

February 13, 2024

ADDENDUM #1

TO CONTRACT DOCUMENTS FOR: Project CP231262 – Schweitzer Hall Roof Replacement

ADVERTISEMENT DATE: January 17, 2024

PREPARED FOR: The Curators of the University of Missouri
Planning, Design & Construction
University of Missouri
130 General Services Building
(573) 882-6800

CONSULTANT: RMT Roofing & Waterproofing Consultants
Attn: Ryan O’Connell
410 Sovereign Court, Suite 18
Manchester, MO 63011
(636) 391-2185

The contract documents for the above noted project and the work covered thereby and herein modified.

CLARIFICATION:

- 1) **CLARIFICATION-** MU will not be accepting the Carlisle Sure-Seal EPDM roof system “brand”. MU has specified Versico as the accepted Carlisle manufactured roof system product.
- 2) **CLARIFICATION-**New bid opening date will be on 02/20/2024.

PROJECT MANUAL:

- 1) **DELETE-** Table of Contents in its entirety and **REPLACE** with Revised Table of Contents attached.
- 2) **DELETE-** Section 1.F Index of Drawings in its entirety and **REPLACE** with Revised Section 1.F Index of Drawings attached
- 3) **ADD-** Document CP231262 Schweitzer Hall Environmental Health and Safety Asbestos report for Schweitzer Hall Roof Replacement, Page 5 regarding the Schweitzer Hall building: Please refer to location and description of identified samples.
- 4) **ADD-** Document CP231262 Schweitzer Hall Roof Replacement Environmental Health and Safety Asbestos report for project CP231262, please utilize attached

Technical Specifications-Asbestos-Containing Materials removal and disposal specification section 02 8233.

- 5) **ADD** – Document CP231262 Schweitzer Hall ERU-1 RFP. This document includes specifications, schedules and drawings for owner purchased, contractor installed energy recovery unit, ERU-1 and is provided for reference.
- 6) **ADD** – Document CP231262 Schweitzer Hall FHE-1&2 RFP. This document includes specifications, schedules and drawings for owner purchased, contractor installed Fume Hood Exhaust Fans, FHE-1&2 and is provided for reference.
- 7) **ADD**- Specification Section 1.E - SPECIALTIES - Paragraph 29. EARLY PROCUREMENT PACKAGE: An early material and equipment procurement that is defined as Owner-Furnished-Contractor-Installed is being coordinated by MU Owner's Rep. The following items are currently being procured by the Owner under a separate contract and will be assigned to this Contractor once this Contract is executed. Delivery, receipt, installation, and warranties will be assigned by the Owner to the Contractor of #CP231262 once this Contract is executed.
 - a. ERU-1 RFP. Laboratory Exhaust Systems
 - b. FHE-1&2 RFP Custom Air Handling System

The Early Procurement Package requires the manufacturer to coordinate the Owner's Representative on shipping deliveries. The manufacturer shall provide factory authorized field services personnel to unload equipment and perform an inspection of the equipment including removal of any shipping blocking. The manufacturer must notify the Owner prior to inspection activities to facilitate Owner witness.

DRAWINGS:

- 1) M5.01 – **ADD** – DDC Panel Mounting Detail
- 2) M5.01 – **REVISE** – Strobic Exhaust Fan Detail
- 3) M5.01 – **REVISE** – Exhaust Fan Control Detail
- 4) M5.01 – **REVISE** – FC BUS Schematic Diagram
- 5) M5.02 – **DELETE** – Lab Exhaust Fan Start Circuit
- 6) Scaffolding shall be erected at the north end of the building to help protect vehicles.

END OF ADDENDUM #1

PROJECT MANUAL FOR: SCHWEITZER HALL – ROOF REPLACEMENT

PROJECT NUMBER: CP231262

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UNIVERSITY *of* MISSOURI

ENVIRONMENTAL HEALTH AND SAFETY

ASBESTOS SURVEY

CP231262

SCHWEITZER HALL – ROOF REPLACEMENT

DUCTWORK MODIFICATIONS

1/19/2024

TO: Jessica Crocker

Planning, Design, and Construction

FROM: Pete Kohler

Environmental Health and Safety

MU Environmental Health and Safety has completed an asbestos survey of specific areas of Schweitzer Hall that will be affected by the upcoming project to replace the roof. Ductwork throughout the building will be modified to improve the exhaust system for the labs.

This survey is an addendum to the roof survey which was completed November 21, 2023.

Historical data from previous surveys in Schweitzer proved useful in this survey. Information concerning material in this building was used to inform this project. Historical sample analysis is cited in the table included here.

The asbestos inspection was conducted to satisfy the requirements of 40CFR 61, subpart M, which stipulates that all buildings be “thoroughly inspected” for asbestos before the commencement of renovation or demolition activities. The asbestos inspection was conducted by Pete Kohler (MO Asbestos Inspector #10883, expires 10/17/2024). The survey was conducted in December 2023 through January 2024 and the report was completed January 19, 2024.

Analysis was made by polarized light microscopy (PLM), with an additional step in the preparation of hard-to-analyze samples, including sealant (PLM NOB).

Some of the fume hood interior panels are transite which contains asbestos.

Some sealant on ductwork joints contains asbestos.

Suspect vibration cloth for the exhaust fans in the attic must be sampled and analyzed, when out of service.



FIELD OBSERVATIONS

Ductwork modifications will be made in laboratories on each of the three floors. The labs on the ground floor are currently being renovated and the ceilings are removed from two of the labs. The third lab on the ground floor has a drop ceiling, with acoustic ceiling tiles in a suspended metal grid. The labs on the 1st and 2nd floors have drop ceilings. Ceiling tiles were sampled in various locations. Analysis of the different ceiling tiles found no asbestos.

Previous surveys have found debris on top of the drop ceiling tiles. In 127 and 213, I found new ceilings had been installed since the survey was made, and the debris problem is eliminated.

The ceiling in 223 has a problem with paint chips on top of the ceiling tiles. Much of the area above the drop ceilings has been found to have at least one layer of lead-based paint. Paint chips found on the ceiling tiles should be handled as LBP and collected. Any preparatory scraping should be handled as lead-based work.

The decks above drop ceilings are plaster. The plaster may be affected by the addition of new ductwork. The wall and ceiling plaster was sampled and analyzed. It is negative for asbestos. The plaster has been sampled numerous times over the years, and found to be negative for asbestos.

No spray-on was found on the deck above.

The plumbing found above the drop ceilings is fiberglass and black neoprene, which is not suspect. No samples of pipe insulation were necessary. No suspect pipe insulation was identified which will need to be disturbed by the project.

Glass pipes run above the ceiling on each floor, and in the attic. **It is extremely important that workers are careful around the glass piping.**

The interior of the fume hoods in labs have transite panels, which are asbestos-containing; except in Lab 217, which has a metal interior.

Ductwork in the labs is stainless steel. Visible above the drop ceiling and in the attic space where they connect with the exhaust fans, the stainless ducts seem to run throughout the building.

Some joints in the ductwork have sealant applied. Different types and colors of sealant are found in the labs. The sealant has been applied in narrow strips, painted on, covering several inches at some joints in the ducts. Some of the sealants contain asbestos.

Generally, the black sealant is negative for asbestos. The tan, brown, or brown-green sealant is positive for asbestos. Some of the analysis results show the asbestos content in the sealant being <1% chrysotile, meaning this material does not strictly meet the criteria for asbestos-containing material. Had the sample been taken an inch to the

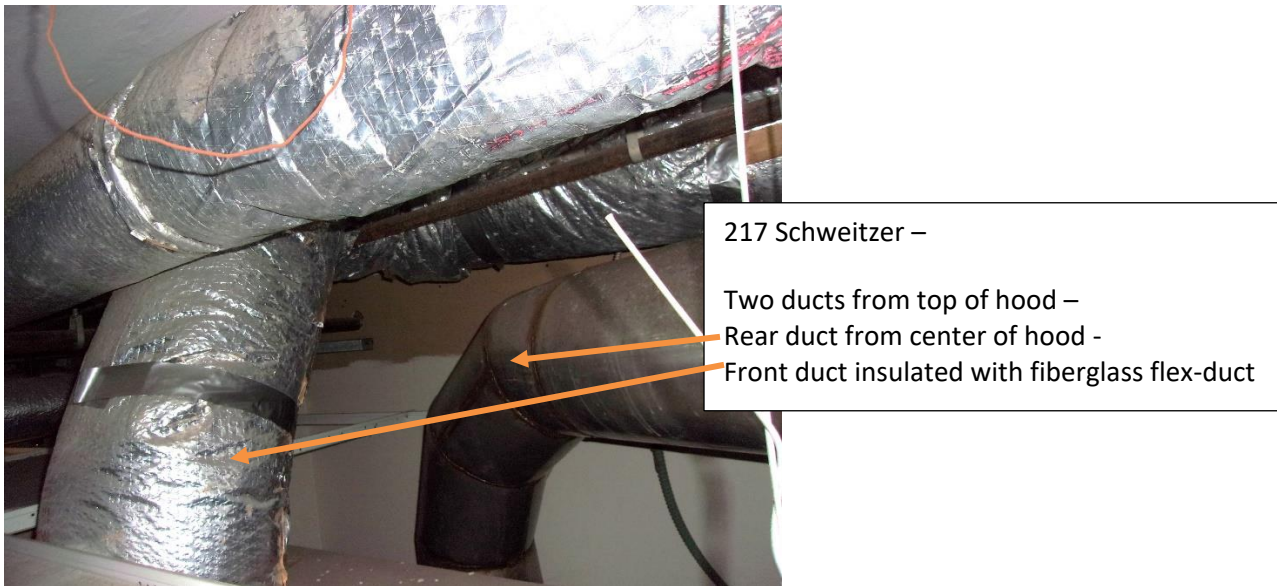


right or left, the result would have been different, and the percentage of asbestos could have been greater. I consider results of <1% to be positive in this case, and classify the material as asbestos-containing.

Work will be done at some of these locations, according to the plans. If the work can be moved slightly, to adjust for where the joints are covered with sealants, asbestos disturbance can be avoided. If the work MUST occur at a specific location that is sealed with ACM, then it must be removed by asbestos-certified workers.

The sealant has been used at ductwork from the fume hoods and on HVAC ductwork.

Many of the hoods have two ducts attached; one at the center of the fume hood roof and another toward the front of the top, over the space where the technician would stand. The front duct is often insulated. The insulation for this specific ductwork is fiberglass flex-duct. The fiberglass is not suspect material.



The attic was surveyed when the roof was sampled. The building materials found in the attic spaces are not suspect.

Exhaust fans and their ducts in the attic are isolated by vibration cloth. The fans are currently in use and I did not collect samples of the vibration cloth. **Before their removal, the fans' vibration cloth needs to be sampled and analyzed.**

There are several fans which are labelled 'not in service'. However, these fans don't have the vibration cloth material that I consider most suspect.

Ductwork from throughout the building comes into the attic and feeds into the fan room, Mechanical Room 303, through the wall. The ducts are all metal. I did not find any of the suspect sealant on the ducts in the attic.





Steel ductwork in the attic –

All seams are welded; no sealant used.



Ducts from the exhaust fans travel up through the ceiling of the fan room and out through the roof. The ceiling of the room is gypsum panels finished with joint compound. The sheet rock joint compound is negative for asbestos. Where the ducts penetrate the ceiling, fiberglass insulation is visible. The fiberglass is not suspect.



SAMPLE ID	LOCATION/DESCRIPTION	ANALYSIS
240103-01	Schweitzer Hall Room 11, fume hood interior panel	CONTAINS 40% CHRYSOTILE , 60% non-fibrous
240103-02	11 Schweitzer, black sealant on S/S duct	Correct layer not present – no analysis
240103-03	20 Schweitzer, 2x2 ceiling tile, gray body	60% cellulose, 20% mineral wool, 15% perlite, 5% non-fibrous
240104-01	11 Schweitzer, ceiling plaster	15% quartz, 85% non-fibrous
240104-02	11 Schweitzer, black sealant on S/S duct	100% matrix material
240104-03	11 Schweitzer, black sealant on HVAC duct	100% matrix material
240104-04	16 Schweitzer, wall plaster	100% non-fibrous
240104-05	110 Schweitzer, 2x4 ceiling tile, gray body	60% cellulose, 20% mineral wool, 15% perlite, 5% non-fibrous
240104-06	217 Schweitzer, brown/green sealant on HVAC duct	.69% CHRYSOTILE , 99.3% matrix material
240110-01	14 Schweitzer, black sealant on fume hood duct	100% non-fibrous
HISTORICAL DATA		
PROJECT CP211261 210518-21	213 Schweitzer, tan sealant on HVAC ductwork	CONTAINS 2% CHRYSOTILE , 98% non-fibrous
210526-01	214 Schweitzer, brown sealant on fan coil unit	CONTAINS 3% CHRYSOTILE , 97% non-fibrous

ASBESTOS SUMMARY

Interior panels of fume hoods in Labs 11, 14, 20, 108, 111, 127, 211, 213, 221, 223, 245, and 247 are transite and contain asbestos. The fume hoods are not slated for demolition or replacement, and it is important that the project not affect them. Workers must be aware that the hoods contain positive material.

Tan, brown, and brown/green sealant on the duct joints contains asbestos. If may be possible to perform modifications to the stainless steel ducts without disturbing the sealant on the ducts, if the locations for the work can be chosen carefully.

Vibration cloth on the duct/fan connections in the attic must be sampled and analyzed when the ductwork is shut down. The vibration cloth is suspect material.

UNIVERSAL WASTE

Fluorescent light fixtures that are removed and replaced should be collected as universal waste and handled appropriately.



TECHNICAL SPECIFICATIONS - ASBESTOS-CONTAINING MATERIALS REMOVAL AND DISPOSAL

For

PROJECT CP231262 SCHWEITZER HALL – ROOF REPLACEMENT DUCTWORK MODIFICATIONS

Prepared for

**UNIVERSITY OF MISSOURI
Campus Facilities
Columbia, Missouri 65211**

Prepared by

**UNIVERSITY OF MISSOURI
ENVIRONMENTAL HEALTH AND SAFETY**

PART 1 - GENERAL

Provisions of the General Conditions and Special Conditions are part of this Division.

1.1 SCOPE OF WORK

1. General: The work specified herein shall be the abatement of asbestos containing materials by certified and registered persons who are knowledgeable, qualified and trained in the abatement, handling, and disposal of asbestos containing material, and subsequent cleaning of the affected environment.

2. The Contractor shall furnish all labor, material, equipment, testing, services, permits, insurance, notifications, necessary or required to perform the work in accordance with applicable local, state, and federal regulations for the abatement of asbestos containing materials and for other work as specified in this section or as indicated in associated drawings, sketches, or reports of the work.

All fees required for notification requirements, renotifications, and/or inspections by the regulatory agencies shall be paid by the Contractor. Bulk sample analysis information required by the Department of Natural Resources, U.S. Environmental Protection Agency or local authority having jurisdiction in conjunction with the notification shall also be provided by the Contractor unless provided within this section.

3. The work shall include the removal and legal disposal of friable and non-friable asbestos containing materials including:

Non-friable asbestos:

Seven hundred sixty eight (768) square feet of ACM underlayment, including a hot mop-on layer and a nail-down base sheet from beneath EPDM roofing on the flat parts of Schweitzer Hall roof, including gutters

Twenty (20) square feet of silver and black patch on flashing and stone parapets around the perimeter of Schweitzer

One square foot of tar from the sloped slate roof on the southwest corner

Two (2) fire doors from Mechanical Room 303, with presumed positive asbestos cores

Ten (10) square feet of brown or green/brown sealant from steel ductwork above drop ceilings of labs. This material would need to be removed if a specific location in ductwork is needed for a modification.

1.2 DEFINITIONS

1. Abatement - Procedures to decrease or eliminate the source of fiber release from asbestos containing building materials. Includes encapsulation, enclosure, and removal.
2. Adequately Wet - To sufficiently mix or penetrate with liquid to prevent the release of particulate.
3. Aggressive Air Sampling - Sweeping of floors, ceilings and walls and other surfaces with the exhaust of a minimum of one (1) horsepower leaf blower or equivalent immediately prior to air monitoring.
4. Approved Waste Disposal Site - A solid waste disposal area that is authorized by the Department of Natural Resources to receive asbestos containing solid wastes.
5. Asbestos - The asbestiform varieties of serpentine (chrysotile, antigorite), riebeckite (crocidolite), cummingtonite-grunerite (amosite), anthophyllite, and actinolite-tremolite.
6. Asbestos Abatement Supervisor - An individual who directs, controls, or supervises others in asbestos abatement projects.
7. Asbestos Containing Building Material (ACBM) - Surfacing ACM, thermal system insulation ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a building.
8. Asbestos Containing Material (ACM) - Any material containing more than 1 percent asbestos by weight.
9. Barrier - Any surface that seals off the work area to inhibit the movement of fibers.
10. Category I Nonfriable ACM - Asbestos-containing packings, gaskets, resilient floor covering and asphalt roofing products containing more than one percent (1%) asbestos as determined using the method specified in 40 CFR part 763, subpart F, Appendix A, section 1, Polarized Light Microscopy.
11. Category II Nonfriable ACM - Any material, excluding category I nonfriable ACM, containing more than one percent (1%) asbestos as determined using the methods specified in 40 CFR part 763, subpart F, Appendix A, section 1, Polarized Light Microscopy that, when dry, cannot be crumbled, pulverized or reduced to powder by hand pressure.

12. Containment - Area where asbestos abatement project is conducted. Area must be enclosed either by a glove bag or plastic sheeting barrier.

13. Contractor's Competent Person (Qualified Person) - One who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32 (f); in addition, for Class I, II, III, and IV work, who is specially trained in training courses which meet the criteria of EPA's Model Accreditation Plan (40 CFR Part 763) for project designer or supervisor, or its equivalent.

14. Decontamination Area - Enclosed area adjacent and connected to the regulated area which is used for decontamination of workers, materials, and equipment that are contaminated with asbestos.

15. Demolition - the wrecking or taking out of any load bearing structural member of a facility together with any related handling operations.

16. Disposal Bag - A properly labeled 6 mil. thick leak-tight plastic bag used for transporting asbestos waste from work area to disposal site.

17. Encapsulant (Sealant) - A liquid material which can be applied to asbestos-containing material and which prevents the release of asbestos fibers from the material either by creating a membrane over the surface or by penetrating into the material and binding its components together.

18. Encapsulation - Treatment of asbestos containing materials with an encapsulant.

19. Enclosure - The construction of an airtight, impermeable, permanent barrier around asbestos containing material to control the release of asbestos fibers into the air.

20. Friable Asbestos Material - Any material containing more than one percent asbestos as determined using the method specified in appendix A, subpart F, 40 CFR part 763 section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

21. Glove Bag - A manufactured or fabricated device, typically constructed of six (6) mil transparent polyethylene or polyvinyl chloride plastic. This device consist of two (2) inward projecting long sleeves, an internal tool pouch and an attached, labeled receptacle for asbestos waste.

22. Homogeneous Work Site - Continuous areas with the same type of ACM and in which one type of abatement process is performed.

23. Negative Initial Exposure Assessment - An assessment by a "Competent Person" in which it is concluded that employee exposures during the job are likely to be consistently below the Permissible Exposure Levels.

24. Outside Air - Air outside of the containment.

25. Owner's Air Monitoring Firm - Air Monitoring conducted by a person who is not under the direct control of the person carrying out the asbestos abatement project and who has been selected by the Owner.

26. Owner's Air Sampling Professional - An individual who holds a valid certification from the State of Missouri. The individual shall conduct, oversee, or be responsible for air monitoring of asbestos abatement projects before, during, and after the project has been completed. The air sampling professional must hold a 40 hour AHERA Asbestos Contractor/Supervisor Certificate, and supervised by the Owner's Certified Industrial Hygienist (C.I.H.).

27. Owner's Air Sampling Technician - An individual who has been trained by and is under the supervision of an air sampling professional to do air monitoring before, during, and after the asbestos abatement project. The air sampling technician must hold a 40 hour AHERA Asbestos Contractor/Supervisor Certificate, and be supervised by the Owner's Certified Industrial Hygienist (C.I.H.).

28. Owner's Certified Industrial Hygienist (C.I.H.) - an Industrial Hygienist, Certified in Comprehensive Practice by the American Board of Industrial Hygiene. The Owner's C.I.H. must also be certified by the Missouri Department of Natural Resources as an air sampling professional and hold a 40 hour AHERA Asbestos Contractor/Supervisor Certificate. The Owner will identify C.I.H. before application for permit.

29. Personal Monitoring - Sampling of the asbestos fiber concentrations within the breathing zone.

30. Regulated Asbestos Containing Material (RACM) - Friable asbestos material; Category I nonfriable ACM that has become friable; Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading; Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

31. Remove - To take out RACM or facility components that contain or are covered with RACM from any facility.

32. Renovation - Altering a facility or one or more facility components in any way, including the stripping or removal of RACM from a facility component.

33. Repair - The restoration of asbestos material that has been damaged. Repair consists of the application of rewettable glass cloth, canvas, cement or other suitable material. It may also involve filling damaged areas with non-asbestos substitutes and re-encapsulating or painting previously encapsulated materials.

34. Strip - To take off RACM from any part of a facility or facility components.

35. Waste Shipment Record - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos containing waste material.

36. Work Area - A specific isolated area, other than the space enclosed within a glove bag, in which friable asbestos-containing materials is required to be handled. The area is designated as a work area from the time that the area is secured and access restrictions are in place. The area remains designated as a work area until the time that it has been cleaned in accordance with any requirements applicable to the operations conducted.

1.3 CODES AND REGULATIONS

1. General Applicability Of Codes, Regulations and Standards - All applicable codes, regulations, standards, statutes, laws, and rules have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith. Where conflicts arise, the most stringent specification shall apply.

2. Contractor Responsibility - The Contractor shall assume full responsibility and liability for the compliance with all applicable federal, state, and local regulations pertaining to work practices, hauling, disposal and protection of workers, visitors to the site, and persons occupying areas adjacent to the site. The Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable federal, state, and local regulations. The Contractor shall hold the owner harmless for failure to comply with any applicable work, hauling, disposal, safety, health, or other regulations on the part of the contractor, contractor's employees, or contractor's subcontractors.

3. Federal and State requirements which govern asbestos abatement work or hauling and disposal of asbestos waste materials include but are not limited to the following:

1. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) including but not limited to:

1. Title 29, Part 1910, Section 1001 and Part 1926, Section 1101 of the Code of Federal Regulations.

2. Respiratory Protection, Title 29, Part 1910, Section 134 of the Code of Federal Regulations.

3. Construction Industry, Title 29. Part 1926, of the Code of Federal Regulations.

4. Access to Employee Exposure and Medical Records, Title 29, Part 1910, Section 2 of the Code of Federal Regulations.

5. Hazard Communication, Title 29, Part 1910, Section 1200 of the Code of Federal Regulations.

6. Specifications for Accident Prevention Signs and Tags, Title 29, Part 1910, Section 145 of the Code of Federal Regulations.

2. U.S. Environmental Protection Agency (EPA) including but not limited to:

1. National Emission Standards for Hazardous Air Pollutants (NESHAPS)
Title 40, Part 61, Subpart M, Code of Federal Regulations.

3. U.S. Department of Transportation (DOT) including but not limited to:

1. Title 49, Part 172, Section 101 of the Code of Federal Regulations.

4. State of Missouri including but not limited to:

1. H.B. 77, 85th General Assembly.

2. Missouri Air Conservation Law Chapter 643.

3. Missouri Department of Natural Resources, Division 10, Chapter 6 of
the Code of State Regulations as follows:

(1) 10 CSR 10-6.020, Definitions

(2) 10 CSR 10-6.080, Emission Standards for Hazardous Air
Pollutants

(3) 10 CSR 10-6.230, Administrative Penalties

(4) Volume 18, Missouri Register, Page 44

(5) 10 CSR 10-6.250, Asbestos Abatement Projects - Certification,
Accreditation, and Business Exemption Requirements

1.4 NOTIFICATIONS

1. Notifications meeting the requirements of Volume 18, Missouri Register, page 44,
shall be completed and sent by the Contractor not less than ten (10) days before the
intended starting date of the project. Send notification to the following:

1. Department of Natural Resources
Air Pollution Control Program (Asbestos)
P.O. Box 176
Jefferson City, Missouri 65102

2. U.S. Environmental Protection Agency
Region VII
Air & Toxic Division, Air Branch
ATTN: Air Compliance
726 Minnesota Avenue
Kansas City, Kansas 66101

3. Provide a copy to the Owner's Representative. Five (5) day notification to the
Owner's Representative is required on jobs less than the reportable quantity.

4. If the project is under the jurisdiction of the Kansas City Air Quality Section, St. Louis County Air Pollution Control Branch, or the Springfield-Green County Air Pollution Control Authority, send notification directly to the appropriate agency.

1.5 SUBMITTALS

1. The following will be submitted by contractor prior to commencement of work for approval by the Owner's Certified Industrial Hygienist (one copy for the Owner's Representative). Owner's C.I.H. will return reviewed copies to contractor and Owner's Representative.

1. One copy of material safety data sheets (MSDS) for products to be used by the Contractor in the performance of his work. Contractor will also maintain copies of MSDS on site per OSHA.

2. One copy of the notifications to, or any correspondence with, the regulatory agencies. Submit a listing of all prior regulatory violations.

2. Friable Abatement:

1. Current Certificates of training and statement of qualifications for the project asbestos abatement supervisor and the Missouri Asbestos Occupational Certificates for all project personnel. List a summary of project personnel and contact phone numbers.

2. Name, address, and contact person's name of testing laboratory or laboratories to be utilized analyzing samples for bulk analysis or air samples.

3. Submit a detailed plan of the procedures proposed for use in complying with requirements of this specification and Volume 18, Missouri Register, page 44, and 29 CFR 1926.1101. Include in the plan the layout and location of barriers, decontamination units, route of ingress and egress for work area, methods used to assure safety of building occupants and visitors, methods used to isolate or closing out of HVAC system, personal air monitoring strategy, method of removal of material, and engineering controls utilized to prevent emissions from the work area.

4. Provide a disposal plan to detail type of disposal container, method of transportation to disposal site, waste hauler, and disposal site.

5. Copy of notifications required as part of the emergency notification plan.

3. Non-Friable Abatement:

1. Submit a detailed plan of the procedures proposed to minimize emissions and to prevent the material from becoming friable during removal.

2. Copy of emergency protection plan to be used if the nonfriable material should become friable during removal.

3. Current Certificates of training and statement of qualifications for the "Competent Person".

4. One copy of the Negative Initial Exposure Assessment.

4. Upon completion of the abatement work, the following information shall be submitted to the Owner's Representative.

1. Waste disposal receipts and waste shipment record on all asbestos waste removed from the project.

5. Upon completion of the abatement work, the following information shall be submitted by the Owner's C.I.H. to the Contractor.

1. Air sampling test results for personal (non-OSHA) and final clearance air samples taken under the supervision of Owner's Certified Industrial Hygienist. Results must be in writing in final report form.

2. Written certification from the Owner's Certified Industrial Hygienist.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 SUPERVISION OF ABATEMENT

1. The Contractor shall designate a competent supervisor subject to the approval of the Owner's C.I.H. and the Owner's Representative. The supervisor shall be the Contractor's representative on the project and shall meet the requirements of all applicable regulations and perform the following minimum requirements.

1. Be Certified by the State of Missouri as an Asbestos Abatement Supervisor, a minimum of one year prior full time experience in asbestos abatement work and a minimum of two years experience as a supervisor, and be qualified as a Competent Person in accordance with OSHA regulation 1926.1101.

2. Be on site and supervise all abatement work in accordance with OSHA and Volume 18, Missouri Register, page 44.

3. Conduct all OSHA required air monitoring.

4. Maintain a daily log on the project documenting events, visitations, problems, equipment failures, accidents, and inspections.

5. Be responsible for implementation of first aid, safety training, respiratory protection, and ensuring all workers are trained in emergency procedures.

6. Be responsible for conducting a visual inspection of the work area prior to a visual inspection by the Owner's Certified Industrial Hygienist. Inspection shall be documented.

3.2 NEGATIVE INITIAL EXPOSURE ASSESSMENT

1. The Contractor must conduct a Negative Initial Exposure Assessment (non-friable asbestos) prior to removal of the asbestos material. The Negative Initial Exposure Assessment shall be performed by a "Competent Person" to determine whether the material may be removed and maintained in a nonfriable condition. If the material cannot be removed without becoming friable then the contractor shall comply to the requirements in this specification at no additional cost to the Owner.

2. The method of removal is the Contractor's option. However, in the event of any of the following:

1. Visible emissions are observed
2. Sanding, grinding, cutting, or abrading of the material
3. Air samples exceed 0.1 f/cc

The contractor shall immediately stop work, implement corrective work practices, make any necessary notifications to all regulatory agencies of the changes in work practices and material conditions, and comply with the requirements as set forth in this specification.

3.3 WORKER PROTECTION & TRAINING

1. The Contractor shall be responsible for providing his employees with proper respiratory protection, respiratory training, written respirator program, medical examinations, maintaining medical records, and protective clothing and equipment to comply with OSHA requirements.

2. The Contractor shall be responsible for all testing and costs incurred for complying with requirements of OSHA regulations for Personal Air Sampling.

3. All workers shall be trained in the dangers inherent in handling asbestos and breathing asbestos dust and in proper work procedures and personal and protective measures.

4. All workers shall hold valid diplomas as accredited Asbestos Abatement Workers as required by 10 CSR 10-6.250.

3.4 INDEPENDENT TESTING LABORATORY

1. Testing Laboratories utilized by the Contractor for sample analysis during the project shall meet the following minimum requirements and be approved by the Owner's C.I.H. This information shall be submitted to the Owner's Representative for review.

1. All air monitoring samples shall be analyzed by a testing laboratory accredited by the American Industrial Hygiene Association (AIHA) or by an individual who is currently on the Asbestos Analyst Registry.
2. All bulk samples shall be analyzed by a testing laboratory accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

3.5 OWNER'S AIR SAMPLING PROFESSIONAL & CERTIFIED INDUSTRIAL HYGIENIST

1. It will be the Owner's responsibility to hire an Air Sampling Professional & Certified Industrial Hygienist. The Air Sampling Professional & Industrial Hygienist will also be required to perform the following duties as a minimum:

1. Approval of the Contractor's work plan and methods of abatement to meet regulatory requirements and ensure the health and safety of University faculty, staff, and students.
2. Verify that the contractor is satisfactorily performing personal air monitoring as directed by OSHA regulations.
3. Visual inspection of the work area and final clearance air monitoring.
4. Certify in writing that the Contractor's procedures, methods and practices were, to the best of my knowledge and belief, in compliance with current EPA, OSHA, State and/or applicable local regulations and that the work areas meet the requirements for final clearance testing and account of any known deviations.
5. Issue final air clearance.

3.6 EMERGENCY PROTECTION PLAN

1. The contractor shall be responsible for developing a written Emergency Protection Plan and shall maintain this plan on site. The plan shall include considerations of asbestos leakage from the site, fire, explosion, toxic atmospheres, electrical hazards, slips, falls, and heat related injury. All employees shall be instructed and trained in the procedures.
2. Emergency protection plan shall also include written notification of police, fire and medical personnel of the planned abatement activities, work schedule, and layout of work area, particularly barriers that may affect response capabilities.

3.7 LOCAL AREA PROTECTION & SITE SECURITY

1. The contractor shall be responsible for all areas of the building used by him and/or subcontractors in the performance of the work. Contractor shall exert full control over the actions of all employees and other persons with respect to the use and preservation of the existing building, except such controls as may be specifically reserved to the owner.
2. Contractor has the right to exclude from the work area all persons who have no purpose related to the work or its inspection, and shall require all persons in the work area to observe the same regulations required of Contractor's employees.
3. The contractor shall have control of site security during abatement operations in order to protect work environment and equipment. Contractor shall have the owners assistance in notifying building occupants of impending activity and enforcement of restricted access by owners employees.
4. The contractor shall keep a minimum of two 10 lbs. type ABC fire extinguishers on site. One shall be maintained outside the work area and one inside the work area. The employees shall be trained in the operation of extinguishers.
5. Where areas cannot be isolated by existing walls and doors from employees, clients, or the public, barriers must be constructed of 1/2" plywood and 2"x4" framing 16" o.c. to isolate the area. The barriers must be installed in such a manner to prevent damage to existing walls, floors, or ceilings. Barrier may have a lockable door.
6. The contractor shall maintain the work area free from rubbish, debris, and dirt and keep a clean, safe working area.
7. The Contractor shall provide warning signage around the regulated area as required by OSHA.
8. The Contractor shall isolate any and all air supply and returns to the abatement space as required by OSHA. Contractor shall coordinate with the Owner's Representative.
9. The Contractor shall keep all areas where adhesive stripper is in use (such as mastic removal) under negative pressure and exhausted to the outside ambient air.

3.8 FINAL CLEARANCE REQUIREMENTS (FRIABLE ASBESTOS)

1. Upon completion of the abatement work, the supervisor shall perform a visual inspection of the work area. If satisfactory, the supervisor shall then request the Owner's C.I.H. or the C.I.H.'s air sampling technician to perform a visual inspection. When the Owner's C.I.H. feels the area is ready based on the results of their visual inspection, the Contractor shall apply a lockdown encapsulant. Following application of lockdown encapsulant, the Owner's C.I.H. shall perform the final clearance sampling for airborne fiber concentrations.
2. The Owner's C.I.H. or designee will perform final clearance testing per the following requirements:

1. Aggressive sampling shall be required for all areas where removal has taken place with the exception of glove bag projects where nonaggressive sampling is permitted.
2. P.C.M. samples analyzed on site shall be counted by an accredited registered microscopist.
3. For areas specifically specified for clearance by Transmission Electron Microscopy, the method shall be NIOSH 7402.
3. Any work areas failing to meet the clearance requirements of this section shall be recleaned and retested at the contractor's expense until satisfactory levels are obtained.
4. The Owner's C.I.H. shall provide a written report of the air monitoring activities to the contractor within 7 days after the final clearance testing.

3.9 REESTABLISHMENT OF THE WORK AREA AND SYSTEMS

1. Reestablishment of the work area shall only occur after the contractor has received final clearance in writing from the Owner's C.I.H.
2. All damage to finishes, equipment, and/or the area affected by the abatement shall be repaired by the contractor to equal or better condition as it was prior to the work, at no cost to the owner.

3.10 WASTE DISPOSAL

1. All asbestos containing waste and/or asbestos contaminated debris shall as a minimum be double bagged in approved 6 mil. disposal bags. Each bag shall be tagged to meet requirements of NESHAPS with an asbestos caution label and a source identification label.
2. Transportation shall meet the requirements of all regulatory agencies for asbestos containing materials and shall be transported in an enclosed truck.
3. The waste disposal site shall be approved by the Missouri Department of Natural Resources for asbestos disposal. A chain of custody letter/waste shipment record and disposal receipts shall be provided to the owner for all materials disposed of.

3.11 DRAWINGS

1. Drawings, when provided, are not intended to be used for anything but a "reference" to the work area. Information is not specific to quantities or to exact location of ACM unless explicitly noted. Contractor will be required to field verify the conditions and quantities.

3.12 REPORTS

1. Reports, when provided, are intended to be used as a basis for the type and composition of the asbestos present for both bidding purposes and for the information required for the notifications to the governing agencies.

ERU-1 PRODUCT SPECIFICATIONS

1. DESCRIPTION OF BID:

- A. Furnish and deliver F.O.B. Owner's premises, General Services Building, University of Missouri Columbia, Columbia, Missouri 65211, one (1) Energy Recovery Unit as specified below.
- B. Estimated product delivery shall be submitted with each bid and may be considered in the bid evaluation.

2. CAPACITY AND PERFORMANCE REQUIREMENTS

Refer to the attached drawing for scheduled performance, dimensional data, and layout.

3. ERU-1 DESIGN CHARACTERISTICS

- A. The unit shall be a complete factory assembled package including base, casings, filter rack, access panels and doors, conduit systems, and lighting system.
- B. The unit shall be shipped with shipping splits. The maximum dimension for any single piece is 126”L x 90”H x 66”W. The heaviest weight of any section shall not exceed 2,500lbs. Dimensions shown on attached drawing are based on preliminary selection and are not mandatory. The listed overall ERU-1 dimensions here represent the maximum allowable dimensions in each direction. The unit’s air tunnel shall be sized to fit (6) 24”x24” filters in a 2 wide by 3 high arrangement.
- C. The unit shall be in accordance with the following as applicable to their design, fabrication, assembly and testing:
 - AHRI 430 – Central Station Air Handling Units
 - AHRI 1350/1351 – Performance Rating of Central Station Air Handling Unit Casing
 - NFPA 70 – National Electric Code
 - NFPA 90A – Standard for the Installation of Air Conditioning and Ventilation Systems
 - AMCA 99 – Standard Handbook
 - Casing shall be AHRI 1350 certified
 - Equipment shall be UL listed where applicable.
- D. Steel components shall be hot dipped galvanized or treated with a rust inhibitor coating. Aluminum or stainless-steel components may be mill finish, unless noted otherwise.
- E. The unit and each component of the unit shall be designed to meet the site specific seismic requirements per ASCE 7-16:
 - a. Risk Category II

- b. Site Soil Class D (Default)
- c. Seismic Design Category C
- d. $S_S = 0.162$
- e. $S_{DS} = 0.173$
- f. Importance Factor 1.5

F. Unit Base

1. The unit shall be constructed on a structural base. The base shall be designed to distribute loads properly to the mounting surface and be braced to support internal components without sagging or pulsating. The base floor shall be supported with adequate stiffening members and designed for a minimum live load of 100 pounds per square foot throughout the unit.
2. The perimeter support members shall be properly sized to support all major components and the housing during rigging, handling and operation of the unit. Unit to be provided with properly sized and located lifting lugs to adequately allow rigging of the unit in place. Lifting lugs shall be bolted for removal, located on the exterior edges only, air tunnel face not acceptable.
3. The unit floor shall be thermally broken from the unit base and insulation liner such that there is no direct metal to metal contact that could cause sweating. Per below unit would have a gasketed thermal break such that the only metal to metal path would only occur at fasteners.
4. The underneath side of the base pan and base perimeter shall be insulated with minimum 4" thick, 2# density fiberglass insulation or 2" thick, polyisocyanurate covered with a vapor barrier. Vapor barrier material is to be continuous with no seams. Vapor barrier is then protected by sheet metal attached to the bottom of the base.
5. The following specifics shall apply:
 - 1) Structural steel base, painted
 - 2) 3/16" 304 stainless steel floor.
 - 3) Gasketed thermal break.
 - 4) Fastening to floor plate or joining of unit sections to be accomplished by bolting through gasketed joints above the floor line or continuously welding. Fasteners which penetrate base floor plate are not acceptable. All equipment within air handling unit shall be provided with a minimum 2" high base to raise equipment off unit floor.
 - 5) The section downstream of the cooling coil of the unit base shall contain a minimum 1" NPT drain to facilitate section draining, maintenance and condensate removal. All areas in the base shall be drainable without standing water. Cleanout drain shall be provided with non-corrosive removable caps.

- 6) Floor insulation – Insulation per above foam with galvanized bottom liner

G. Unit Casing

1. Air handling unit casing shall be built up from the unit base with panels. The casing shall be designed to operate at 8” w.c. positive or negative pressure with a leakage rate less than 1% at 1-1/2 times design positive – leakage class CL₆ at 12” +/- operating pressures per AHRI Standard 1350.
2. All panels shall be double wall construction. Each panel shall contain an integral frame or be properly supported by a structural framing system. Steel frame assemblies shall be hot dipped galvanized after fabrication, or suitably treated with a rust inhibitor coating. Panel shall have continuous tight seal at the interior and exterior skins completely encapsulating the insulation. The inner panel shall be attached to the frame and the air tunnel shall be continuous without gaps where panels meet.
3. The minimum panel thickness shall be 2.0”. Panel assembly shall have a thermal conductivity of U=1 BTU/(h*ft² *°F) or less. Core material shall comply with NFPA 90A requirements.
4. Thickness of the panel skin, core density, rib structural frame spacing shall be regulated to eliminate panel pulsation and restrict the maximum deflection in each panel direction (width and height) to L/Specified value per unit Type of any span at 1-1/2 times design positive or negative pressure.
5. Any equipment flashing, internal partitions or other attachments to the casing shall be made in such a way as to ensure a permanent leak-tight connection. Attachments that are bolted, screwed, or welded to or through the casing shall not create air bypass, air leakage or rust propagation areas.
6. All ductwork penetrations through unit enclosure shall be provided with framed openings of size indicated on drawing attached to this document. Openings to be provided with radiused transition on the interior.
7. All conduit penetrations shall be provided with sleeves sealed watertight to unit casing; penetrations through the unit casings shall be by the unit manufacturer. Penetrations created by cutting through panels, compromising panel integrity, will not be acceptable.
8. Provide minimum 24” wide access doors for access to all internal components. Access doors shall be installed to open against the greatest pressure relative to air pressure on each side of access door.
 - a. Access doors shall be of the same construction as unit panels.

- b. Access doors shall contain a thermopane safety glass window (min. 12” square).
 - c. Provide minimum 1” dia. Test ports with screwed caps on casing upstream and downstream of all coils and filters for pressure and temperature measurement.
 - d. Each access door shall be mounted with a corrosion-resistant hinge and shall have at least two (2) non-corrosive handles operable from either side. The door handles shall include self-locking nuts and stainless steel hardware. Hinges and door hardware shall be constructed from stainless steel, aluminum, or other non-ferrous alloys.
9. Removable access panels shall be provided at future coil section and as indicated on the drawings for service and maintenance. Access panels shall be of the same construction as panels described above. Removable access panels shall be designed and constructed such that removal and replacement may be accomplished without disturbing adjacent panels. Airtight integrity must be maintained.
10. Interior panel shall be 304 stainless steel within all sections.
11. The following specifics shall apply:
- 1) Case Rated Pressure 8”
 - 2) Case Deflection L/240 @ Rated pressure
 - 3) Galvanized outer min 18 ga, 304 stainless steel inner, min 20 ga. Thicker metal gauge as required to meet pressure and deflection ratings.
 - 4) Exterior finish to be painted with a minimum of two coats of factory applied rust inhibitor paint or enamel.
 - 5) 2” thick minimum, rigid foam insulation
 - 6) No-thru-metal with 1/2” structural thermal break
 - 7) Wash down construction
 - 8) Sound Transmission Class, STC = 22 for rigid foam

H. Filter Sections

- 1. Filters are not required to be provided with unit. A filter rack shall be provided such that filters may be installed at a later date.
- 2. Each filter cell shall be 24” x 24”. The filter rack shall be arranged in a 2-wide by 3-high arrangement within the air tunnel.
- 3. Filters shall side loading from the unit exterior. Filter frames shall be 304 stainless steel construction. Frames to be provided with closed cell neoprene gasketing. Frames shall be designed to accommodate 2” deep panel pre-filters.

4. Filter holding frames shall be installed and sealed around perimeter of rack and at access door to prevent leakage around frames. Filter banks shall be reinforced with vertical stiffeners to assure rigidity. Unit manufacturer shall provide flashing between filter banks and unit casings to prevent air leakage or bypass around the frames.
5. Unit manufacturer shall provide and install a Dwyer Series 2000 magnehelic gauge complete with stainless steel static pressure tips and accessories for indicating the operating pressure drop of the filter bank. Indicating range of gauge shall be 0 – 1” w.c

I. Coil Section

1. A coil section shall be provided within the unit as scheduled, described below, and shown on the drawings. A coil shall NOT be provided with the unit. The intent is to provide a section for a coil to be installed in the unit during a future project.
 - a. Provisions for a future coil shall allow for the installation of a 8-row coil with the following characteristics: minimum 0.025” thick, 5/8” diameter, copper tubes, 0.010” aluminum fins, nonferrous headers with min. ½” dia. NPT drain and vent connections. Coil casings will be minimum 16 gauge 304 stainless steel.
 - b. Future Coils will be individually supported by a stainless steel rack system. This rack shall allow any one (1) coil to be removed without disturbing any other coil. Coils stacked one on top of the other will not be accepted.
 - c. Provide cut sheet and detailed drawing of a coil meeting this criteria in product submittal for ease of future ordering. Coil dimensions shall be the largest cross-sectional area that can fit within air tunnel.
2. The coil section shall include a sloped in a minimum of three direction, positive-draining stainless steel condensate pan assembly. Drain pan to be constructed from minimum 14 gauge 304 stainless steel material. Primary drain pan may be a sump section in the unit base. Drain pan to be provided with a drain connection of sufficient size to remove condensate, drain connection shall be on one side of the unit only and be provided with a threaded cap on the exterior of the unit. Drain pan will be included with purchased unit.

J. Electrical

1. All electrical work shall be installed in full compliance with the National Electric Code, and all local codes and requirements. Where applicable, components shall be UL approved. All equipment shall contain a grounding conductor.

WIRING : 600 volt rated, type, #12 THHN copper (minimum size).

CONDUIT: Heavy wall 304 stainless steel conduit, minimum 3/4" dia. Utilizing threaded type fittings and cast FS boxes. Conduit and wiring for lights shall be mounted on the interior of the unit. Conduit connection to devices shall be liquid-tight flexible metallic conduit.

3. Unit manufacturer shall furnish, install and wire a complete lighting system to one (1) identified 120 volt feed location. System shall be configured for shipping splits. Lighting system to include one (1) junction box power connection point, light fixtures, and switch per the following:
 - a) LIGHT FIXTURES: 120 volt, dust and moisture resistant, LED type. Each access section to be provided with minimum of one (1) light fixture.
 - b) LIGHT SWITCHES: 20 AMP, single pole, specification grade, 60 minute timer switch in cast FS device box. A single switch shall operate all light fixtures.

K. Controls

1. All work shall be installed in full compliance with the National Electric Code, and all local codes and requirements. Where applicable, components shall be UL approved. Wiring and devices are not included.
2. CONDUIT: Heavy wall 304 SS conduit within the air tunnel, exterior standard EMT, minimum 3/4" dia. Utilizing threaded type fittings and cast FS boxes. Conduit shall be mounted on the interior of the unit.
3. Include one (1) junction box connection point on the outside of the unit, conduit shall run on the inside of the unit with one junction box located in each section and where shown on the drawings. System shall be configured for shipping splits.

4. GUARANTEE

All materials, equipment, devices and components furnished under this proposal shall be guaranteed by the manufacturer to be free of any and all defects in materials and workmanship for a period of two (2) years from the date when the unit delivered to the job site. Any defects or malfunctions which develop as a result of defective materials or workmanship shall be corrected at no cost to the Owner. This guarantee shall include all costs of labor, materials and supplies to correct such defects or resulting from such defects.

5. O&M MANUALS

The manufacturer shall provide the Owner with three (3) sets of detailed operating, maintenance, and service instruction publications. A USB drive of maintenance and service operations shall also be provided with the Equipment.

6. MANUFACTURERS AND MODELS

Approved Manufacturers and series or models of the Equipment are:

ERU-1: Trane TCFS, Alliance Air Products, Climate Craft, Innovent, Seasons 4, Marlo, Temtrol, Governair, or Huntair.

Bids for alternate series units shall be considered only if permission to submit the alternate proposal has been obtained from UM Procurement. If approved, an addendum will be issued covering the alternate series.

7. SHOP DRAWINGS AND MATERIAL LISTS

Complete certified shop drawings and material lists shall be submitted within 10 days of Notice of Award. Shop drawings must include, as a minimum:

- a) Detailed construction drawings indicating dimensions, arrangement components, location and size of each field connection.
- b) Materials of construction, gauges, and finishes.
- c) Construction details.
- d) Bill of materials (lights, etc.)
- e) Wiring diagrams.
- f) Installation Instructions: rigging, installation, start-up instructions recommended by manufacturer.

Operational and Maintenance Manuals shall be prepared and shipped when the unit ships. They shall be transmitted to the Engineer for review and approval.



ENERGY RECOVERY UNIT SCHEDULE - OWNER FURNISHED, CONTRACTOR INSTALLED

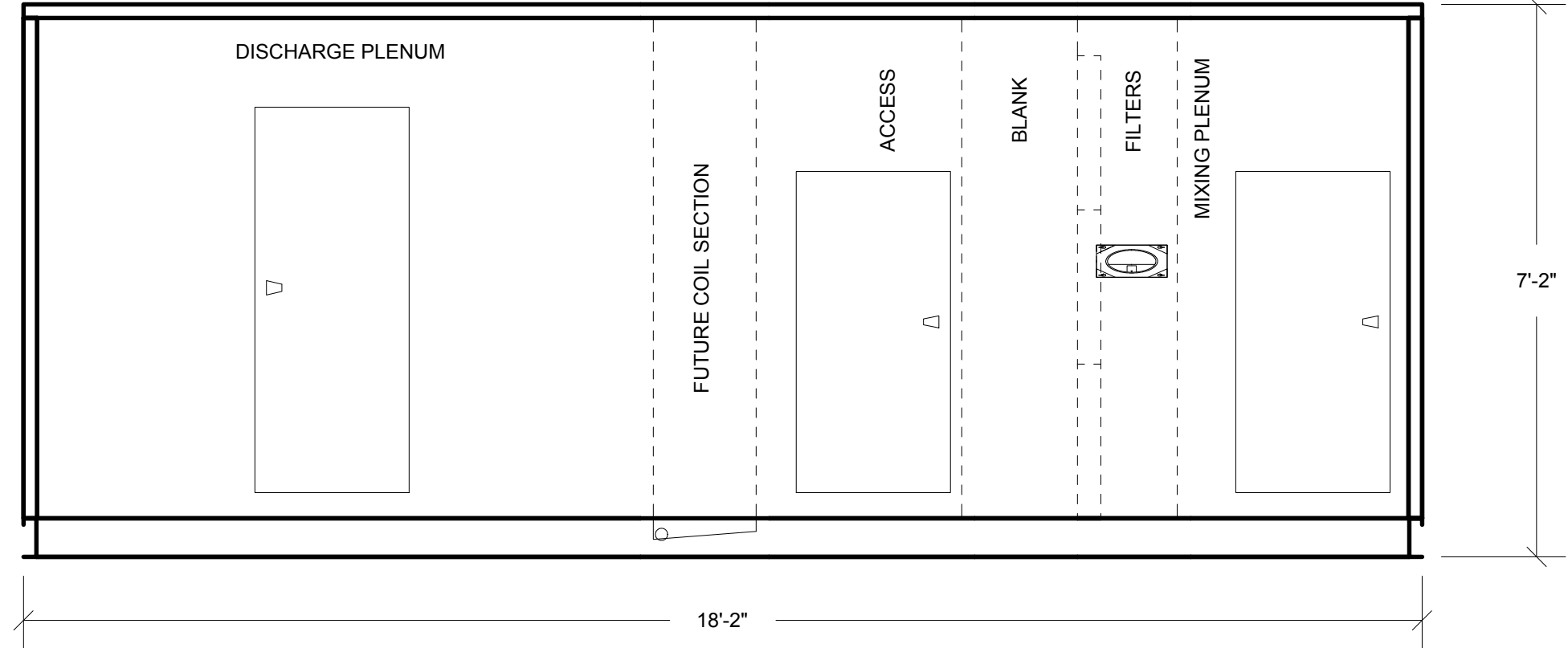
UNIT DESIG.	LOCATION	SERVICE	MANUFACTURER & MODEL NO.	TOTAL AIRFLOW (CFM)	MIXING SECTION LENGTH (FT.)	ACCESS		FILTER SECTION (SEE NOTES)			ACCESS		RUN-AROUND COIL (SEE NOTES)		ACCESS		NOTES
						LENGTH (IN.)	DOOR ORIENTATION	QUANTITY	SIZE (IN.)	DEPTH	LENGTH (IN.)	DOOR ORIENTATION	AIRFLOW (CFM)	MIN ROWS	LENGTH (IN.)	DOOR ORIENTATION	
ERU-1	ATTIC	FUME HOOD EXHAUST	REFER TO RFP	10,000	3	24	RH	6	24 X 24	2	24	RH	10,000	4	24	RH	ALL

ORIENTATION

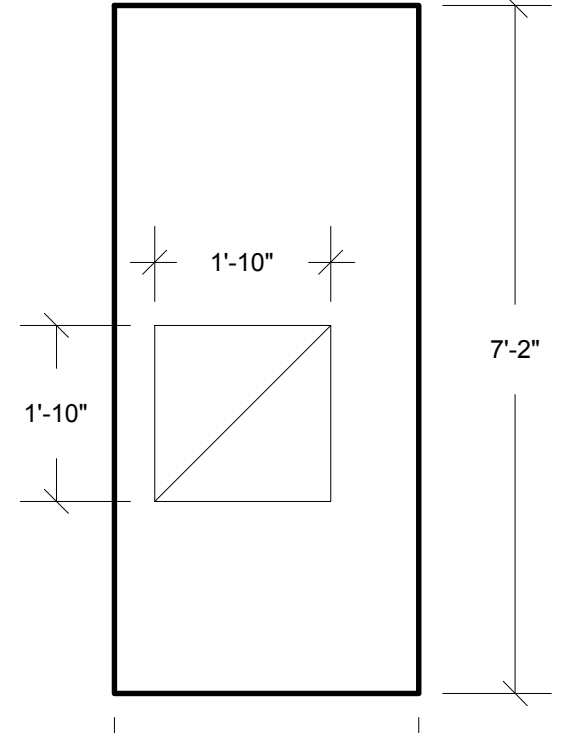
RH - RIGHT HAND
 LH - LEFT HAND
 (ORIENTATION BASED ON LOOKING INTO AIRFLOW)

GENERAL NOTES:

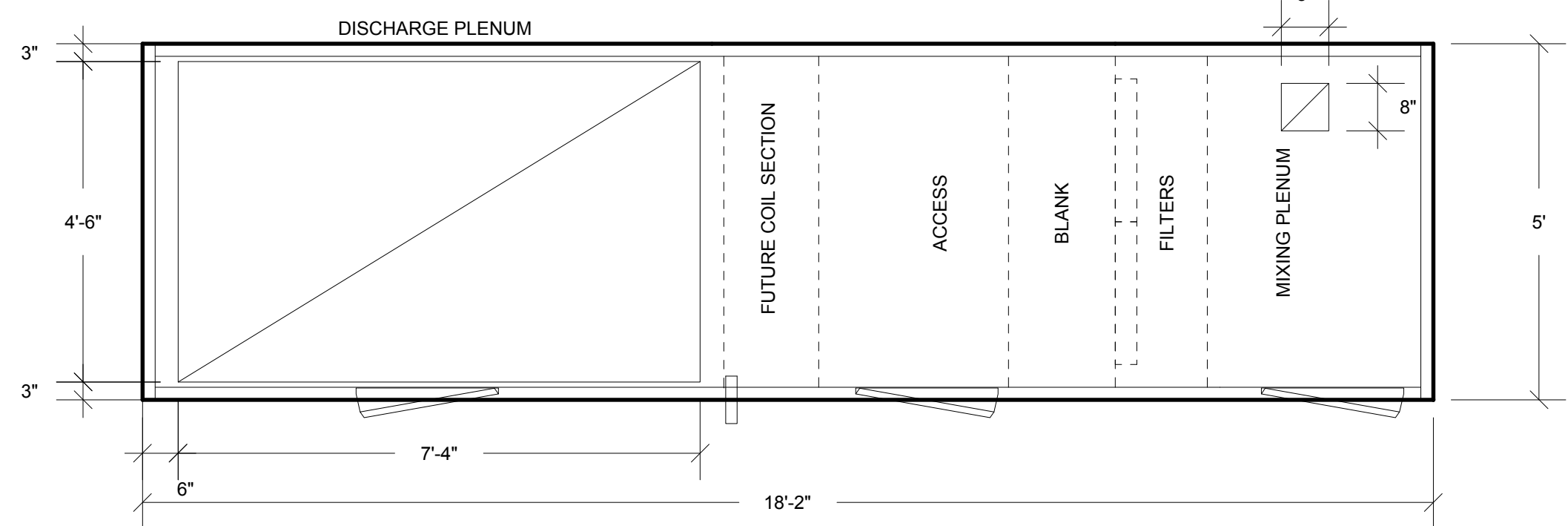
- UNIT TO INCLUDE FILTER RACK WITHIN AIR TUNNEL. FILTERS ARE NOT REQUIRED AND WILL BE INSTALLED AT A LATER DATE. FILTER RACK TO BE 2 WIDE BY 3 HIGH ARRANGEMENT.
- UNIT TO INCLUDE A SECTION FOR FUTURE INSTALLATION OF A 8-ROW RUN-AROUND COIL. STAINLESS STEEL DRAIN PAN TO PROVIDED WITH THREADED CAP ON EXTERIOR OF UNIT.
- UNIT TO INCLUDE LIGHTS IN EACH SECTION WITH A SINGLE POINT, 120V POWER CONNECTION.



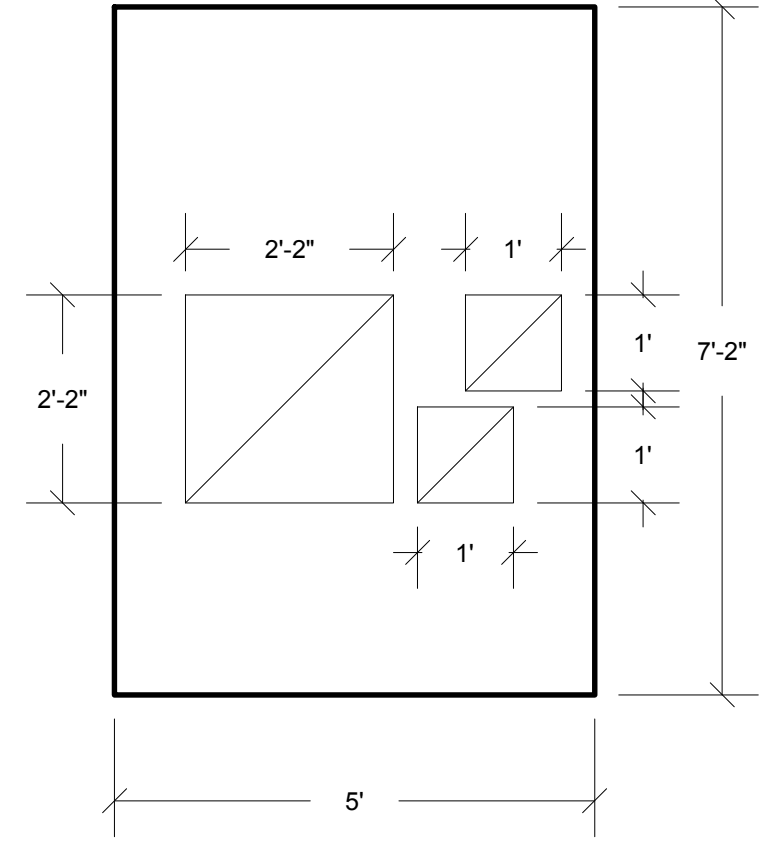
ERU-1 ELEVATION VIEW
 SCALE: 1/2" = 1'0"



ERU-1 MIXING PLENUM BACK ELEVATION
 SCALE: 1/2" = 1'0"



ERU-1 PLAN VIEW
 SCALE: 1/2" = 1'0"



ERU-1 MIXING PLENUM END ELEVATION
 SCALE: 1/2" = 1'0"

NO.	DATE	REVISIONS DESCRIPTION

DATE: 01/17/2024
 PROJECT #: 071672.000
 DRAWN BY: KA
 CHECKED BY: KG

ERU UNIT DIMENSION DRAWINGS

R5.01

File: S:\071672.000 UMC SCHWEITZER HALL ROOF AND HOOD FANS\03 MECHANICAL\R5.00-071672.000 Saved: 2024-1-10 09:27 By: KArrens

FHE-1 AND 2 PRODUCT SPECIFICATIONS

1. DESCRIPTION OF BID:

- a. Furnish and deliver F.O.B. Owner's premises, General Services Building, University of Missouri Columbia, Columbia, Missouri 65211, two (2) Laboratory Exhaust Fans as a part of an exhaust assembly as specified below.
- b. Estimated product delivery shall be submitted with each bid and may be considered in the bid evaluation.

2. CAPACITY AND PERFORMANCE REQUIREMENTS

Refer to the attached drawing for scheduled performance, dimensional data, and layout.

3. FHE-1&2 DESIGN CHARACTERISTICS

PART 1-GENERAL

1.1 References:

- .1 Fans must be tested in accordance with AMCA 210 and 300 in an AMCA accredited laboratory certified for air and sound performance.
- .2 Fans shall be UL and CUL listed per UL 705 safety standard.
- .3 Fans shall meet the criteria of NFPA-45.
- .4 Classification for Spark Resistant Construction shall conform to AMCA 99.

1.3 Submittals:

- .1 Submit shop drawings and product data sheets including performance data, fan performance curves, vibration levels, maintenance requirements and sound power levels.
- .2 Fan manufacturer shall furnish a certificate of guarantee stating that the fan, mixing plenum, outlet nozzle, acoustical silencer nozzle, stack extension if any, and all related accessories specified herein have been pre-tested at the factory and that the curves supplied in 1.3.1 have been de-rated for any and all system effects created by the accessories.

1.4 Warranty

1. Fan manufacturer shall provide a 7 year parts warranty from time of purchase to include fan, motor and drive mechanisms including pillow blocks, sheaves, shafts, couplings. This warranty shall be held solely by the fan manufacturer. All warranty claims, as defined above, shall be the sole responsibility of the fan manufacturer.

PART 2 - PRODUCTS

2.1 Mixed-flow induced dilution fans:

- .1 Impellers shall be mounted directly to the motor shaft to provide Arrangement 4 Direct Drive. Motors shall be isolated from the primary exhaust air stream. Motor maintenance shall be limited to greasing and accessible from the fan exterior.
- .2 Mixed flow impellers shall consist of combination axial/backward curved blades and shall be of welded steel construction unless scheduled AMCA Spark Clas B. The impellers shall have non-stall and non-overloading performance characteristics with aerodynamically stable operation at any point on the fan curves.
- .3 Fan Performance shall be as stated on the schedule. The Static Pressure stated on the schedule shall be at the inlet to the “Fan System” and does not include any losses of equipment provided by the fan manufacturer (ie: dampers, internal losses, stack discharge losses, etc.). All losses for the equipment provided by the fan manufacturer shall be detailed in the fan manufacturers technical proposal and or submittal.
- .4 Fan and all drive components, including motors, shall have a combined bearing life of a minimum of $L_{10} = 150,000$ hours.
- .5 Stationary discharge guide vane sections shall be provided to increase fan efficiencies.
- .6 Fan dynamic balance shall not exceed 0.5 mil, peak-to-peak for 1800RPM fans, or 0.055 in/sec -peak for 1800 RPM fans measured at the blade pass area when operating at fan frequency. Vibration isolation shall be limited to rubber-in-shear pad type isolators.
- .7 Factory test reports detailing vibration levels at the blade pass area shall be provided. Vibration levels shall be reported in both the axial and radial direction and shall not be greater than 0.5 mils peak-to-peak at the blade pass area.
- .8 Standard fan assemblies (4 feet or lesser above standard height) shall be designed for mounting on conventional roof curb without the need for guy wire supports.
- .9 Discharges shall include twin nozzles with passive third central stacks that are capable of generating aspiration. They shall be chemically and UV resistant.
- .10 Entrainment windbands shall provide secondary induction of outside air. Induction shall take place downstream of the fan impeller and shall not influence BHP or static pressure requirements. The manufacturer shall publish discharge volumes for all fans at specified primary exhaust flow.
- .11 Fan shall be constructed to AMCA “B” standards per AMCA 99 with a non-ferrous inlet bell provided in order to reduce sparking in the event of a motor bearing failure.
- .12 Fans shall be modular construction and capable of being assembled on the roof.
- .13 Chemical resistant gaskets shall be provided at all companion flanged joints.
- .14 Fasteners shall be 316 stainless steel.
- .15 A bolted access door shall be provided for impeller inspection on each fan.
- .16 Fans and accessories shall have internal drain systems to prevent rainwater from entering building duct system.
- .17 Electric motors shall be TEFC Mill & Chemical duty with a 1.15 service factor and an L_{10} bearing life of 150,000 hours. Premium Efficient motors shall have regreasable bearings with grease relief fittings in every NEMA frame. Fan motors shall be C-Face and foot mounted. Shaft grounding kits shall be installed

- on motors below 400 frames and insulated bearings on motors frames 400 and above.
- .18 Extended motor lube lines of Teflon tubing covered with braided stainless steel shall be provided. Extended lube lines shall be mounted to a bracket located on the fan housing with grease relief fittings on each line.
 - .19 A NEMA 4x non-fused rotary disconnect switch shall be provided, mounted and wired to each motor.
 - .20 All steel and aluminum surfaces components must be coated with a high solids epoxy with low VOC chemical resistant barrier coating epoxy. The coating system, a total thickness of up to 12 mils, is not affected by the UV component of sunlight (does not chalk), and has superior corrosion resistance to acid, alkali, and solvents. Coating system shall exceed 7000 hour ASTM B117 Salt Spray Resistance. Standard finish color to be gray. All coatings that include a zinc-rich epoxy primer are strictly prohibited. Zinc coatings react with alkalis and acids, thus causing premature failure of the coating system and should never be used for laboratory applications.
 - .21 The fan supplied must meet the system exhaust CFM and the motor BHP shall not be larger than that shown on the fan schedule.
 - .24 Fan and Mixing Box systems supplied by the manufacturer must have a footprint as shown on the drawings / schedule. Exhaust systems with larger footprints shall not be acceptable.
 - .25 The static pressure shown on the schedule is based on the static pressure requirements at the inlet to the mixing box. Any system deviating from the basis of design shall include and detail in their proposal additional losses for flexible connectors, fan losses, mixing box, etc. that are not included in their fan curves. In addition, any deviation from the basis of design shall be subject to requirements stated in sections 1.3.2, 2.1.8.

3.1 Accessories

- .1 Inlet mixing plenums shall be provided by the fan manufacturer. Each plenum shall be sized to support the weight and performance requirement of the number of fans listed on the schedule. Multiple-fan plenums shall be double wall construction with structural stiffeners. Double-wall plenum shall have an overall minimum wall thickness of 1.5". Outer skin of double wall plenums shall be coated Galvaneal steel or embossed aluminum. Inner skin shall be uncoated 304 stainless steel. Multiple-fan plenums shall be able to withstand a minimum of 12 in. w.g. of negative pressure. All plenums shall be capable of supporting the fan(s) without guy wires or supports. The plenums shall include hinged access doors. The primary air inlets shall be located on the bottom as noted on drawings. Plenums shall be suitable for mounting on roof curbs.
- .2 Bypass dampers shall be provided with all mixing plenums for outside air with primary exhaust. Bypass dampers shall be sized to bypass the airflow capacity of one fan at the required static pressure of the system. Dampers will be opposed blade low leakage air foil control dampers with extended shaft for connection to an operator. The dampers shall be all aluminum construction. Rain hoods shall be provided with each damper. The dampers shall be controlled by electric

proportional control damper actuators, which require no crank arm nor linkage. Bypass damper actuators shall be warranted under the original part manufacturer's warranty term.

- .3 Low leakage isolation dampers shall be constructed of aluminum air foil extrusions and epoxy coated. Operators shall be 2 position, shall have On-off electronic spring return damper actuators that are direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft. Isolation damper actuators shall be warranted under the original part manufacturer's warranty term.
- .4 Vortex breakers shall be provided on all side inlet and multiple fan plenums.
- .5 A galvanized steel roof curb shall be provided to support the fans/plenums. The curb shall be minimum 14 gauge and canted for rigidity in wind loads. The curb shall include a rigid fiberglass liner and a wood nailer.
- .6 Acoustical Silencer Nozzle shall be designed as an integral component of the exhaust fan discharge nozzle and shall not increase the height of the overall assembly. Integral Acoustical Silencer Nozzle with a minimum of 12dBA insertion loss. Lining the interior of the windband is not an acceptable method of attenuation due to line of site sound in the free area between the nozzle and windband.

A. The silencer shall be constructed with an outer shell of fiber-reinforced plastic. The inner liner shall be perforated corrosion-resistant steel. The silencer shall match the color of the fans. Acoustic media shall be isolated from the air stream by a non-fibrous acoustical media.

4. GUARANTEE

All materials, equipment, devices and components furnished under this proposal shall be guaranteed by the manufacturer to be free of any and all defects in materials and workmanship for a period of two (2) years from the date when the unit delivered to the job site. Any defects or malfunctions which develop as a result of defective materials or workmanship shall be corrected at no cost to the Owner. This guarantee shall include all costs of labor, materials and supplies to correct such defects or resulting from such defects.

5. STARTUP, O&M MANUALS, TRAINING, AND INSPECTIONS

After installation, the exhaust fan FHE-1/2 manufacturer shall provide the services of a technical representative of the manufacturer to inspect the completed installation including all wiring and control connections, and auxiliary apparatus. This test shall be made in the presence of the Engineer and the Owner's designated representative.

The manufacturer shall provide the Owner with three (3) sets of detailed operating, maintenance, and service instruction publications. A USB drive of maintenance and service operations shall also be provided with the Equipment.

6. MANUFACTURERS AND MODELS

Approved Manufacturers and series or models of the Equipment are:

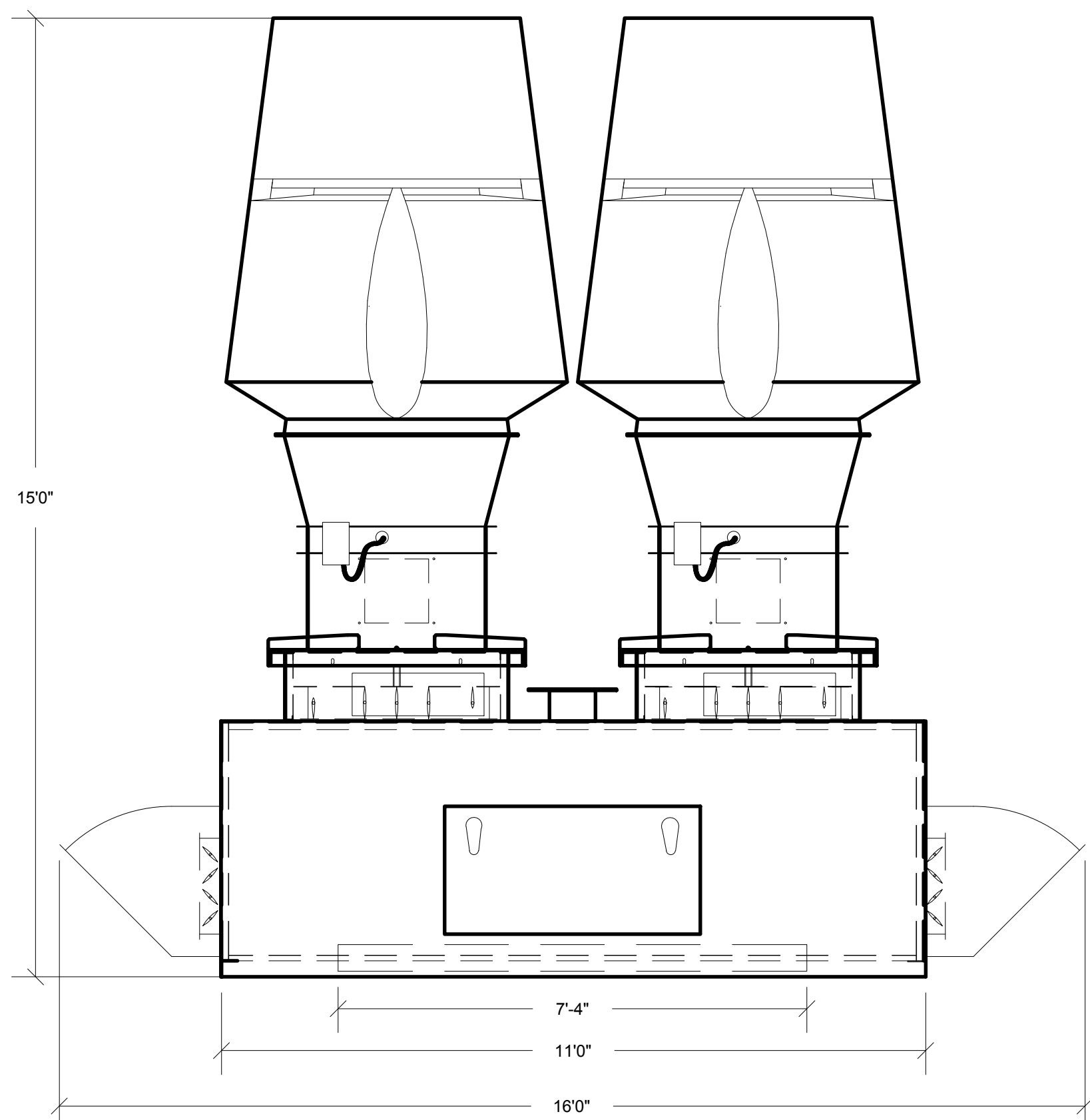
FHE-1/2: Strobic Air Corporation TS Series, Greenheck Vektor-MD Series, or Twin Cities TVIFE Series.

Bids for alternate series units shall be considered only if permission to submit the alternate proposal has been obtained from UM Procurement. If approved, an addendum will be issued covering the alternate series.

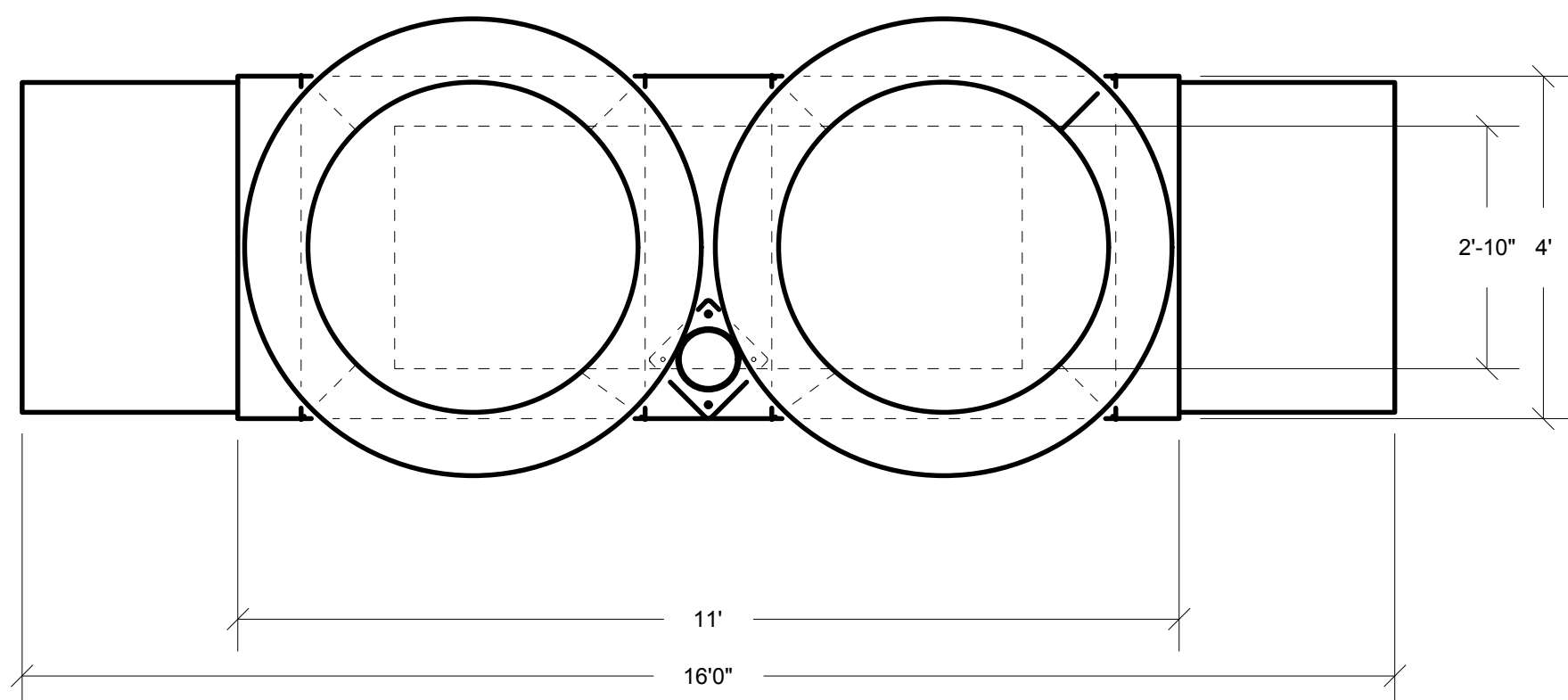
7. SHOP DRAWINGS AND MATERIAL LISTS

Complete certified shop drawings and material lists shall be submitted within 10 days of Notice of Award. Shop drawings must include, as a minimum:

- a) Detailed construction drawings indicating dimensions, arrangement components, location and size of each field connection.
- b) Materials of construction, gauges, and finishes.
- c) Construction details.
- d) Bill of materials (lights, etc.)
- e) Wiring diagrams.
- f) Installation Instructions: rigging, installation, start-up instructions recommended by manufacturer.



FHE-1/2 ELEVATION VIEW
SCALE: 1/2" = 1'-0"



FHE-1/2 PLAN VIEW
SCALE: 1/2" = 1'-0"

FAN SCHEDULE - OWNER FURNISHED CONTRACTOR INSTALLED

UNIT DESIG.	LOCATION	SERVICE	MANUFACTURER & MODEL NO.	FAN TYPE	AIRFLOW (CFM)	FSP (IN. W.C.)	RPM	WHEEL DIAM. (IN.)	FAN DISCHARGE	MOTOR				UNIT CONTROL	ACCESSORIES	NOTES
										BHP	HP	RPM	VOLTS/PH			
FHE-1	ROOF	FUME HOOD EXHAUST	STROBIC TS-1L	LAB EXH	10,000	5.0	1800	33.0	UBD	19.9	20	1800	208/3	VFD (BY DIV 26)	ALL	ALL
FHE-2	ROOF	FUME HOOD EXHAUST	STROBIC TS-1L	LAB EXH	10,000	5.0	1800	33.0	UBD	19.9	20	1800	208/3	VFD (BY DIV 26)	ALL	ALL

- | | | |
|---|---|--|
| <p>FAN TYPE:
CENTRIFUGAL
IN-LINE CENTRIFUGAL
ROOF EXHAUSTER
UTILITY FAN
PROPELLER FAN
MIXED FLOW IN-LINE
LAB EXHAUSTER</p> | <p>FAN DISCHARGE:
THD - TOP HORIZONTAL DISCHARGE
BHD - BOTTOM HORIZONTAL DISCHARGE
TAU - TOP ANGULAR DISCHARGE
BH - BOTTOM ANGULAR DISCHARGE
UBD - UP BLAST DISCHARGE
DBD - DOWN BLAST DISCHARGE
HM - HORIZONTAL MOUNT</p> | <p>ACCESSORIES:
1. DISCHARGE SILENCER NOZZLE
2. ACOUSTICAL WINDBAND
3. INSULATED DOUBLE WALL PLENUM, BOTTOM INLET
4. ISOLATION DAMPER AND ACTUATOR WITH END SWITCH, 120V TO 24V TRANSFORMER (TYP EACH FAN INLET)
5. BYPASS DAMPER WITH RAIN HOOD AND ACTUATOR, 120V TO 24 TRANSFORMER (TYP EACH FAN)
6. FACTORY STEEL ROOF CURB WITH STRUCTURAL STIFFENERS AND CANTED BASE
7. JIB SOCKET
8. MANUFACTURER PROVIDED ROOF CURB WITH CANTED BASE.</p> |
|---|---|--|

- NOTES:**
- A. ALL FANS WITH VFD DRIVES SHALL HAVE INVERTER DUTY MOTORS, OTHERWISE A PREMIUM EFFICIENCY MOTOR SHALL BE PROVIDED REFER TO MOTOR SPECIFICATIONS FOR MORE DETAIL.
 - B. BASIS OF DESIGN FAN MODEL STROBIC M33C20N2004
 - C. FHE-1 & 2 TO BE LIFTED AS SEPARATE COMPONENTS AND ASSEMBLED BY CONTRACTOR IN FIELD.
 - D. FAN STATIC PRESSURE IS REQUIRED INLET STATIC PRESSURE. MANUFACTURER TO ADD FAN STATIC PRESSURE TO THIS VALUE.



CP231262 - SCHWEITZER HALL ROOF REPLACEMENT
 COLUMBIA, MO
 503 S. COLLEGE AVE.

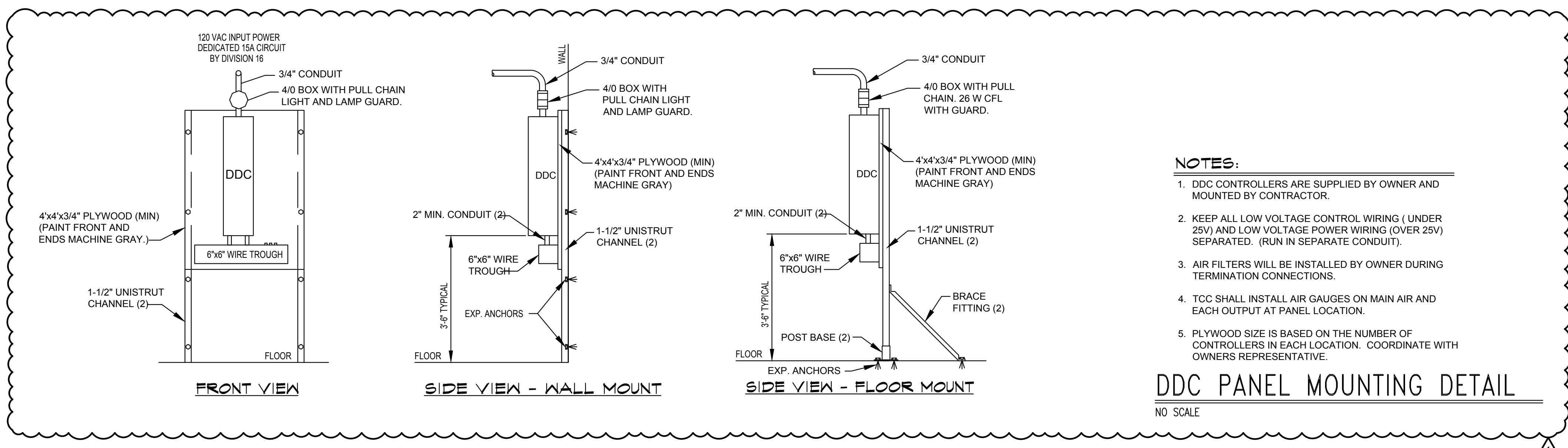
NO.	DATE	REVISIONS DESCRIPTION

DATE: 01/17/2024
PROJECT #: 071672.000
DRAWN BY: KA
CHECKED BY: KG

FHE UNIT DIMENSION DRAWINGS

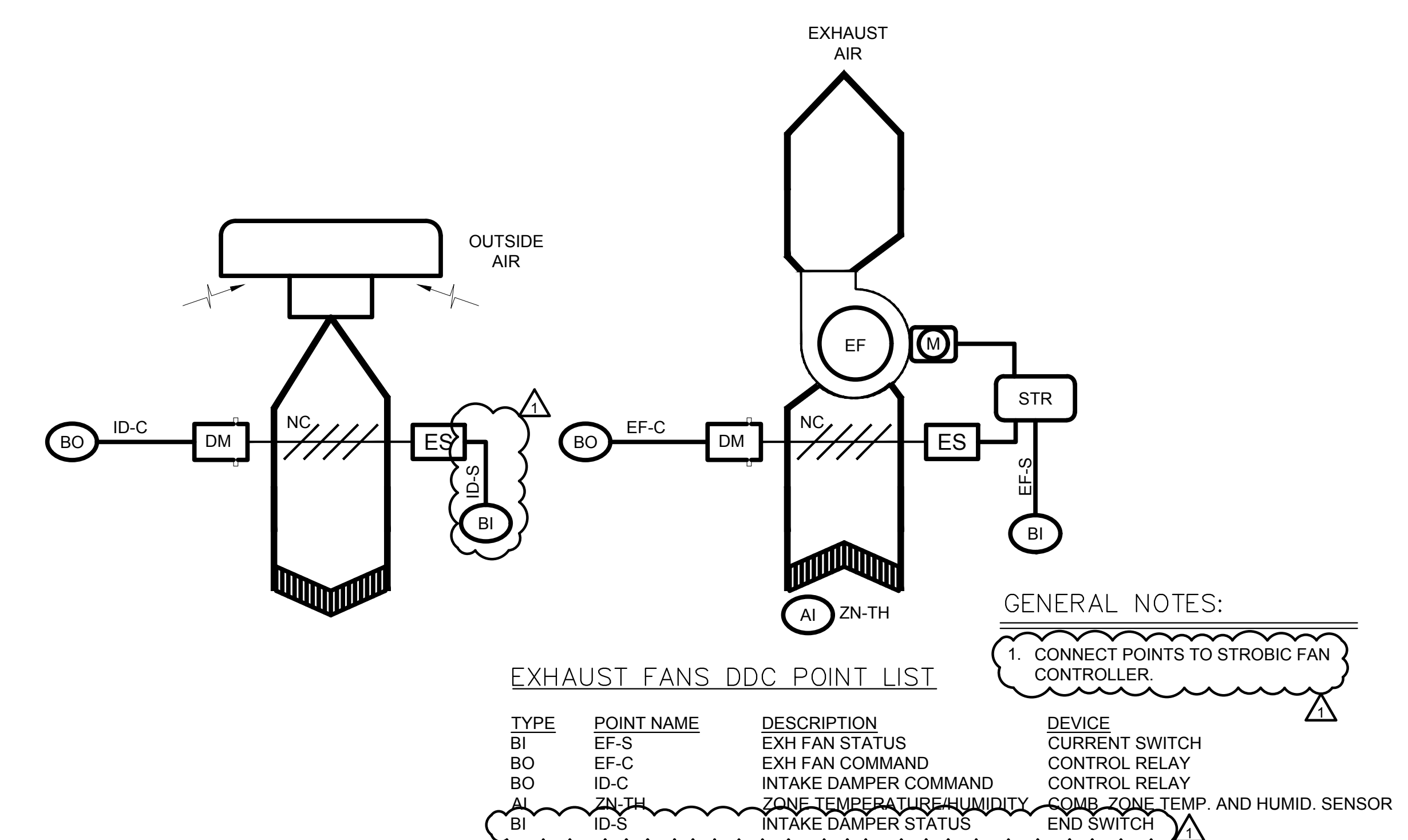
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- NOTES:**
- DDC CONTROLLERS ARE SUPPLIED BY OWNER AND MOUNTED BY CONTRACTOR.
 - KEEP ALL LOW VOLTAGE CONTROL WIRING (UNDER 25V) AND LOW VOLTAGE POWER WIRING (OVER 25V) SEPARATED. (RUN IN SEPARATE CONDUIT).
 - AIR FILTERS WILL BE INSTALLED BY OWNER DURING TERMINATION CONNECTIONS.
 - TCC SHALL INSTALL AIR GAUGES ON MAIN AIR AND EACH OUTPUT AT PANEL LOCATION.
 - PLYWOOD SIZE IS BASED ON THE NUMBER OF CONTROLLERS IN EACH LOCATION. COORDINATE WITH OWNERS REPRESENTATIVE.

DDC PANEL MOUNTING DETAIL
NO SCALE

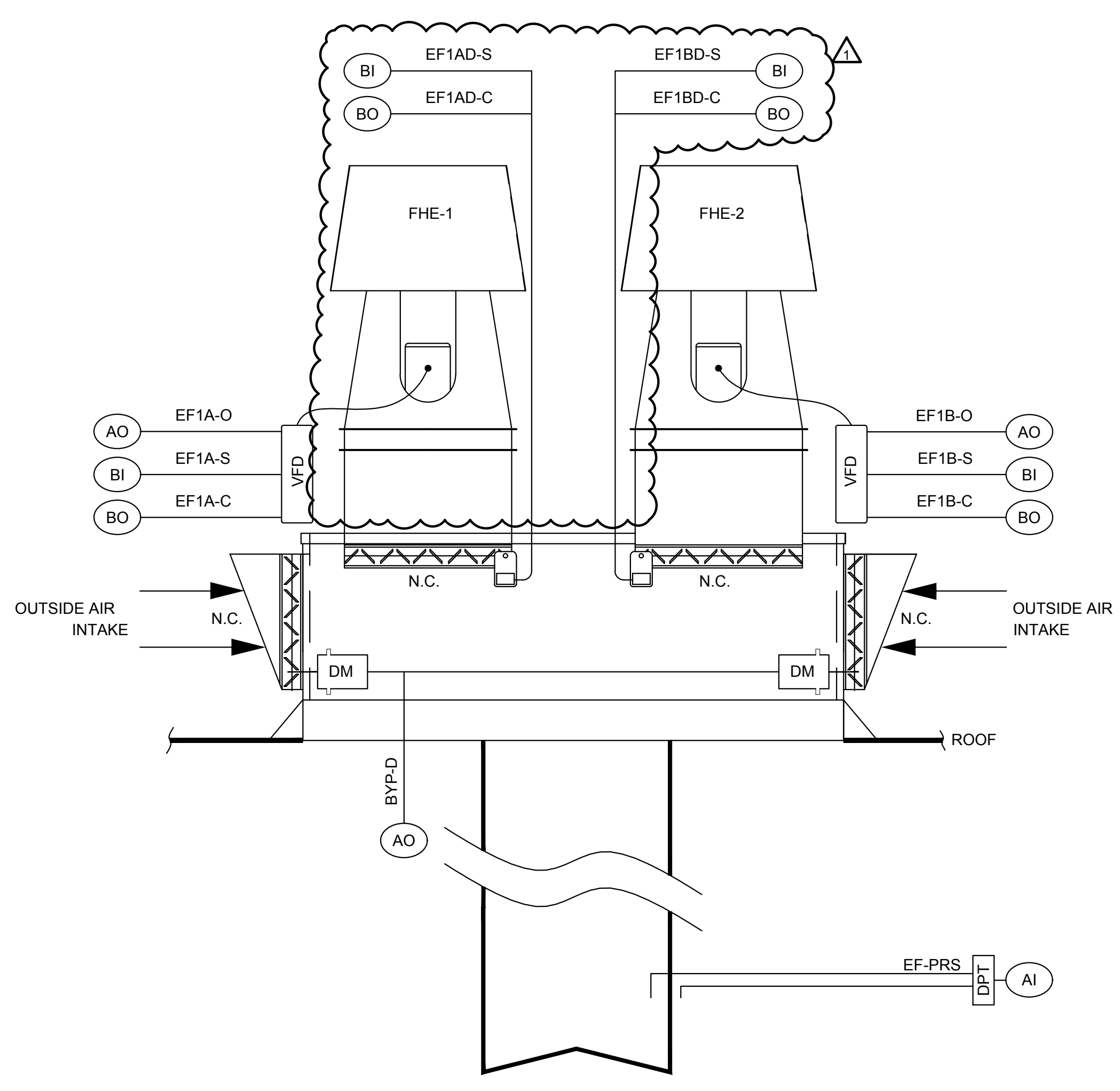


EXHAUST FANS DDC POINT LIST

TYPE	POINT NAME	DESCRIPTION	DEVICE
BI	EF-S	EXH FAN STATUS	CURRENT SWITCH
BO	EF-C	EXH FAN COMMAND	CONTROL RELAY
BO	ID-C	INTAKE DAMPER COMMAND	CONTROL RELAY
AI	ZN-TH	ZONE TEMPERATURE/HUMIDITY	COMB. ZONE TEMP. AND HUMID. SENSOR
BI	ID-S	INTAKE DAMPER STATUS	END SWITCH

- GENERAL NOTES:**
- CONNECT POINTS TO STROBIC FAN CONTROLLER.

EXHAUST FAN CONTROL DETAIL
NO SCALE

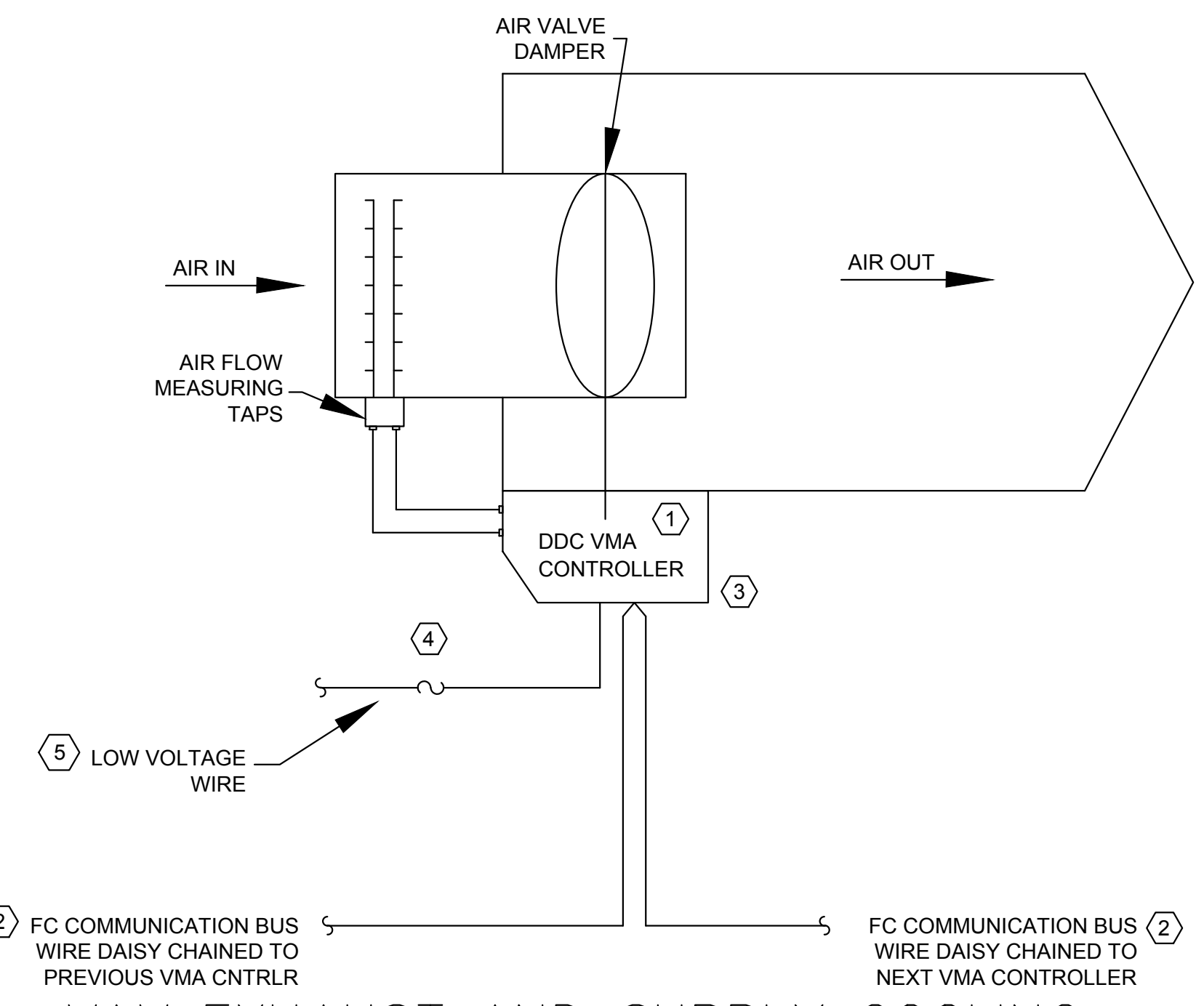


STROBIC EXHAUST FAN DETAIL
NO SCALE

STROBIC FAN DDC POINT LIST

TYPE	POINT NAME	DESCRIPTION	DEVICE
AI	EF-P	EXH FAN STATIC PRESSURE	DP TRANSMITTER
AO	FHE1-O	EXH FAN OUTPUT	VFD
AO	FHE2-O	EXH FAN OUTPUT	VFD
BI	FHE1-S	EXH FAN STATUS	CURRENT SWITCH
BI	FHE2-S	EXH FAN STATUS	CURRENT SWITCH
BO	FHE1-C	EXH FAN COMMAND	CONTROL RELAY
BO	FHE2-C	EXH FAN COMMAND	CONTROL RELAY
BI	EF1AD-C	EXH FAN ISO DAMPER COMMAND	CONTROL RELAY
BI	EF1AD-S	EXH FAN ISO DAMPER STATUS	END SWITCH
BO	EF1BD-C	EXH FAN ISO DAMPER COMMAND	CONTROL RELAY
BI	EF1BD-S	EXH FAN ISO DAMPER STATUS	END SWITCH

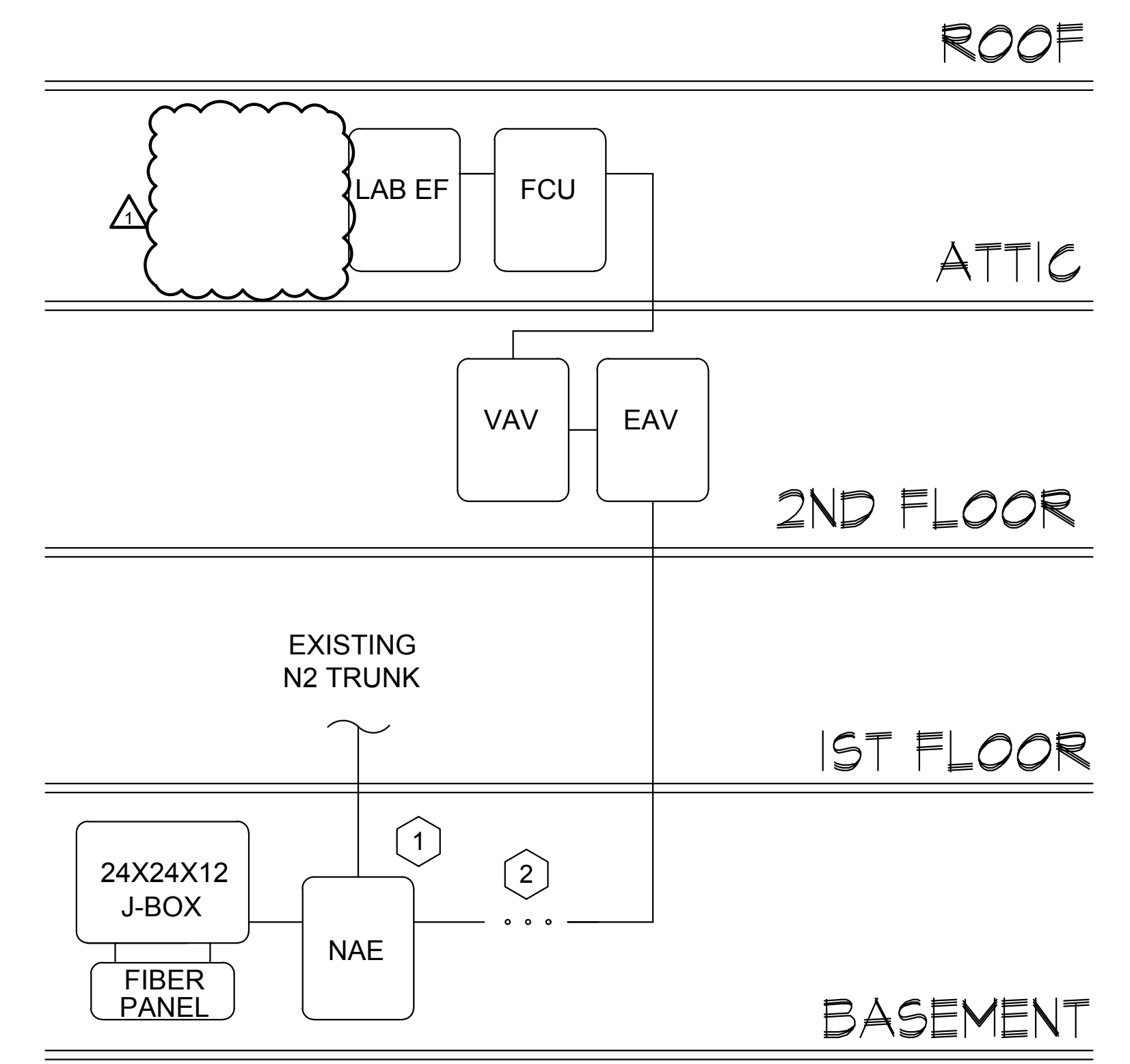
- NOTES:**
- DPT SHALL BE INSTALLED ON DUCTWORK APPROXIMATELY 1/2 DOWN THE DUCT, AND WIRED BACK TO CORRESPONDING CONTROL PANEL, UNLESS SHOWN OTHERWISE OR APPROVED BY OWNERS REPRESENTATIVE.
 - LOCATE EPS, CTS, AND RELAYS IN PANEL NEXT TO EMCS PANEL.
 - ANY DEVICE REQUIRING POWER MUST BE POWERED BY CONTRACTOR.
 - ISOLATION DAMPER ACTUATOR TO BE DE-ENERGIZED WHEN POWER TO THE EXHAUST FAN MOTOR IS INTERRUPTED. THIS SHOULD BE HARDWIRED (AUX CONTACTS ON LOCAL DISCONNECTS).
 - SEE MECHANICAL PLANS FOR STATIC PRESSURE TRANSMITTER LOCATIONS.



VAV EXHAUST AND SUPPLY COOLING ONLY BOX CONTROL DIAGRAM
NO SCALE

- NOTES:**
- VMA TERMINAL INCLUDES CONSTANT VOLUME (CV) UNITS & VARIABLE AIR VOLUME (VAV) UNITS. UNLESS OTHERWISE NOTED, ALL CONTROL WORK SHALL BE BY CONTRACTOR.
 - CAPS FOR VAV DP TEST PORTS MUST BE NEOPREME CAPS OR 1/4\"/>

- KEYED NOTES:**
- CONTROLLER WILL BE FURNISHED BY OWNER. CONTROLLER WILL BE JCI MODEL MS-VMA-16XX SERIES OR M4-CVM-3050. PROGRAMMING WILL BE PROVIDED BY OWNER.
 - FC COMMUNICATION BUS WIRE SHALL BE 22 AWG, PLENUM RATED, TWISTED SHIELDED, 3 CONDUCTOR, WITH BLUE OUTER CASING. DESCRIBED AS 22-03 OAS STR PLNM NEON BLU JK DISTRIBUTED BY WINDY CITY WIRE CONSTRUCTED BY CABLE-TEK, OR APPROVED EQUIVALENT.
 - CONTROLLER MUST HAVE A MINIMUM OF 18 INCHES OF ACCESSIBLE CLEARANCE.
 - FUSE LOCATED WITHIN 2 FT. OF VMA CONTROLLER. IN LINE REMOVABLE FUSE, NOT FIXED TO FUSE HOLDER
 - LOW VOLTAGE WIRE BY DIVISION 23. SEE ELECTRICAL DRAWINGS FOR SOURCE.



KEYED NOTES:

- MU SHALL REPLACE EXISTING NAE.
- PROVIDE NEW FC BUS TO NEW EXHAUST VAV BOX, FCU, AND EF CONTROLLER.

GENERAL NOTES:

- FC BUS TO BE CONTINUOUS DAISY CHAIN WITHOUT SPLICES. CONNECTIONS CAN ONLY BE MADE AT CONTROLLERS. SEE PLANS FOR QUANTITY AND LOCATIONS OF VAV/FCU CONTROLLERS. LOCATE PANELS IN SAME ROOM AS EQUIPMENT SERVED.
- FC COMMUNICATION BUS WIRE SHALL BE 22 AWG, PLENUM RATED, TWISTED SHIELDED, 3 CONDUCTOR, WITH BLUE OUTER CASING. DESCRIBED AS 22-03 OAS STR PLNM NEON BLU JK DISTRIBUTED BY WINDY CITY WIRE, CONSTRUCTED BY CABLE-TEK, OR APPROVED EQUIVALENT.
- NAE'S CAN HAVE TWO TRUNKS EACH WITH 85 DEVICES. INSTALL A REPEATER AFTER 50 DEVICES. TRUNKS CAN NOT BE OVERLOADED. COORDINATE FINAL ROUTING WITH OWNERS REPRESENTATIVE.
- ALL NON JCI BACNET DEVICES MUST BE SEPARATED ONTO THEIR OWN TRUNK(S) AS SHOWN. LIMIT BACNET TRUNKS TO 40 DEVICES OR 3000 POINTS.

FC BUS SCHEMATIC DIAGRAM
NO SCALE

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Saint Louis, Missouri 63102
T (314) 645-6232
MEP Engineers
McClure Engineering
Professional Engineering Corporation
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MU

CP231262 - SCHWEITZER HALL ROOF REPLACEMENT

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NICHOLAS B. ALLEN
REGISTERED PROFESSIONAL ENGINEER
STATE OF MISSOURI
NUMBER 220000000
EXPIRES 12-31-2024

NO.	DATE	DESCRIPTION
1	02/07/2024	ADDENDUM NO. 1

DATE: 01/17/2024
PROJECT #: 071672.000
DRAWN BY: KA
CHECKED BY: KG

CONTROL DIAGRAMS

M5.01

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File: S:\071672.000 UMC SCHWEITZER HALL ROOF AND HOOD FANS\03 MECHANICAL\M5.01-071672.000 Saved: 2024-1-17 07:16 By: Karens

TEMPERATURE CONTROL SEQUENCES OF OPERATION:

LAB EXHAUST FAN SEQUENCE (FHE-1/2)

SYSTEM OVERVIEW:

THE CENTRAL LAB EXHAUST SYSTEM CONSISTS OF AN ENERGY RECOVERY UNIT (ERU-1) AND EXHAUST FAN ASSEMBLY (FHE-1/2). THE EXHAUST FAN ASSEMBLY INCLUDES AN INTAKE PLENUM WITH BYPASS DAMPERS, TWO HIGH PLUME EXHAUST FANS WITH VFD SPEED CONTROL, AND AN ISOLATION DAMPER AT THE INLET TO EACH FAN. THE FANS ARE SIZED FOR N+1 REDUNDANCY.

SCHEDULE:

THE SYSTEM SHALL OPERATE 24/7/365.

FAN CONTROL:

A GIVEN FAN SHALL OPERATE TO MEET THE STATIC PRESSURE SETPOINT (ONLY ONE FAN WILL OPERATE AT A TIME). THE SENSOR IS LOCATED IN THE INLET OF ERU-1. THE SETPOINT SHALL INITIALLY BE SET TO -2" W.C. AND A FINAL SETPOINT SHALL BE DETERMINED BY THE BALANCER. THE LEAD FAN SHALL SWITCH WEEKLY, SUNDAY AT 1AM (ADJUSTABLE). AS THE LEAD FAN SWITCHES, BOTH FANS SHALL OPERATE SUCH THAT THE STATIC PRESSURE SETPOINT IS MAINTAINED. EACH FAN ISOLATION DAMPER INCLUDES AN END SWITCH. THE ISOLATION DAMPER SHALL BE COMMANDED OPEN WHEN THE FAN IS COMMANDED ON AND CLOSED WHEN THE CORRESPONDING FAN IS OFF. THE RESPECTIVE FAN SHALL NOT OPERATE UNTIL THE ISOLATION DAMPER END SWITCH IS MET. FAN BYPASS DAMPERS SHALL MODULATE OPEN WHEN A CORRESPONDING FAN IS ON AND MODULATE CLOSED WHEN THE RESPECTIVE FAN IS OFF.

FAN COIL UNIT SEQUENCE:

THE FAN COIL UNIT IS LOCATED IN THE ATTIC FAN ROOM AND CONSISTS OF A FAN, FILTERS, CHILLED WATER COOLING COIL, AND HOT WATER HEATING COIL. A T-STAT PROVIDED BY DIV 25 SHALL BE WALL MOUNTED IN THE SPACE. THE SPACE TEMPERATURE SETPOINT RANGE SHALL BE 55F-85F (ADJ.). WHEN THE SPACE TEMPERATURE EXCEEDS 85F THE COOLING COIL CONTROL VALVE SHALL BE COMMANDED OPEN AND THE FAN SHALL BE COMMANDED ON. UPON A DROP IN SPACE TEMPERATURE BELOW 82F (ADJ.) THE FAN SHALL BE COMMANDED OFF AND THE COOLING COIL CONTROL VALVE SHALL MODULATE CLOSED. WHEN SPACE TEMPERATURE DROPS BELOW 55F THE HEATING COIL CONTROL VALVE SHALL MODULATE OPEN AND THE FAN SHALL BE COMMANDED ON. WHEN THE SPACE TEMPERATURE RISES ABOVE 58F (ADJ.) THE HEATING COIL SHALL BE COMMANDED CLOSED AND THE FAN SHALL BE COMMANDED OFF.

EXHAUST VENTURI VALVE SEQUENCE:

EXHAUST VENTURI VALVES ARE CONSTANT VOLUME VENTURI VALVES WITH MECHANICAL COMPONENTS TO MAINTAIN CONSTANT AIRFLOW. VALVES SERVING FUME HOODS INCLUDE FUME HOOD ALARM MONITORS AT THE RESPECTIVE FUME HOOD. WHEN THE PRESSURE SWITCH ON THE VALVE INDICATES LOW PRESSURE, A VISUAL ALARM SHALL BE INITIATED AT THE FUME HOOD DISPLAY.

GENERAL EXHAUST BOX SEQUENCE (EAV-146):

GENERAL EXHAUST TERMINAL UNIT SERVES 1ST FLOOR RESTROOMS AND SHALL OPERATE AT A CONSTANT AIRFLOW RATE. TERMINAL UNIT INCLUDES MODULATING ACTUATOR AND INLET AIRFLOW SENSOR RING. THE ACTUATOR SHALL MODULATE TO MAINTAIN THE AIRFLOW SETPOINT SHOWN ON THE SCHEDULES.

SUPPLY VAV SEQUENCE (VAV-218)

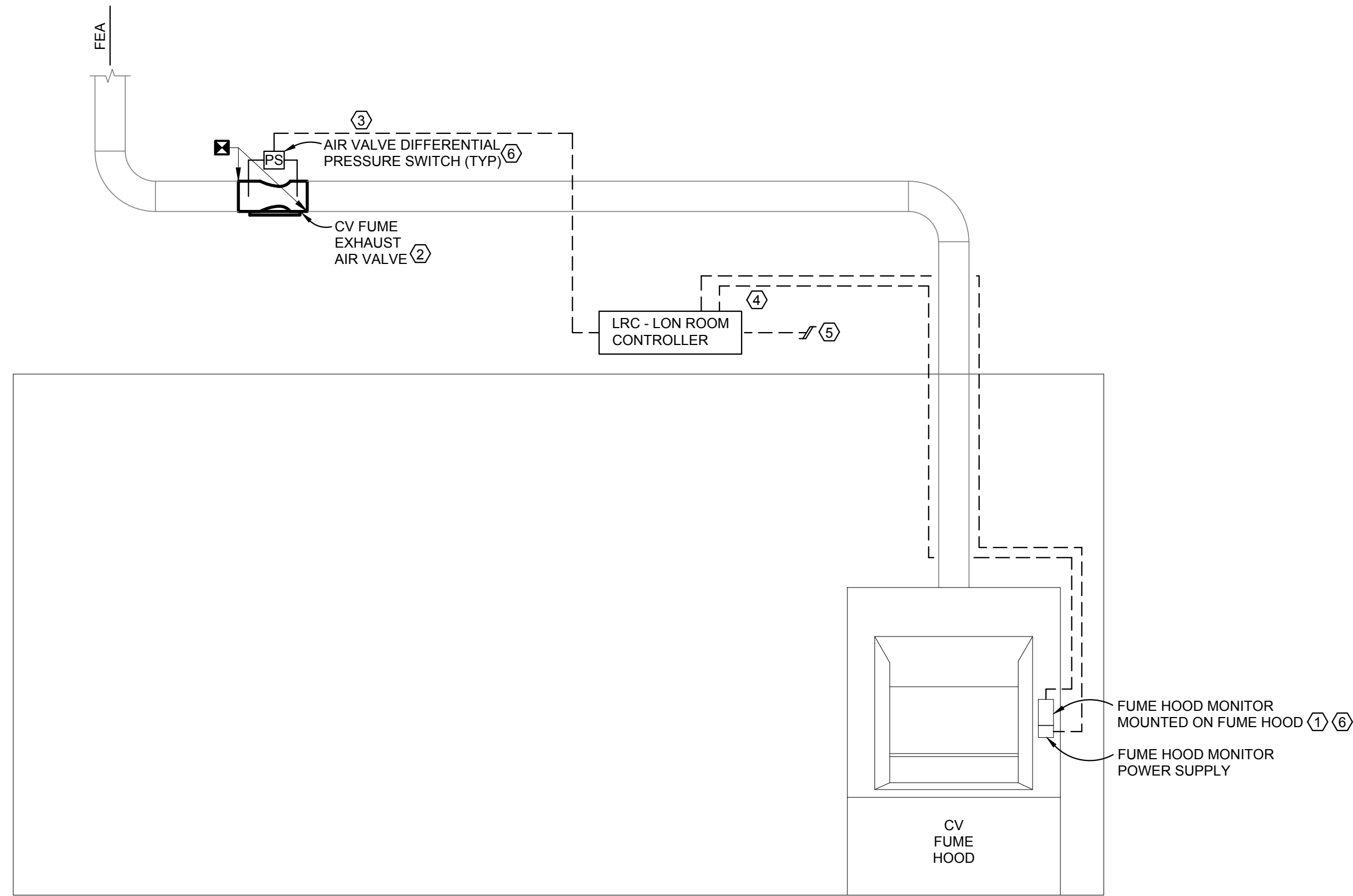
SUPPLY VAV-218 IS A COOLING ONLY VAV THAT SERVES SECOND FLOOR CONFERENCE ROOM 218 AND SHALL OPERATE AT A CONSTANT AIRFLOW RATE. TERMINAL UNIT INCLUDES MODULATING ACTUATOR AND INLET AIRFLOW SENSOR RING. THE ACTUATOR SHALL MODULATE TO MAINTAIN THE AIRFLOW SETPOINT SHOWN ON THE SCHEDULES.

ATTIC VENTILATION FAN SEQUENCE (EF-3)

THE ATTIC VENTILATION CONSISTS OF AN INTAKE HOOD WITH 24VAC 2-POSITION DAMPER WITH END SWITCH, ROOF EXHAUSTER WITH 24VAC 2-POSITION DAMPER WITH END SWITCH, AND COMBINATION ZONE TEMP/HUMIDITY SENSOR.

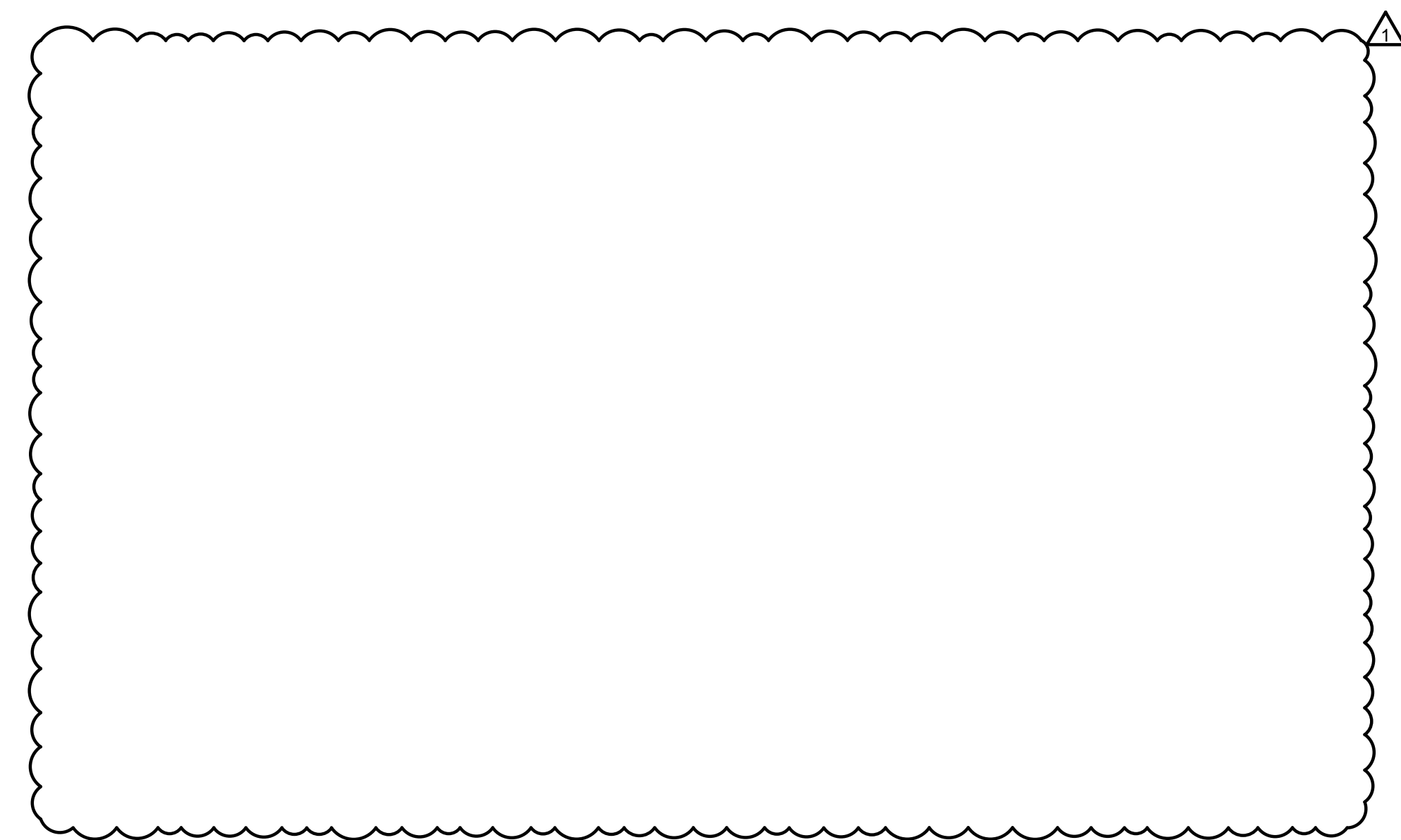
WHEN THE TEMPERATURE RISES ABOVE 95°F WITHIN THE ATTIC SPACE, EXHAUST FAN AND INTAKE DAMPERS SHALL BOTH MODULATE OPEN AND THE EXHAUST FAN SHALL BE COMMANDED ON. UPON A DROP IN TEMPERATURE BELOW 90°F THE FAN SHALL BE COMMANDED OFF AND INTAKE/FAN DAMPER SHALL BE COMMANDED CLOSED.

WHEN ATTIC HUMIDITY RISES ABOVE 85% RH EXHAUST FAN AND INTAKE DAMPERS SHALL BOTH MODULATE OPEN AND THE EXHAUST FAN SHALL BE COMMANDED ON. UPON A DROP IN HUMIDITY BELOW 75%RH THE FAN SHALL BE COMMANDED OFF AND INTAKE/FAN DAMPER SHALL BE COMMANDED CLOSED.



LABORATORY AIRFLOW CONTROL SYSTEM SCHEMATIC

NO SCALE



FAN COIL UNIT DETAIL

NO SCALE

KEYED NOTES:

- ① PHOENIX CONTROLS FHD-110 FUME HOOD MONITOR OR APPROVED EQUIVALENT.
- ② PHOENIX CONTROLS CEVB1#ML-ACNHZ-PSL.
- ③ 2-CONDUCTOR WIRE ROUTED FROM PRESSURE SWITCH ON AIR VALVE TO LRC BY DIV 25 CONTRACTOR.
- ④ 2-CONDUCTER 24 VAC POWER FROM LRC TO FUME HOOD DISPLAY BY DIV 25 CONTRACTOR.
- ⑤ 24 VAC POWER BY DIV 25 CONTRACTOR FROM POWER SUPPLIED BY DIV 26. REFER TO E SERIES DRAWINGS FOR LOCATIONS.
- ⑥ WHEN THE DIFFERENTIAL PRESSURE ACROSS THE VALVE DROPS BELOW THE MINIMUM OPERATING DIFFERENTIAL PRESSURE, THE SWITCH SHALL NOTIFY THE FUME HOOD MONITOR, WHICH SHALL GENERATE AN AUDIBLE AND VISUAL ALARM.

KEYED NOTES:

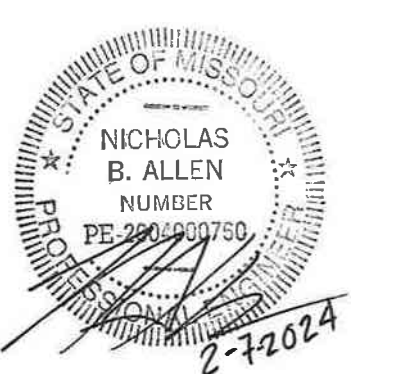
- ① FAN RELAYS WIRING SHALL BE CONNECTED TO A TERMINAL STRIP IN THE FCU AT THE FACTORY. CONTROL VALVES WIRED IN FIELD FROM FACTORY TERMINAL STRIP.
- ② ALL CONDUIT AND WIRING SHALL BE BY CONTRACTOR. WIRING SHALL BE PROVIDED FROM FCU TERMINAL STRIP TO THE THERMOSTAT LOCATION WITH AN EXTRA 3-FOOT LENGTH OF WIRE AT THE THERMOSTAT LOCATION.
- ③ THERMOSTAT CONTROLLER WILL BE FURNISHED AND INSTALLED BY OWNER. CONTROLLER WILL BE JCI MODEL TEC SERIES. CONTRACTOR SHALL ROUGH-IN CONDUIT AND BOX FOR MOUNTING REMOTELY LOCATED THERMOSTATS. OWNER WILL TERMINATE, PROGRAM, AND COMMISSION CONTROLLER AFTER POWER IS ENERGIZED TO FCU.
- ④ FC COMMUNICATION BUS WIRE SHALL BE 22 AWG PLENUM RATED, TWISTED SHIELDED, 3 CONDUCTOR. FC BUS TO BE PULLED BY CONTRACTOR AND SHALL BE CONTINUOUS DAISY CHAIN WITHOUT SPLICES. SEE FC LAYOUT DETAIL. LEAVE EXTRA 3-FOOT OF WIRE AT THERMOSTAT LOCATION.
- ⑤ SERVICE DISCONNECT/SWITCH AND TRANSFORMER PROVIDED AND INSTALLED BY CONTRACTOR.
- ⑥ 8 CONDUCTOR 22 GAUGE TWISTED, SHIELDED, STRANDED WIRE



COLUMBIA, MO

CP231262 - SCHWEITZER HALL ROOF REPLACEMENT

803 S. COLLEGE AVE.



NICK B. ALLEN
MO # PE200400760

NO.	DATE	DESCRIPTION
1	02/07/2024	ADDENDUM NO. 1

DATE: 01/17/2024
PROJECT #: 071672.000
DRAWN BY: KA
CHECKED BY: KG

CONTROL DIAGRAMS

M5.02