

ADDENDUM #1 (ONE)

OCTOBER 17, 2025

**JOB #2025-02 IMPROVEMENTS TO J.I. BARRON ELEMENTARY SCHOOL
PINEVILLE, LA
RAPIDES PARISH SCHOOL BOARD- OWNER**

Yeager, Watson & Associates, LLC; (Job #2025-02/RPSB BID #52-26-01)

Each bidder shall note on his Bid Form receipt of Addendum #1; that his Bid is for the conditions set forth in this Addendum plus the complete Contract Documents.

SEALED PROPOSALS OF CURRENT LOUISIANA LICENSED GENERAL CONTRACTORS FOR #2025-02/RPSB BID #52-26-01 IMPROVEMENTS TO J.I. BARRON ELEMENTARY SCHOOL WILL BE RECEIVED BY THE RAPIDES PARISH SCHOOL BOARD, P.O. BOX 7117; 619 SIXTH ST, ALEXANDRIA, LOUISIANA 71306, UNTIL 2:00 PM LOCAL TIME, WEDNESDAY, OCTOBER 29, 2025.

SOLE RESPONSIBILITY FOR PROPER DELIVERY OF BID IN COMPLIANCE WITH THE OFFICIAL PROJECT ADVERTISEMENT IS THAT OF THE GENERAL CONTRACTOR'S.

PRE-BID CONFERENCE ATTENDEES (10:00 A.M. CST, THURSDAY, OCTOBER 16, 2025)

<u>Pre- Bid Attendees</u>	<u>Company</u>	<u>Phone Number</u>
Perry Watson	YWA	318-202-5708
Stephanie Morse	YWA	318-202-5708
Trey Gallet	M&E	337-234-7474
Zaki Mitchell	M&E	337-362-3952
Gabrielle Wehner	M&E	337-362-3961
Richard Dewees	JIB/RPSB	318-664-0233
Steve Berry	RPSB	318-613-2710
India Rhodes	Rhodes Properties & Development	318-663-1092
Donnie Keiper	Ward Electric	337-424-5120
Russ Jeansonne	Pat Williams Construction	318-460-0006
Dain Perrault	Orion Environmental	225-333-2302
Justin Floyd	Tudor, Inc.	318-623-8343
Norberto Chapa	MBCI	936-703-0381
Mark Wing	A-Lert Roof	210-669-7699
Clif Johnson	Traclif L.L.C.	303-718-9598
Kendal Perkins	RPSB	318-581-3237
Kathy Baden	RPSB	318-449-3119
Edward Payton	ARL Construction, Inc.	337-828-7504
James McBride	Bayou Roofing	318-947-8090
Chris Jones	Bayou Roofing	318-655-1931

PLAN ROOMS HOLDING CONTRACT DOCUMENTS:

CENTRAL BIDDING: www.centralauctionhouse.com **ISQFT/ Construct Connect:** www.isqft.com
CMD/Dodge - online plan room **LAGC:** centralauctionhouse.com/Category/4/LAGCPlanRooms

GENERAL CLARIFICATIONS

1. It is the intent for the new structural members for the retrofit roof to be fastened through the existing roof decks.
2. Since school will in session during construction, the SCHOOL will make efforts to accommodate the General Contractor with necessary access and coordination throughout the school year. Spring testing will not impact the student population in the buildings scheduled for new roofing and flooring work.
3. Lay-down yard will be coordinated with the Owner prior to construction.

4. Provide access doors to the attic space through the new gable end wall panels in locations shown on attached RA211 and in attached specification.

PROJECT MANUAL

017700- CLOSEOUT PROCEDURES

ADD the following: "1.3 OPERATIONS AND MAINTENANCE MANUAL" to Section 017700, Part 1-General.

1.3 OPERATIONS AND MAINTENANCE MANUAL

- A. As a requirement for Substantial Completion, the final Operation and Maintenance Manual shall be submitted to, and reviewed and accepted by the Architect prior to issuance of the Certificate.
- B. Prepare 3-ring D-slant binder cover and spline with printed title "OPERATIONS AND MAINTENANCE MANUAL", title of project, and subject matter of binder when multiple binders are required.
- C. Submit one (1) copy of preliminary Operations and Maintenance Manuals to respective consultants (Civil, MEP, Structural, *etc.*) for review of conformance with contract requirements prior to submitting final to Architect. Allow time for proper review.
- D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- F. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
 2. Part 2: Operation and Maintenance, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Equipment start-up instructions
 - e. Operating instructions.
 - f. Maintenance instructions for equipment and systems.
 - g. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 3. Part 3: Project documents and certificates, including the following:
 - a. Product data.
 - b. Air and water balance reports.
 - c. Photocopies of warranties, certificates and bonds. Submit originals with Closeout Documents as specified below.
- G. Submit one (1) final original and two (2) copies to Architect.

Section 083113 Access Door and Frames:

ADD this specification section in its entirety.

Section 230523 – Ball Valves for HVAC Piping

ADD this specification section in its entirety.

Section 230523.14 – Check Valves for HVAC Piping

ADD this specification section in its entirety.

Section 230713 – Duct Insulation:

ADD this specification section in its entirety.

Section 230923.11 – Control Valves:

ADD this specification section in its entirety.

Section 232113 – Hydronic Piping:

ADD this specification section in its entirety.

Section 237413 – Packaged, Outdoor, Central-Station Air-Handling Units:

ADD this specification section in its entirety.

Section 260519 Low Voltage Electrical Power Conductors:

ADD this specification section in its entirety.

Section 262813 Fuses:

ADD this specification section in its entirety.

Section 262816 Enclosed Switches and Circuit Breakers:

ADD this specification section in its entirety.

PLAN SHEETS / DRAWINGS

SHEETS S201, S202, S301, S401, & S402:

REPLACE sheets in their entirety with the REVISED sheets S201R, S202R, S301R, S401R, & S402R attached.

SHEETS A201 & A211:

REPLACE sheets in their entirety with the REVISED sheets RA201 & RA211 attached.

SHEETS M101, M201, M202 & M301:

REPLACE sheets in their entirety with the REVISED sheets attached.

SHEETS E101, E201 & E301:

REPLACE sheets in their entirety with the REVISED sheets attached.

OTHER ACCEPTABLE MANUFACTURERS - ARCHITECTURAL PRODUCTS

No Exceptions are taken to the following manufacturers and/or products for bidding purposes in addition to those specified. Substituting products other than those specified is based upon the best information now available. Should any modification be required to accommodate the substitute product, it is the responsibility of this supplier and/or subcontractor to include the cost of this modification in his quotation. It should be understood that any deviation from the products specified with respect to quality, details and performance in the opinion of the Architect is grounds for disapproval of this product subsequent to a contract award. Any manufacturer or product that is not listed here or in the Specifications shall be deemed NOT ACCEPTABLE for this project. Verification of this is the responsibility of the General Contractor. The Architect after Contract Award will strictly enforce this policy.

072200 Roof Insulation: GAF EnergyGuard Tapered Polyiso & GAF Fasteners; DEXcell FA Glass Mat Roof Board

074113.16 Standing-Seam Metal Roof Panels: SUBJECT TO MATCHING SPECIFIED MANUFACTURER 20-YEAR NDL WARRANTY: A-Lert KR24-S Striated Standing Seam Roof; Berridge 24 ga. Double-Lock Zee-Lock Standing Seam Roof

074213.13 Formed Metal Wall Panels/074293 Soffit Panels: A-Lert AL-12 with Indents; Berridge FW-12 with Grooves

075419 Polyvinyl-Chloride (PVC) Roofing: SUBJECT TO MATCHING SPECIFIED MANUFACTURER 20-YEAR NDL WARRANTY: GAF EverGuard PVC 60 mil & GAF Fasteners; Johns Manville PVC SD Plus 60 mil & JM Fasteners; Sika Sarnafil S 327-60 Energy Smart.

NOTE: ATTACHED TO THE END OF THIS ADDENDUM ARE THE FOLLOWING REVISION DOCUMENTS INCORPORATED INTO THIS PROJECT BY THIS ADDENDUM #1:

- **Section 083113 – Access Door and Frames**
- **Section 230523 – Ball Valves for HVAC Piping**
- **Section 230523.14 – Check Valves for HVAC Piping**
- **Section 230713 – Duct Insulation**
- **Section 230923.11 – Control Valves**
- **Section 232113 – Hydronic Piping**
- **Section 237413 – Packaged, Outdoor, Central-Station Air-Handling Units**
- **Section 260519 – Low Voltage Electrical Power Conductors**
- **Section 262813 – Fuses**
- **Section 262816 – Enclosed Switches and Circuit Breakers**
- **Sheet S201R – Partial Existing Roof Framing Plan – East end Building B.**
- **Sheet S202R – Partial Existing Roof Framing Plan – Building C.**
- **Sheet S301R – Partial Roof Retrofit Column Layout/Plan – East end Building B.**
- **Sheet S401R – Partial Roof Retrofit Rafter and Purlin Layout Plan – East end Building B.**
- **Sheet S402R – Partial Roof Retrofit Rafter and Purlin Layout Plan– Building C.**
- **Sheet RA201 – Overall Floor Plan**
- **Sheet RA211 – Roof Plan**
- **Sheet M101 – Mechanical Roof Plan - Demolition**
- **Sheet M201 – Mechanical Floor Plan - New**
- **Sheet M202 – Mechanical Roof Plan - New**
- **Sheet M301 – Mechanical Details and Schedules**
- **Sheet E101 – Electrical Roof Plan - Demolition**
- **Sheet E201 – Electrical Floor Plan - New**
- **Sheet E301 – Electrical Roof Plan - New**

END OF ADDENDUM #1 (ONE)

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details material descriptions, dimensions of individual components and profiles, and actual samples of finishes.
- B. Provide manufacturer's standard warranty.
- C. Manufacturer's Installation Instructions and Operation & Maintenance: Indicate installation, operation and maintenance requirements and rough-in dimensions.

1.3 QUALITY ASSURANCE

- A. Specify single source supplier for consistent appearance throughout the building.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site ready use.
- B. Exercise proper care in handling of Work so as not to disrupt finished surfaces.
- C. Store materials under cover in a dry and clean location off the ground.

1.5 WARRANTY

- A. Provide manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Nystrom, 9300 73rd Avenue North, Minneapolis, MN 55428; Phone: 800.547.2635; Web: www.nystrom.com, or a comparable product by one of the following manufacturers:
 - 1. Acudor.
 - 2. Best Access Doors.

2.2 EXTERIOR (NON-RATED) ACCESS DOORS AND FRAMES

- A. Flush Access Doors (Model: NTC Architectural) with Exposed Flanges (Non-Rated Exterior Access Door).
 - 1. Description: Weatherproof assembly, with face of door fit flush with frame and with exposed frame. Include extruded door gaskets and nominal 1- 3/4 inch- thick closed-cell polyurethane insulation.
 - 2. Location: Wall.
 - 3. Door Size: 30 inches x 36 inches.
 - 4. Door Material: Galvannealed; 16 gauge steel.
 - 5. Frame Material: 16 gauge steel.
 - 6. Finish: Paint grip primer on steel. Field paint by contractor to match wall panels.
 - 7. Hinges: Concealed continuous hinge.
 - 8. Latch and Lock: Cam latch, screwdriver operated, no lock.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION

SECTION 23 05 23 – BALL VALVES FOR HVAC PIPING

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. Brass ball valves.
 - 2. Bronze ball valves.
 - 3. Steel ball valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. SWP: Steam working pressure.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, and weld ends.
 - 3. Set ball valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded-end valves.
 - 2. ASME B16.1 for flanges on iron valves.
 - 3. ASME B16.5 for flanges on steel valves.
 - 4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 5. ASME B16.18 for solder-joint connections.
 - 6. ASME B31.1 for power piping valves.
 - 7. ASME B31.9 for building services piping valves.
- C. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- D. Refer to HVAC valve schedule articles for applications of valves.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
 - 1. Gear Actuator: For quarter-turn valves **NPS 4 (DN 100)** and larger.
 - 2. Handlever: For quarter-turn valves smaller than **NPS 4 (DN 100)**.
- H. Valves in Insulated Piping:
 - 1. Include **2-inch (50-mm)** stem extensions.
 - 2. Extended operating handle of nonthermal-conductive material, and protective sleeves that allow operation of valves without breaking the vapor seals or disturbing insulation.
 - 3. Memory stops that are fully adjustable after insulation is applied.
- I. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRASS BALL VALVES

- A. Two-Piece Brass Ball Valves with Full Port and Brass Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Apollo Flow Controls; Conbraco Industries, Inc.
 - c. Crane; a Crane brand.

- d. [KITZ Corporation.](#)
- e. [NIBCO INC.](#)
- f. [WATTS.](#)

2. Description:

- a. Standard: MSS SP-110.
- b. SWP Rating: 150 psig (1035 kPa).
- c. CWP Rating: 600 psig (4140 kPa).
- d. Body Design: Two piece.
- e. Body Material: Forged brass.
- f. Ends: Threaded.
- g. Seats: PTFE.
- h. Stem: Brass.
- i. Ball: Chrome-plated brass.
- j. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece Bronze Ball Valves with Full Port and Brass Trim:

- 1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:

- a. [American Valve, Inc.](#)
- b. [Apollo Flow Controls; Conbraco Industries, Inc.](#)
- c. [Crane; a Crane brand.](#)
- d. [NIBCO INC.](#)
- e. [WATTS.](#)

2. Description:

- a. Standard: MSS SP-110.
- b. SWP Rating: 150 psig (1035 kPa).
- c. CWP Rating: 600 psig (4140 kPa).
- d. Body Design: Two piece.
- e. Body Material: Bronze.
- f. Ends: Threaded.
- g. Seats: PTFE.
- h. Stem: Bronze.
- i. Ball: Chrome-plated brass.
- j. Port: Full.

2.4 STEEL BALL VALVES

A. Class 150 Steel Ball Valves with Full Port and Stainless-Steel Trim:

- 1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:

- a. [Apollo Flow Controls; Conbraco Industries, Inc.](#)

b. NIBCO INC.

2. Description:

- a. Standard: MSS SP-72.
- b. CWP Rating: 285 psig (1964 kPa).
- c. Body Design: Split body.
- d. Body Material: Carbon steel, ASTM A 216, Type WCB.
- e. Ends: Flanged.
- f. Seats: PTFE.
- g. Stem: Stainless steel.
- h. Ball: Stainless steel, vented.
- i. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install valve tags. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified SWP classes or CWP ratings are unavailable, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- B. Select valves with the following end connections:
 - 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
 - 4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
 - 5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.

3.4 CHILLED-WATER VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller: One piece, regular port, brass or bronze with stainless-steel trim.
 - 1. Valves may be provided with solder-joint ends instead of threaded ends.
- B. Pipe NPS 2-1/2 (DN 65) and Larger: Iron ball valves.
 - 1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): May be provided with threaded ends instead of flanged ends.
 - 2. Steel Ball Valves: Class 150.
- C. Pipe NPS 2-1/2 (DN 65) and Larger:
 - 1. Iron ball valves.
 - a. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): May be provided with threaded ends instead of flanged ends.
 - 2. Class 150 steel ball valves.

END OF SECTION 23 05 23

SECTION 23 05 23.14 – CHECK VALVES FOR HVAC PIPING

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. Bronze lift check valves.
 - 2. Iron swing check valves with closure control.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. SWP: Steam working pressure.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded-end valves.
 - 2. ASME B16.1 for flanges on iron valves.
 - 3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 4. ASME B16.18 for solder joint.
 - 5. ASME B31.1 for power piping valves.
 - 6. ASME B31.9 for building services piping valves.
- C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE LIFT CHECK VALVES

- A. Class 125 Lift Check Valves with Bronze Disc:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane; a Crane brand.
 - b. Jenkins Valves; a Crane brand.
 - c. Stockham; a Crane brand.
 - 2. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Design: Vertical flow.
 - d. Body Material: ASTM B 61 or ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: Bronze.

2.3 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

- A. Class 125, Iron Swing Check Valves with Lever- and Spring-Closure Control:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. NIBCO INC.
2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).
 - c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).
 - d. Body Design: Clear or full waterway.
 - e. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - f. Ends: Flanged.
 - g. Trim: Bronze.
 - h. Gasket: Asbestos free.
 - i. Closure Control: Factory-installed, exterior lever and spring.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows:
 1. Swing Check Valves: In horizontal position with hinge pin level.

2. Center-Guided and Plate-Type Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

F. Install valve tags. Comply with requirements for valve tags and schedules in Section 230553 "Identification for HVAC Piping and Equipment."

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 1. Pump-Discharge Check Valves:
 - a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze disc.
 - b. NPS 2-1/2 (DN 65) and Larger: Iron swing check valves with lever and weight or with spring or iron, center-guided, metal-seat check valves.
- B. If valves with specified SWP classes or CWP ratings are unavailable, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules.
 2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules.
 3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
 4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
 5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules.
 6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.
 7. For Grooved-End Copper Tubing and Steel Piping except Steam and Steam Condensate Piping: Valve ends may be grooved.

3.5 CHILLED-WATER VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller:
 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
- B. Pipe NPS 2-1/2 (DN 65) and Larger:
 1. Iron Swing Check Valves with Closure Control, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): Class 125, lever and spring.

END OF SECTION 23 05 23.14

SECTION 23 07 13 – DUCT INSULATION**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed supply air.
 - 2. Indoor, concealed return air.
 - 3. Indoor, concealed exhaust air.
 - 4. Indoor, concealed outdoor air.
 - 5. Indoor, return air plenum boxes.
 - 6. Indoor, tops of ceiling diffusers and grilles.
 - 7. Outdoor, supply air.
 - 8. Outdoor, return air.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance, thickness, and jackets (both factory- and field-applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
 - 3. Detail application of field-applied jackets.
 - 4. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields as specified.
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Fire Rated Insulation:
 - 1. Manufacturer shall be one of the following:
 - a. 3M FireMaster Fast Wrap 615+.
 - b. Thermal Ceramics FireMaster.
- G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.
 - 1. Manufacturer shall be one of the following:
 - a. Aeroflex, USA, Inc.
 - b. Armacell LLC.
- H. Fiber-Glass Blanket Insulation: Fiber-Glass bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Manufacturer shall be one of the following:
 - a. Certainteed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Manson Insulation Inc.
 - e. Owens Corning.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 - 1. Manufacture shall be one of the following:
 - a. Aeroflex USA, Inc.
 - b. Armacell LLC.
 - c. Foster Brand.
- C. Fiber-Glass Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Manufacturer shall be one of the following:
 - a. Childers Brand.
 - b. Eagle Bridges – Marathon Industries.
 - c. Foster Brand.
 - d. Mon-Eco Industries, Inc.

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 - 1. Manufacturer:

- a. Foster Brand.
- b. Knauf Insulation.
- c. Vimasco Corporation.
- d. Childers.
- 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
- 3. Service Temperature Range: Minus 20 to plus 180 deg F.
- 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
- 5. Color: White.

2.4 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: Aluminum.
 - 5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.6 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 6.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.7 SECUREMENTS

- A. Bands:
 - 1. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.
- B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated.
2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
 - d. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
 - e. Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
 - f. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

2.8 WALL LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
1. Manufacturers shall be as follows:
 - a. Certainteed
 - b. Owens Corning
 - c. Johns Manville
 - d. Knauf
 2. Maximum Thermal Conductivity:
 3.
 - a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 4. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 - 5.
 6. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 - a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - b.
- B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install

- insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
- E. Insulation Installation at Floor Penetrations:
1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
 2. Seal penetrations through fire-rated assemblies.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF FIBER-GLASS INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch

- o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
- 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
- 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
- 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.7 WALL LINER

- A. Apply on all mechanical room walls from floor to ceiling / deck.
 - 1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
 - 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
 - 3. Butt transverse joints without gaps, and coat joint with adhesive.
 - 4. Fold and compress liner in corners or cut and fit to ensure butted-edge overlapping.
 - 5. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

3.8 FIELD-APPLIED JACKET INSTALLATION

- A. Where FSK jackets are indicated, install as follows:
 - 1. Draw jacket material smooth and tight.
 - 2. Install lap or joint strips with same material as jacket.
 - 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 - 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
 - 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

3.9 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.

- C. Install firestopping at penetrations through fire-rated assemblies.

3.10 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified.
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, concealed supply air.
 - 2. Indoor, concealed return air.
 - 3. Indoor, concealed exhaust air.
 - 4. Indoor, concealed outdoor air.
 - 5. Indoor, return air plenum boxes.
 - 6. Indoor, tops of ceiling diffusers and grilles.
 - 7. Outdoor, supply air.
 - 8. Outdoor, return air.
- B. Items Not Insulated:
 - 1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 - 2. Factory-insulated flexible ducts.
 - 3. Factory-insulated plenums and casings.

4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.13 DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, round and flat-oval, supply-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 2. Minimum installed R-value shall be R-6.0.
- B. Concealed, round and flat-oval, return-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 2. Minimum installed R-value shall be R-6.0.
- C. Concealed, round and flat-oval, outdoor-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 2. Minimum installed R-value shall be R-6.0.
- D. Concealed, round and flat-oval, exhaust-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 2. Minimum installed R-value shall be R-6.0.
- E. Concealed, rectangular, supply-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 2. Minimum installed R-value shall be R-6.0.
- F. Concealed, rectangular, return-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 2. Minimum installed R-value shall be R-6.0.
- G. Concealed, rectangular, outdoor-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 2. Minimum installed R-value shall be R-6.0.
- H. Concealed, rectangular, exhaust-air duct shall be the following:
 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 2. Minimum installed R-value shall be R-6.0.
- I. Concealed, supply-air plenum insulation shall be the following:
 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 2. Minimum installed R-value shall be R-6.0.
- J. Return air plenum boxes installation shall be the following:
 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 2. Minimum installed R-value shall be R-6.0.
- K. Tops of supply air diffusers and grilles insulation shall be the following:
 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 2. Minimum installed R-value shall be R-6.0.
- L. Outdoor (exposed to weather), supply air shall be the following:
 1. Elastomeric Insulation: 2 inch thick flexible blanket.

2. Install jacket over insulation material with Stainless Steel, Type 304 or Type 316, sheet metal with 0.024 inch thickness.
 3. In lieu of the stainless steel jacket, at contractor's option, the contractor may provide a paint grip sheet metal rain cap to cover the duct insulation. Paint the rain cap. Coordinate the final finish color of the sheet metal rain cap with the Architect. Provide three coats of paint.
- M. Outdoor (exposed to weather), return air shall be the following:
1. Elastomeric Insulation: 2 inch thick flexible blanket.
 2. Install jacket over insulation material with Stainless Steel, Type 304 or Type 316, sheet metal with 0.024 inch thickness.
 3. In lieu of the stainless steel jacket, at contractor's option, the contractor may provide a paint grip sheet metal rain cap to cover the duct insulation. Paint the rain cap. Coordinate the final finish color of the sheet metal rain cap with the Architect. Provide three coats of paint.

END OF SECTION 23 07 13

SECTION 23 09 23.11 – CONTROL VALVES

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 control valves and actuators for DDC systems.
- B. Related Requirements:
 - 1. Section 23 09 23 "Direct-Digital Control System for HVAC" control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.
 - 2. Section 23 09 93 "Sequence of Operations for HVAC Controls" for requirements that relate to Section 230923.11.

1.3 DEFINITIONS

- A. Cv: Design valve coefficient.
- B. DDC: Direct-digital control.
- C. NBR: Nitrile butadiene rubber.
- D. PTFE: Polytetrafluoroethylene
- E. 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including 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 affecting performance.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Include diagrams for pneumatic signal and main air tubing.

C. Delegated-Design Submittal:

1. Schedule and design calculations for control valves and actuators, including the following:
 - a. Flow at project design and minimum flow conditions.
 - b. Pressure differential drop across valve at project design flow condition.
 - c. Maximum system pressure differential drop (pump close-off pressure) across valve at project minimum flow condition.
 - d. Design and minimum control valve coefficient with corresponding valve position.
 - e. Maximum close-off pressure.
 - f. Leakage flow at maximum system pressure differential.
 - g. Torque required at worst case condition for sizing actuator.
 - h. Actuator selection indicating torque provided.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plan drawings and corresponding product installation details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Control valve installation location shown in relationship to room, duct, pipe, and equipment.
 2. Size and location of wall access panels for control valves installed behind walls.
 3. Size and location of ceiling access panels for control valves installed above inaccessible ceilings.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For control valves to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. 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.

- B. ASME Compliance: Fabricate and label products to comply with ASME Boiler and Pressure Vessel Code where required by authorities having jurisdiction.
- C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to size products where indicated as delegated design.
- D. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.
- E. Backup Power Source: Systems and equipment served by a backup power source shall have associated control valve actuators served from a backup power source.
- F. 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.
 - a. Hazardous Locations: Explosion-proof rating for condition.
- G. Determine control valve sizes and flow coefficients by ISA 75.01.01.
- H. Control valve characteristics and rangeability shall comply with ISA 75.11.01.
- I. Selection Criteria:
 - 1. Control valves shall be suitable for operation at following conditions:
 - a. Chilled Water: 90 PSI at 30 to 50 degrees F.
 - b. Condenser Water: 90 PSI at 50 to 110 degrees F.
 - c. Heating Hot Water: 90 PSI at 80 to 200 degrees F.
 - d. Steam: 200 PSI at 100 to 300 degrees.
 - 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. Chilled Water: Close.
 - b. Condenser Water: Close.
 - c. Heating Hot Water: Close.
 - d. 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 7 psig ((48 kPa)) 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. 50 percent of the valve inlet pressure.
 - b. 50 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 ((DN 50)) and smaller and butterfly style for valves larger than NPS 2 (DN 50).
17. In steam systems, use ball- or globe-style control valves regardless of size.
18. Pneumatic, two-position control valves shall provide a smooth opening and closing characteristic slow enough to avoid water hammer. Valves with pneumatic actuators shall have an adjustable opening time (valve full closed to full open) and an adjustable closing time (valve full open to full closed) ranging from zero to 10 seconds. Opening and closing times shall be independently adjustable.
19. Control valve, pneumatic-control signal shall not exceed 200 feet (60 m). For longer distances, provide an electric/electronic control signal to the valve and an electric solenoid valve or electro-pneumatic transducer at the valve to convert the control signal to pneumatic.

2.2 BALL-STYLE CONTROL VALVES

A. Pressure-Independent Ball Valves NPS 2 (DN 50) and Smaller:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Belimo Aircontrols (USA), Inc.
 - b. HCI; Hydronics Components Inc.
 - c. Siemens Industry, Inc., Building Technologies Division.
2. Performance:
 - a. Pressure Rating: 600 psig (4137 kPa) for NPS 1 (DN 25) and 400 psig (2528 kPa) for NPS 1-1/2 and NPS 2 (DN 38 and DN 50).
 - b. Close-off pressure of 200 psig (1379 kPa).
 - c. Process Temperature Range: Between zero to 212 deg F (minus 18 to plus 100 deg C).
 - 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 ((34 to 345 kPa)).
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.

2.3 BUTTERFLY-STYLE CONTROL VALVES

A. Commercial-Grade, Two-Way Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Keystone; Emerson Electric Co.
 - b. Siemens Industry, Inc., Building Technologies Division.
2. Performance:
 - a. Bi-directional bubble tight shutoff at **250 psig (1724 kPa)**.
 - 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 A 126, Class B, ductile iron ASTM A 536 or cast steel ASTM A 216/A 216M 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.

B. Commercial-Grade, Three-Way Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Keystone; Emerson Electric Co.
2. Arrangement: Two valves mated to a fabricated tee with interconnecting mechanical linkage.
3. Performance:
 - a. Bi-directional bubble tight shutoff at **250 psig (1724 kPa)**.
 - b. Comply with MSS SP-67 or MSS SP-68.

- c. Rotation: Zero to 90 degrees.
 - d. Linear or modified equal percentage flow characteristic.
- 4. Body: Cast iron ASTM A 126, Class B, ductile iron ASTM A 536 or cast steel ASTM A 216/A 216M WCB fully lugged, suitable for mating to ASME B16.5 flanges.
 - 5. Disc: 316 stainless steel.
 - 6. Shaft: 316 or 17-4 PH stainless steel.
 - 7. Seat: Reinforced EPDM or reinforced PTFE seat with retaining ring.
 - 8. Shaft Bushings: Reinforced PTFE or stainless steel.
 - 9. Replaceable seat, disc, and shaft bushings.
 - 10. Corrosion-resistant nameplate indicating:
 - a. Manufacturer's name, model number, and serial number.
 - b. Body size.
 - c. Body and trim materials.
 - d. Flow arrow.

2.4 ELECTRIC AND ELECTRONIC CONTROL VALVE ACTUATORS

- A. Actuators for Hydronic Control Valves: Capable of closing valve against system pump shutoff head.
- B. Actuators for Steam Control Valves: Shutoff against 1.5 times steam design pressure.
- C. Position indicator and graduated scale on each actuator.
- D. Type: Motor operated, with or without gears, electric and electronic.
- E. Voltage: 24-V ac.
- F. Deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.
- G. Function properly within a range of 85 to 120 percent of nameplate voltage.
- H. 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.
- I. Field Adjustment:
 - 1. Spring Return Actuators: Easily switchable from fail open to fail closed in the field without replacement.
 - 2. Gear Type Actuators: External manual adjustment mechanism to allow manual positioning when the actuator is not powered.
- J. Two-Position Actuators: Single direction, spring return or reversing type.

K. 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.
 - c. Pulse Width Modulation (PWM): Actuator drives to a specified position according to pulse duration (length) of signal from a dry contact closure, triac sink, or source controller.
 - d. Programmable Multi-Function:
 - 1) Control Input, Position Feedback, and Running Time: Factory or field programmable.
 - 2) Diagnostic: Feedback of hunting or oscillation, mechanical overload, mechanical travel, and mechanical load limit.
 - 3) Service Data: Include, at a minimum, number of hours powered and number of hours in motion.

L. 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.

M. 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.

N. 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.

O. 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.

P. 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** ((**minus 29 to plus 49 deg C**)).
2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.

Q. 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.

R. Stroke Time:

1. Operate valve from fully closed to fully open within 15 seconds.
2. Operate valve from fully open to fully closed within 15 seconds.
3. Move valve to failed position within 15 seconds.
4. Select operating speed to be compatible with equipment and system operation.

S. Sound:

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

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.
- B. Examine roughing-in for valves installed in piping to verify actual locations of piping connections before installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Furnish and install products required to satisfy most stringent requirements indicated.
- B. Install products level, plumb, parallel, and perpendicular with building construction.

- C. Properly support instruments, tubing, piping, wiring, and conduits to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a excessive force.
- D. Provide ceiling, floor, roof, and wall openings and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.
- E. Firestop penetrations made in fire-rated assemblies and seal penetrations made in acoustically rated assemblies.
- F. Fastening Hardware:
 - 1. Stillson wrenches, pliers, and other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for 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.
- G. Install products in locations that are accessible and that will 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.
- H. Corrosive Environments:
 - 1. Use products that are suitable for environment to which they will be subjected.
 - 2. If possible, avoid or limit use of materials in corrosive environments, including, but not limited to, the following:
 - a. Laboratory exhaust airstreams.
 - b. Process exhaust airstreams.
 - 3. Use Type 316 stainless-steel tubing and fittings when in contact with a corrosive environment.
 - 4. When conduit is in contact with a corrosive environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
 - 5. Where control devices are located in a corrosive environment and are not corrosive resistant from manufacturer, field install products in a NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.3 ELECTRIC POWER

- A. Furnish and install electrical power to products requiring electrical connections.
- B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."
- C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

- D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.4 CONTROL VALVES

- A. Install pipe reducers for valves smaller than line size. Position reducers as close to valve as possible but at distance to avoid interference and impact to performance. Install with manufacturer-recommended clearance.
- B. Install flanges or unions to allow drop-in and -out valve installation.
- C. Where indicated, install control valve with three-valve bypass manifold to allow for control valve isolation and removal without interrupting system flow by providing manual throttling valve in bypass pipe.
- D. Install drain valves in piping upstream and downstream of each control valve installed in a three-valve manifold and for each control valve larger than **NPS 4 ((DN 100))**.
- E. Install pressure temperature taps in piping upstream and downstream of each control valve larger than **NPS 2 ((DN 50))**.
- F. Valve Orientation:
 - 1. Where possible, install globe and ball valves installed in horizontal piping with stems upright and not more than 15 degrees off of vertical, not inverted.
 - 2. Install valves in a position to allow full stem movement.
 - 3. Where possible, install butterfly valves that are installed in horizontal piping with stems in horizontal position and with low point of disc opening with direction of flow.
- G. Clearance:
 - 1. Locate valves for easy access and provide separate support of valves that cannot be handled by service personnel without hoisting mechanism.
 - 2. Install valves with at least **12 inches (300 mm)** of clear space around valve and between valves and adjacent surfaces.
- H. Threaded Valves:
 - 1. Note internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.
 - 2. Align threads at point of assembly.
 - 3. Apply thread compound to external pipe threads, except where dry seal threading is specified.
 - 4. Assemble joint, wrench tight. Apply wrench on valve end as pipe is being threaded.
- I. Flanged Valves:
 - 1. Align flange surfaces parallel.
 - 2. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

3.5 CONNECTIONS

- A. Connect electrical devices and components to electrical grounding system. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.6 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Install engraved phenolic nameplate with valve identification on valve and on face of ceiling directly below valves concealed above ceilings.

3.7 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.

3.8 CHECKOUT PROCEDURES

- A. Control Valve Checkout:
 - 1. Check installed products before continuity tests, leak tests, and calibration.
 - 2. Check valves for proper location and accessibility.
 - 3. Check valves for proper installation for direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.
 - 4. For pneumatic products, verify air supply for each product is properly installed.
 - 5. For pneumatic valves, verify that pressure gauges are provided in each air line to valve actuator and positioner.
 - 6. Verify that control valves are installed correctly for flow direction.
 - 7. Verify that valve body attachment is properly secured and sealed.
 - 8. Verify that valve actuator and linkage attachment are secure.
 - 9. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
 - 10. Verify that valve ball, disc, and plug travel are unobstructed.
 - 11. 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.

3.9 ADJUSTMENT, CALIBRATION, AND TESTING

- A. Stroke and adjust control valves following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.

- B. Stroke control valves with pilot positioners. Adjust valve and positioner following manufacturer's recommended procedure, so valve is 100 percent closed, 50 percent closed, and 100 percent open at proper air pressures.
- C. Check and document open and close cycle times for applications with a cycle time of less than 30 seconds.
- D. For control valves equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

END OF SECTION 23 09 23.11

SECTION 23 21 13 – HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes pipe and fitting materials and joining methods for the following:

1. Chilled-water piping.
2. Air-vent piping.
3. Safety-valve-inlet and -outlet piping.

1.2 ACTION SUBMITTALS

- A. Delegated-Design Submittal:

1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
2. Locations of pipe anchors and alignment guides and expansion joints and loops.
3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
4. Locations of and details for penetration and firestopping for fire- and smoke-rated wall and floor and ceiling assemblies.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:

1. Chilled-Water Piping: 150 psig at 200 deg F.
2. Air-Vent Piping: 200 deg F.

3. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.
- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in "Piping Applications" Article.
- C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.
- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.
- E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.
- F. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 1. Material Group: 1.1.
 2. End Connections: Butt welding.
 3. Facings: Raised face.

2.3 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- D. Solvent Cements for Joining Plastic Piping:
 1. CPVC Piping: ASTM F 493.
 - a. CPVC solvent cement shall have a VOC content of 490 g/L or less.
 - b. Adhesive primer shall have a VOC content of 550 g/L or less.

- c. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - a. PVC solvent cement shall have a VOC content of 510 g/L or less.
 - b. Adhesive primer shall have a VOC content of 550 g/L or less.
 - c. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.4 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 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. WATTS; A Watts Water Technologies Company.
 - b. Wilkins.
 - c. Zurn Industries, LLC.
 - d. Or Prior Approved Equal
 - 2. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 150 psig.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Chilled-water piping, aboveground, NPS 2 and smaller shall be any of the following:
 - 1. Schedule 40 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; and threaded joints.

- B. Chilled-water piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:
 - 1. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
- C. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.
- D. Air-Vent Piping:
 - 1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.
 - 2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.
- E. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

3.2 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install branch connections to mains using [**mechanically formed**] tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. Install valves according to Section 230523.11 "Globe Valves for HVAC Piping," Section 230523.12 "Ball Valves for HVAC Piping," Section 230523.13 "Butterfly Valves for HVAC Piping," Section 230523.14 "Check Valves for HVAC Piping," and Section 230523.15 "Gate Valves for HVAC Piping."
- Q. Install unions in piping, [**NPS 2**] and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- R. Install flanges in piping, [**NPS 2-1/2**] and larger, at final connections of equipment and elsewhere as indicated.
- S. Install shutoff valve immediately upstream of each dielectric fitting.
- T. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.
- U. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.
- V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.4 HANGERS AND SUPPORTS

- A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 7 feet.
2. NPS 1: Maximum span, 7 feet.
3. NPS 1-1/2: Maximum span, 9 feet.
4. NPS 2: Maximum span, 10 feet.
5. NPS 2-1/2: Maximum span, 11 feet.
6. NPS 3 and Larger: Maximum span, 12 feet.

D. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.

E. Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.

F. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.
- E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.6 TERMINAL EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
- B. Install control valves in accessible locations close to connected equipment.
- C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.
- D. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230519 "Meters and Gages for HVAC Piping."

3.7 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
 - 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 - 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 - 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 - 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 - 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
 - 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 - 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.

3. Isolate expansion tanks and determine that hydronic system is full of water.
 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
 5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 6. Prepare written report of testing.
- C. Perform the following before operating the system:
1. Open manual valves fully.
 2. Inspect pumps for proper rotation.
 3. Set makeup pressure-reducing valves for required system pressure.
 4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
 5. Set temperature controls so all coils are calling for full flow.
 6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
 7. Verify lubrication of motors and bearings.

END OF SECTION 23 21 13

SECTION 23 74 13 - PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:
 - 1. Air Mixing Section
 - 2. Filter Section (2" MERV 8 flat section and 2" angled MERV 13 Section)
 - 3. Access Section
 - 4. Access Section
 - 5. Chilled Water-Cooling Coil Section
 - 6. Access Section
 - 7. Fan Section (Fan Array with minimum of two fans)
 - 8. Controls section
 - 9. Vibration Isolation Roof curbs

1.3 DEFINITIONS

- A. DDC: Direct-digital controls.
- B. ECM: Electrically commutated motor.
- C. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.
- D. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design RTU supports to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Wind-Restraint Performance:
 - 1. Basic Wind Speed: 120 MPH

2. Minimum 10 lb/sq. ft (48.8 kg/sq. m) multiplied by the maximum area of the mechanical component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

1.5 ACTION SUBMITTALS

- A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 1. Wiring Diagrams: Power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Structural members to which RTUs will be attached.
 2. Roof openings
 3. Roof curbs and flashing.
- B. Field quality-control test reports.
- C. Warranty: Special warranty specified in this Section.

1.7 CLOSEOUT SUBMITTALS

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

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fan Belts: Two set for each belt-driven fan.
 2. Filters: Two set of filters for each unit.

1.9 QUALITY ASSURANCE

- A. ARI Compliance:
 1. Comply with ARI 203/110 and ARI 303/110 for testing and rating energy efficiencies for RTUs.
 2. Comply with ARI 270 for testing and rating sound performance for RTUs.

- B. ASHRAE Compliance:
 - 1. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
 - 2. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.
- E. UL Compliance: Comply with UL 1995.
- F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for parts, besides controls: Manufacturer's standard, but not less than 5 years from date of Substantial Completion.
 - 2. Warranty Period for Control Boards: Manufacturer's standard, but not less than five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Carrier Corporation; a unit of United Technologies Corp.
 - 2. Daikin Applied.
 - 3. Trane. (Basis of Design)
 - 4. YORK; a Johnson Controls company.

2.2 GENERAL

- A. Unit layout and configuration shall be as defined in project plans and schedule.
- B. Manufacturer to provide a full perimeter integral base frame for either ceiling suspension of units or to support and raise all sections of the unit for proper trapping. Base frame will either be bolted construction or welded construction. Refer to schedule for base height and construction type. Contractor will be responsible for providing a housekeeping pad when unit base frame is not of sufficient height to properly trap unit. Unit base frames not constructed of galvanized steel shall

be chemically cleaned and coated with both a rust-inhibiting primer and finished coat of rust-inhibiting enamel. Unit base height to be included in total height required for proper trap height.

2.3 UNIT CASING

- A. Unit manufacturer shall ship unit in segments as specified by the contractor for ease of installation in tight spaces. The entire air handler shall be constructed of galvanized steel. Casing finished to meet ASTM B117 125-hour salt-spray test. The removal of access panels or access doors shall not affect the structural integrity of the unit. All removable panels shall be gasketed. All doors shall have gasketing around full perimeter to prevent air leakage. Contractor shall be responsible to provide connection flanges and all other framework that is needed to properly support the unit.
- B. Casing performance - Casing air leakage shall not exceed leak class 6 (CL = 6) per ASHRAE 111 at specified casing pressure, where maximum casing leakage (cfm/100 ft² of casing surface area) = CL X P^{0.65}.
- C. Air leakage shall be determined at 1.00 times maximum casing static pressure up to 8 inches w.g. Specified air leakage shall be accomplished without the use of caulk. Total estimated air leakage shall be reported for each unit in CFM, as a percentage of supply air, and as an ASHRAE 111 Leakage Class.
- D. Under 55F supply air temperature and design conditions on the exterior of the unit of 81F dry bulb and 73F wet bulb, condensation shall not form on the casing exterior. The AHU manufacturer shall provide tested casing thermal performance for the scheduled supply air temperature plotted on a psychrometric chart. The design condition on the exterior of the unit shall also be plotted on the chart. If tested casing thermal data is not available, AHU manufacturer shall provide, in writing to the Engineer and Owner, a guarantee against condensation forming on the unit exterior at the stated design conditions above. The guarantee shall note that the AHU manufacturer will cover all expenses associated with modifying units in the field should external condensate form on them. In lieu of AHU manufacturer providing a written guarantee, the installing contractor must provide additional external insulation on AHU to prevent condensation.
- E. Unit casing (wall/floor/roof panels and doors) shall be able to withstand up to 1.5 times design static pressure, or 8-inch w.g., whichever is less, and shall not exceed 0.0042 per inch of panel span (L/240).
- F. Floor panels shall be double-wall construction and designed to support a 300-lb load during maintenance activities and shall deflect no more than 0.0042 per inch of panel span.
- G. Unit casing panels shall be 2-inch double-wall construction, with solid galvanized exterior and solid galvanized interior, to facilitate cleaning of unit interior.
- H. Unit casing panels (roof, walls, floor) and doors shall be provided with a minimum thermal resistance (R-value) of 13 Hr*Ft²*°F/BTU.
- I. Unit casing panels (roof, walls, floor) and external structural frame members shall be completely insulated filling the entire panel cavity in all directions so that no voids exist. Panel insulation shall comply with NFPA 90A.
- J. Casing panel inner liners must not extend to the exterior of the unit or contact the exterior frame. A mid-span, no-through-metal, internal thermal break shall be provided for all unit casing panels.

- K. Access panels and/or access doors shall be provided in all sections to allow easy access to drain pan, coil(s), motor, drive components and bearings for cleaning, inspection, and maintenance.
- L. Access panels and doors shall be fully removable without the use of specialized tools to allow complete access of interior surfaces.

2.4 OUTDOOR UNIT FEATURES

- A. Outdoor Casing Details - In addition to all other details specified within for air handling units, units that are installed outdoors shall also comply with the following –
 - 1. Outdoor air handling units shall have only single door handles for each door linking multiple latching points necessary to maintain the specified air leakage integrity of the unit and ease of maintenance.
 - 2. Unit Paint - External surfaces of all outdoor unit casings shall be prepared and painted with a minimum 1.5 mil thick water based polyurethane finish or equal. Paint shall be able to withstand a salt spray test in accordance with ASTM B117 for a minimum of 500 consecutive hours. Paint shall be Slate Grey unless otherwise indicated in the schedule and drawings.
 - 3. Unit Base - Outdoor units shall have a welded base and steel cross members for structural rigidity and supports the full perimeter of the air handling unit. AHU panels must overhang the primary unit base such that no ledge exists for water to pool. The entire AHU perimeter shall be sealed for additional water management protection. A drain pan under the entire unit or sections shall not be an acceptable alternative to prevent water from entering the building space. Unit base shall be designed to allow the unit to be curb mounted when field-installed as indicated on the schedule and drawings.

2.5 ACCESS DOORS

- A. Access doors shall be 2-inch double-wall construction. Interior and exterior shall be of the same construction as the interior and exterior wall panels.
- B. All doors shall be provided with a thermal break construction of door panel and door frame.
- C. Gasketing shall be provided around the full perimeter of the doors to prevent air leakage.
- D. Door hardware shall be surface-mounted to prevent through-cabinet penetrations that could likely weaken the casing leakage and thermal performance.
- E. Handle hardware shall be designed to prevent unintended closure.
- F. Access doors shall be hinged and removable without the use of specialized tools.
- G. Hinges shall be interchangeable with the door handle hardware to allow for alternating door swing in the field to minimize access interference due to unforeseen job site obstructions.
- H. Door handle hardware shall be adjustable and visually indicate locking position of door latch external to the section.

- I. All doors shall be a 60-inch high when sufficient unit height is available, or the maximum height allowed by the unit height.
- J. A single door handle shall be provided for each door linking multiple latching points necessary to maintain the specified air leakage integrity of the unit.
- K. An optional shatterproof window shall be provided in access doors where indicated on the plans. Window shall either be single pane, or thermal dual pane, as defined on schedule. Window shall be capable of withstanding unit operating pressures and shall be safe for viewing UV-C lamps.

2.6 PRIMARY DRAIN PANS

- A. All cooling coil sections shall be provided with an insulated, double-wall, galvanized drain pan.
- B. The drain pan shall be designed in accordance with ASHRAE 62.1 being of sufficient size to collect all condensation produced from the coil and sloped in two planes, pitched toward drain connections, promoting positive drainage to eliminate stagnant water conditions when unit is installed level and trapped per manufacturer's requirements.
- C. The outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.
- D. All drain pan threaded connections shall be visible external to the unit. Threaded connections under the unit floor shall not be accepted.
- E. Drain connections shall be of the same material as the primary drain pan and shall extend a minimum 2-1/2-inch beyond the base to ensure adequate room for field piping of condensate traps.
- F. The installing contractor is responsible to ensure the unit is installed level, trapped in accordance with the manufacturer's requirements, and visually inspected to ensure proper drainage of condensate.
- G. Coil support members inside the drain pan shall be of the same material as the drain pan and coil casing.

2.7 FANS

- A. Fan sections shall have a minimum of one hinged and latched access door located on the drive side of the unit to allow inspection and maintenance of the fan, motor, and drive components.
- B. Provide fans of type and class as specified on the schedule. All fans shall be statically and dynamically tested by the manufacturer for vibration and alignment as an assembly at the operating RPM to meet design specifications. Fans that are selected with inverter balancing shall first be dynamically balanced at design RPM. The fans then will be checked in the factory from 25% to 100% of design RPM to insure they are operating within vibration tolerance specifications, and that there are no resonant frequency issues throughout this operating range. Inverter balancing that requires lockout frequencies inputted into a variable frequency drive to in order to bypass resonant frequencies shall not be acceptable. If supplied in this manner by the unit manufacturer, the contractor will be responsible for rebalancing in the field after unit installation.

Fans selected with inverter balancing shall have a maintenance free grounding assembly installed on the fan motor to discharge both static and induced shaft currents to ground.

- C. Direct drive plenum fans with integral frame motors, shall be mounted on isolation bases. Fan shall be dynamically balanced throughout the operating range to a BV-3 (0.20 in/s) per AMCA 204 test standard. Fan and motor shall be internally isolated with spring isolators. A flexible connection shall be installed between fan and unit casing to ensure complete isolation. Flexible connection shall comply with NFPA 90A and UL 181 requirements. If fans and motors are not internally isolated, then the entire unit shall be externally isolated from the building, including supply and return duct work, piping, and electrical connections. External isolation shall be furnished by the installing contractor in order to avoid transmission of noise and vibration through the ductwork and building structure.
- D. MOTORS AND DRIVES
 - 1. Motors shall meet or exceed all NEMA Standards Publication MG 1 - 2006 requirements and comply with NEMA Premium efficiency levels when applicable. Motors shall comply with applicable requirements of NEC and shall be UL Listed.
 - 2. Fan Motors shall be heavy duty, open drip-proof operable at scheduled voltage. If applicable, motor efficiency shall meet or exceed NEMA Premium efficiencies.
 - 3. Direct driven fans utilizing integral frame motors shall use 2-pole (3600 rpm), 4-pole (1800 rpm) or 6-pole (1200 rpm) motors, NEMA Design B, with Class B insulation capable to operate continuously at 104 deg F (40 deg C) without tripping overloads.
 - 4. Motors shall have a +/- 10 percent voltage utilization range to protect against voltage variation.

2.8 COILS

- A. Coils section header end panel shall be removable to allow for removal and replacement of coils without impacting the structural integrity of the unit.
- B. Install coils such that headers and return bends are enclosed by unit casing to ensure that if condensate forms on the header or return bends, it is captured by the drain pan under the coil.
- C. Coils shall be manufactured with plate fins to minimize water carryover and maximize airside thermal efficiency. Fin tube holes shall have drawn and belled collars to maintain consistent fin spacing to ensure performance and air pressure drop across the coil as scheduled. Tubes shall be mechanically expanded and bonded to fin collars for maximum thermal conductivity. Use of soldering or tinning during the fin-to-tube bonding process is not acceptable due to the inherent thermal stress and possible loss of bonding at that joint.
- D. Construct coil casings of galvanized steel. End supports and tube sheets shall have belled tube holes to minimize wear of the tube wall during thermal expansion and contraction of the tube.
- E. All coils shall be completely cleaned prior to installation into the air handling unit. Complete fin bundle in direction of airflow shall be degreased and steam cleaned to remove any lubricants used in the manufacturing of the fins, or dirt that may have accumulated, in order to minimize the chance for water carryover.
- F. When two or more cooling coils are stacked in the unit, an intermediate drain pan shall be installed between each coil. The intermediate drain pan shall be designed being of sufficient size to collect all condensation produced from the coil and sloped to promote positive drainage to eliminate

stagnant water conditions. The intermediate drain pan shall be constructed of the same material as the sections primary drain pan.

- G. The intermediate drain pan shall begin at the leading face of the water-producing device and be of sufficient length extending downstream to prevent condensate from passing through the air stream of the lower coil.
- H. Intermediate drain pan shall include downspouts to direct condensate to the primary drain pan. The intermediate drain pan outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.
- I. Hydronic Coils
 - 1. Supply and return header connections shall be clearly labeled on unit exterior such that direction of coil water-flow is counter to direction of unit air-flow.
 - 2. Coils shall be proof-tested to 300 psig and leak-tested to 200 psig air pressure under water.
 - 3. Headers shall be constructed of round copper pipe or cast iron.
 - 4. Tubes shall be 5/8-inch .020 copper, with aluminum fins.

2.9 FILTERS

- A. Provide factory-fabricated filter section of the same construction and finish as unit casings. Filter section shall have side access filter guides and access door(s) extending the full height of the casing to facilitate filter removal. Construct doors in accordance with Section 2.04. Provide fixed filter blockoffs as required to prevent air bypass around filters. Blockoffs shall not need to be removed during filter replacement. Filters to be of size, and quantity needed to maximize filter face area of each particular unit size.
- B. Provide factory-fabricated filter section of the same construction and finish as unit casings. Filter section shall be provided with front loading filter frames. Filter holding frames shall be constructed of galvanized steel and equipped with foam gaskets to seal filters against filter frames. Frame seams shall be sealed to eliminate air bypass. Access door(s) shall be provided to facilitate filter removal. Construct doors in accordance with Section 2.04. Manufacturer to provide necessary filter clips to lock primary and secondary prefilters (if ordered) tightly to filter frame without the need for special tools, bolts or nuts. Filter holding frames shall be of a universal type to accommodate standard filters of 12x24 and 24x24 nominal size as well as appropriate fasteners.
- C. Filter type, MERV rating, and arrangement shall be provided as defined in project plans and schedule.

2.10 DAMPERS

- A. All dampers, with the exception of external bypass and multizones (if scheduled), shall be internally mounted. Dampers shall be premium ultra low leak and located as indicated on the schedule and plans. Blade arrangement (parallel or opposed) shall be provided as indicated on the schedule and drawings. Dampers shall be Ruskin CD60 double-skin airfoil design or equivalent for minimal air leakage and pressure drop. Leakage rate shall not exceed 3 CFM/square foot at one inch water gauge complying with ASHRAE 90.1 maximum damper leakage and shall be AMCA licensed for Class 1A. All leakage testing and pressure ratings shall be based on AMCA Standard 500-D. Manufacturer shall submit brand and model of damper(s) being furnished, if not Ruskin CD60.

2.11 ACCESS SECTIONS

- A. Access sections shall be provided where indicated in the schedule and plans to allow additional access for inspection, cleaning, and maintenance of unit components. The unit shall be installed for proper access. Procedure for proper access, inspection and cleaning of the unit shall be provided in the AHU manufacturer's maintenance manual.

2.12 DISCHARGE PLENUM SECTIONS

- A. Plenums shall be provided as indicated in the schedule and plans to efficiently turn air and provide acoustical attenuation. Discharge plenum opening types and sizes shall be scaled to meet pressure drop requirements scheduled and align with duct takeoffs.

2.13 VFD per Fan

- A. Multiple VFDs on a common panel, shall be provided for each fan array to provide redundancy in case of loss of function of one of the VFDs or motors. Individual VFD shall be sized based on motor FLA to reduce overall panel input current. In the event of a VFD failure, the remaining VFDs must be capable of compensating and maintaining normal fan array operation.
- B. VFD panel shall have a common disconnect that is accessible from the outside of the unit. Disconnect shall open input power to all VFDs simultaneously. Disconnect shall be lockable in the off position. Disconnect shall utilize circuit breaker to provide overcurrent and short circuit protection.
- C. VFD panel shall be provided with a common point connection for speed input signal, start/stop signal, fault status, and field interlock connection.
- D. VFD panel shall be provided with a single point of field connection for field input power. Each VFD shall be supplied with independent input fusing, as required. Panel shall be provided with short circuit current of 5kA RMS symmetrical.
- E. VFD panel shall be provided with a single point of field connection for field input power. Each VFD shall be supplied with independent input fusing, as required. Panel shall be provided with short circuit current of 65kA RMS symmetrical.
- F. Externally mounted VFDs shall be provided with independent keypad.

2.14 Factory Wiring of Lights, VFDs, Motorized Impeller Control Panels, and Combination Starters/Disconnects

- A. VFDs shall be wired per NEC, UL, and NFPA 90A requirements. Units with factory-mounted controls shall also include power wiring from the VFD or starter/disconnect control transformer to the control system transformers. Units with VFDs and factory-mounted controls shall have a binary start-stop signal and an analog speed signal wired from the direct digital controller to the VFD.
- B. All power wiring for voltages greater than 24V and traveling through multiple unit sections shall be contained in an enclosed, metal, power-wiring raceway or EMT. Sections less than 6-inch in length may be contained in FMC.

- C. After mounting and wiring of VFDs, on the AHUs, trained factory personnel shall ensure proper operation of each VFD, through a thorough factory test. Testing shall include a Hypot test of unit wiring to ensure that no weaknesses exist in wiring or motor. Each VFD shall be energized and the fan run to ensure the VFD will operate throughout the usable range of the drive and that the fan rotation is correct. Each VFD with bypass shall also be tested in the bypass position to ensure the bypass is operational.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.
- B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.
- C. Examine roofs for suitable conditions where RTUs will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Unit Support: Install unit level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure RTUs to structural support with anchor bolts.

3.3 CONNECTIONS

- A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.
- B. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
 - 1. Install ducts to termination at top of roof curb.
 - 2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
 - 3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."
 - 4. Install return-air duct continuously through roof structure.
 - 5. Install normal-weight, 3000-psi (20.7-MPa), compressive strength (28-day) concrete mix inside roof curb, 4 inches (100 mm) thick. Concrete, formwork, and reinforcement are specified with concrete.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- B. Perform tests and inspections and prepare test reports.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.
- C. Tests and Inspections:
 - 1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
 - 2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.

3.5 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
 - 1. Inspect for visible damage to unit casing.
 - 2. Inspect for visible damage to furnace combustion chamber.
 - 3. Inspect for visible damage to compressor, coils, and fans.
 - 4. Inspect internal insulation.
 - 5. Verify that labels are clearly visible.
 - 6. Verify that clearances have been provided for servicing.
 - 7. Verify that controls are connected and operable.
 - 8. Verify that filters are installed.
 - 9. Clean furnace flue and inspect for construction debris.
 - 10. Connect and purge gas line.
 - 11. Remove packing from vibration isolators.
 - 12. Inspect operation of barometric relief dampers.
 - 13. Verify lubrication on fan and motor bearings.
 - 14. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
 - 15. Adjust fan belts to proper alignment and tension.
 - 16. Start unit according to manufacturer's written instructions.
 - a. Start refrigeration system.
 - b. Do not operate below recommended low-ambient temperature.
 - c. Complete startup sheets and attach copy with Contractor's startup report.
 - 17. Inspect and record performance of interlocks and protective devices; verify sequences.

18. Operate unit for an initial period as recommended or required by manufacturer.
19. Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency.
 - a. Measure gas pressure on manifold.
 - b. Inspect operation of power vents.
 - c. Measure combustion-air temperature at inlet to combustion chamber.
 - d. Measure flue-gas temperature at furnace discharge.
 - e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
 - f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.
20. Calibrate thermostats.
21. Adjust and inspect high-temperature limits.
22. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
23. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F (8 deg C) above return-air temperature:
 - a. Coil leaving-air, dry- and wet-bulb temperatures.
 - b. Coil entering-air, dry- and wet-bulb temperatures.
 - c. Outdoor-air, dry-bulb temperature.
 - d. Outdoor-air-coil, discharge-air, dry-bulb temperature.
24. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
25. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.
 - a. Supply-air volume.
 - b. Return-air volume.
 - c. Relief-air volume.
 - d. Outdoor-air intake volume.
26. Simulate maximum cooling demand and inspect the following:
 - a. Compressor refrigerant suction and hot-gas pressures.
27. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:
 - a. Low-temperature safety operation.
 - b. Filter high-pressure differential alarm.
 - c. Economizer to minimum outdoor-air changeover.
 - d. Relief-air fan operation.
 - e. Smoke and firestat alarms.
28. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.6 CLEANING AND ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than-normal occupancy hours for this purpose.
- B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs. Refer to Section 017900 "Demonstration and Training."

END OF SECTION

SECTION 26 05 19 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.
- B. Related Sections include the following:
 - 1. Section "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70- Latest edition or edition enforced by state and local code authority.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.
- B. Conductor Material: Copper; stranded conductor or solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- C. Conductor Insulation Types: Type THHN-THWN.

2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway or MC Cable is allowed for concealed lighting and receptacle branch circuits.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- H. Fire Alarm Cabling: Plenum rated in plenum areas, exposed above accessible ceilings and in conduit when concealed in finished walls, inaccessible ceilings. Secured per NFPA 70-760.
- I. Low Voltage Cabling: Plenum rated in plenum areas, exposed above accessible ceilings and in conduit when concealed in finished walls, inaccessible ceilings. Secured per NFPA 70-760.
- J. Single Phase Circuits: Provide a dedicated neutral. Sharing of neutrals is not allowed.

3.2 INSTALLATION

- A. Conceal cables in conduit in finished walls, inaccessible ceilings, and floors.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Support cables according to Section "Basic Electrical Materials and Methods."
- E. Identify and color-code conductors and cables according to Section "Electrical Identification."
- F. Use #10 AWG conductors for 20 amperage 120 circuits when the circuit conductors are longer than 75 feet. Use #10 AWG conductors for 20 amperage 277 circuits when the circuit conductors are longer than 200 feet.

3.3 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.
 - 1. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

END OF SECTION 26 05 19

SECTION 26 28 13 – FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Cartridge fuses rated 600 V and less for use in switches.

1.3 SUBMITTALS

- A. Product Data: Include the following for each fuse type indicated:
 - 1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 - 2. Fuse size for elevator feeders and elevator disconnect switches.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ferraz Shawmut, Inc.
 - 2. Little Fuse.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.
- B. End Caps: End caps shall be capable of being tested if fuse is blown.
- C. Indicating Feature: Fuse shall have an indicating feature which clearly indicates when fuse is blown.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

- A. Motor Branch Circuits: Class RK1, time delay.

3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

- A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 26 28 13

SECTION 26 28 16 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes individually mounted enclosed switches and circuit breakers used for the following:
 - 1. Feeder and branch-circuit protection.
 - 2. Motor and equipment disconnecting means.

1.3 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. RMS: Root mean square.
- C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

- A. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each switch and circuit breaker.
 - 1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Current and voltage ratings.
 - c. Short-circuit current rating.
 - d. UL listing for series rating of installed devices.
 - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

3. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70- Latest edition or edition enforced by state and local code authority.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Fusible Switches:
 - a. Eaton Corp.; Cutler-Hammer Products, K-Series.
 - b. General Electric Co.; Electrical Distribution & Control Division, TH.
 - c. Siemens Energy & Automation, Inc., VBII.
 - d. Square D Co, 3110.

2.2 ENCLOSED SWITCHES

- A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.
- B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handle with two padlocks, and interlocked with cover in closed position.

2.3 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2.4 FACTORY FINISHES

- A. Manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in "Basic Electrical Materials and Methods."
- B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.
- C. If the disconnect or enclosed circuit breaker is used as a Main Service Disconnect then the maximum available fault current shall be listed on the device to meet the requirements of NFPA 70:110.24. The labeling shall be engraved plastic. The maximum available fault current shall be obtained from the electrical utility for the secondary side of the utility transformer.

3.3 CONNECTIONS

- A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.
- B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.
- D. Maintain all necessary clearances per NFPA-70.

3.4 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
2. Test continuity of each line- and load-side circuit.

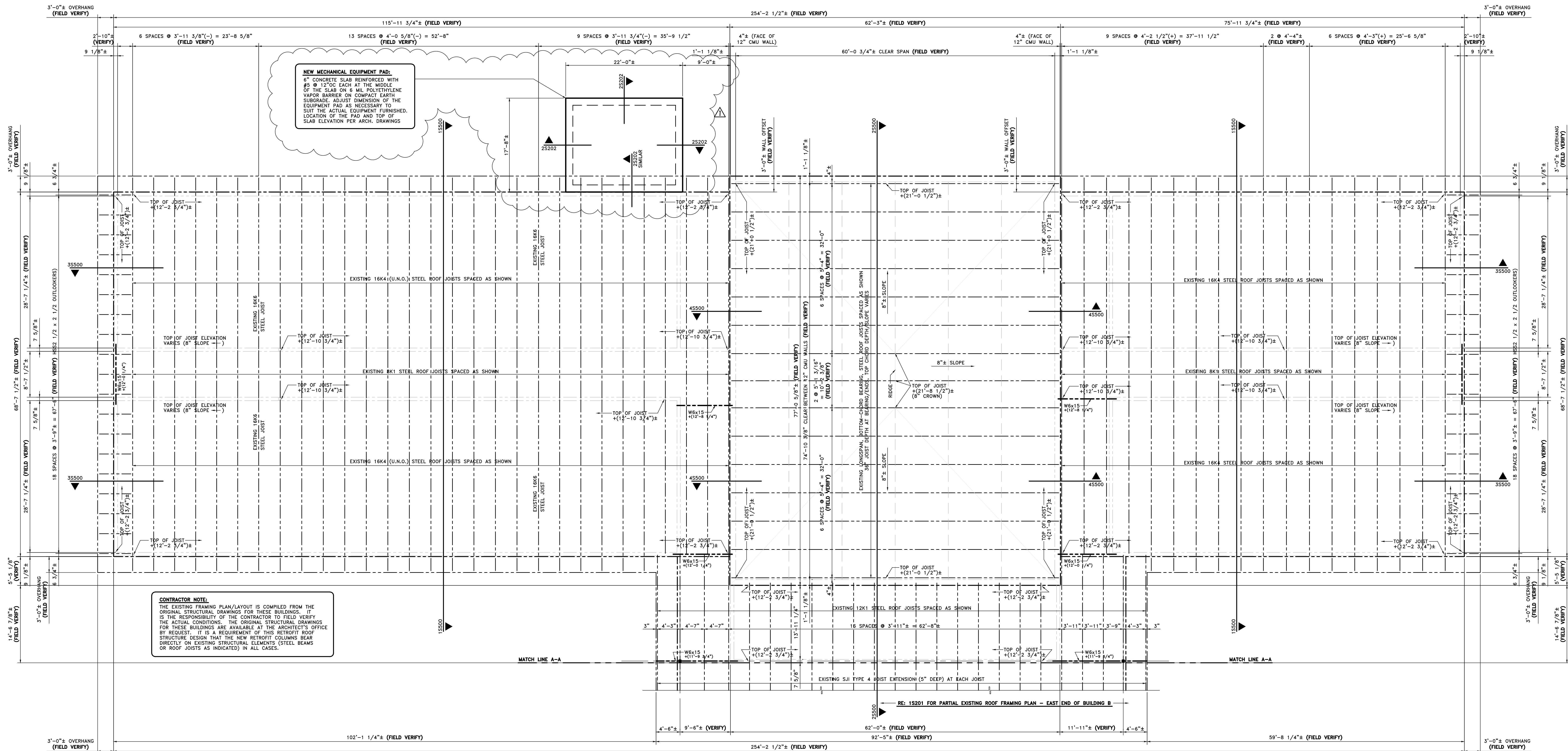
3.5 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

- A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 26 28 16

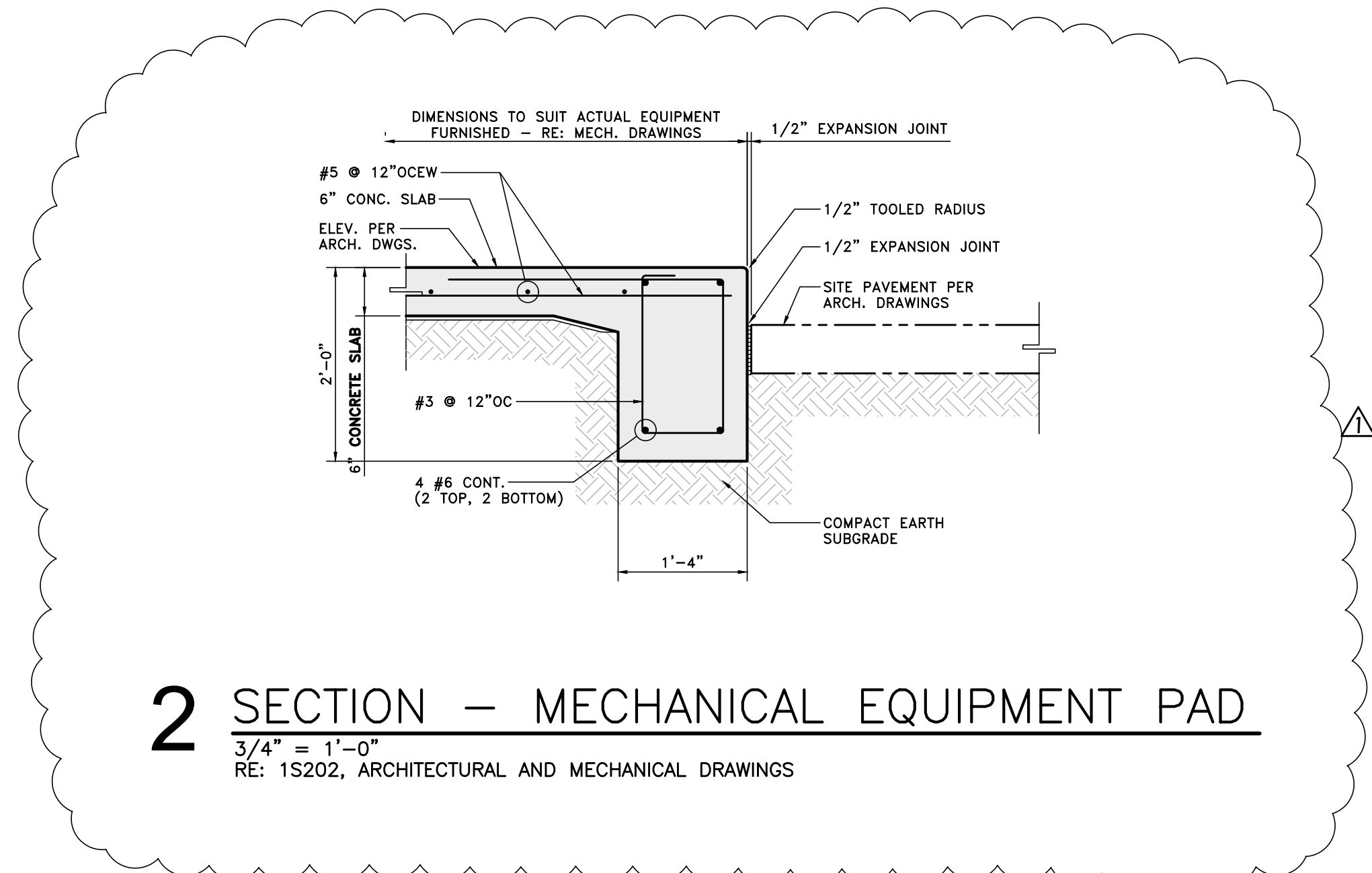


CONTRACTOR NOTE:
THE EXISTING FRAMING PLAN/LAYOUT IS COMPILED FROM THE ORIGINAL STRUCTURAL DRAWINGS FOR THESE BUILDINGS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO FIELD VERIFY THE ACTUAL CONDITIONS. THE ORIGINAL STRUCTURAL DRAWINGS FOR THESE BUILDINGS ARE AVAILABLE AT THE ARCHITECT'S OFFICE BY REQUEST. IT IS A REQUIREMENT OF THIS RETROFIT ROOF STRUCTURE DESIGN THAT THE NEW RETROFIT COLUMNS BEAR DIRECTLY ON EXISTING STRUCTURAL ELEMENTS (STEEL BEAMS OR ROOF JOISTS AS INDICATED) IN ALL CASES.



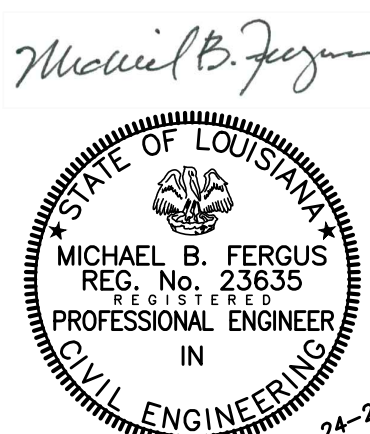
1 PARTIAL EXISTING ROOF FRAMING PLAN – BUILDING C

1/8" = 1'-0"
RE: 1S100, ARCHITECTURAL, MECHANICAL, ELECTRICAL DRAWINGS, GENERAL STRUCTURAL NOTES



2 SECTION – MECHANICAL EQUIPMENT PAD

3/4" = 1'-0"
RE: 1S202, ARCHITECTURAL AND MECHANICAL DRAWINGS



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LAKEVIEW, LA 70001
713.877.4600
www.fergusengineering.com

ADDENDUM NO. 1

PARTIAL EXISTING ROOF FRAMING PLAN - BUILDING C

DATE: SEPTEMBER 2025
REVISIONS: 10/17/25
JOB NUMBER: 2025-02

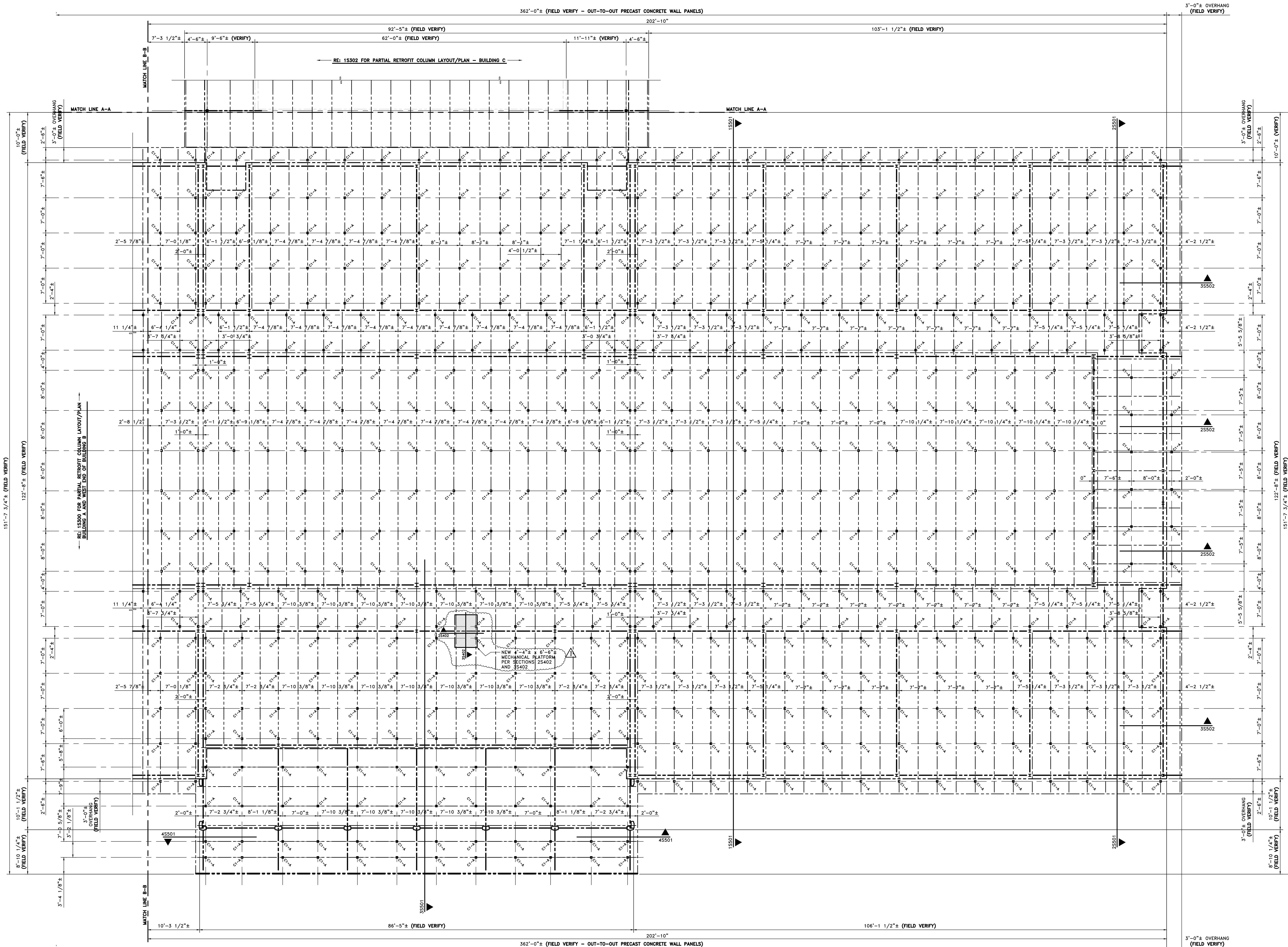
Pineville, Louisiana

J.I. BARRON ELEMENTARY SCHOOL
PINEVILLE, LA

Owner : Rapides Parish School Board

YEAGER, WATSON & ASSOCIATES, INC.
AN ARCHITECTURAL CORPORATION
118 SOUTH TRENTON STREET
RUSTON, LOUISIANA 71270-4432
TELEPHONE: (318) 202-5708

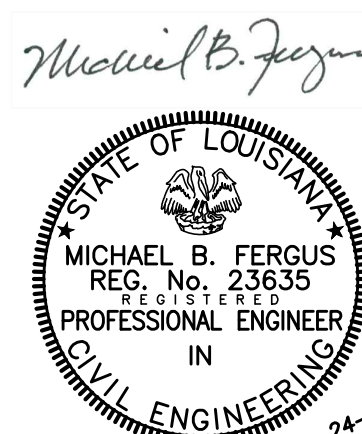
REFER TO STANDARD DRAWINGS, DETAILS AND SCHEDULES IN PROJECT MANUAL.



1

PARTIAL ROOF RETROFIT COLUMN LAYOUT/PLAN - EAST END OF BUILDING B

1/8" = 1'-0"
RE: 1S100, ARCHITECTURAL, MECHANICAL, ELECTRICAL DRAWINGS, GENERAL STRUCTURAL NOTES



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ADDENDUM NO. 1

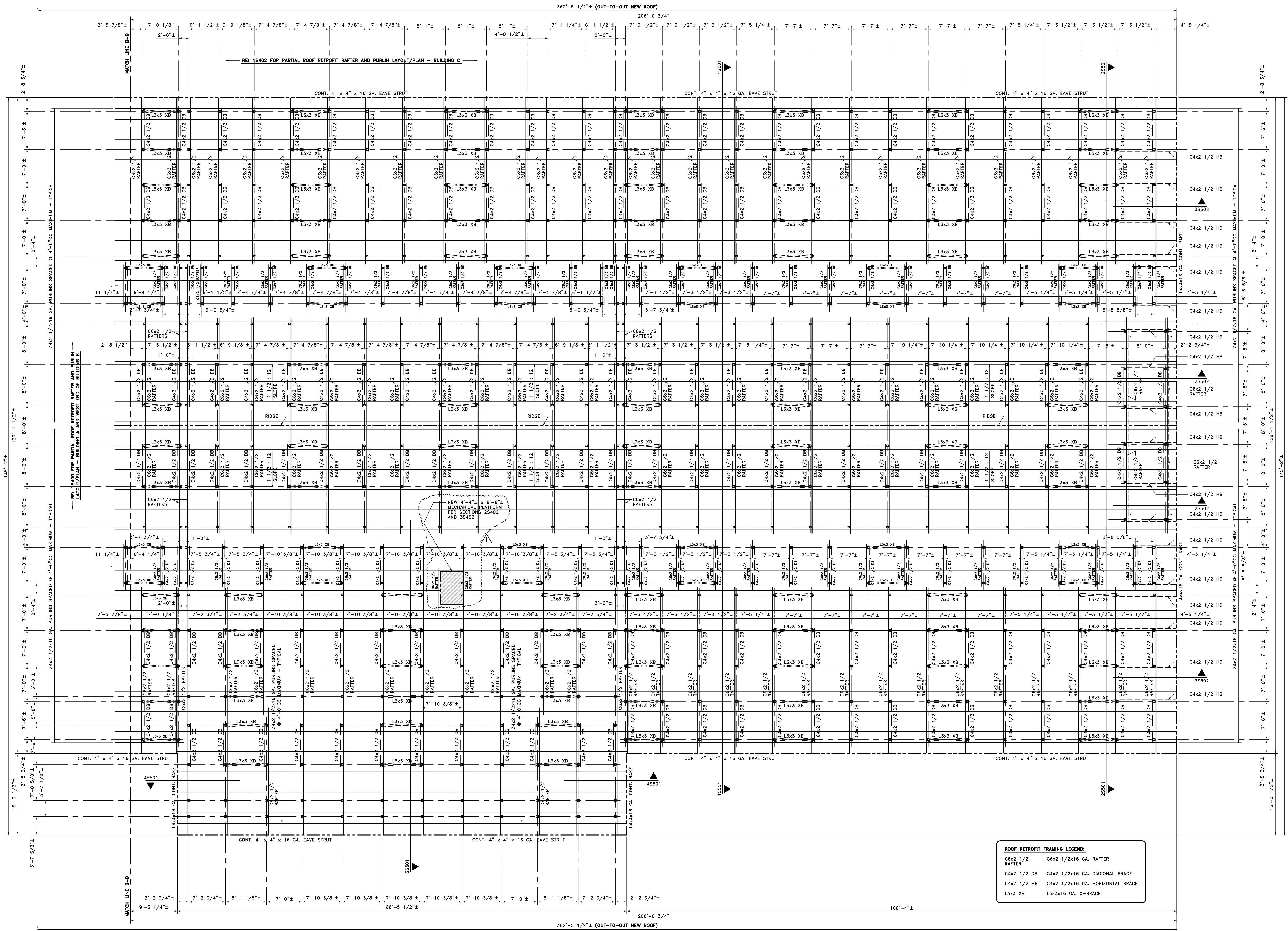
REFER TO STANDARD DRAWINGS, DETAILS AND SCHEDULES IN PROJECT MANUAL.

PARTIAL ROOF RETROFIT COLUMN LAYOUT/PLAN - EAST END OF BUILDING B		
DATE:	REVISIONS:	
SEPTEMBER 2025	10/17/25	
JOB NUMBER:		
2025-02		

S301R OF 13S

IMPROVEMENTS TO
J.I. BARRON ELEMENTARY SCHOOL
PINEVILLE, LA
Owner : Rapides Parish School Board

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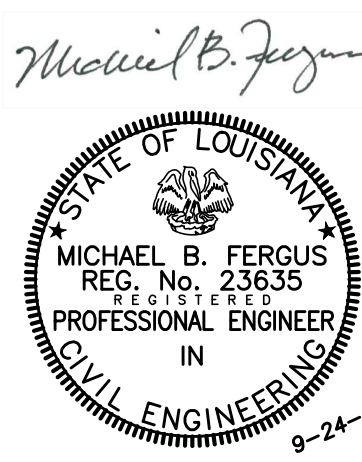


ROOF RETROFIT FRAMING LEGEND:			
C6x2 1/2 DB	C6x2 1/2x16 GA. RAFTER		
RAFTER			
C4x2 1/2 DB	C4x2 1/2x16 GA. DIAGONAL BRACE		
C4x2 1/2 HB	C4x2 1/2x16 GA. HORIZONTAL BRACE		
L3x3 XB	L3x3x16 GA. X-BRACE		



1 PARTIAL ROOF RETROFIT RAFTER AND PURLIN LAYOUT/PLAN - EAST END OF BUILDING B

1/8" = 1'-0"
RE: 1S100, ARCHITECTURAL, MECHANICAL, ELECTRICAL DRAWINGS, GENERAL STRUCTURAL NOTES



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ADDENDUM NO. 1

PARTIAL ROOF RETROFIT RAFTER AND PURLIN LAYOUT/PLAN - EAST END OF BUILDING B

DATE: SEPTEMBER 2025
JOB NUMBER: 2025-02

REVISIONS:
10/17/25

S401R OF 13S

REFER TO STANDARD DRAWINGS, DETAILS AND SCHEDULES IN PROJECT MANUAL.

IMPROVEMENTS TO

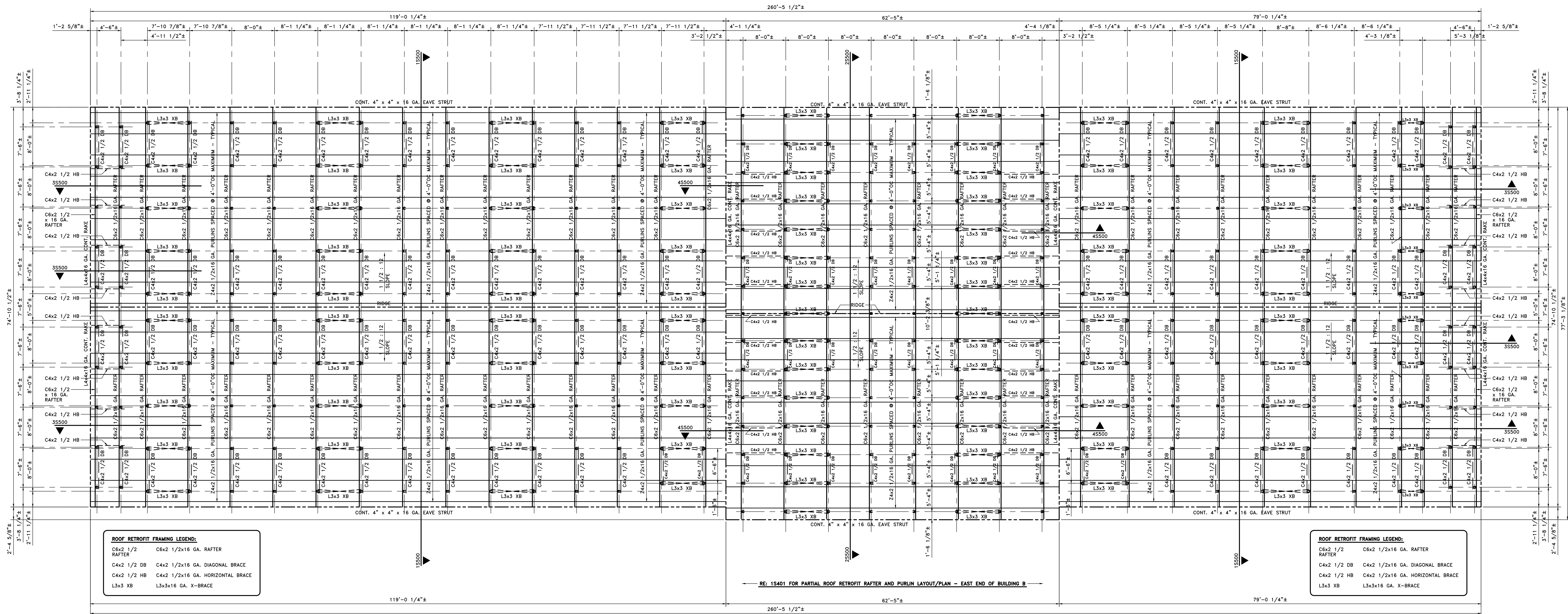
J.I. BARRON ELEMENTARY SCHOOL

PINEVILLE, LA

Pineville, Louisiana

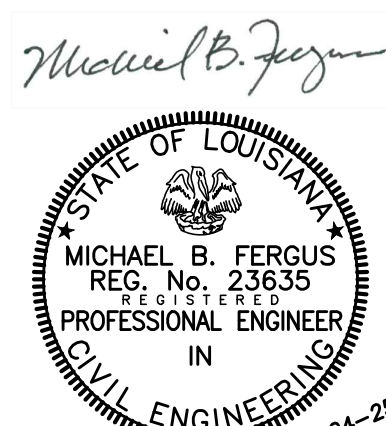
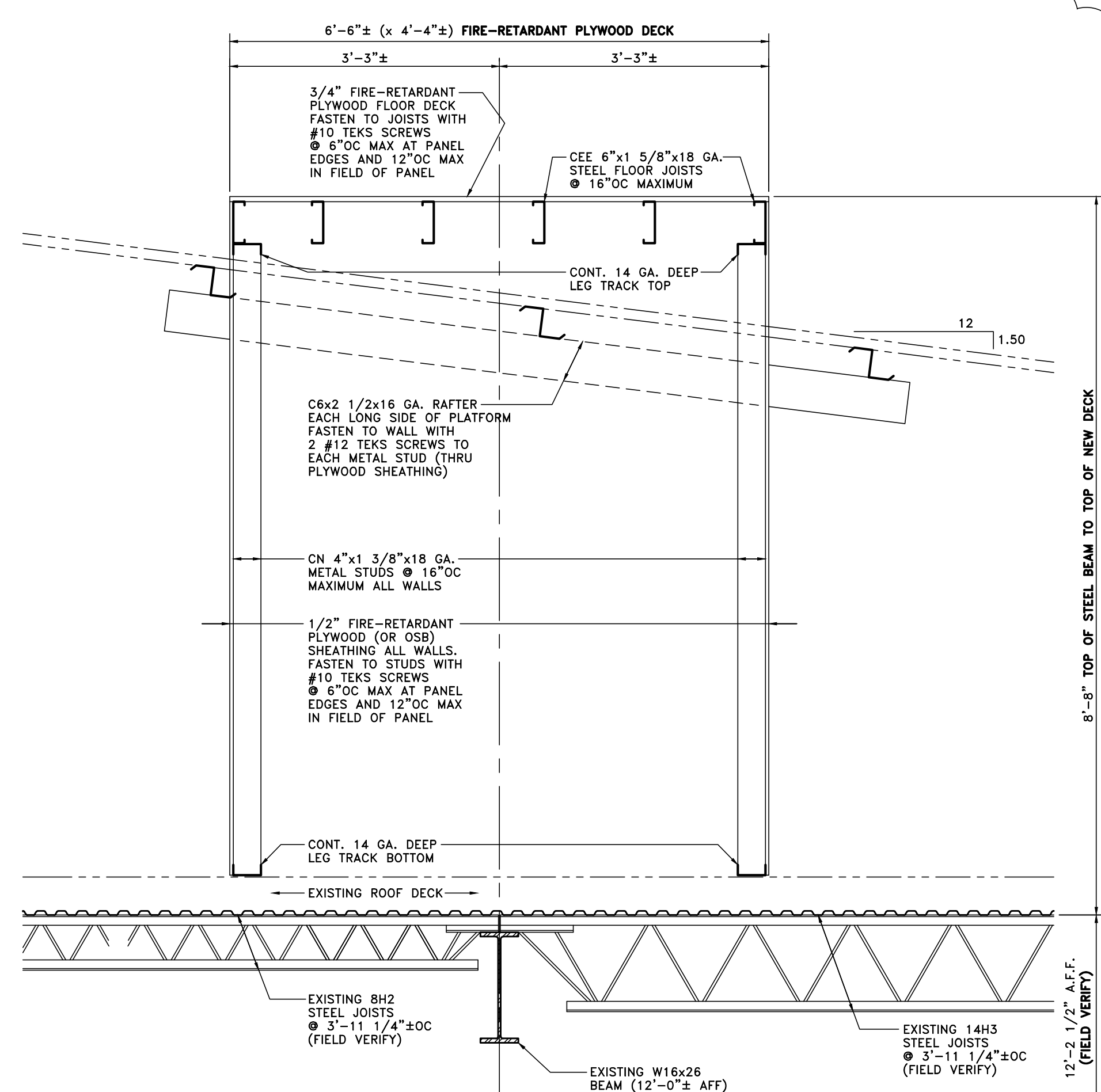
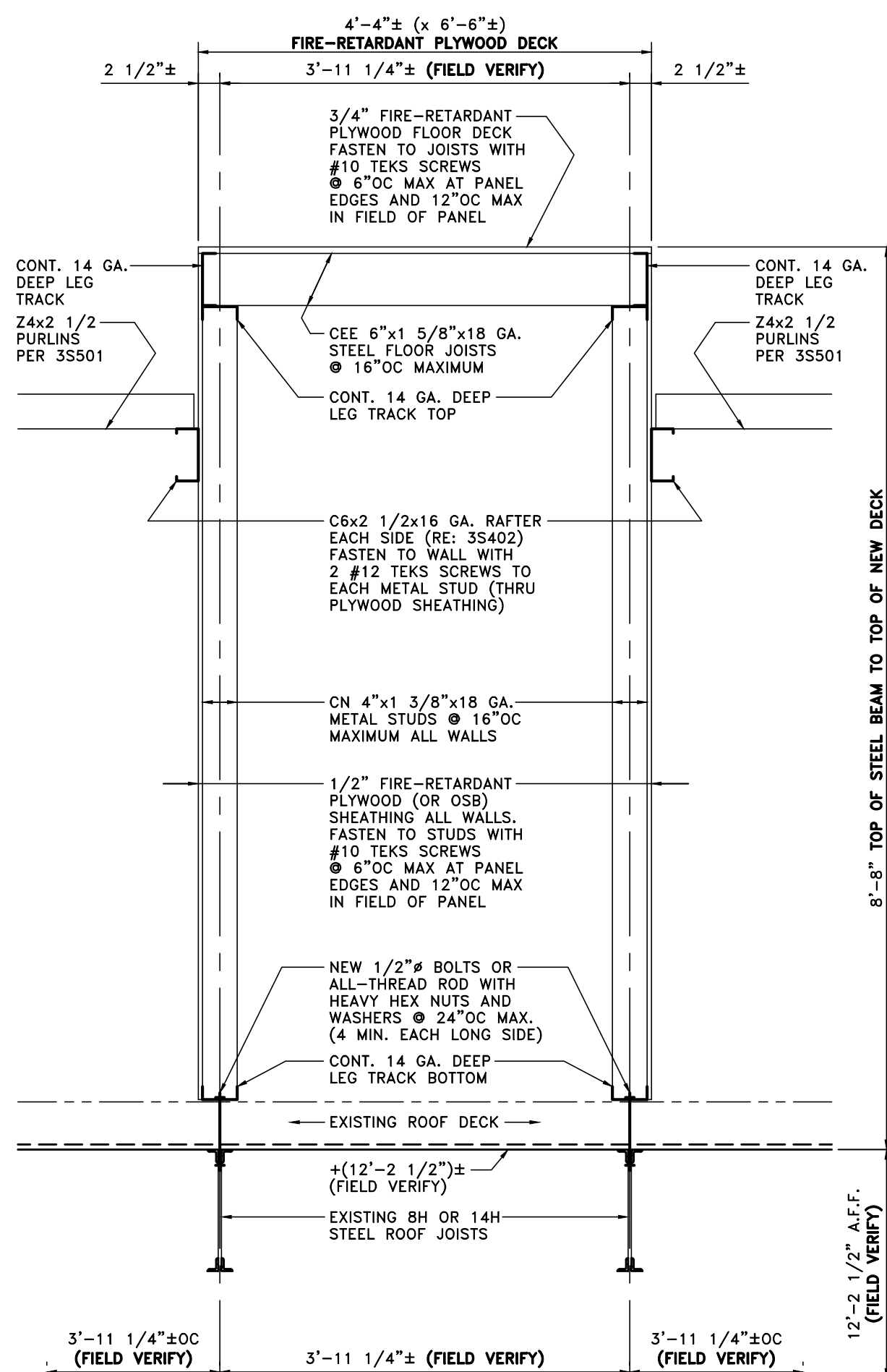
Owner : Rapides Parish School Board

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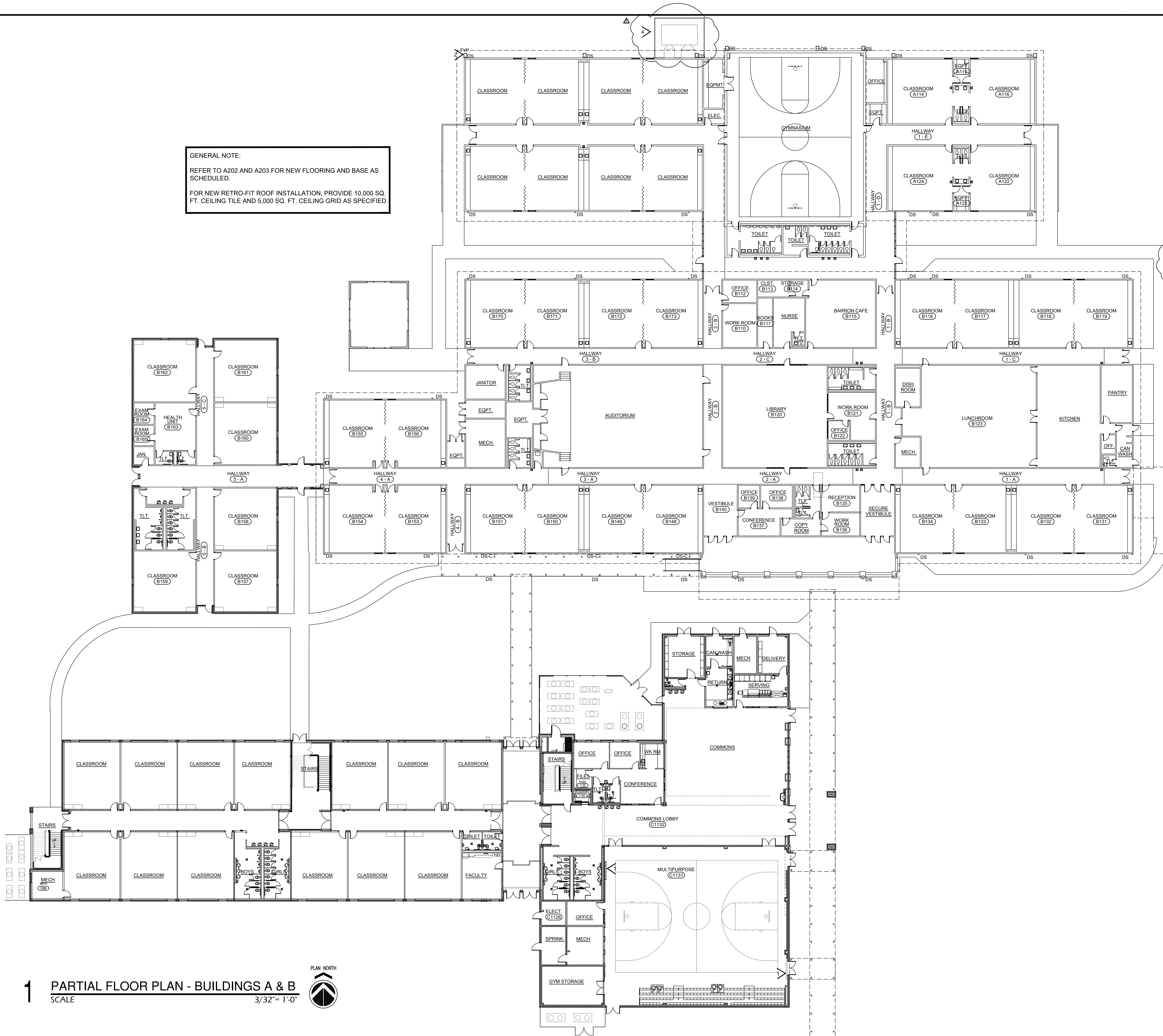
1 PARTIAL ROOF RETROFIT RAFTER AND PURLIN LAYOUT/PLAN - BUILDING C

1/8" = 1'-0"
RE: 1S100, ARCHITECTURAL, MECHANICAL, ELECTRICAL DRAWINGS, GENERAL STRUCTURAL NOTES



FERGUS ENGINEERING
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ADDENDUM NO. 1



GENERAL NOTE:
REFER TO A202 AND A203 FOR NEW FLOORING AND BASE AS SCHEDULED.
FOR NEW RETRO-FIT ROOF INSTALLATION, PROVIDE 10,000 SQ. FT. CEILING TILE AND 5,000 SQ. FT. CEILING GRID AS SPECIFIED.

- GENERAL PLAN NOTES:**
- G1. INSTALL PROTECTIVE BARRIERS TO DIRECT PUBLIC TRAFFIC AROUND CONSTRUCTION AREA. DO NOT ALLOW GENERAL PUBLIC DIRECT ACCESS INTO CONSTRUCTION AREA.
 - G2. COORDINATE CONSTRUCTION STAGING, PARKING AND PERSONNEL WITH SCHOOL ADMINISTRATION.
 - G3. MAINTAIN EXIT PATHWAYS AND PROVIDE FOR DAILY FOOT TRAFFIC. BARRICADE AREAS AS REQUIRED TO KEEP POPULATION SAFE.
 - G4. MAINTAIN FIRE ALARM AND ELECTRICAL SERVICE WHENEVER DISRUPTION OF SERVICES ARE REQUIRED. GIVE THE PRINCIPAL 48 HOURS NOTICE IF AT ALL POSSIBLE.
 - G5. ALLOW REPLACEMENT OF CEILING TILE UP TO 1,000 SQUARE FEET. ALLOW REPLACEMENT OF CEILING GRID UP TO 500 LINEAR FEET.

- PLAN NOTES**
- 1 IN BUILDING C MULTIPURPOSE ROOM, NEW SCOREBOARDS AS SPECIFIED. REFER TO ELECTRICAL.
 - 2 NEW SPLASH BLOCKS AT DOWNSPOUTS. REFER TO CIVIL.
 - 3 NEW INLINE DRAINAGE CONNECTION. REFER TO CIVIL.
 - 4 NEW HVAC AND MECHANICAL PAD. REFER TO MECH AND STRUCTURAL.

- DRAINAGE LEDGEND**
- DS DOWNSPOUT WITH SPLASH BLOCK REFER TO CIVIL.
 - DS DOWNSPOUT WITH INLINE DRAIN. AT EXISTING CONCRETE, CUT AND REPLACE CONCRETE AS REQUIRED. REFER TO CIVIL.
 - DS-C AT EXISTING WALKWAY COVER, RUN DOWNSPOUT OUT OVER COVER AND DOWN EXISTING COLUMN.

1 PARTIAL FLOOR PLAN - BUILDINGS A & B
SCALE 3/32" = 1'-0"



IMPROVEMENTS TO
J.I. BARRON ELEMENTARY SCHOOL
PINEVILLE, LA
RPSB# 52-26-01

Pineville, Louisiana

OVERALL FLOOR PLAN

DATE:	REVISIONS:
SEPTEMBER 2025	NO. 2909
JOB NUMBER:	ADDITION #1-10/17/2025
2025-02	

RA201

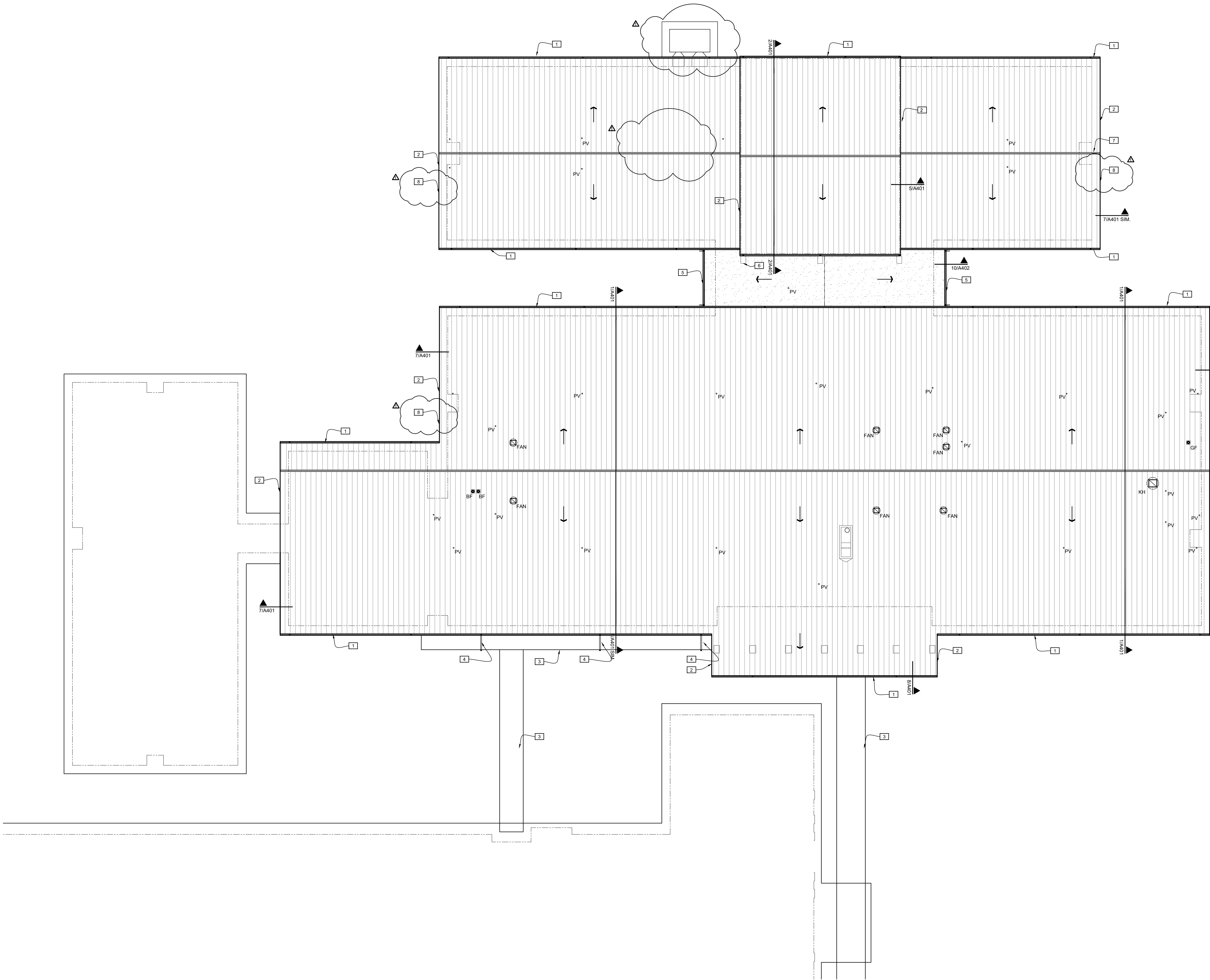
3 OF 10A

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TELEPHONE: (504) 293-5298
FACSIMILE: (504) 293-5272



1 ROOF PLAN
SCALE

1/16"= 1'-0"



GENERAL PLAN NOTES:

- G1. INSTALL PROTECTIVE BARRIERS TO DIRECT PUBLIC TRAFFIC AROUND CONSTRUCTION AREA. DO NOT ALLOW GENERAL PUBLIC DIRECT ACCESS INTO CONSTRUCTION AREA.
- G2. COORDINATE CONSTRUCTION STAGING, PARKING AND PERSONNEL WITH SCHOOL ADMINISTRATION.
- G3. MAINTAIN EXIT PATHWAYS AND PROVIDE FOR DAILY FOOT TRAFFIC. BARRICADE AREAS AS REQUIRED TO KEEP POPULATION SAFE.
- G4. MAINTAIN FIRE ALARM AND ELECTRICAL SERVICE WHENEVER DISRUPTION OF SERVICES ARE REQUIRED. GIVE THE PRINCIPAL 48 HOURS NOTICE IF AT ALL POSSIBLE.

ROOF LEGEND

- KYNAR FINISHED STANDING SEAM METAL ROOF ON STRUCTURAL FRAMING. REFER TO ROOF DEMO PLAN FOR ORIGINAL BUILDING DECK TYPE.
- PVC MEMBRANE ON 1/4" DENSDECK OVER TAPERED INSULATION. TAPER AT 1/8" PER FOOT AND 2 LAYERS OF 3" ISO BOARD INSULATION OVER EXISTING LIGHT WEIGHT CONCRETE AND METAL DECK.
- FAN
- GF
- BF
- KH
- PV
- EXISTING INTAKE OR EXHAUST FAN. EXTEND PAST NEW ROOF. INSTALL ON NEW CURB FLASHING. REFER TO MECHANICAL AND 6/A402.
- EXISTING GAS FIRED APPLIANCE FLUE STACK : REPLACE WITH NEW GALV. STACK TO A MIN. OF 24" HIGH ABOVE NEW ROOF. REFER TO DETAIL 9/A402.
- EXISTING BOILER FLUE: REMOVE EXISTING STEEL FLUE CAP AND CARRIAGE. CLEAN OFF SQUARE CURB PENETRATION. PREP. FOR NEW INSULATED FLASHING BASE AND FLUE. EXTEND TO A MIN. 24" ABOVE NEW ROOF. REFER TO DETAIL 9/A402.
- EXISTING KITCHEN HOOD VENT FAN EXTEND UP PAST NEW ROOF. INSTALL ON NEW FLASHING AND CURB. REFER TO MECHANICAL AND DETAILS 6/A402 AND 11/A402.
- TYPICAL ROUND PENETRATION (VTR: Vent Thru Roof) AT METAL STANDING SEAM ROOF. EXTEND EXISTING VENT PIPE UP PAST NEW ROOF SURFACE. USE MANUFACTURED APPROVED AND WARRANTY ROUND PENETRATION BOOTS. REFER TO DETAIL 8/A402 AT METAL ROOF AND DETAIL 11/A402 AT PVC MEMBRANE ROOF.
- EXISTING ROOF CURB MOUNTED HVAC UNIT. EXTEND DUCT WORK PER MECHANICAL. REINSTALL ON NEW CURB AND NEW MECHANICAL PLATFORM.
- NEW KYNAR FINISHED GUTTER AND DOWNSPOUTS AS SCHEDULED. REFER TO 7/A402.
- NEW KYNAR FINISHED GUTTER AND DOWNSPOUTS WITH SPLASH PADS AT FLAT ROOF. REFER TO 7/A402 AND CIVIL.
- ROOF SLOPE DIRECTION.

ROOF EQUIPMENT ABBREVIATIONS

- GF = HOT GAS FLUE STACK
- PV = CAST IRON PLUMBING VENT WITH COVER
- FAN = MOTORIZED FAN
- RD = ROOF DRAIN
- KH = KITCHEN HOOD EXHAUST VENT

ROOF NOTES:

- 1 KYNAR FINISHED SCULPTED GUTTERS AND DOWNSPOUTS. REFER TO EXTERIOR ELEVATIONS, DETAIL 1/A402, AND DETAIL 7/A402.
- 2 KYNAR FINISHED SCULPTED RAKE. REFER TO 2/A402.
- 3 EXISTING WALKWAY COVER TO REMAIN.
- 4 NEW PRE-FINISHED DOWNSPOUTS, RUN ALONG TOP OF WALKWAY COVER AND STRAP TO WALKWAY COVER COLUMN. REFER TO EXTERIOR ELEVATIONS.
- 5 NEW KYNAR FINISHED BOX GUTTER AS SPECIFIED. REFER TO 9/A402.
- 6 SPLASH PADS ON WELDED WALKOFF PVC MEMBRANE. REFER TO CIVIL.
- 7 KYNAR FINISHED NON-VENTED RIDGE VENT. REFER TO 3/A402.
- 8 ATTIC ACCESS DOORS 30" W x 36" H IN WALL PANELS. PRIME AND PAINT TO MATCH METAL PANELS. COLOR SELECTED BY ARCHITECT. DETAIL SIM. TO LOUVER DETAIL 7/A301.

IMPROVEMENTS TO
J.I. BARRON ELEMENTARY SCHOOL
PINEVILLE, LA

RPSB# 52-26-01

Pineville, Louisiana

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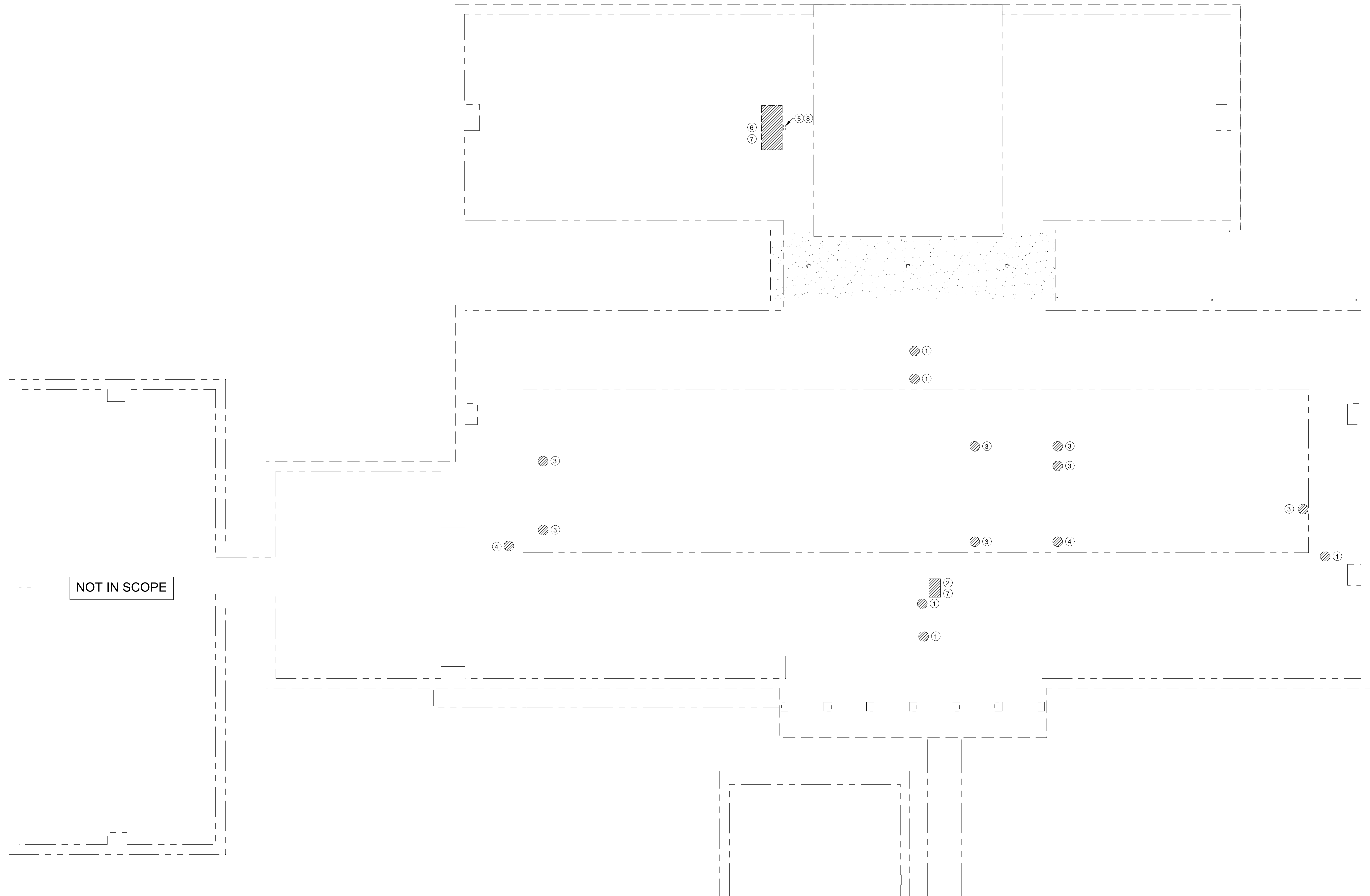
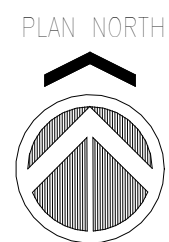


ROOF PLAN	REVISIONS:	DATE:	JOB NUMBER:
	ADDENDUM #1-	SEPTEMBER 2025	2025-02
		10/17/2025	

RA211
7 OF 10A

1 MECHANICAL ROOF PLAN - DEMOLITION

1/16" = 1'-0" Refer to Architectural Drawings for All Dimensions



MECHANICAL NOTES		
1	EXISTING ROOF EXHAUST FAN AND ASSOCIATED ROOF CURB SHALL BE REMOVED. PATCH ROOF PENETRATIONS AS NECESSARY TO MATCH SURROUNDING ROOF.	
2	EXISTING AIR HANDLING UNIT TO BE DISCONNECTED, REMOVED, AND SALVAGED FOR RE-INSTALLATION ON NEW ROOF. PRIOR TO DISCONNECTING, CONTRACTOR SHALL PROPERLY EVACUATE REFRIGERANT FROM SYSTEM AND DISPOSE/RECYCLE REFRIGERANT ACCORDING TO EPA RECLAMATION REQUIREMENTS. CONTRACTOR TO CLEAN UNIT CABINET (INTERNAL AND EXTERNAL), COILS, AND SEAL ANY AIR LEAKS IN THE CABINET. ASSOCIATED THERMOSTAT, CONTROLS WIRING, DUCT WORK, DUCT ACCESSORIES, DIFFUSERS/GRILLES/REGISTERS, AND CONDENSATE PIPING TO REMAIN.	
3	EXISTING ROOF FAN TO BE REMOVED, CLEANED, AND STORED FOR RE-INSTALLATION ON NEW ROOF.	
5	EXISTING 3" CHILLED/HOT WATER PIPING, DISCONNECT FROM UNIT AND TEMPORARILY CAP ABOVE EXISTING ROOF FOR TIE IN TO NEW CHILLED WATER PIPING. REFER TO SHEET M201 FOR NEW LOCATION TIE-IN.	
6	EXISTING CHILLED WATER AIR HANDLING UNIT ON EXISTING ROOF TO BE DISCONNECTED AND DEMOLISHED. PRIOR TO DISCONNECTING, CONTRACTOR SHALL CLOSE VALVES ON PIPE SERVICING THIS UNIT AND DRAIN UNIT. ASSOCIATED THERMOSTAT, EXISTING 2-WAY VALVE, CONTROLS WIRING, DUCT WORK, DUCT ACCESSORIES, AND DIFFUSERS/GRILLES/REGISTERS TO REMAIN.	
8	PERFORM FLOW TEST ON ALL EXISTING CHILLED WATER PIPING TO RECORD EXISTING GPM AND PRESSURE.	



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PROJECT NO. 25051-00



MECHANICAL ROOF PLAN - DEMOLITION

DATE: SEPTEMBER 2025

REVISIONS:

1

ADD. 1

10-17-2025

JOB NUMBER:

2025-02

M101

OF

X

Owner: Rapides Parish School Board

RPSB# 52-26-01

Pineville, Louisiana

J.I. BARRON ELEMENTARY SCHOOL

PINEVILLE, LA

IMPROVEMENTS TO

YEAGER, WATSON & ASSOCIATES, LLC

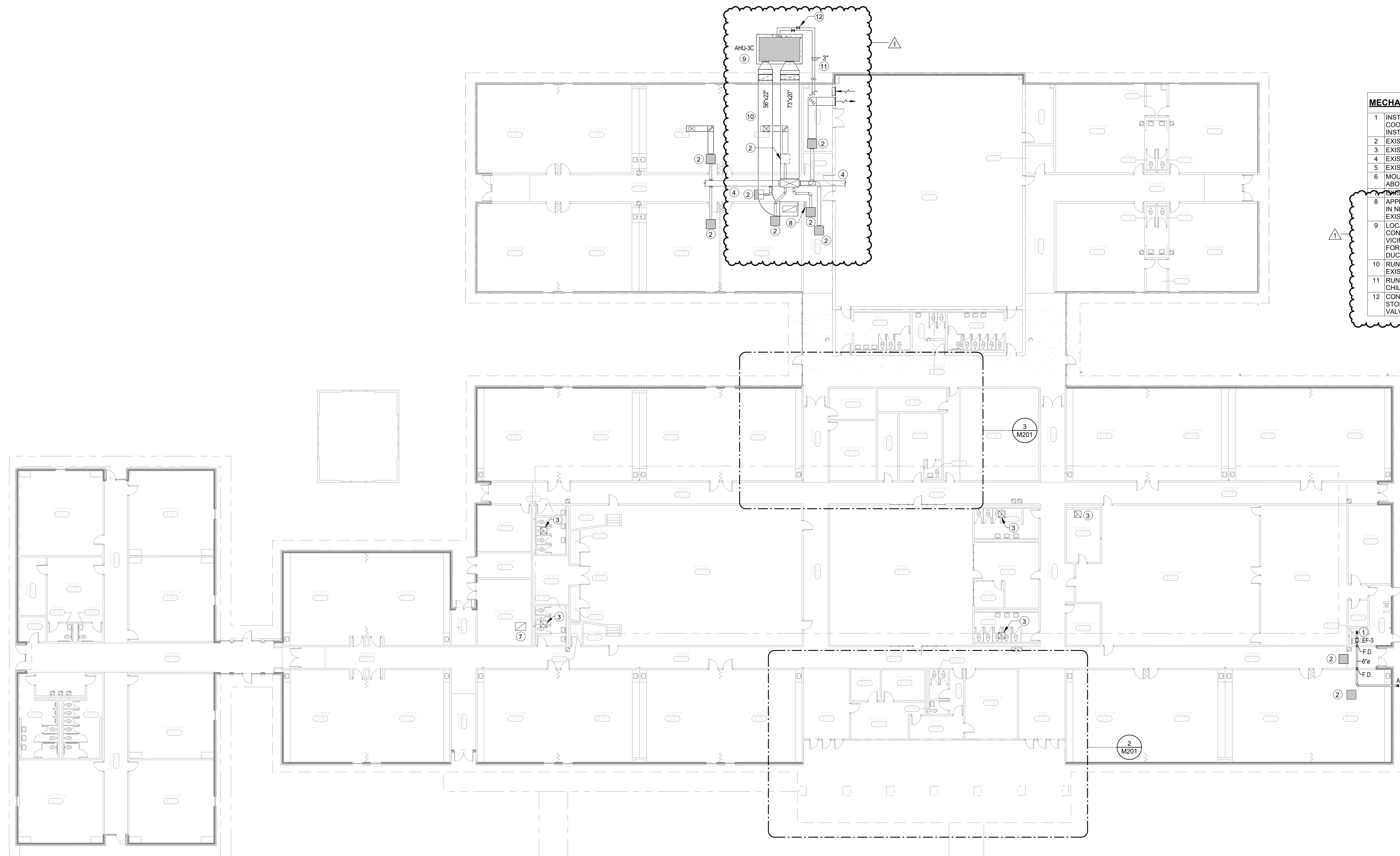
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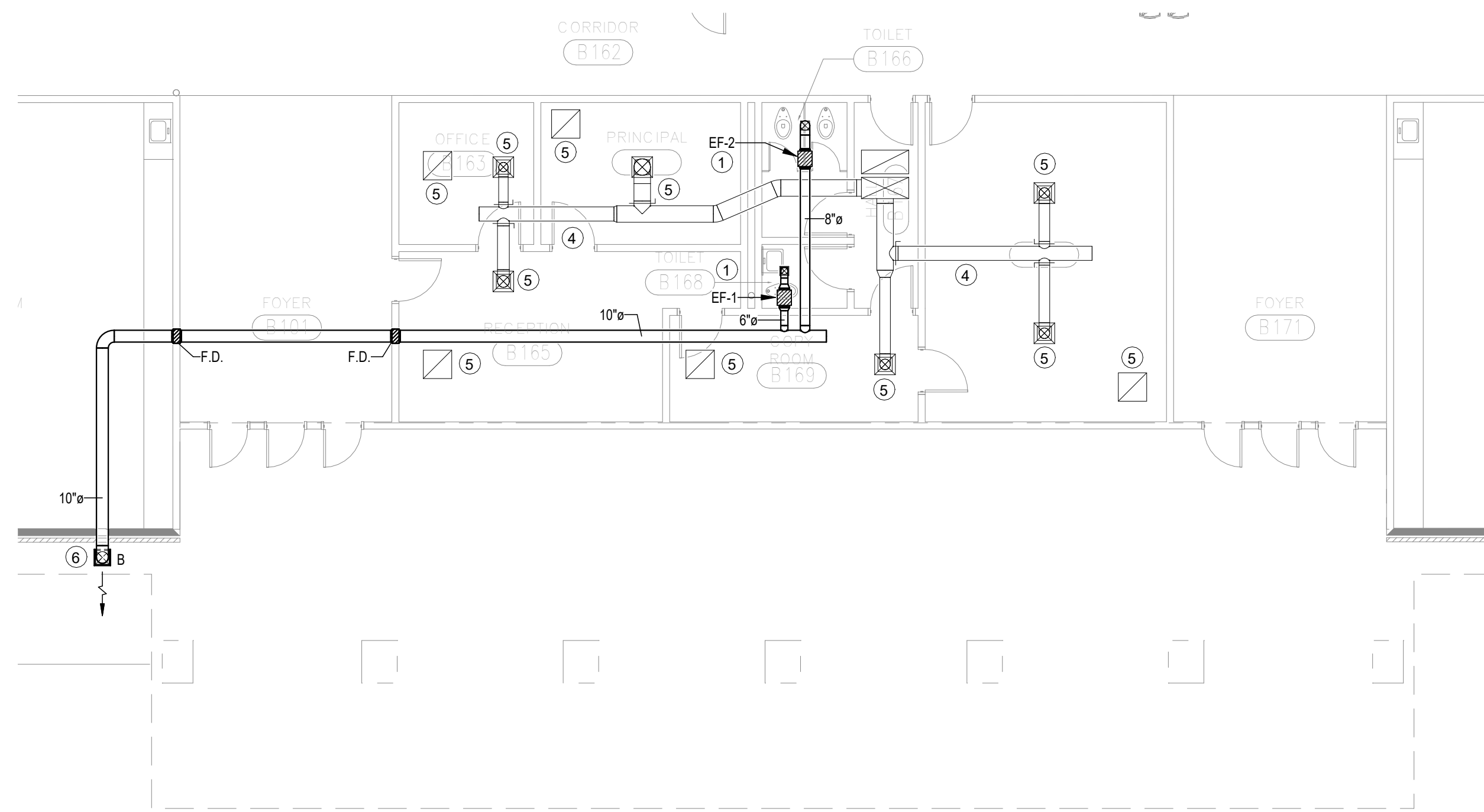


MECHANICAL NOTES

1. INSTALL NEW INLINE EXHAUST FAN ABOVE CEILING IN THIS VICINITY AND CONNECT TO EXISTING EXHAUST GRILLE. COORDINATE EXACT LOCATION WITH STRUCTURE, PIPING, CONDUIT, DEVICES ABOVE CEILING PRIOR TO INSTALLATION AND DUCTWORK FABRICATION.
2. EXISTING MIXING BOX REMAIN.
3. EXISTING EXHAUST GRILLE TO REMAIN.
4. EXISTING SUPPLY DUCTWORK TO REMAIN.
5. EXISTING DIFFUSER/GRILLE TO REMAIN.
6. MOUNT EXHAUST GRILLE IN EXISTING SOFFIT IN THIS VICINITY AND CONNECT TO NEW EXHAUST DUCTWORK ABOVE CEILING.
8. APPROXIMATE LOCATION OF EXISTING 3" CHILLED/HOT WATER PIPING UP TO DEMOLISHED AIR HANDLING UNIT. TIE IN NEW CHILLED WATER PIPING FROM AHU-3C IN THIS VICINITY. COORDINATE EXACT LOCATION WITH STRUCTURE, EXISTING CHILLED WATER PIPING, CONDUIT, DEVICES ABOVE CEILING, ETC. PRIOR TO INSTALLATION.
9. LOCATION OF NEW CHILLED WATER AIR HANDLING UNIT ON NEW 4" CONCRETE PAD IN THIS VICINITY. TERMINATE CONDENSATE DRAIN LINE INDIRECTLY TO NEAREST DOWNSPOUT AT THE EXTERIOR OF THE BUILDING IN THIS VICINITY. CONNECT UNIT TO EXISTING THERMOSTATIC/CONTROLS SYSTEM AND RESTORE SEQUENCE OF OPERATION FOR THIS UNIT. INSTALL UNIT AS PER MANUFACTURER'S RECOMMENDATIONS AND COORDINATE NEW PIPING AND DUCTWORK WITH LATEST STRUCTURAL SET.
10. RUN NEW SUPPLY AND RETURN DUCTWORK THROUGH SOFFIT ABOVE EXISTING ROOF AND RECONNECT TO EXISTING CHILLED WATER AIR HANDLING UNIT DUCT PENETRATIONS. COORDINATE WITH STRUCTURE.
11. RUN NEW 3" CHILLED WATER PIPING BELOW GRADE UP THROUGH SOFFIT ABOVE EXISTING ROOF TO EXISTING CHILLED WATER PIPING PENETRATION FROM KEYNOTE 8. COORDINATE WITH STRUCTURE.
12. CONTRACTOR TO CONFIRM LOCATION OF EXISTING ISOLATION VALVES. IF EXISTING VALVES ARE NOT FOUND, NEW STOP VALVES SHALL BE INSTALLED AS PER DRAWINGS AND SPECIFICATIONS. IF VALVES ARE FOUND, NEW STOP VALVES ARE NOT REQUIRED.

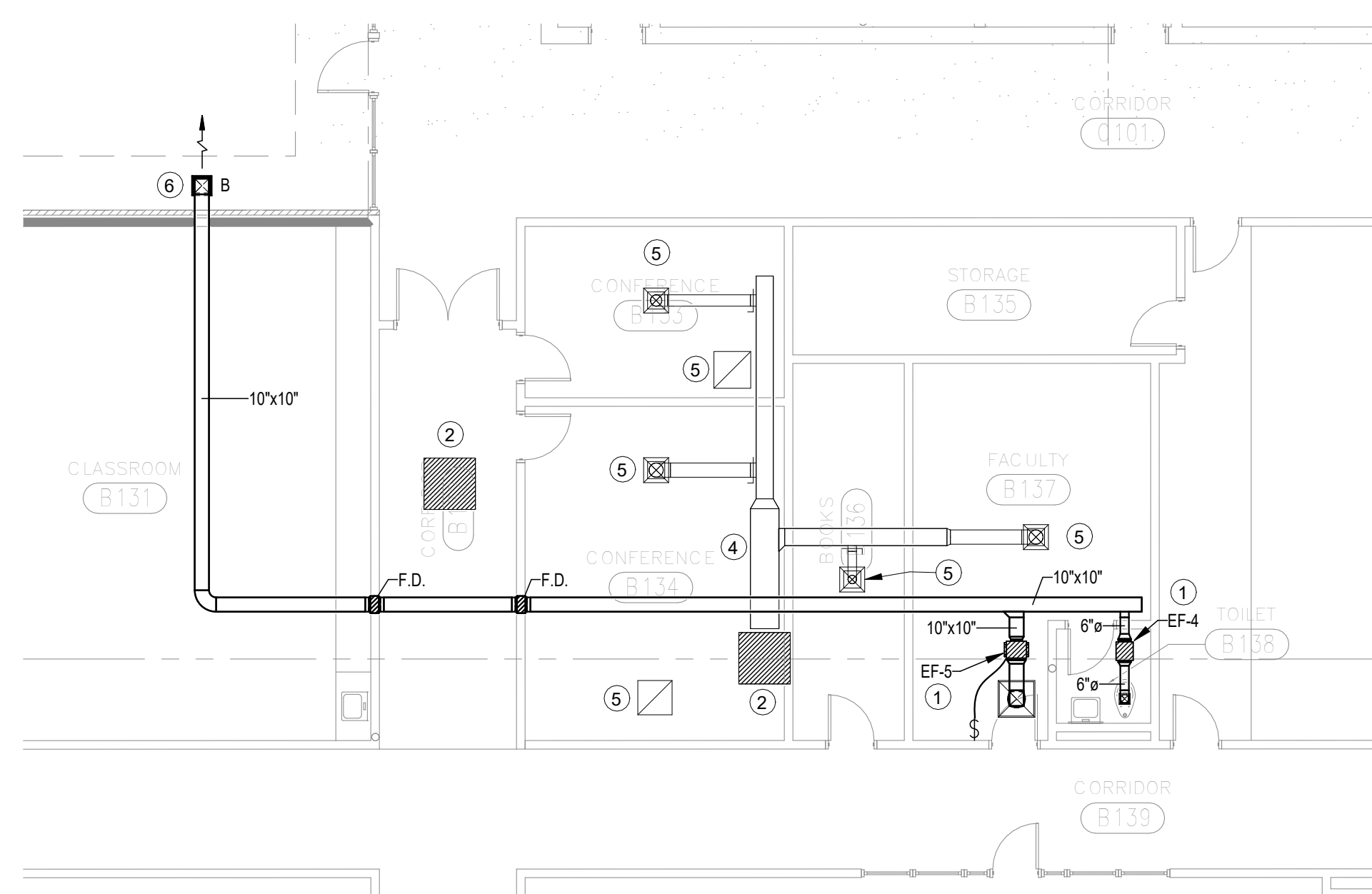
1 MECHANICAL FLOOR PLAN

1/16" = 1'-0" Refer to Architectural Drawings for All Dimensions



2 ENLARGED MECHANICAL FLOOR PLAN - TOILET 166 & 168

1/8" = 1'-0" Refer to Architectural Drawings for All Dimensions



3 ENLARGED MECHANICAL FLOOR PLAN - FACULTY B137

1/8" = 1'-0" Refer to Architectural Drawings for All Dimensions

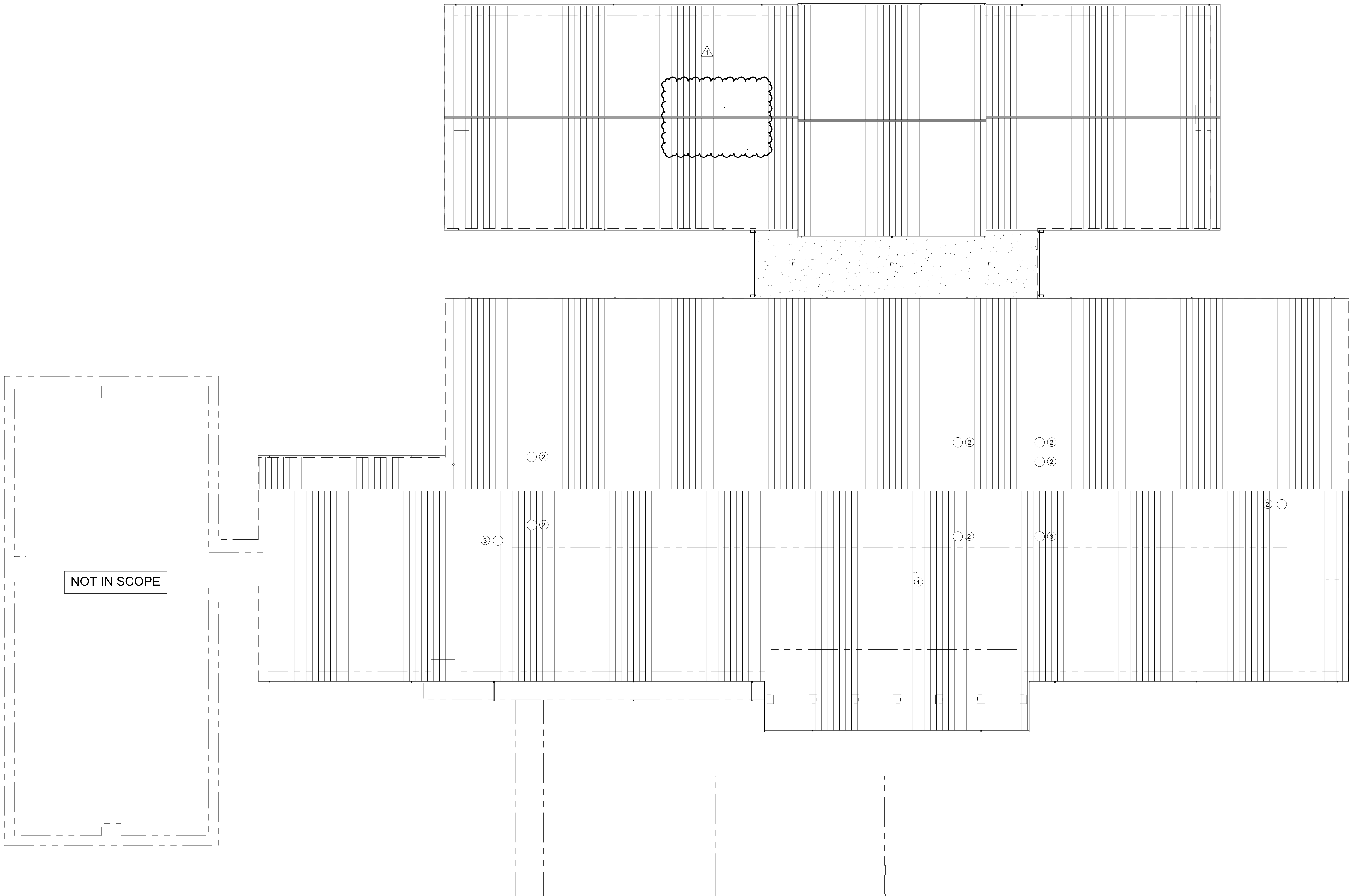
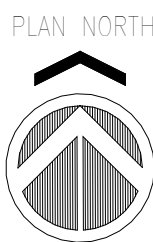


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PROJECT NO. 25051.00



1

MECHANICAL ROOF PLAN - NEW
1/16" = 1'-0" Refer to Architectural Drawings for All Dimensions



MECHANICAL NOTES	
1	NEW LOCATION OF EXISTING ROOF TOP UNIT. CONNECT DUCTWORK FULL SIZE IN THIS VICINITY. EXISTING CONDENSATE PIPING IN THIS VICINITY TO REMAIN. CONNECT NEW CONDENSATE PIPING FULL SIZE IN THIS VICINITY. COORDINATE NEW PIPING AND DUCTWORK WITH LATEST STRUCTURAL SET. REFER TO DETAIL #4 ON SHEET M301 FOR ROOF CURB DETAIL.
2	NEW LOCATION OF EXISTING ROOF FAN. EXTEND AND CONNECT EXISTING DUCTWORK FULL SIZE IN THIS VICINITY.
3	NEW LOCATION OF EXISTING ROOF INTAKE GRAVITY VENTILATOR. EXTEND AND CONNECT EXISTING DUCTWORK FULL SIZE IN THIS VICINITY.



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MECHANICAL ROOF PLAN - NEW

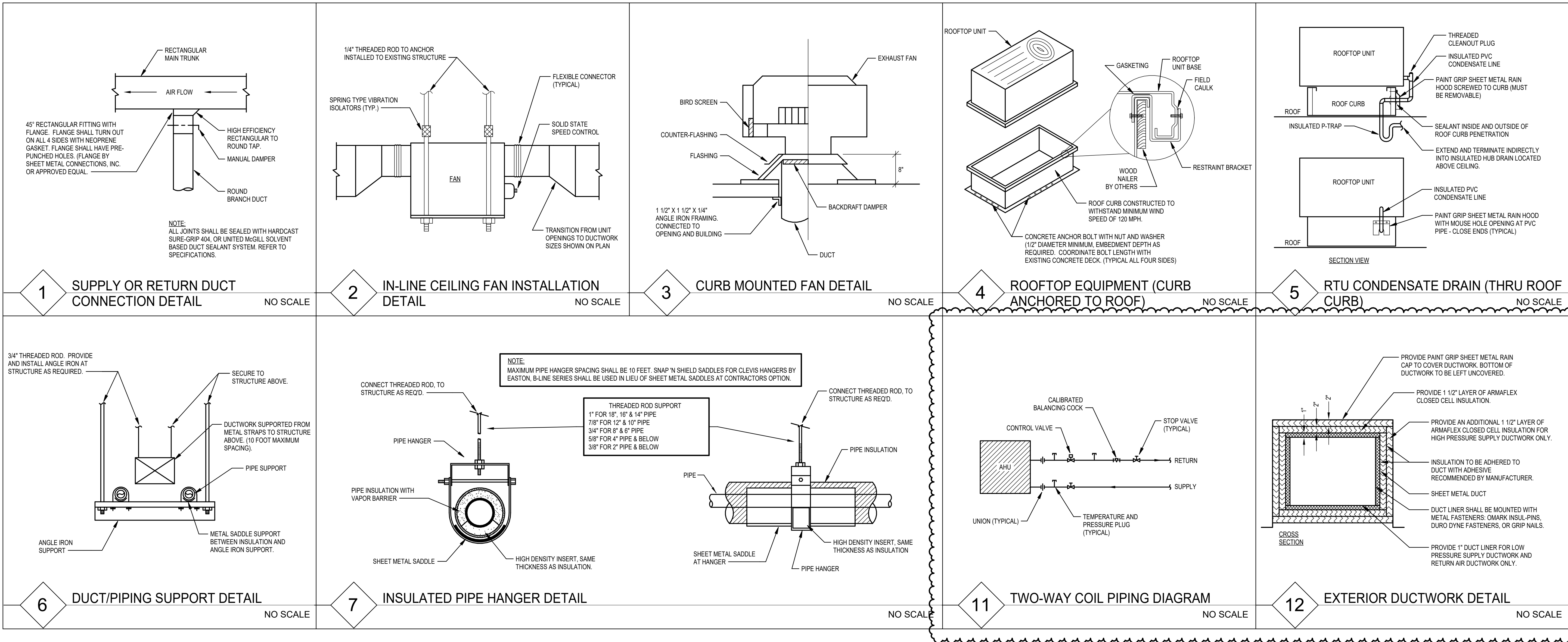
DATE:	REVISIONS:	ADD.	DATE
SEPTEMBER 2025	1	ADD. 1	10-17-2025
JOB NUMBER:		2025-02	

M202 OF 2



IMPROVEMENTS TO
J.I. BARRON ELEMENTARY SCHOOL
PINEVILLE, LA
RPSB# 52-26-01
Pineville, Louisiana
Owner : Rapides Parish School Board

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CHILLED WATER AIR HANDLING UNIT SCHEDULE																								
UNIT NO.	SERVICE	UNIT TYPE	FAN											COOLING								BASIS OF DESIGN		
			TOTAL CFM	FRESH AIR	STATIC PRESS. EXT.	STATIC PRESS. TOTAL	H.P.	VOLTAGE	PHASE	F.L.A.	M.C.A.	DRIVE	FAN MOTOR CONTROL	TOTAL BTU/H CAPACITY	EAT (°F) DB	EAT (°F) WB	LAT (°F) DB	LAT (°F) WB	EW	CHILLED WATER LWT	CHILLED WATER GPM		CHILLED WATER W.P.D.	ROWS
AHU-3C	BUILDING C	HORIZONTAL UNIT (SIDE SUPPLY, SIDE RETURN)	13,478	4,680	3.00	5.316	19	460	3	27.0	33.75	DIRECT DRIVE	VFD	755,000	83.4	67.7	48.8	48.7	42.0	53.94	126.0	12.38	8	TRANE PERFORMANCE CLIMATE CHANGER CSA0030

NOTES: 1. PROVIDE FANS WITH VFD.
2. REFER TO UNIT ORIENTATION FOR MAINTENANCE AND PIPING CONNECTION SIDE BEFORE ORDERING.
3. CHILLED WATER COILS SHALL HAVE THREE WAY CONTROL VALVES.
4. PROVIDE UNIT WITH OUTSIDE AIR WEATHERHOOD AND MOTORIZED DAMPER.
5. ALL NEW CHILLED WATER AIR HANDLING UNITS SHALL HAVE CONNECTION TO EMERGENCY POWER.

FAN SCHEDULE													
UNIT NO.	SERVICE	MIN. CFM	EXT SP	RPM	SONES	FAN H.P.	TYPE	DRIVE	VOLTAGE	PHASE	CONTROL	MANUFACTURER	MODEL
EF-1	TOILET B188	50	0.25	1259	2.2	7 W	INLINE	DIRECT	115	1	OCC. SENSOR	GREENHECK, COOK	SQ-70-VG, GN-100
EF-2	TOILET B166	100	0.25	1336	2.2	50 W	INLINE	DIRECT	115	1	OCC. SENSOR	GREENHECK, COOK	SQ-70-VG, GN-100
EF-3	TOILET B149	50	0.25	1259	2.2	7 W	INLINE	DIRECT	115	1	OCC. SENSOR	GREENHECK, COOK	SQ-70-VG, GN-100
EF-4	TOILET B138	50	0.25	1259	2.2	7 W	INLINE	DIRECT	115	1	OCC. SENSOR	GREENHECK, COOK	SQ-70-VG, GN-100
EF-5	FACULTY B137	340	0.25	1252	2	67 W	INLINE	DIRECT	115	1	SWITCH	GREENHECK, COOK	CSP-A390-VG, GN-342

NOTES: 1. PROVIDE FAN WITH INTEGRAL BACK-DRAFT DAMPER, INTEGRAL ALUMINUM CEILING GRILLE, SOLID STATE SPEED CONTROLLER FOR BALANCING, SPRING TYPE ISOLATORS.

DIFFUSER/GRILLE SCHEDULE						
SYMBOL	SIZE	SERVICE	LOCATION	FINISH	O.B.D.	BASIS OF DESIGN
A	6" X 6"	EXHAUST	SOFFIT	PRIME ALUMINUM	---	TITUS 350FL-1 (WITH DEBRIS SCREEN), PRICE 635-N (WITH INSECT SCREEN)
B	12" X 12"	EXHAUST	SOFFIT	PRIME ALUMINUM	---	TITUS 350FL-1 (WITH DEBRIS SCREEN), PRICE 635-N (WITH INSECT SCREEN)

NOTES: 1. COORDINATE FINAL FINISHES AND COLOR WITH ARCHITECT.
2. REFER TO PLANS FOR DIRECTION OF AIR FLOW FOR GRILLES. IF DIRECTION IS NOT INDICATED, AIR FLOW IS IN FOUR DIRECTION (4-WAY GRILLE).
3. COORDINATE FINAL LOCATIONS WITH REFLECTIVE CEILING PLANS. REFER TO ARCHITECTURAL DRAWINGS.
4. ALL DIFFUSERS SHALL HAVE ALUMINUM CONSTRUCTION.



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MECHANICAL DETAILS AND SCHEDULES

DATE: SEPTEMBER 2025
REVISIONS: 1
ADD. 1
10-17-2025

JOB NUMBER: 2025-02

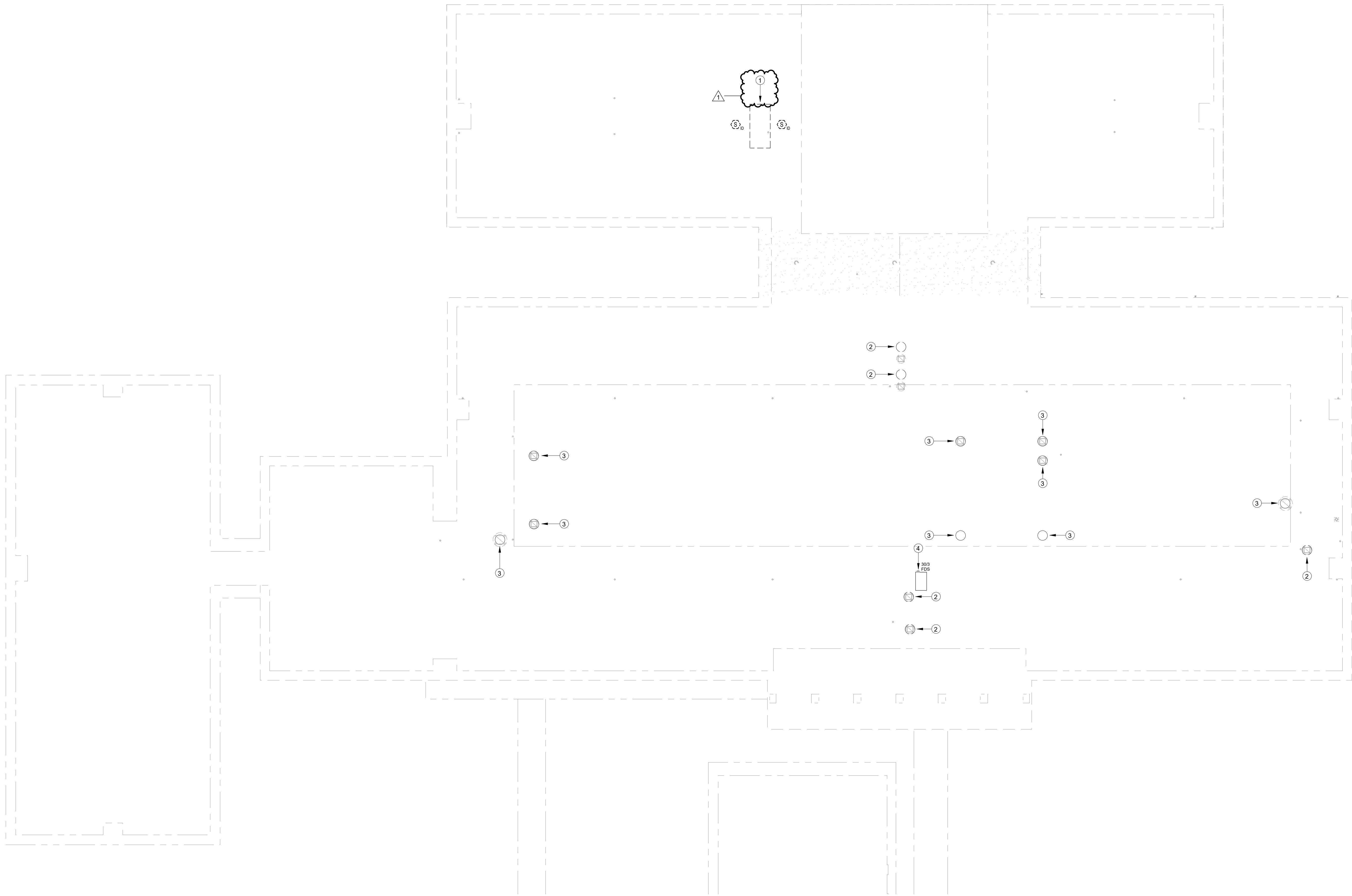
M301

IMPROVEMENTS TO
J.I. BARRON ELEMENTARY SCHOOL
PINEVILLE, LA
RPSB# 52-26-01

Pineville, Louisiana

Owner : Rapides Parish School Board

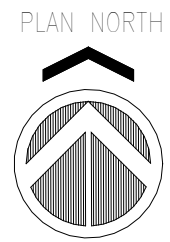
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ELECTRICAL DEMOLITION NOTES (#)	
1	DISCONNECT ELECTRICAL AND FIRE ALARM ASSOCIATED WITH REMOVAL OF EXISTING CHILLED WATER AIR HANDLING UNIT. PREPARE CIRCUIT TO BE INTERCEPTED. SEE ELECTRICAL FLOOR PLAN - NEW FOR NEW LOCATION.
2	DISCONNECT ELECTRICAL ASSOCIATED WITH REMOVAL OF ROOF MOUNTED EXHAUST FAN.
3	DISCONNECT ELECTRICAL ASSOCIATED WITH EXISTING MECHANICAL EQUIPMENT AS REQUIRED FOR DEMOLITION/NEW INSTALLATION OF ROOF. PREPARE FOR RECONNECTION OF ELECTRICAL UPON COMPLETION OF ROOF AND RE-INSTALLATION OF EXISTING MECHANICAL EQUIPMENT.
4	DISCONNECT ELECTRICAL ASSOCIATED WITH EXISTING AIR HANDLING UNIT AS REQUIRED FOR DEMOLITION/NEW INSTALLATION OF ROOF. PREPARE FOR RECONNECTION OF ELECTRICAL UPON COMPLETION OF ROOF AND RE-INSTALLATION OF EXISTING AIR HANDLING UNIT.

1 ELECTRICAL DEMOLITION PLAN - ROOF

1/16" = 1'-0" Refer to Architectural Drawings for All Dimensions



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ELECTRICAL ROOF PLAN - DEMOLITION	
DATE: SEPTEMBER 2025	REVISIONS: 1 ADD. 1 10-17-2025
JOB NUMBER: 2025-02	

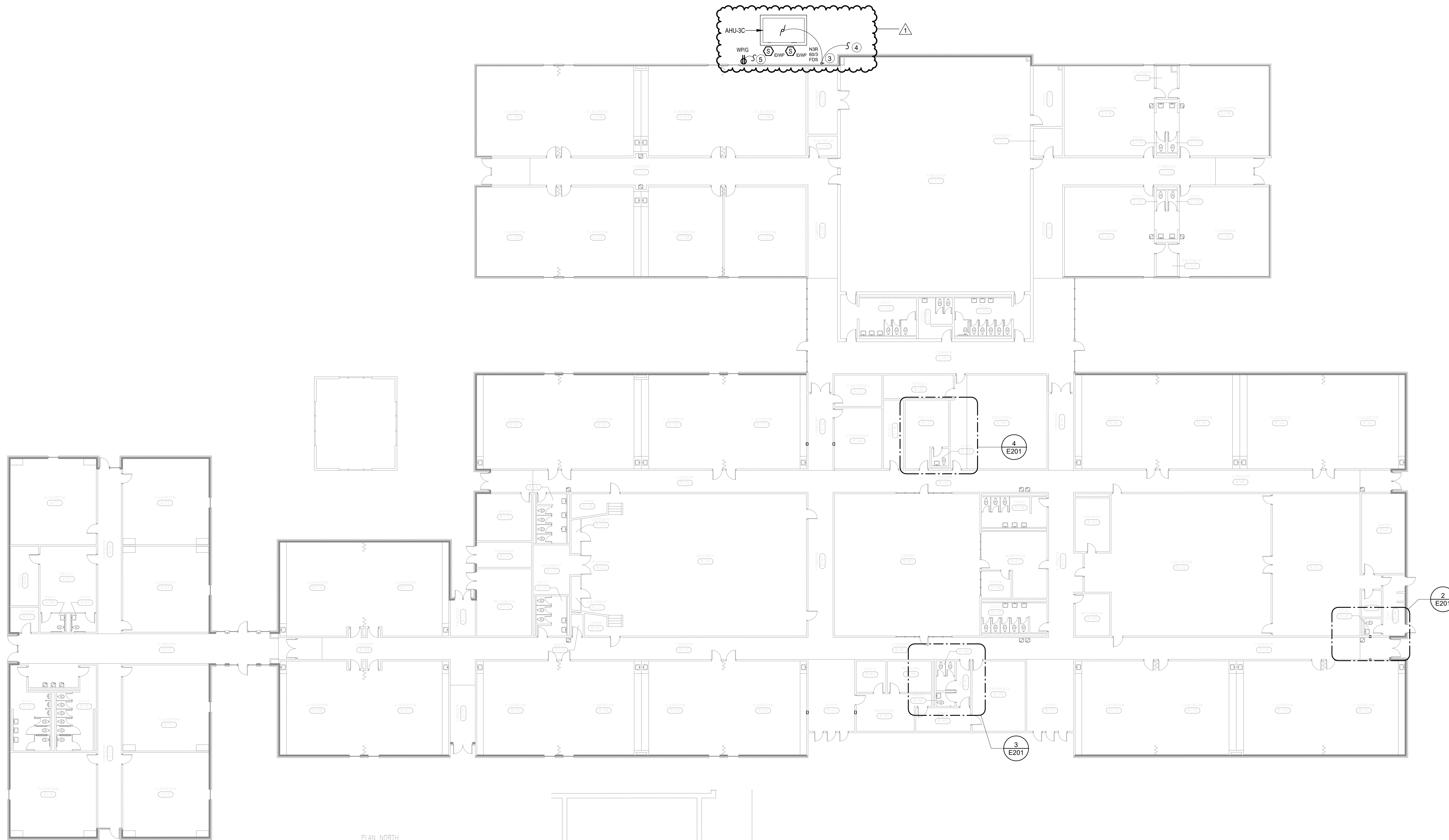
E101

IMPROVEMENTS TO
J.I. BARRON ELEMENTARY SCHOOL
PINEVILLE, LA
RPSB# 52-26-01

Pineville, Louisiana

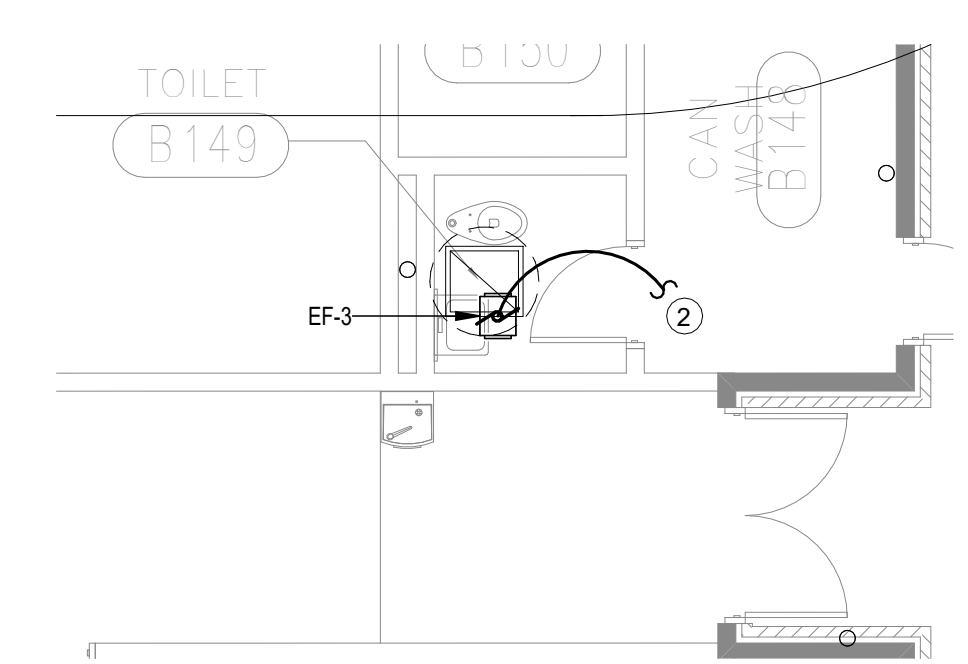
Owner : Rapides Parish School Board

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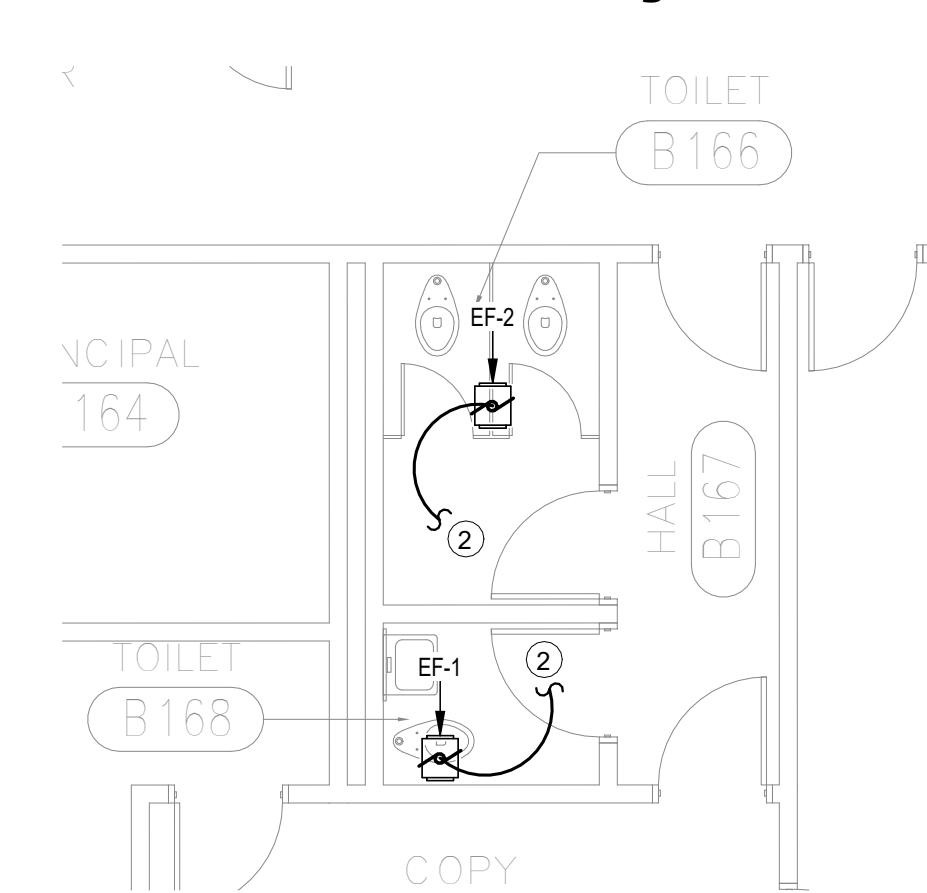


ELECTRICAL NOTES (R)	
1	INTERCEPT EXISTING 120V CIRCUIT PREVIOUSLY SERVING EXHAUST FAN IN THIS AREA WITH 3/4" IN 1/2" CONDUIT (CONTRACTOR TO MATCH EXISTING CONDUIT AND CONDUCTORS). SWITCHING ARRANGEMENT TO REMAIN THE SAME. PROVIDE ADDITIONAL CONDUIT, WIRING, ETC. AS NEEDED.
2	INTERCEPT EXISTING 120V CIRCUIT PREVIOUSLY SERVING EXHAUST FAN IN THIS AREA WITH 3/4" IN 1/2" CONDUIT (CONTRACTOR TO MATCH EXISTING CONDUIT AND CONDUCTORS). PROVIDE AND INSTALL OCCUPANCY SENSOR FOR FAN CONTROL.
3	VERIFY LOCATION WITH MECHANICAL PRIOR TO INSTALLATION.
4	INTERCEPT CIRCUIT PREVIOUSLY SERVING EXISTING CHILLED WATER AIR HANDLING UNIT ON ROOF WITH 3/4" IN 1-1/4" CONDUIT. PROVIDE ADDITIONAL CONDUIT, WIRING, ETC. AS NEEDED.
5	TIE INTO NEAREST AVAILABLE 120V POWER OUTLET CIRCUIT IN THIS AREA. PROVIDE ADDITIONAL CONDUIT, WIRING, ETC. AS NEEDED.

1 ELECTRICAL PLAN - OVERALL FLOOR PLAN
1/16" = 1'-0" Refer to Architectural Drawings for All Dimensions

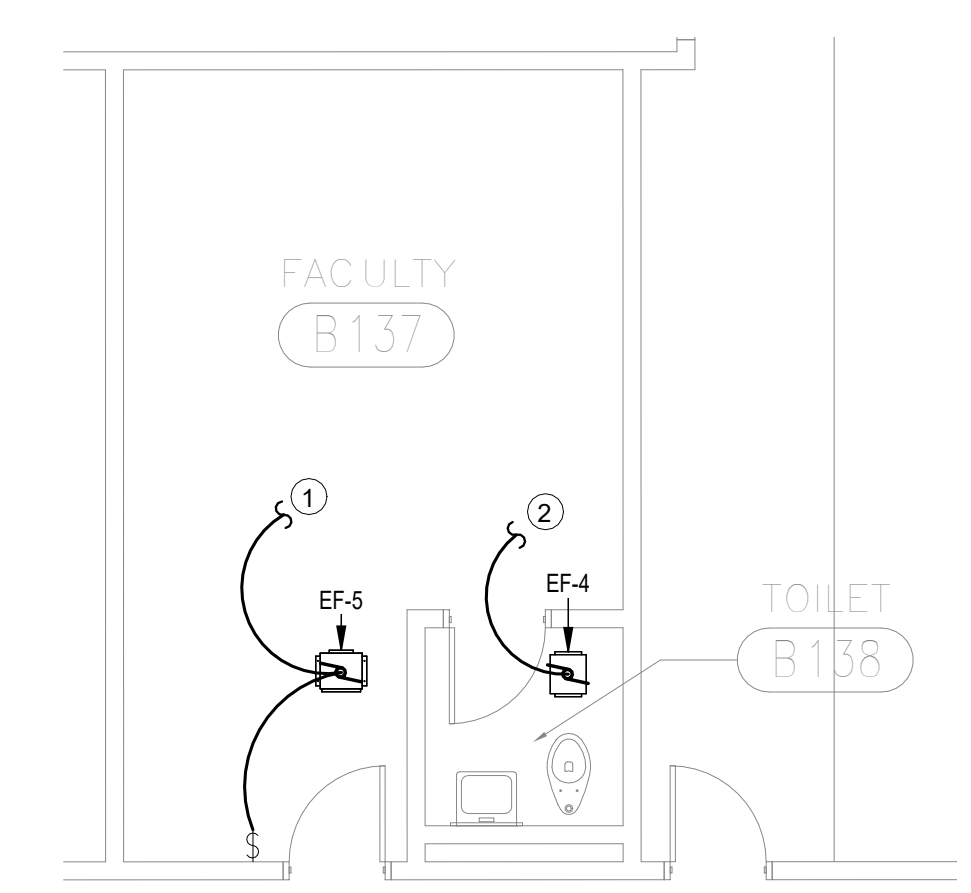


2 ENLARGED ELECTRICAL PLAN - TOILET B149
3/16" = 1'-0" Refer to Architectural Drawings for All Dimensions



3 ENLARGED ELECTRICAL PLAN - TOILETS B166 & B168
3/16" = 1'-0" Refer to Architectural Drawings for All Dimensions

4 ENLARGED ELECTRICAL PLAN - TOILET B138 & FACULTY B137
3/16" = 1'-0" Refer to Architectural Drawings for All Dimensions



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**IMPROVEMENTS TO
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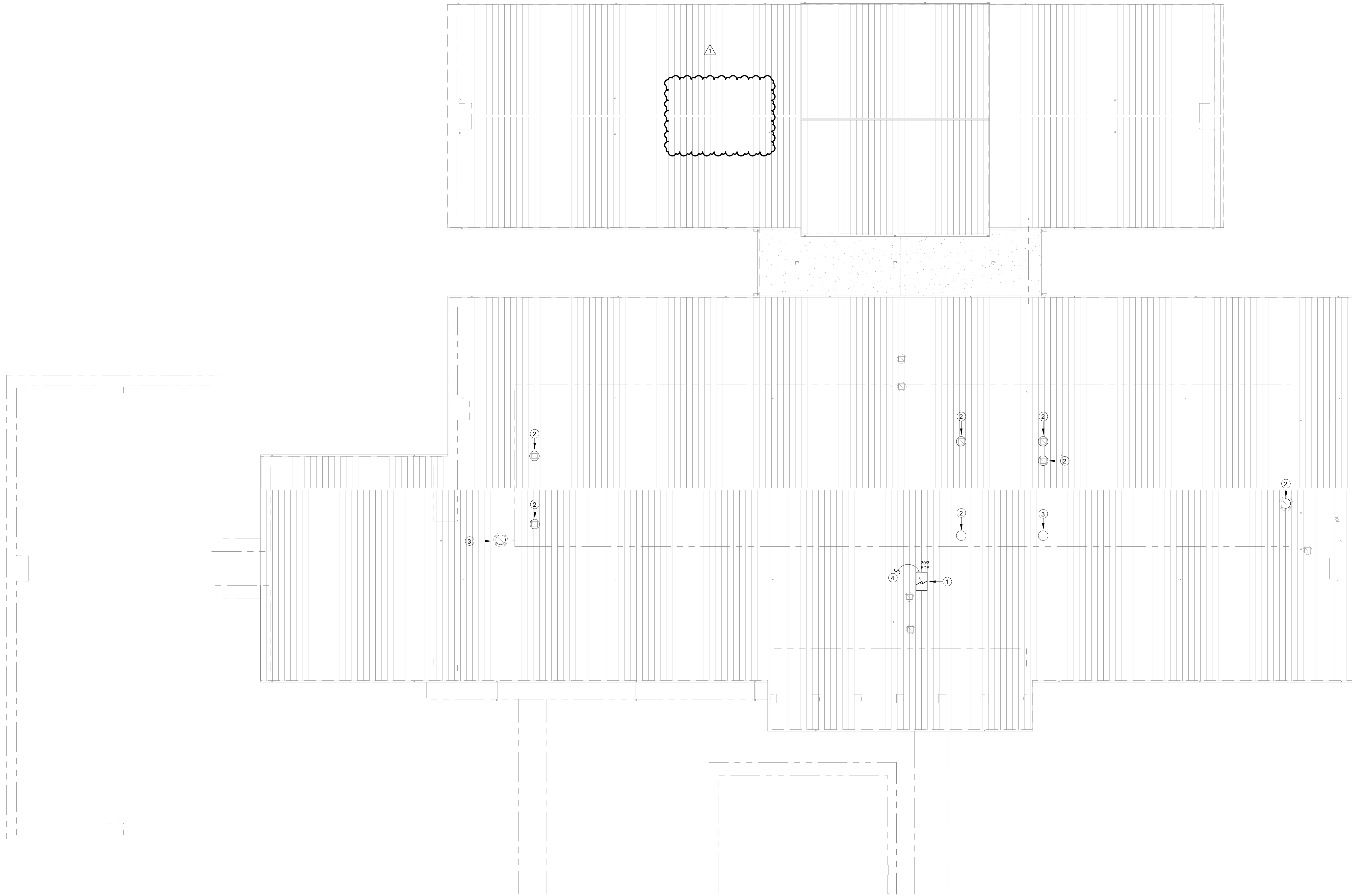
ELECTRICAL FLOOR PLAN - NEW

DATE:	REVISIONS:	10-17-2025
SEPTEMBER 2025	1 ADD. 1	
JOB NUMBER:		2025-02

E201

X OF X

1 ELECTRICAL PLAN - ROOF NEW
1/16" = 1'-0" Refer to Architectural Drawings for All Dimensions



ELECTRICAL NOTES (R)	
1	RECONNECT ELECTRICAL ASSOCIATED WITH ROOF TOP UNIT. PROVIDE ADDITIONAL CONDUIT, WIRING, ETC. AS NEEDED.
2	RECONNECT ELECTRICAL ASSOCIATED WITH EXISTING ROOF FAN. PROVIDE ADDITIONAL CONDUIT, WIRING, ETC. AS NEEDED.
3	RECONNECT ELECTRICAL ASSOCIATED WITH EXISTING ROOF INTAKE GRAVITY VENTILATOR. PROVIDE ADDITIONAL CONDUIT, WIRING, ETC. AS NEEDED.
4	TIE INTO EXISTING CIRCUIT PREVIOUSLY SERVING EXISTING ROOF TOP UNIT WITH 3/4" IN 3/4" CONDUIT (CONTRACTOR TO MATCH EXISTING CONDUIT AND CONDUCTORS). PROVIDE ADDITIONAL CONDUIT, WIRING, ETC. AS NEEDED.

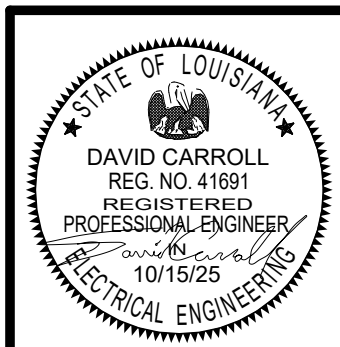


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PROJECT 25051.00
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ELECTRICAL ROOF PLAN - NEW

REVISIONS:	
DATE:	10-17-2025
1	ADD. 1
JOB NUMBER:	2025-02



IMPROVEMENTS TO
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