITEMS TO ALLOW UNIMPEDED AIRFLOW TO THE FLOOR.
3. WHERE DUCTWORK IS EXPOSED, IT SHALL BE DOUBLE WALL, SPIRAL SEAMED FLAT OVAL OR ROUND.

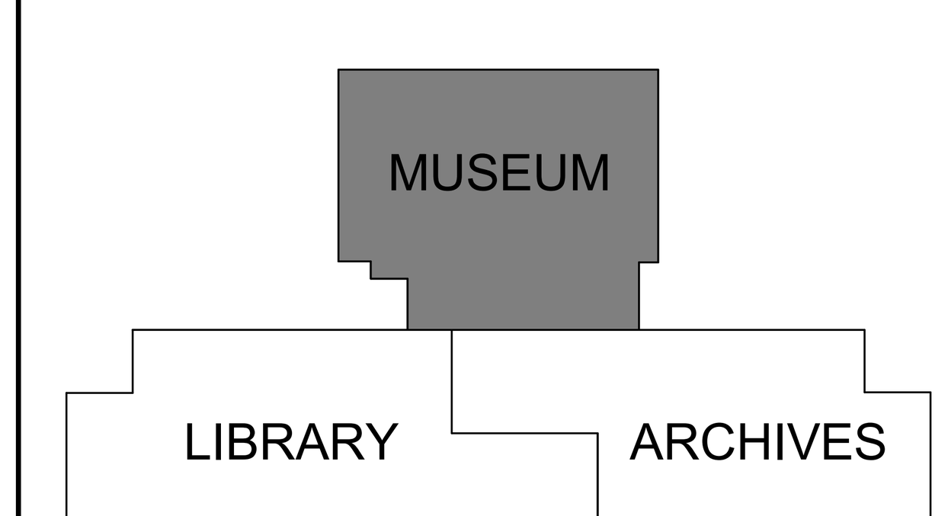
KEYED NOTES

1. DUCT PASSES THROUGH EXISTING OPENING IN BEAM.
2. 3-HR RATED FIRE DAMPER
3. 3-HR RATED FIRE DAMPER



A1 MUSEUM - SECOND LEVEL DUCTWORK PLAN
1/8" = 1'-0"
PLAN NORTH

KEY PLAN



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MUSEUM - SECOND LEVEL DUCTWORK PLAN

SHEET ID:
MH106

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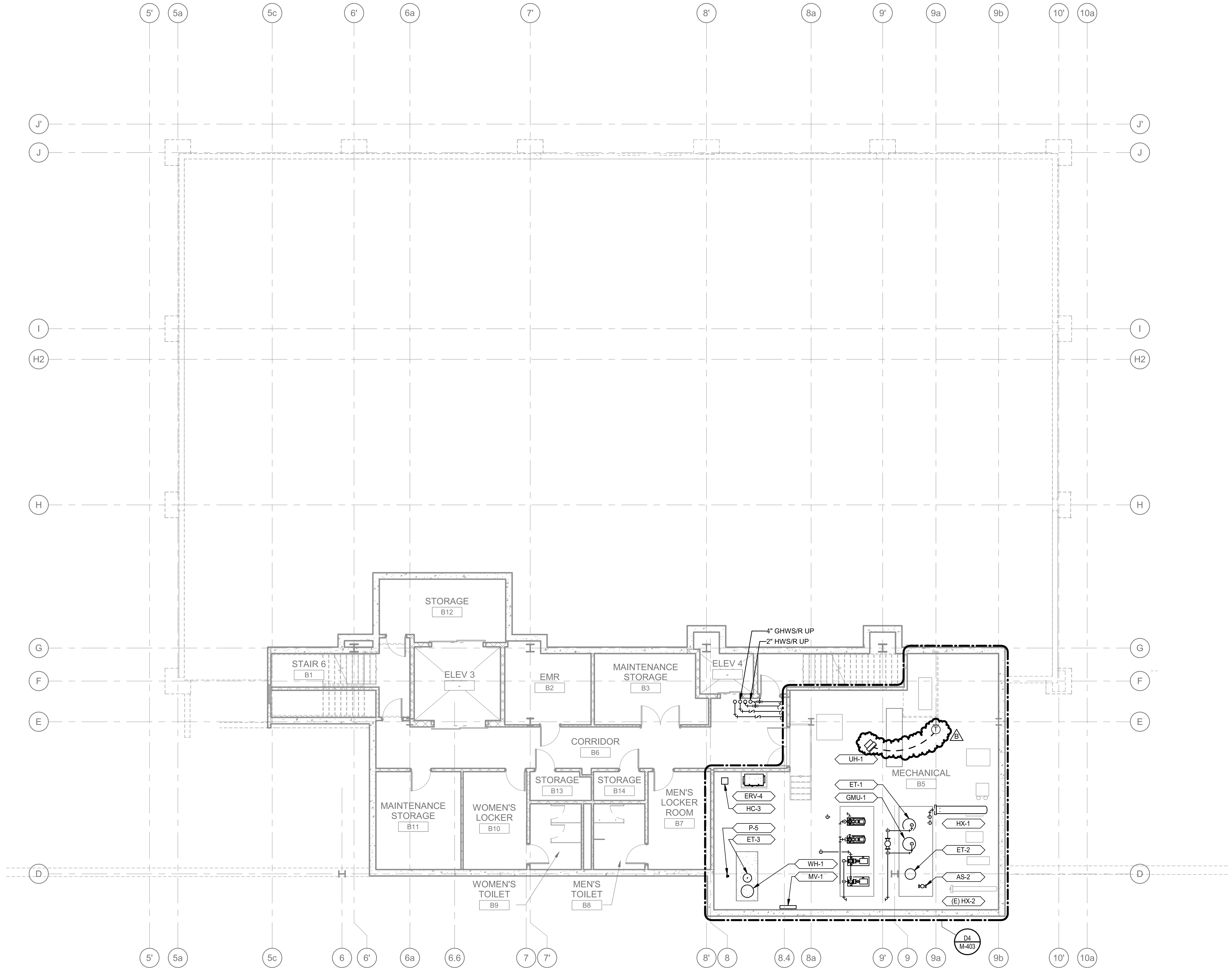
NOTES

1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. REFER TO VRF SYSTEM FLOW DIAGRAMS ON SHEETS M-701 THROUGH M-705 FOR REFRIGERANT PIPE SIZE.

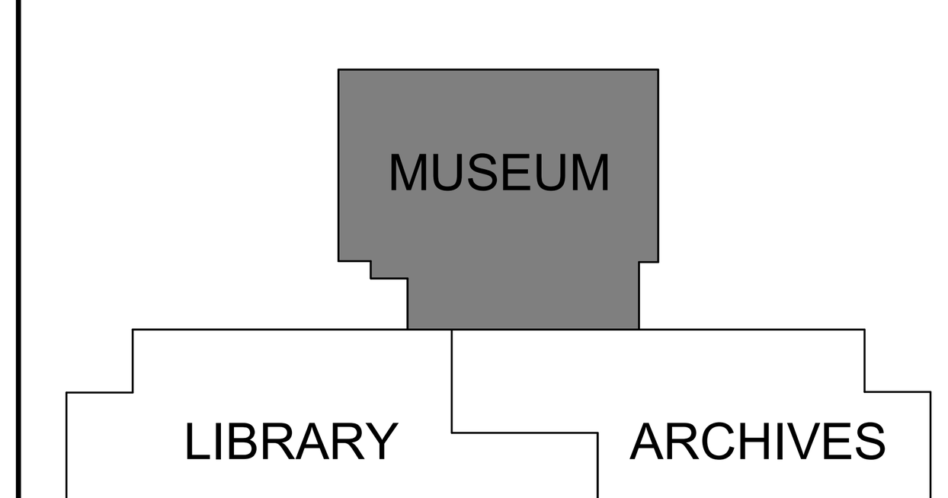


A1 OVERALL BASEMENT LEVEL PIPING PLAN

1/8" = 1'-0"

PLAN NORTH

KEY PLAN



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(207) 624-7314

STATE OF MAINE
STEVEN M. MARTEL
2/8/2022
7148
LICENSED
PROFESSIONAL ENGINEER

CURRENT ISSUE STATUS:
PHASE 2 - ISSUED FOR BID
JANUARY 7, 2022

PROJECT:
STATE OF MAINE CULTURAL BUILDING
ASBESTOS ABATEMENT & MECHANICAL UPGRADES
Maine State Museum 230 State Street, Augusta ME 04333-0083

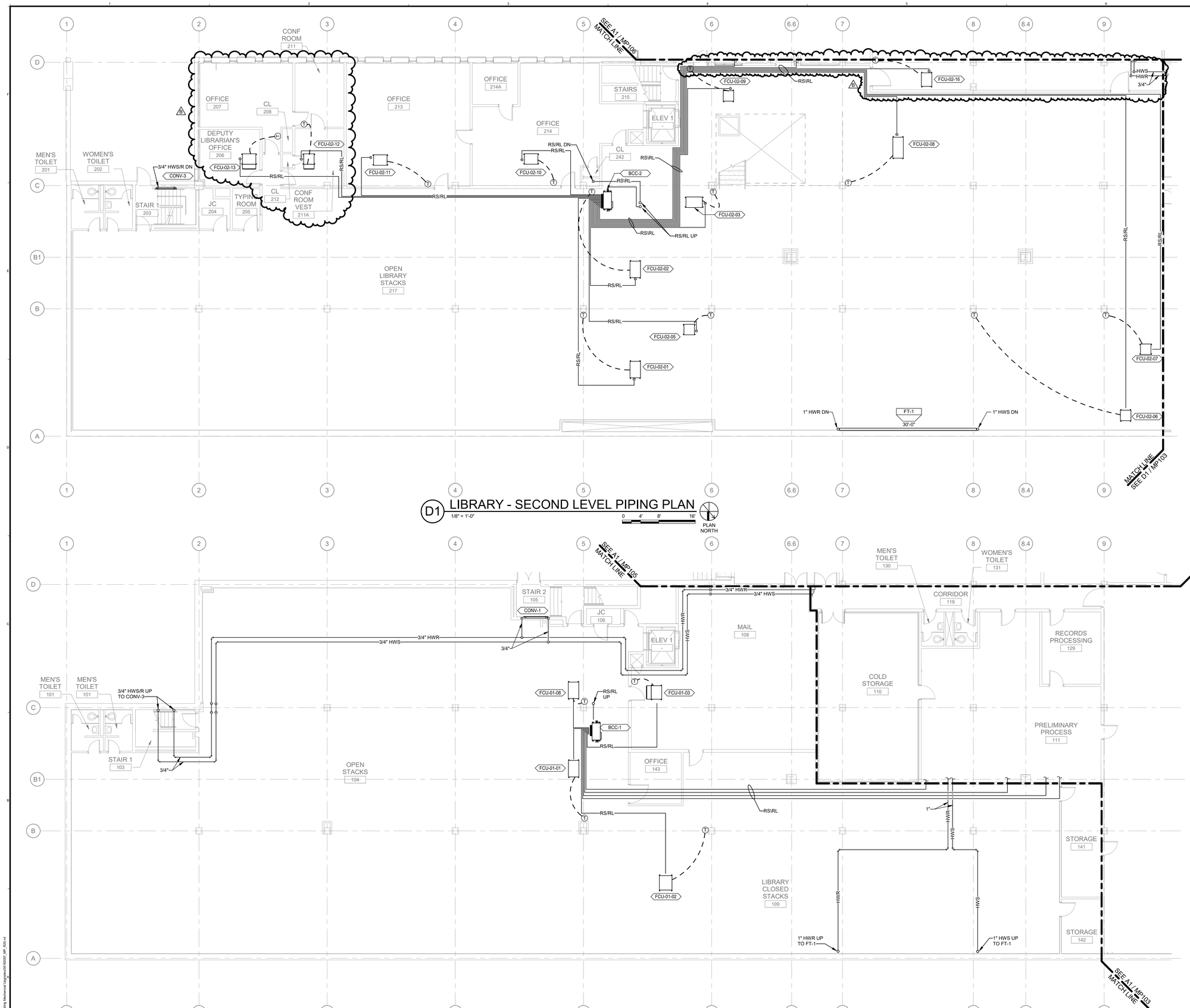
REV.	REVISION ISSUE DESCRIPTION	DATE
B	ADDENDUM NO. 2	02-08-2022
A	ISSUED FOR BID	01-07-2022

PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	SMM
DESIGNED BY:	SMM
DRAWN BY:	BAL

SHEET TITLE:
BASEMENT LEVEL PIPING PLAN

SHEET ID:
MP100

NOT FOR CONSTRUCTION



D1 LIBRARY - SECOND LEVEL PIPING PLAN

1/8" = 1'-0"

0 4' 8' 16'

PLAN NORTH

A1 LIBRARY - FIRST LEVEL PIPING PLAN

1/8" = 1'-0"

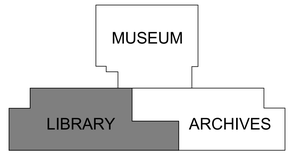
0 4' 8' 16'

PLAN NORTH

NOTES

1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. REFER TO VRF SYSTEM FLOW DIAGRAMS ON SHEETS M-701 THROUGH M-705 FOR REFRIGERANT PIPE SIZE.

KEY PLAN



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STEVEN M. MARTEL
2/3/2022
148
LICENSED PROFESSIONAL ENGINEER

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JANUARY 7, 2022

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REV	REVISION ISSUE DESCRIPTION	DATE
A	ISSUED FOR BID	01-07-2022
B	ADDENUM NO. 2	02-08-2022

PROJECT NO:	361820820
PROJECT MANAGER:	KFM
A/E OF RECORD:	SMM
DESIGNED BY:	SMM
DRAWN BY:	BAL

SHEET TITLE:
LIBRARY - FIRST AND SECOND LEVEL PIPING PLANS

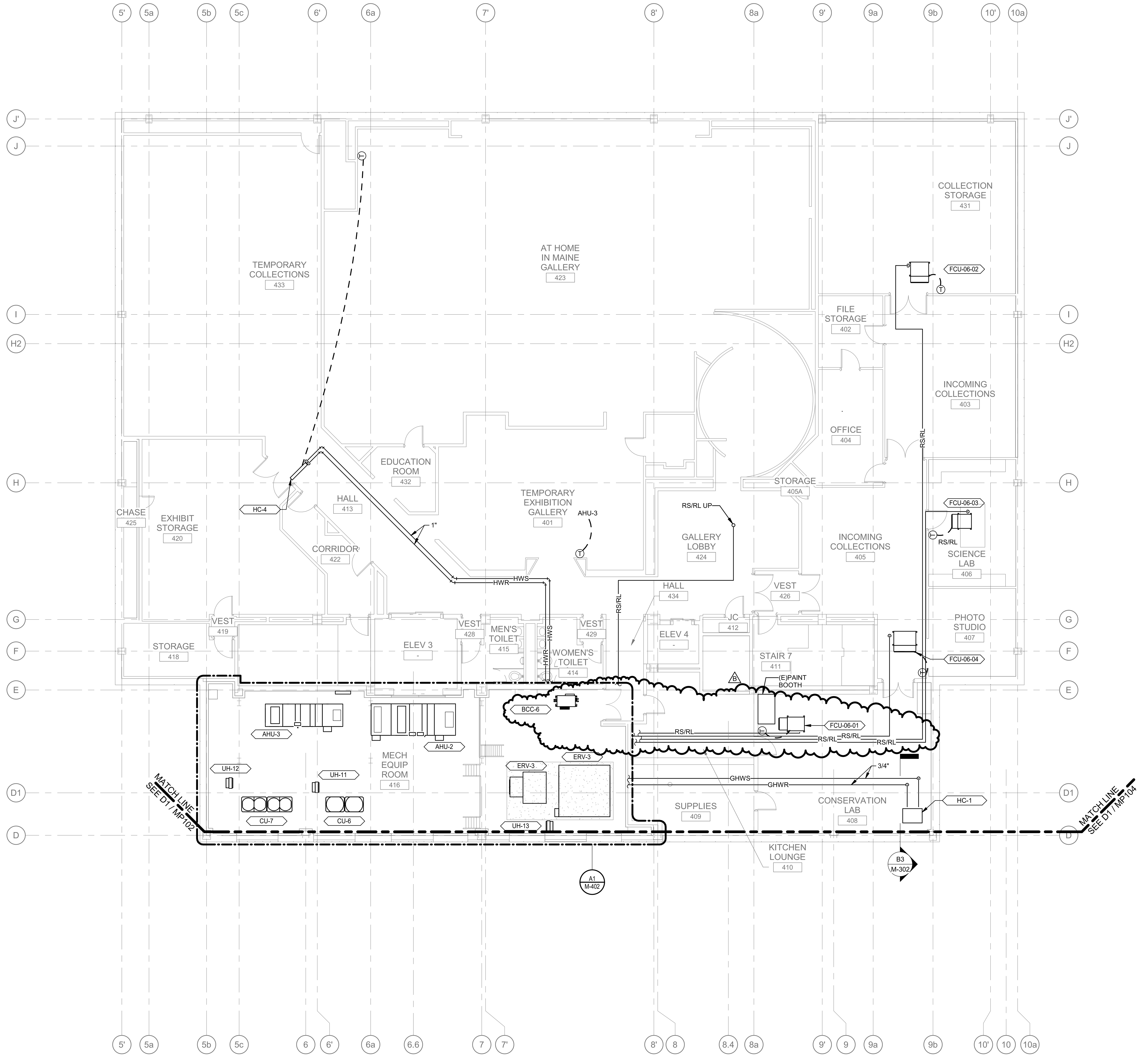
SHEET ID:
MP101

NOT FOR CONSTRUCTION

BIM 360://361820820 - ME Culture Building Mechanical Upgrades/M105267_MP_R20.rvt

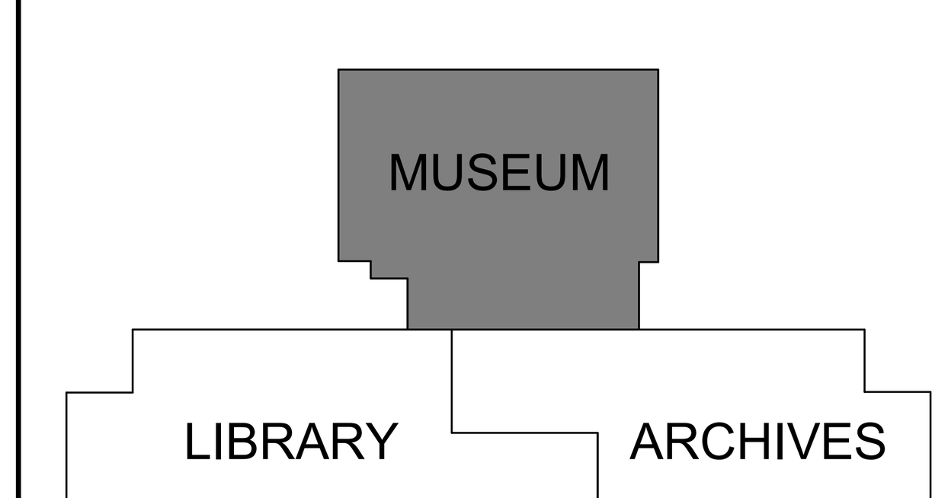
NOTES

1. SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. REFER TO VRF SYSTEM FLOW DIAGRAMS ON SHEETS M-701 THROUGH M-705 FOR REFRIGERANT PIPE SIZE.



A1 MUSEUM - FOURTH LEVEL PIPING PLAN
1/8" = 1'-0"
PLAN NORTH

KEY PLAN



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STATE OF MAINE · STEVEN M. MARTEL · 2/8/2022 · 7148 · LICENSED · PROFESSIONAL ENGINEER

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PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	SMM
DESIGNED BY:	SMM
DRAWN BY:	BAL

SHEET TITLE:
MUSEUM - FOURTH LEVEL PIPING PLAN

SHEET ID:
MP108

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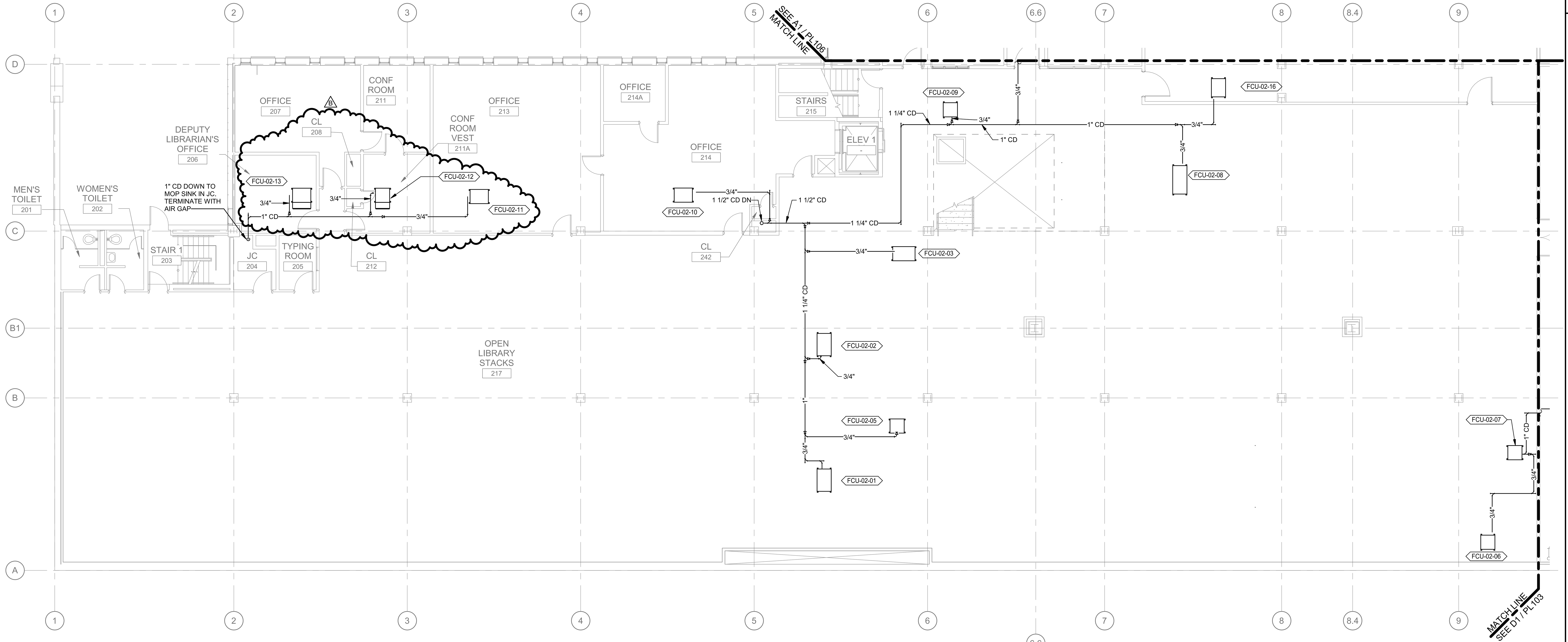
NOTES

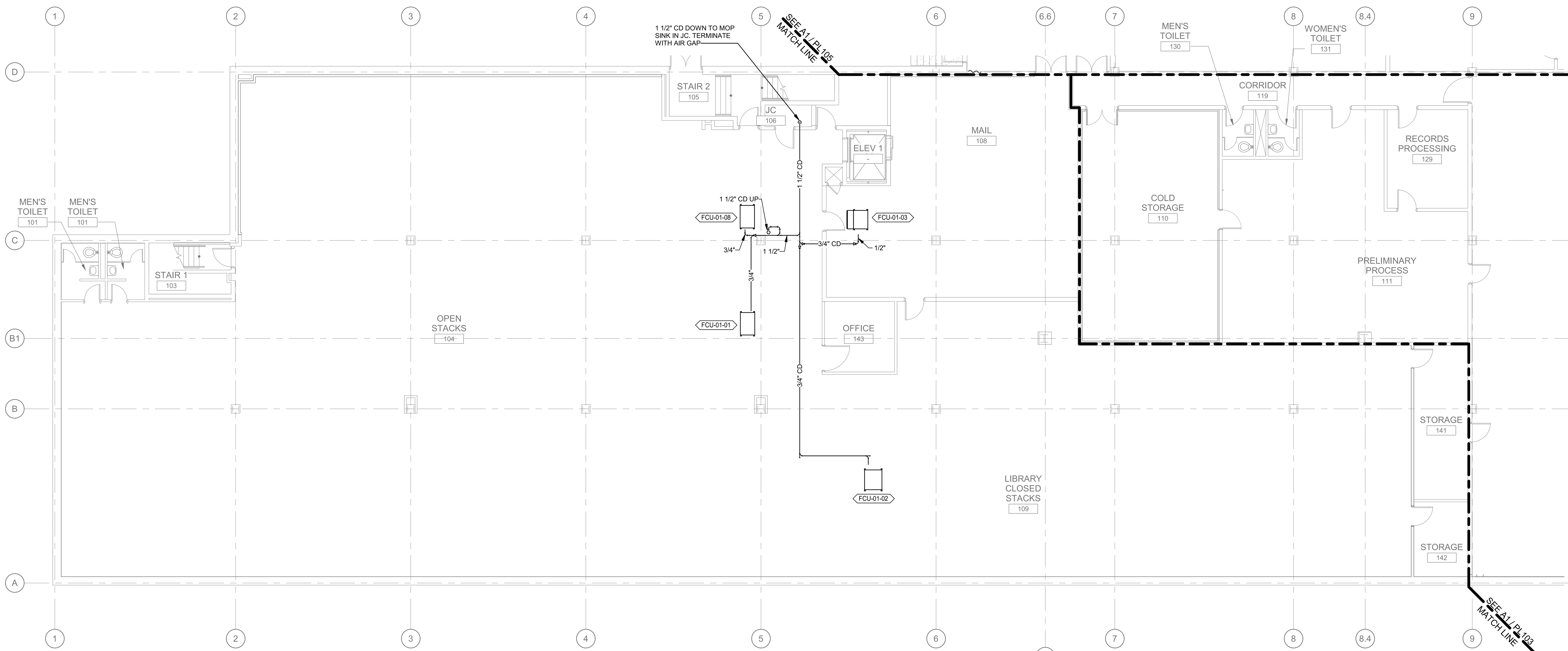
1. SEE SHEET P-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
2. CONTRACTOR MAY ROUTE CD PIPING FROM FCU CONDENSATE PUMP USING SMALLER PIPE SIZE AND DIFFERENT ROUTING THAN SHOWN ON PLAN IN ORDER TO ROUTE AROUND OBSTRUCTIONS. PIPE SIZE AND ROUTING MUST BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS.



D1 LIBRARY - SECOND LEVEL PLUMBING PLAN

1/8" = 1'-0"

PLAN NORTH

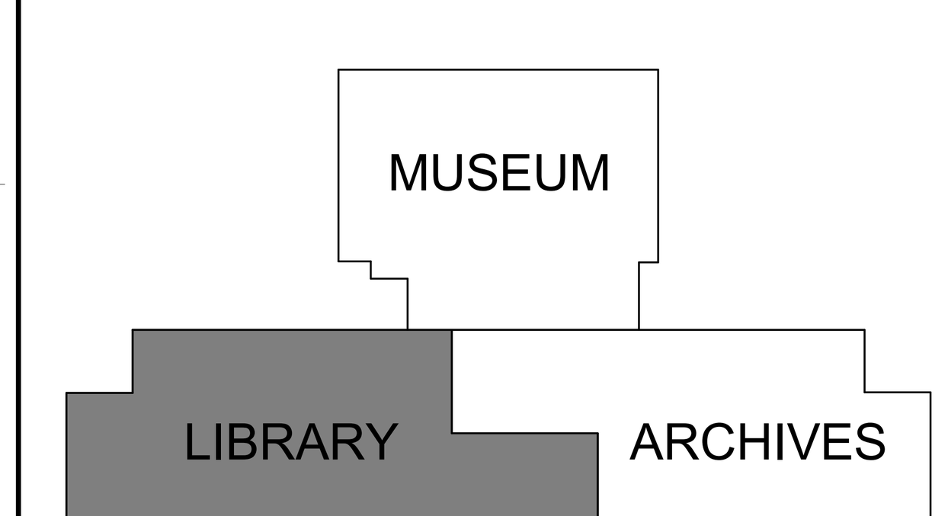


A1 LIBRARY - FIRST LEVEL PLUMBING PLAN

1/8" = 1'-0"

PLAN NORTH

KEY PLAN



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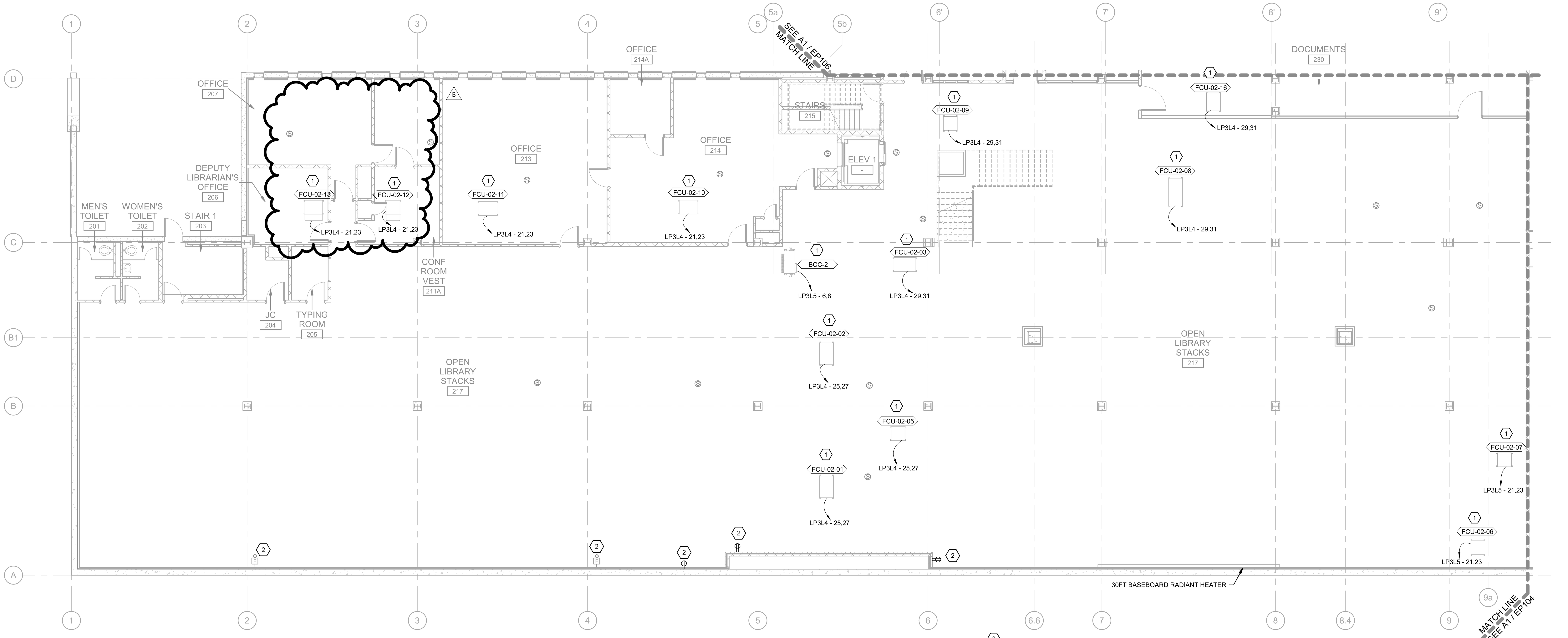
DESIGNED BY:	SMM
DRAWN BY:	BAL

SHEET TITLE:
LIBRARY - FIRST AND SECOND LEVEL PLUMBING PLANS

SHEET ID:
PL101

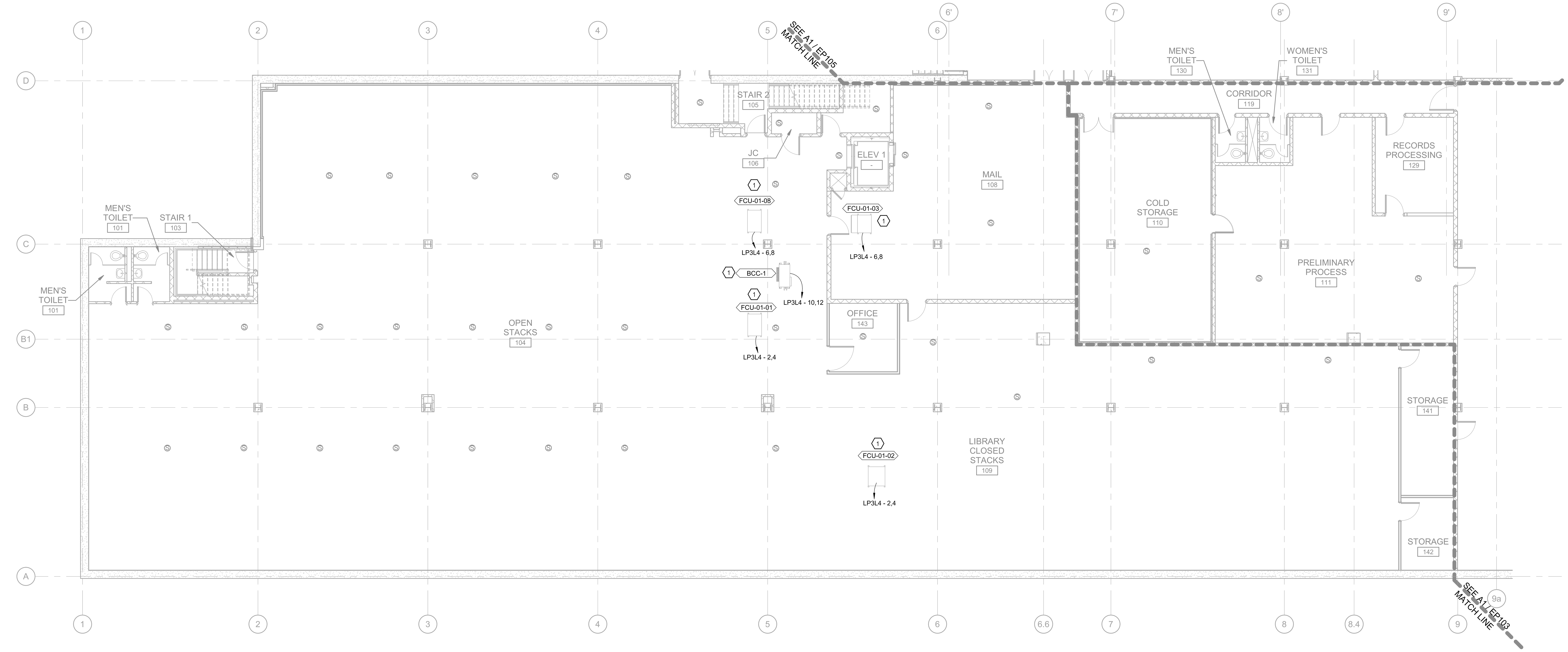
NOT FOR CONSTRUCTION



D1 LIBRARY - SECOND LEVEL ELECTRICAL PLAN

1/8" = 1'-0"

PLAN NORTH



A1 LIBRARY - FIRST LEVEL ELECTRICAL PLAN

1/8" = 1'-0"

PLAN NORTH

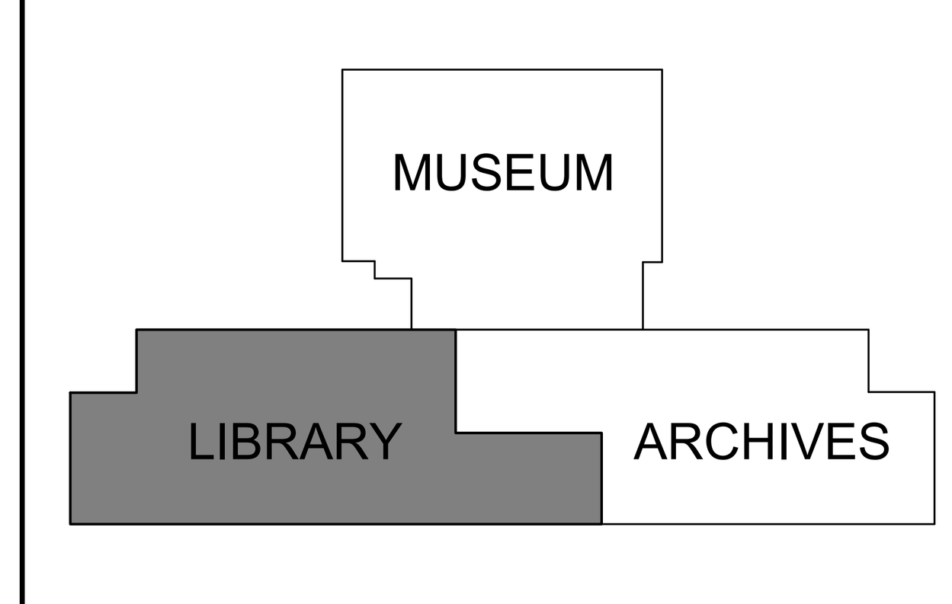
NOTES

1. REFER TO SHEET E-001 FOR GENERAL NOTES.
2. FOR CIRCUIT LENGHTS APPROXIMATELY 100 FEET OR LESS, PROVIDE CIRCUIT CONDUCTORS AND CONDUIT CONSISTING OF (2)#12, (1)#12G IN 3/4" CONNECTED TO THE PANEL AND CIRCUIT INDICATED UNLESS NOTED OTHERWISE FOR CIRCUIT LENGTHS MORE THAN 100 FEET, USE #10 BRANCH CIRCUIT CONDUCTORS.
3. REFER TO SHEET E-501 FOR APPLICABLE DETAILS.
4. DEVICE LAYOUT OF PUBLIC ADDRESS SYSTEM DEVICES. ACCESS CONTROL SYSTEM DEVICES AND FIRE DETECTION AND ALARM DEVICE INDICATED ARE FOR REFERENCE ONLY.
5. UNLESS NOTED OTHERWISE, FIELD COORDINATE THE REINSTALLATION OF EXISTING PUBLIC ADDRESS SYSTEM DEVICES, ACCESS CONTROL SYSTEM DEVICES, AND FIRE DETECTION AND ALARM DEVICES RETAINED FROM DEMOLITION UPON THE COMPLETION OF ARCHITECTURAL, STRUCTURAL AND MECHANICAL SCOPE WORK ASSOCIATED WITH MECHANICAL UPGRADES WHERE APPLICABLE. RECONNECT TO EXISTING CIRCUIT WIRING AND CONDUITS MAINTAINED FROM DEMOLITION. CONTRACTOR SHALL VERIFY SYSTEM COMPONENTS ARE FULLY FUNCTIONAL UPON COMPLETION OF REINSTALLATION. WHERE APPLICABLE, CONTRACTOR SHALL REPLACE UNREPAIRABLE DEVICES AND/OR MODIFY CIRCUITS AS REQUIRED FOR A COMPLETE AND OPERABLE INSTALLATION.
6. REFER TO SHEET E-603 FOR MECHANICAL EQUIPMENT CONNECTION SCHEDULE.
7. ELECTRICAL DEVICES SHOWN IN BOLD LINE WEIGHT ARE TO BE INSTALLED UNLESS NOTED OTHERWISE.

KEYED NOTES

1. PROVIDE ELECTRICAL EQUIPMENT (AS REQUIRED) AND BRANCH CIRCUIT CONDUCTORS AND CONDUIT FOR MECHANICAL EQUIPMENT LOAD INDICATED. REFER TO MECHANICAL EQUIPMENT CONNECTION SCHEDULE FOR ADDTITIONAL ELECTRICAL REQUIREMENTS.
2. RE-INSTALL EXISTING ELECTRICAL DEVICES RETAINED FROM DEMOLITION. EXTEND EXISTING CIRCUIT WIRING AND RACEWAY AS REQUIRED FOR A COMPLETE INSTALLATION

KEY PLAN



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STATE OF MAINE — Mark A. Griffith — 10568 — 2-8-22 — REGISTERED PROFESSIONAL ENGINEER

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PROJECT NO:	3618208720
PROJECT MANAGER:	KFM
A/E OF RECORD:	MAG
DESIGNED BY:	BHG
DRAWN BY:	NBR

SHEET TITLE:
LIBRARY - FIRST AND SECOND LEVEL ELECTRICAL PLAN

SHEET ID:
EP101

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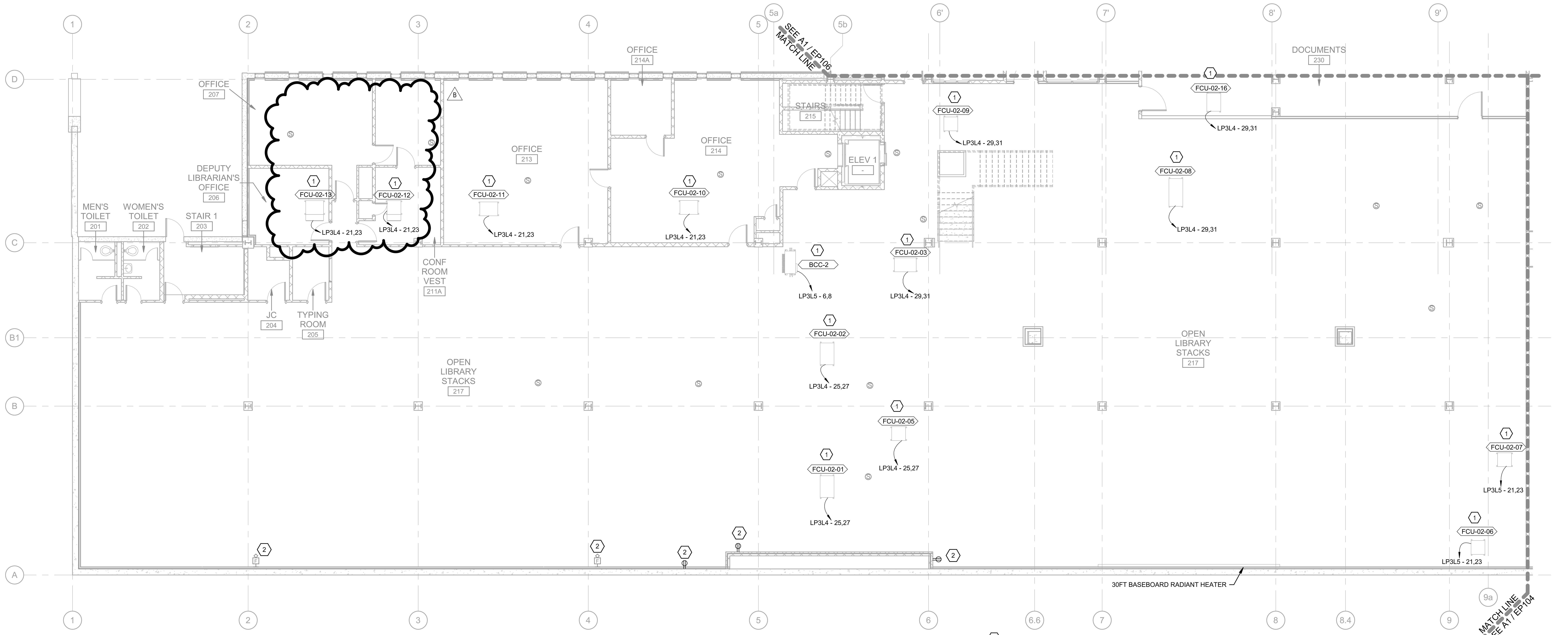
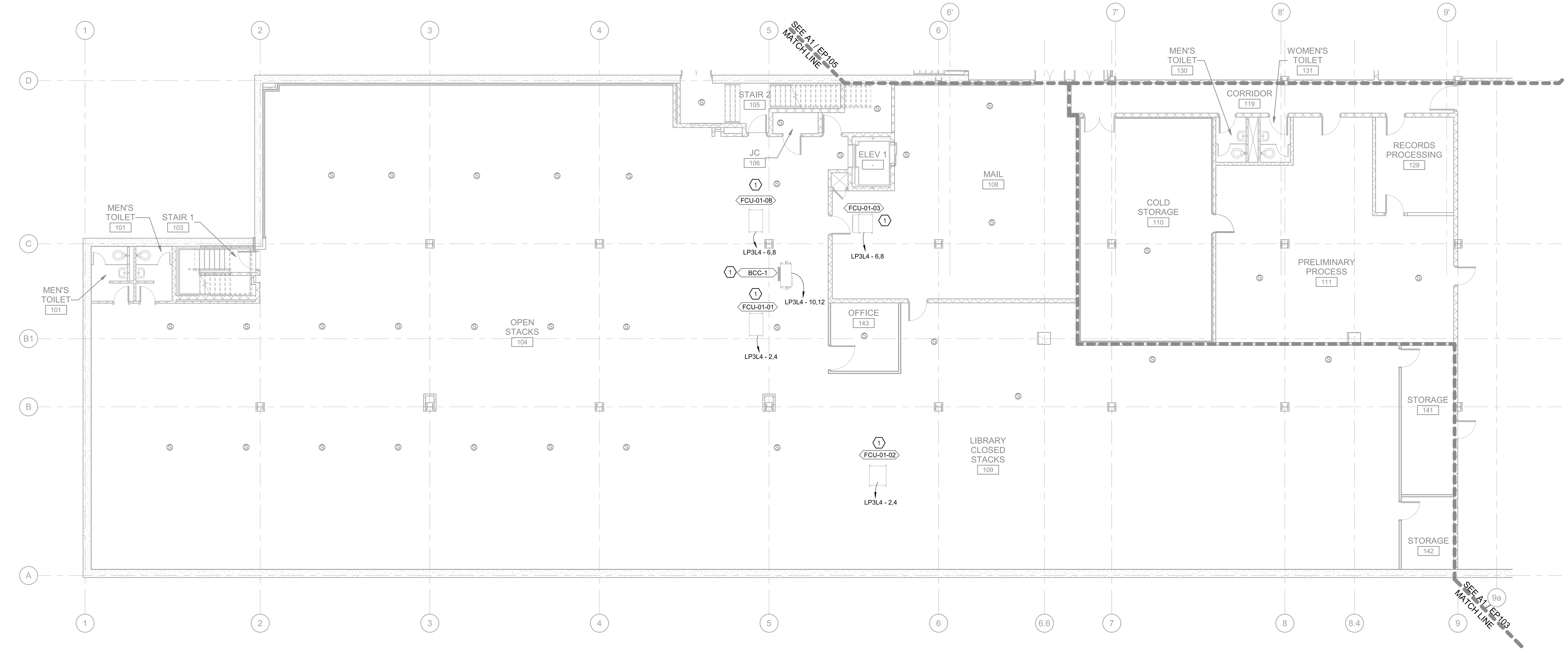


D1 LIBRARY - SECOND LEVEL ELECTRICAL PLAN (2)
1/8" = 1'-0"
0 4' 8' 16'
PLAN NORTH



A1 LIBRARY - FIRST LEVEL ELECTRICAL PLAN (2)
1/8" = 1'-0"
0 4' 8' 16'
PLAN NORTH

NOTES

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7. ELECTRICAL DEVICES SHOWN IN BOLD LINE WEIGHT ARE TO BE INSTALLED UNLESS NOTED OTHERWISE.

KEYED NOTES

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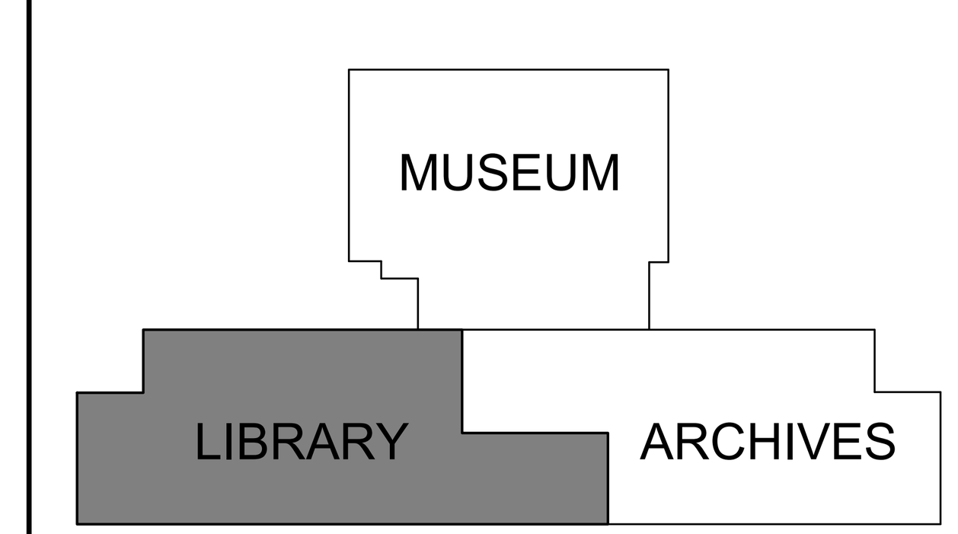
KEY PLAN



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DESIGNED BY:	BHG
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SHEET TITLE:
LIBRARY - FIRST AND SECOND LEVEL ELECTRICAL PLAN

SHEET ID:
EP101

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