ADDENDUM NUMBER ONE

To the Drawings and Project Manual

Dated: 13 May 2025

Entitled: BL065 - Optometry School - Lab Renovation Rooms 401, 406, 407 (IU20241256)

Owner:
Trustees of Indiana University
Bloomington, IN 47408

Project Address:
Indiana University Bloomington Campus

Prepared By:

Chris W. Lake, AIA

Indiana Registration No. AR10400187

Addendum Dated: 13 May 2025

Project Number: 24-065

CHANGES TO THE PROJECT MANUAL

1. DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

   a. Section 230952 “HVAC INSTRUMENTATION AND CONTROLS”

      (1) DELETE Section 230592 in its entirety and replace with the attached Section 230592.

CHANGES TO THE DRAWINGS

1. DRAWING SHEETS: ADDITIONS, DELETIONS AND REPLACEMENTS

   a. Changes as indicated in chart below:

Drawing No.	INDICATE ACTION: REPLACE (r), add (a), delete (d)
M-SERIES DRAWINGS	
MD101	DELETE AND REPLACE
MH101	DELETE AND REPLACE
MP101	DELETE AND REPLACE
M-601	DELETE AND REPLACE
M-701	DELETE AND REPLACE
M-702	DELETE AND REPLACE

GENERAL CLARIFICATIONS/QUESTIONS

1. What is the size of the freight elevator for stocking?

   ANSWER: There is only one passenger elevator so no freight elevator, but see attached PDF showing its cab dimensions.

2. What is the deck height for the fourth floor?

   ANSWER: 12’-6” (see attached PDF)

3. What is the allowable deflection for the metal stud framing

   ANSWER: L/240

4. What is the seismic category?

   ANSWER: B

5. What are the cleaning expectations for the hallway?

ANSWER: Daily mopping is required to keep dust from becoming an issue (tracking throughout the floor and impacting researchers). Mopping around equipment in the hallway will be required.

6. What will be the best approach for loud tasks, i.e. core drilling? Other disruptions?

   ANSWER: These types of loud tasks should be prioritized to occur outside of the building's hours of operation (8:00-5:00, Monday thru Friday). The building opens at 6:00 am. 3-day notice is required for power outages and typically these should be prioritized as early as possible to avoid impact to building occupants.

7. Will the communications be "Rough-in" only with UITS providing/installing the communications cabling?

   ANSWER: Provide rough-ins only for communications cabling as detailed in the documents. All communications cabling and terminations will be provided by UITS.

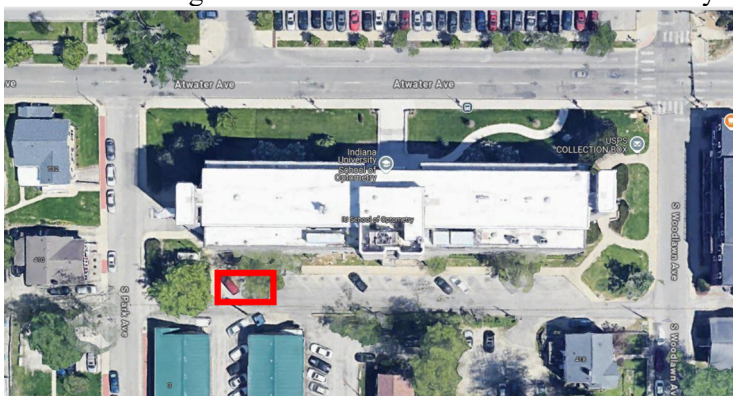
8. Can you elaborate on the drying racks requirements and on the adjustable height tables?

   ANSWER: These should all be provided by the contractor, the tables are as described on the equipment sheet and are to be in the lab casework scope. The drying racks are also by the lab casework company, there is peg-style drying rack mounted to the side of the existing cabinet and a much smaller wall mounted dish drying rack that can be purchased through Amazon, see image of item name below. The size needed is single tier, wall mount.

   Wall Mount Dish Drying Rack, Hanging Dish Racks for Kitchen Dish Drainer with Drain Tray Bowls Plates Coffee Cups Wine Glasses Utensil Holder Small Compact Black
   Visit the junyuan Store

9. Can the dumpster location be provided?

   ANSWER: Image below of desired location from University.



END OF ADDENDUM NUMBER ONE

Attachments:

1. Pre-Bid Meeting Minutes + Sign-in Sheet (2025-05-07)
2. Building Section (depicting deck heights)
3. Elevator shop drawings
4. Specification Section 230952
5. MD101
6. MH101
7. MP101
8. M-601
9. M-701
10. M-702

05/07/25

Project: IU 20241256 - BL065 - Optometry School - Lab Renovation Rooms 401, 406, 407

DELV Project No: 24-065

Meeting Minutes

Meeting Minutes – Pre-Bid Meeting (IU 20241256)

Date/Time: 05/07/25 @ 3:00 pm
Location: Optometry Building – Fourth Floor Lobby

Project Team Attendees:

Jeff Moulden	IU Capital Projects
Diana Short	DELV Design
Lojine Breakah	DELV Design

Contractors Present:

Sign-in to be distributed with Addendum #1

Meeting Agenda (w/ Summary Comments)

1. Introductions
2. Design Intent (Led by DELV)–
    a. General Project Description
    b. Architectural/MEP Overview
3. Schedule –
    a. Bids Due – 05/22/25 @ 2:00pm
    b. Questions to be submitted by 2:00pm on Thursday, May 15, 2025.
    c. Construction Complete – 9/1/2025 for Lab 406 and 11/21/2025 for the remainder of the scope.
4. Construction (led by IU) –
    a. Use of Site
        i. Access
            1. All contractor personnel must have a Crimson Card.

2. IU Indy will provide construction cores where needed
3. Parking with tags in marked lots.
4. Loading and unloading is where?
5. Staging will need to be within the space.
6. Dumpster location?
7. Cleaning and noise requirements
8. Bi-Weekly meetings during construction
9. E-Builder will be used for most CA processes.
    a. Submittals will be via email with the final approved copy uploaded to E-Builder.

5. Addendums will be issued as needed. Addendum #1, to include Pre-bid Meeting Minutes, will be issued on 05/13/24.

6. Q/A-

IU PROJECT NO.
IU 20241256-bl065
DELV PROJECT NO.
24-065

07 MAY 2025

IUB Optometry School - Lab Renovation Rooms 401, 406, 407

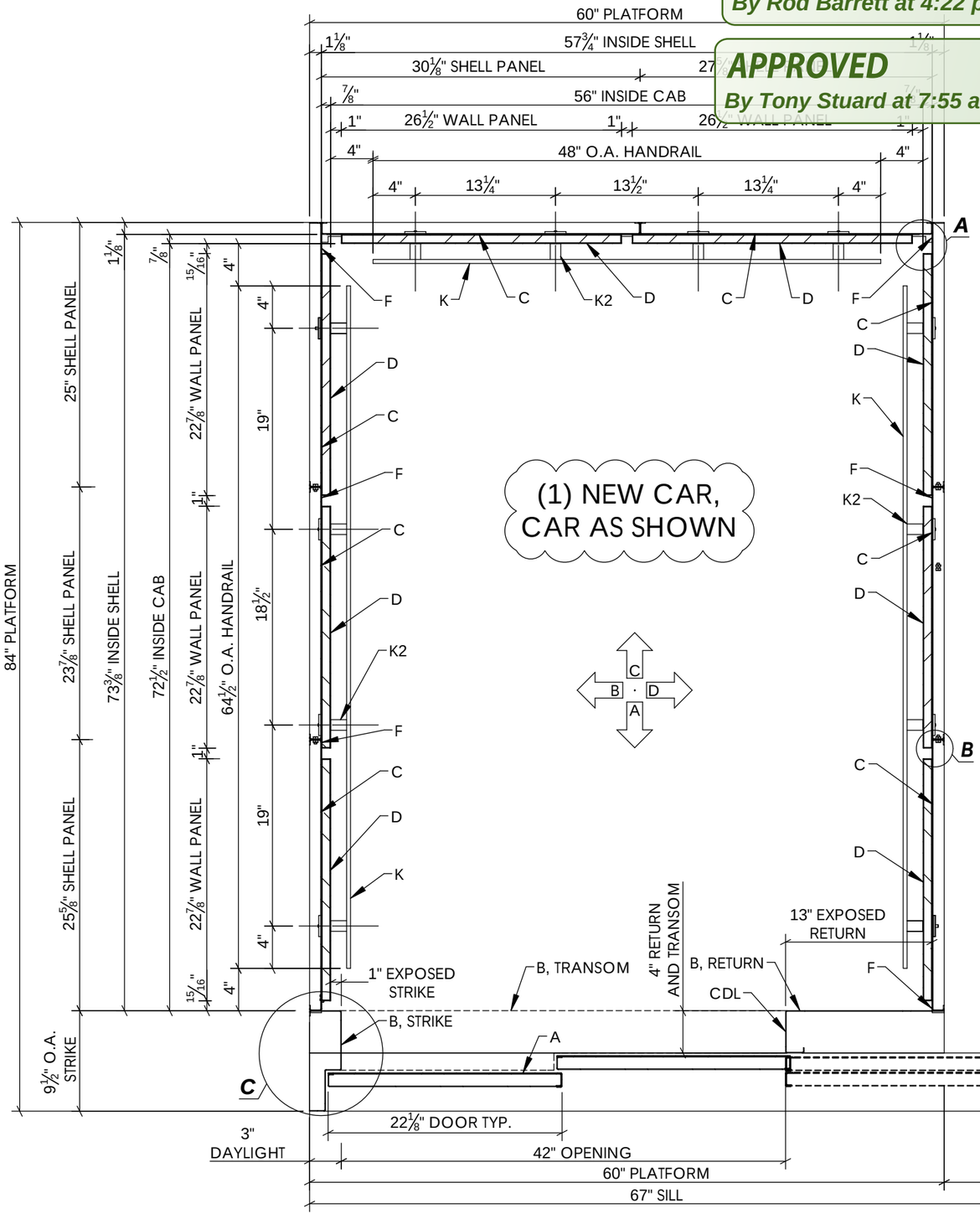
PRE-CONSTRUCTION MEETING SIGN-IN SHEET

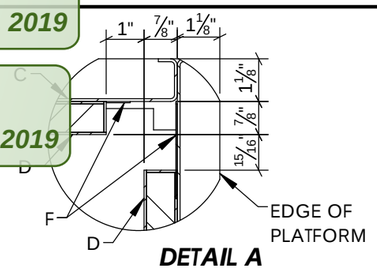
Name + Company	Email	Phone
Diana Short – DELV	diana@DELVdesign.com	(317) 296-7400
Lojine Breakah	Lojine@DELVdesign.com	--
Chris Kelley Electric Plus	ckelley@electricplus.com	812-325-3048
Joe Townsend	IU CPF	812-855-6489
Charlie Whitlow	C-CAT cwhitlow@c-cat.com	317-696-7574
Larry Lee	Larry@ Rose Construction	317-908-7892
Rud Sills	rsills@weddlebros.com	812-320-7283
Mallory Halcomb	mhalcomb@Harrell-fish.com	317-517-5541
Andy Hays	ahays@spartanmechanical.net	(812)327-3598
JEFF MOULDER	JMOULDER@IU.EDU	812-320-0021

TYPICAL COPING
FLASHING & SEALANT DETAILS
DETAIL 8
DETAIL 5
SET ANCHORS IN MORTAR SO AS NOT TO RESTRICT EXPANSION
PRIME & CAULK ALL BEDS & JOINTS PLUS RESILIENT BACK UP MATERIAL
SECTION LOOKING EAST
BETWEEN COL'S. 16 & 17
SCALE 1/4" = 1'-0"
RM 155
DETAIL SH. 8A
DETAIL 7
STONE BETWEEN SUPPORTS
ALL COPING TO HAVE
GROUND
4th FLOOR
5th FLOOR
TRANSVERSE SECTION, WALL DETAILS, STONE ANCHORS
WM. J. STRAIN, A.I.A.
ARCHITECT
BLOOMINGTON, INDIANA
EGGERS & HIGGINS
CONSULTING ARCHITECTS
NEW YORK, NEW YORK
CONSULTING ENGINEERS (STRUCT.)
INDIANAPOLIS, INDIANA
CONSULTING ENGINEERS (MECH. & ELECT.)
INDIANAPOLIS, INDIANA
LANDSCAPE ARCHITECT
INDIANAPOLIS, INDIANA
BUILDING FOR THE
DIVISION OF OPTOMETRY
FOR
INDIANA UNIVERSITY
BLOOMINGTON, INDIANA
SH
13

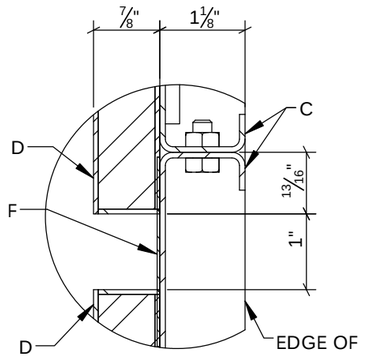
APPROVED With Changes
By Rod Barrett at 4:22 pm, Aug 14, 2019

APPROVED
By Tony Stuard at 7:55 am, Aug 15, 2019

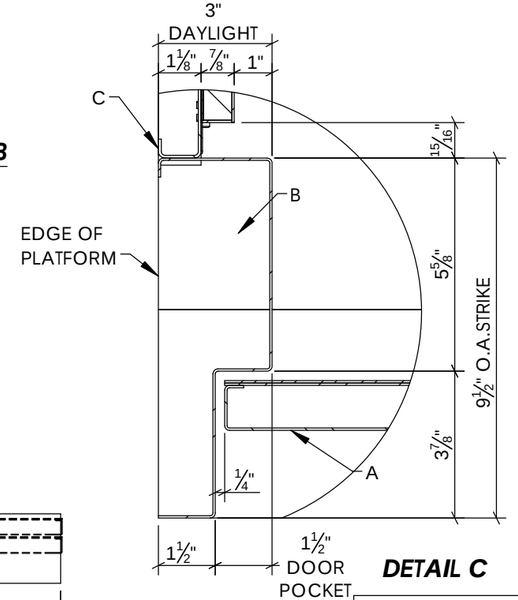




DETAIL A



DETAIL B



DETAIL C

MATERIALS AND FINISHES		*WEIGHT: 1911 LBS*
A	**DOORS**	42" X 84" DOUBLE SPD SSL LH, 1 1/4" DOOR CORE CLAD W/#4 SATIN STAINLESS STEEL [16GA] (2 GIBS PER DOOR PANEL)
B	**FRONTS**	(1) STATIONARY RETURN; (1) STRIKE AND (1) FULL WIDTH TRANSOM #4 SATIN ST. STEEL [16GA]
C	**SHELL**	GALVANIZED STEEL [14GA]
D	**WALL PANELS**	VERTICAL, REMOVABLE CLASS B, 3/4" FRPB W/ BALANCE BACKER FACED AND EDGED ON VERTICAL SIDES W/ 5WL RIGIDIZED STAINLESS STEEL[16 GA]
F	**REVEALS/BASE**	BETWEEN & BELOW PANELS #4 SATIN ST. STEEL [20GA]
G	**UPPER CEILING**	W/ HINGED EMERGENCY EXIT, PAINTED STEEL [12GA]
H	**LOWER CEILING**	W/ LIFTOUT EXIT, 3/4" F.R.P.B. MULTIPLE SECTIONS FACED W/ #4 SATIN ST. STL. [20GA]
J	**LIGHTING**	(6) UNIT MAN-D-TEC WARM WHITE 3000K DOWNLIGHTS W/ BLACK TRIM & DIMMER
K	**HANDRAILS/BUMPERRAILS**	TWO ROWS @ REAR AND SIDE WALLS 3/8" X 2" STAINLESS STEEL BAR WITH STRAIGHT ENDS
K2	**RAIL BRACKETS**	1"∅ ST. STL. 1 1/2" LONG REMOVABLE TK TYPE WITH 2" X 2" REINFORCEMENT PLATES
L	**SILL**	5 1/2" X 67" ALUMINUM
M	**FAN**	MAN-D-TEC STD. TWO SPEED FAN WITH BAFFLE
N	**PAD HANGERS**	ST. STL. STUD TYPE @ WALLS & RETURN
-	**HEADER ANGLE/ OPERATOR SUPPORT**	BY G&R
-	**EMERGENCY LIGHTING**	MAN-D-TEC ELS-SB INTEGRAL WITH DOWNLIGHTS

PRINT RECORD			
7/24/19	(1) APPROVAL		
8/13/19	(1) REV. APPROVAL		

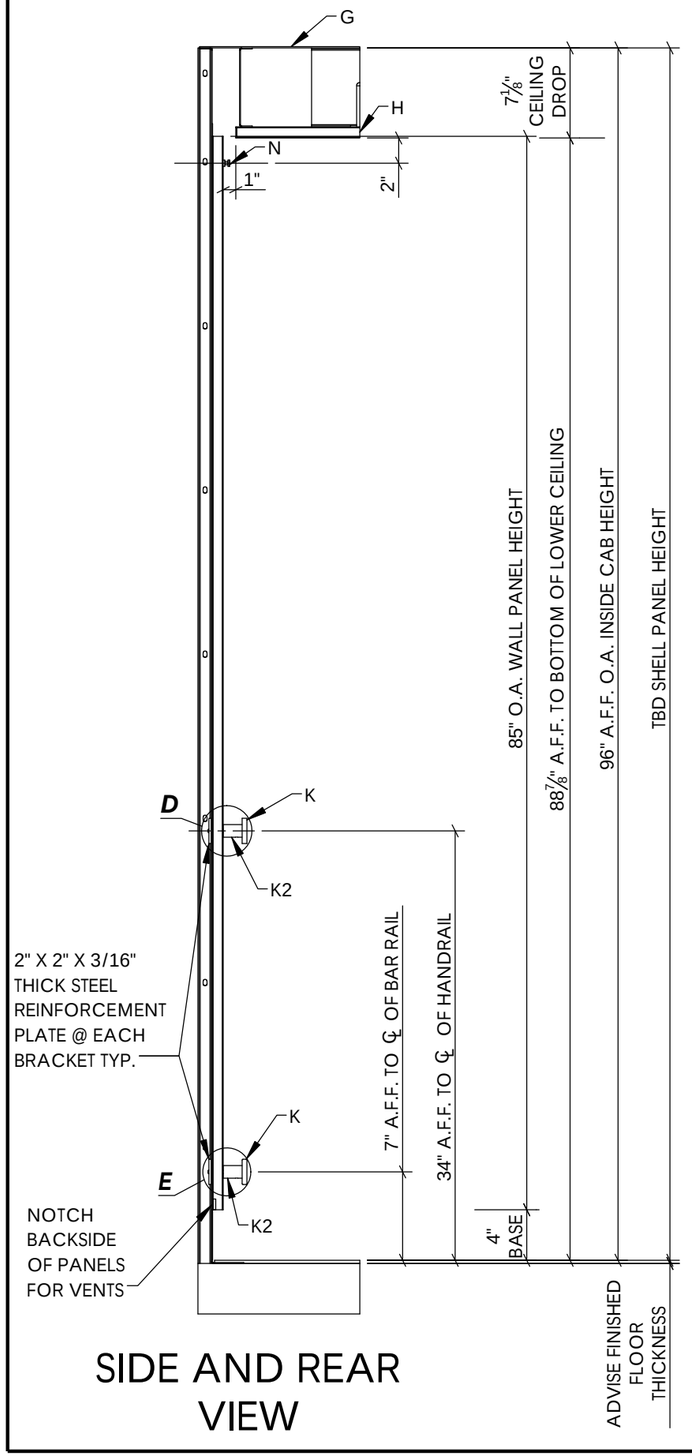
JOB NAME: IU SCHOOL OF OPTOMETRY
CAR(S) # 1 **CAPACITY:** 2500#
LOCATION: BLOOMINGTON, IN
CUSTOMER: AMERICAN ELEVATOR, INC.

SIZE **B**

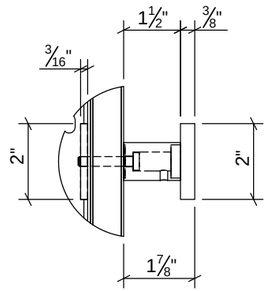
CUSTOMER#: IU OPTOMETRY
DRAWN BY: KPE 7/23/2019
SHEET 1 OF 5
JOB NO.: **21382**

G&R Custom Elevator Cabs
2352 STATION PARKWAY NW
ANDOVER, MN 55304
PHONE: 763-757-6177
FAX: 763-757-6420

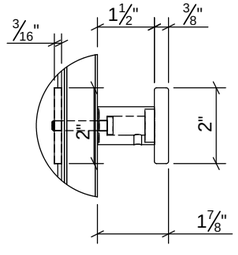
GAL #8232



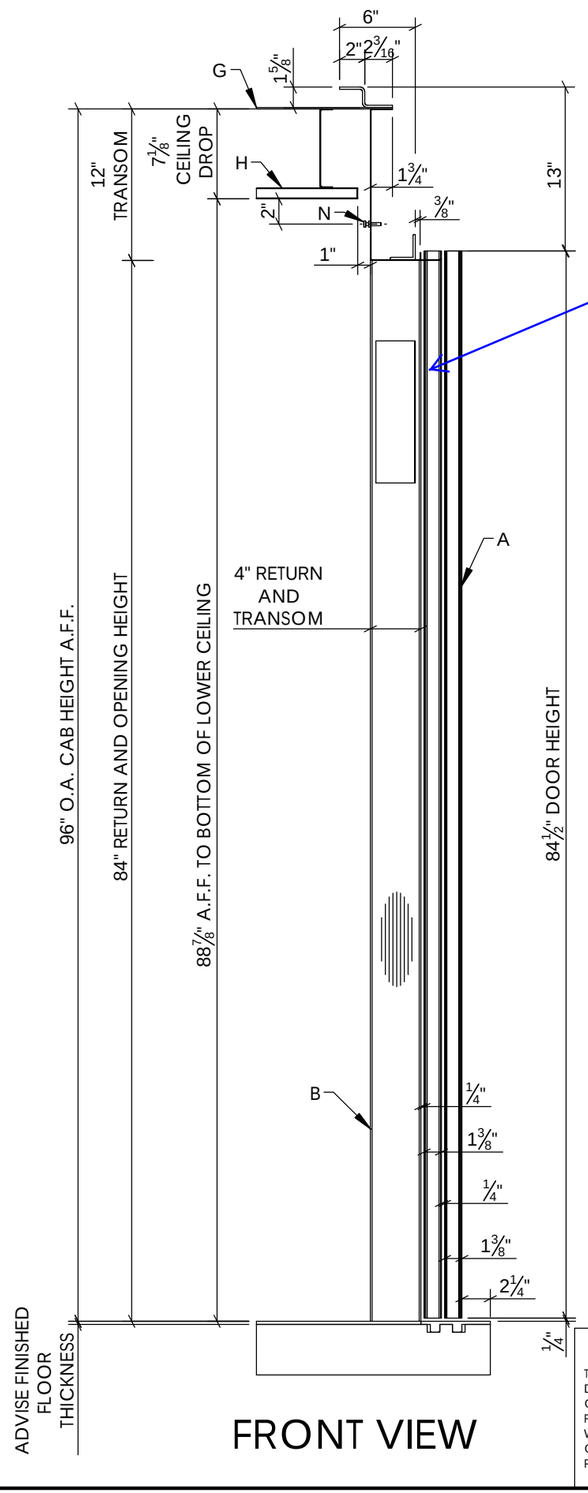
SIDE AND REAR VIEW



DETAIL D



DETAIL E



FRONT VIEW

LOWER VENITLATION REQUIREMENTS:
MINIMUM 75 SQ. INCHES OF TOTAL VENTILATION AREA REQUIRED. PROVIDE HOLES IN THE SHELL WALL BEHIND PROJECTED BASES. (SEE BELOW FOR HOLE OPTIONS):

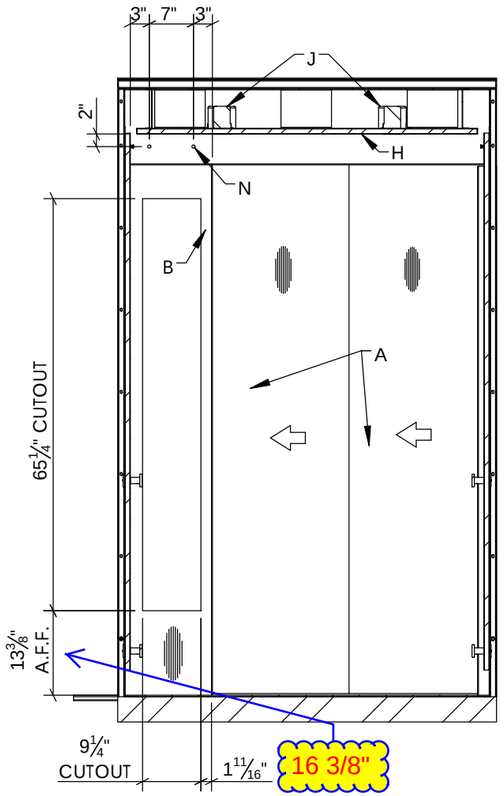
2" ∅ =	(36) REQUIRED	OR
1½" ∅ =	(50) REQUIRED	OR
1" ∅ =	(75) REQUIRED	MINIMUM

SIZE **B**

G&R Custom Elevator Cabs
2352 STATION PARKWAY NW
ANDOVER, MN 55304
PHONE: 763-757-6177
FAX: 763-757-6420

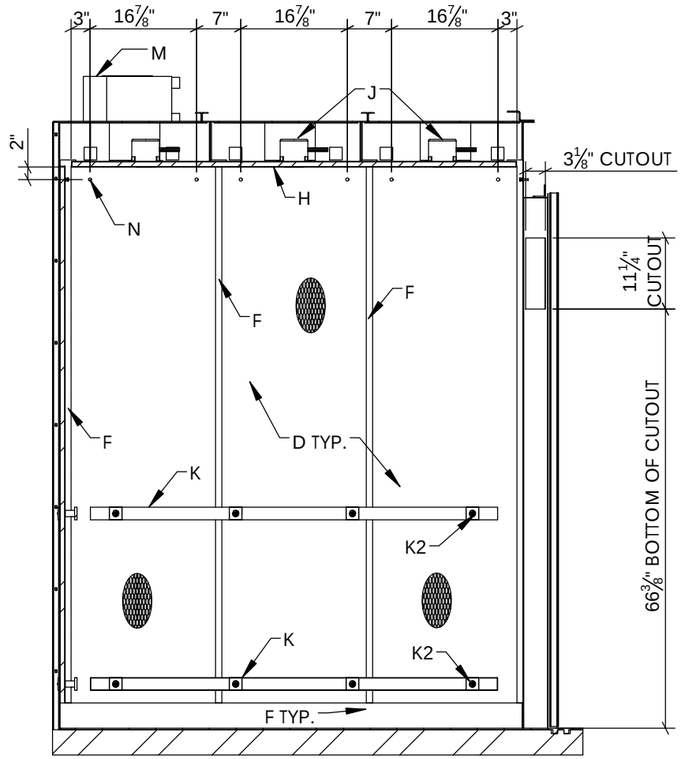
JOB NAME: IU SCHOOL OF OPTOMETRY
CAR(S) # 1 **CAPACITY:** 2500#
LOCATION: BLOOMINGTON, IN
CUSTOMER: AMERICAN ELEVATOR, INC.
CUSTOMER#: IU OPTOMETRY
DRAWN BY: KPE 7/23/2019
SHEET 2 OF 5
JOB NO.: **21382**

PAD HANGER LOCATIONS



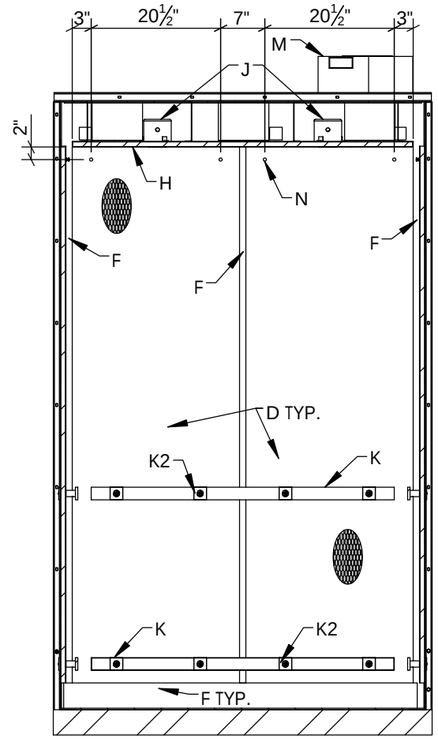
ELEVATION A

PAD HANGER LOCATIONS



ELEVATION B & D

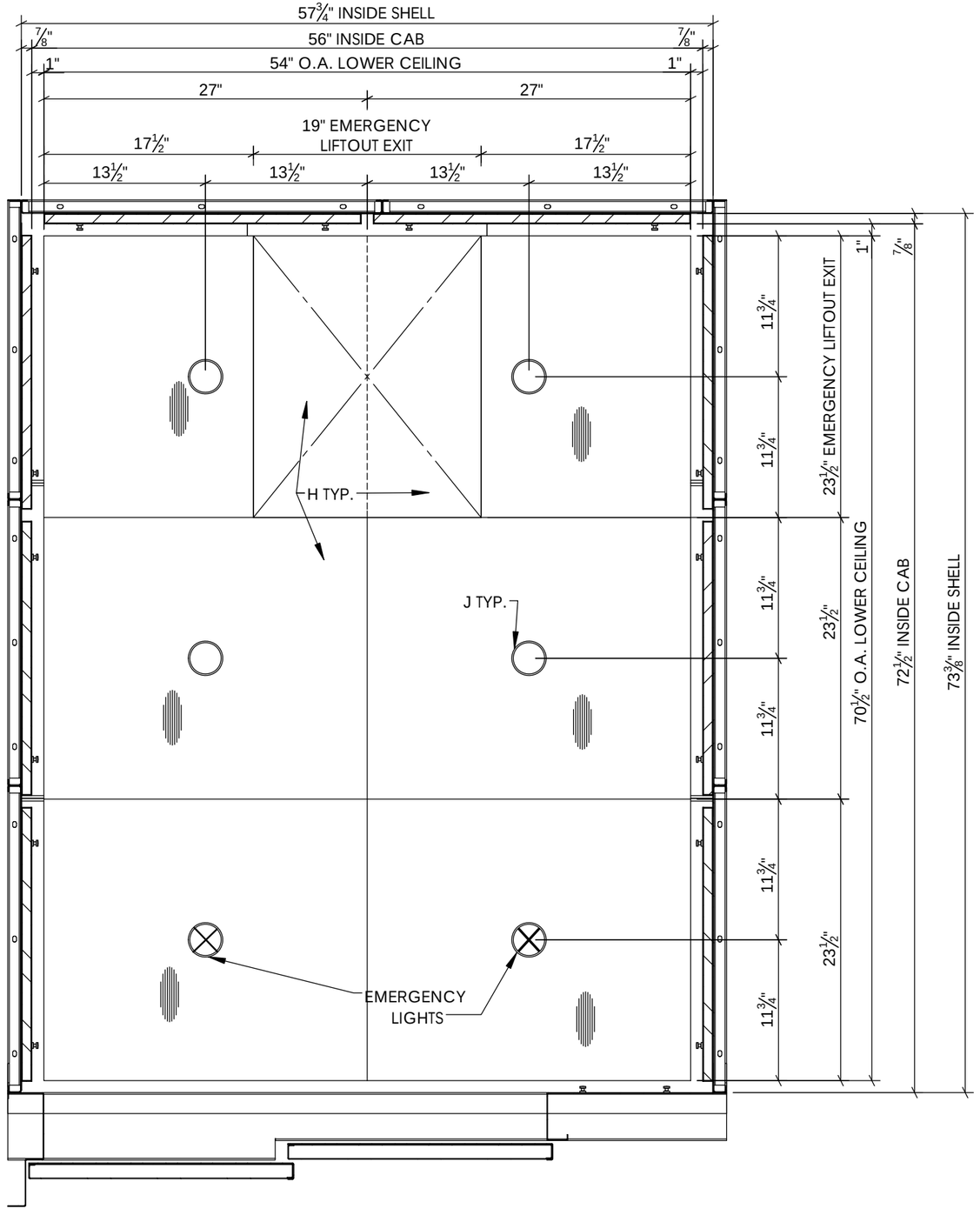
PAD HANGER LOCATIONS



ELEVATION C

JOB NAME:	IU SCHOOL OF OPTOMETRY
CAR(S) # 1	**CAPACITY:** 2500#
LOCATION:	BLOOMINGTON, IN
CUSTOMER:	AMERICAN ELEVATOR, INC.
SIZE **B**	**CUSTOMER#:** IU OPTOMETRY
	DRAWN BY: KPE 7/23/2019
	SHEET 3 OF 5
	JOB NO.: **21382**

G&R Custom Elevator Cabs
2352 STATION PARKWAY NW
ANDOVER, MN 55304
PHONE: 763-757-6177
FAX: 763-757-6420



REFLECTED LOWER CEILING PLAN

SIZE **B**

G&R Custom Elevator Cabs
2352 STATION PARKWAY NW
ANDOVER, MN 55304
PHONE: 763-757-6177
FAX: 763-757-6420

JOB NAME: IU SCHOOL OF OPTOMETRY

CAR(S) # 1 **CAPACITY:** 2500#

LOCATION: BLOOMINGTON, IN

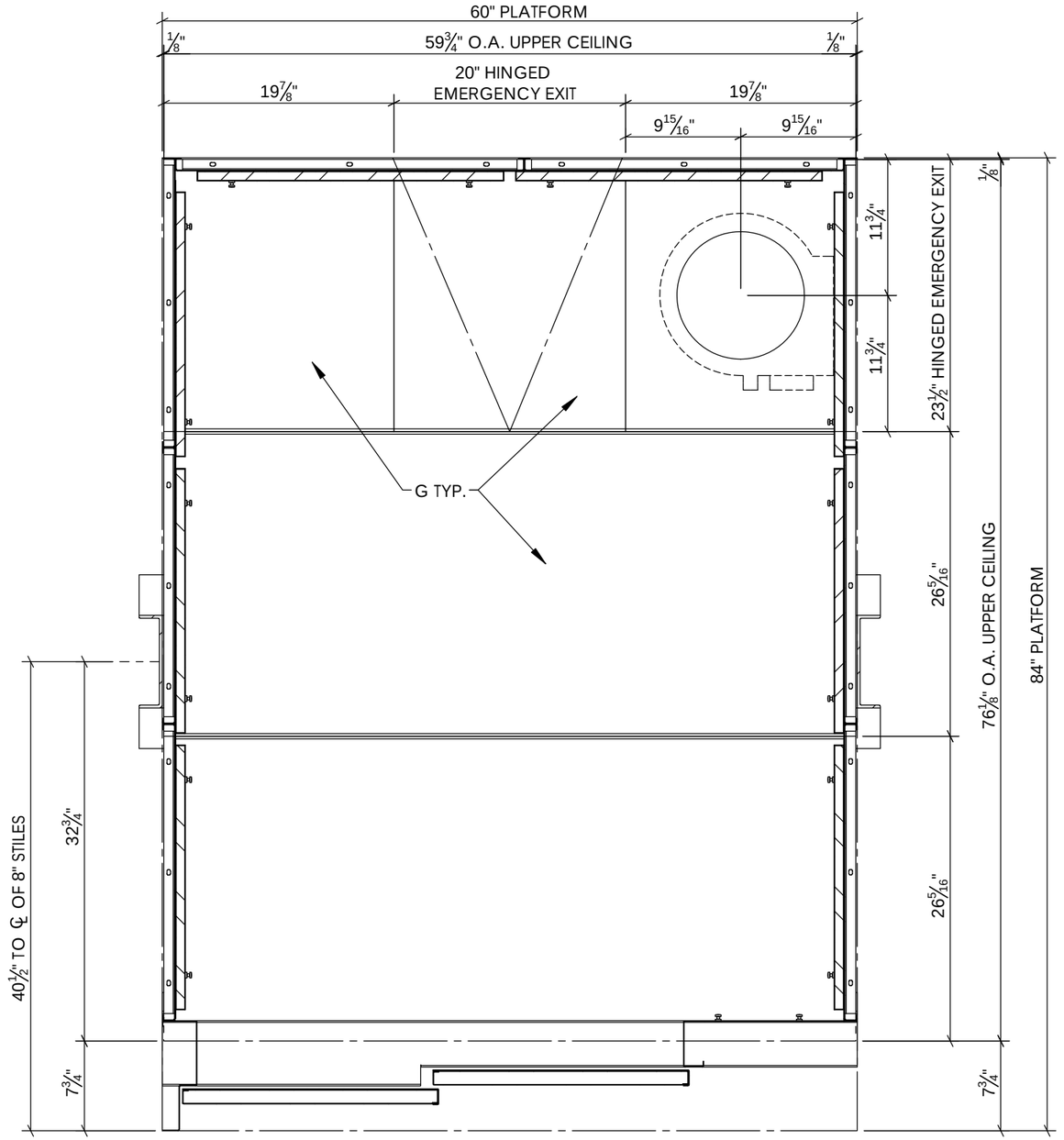
CUSTOMER: AMERICAN ELEVATOR, INC.

CUSTOMER#: IU OPTOMETRY

DRAWN BY: KPE 7/23/2019

SHEET 4 OF 5

JOB NO.: **21382**



REFLECTED UPPER CEILING PLAN

JOB NAME: IU SCHOOL OF OPTOMETRY	
CAR(S) # 1	**CAPACITY:** 2500#
LOCATION: BLOOMINGTON, IN	
CUSTOMER: AMERICAN ELEVATOR, INC.	
SIZE **B**	**CUSTOMER#:** IU OPTOMETRY
	DRAWN BY: KPE 7/23/2019
	SHEET 5 OF 5
	JOB NO.: **21382**

G&R Custom Elevator Cabs
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ANDOVER, MN 55304
PHONE: 763-757-6177
FAX: 763-757-6420

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 23 01 00 "Basic Mechanical Requirements," and Section 23 05 00 "Basic Mechanical Materials and Methods" all apply to the work of this Section as if fully repeated herein.

1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.

B. Controls Installation Contractor (CIC) is to receive, install, connect and test devices that are purchased directly from Siemens by the University.

C. Mechanical contractor to install control valves.

D. Mechanical contractor to provide necessary sensor wells and gauge taps.

E. Electrical contractor is to provide 120/60 VAC power to DDC panels. CIC is to install power from available 120V circuits at panels boards to controllers and actuators (provide transformers as necessary).

F. Electrical contractor is to provide and install variable frequency drives and associated connections for power (to VFD and from VFD to motor) except when drives are factory-mounted and factory-wired. CIC to install low-voltage control signal cabling to VFDs.

G. Sheet metal contractor is to install automatic dampers.

1.3 SEQUENCE OF OPERATION

A. A DDC Points List and a written Sequence of Operation for each system appears on the Construction Documents.

1.4 SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

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. Bill of materials of equipment indicating quantity, manufacturer, and model number.
   2. Schematic flow diagrams coils, dampers, valves, and control devices.
   3. Wiring Diagrams: Power, signal, and control wiring.
   4. Details of control panel faces, including controls, instruments, and labeling.

5. Written description of sequence of operation.
6. Schedule of dampers including size, leakage, and flow characteristics.
7. Schedule of valves including flow characteristics.
8. DDC System Hardware:
    a. Wiring diagrams for control units with termination numbers.
    b. Schematic diagrams and floor plans for field sensors and control hardware.
    c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.
9. Controlled Systems:
    a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
    b. Written description of sequence of operation including schematic diagram.
    c. Points list.

1.5 QUALITY ASSURANCE

2

A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.

PART 2 - PRODUCTS

2.1 CONTROL SYSTEM

A. Indiana University, the Owner, will pre-purchase directly from Siemens Building Technologies the following equipment for the building automation system:
    1. Direct Digital Control panels.
    2. Auxiliary panels with internal components pre-wired.
    3. All required sensing devices (i.e.: temperature, C02 sensors).
    4. Safety devices: low temperature detectors.
    5. Valves, valve actuators.
    6. Dampers, damper actuators.
    7. Relays.
    8. Transformers.
    9. Thermostats.
    10. Variable Frequency Drives.
    11. All necessary design engineering labor.
    12. All necessary technician labor to verify point wiring, program and start up all DDC panels, perform acceptance testing.
    13. Project management labor required to direct the CIC and attend job meetings.

B. During the bidding process, the Control Installation Contractor (CIC) shall address all questions relative to the Siemens drawings to Siemens Building Technologies Inc. directly in writing. Siemens shall respond in writing with a copy to the consulting engineer and to Indiana University Architects Office, attention Mr. P.K. Patel.

C. All products pre-purchased by the Owner, as listed above, will be shipped to the (CIC) Control Installation Contractor for installation and wiring. The CIC shall receive, handle and store all material to be installed under this contract. The CIC shall be responsible for verification of quantity received. Any discrepancies shall be reported in writing to Siemens Building Technologies, Inc. within 48 hours of delivery.

D. CIC shall install all control equipment provided by the Owner. The CIC shall furnish, install, and terminate all necessary wiring, conduit, hangers, etc. to provide a complete control system installation. All controls to be installed and adjusted by trained mechanics in the full time employ of the CIC.

E. Upon completion of all installation and wiring by the CIC the Owners agent (Siemens Building Technologies) will conduct verification of point-to-point wiring and pneumatic tubing. The CIC will be responsible to make any necessary corrections. At the completion of the point-to-point verification, approval shall be made by the Owner's Construction Inspection Department and Siemens Building Technologies, Inc.

F. Upon approval by the Owners Construction Inspection Department, the Owner's agent shall program all DDC panels, create necessary graphics and provide any interface between the building automation system and the campus environmental control system.

G. Upon completion of the aforementioned, a performance test shall be conducted as specified in Section 5.0 On-site Testing.

H. Upon a successful conclusion of the final checkout, performance test and the Owner's acceptance, the CIC's responsibility reverts to a standard 24-month warranty for labor and material installed by the CIC and labor only for equipment supplied by others.

I. The Owner's agent (Siemens Building Technologies, Inc.) assumes the manufacturer's warranty for all equipment supplied to the CIC on this project.

J. Siemens shall supply the following directly to Indiana University:
    1. Design Engineering labor required to interface with IC and the consulting engineer to design the temperature control system.
    2. Supervision of the CIC installation and final checkout and approval.
    3. Project management labor to attend job meetings and ensure construction time compliance and settlement of any conflicts.
    4. Technician labor required for point to point check out, software programming, graphics creation and Owner training.
    5. All material listed in 2.1, A.
    6. During the warranty period, Siemens will respond to all requests rendered by the Owner for satisfactory operation of the system.

K. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories to control mechanical systems.

L. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems. A local or remote operator workstation permits interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

2.2 DDC EQUIPMENT

A. Application Software: Provide all required updates to application software for existing campus operator workstations to ensure complete interoperability with existing Siemens systems, as applicable.

B. Central (Master) Control Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory.
   1. Units monitor or control each input/output point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator station.
   2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
      a. Global communications.
      b. Discrete/digital, analog, and pulse input/output.
      c. Monitoring, controlling, or addressing data points.
      d. Testing and developing control algorithms without disrupting field hardware and controlled environment.

C. Local Control Units: Modular, comprising processor board with electronically programmable, non-volatile, read-only memory; and backup power source.
   1. Units monitor or control each input/output point; process information; and download from or upload to operator station.
   2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
      a. Global communications.
      b. Discrete/digital, analog, and pulse input/output.
      c. Monitoring, controlling, or addressing data points.

D. Software: Update to latest version of software at Project completion. Include and implement the following capabilities from the control units:
   1. Units of Measure: Inch-pound and SI (metric).
   2. Load Control Programs: DDC with fine tuning, and trend logging.
   3. Programming Application Features: Include trend point, alarm messages, weekly scheduling, and interlocking.

2.3 CONTROL PANELS

A. Control Panels: Fully enclosed standard metal or plastic cabinet with locking doors or locking removable backs. Match finish of panels.

B. Local Control Panels: Unitized cabinet with suitable brackets for wall or floor mounting, located adjacent to each system under automatic control. Provide common keying for all panels.
   1. Fabricate panels of 0.06-inch-thick, furniture-quality steel, or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with manufacturer's standard shop-painted finish.
   2. Panel-Mounted Equipment: Temperature and humidity controllers, relays, and automatic switches; except safety devices. Mount devices with adjustments accessible through front of panel.
   3. Door-Mounted Equipment: Flush-mount (on hinged door) manual switches, including damper-positioning switches, changeover switches, thermometers, and gages.

2.4 DDC CONTROLLERS

A. Each stand-alone DDC Controller shall be able to extend its performance and capacity through the use of remote Application Specific Controllers (ASCs).

B. Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.

C. Each ASC shall have sufficient memory to support its own operating system and data bases including:
   1. Control Processes.
   2. Energy Management Applications,
   3. Operator I/O.

D. The operator interface to any ASC point data or programs shall be through any network-resident PC workstation, or any PC or portable operator's terminal connected to any DDC panel in the network.

E. Application Specific Controllers shall directly support the use of a portable terminal. The capabilities of the portable terminal shall include but not be limited to the following:
   1. Display temperatures.
   2. Display status.
   3. Display set-points.
   4. Display control parameters.
   5. Override binary output control.
   6. Override analog set-points.
   7. Modification of gain and offset constants.

F. Power fail Protection: All system set-points, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the controller.

G. Configuration and Download: The ASCs shall have the capability of receiving configuration and program loading by both of the following: 1) locally, via a direct connect portable laptop service tool, 2) over the network, from the portable laptop service tool, and; 3) from the Operation Workstation, via the communication networks.

H. Continuous Zone Temperature Histories: Application Specific Controllers shall have the capability to automatically and continuously maintain a history of the associated zone temperature to allow users to quickly analyze space comfort and equipment performance for the past 24 hours. A minimum of two samples per hour shall be stored.

I. Extended Digital Controllers: Extended Digital Controllers shall provide all of the capabilities defined above for the ASCs. In addition, they shall include the following features:
   1. Extendable input and output points.
   2. Customizable graphic software programming of control sequences.

2.5 SENSORS

A. Electronic Sensors: Vibration and corrosion resistant for wall, immersion, or duct mounting as required.
   1. Resistance Temperature Sensors and Transmitters: Platinum or nickel.
      a. Accuracy: Plus or minus 0.2 percent at calibration point.
      b. Wire: Twisted, shielded-pair cable.

c. Insertion Elements in Ducts: Use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.
d. Averaging Elements in Ducts: Use where prone to temperature stratification or where ducts are larger than 9 sq. ft., length as required.
e. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.
f. Space Temperature Sensors: Mount beneath a thermostat cover with local set-point adjustment.

2. Carbon Dioxide Sensor and Transmitter: Single detectors, using solid state infrared sensors, suitable over a temperature range of 23 to 130 degrees F (minus 5 to plus 55 C), calibrated for 9 to 2 percent, with continuous or averaged reading, 4 to 20 mA output, and suitable for wall-mounting, as indicated.

2.6 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action. Actuators shall be manufactured by Siemens.

B. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

C. Electronic Damper and Large-Valve Actuators: Direct-coupled type designed for minimum 60,000 fully-stroke cycles at rated torque.
1. Valves: Size for torque required for valve close-off at maximum pump differential pressure.
2. Dampers: Size for running torque calculated as follows:
a. Dampers with 2 to 3 Inches wg of Pressure Drop or Face Velocities of 1000 to 2500 FPM: Multiply the minimum full-stroke cycles above by 1.5.
b. Dampers with 3 to 4 Inches wg of Pressure Drop or Face Velocities of 2500 to 3000 FPM: Multiply the minimum full-stroke cycles above by 2.0.
3. Coupling: V-bolt and V-shaped, toothed cradle.
4. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
5. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on non-spring-return actuators.
6. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
7. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.

2.7 CONTROL VALVES

A. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

B. Globe or Ball Valves NPS 2 and Smaller: Bronze body, bronze trim, and screwed ends.

PART 3 – EXECUTION

3
3.1 EXAMINATION

A. Verify that conditioned power supply is available to control units.

B. Verify that duct, pipe, and equipment-mounted devices and wiring are installed before proceeding with installation.

3.2 DDC CONTROL SYSTEM INSTALLATION

A. Install equipment level and plumb.

B. Install software in control units. Implement all features of programs to specified requirements and as appropriate to sequence of operations indicated on the Drawings.

C. Connect and configure equipment and software to achieve sequence of operations specified on the Drawings.

D. Verify location of space temperature sensors, and other exposed control sensors with plans and room details before installation. Locate all 48 inches above the floor (align horizontally with light switches), unless indicated otherwise on the Drawings.
   a. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

E. Install labels and nameplates to identify control components according to Division 23 Section "Identification for HVAC Piping and Equipment."

F. Install hydronic instrument wells, valves, and other accessories according to Division 23 Section "Hydronic Piping."

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Division 26 Section "Raceways, Boxes, and Cabinets."

B. Install building wire and cable according to Division 26 Section "Conductors and Cables."
   1. All control cable wiring shall be installed in the raceway. See Div. 026 for raceway specifications.
   2. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
   3. Concealed and accessible cable shall be jacketed plenum rated cable.
   4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
   5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
   6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
   7. Connect manual-reset limit controls independent of manual-control switch positions.
   8. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
    1. Install piping adjacent to machine to allow service and maintenance.

B. Ground Equipment
    1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Manufacturers Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, Report results in writing.
    1. Test and adjust controls and safety. Replace damaged and malfunctioning controls and equipment, and retest.

B. Engage a factory-authorized service representative to perform startup service.

C. Replace damaged or malfunctioning controls and equipment.
    1. Start, test, and adjust control systems.
    2. Demonstrate compliance with requirements. including calibration and testing, and control sequences.
    3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified on the Drawings.

D. Verify DDC as follows:
    1. Verify software including automatic restart, control sequences, scheduling, reset controls, and occupied/unoccupied cycles.
    2. Verify local control units including self-diagnostics.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain control systems and components.
    1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.

END OF SECTION 230952

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05/09/25

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44OP-398851

DELV DESIGN
ARCHITECT

CREATIVE ENGINEERING SOLUTION
ENGINEER

INDIANA UNIVERSITY
CONTRACTOR

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TOCA

CONTROL SYMBOL	CONTROL SYMBOL DESCRIPTION
AC	AIR COMPRESSOR
AD	AIR DRYER
ADXR	ACTUATOR DXR
AE	ACTUATOR ELECTRIC
AEM	APOGEE ETHERNET MICROSERVER
AF	AIR FILTER
AFS	AIR FLOW STATION
AOP	ANALOG OUTPUT, PNEUMATIC
AP	ACTUATOR PNEUMATIC
APS	AUX. POWER SUPPLY
AT	AUTOMATIC TRAP
ATD	AUTO TANK DRAIN
ATEC	ACTUATOR TEC
AZM	AUTOZERO MODULE
BCU	BUS COUPLING UNIT
BELL	BELL
BIM	BUS INTERFACE MODULE
BOIL	BOILER
BRT	BRIGHTNESS
BRTT	BRIGHTNESS AND TEMPERATURE
BTN	BUTTON
CBL	CABLES
CKV	CHECK VALVE
CM	CONSTRUCTION MATERIALS
CP	COMPONENT PANEL
CPU	CENTRAL PROCESSING UNIT
CRT	CATHODE RAY TUBE
CS	CURRENT SWITCH
CT	CURRENT TRANSDUCER
CTTE	CO2 TEMP TRANSMITTER ELEC
CVC	CONSTANT VOLUME CONTROLLER
D	DAMPER
DDC	DUAL DUCT CONTROLLER
DEM	DEMAND ENERGY MONITOR
DP	DEW POINT TRANSMITTER
DPR	DIFFERENTIAL PRESS. REGULATOR
DPS	DIFFERENTIAL PRESSURE SWITCH
DPTE	DIFF. PRESS. TRANSMITTER ELEC.
DPTP	DIFFERENTIAL PRESSURE PNEUMATIC
DPU	DIGITAL POINT UNIT
DXR	TERMINAL EQUIPMENT CONTROLLER
EC	ENTHALPY COMPARITOR
EP	ELECTRO-PNEUMATIC VALVE
ES	END SWITCH
ET	ENTHALPY TRANSMITTER
EXP	EXPANSION PANEL
FAN	FAN
FHC	FUME HOOD CONTROLLER
FM	FLOW MTR. (FLOW METER STATION)
FMS	FIRE MGMT. SYSTEM
FS	FLOW SWITCH
FTP	FLOW TRANSMITTER PNEU.
G	GAUGE
GD	GAS DETECTOR
H	HYGROSTATS
HE	HUMIDIFIER ELECTRIC
HHC	HAND-HELD OPERATOR'S TERMINAL
HL	HIGH LIMIT
HMI	GAMMA TOUCH PANEL
HOA	HAND-OFF-AUTO SWITCH
HORN	HORN
HPC	HEAT PUMP CONTROLLER
HTD	HIGH TEMPERATURE DETECTOR
HTE	HUMIDITY TRANSMITTER ELECTRIC
HTP	HUMIDITY TRANSMITTER PNEUMATIC
INT	INTERCOM
KWM	ELECTRIC KILOWATT METER
LA	LIGHT ACTUATOR
LC	LIMIT CONTROLLER (LIMITEM)
LLS	LIQUID LEVEL SWITCH
LLT	LIQUID LEVEL TRANS.
LPR	POWER SUPPLY 24VAC/24VDC
LTDE	LOW TEMP. DETECTOR ELECTRIC
LTDP	LOW TEMP. DETECTOR PNEUMATIC
LUI	LOCAL USER INTERFACE
MBC	MODULAR BUILDING CONTROLLER
MDM	MODEM
ME	ELECTRONIC ACTUATOR
MEC	MODULAR EQUIPMENT CONTROLLER
MG	MAGNEHELIC GAUGE
MPU	MULTI-POINT UNIT
MS	MOTOR STARTER
OCC	OCCUPANCY
OCCB	OCCUPANCY AND BRIGHTNESS
OBS	OBSOLETE
ODP	OPERATOR DATA PANEL
P	PUMP
PA	PULSE ACCUMULATOR
PCT	PROGRAMMABLE CLOCK TIMER
PE	PRESSURE ELECTRIC SWITCH
PL	PILOT LIGHT
PM	POWER MONITOR
PNL	PANEL
PPM	POINT PICKUP MODULE
PRC	PRESSURE REG. CONTROLLER
PRV	PRESSURE REDUCING VALVE
PS	POSITIONING SWITCH
PSE	POSITION SENSOR ELECTRIC
PST	PULL STATION
PT	PITOT TUBE
PTE	PRESSURE TRANSMITTER ELECTRIC
PTP	PRESSURE TRANSMITTER PNEUMATIC
PTR	PRINTER
PV	PILOT VALVE
PXCC	PX COMPACT CONTROLLER
PXCM	PXC-MODULAR CONTROLLER
PXG3	BACNET ROUTER ETHERNETIP-MS/TP
RBC	REMOTE BUILDING CONTROLLER
RC	RECEIVER CONTROLLER
RCU	REMOTE CONTROL UNIT
RE	RELAY ELECTRIC
RP	RELAY PNEUMATIC
RS	RESTRICTOR
RV	RELIEF VALVE
S/W	SOFTWARE
SA	SHADE ACTUATOR
SC	STEP CONTROLLER
SCU	STAND ALONE CONTROL UNIT
SD	SMOKE DETECTOR
SE	SWITCH ELECTRIC
SIO	SLX IO MODULES
SLX	APOGEE SLX CONTROLLER
SPKR	SPEAKER
SPP	STATIC PRESSURE PROBE
SPR	STATIC PRESSURE REGULATOR
SV	SOLENOID VALVE
SW	SWITCH PNEUMATIC
T	ROOM THERMOSTAT, PNEUMATIC
TBC	TERMINAL BOX CONTROLLER
TC	TEMPERATURE CONTROLLER(S200)
TCU	TERMINAL CONTROL UNIT
TDR	TIME DELAY RELAY
TE	THERMOSTAT, ELECTRIC
TEC	TERMINAL EQUIPMENT CONTROLLER
TH	THERMOMETER
TI	TRUNK INTERFACE
TIE	TRUNK ISOLATOR EXTENDER
TIU	TELCOM INTERFACE UNIT
TMR	TIMER, TIME CLOCK
TTE	TEMPERATURE TRANSMITTER ELECTRIC
TTP	TEMPERATURE TRANSMITTER PNEUMATIC
TXIO	TX-I/O FAMILY CONTROLLER MODULES
UC	UNITARY CONTROLLER
UCC	UNIT CONDITIONER CONTROLLER
UVC	UNIT VENT CONTROLLER
V	VALVE
V*	VALVE SERVICE PARTS
VA	TEC VALVE ACTUATOR
VAC	VARIABLE AIR VOLUME CONTROLLER
VB	VIBRATION ISOLATOR
VTE	VELOCITY TRANSMITTER ELECTRICAL
W	WELL
WST	WEATHER STATION
XDR	TRANSDUCER
XFMR	TRANSFORMER

DDC ELECTRICAL POINT

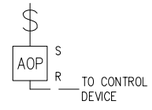
PTNAME 0|00|0|00|00

TRUNK NUMBER
CABINET NUMBER
LAN TRUNK
DROP NUMBER
POINT NUMBER

DDC PNEUMATIC POINT

PTNAME 0|00|0|00|00

TRUNK NUMBER
CABINET NUMBER
LAN TRUNK
DROP NUMBER
POINT NUMBER



DETAILS

ELECTRICAL TERMINATION

PNEUMATIC TERMINATION

DETAIL XX STANDARD DDC TERMINATION

NOTE OR REVISION

DETAIL XX PAGE REFERENCE

APOGEE: PII – EXAMPLE

LOGICAL POINT NAME – AH1LTD
0.10.3.10.27
DETAIL 5A ← READ AS " SEE PAGE 5A FOR MORE DETAIL "
DETAIL MC ← DIGITAL INPUT

BLN NUMBER
CABINET NUMBER
FLN TRUNK
DROP NUMBER
POINT NUMBER

APOGEE: ETHERNET – EXAMPLE

LOGICAL POINT NAME – AH1LTD
0001: 3.10.27
DETAIL 5A ← READ AS " SEE PAGE 5A FOR MORE DETAIL "
DETAIL MC ← DIGITAL INPUT

REFERENCE NUMBER
NODE NUMBER
FLN TRUNK
DROP NUMBER
POINT NUMBER

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BL065 OPTOMETRY SCH-LAB RENO
IU PROJECT #20241256, IN

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Legend & Abbreviations

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FLNC WIRING TYPE AND GAUGE REQUIREMENTS

TABLE 1

CIRCUIT TYPE	CLASS	WIRE TYPE	MAX. DISTANCE	CONDUIT SHARING
AC LINE POWER (FLNC)	Power	#12–14 THHN	AS REQUIRED	CHECK LOCAL CODES
DIGITAL OUTPUT	1	CHECK LOCAL CODES	SEE TABLE 4	CHECK LOCAL CODES
DIGITAL OUTPUT	2	CHECK LOCAL CODES	SEE TABLE 4	CHECK LOCAL CODES
DIGITAL INPUT	2	#18–22 TP	750ft (230 m)	CLASS 1 & 2 CHECK LOCAL CODES
ANALOG INPUT THERMISTOR	2	#18–22 TP	100ft (30.5 m)	CLASS 1 & 2 CHECK CODES
LAN TRUNK [1]	2	#18–22 AWG TSP	4kft (1220 m)	CLASS 2 ONLY

TABLE 1A NOTES:

1. WHEN A TIE IS USED ON A LAN TRUNK, THE LAN TRUNK CAN BE EXTENDED ANOTHER 4000–5000 FEET (DEPENDING ON WIRE GAUGE). USING THREE TIE'S ON ONE FIELD PANEL COULD ALLOW A MAXIMUM OF 16,000 FEET OF #20 TSP WIRE (THE LOCAL 4000 PLUS 4000 FOR EACH TIE).

DI, AI, AO WIRE SPECIFICATIONS

TABLE 2

SPECIFICATION	WIRE TYPE	
	SHIELDED	UNSHIELDED
CAPACITANCE WIRE TO WIRE	NOT SPECIFIED	NOT SPECIFIED
CAPACITANCE BETWEEN ONE CONDUCTOR WITH OTHER CONDUCTOR CONNECTED TO SHIELD	NOT SPECIFIED	N/A
WIRE LAY	2" MAX.	2" MAX.
AWG	18–22	18–22

TABLE 2 & 4 NOTES:

1. OPTIMAL NOISE REDUCTION IS ACHIEVED WITH TIGHTER WIRE LAYS (E.G. 1/2").

LAN TRUNK WIRE

TABLE 3

SPECIFICATION	LENGTH OF TRUNK SECTION	
	4000 FT	10,000 FT
CAPACITANCE WIRE TO WIRE	60pF MAX.	24pF MAX.
CAPACITANCE BETWEEN ONE CONDUCTOR WITH OTHER CONDUCTOR CONNECTED TO SHIELD	100pF MAX.	44pF MAX
WIRE LAY	2" MAX.	2" MAX.
AWG	18–22	18 MIN.

TABLE 3 NOTES:

1. DISTANCES SHOWN ASSURE LESS THAN 10% VOLTAGE DROP ACROSS THE WIRE FOR A TYPICAL STARTER.

MAXIMUM DO WIRE RUN LENGHTS

TABLE 4

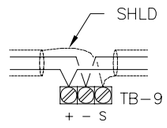
NOMINAL INRUSH	STARTER SIZE	WIRE SIZE		
		#18	#16	#14
200 VA	0 1	500ft (152m)	900ft (274m)	1400ft (427m)
550 VA	2	200ft (61m)	300ft (91m)	500ft (152m)
1150 VA	3	100ft (30m)	150ft (46m)	250ft (76m)
1500 VA	4	70ft (21m)	100ft (30m)	200ft (61m)

GENERAL NOTES:

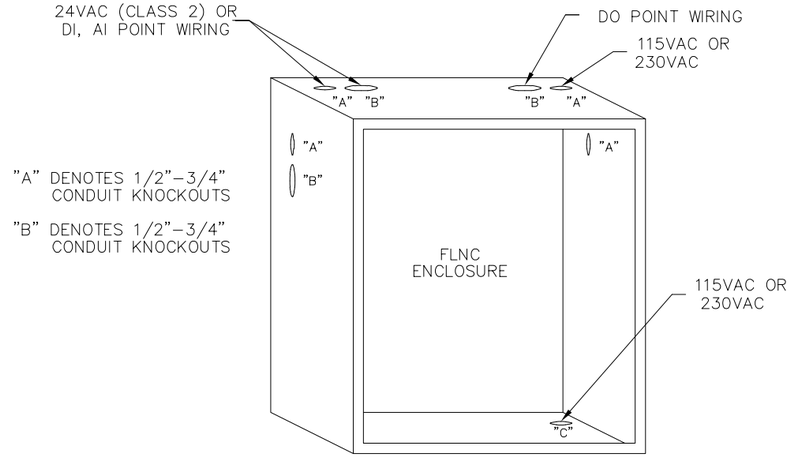
- COMPLY WITH LOCAL BUILDING CODES.
- SIZE WIRE FOR LOAD, CURRENT, AND VOLTAGE.
- ALL WIRE TO BE APPROVED OR LISTED FOR THE INTENDED APPLICATION BY AGENCIES SUCH AS UL, CSA.
- ALWAYS REFER TO LOCAL CODES FOR CONDUIT SHARING.
- WIRING MUST HAVE INSULATION RATED FOR HIGHEST VOLTAGE CIRCUIT IN CONDUIT.
- PLENUM WIRING MAY BE USED IN PLACE OF ANY LOW VOLTAGE WIRING WITHOUT CHANGES TO LENGTH EXCEPT FOR PMD OR LAN TRUNK. IN CASES WHERE PLENUM WIRE (#18 OR #20 AWG) IS USED FOR PMD OR LAN TRUNK, USE THE REDUCED LENGTHS OF #20 AWG CABLE.
- THE LAN TRUNK MUST BE AN UNINTERRUPTED RUN BETWEEN CABINETS. NO SPLICES ALLOWED.

NOTE:

1. CABINETS MAY BE MULTI–DROPPED ON LAN.

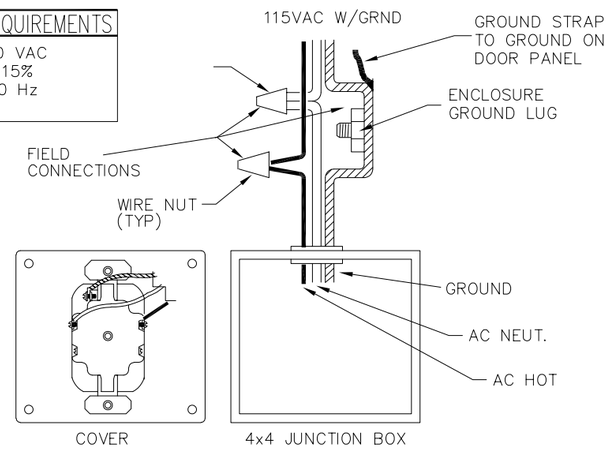


3/00 FLNC LAN TERMINATION

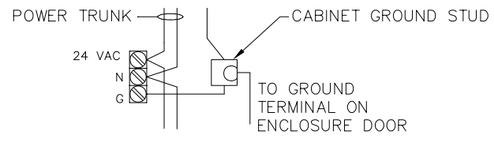


1/00 FLNC CONDUIT PENETRATION

FLNC POWER SOURCE REQUIREMENTS	
VOLTAGE:	115/230 VAC +10% –15%
LINE FREQUENCY:	50 / 60 Hz
POWER:	12 VA



2/00 FLNC POWER WIRING



NOTE:
FOR OPTIONAL 115VAC PLUG–IN TRANSFORMER, REFER TO DETAIL 2.

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FLNC Termination Specification

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DPU/MPU WIRING TYPE AND GAUGE REQUIREMENTS

TABLE 1

CIRCUIT TYPE	CLASS	WIRE TYPE	MAX. DISTANCE	CONDUIT SHARING
AC LINE POWER (DPU)	1	#12–14 THHN	AS REQUIRED	CHECK LOCAL CODES
POWER TRUNK [1] (MPU)	2	#14 THNN OR #14 TP	180ft (55 m)	CLASS 1 & 2 CHECK CODES
DIGITAL OUTPUT	1	CHECK LOCAL CODES	SEE TABLE 4	CHECK LOCAL CODES
DIGITAL OUTPUT	2	CHECK LOCAL CODES	SEE TABLE 4	CHECK LOCAL CODES
DIGITAL INPUT	2	#18–22 TP	750ft (230 m)	CLASS 1 & 2 CHECK LOCAL CODES
ANALOG INPUT THERMISTOR	2	#18–22 TP	100ft (30.5 m)	CLASS 1 & 2 CHECK CODES
LAN TRUNK [2]	2	#18–22 AWG TSP	4kft (1220 m)	CLASS 2 ONLY

TABLE 1A NOTES:

1. DISTANCE WILL DEPEND ON TRANSFORMER LOCATION. USE ONE 100 VA TRANSFORMER FOR EVERY EIGHT (8) MPU'S. 180 FT. USING #14 AWG IS WORST CASE.
2. WHEN A TIE IS USED ON A LAN TRUNK, THE LAN TRUNK CAN BE EXTENDED ANOTHER 4000–5000 FEET (DEPENDING ON WIRE GAUGE). USING THREE TIE'S ON ONE FIELD PANEL COULD ALLOW A MAXIMUM OF 16,000 FEET OF #20 TSP WIRE (THE LOCAL 4000 PLUS 4000 FOR EACH TIE).

DI, AI, AO WIRE SPECIFICATIONS

TABLE 2

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AWG	18–22	18–22

TABLE 2 & 4 NOTES:

1. OPTIMAL NOISE REDUCTION IS ACHIEVED WITH TIGHTER WIRE LAYS (E.G. 1/2").

LAN TRUNK WIRE

TABLE 3

SPECIFICATION	LENGTH OF TRUNK SECTION	
	4000 FT	10,000 FT
CAPACITANCE WIRE TO WIRE	60pF MAX.	24pF MAX.
CAPACITANCE BETWEEN ONE CONDUCTOR WITH OTHER CONDUCTOR CONNECTED TO SHIELD	100pF MAX.	44pF MAX
WIRE LAY	2" MAX.	2" MAX.
AWG	18–22	18 MIN.

MAXIMUM DO WIRE RUN LENGHTS

TABLE 4

NOMINAL INRUSH	STARTER SIZE	WIRE SIZE		
		#18	#16	#14
200 VA	0 1	500ft (152m)	900ft (274m)	1400ft (427m)
550 VA	2	200ft (61m)	300ft (91m)	500ft (152m)
1150 VA	3	100ft (30m)	150ft (46m)	250ft (76m)
1500 VA	4	70ft (21m)	100ft (30m)	200ft (61m)

TABLE 3 NOTES:

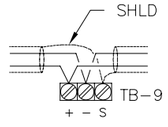
1. DISTANCES SHOWN ASSURE LESS THAN 10% VOLTAGE DROP ACROSS THE WIRE FOR A TYPICAL STARTER.
2. DPU/MPU DO CONTACT RATING
   1.2A @ 120VAC (INDUCTIVE)
   1.2A @ 240VAC (INDUCTIVE)
   SIZE 4 MOTOR STARTER

GENERAL NOTES:

- COMPLY WITH LOCAL BUILDING CODES.
- SIZE WIRE FOR LOAD, CURRENT, AND VOLTAGE.
- ALL WIRE TO BE APPROVED OR LISTED FOR THE INTENDED APPLICATION BY AGENCIES SUCH AS UL, CSA.
- ALWAYS REFER TO LOCAL CODES FOR CONDUIT SHARING.
- WIRING MUST HAVE INSULATION RATED FOR HIGHEST VOLTAGE CIRCUIT IN CONDUIT.
- PLENUM WIRING MAY BE USED IN PLACE OF ANY LOW VOLTAGE WIRING WITHOUT CHANGES TO LENGTH EXCEPT FOR PMD OR LAN TRUNK. IN CASES WHERE PLENUM WIRE (#18 OR #20 AWG) IS USED FOR PMD OR LAN TRUNK, USE THE REDUCED LENGTHS OF #20 AWG CABLE.
- THE LAN TRUNK MUST BE AN UNINTERRUPTED RUN BETWEEN CABINETS. NO SPLICES ALLOWED.

NOTE:

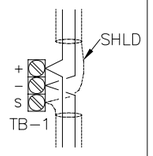
1. CABINETS MAY BE MULTI–DROPPED ON LAN.



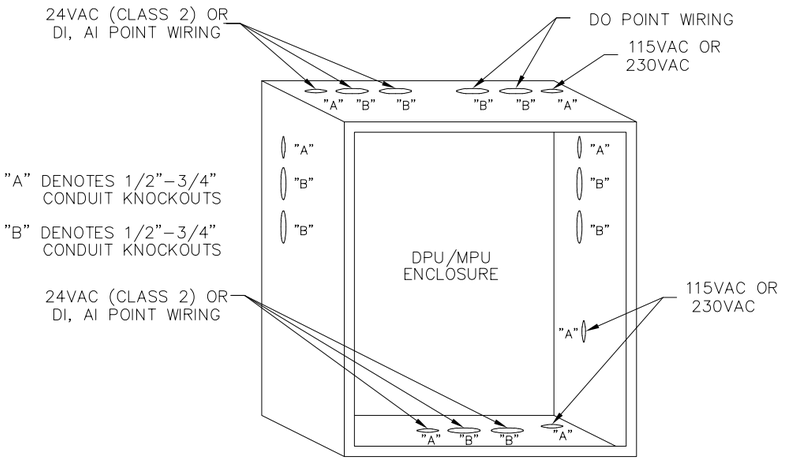
4 00 DPU LAN TERMINATION

NOTE:

1. CABINETS MAY BE MULTI–DROPPED ON LAN.

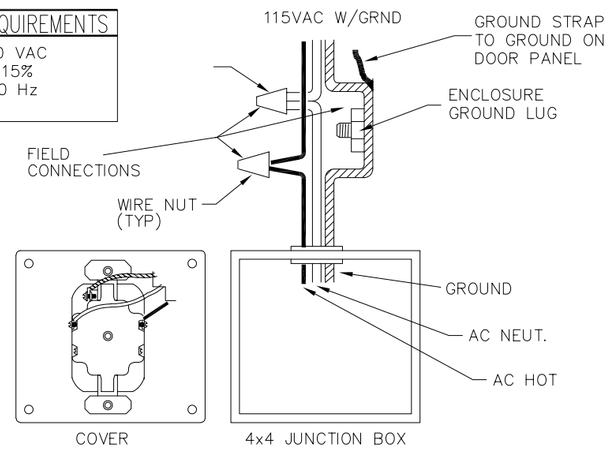


5 00 MPU LAN TERMINATION



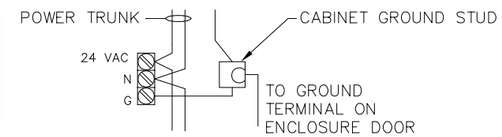
1 00 DPU/MPU CONDUIT PENETRATION

DPU POWER SOURCE REQUIREMENTS	
VOLTAGE:	115/230 VAC +10% –15%
LINE FREQUENCY:	50 / 60 Hz
POWER:	16 VA



2 00 DPU POWER WIRING

MPU POWER SOURCE REQUIREMENTS	
VOLTAGE:	24 VAC +10% –25%
LINE FREQUENCY:	50 / 60 Hz
POWER:	11 VA



3 00 MPU POWER WIRING

NOTE:
FOR OPTIONAL 115VAC PLUG–IN TRANSFORMER, REFER TO DETAIL 2.

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

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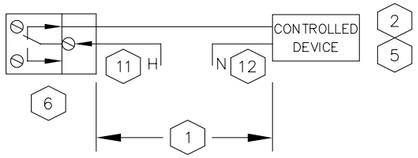
BL065 OPTOMETRY SCH-LAB RENO
IU PROJECT #20241256, IN

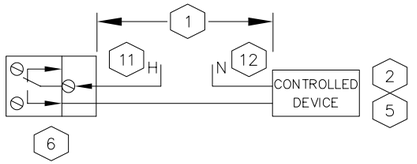
ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		05/09/25	05/09/25

FLN Termination Specification

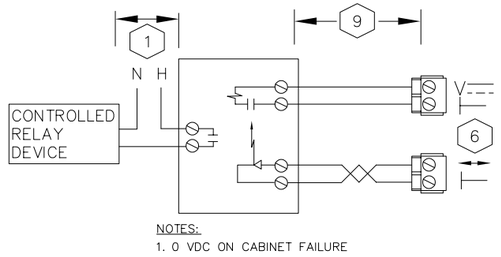
440P398851
0
FTRM



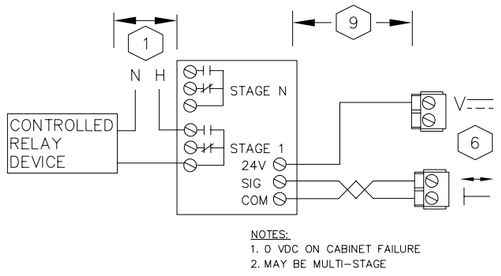
A 00 — DIGITAL OUTPUT (6R) NC
PULSED OR LATCHED



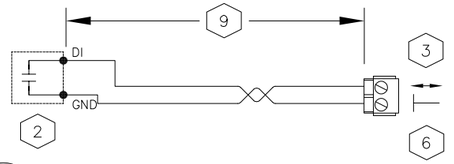
B 00 — DIGITAL OUTPUT (6R) NO
PULSED OR LATCHED



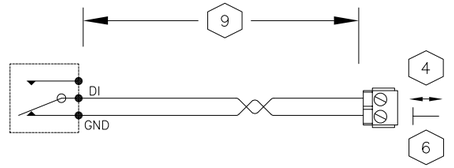
C 00 — DIGITAL OUTPUT (8U,8X) Latched
VOLTAGE TO SOLID STATE RELAY



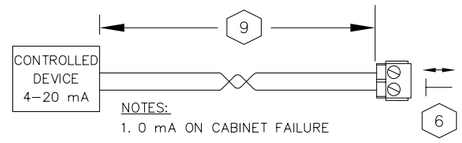
D 00 — DIGITAL OUTPUT (8U,8X) Sequenced
VOLTAGE TO SEQUENCING MODULE



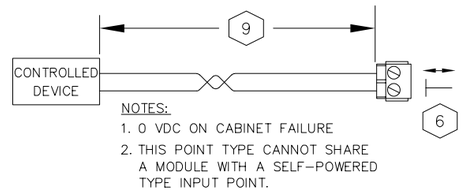
E 00 — DIGITAL INPUT (8D,16D,8U,8x)
DRY CONTACT



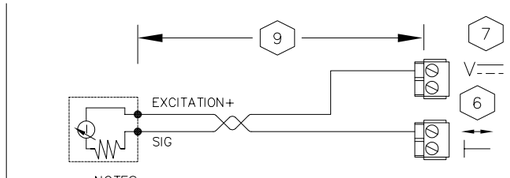
F 00 — DIGITAL INPUT (8D,16D,8U,8X)
PULSE ACCUMULATOR



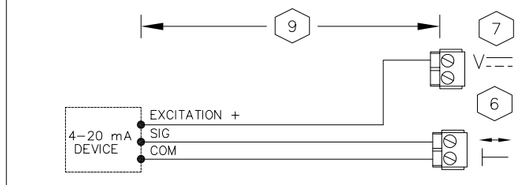
H 00 — ANALOG OUTPUT (8X) 4-20 mA



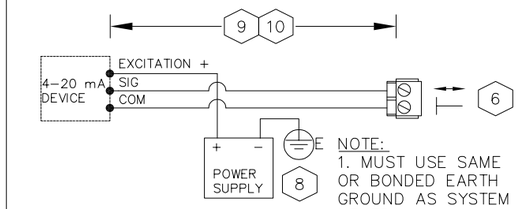
I 00 — ANALOG OUTPUT (8U,8X) 0-10VDC



M 00 — ANALOG INPUT (8X) 4-20 mA
2-WIRE INTERNAL POWERED



N 00 — ANALOG INPUT (8X) 4-20mA
3-WIRE INTERNAL POWERED



O 00 — ANALOG INPUT (8X) 4-20mA
3-WIRE EXTERNAL POWERED

NOTES:

1. MAXIMUM WIRE RUN LENGTHS ARE BASED ON THE CURRENT DRAW AND WIRE GAGE. SEE DRAWING TWIR.
2. SEE CONTROL DRAWINGS FOR NORMAL DE-ENERGIZED CONTACT STATE
3. MAXIMUM CONTACT CLOSURE RATE IS 10 PER SECOND
   8D, 16d EXCITATION = 24VDC, 8mA
   8U, 8X EXCITATION = 24VDC, 8mA, 20ms, 100mA
4. 8D, 16D MAXIMUM PULSE RATE = 10Hz (50ms PER STATE, 100ms PER PULSE)
   8U, 8X MAXIMUM PULSE RATE = 20Hz (25ms PER STATE, 50ms PER PULSE)
5. PXC MODULAR DO CONTACT RATINGS
   AC OPERATION:
   4A @ 240VAC (RESISTIVE)
   3A @ 240VAC (INDUCTIVE)
   SIZE 4 MOTOR STARTER
   DC OPERATION:
   40W @ < 50VDC
   20W @ > 50VDC
6. REFER TO PXC MODULAR PANEL FOR ACTUAL POINT ADDRESSES. REFER TO TXMI TERMINATION TABLES FOR ACTUAL TERMINALS FOR EACH PANEL ADDRESS. COMMON TERMINAL MAY BE SHARED BY 2 POINTS.
7. REFER TO DRAWING P1 ON TWIR FOR MAXIMUM CURRENT PROVIDED BY THE 24VDC SENSOR SUPPLY ON P1 BIM OR BUS POWER SUPPLY
8. EXTERNAL POWER SUPPLY CAN EITHER BE A 24VDC POWER SUPPLY OR A 24VAC TRANSFORMER DEPENDING ON THE SENSOR SELECTED. IF NOT AN ISOLATED NC CLASS 2 CIRCUIT THEN POWER SOURCE, NEUTRAL AND PXC MODULAR COMMON MUST BE BOTH CONNECTED TO THE SAME OR BONDED BUILDING APPROVED EARTH GROUND. FOR FURTHER DETAILS SEE EARTH GROUNDING RULES (125-3002) APOGEE WIRING GUIDELINES FOR FIELD PANELS AND EQUIPMENT CONTROLLERS.
9. 50mA OR LESS – 750ft/230m
   50mA TO 100mA – 375ft/115m
10. 100mA TO 150mA – 250ft/76m
    150mA TO 200mA – 187ft/57m
    200mA TO 250mA – 150ft/46m
11. WHERE H TERMINAL IS NOT A NEC CLASS 2 CIRCUIT, RELAY COMMON TERMINAL BRANCH CURRENT MUST BE EXTERNALLY LIMITED TO 10A MAXIMUM BY AN NEC APPROVED MEANS. NOT A FUSE.
12. WHERE REQUIRED, N TERMINAL BRANCH CURRENT MUST BE EXTERNALLY LIMITED BY AN NEC APPROVED MEANS.

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

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IU PROJECT #20241256, IN

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HB	HB		05/09/25	05/09/25

TX-I/O Termination Spec.

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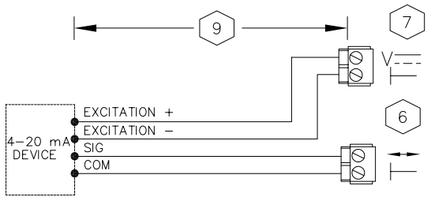
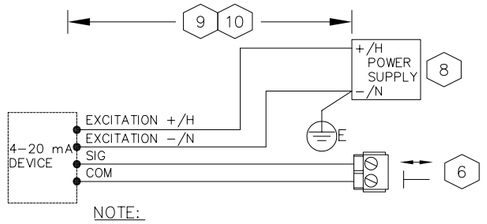
TTRM1

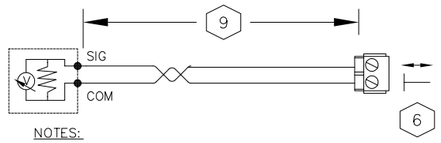


P 00 ANALOG INPUT (8X) 4–20mA
4–WIRE INTERNAL POWERED



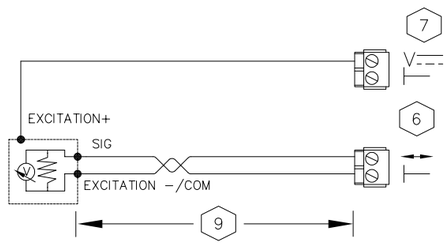
NOTE:
1. MUST USE SAME OR BONDED EARTH GROUND AS SYSTEM NEUTRAL

Q 00 ANALOG INPUT (8X) 4–20mA
4–WIRE EXTERNAL POWERED

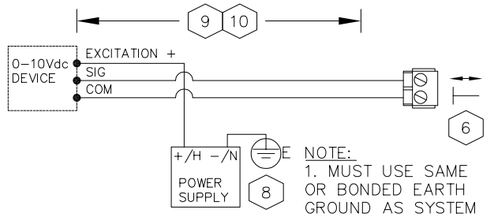


NOTES:
1. TRANSDUCER POWERED FROM ISOLATED INPUT
2. TRANSDUCER OUTPUT VOLTAGE

R 00 ANALOG INPUT (8U,8X) 0–10 Vdc
SELF POWERED TRANSDUCER

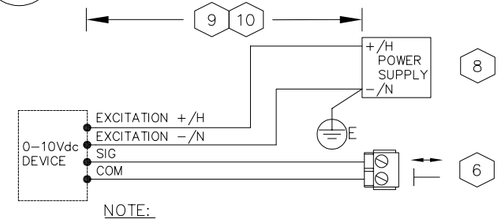


S 00 ANALOG INPUT (8U,8X) 0–10VDC
3–WIRE INTERNAL POWERED



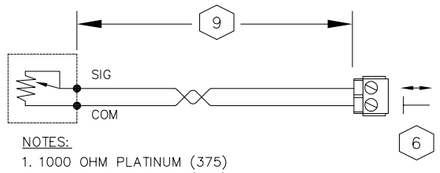
NOTE:
1. MUST USE SAME OR BONDED EARTH GROUND AS SYSTEM NEUTRAL

T 00 ANALOG INPUT (8U,8X) 0–10VDC
3–WIRE EXTERNAL POWERED



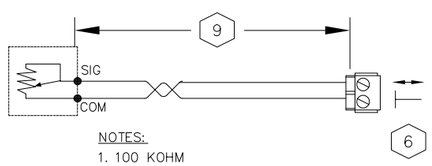
NOTE:
1. MUST USE SAME OR BONDED EARTH GROUND AS SYSTEM NEUTRAL

U 00 ANALOG INPUT (8U,8X) 0–10VDC
4–WIRE EXTERNAL POWERED



NOTES:
1. 1000 OHM PLATINUM (375)
2. 1000 OHM PLATINUM (385)
3. 1000 OHM NICKEL
4. CUSTOM

V 00 ANALOG INPUT (8X,8U) RTD



NOTES:
1. 100 KOHM
2. 10 KOHM
3. CUSTOM

W 00 ANALOG INPUT (8X,8U) THERMISTOR

TXM1 TERMINATION TABLES

1. ALL TXM1 TERMINALS (MEASURING, NEUTRAL, RELAY, SUPPLY) ARE CONNECTED IN THE PLUG–IN I/O MODULE, NOT IN THE TERMINAL BUS.

		TXM1.8D, TXM1.16D							
I/O POINT		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SYSTEM NEUTRAL[1]	⊥ (–)	1	3	5	7	9	11	13	15
DIGITAL INPUT	↑ (+)	2	4	6	8	10	12	14	16

1. NEUTRAL CAN BE CONNECTED TO ANY NEUTRAL TERMINAL ON SAME MODULE AND SEVERAL CAN SHARE SAME NEUTRAL TERMINAL.

		TXM1.16D							
I/O POINT		(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
SYSTEM NEUTRAL	⊥ (–)	18	20	22	24	26	28	30	32
DIGITAL INPUT[1]	↑ (+)	19	21	23	25	27	29	31	33

1. NO PULSE ACCUMULATOR

		TXM1.8U, TXM1.8U–ML							
I/O POINT		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SYSTEM NEUTRAL	⊥ (–)	2	6	10	14	19	23	27	31
UNIVERSAL I/O	↑ (+)	4	8	12	16	21	25	29	33
24V AC/DC ACTUATOR SUPPLY[1]	~		7		15		24		32

1. 24V DC ONLY AVAILABLE WITH BUS CONNECTOR MODULE (BCM) POWERED EXTERNALLY BY DC SUPPLY.

		TXM1.8X, TXM1.8X–ML							
I/O POINT		(1)	(2)	(3)	(4)	(5)[1]	(6)[1]	(7)[1]	(8)[1]
SYSTEM NEUTRAL	⊥ (–)	2	6	10	14	19	23	27	31
UNIVERSAL I/O	↑ (+)	4	8	12	16	21	25	29	33
24V AC/DC ACTUATOR SUPPLY[2]	~		7		15		24		32
24V DC SENSOR SUPPLY[3]	⎓	3		11		20		28	

1. 4–20 mA OUTPUT AVAILABLE ON POINTS 5–8 ONLY.

2. 24V DC ONLY AVAILABLE WITH BUS CONNECTOR MODULE (BCM) POWERED EXTERNALLY BY DC SUPPLY.

3. MAY POWER EXTERNAL SENSORS 0.6w (25mA) OR 1.2w (50mA) PER TERMINATION UP TO 2.4w (100mA) MAXIMUM FOR ALL TERMINATIONS.

		TXM1.6R, TXM1.6R–M					
I/O POINT		(1)	(2)	(3)	(4)	(5)	(6)
COMMON [1]	↑ (C)	3	9	15	20	26	32
NORMALLY CLOSED	⌐ (NC)	4	10	16	19	25	31
NORMALLY OPEN	↓ (NO)	2	8	14	21	27	33

1. COMMONS ARE NOT INTERNALLY CONNECTED.

NOTE: REFER TO TERMINATION SHEET #1 FOR INSTALLATION DETAILS.

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

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BL065 OPTOMETRY SCH-LAB RENO
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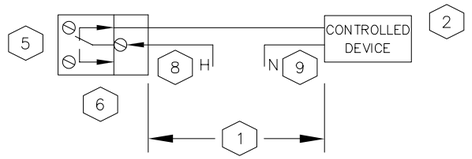
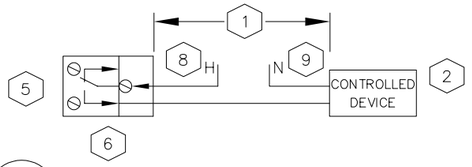
ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		05/09/25	05/09/25

TX-I/O Termination Spec. 2

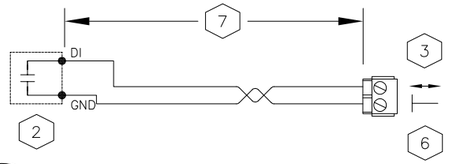
440P398851
0
TTRM2



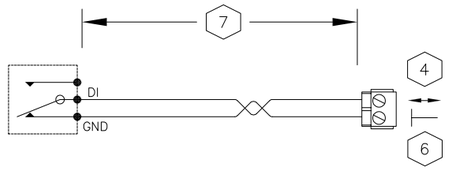
A 00 DIGITAL OUTPUT (1.4D3R, 1.8T) NC
PULSED OR LATCHED



B 00 DIGITAL OUTPUT (1.4D3R, 1.8T) NO
PULSED OR LATCHED



E 00 DIGITAL INPUT (1.4D3R)
DRY CONTACT



F 00 DIGITAL INPUT (1.4D3R)
PULSE ACCUMULATOR

NOTES:

1. MAXIMUM WIRE RUN LENGTHS ARE BASED ON THE CURRENT DRAW AND WIRE GAUGE. SEE DRAWING P7WIR.
2. SEE CONTROL DRAWINGS FOR NORMAL DE-ENERGIZED CONTACT STATE
3. MAXIMUM CONTACT CLOSURE RATE IS 10 PER SECOND
4. 1.4D3R MAXIMUM PULSE RATE UP TO 10Hz
5. DO CONTACT RATINGS
   AC OPERATION:
   4A @ 250VAC (RESISTIVE)
   3A @ 250VAC (INDUCTIVE)

   DC OPERATION:
   4A @ 30VDC (RESISTIVE), UL APPLICATIONS
   3A @ 30VDC GENERAL PURPOSE
   3A @ 30VDC (RESISTIVE)
6. REFER TO PXC7 PANEL FOR ACTUAL POINT ADDRESSES. REFER TO TXM TERMINATION TABLES FOR ACTUAL TERMINALS FOR EACH PANEL ADDRESS. COMMON TERMINAL MAY BE SHARED BY 2 POINTS.
7. 50mA OR LESS – 750ft/230m
   50mA TO 100mA – 375ft/115m
8. WHERE H TERMINAL IS NOT A NEC CLASS 2 CIRCUIT, RELAY COMMON TERMINAL BRANCH CURRENT MUST BE EXTERNALLY LIMITED TO 10A MAXIMUM BY AN NEC APPROVED MEANS. NOT A FUSE.
9. WHERE REQUIRED, N TERMINAL BRANCH CURRENT MUST BE EXTERNALLY LIMITED BY AN NEC APPROVED MEANS.

	TXM1.4D3R		
I/O POINT	(1)	(2)	(3)
SUPPLY	3	9	15
NORMALLY OPEN ⏐ (NO)	2	8	14
NORMALLY CLOSED ⌐ (NC)	4	10	16

	TXM1.4D3R			
I/O POINT	(5)	(6)	(7)	(8)
SYSTEM NEUTRAL[1] ⊥ (–)	26	28	30	32
DIGITAL INPUT ⏐ (+)	27	29	31	33

1. TERMINALS 26, 28, 30, 32 ARE SYSTEM NEUTRAL TERMINALS.

THEY ARE INTERCONNECTED, NOT IN THE TERMINAL BASE BUT IN THE PLUG-IN I/O MODULE. WHEN I/O MODULE IS REMOVED, THERE IS NO CONNECTION.

THE SYSTEM NEUTRAL OF A DIGITAL INPUT CAN BE CONNECTED TO ANY SYSTEM NEUTRAL TERMINAL.

	TXM1.8T							
I/O POINT	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SUPPLY[1] ~	2	6	10	14	19	23	27	31
DIGITAL OUTPUT[2] ⏐ (+)	4	8	12	16	21	25	29	33

1.THE LOAD CAN BE CONNECTED DIRECTLY TO THE CORRESPONDING OUTPUT TERMINALS. NO SEPARATE 24VAC SUPPLY IS REQUIRED.

2. THE TRIAC CLOSES THE CONTACT TO ⊥ (SYSTEM NEUTRAL).

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

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TX-I/O Termination Spec. 3

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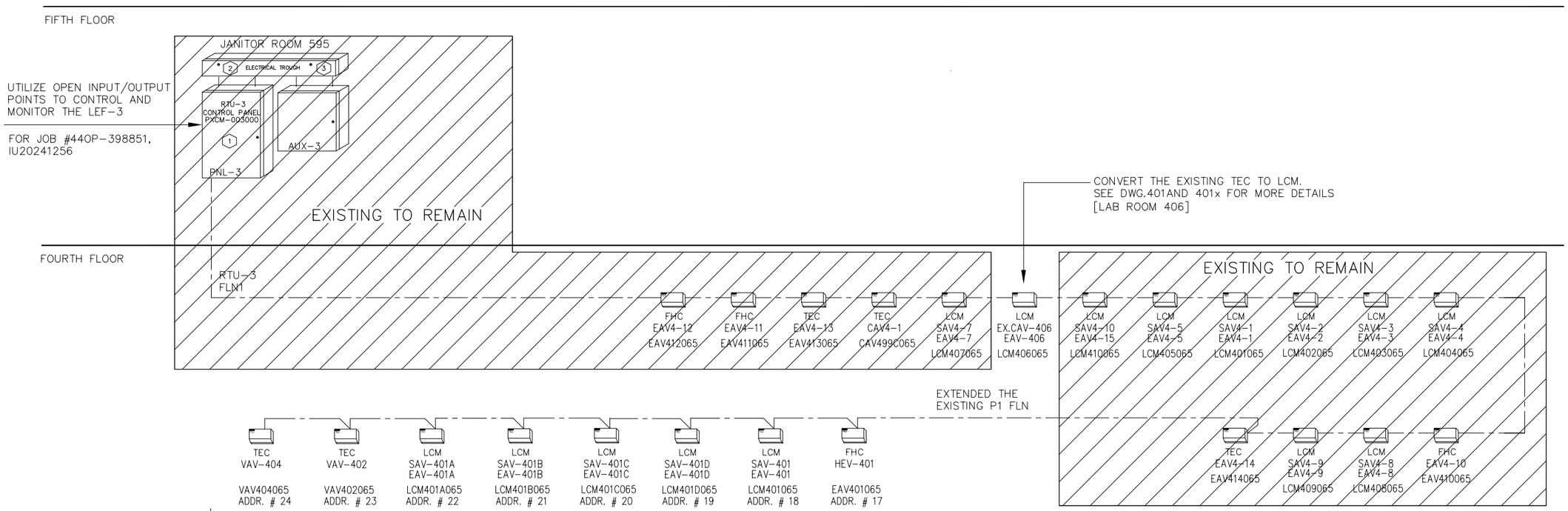

1 R01 SYSTEM NETWORK DIAGRAM
SERVES: P1 FLN DEVICES

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

3502 WOODVIEW TRACE
SUITE 240
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UNITED STATES
PHONE: 317-293-8880
FAX: 317-293-0374

BL065 OPTOMETRY SCH-LAB RENO
IU PROJECT #20241256, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		05/09/25	05/09/25

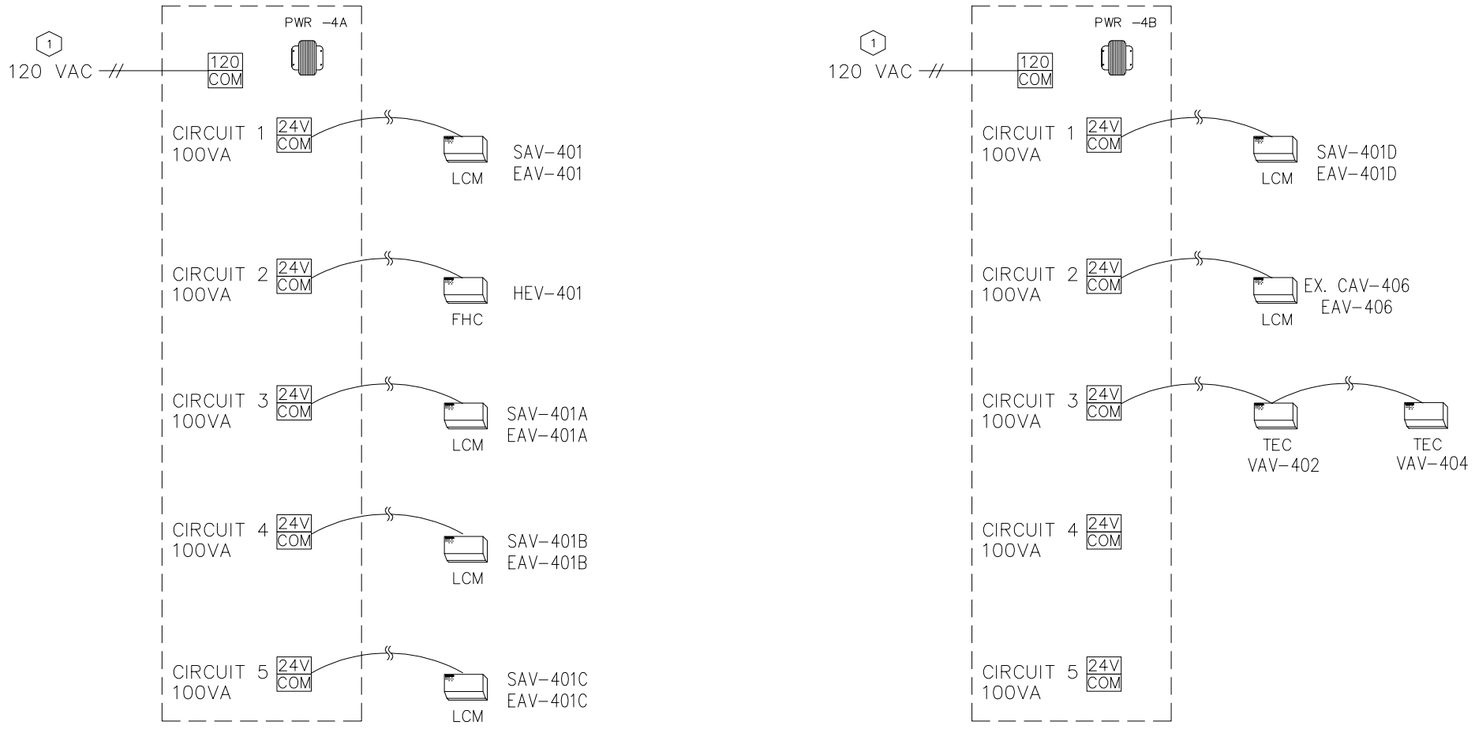
SYSTEM RISER

440P398851
0
R01

INSTALLATION NOTES:

1. TRANSFORMER PANELS TO BE LOCATED AS SHOWN ON ELECTRICAL DRAWINGS. MOUNTING AND FIELD WIRING BY CIC, POWER WIRING BY EC.

FOURTH FLOOR TRANSFORMER
LOCATION: CORRIDOR OUTSIDE OF JANITOR ROOM 495



1 / R02 24 VAC POWER TRUNKS

REVISION HISTORY			
00	5/9/2025	HB	SUBMITTAL SET

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IU PROJECT #20241256, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		05/09/25	05/09/25

POWER TRUNK

440P398851
0
R02

Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
PWR 4A	1	PSH500A-LVC	FUNCTIONAL		Power Supply HILO 100VAx5 multi-tap
PWR 4B	1	PSH500A-LVC	FUNCTIONAL		Power Supply HILO 100VAx5 multi-tap

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

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IU PROJECT #20241256, IN

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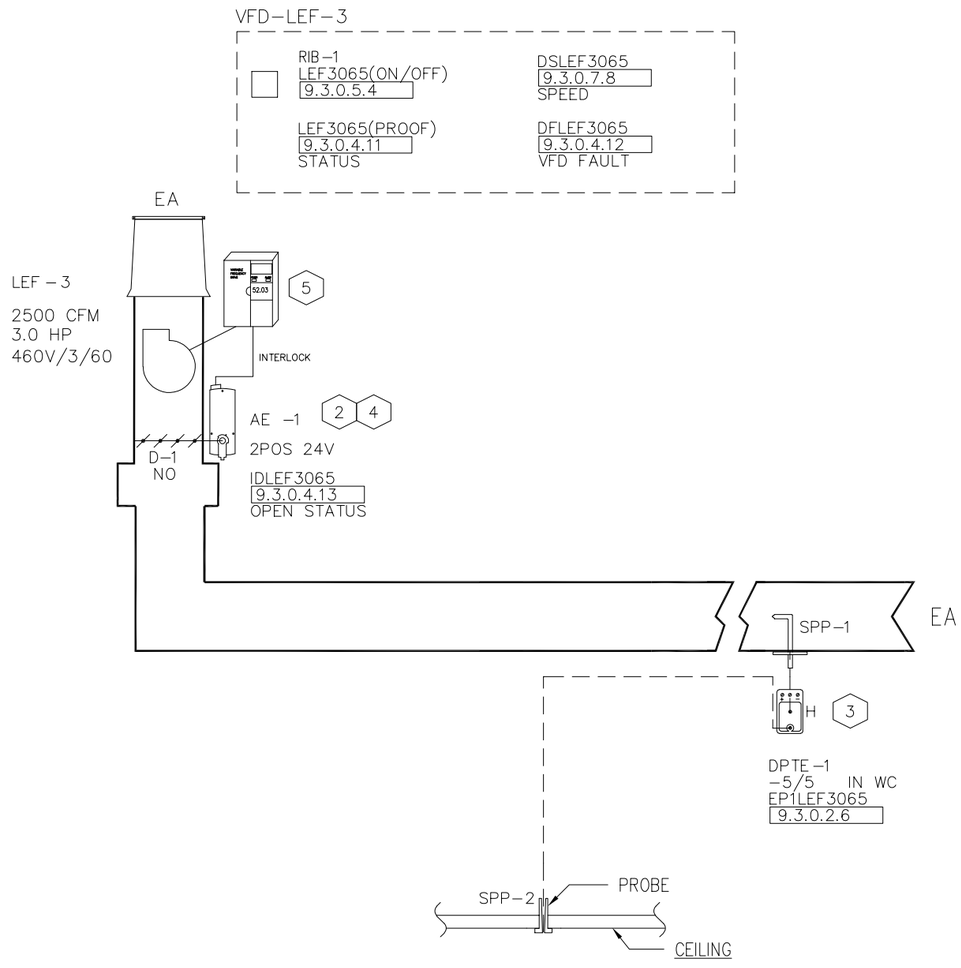
HB	HB		05/09/25	05/09/25

POWER TRUNK BOM

440P398851
0
R02A

INSTALLATION NOTES:

1. SEE WIRING DETAIL ON ELECTRICAL DRAWING ON SUBSEQUENT SHEET.
2. HARDWIRE INTERLOCK OF ACTUATOR ENDSWITCH REQUIRED.
   SEE WIRING DETAIL ON ELECTRICAL DRAWING ON SUBSEQUENT SHEET.
3. MOUNT STATIC PROBE AND SENSOR IN THE FIFTH FLOOR DUCTWORK.
   REFERENCE LOW SIDE TO SPACE.
4. DAMPERS AND ACTUATORS WITH ENDSWITCHES PROVIDED
   AND INSTALLED BY OTHERS.
5. VFD PROVIDED AND INSTALLED BY OTHERS.



1/100 LAB EXHAUST FAN LEF–3

LOCATION: ROOF
SERVES: FOURTH FLOOR LABS

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

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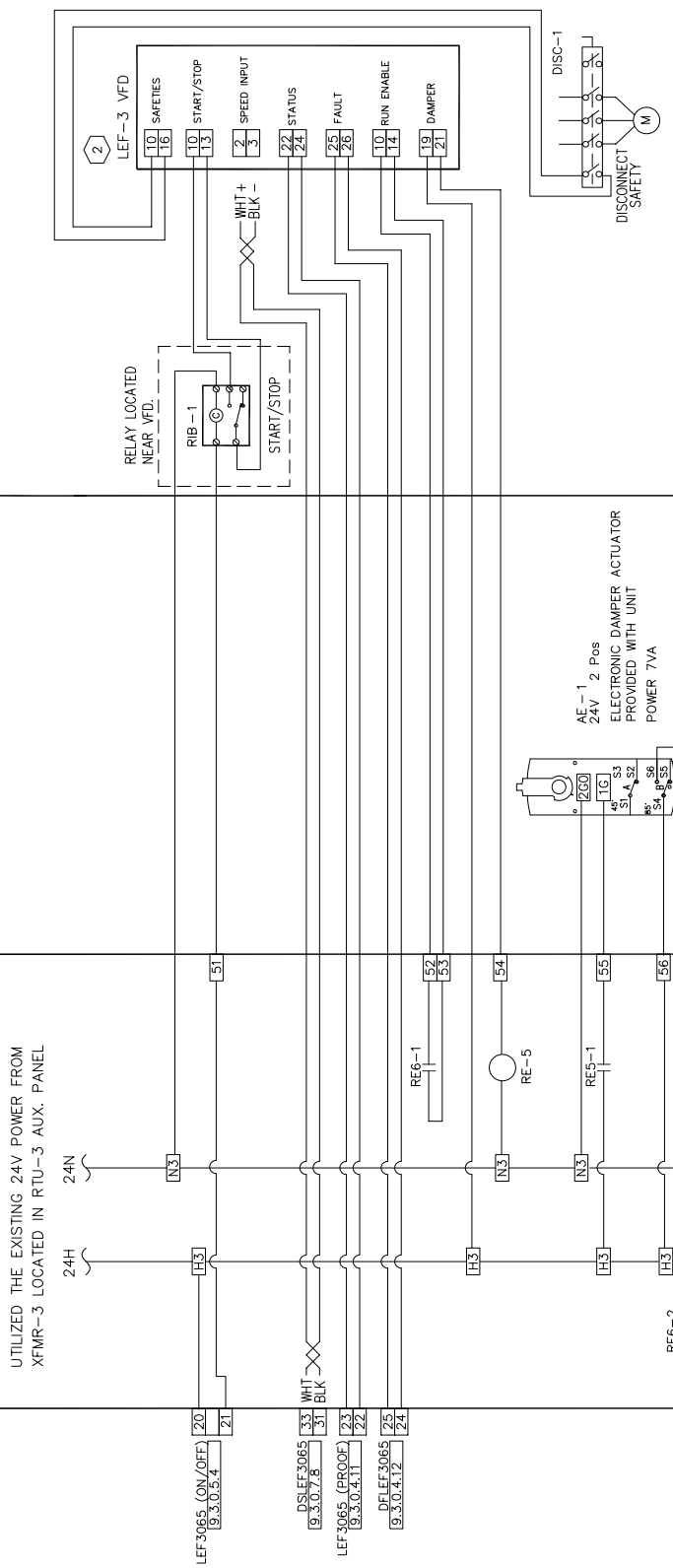
LEF-3 CONTROL

440P398851
0
100

FIELD WIRING | **STARTER WIRING**

COMPONENT PANEL / POWER

FIELD PANEL



DRAWING NOTES: (#)
1. LOCATE RELAY ADJACENT TO ITS ASSOCIATED VARIABLE FREQUENCY DRIVE OR STARTER.
2. VERIFY VFD CABLE SPECIFICATIONS AND INPUT ISOLATION REQUIREMENTS WITH VFD MANUFACTURER.

GENERAL NOTES:
1. ALL WIRING TO MEET REQUIREMENTS OF STANDARD WIRING SPECIFICATIONS DRAWINGS.
2. 120VAC POWER BY ELECTRICAL CONTRACTOR.
3. EXACT LOCATIONS OF FIELD DEVICES TO BE COORDINATED WITH IUPUI/SIEMENS.

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

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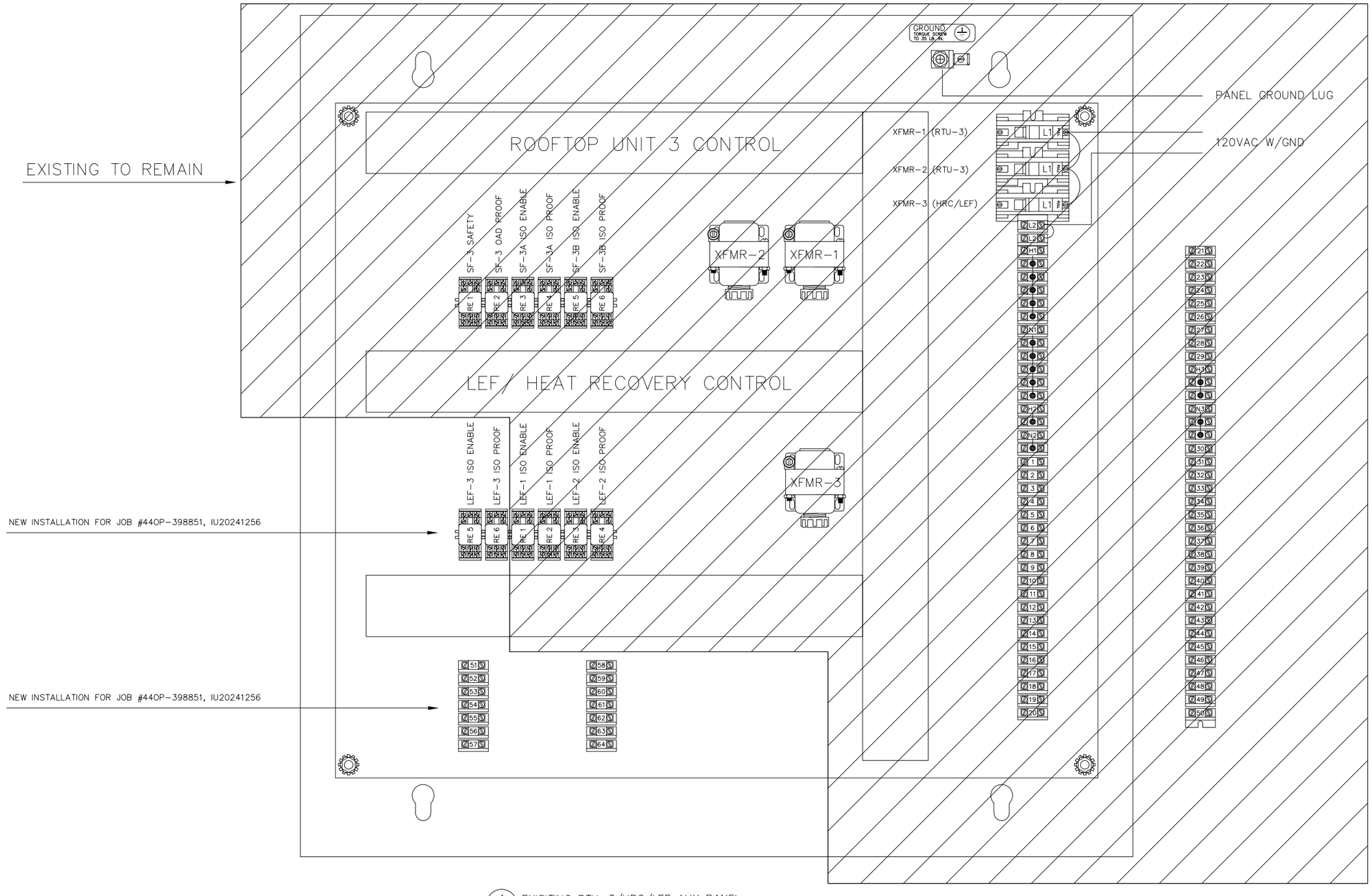
LEF-3 ELEC. WIRING

440P398851
0
100A



1 / 100B EXISITING RTU-3/HRC/LEF AUX PANEL
LOCATION: JANITOR ROOM 595

REVISION HISTORY

SIEMENS

SIEMENS INDUSTRY INC.
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IU PROJECT #20241256, IN

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HB	HB		05/09/25	05/09/25

EXISTING RTU-3 AUX PANEL

440P398851
0
100B

Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
AE 1	1	FBO			FURNISHED BY OTHERS
DPTE 1	1	2641005WB11A1C	SETRA	0608cut003	DP TRAN AIR,1%,+/-5" ENC
RIB 1	1	RIBU1C	FUNCTIONAL DEVICES	1208cut013	RIB 120VAC 24VAC/DC SPDT
SPP 1	1	A-489	DWYER INST	A(PRS TIP)	4" straight static pressure tip w/flange
SPP 2	1	RPS-W	KELE		WHITE PLASTIC ROOM PRESSURE SENSOR
VFD 1	1	FBO			FURNISHED BY OTHERS
Panel Mounted Devices					
RE 5	1	RH2B-UL-AC24VKIT	IDEC	1202cut016	RELAY&SOC,GP DPDT AC24V W/LED
RE 6	1	RH2B-UL-AC24VKIT	IDEC	1202cut016	RELAY&SOC,GP DPDT AC24V W/LED

EXHAUST FAN CONTROL:
LEF-3 OPERATES CONTINUOUSLY. THE VARIABLE FREQUENCY CONTROLER SHALL MODULATE FAN SPEED TO MAINTAIN DUCT STATIC PRESSURE SETPOINT OF -1.0" wg (ADJ). DUCT STATIC PRESSURE SHALL BE DETERMINED AT TIME OF SYSTEM BALANCING.

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

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BL065 OPTOMETRY SCH-LAB RENO
IU PROJECT #20241256, IN

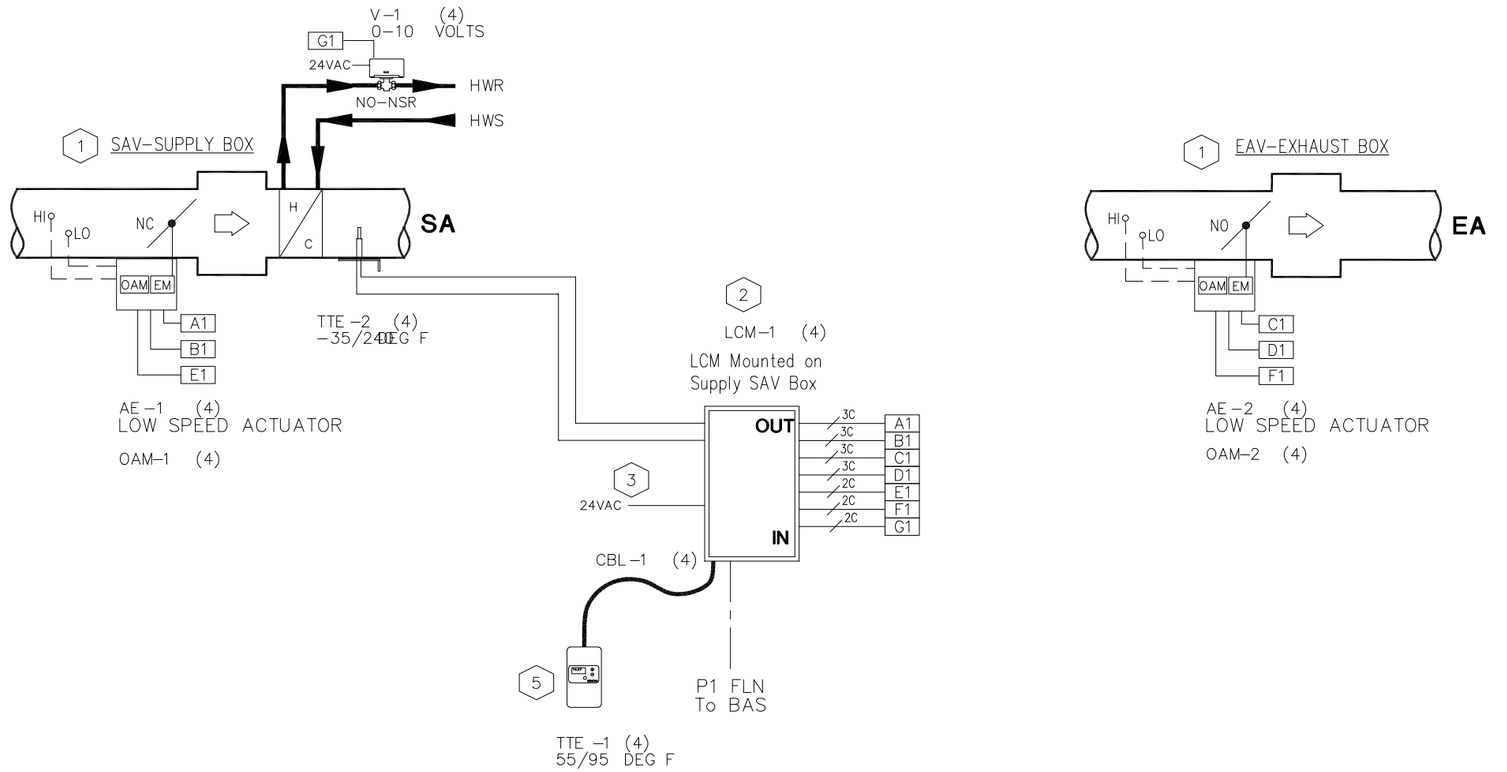
ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		05/09/25	05/09/25

LEF-3 CONTROL BOM & SOO

440P398851
0
100C

INSTALLATION NOTES:

1. SAV / EAV BOX INSTALLED BY MECHANICAL CONTRACTOR WITH 3 TO 5 STRAIGHT DUCT DIAMETERS UPSTREAM OF BOX TO PROVIDE PROPER FLOW SENSING.
2. LCM-1 TO BE MOUNTED IN MANUFACTURER SUPPLIED CONTROLLER ENCLOSURE. CIC FIELD MOUNTED ALL CONTROL DEVICES.
3. REFER TO BUILDING POWER TRUNK DRAWING FOR 24 VAC POWER.
4. SEE ASSOCIATED WIRING DAIGRAM FOR DETAILS ON NEXT PAGE(S).
5. LOCATE AS SHOWN ON FLOOR PLANS/ CONTRACT DOCUMENTS.



1/400 SUP AIR BOX AND EXH AIR BOX, SLOW DAMPER CONTROL DIAGRAM

TYPICAL OF Q'TY: (4)
LOCATION: SEE THE LAB ROOM SCHEDULE
SERVES: SEE THE LAB ROOM SCHEDULE
BASE APPLICATION NUMBER: 2923

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

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BL065 OPTOMETRY SCH-LAB RENO
IU PROJECT #20241256, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		05/09/25	05/09/25

1SAV-1EAV-SLOW-LCM

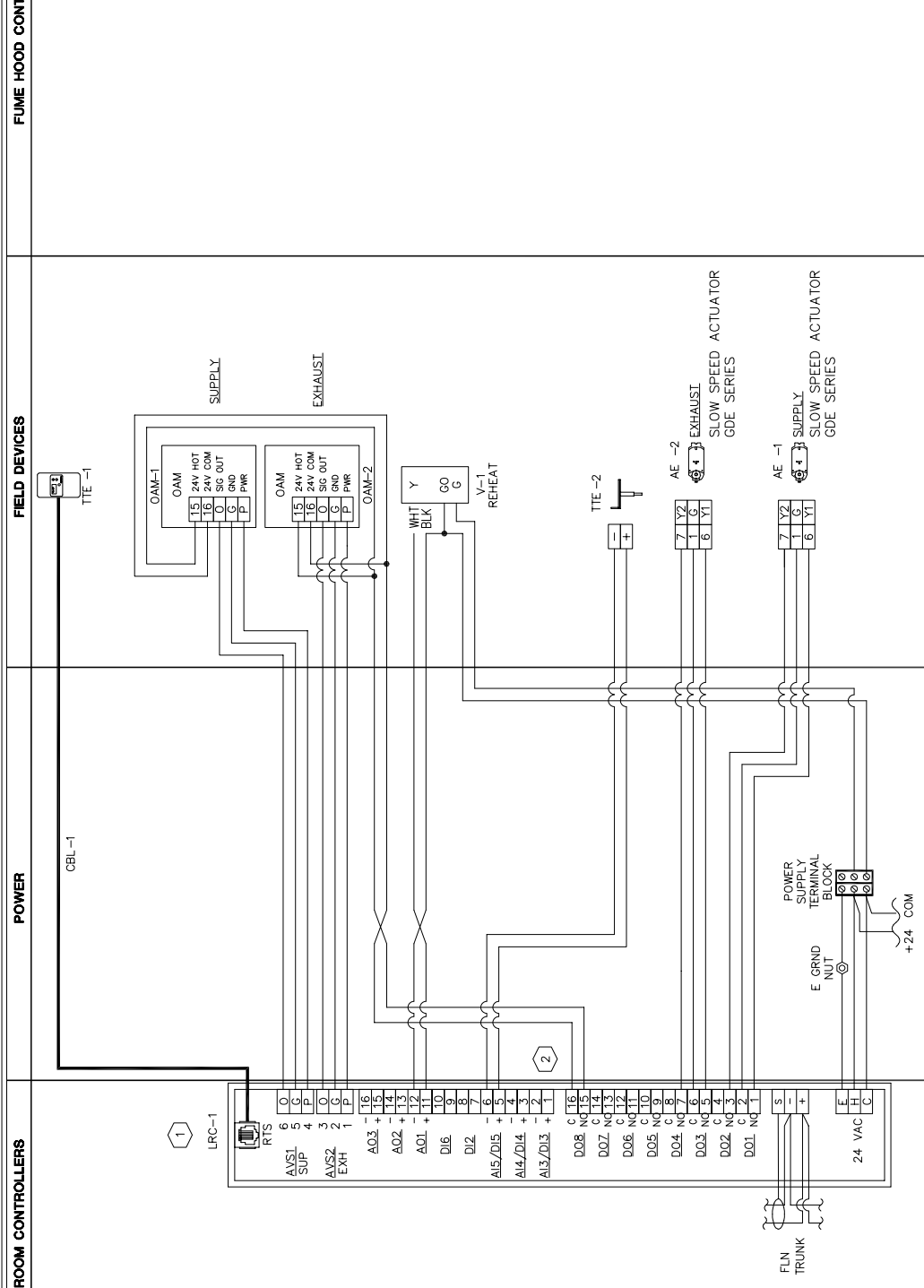
440P398851
0
400

FUME HOOD CONTROLLERS

FIELD DEVICES

POWER

LAB ROOM CONTROLLERS



LAB RM CNTRL–WIRING DIAGRAM

400A

INSTALLATION NOTES:

1. ALL WIRING TO MEET REQUIREMENTS OF STANDARD WIRING SPECIFICATIONS DRAWINGS
2. IF NO FUME HOOD(S) INPUT WILL BE CONNECTED TO AI3, MAKE SURE MAX HOOD VOL = 0 (DEFAULT).

EQUIPMENT TO BE POWERED	PWR TRUNK 1	PWR TRUNK 2	PWR TRUNK 3	MAX RATING
LCM–1	X			7 VA
SUPPLY AIR BOX ACTUATOR GDE	X			2.3 VA
SUPPLY AIR OFF–BOARD MODULE	X			~7 VA
0–10 VDC REHEAT VALVE	X			3.5 VA
EXHAUST AIR BOX ACTUATOR GDE	X			2.3 VA
EXHAUST AIR OFF–BOARD MODULE	X			~7 VA
T–STAT QAA	X			2.0 VA
			TOTAL:	31.1 VA

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

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IU PROJECT #20241256, IN

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HB	HB		05/09/25	05/09/25

1SAV-1EAV-SLOW-LCM ELEC. WIRING

440P398851
0
400A

Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
AE 1-2	8	GDE131.1P	SIEMENS	154 011	ACT NSR PLENUM 24/108L 5Nm
CBL 1	4	588-100B	SIEMENS		6-WIRE 2-RJ11 RS CABLE 50'PLMN
LCM 1	4	550-767FN	SIEMENS	149856	LCM-OAVS DAMPER SLOW SPEED
OAM 1-2	8	550-819B	SIEMENS		REMOTE AIR MODULE, PTEC
TTE 1	4	QAA2280.FWSC	SIEMENS	149820	RTS, TEC/RJ-11, FULL HMI
TTE 2	4	536-811	SIEMENS	149 134	DCT PT TMP, 100K OHM, 4", BRACKET MNT

LABORATORY AIRFLOW SEQUENCE OF OPERATION

A. GENERAL

1. CONTROL OF AIRFLOW TO AN FROM EACH LABORATORY SPACE AND CONTROL OF SPACE TERMPERATURE WITHIN THE LABORATORY SPACE SHALL BE ACCOMPLISHED BY THE LABORATORY AIRFLOW CONTROL SYSTEM (LACS). THE LACS SHALL UTILIZE DDC MICROPROCESSOR BASED LOGIC TO ACHEIVE ALL CONTROL FUNCTIONS.

B. AIRFLOW CONTROL
1. SUPPLY AIR TERMINAL UNIT WITH REHEAT (SAV-XXX): MODULATE SUPPLY TERMINAL UNIT DAMPER TO MAINTAIN OFFSET WITH EXHAUST AIRFLOW. MODULATE HEATING COIL TEMPERATURE CONTROL VALVE TO MAINTAIN SPACE TEMPERATURE SETPOINT.

2. EXHAUST VALVE (EAV-XXX): MODULATE EXHAUST AIR VALVE TO MAINTAIN MAXIMUM EXHAUST WHEN LABORATORY IS OCCUPIED.
GRAPHICALLY DISPLAY THE FOLLOWING POINTS, AT A MINIMUM, AT THE OPERATOR WORKSTATION:

ANALOG INPUTS
SPACE TEMPERATURE (ZN-T)
AIR VALVE POSITION AS A PERCENT OPEN (DPR-O)
TEMPERATURE CONTROL VALVE POSITION AS A PERCENT OPEN (RH-VLV)
EXHAUST AIRFLOW VALUE FOR EXHAUST VALVES AND EXHAUST TERMINAL UNITS (EXH-CFM)
SUPPLY AIRFLOW VALUE FOR SUPPLY TERMINAL UNITS (SA-CFM)
DISCHARGE AIR TEMPERATURE FOR SUPPLY TERMINAL UNITS (DA-T)

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

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BL065 OPTOMETRY SCH-LAB RENO
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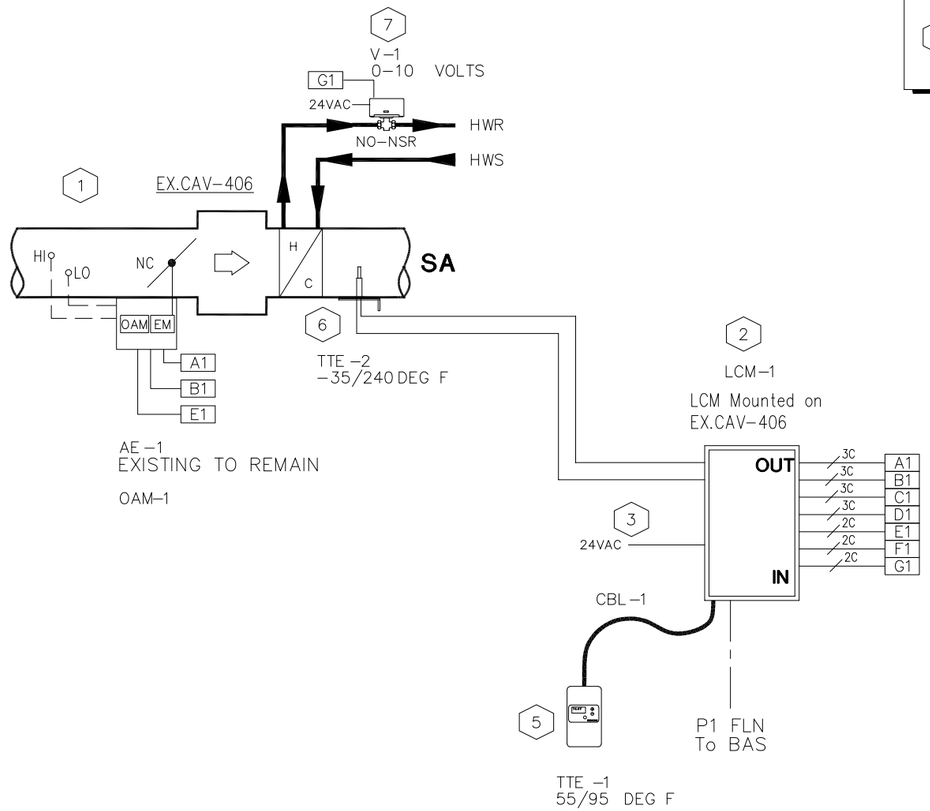
HB	HB		05/09/25	05/09/25

1SAV-1EAV-SLOW-LCM BOM & SOO

44OP398851
0
400B

INSTALLATION NOTES:

1. EAV BOX INSTALLED BY MECHANICAL CONTRACTOR WITH 3 TO 5 STRAIGHT DUCT DIAMETERS UPSTREAM OF BOX TO PROVIDE PROPER FLOW SENSING.
2. REPLACE THE EXISTING TEC WITH LCM, SAVE THE EXISTING TEC AND RETURN TO THE OWNER. CIC FIELD MOUNTED FOR LCM AND ALL CONTROL DEVICES.
3. REFER TO BUILDING POWER TRUNK DRAWING FOR 24 VAC POWER
4. SEE ASSOCIATED WIRING DIAGRAM FOR DETAILS ON NEXT PAGE(S).
5. DEMO THE EXISTING T-STAT AND ASSOCIATED CABLE TO THE EXISTING TEC. INSTALL NEW T-STAT AND CABLE, LOCATE AS SHOWN ON THE PLAN MP101.
6. REPLACE THE EXISTING SA DUCT TEMPERATURE SENSOR WITH NEW ONE RE-USE THE EXISTING WIRE WHERE APPLICABLE.
7. REPLACE THE EXISTING VALVE ACTUATOR WITH NEW MODULATING VALVE ACTUTOR. THE VALVE BODY STAYED IN PLACE. RE-USE THE EXISTING WIRE WHERE APPLICABLE.



1 / 401 LAB ROOM 406

TYPICAL OF Q'TY: (1)

BASE APPLICATION NUMBER: 2923

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

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HB	HB		05/09/25	05/09/25

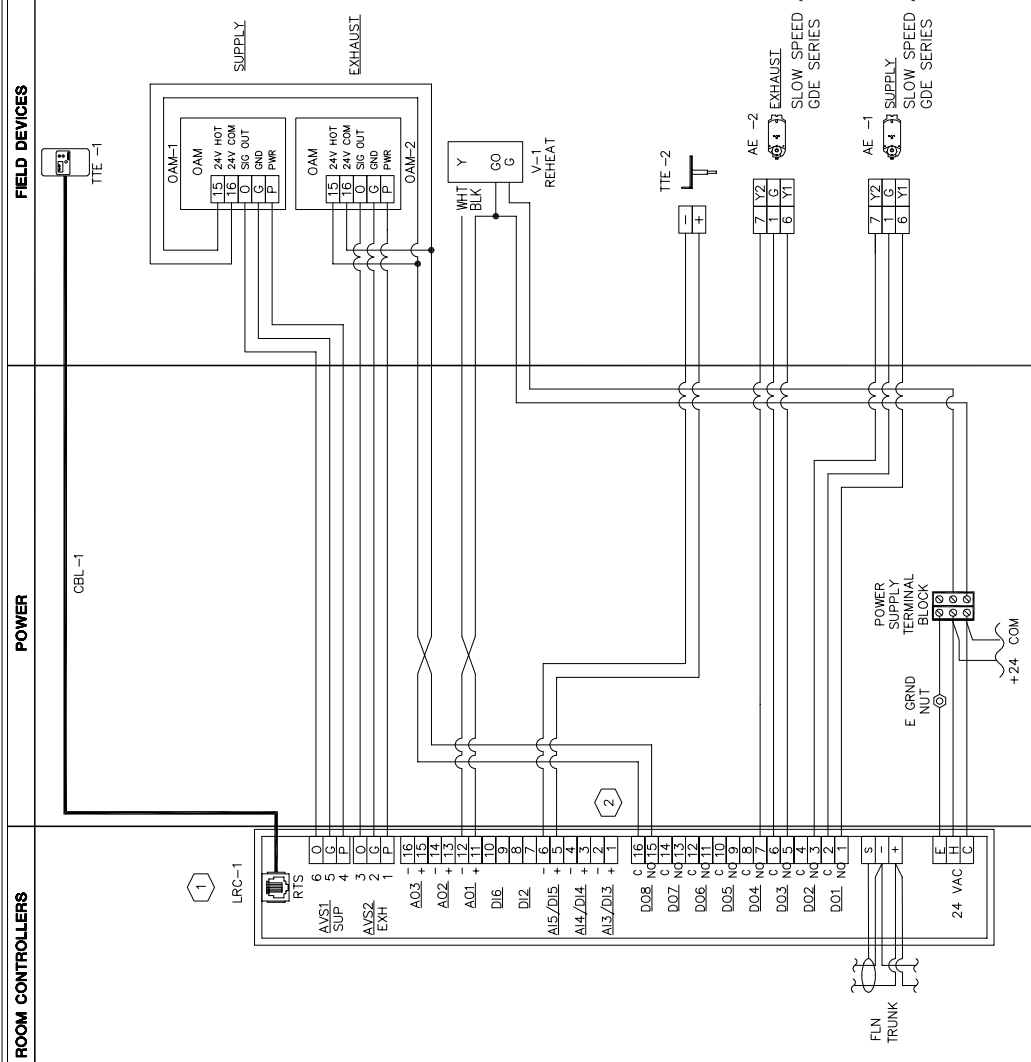
LAB ROOM 406 CONTROL

44OP398851
0
401

FIELD DEVICES | **FUME HOOD CONTROLLERS**

POWER

LAB ROOM CONTROLLERS



1 LAB RM CNTRL—WIRING DIAGRAM
401A

INSTALLATION NOTES:

1. ALL WIRING TO MEET REQUIREMENTS OF STANDARD WIRING SPECIFICATIONS DRAWINGS
2. IF NO FUME HOOD(S) INPUT WILL BE CONNECTED TO AI3, MAKE SURE MAX HOOD VOL = 0 (DEFAULT).

EQUIPMENT TO BE POWERED	PWR TRUNK 1	PWR TRUNK 2	PWR TRUNK 3	MAX RATING
LCM-1	X			7 VA
SUPPLY AIR BOX ACTUATOR GDE	X			2.3 VA
SUPPLY AIR OFF-BOARD MODULE	X			~7 VA
0-10 VDC REHEAT VALVE	X			3.5 VA
EXHAUST AIR BOX ACTUATOR GDE	X			2.3 VA
EXHAUST AIR OFF-BOARD MODULE	X			~7 VA
T-STAT QAA	X			2.0 VA
			TOTAL:	31.1 VA

REVISION HISTORY

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HB	HB		05/09/25	05/09/25

LAB RM 406 ELEC. WIRING

440P398851
0
401A

Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
AE 1	1	EXISTING TO REMAIN			
AE 2	1	GDE131.1P	SIEMENS	154 011	ACT NSR PLENUM 24/108L 5Nm
CBL 1	1	588-100A	SIEMENS		6-WIRE 2-RJ11 RS CABLE 25'PLMN
LCM 1	1	550-767FN	SIEMENS	149856	LCM-OAVS DAMPER SLOW SPEED
OAM 1-2	2	550-819B	SIEMENS		REMOTE AIR MODULE, PTEC
TTE 1	1	QAA2280.FWSC	SIEMENS	149820	RTS, TEC/RJ-11, FULL HMI
TTE 2	1	536-811	SIEMENS	149 134	DCT PT TMP, 100K OHM, 4", BRACKET MNT
V* 1	1	SSC161.05U	SIEMENS		MODULATING VALVE ACTUATOR 0-10VDC

MODIFY CONTROL SEQUENCE AS REQUIRED TO MEET THE FOLLOWING SEQUENCE OF OPERATION.

LABORATORY AIRFLOW SEQUENCE OF OPERATION

A. GENERAL

1. CONTROL OF AIRFLOW TO AN FROM EACH LABORATORY SPACE AND CONTROL OF SPACE TERMPERATURE WITHIN THE LABORATORY SPACE SHALL BE ACCOMPLISHED BY THE LABORATORY AIRFLOW CONTROL SYSTEM (LACS). THE LACS SHALL UTILIZE DDC MICROPROCESSOR BASED LOGIC TO ACHEIVE ALL CONTROL FUNCTIONS.

B. AIRFLOW CONTROL
1. SUPPLY AIR TERMINAL UNIT WITH REHEAT (SAV-XXX): MODULATE SUPPLY TERMINAL UNIT DAMPER TO MAINTAIN OFFSET WITH EXHAUST AIRFLOW. MODULATE HEATING COIL TEMPERATURE CONTROL VALVE TO MAINTAIN SPACE TEMPERATURE SETPOINT.

2. EXHAUST VALVE (EAV-XXX): MODULATE EXHAUST AIR VALVE TO MAINTAIN MAXIMUM EXHAUST WHEN LABORATORY IS OCCUPIED.
GRAPHICALLY DISPLAY THE FOLLOWING POINTS, AT A MINIMUM, AT THE OPERATOR WORKSTATION:

ANALOG INPUTS
SPACE TEMPERATURE (ZN-T)
AIR VALVE POSITION AS A PERCENT OPEN (DPR-O)
TEMPERATURE CONTROL VALVE POSITION AS A PERCENT OPEN (RH-VLV)
EXHAUST AIRFLOW VALUE FOR EXHAUST VALVES AND EXHAUST TERMINAL UNITS (EXH-CFM)
SUPPLY AIRFLOW VALUE FOR SUPPLY TERMINAL UNITS (SA-CFM)
DISCHARGE AIR TEMPERATURE FOR SUPPLY TERMINAL UNITS (DA-T)

REVISION HISTORY

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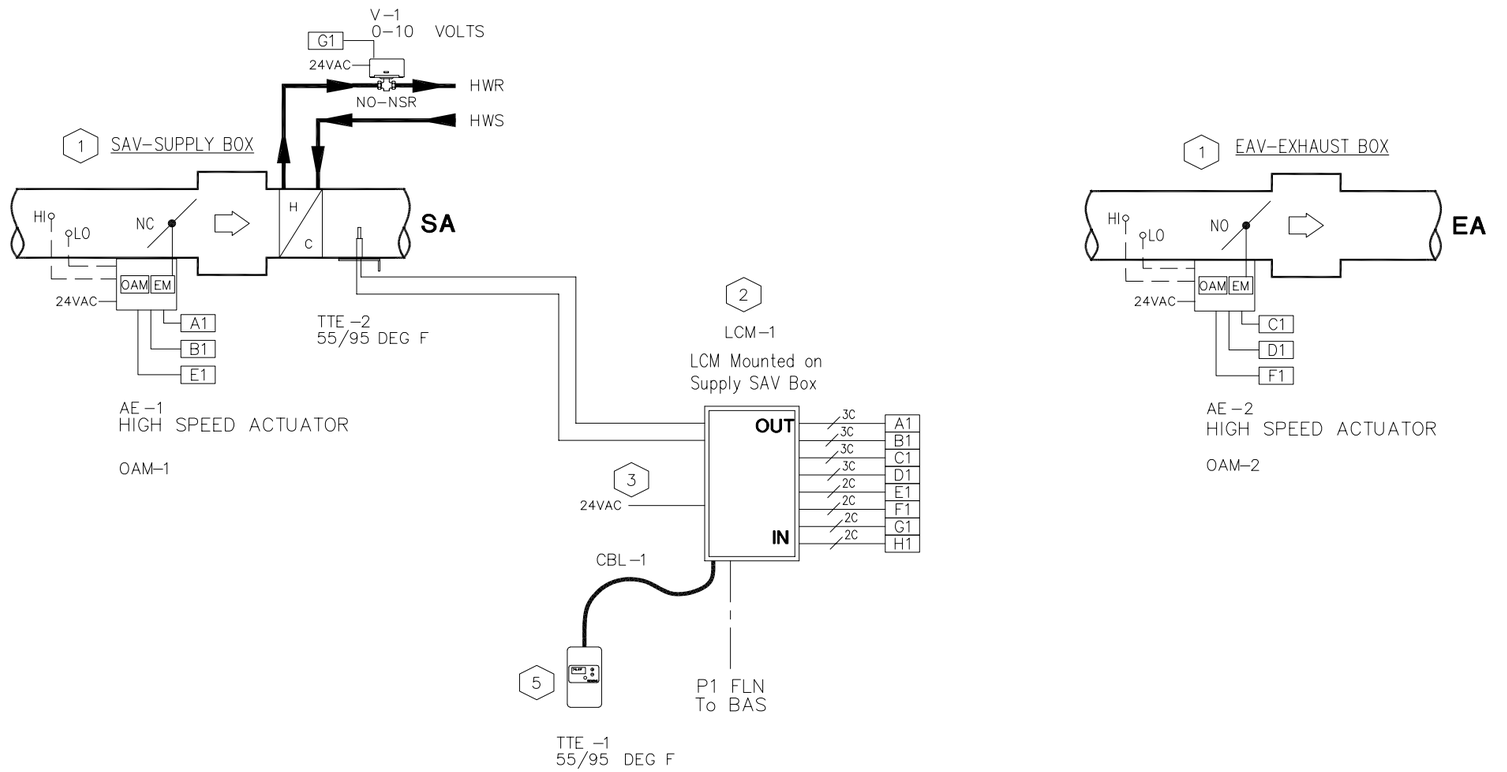
LAB RM 406 CTRL BOM & SOO

440P398851
0
401B

INSTALLATION NOTES:

1. SAV / EAV BOX INSTALLED BY MECHANICAL CONTRACTOR WITH 3 TO 5 STRAIGHT DUCT DIAMETERS UPSTREAM OF BOX TO PROVIDE PROPER FLOW SENSING.
2. LCM–1 TO BE MOUNTED IN MANUFACTURER SUPPLIED CONTROLLER ENCLOSURE. CIC FIELD MOUNTED ALL CONTROL DEVICES.
3. REFER TO BUILDING POWER TRUNK DRAWING FOR 24 VAC POWER
4. SEE ASSOCIATED WIRING DAIGRAM FOR DETAILS ON NEXT PAGE(S).
5. LOCATE AS SHOWN ON FLOOR PLANS/ CONTRACT DOCUMENTS.



1 / 410 SUP AIR BOX AND EXH AIR BOX, FAST DAMPER CONTROL DIAGRAM

TYPICAL OF Q'TY: (1)
LOCATION: SEE THE LAB ROOM SCHEDULE
SERVES: SEE THE LAB ROOM SCHEDULE
BASE APPLICATION NUMBER: 2921

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

SIEMENS

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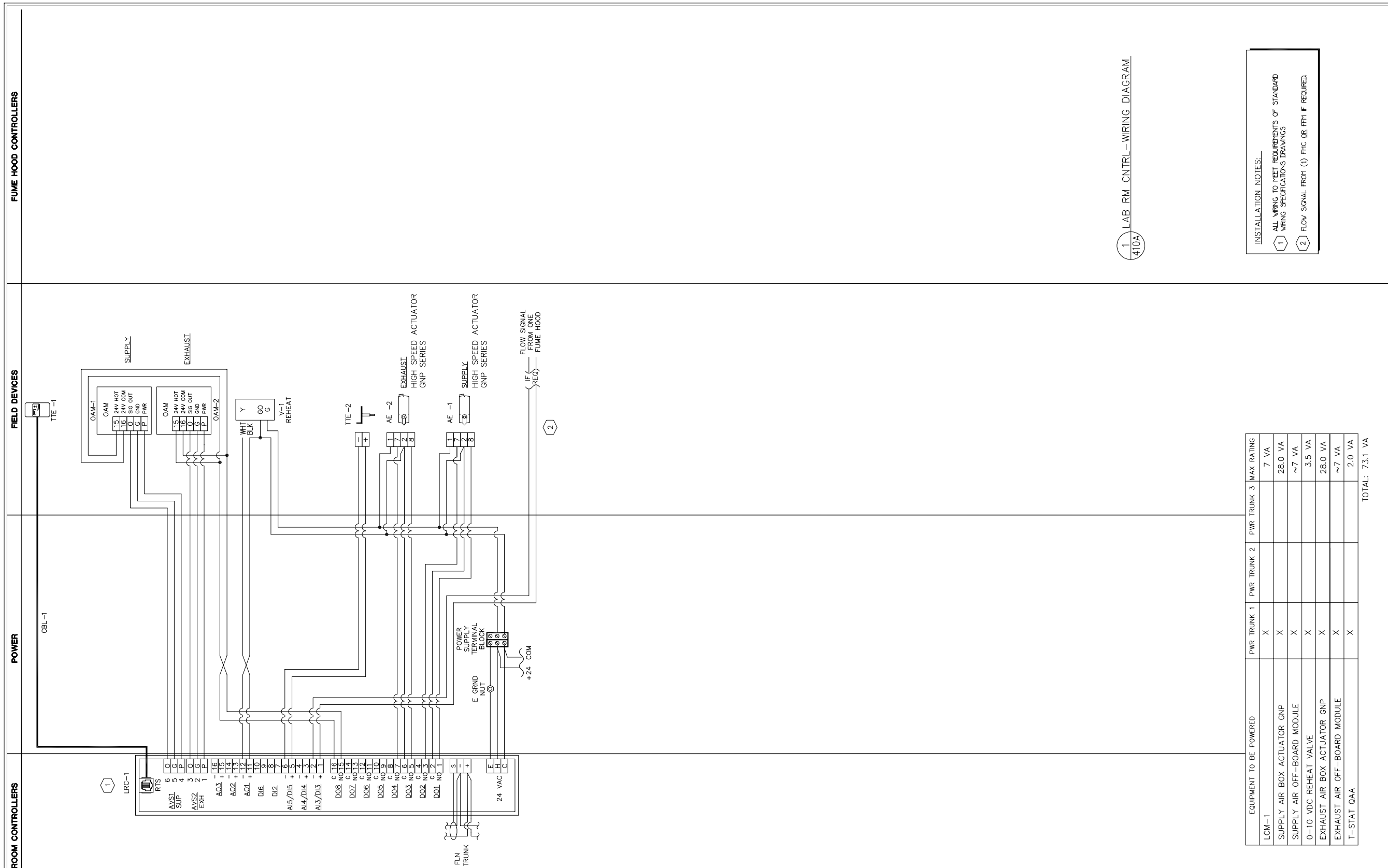
1SAV-1EAV-FAST-LCM

440P398851
0
410



EQUIPMENT TO BE POWERED	PWR TRUNK 1	PWR TRUNK 2	PWR TRUNK 3	MAX RATING
LCM-1	X			7 VA
SUPPLY AIR BOX ACTUATOR GNP	X			28.0 VA
SUPPLY AIR OFF-BOARD MODULE	X			~7 VA
0-10 VDC REHEAT VALVE	X			3.5 VA
EXHAUST AIR BOX ACTUATOR GNP	X			28.0 VA
EXHAUST AIR OFF-BOARD MODULE	X			~7 VA
T-STAT QAA	X			2.0 VA
			TOTAL:	73.1 VA

REVISION HISTORY

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IU PROJECT #20241256, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		05/09/25	05/09/25

1SAV-1EAV-FAST-LCM ELEC. WIRING

440P398851
0
410A

Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
AE 1-2	2	GNP191.1P	SIEMENS	154083	FAIL SAFE, 50 LB-IN, 2 SEC. RUN
CBL 1	1	588-100B	SIEMENS		6-WIRE 2-RJ11 RS CABLE 50'PLMN
LCM 1	1	550-767EN	SIEMENS	149856	LCM - OAVS, DAMPER FAST/RTS&BTU
OAM 1-2	2	550-819B	SIEMENS		REMOTE AIR MODULE, PTEC
TTE 1	1	QAA2280.FWSC	SIEMENS	149820	RTS, TEC/RJ-11, FULL HMI
TTE 2	1	536-811	SIEMENS	149 134	DCT PT TMP, 100K OHM, 4", BRACKET MNT

LABORATORY AIRFLOW SEQUENCE OF OPERATION

A. GENERAL
1. CONTROL OF AIRFLOW TO AN FROM EACH LABORATORY SPACE AND CONTROL OF SPACE TEMPERATURE WITHIN THE LABORATORY SPACE SHALL BE ACCOMPLISHED BY THE LABORATORY AIRFLOW CONTROL SYSTEM (LACS). THE LACS SHALL UTILIZE DDC
MICROPROCESSOR BASED LOGIC TO ACHEIVE ALL CONTROL FUNCTIONS.

2. OPERATE EXHAUST VALVE TO MAINTAIN REQUIRED DESIGN AIRFLOW RATE FOR EACH FUMEHOOD WITH SASH OPEN AND MINIMUM REQUIRED AIRFOW FOR EACH FUMEHOOD WITH SASH CLOSED.

B. AIRFLOW CONTROL
1. SUPPLY AIR TERMINAL UNIT WITH REHEAT (SAV-401): MODULATE SUPPLY TERMINAL UNIT DAMPER TO MAINTAIN OFFSET WITH EXHAUST AIRFLOW. MODULATE HEATING COIL TEMPERATURE CONTROL VALVE TO MAINTAIN SPACE TEMPERATURE SETPOINT.

2. FUME HOOD EXHAUST VALVE (HEV-401): MODULATE EXHAUST AIR VALVE TO MAINTAIN 80 FPM WHEN LABORATORY IS OCCUPIED.

3. GENERAL EXHAUST VALVE (EAV-401): MODULATE GENERAL EXHAUST TERMINAL UNIT DAMPER TO MAINTAIN TOTAL EXHAUST AIRFLOW (FUME HOODS, & GENERAL EXHAUST VALVE) AT 6 AC/HR CONTINUOUSLY (24/7). GENERAL EXHAUST IS THE DIFFERENCE BETWEEN THE TOTAL REQUIRED EXHAUST AIRFLOW FOR THE SPACE AND THE EXHAUST AIRFLOW FROM FUME HOOD AND IN THE LABORATORY SPACE.

GRAPHICALLY DISPLAY THE FOLLOWING POINTS, AT A MINIMUM, AT THE OPERATOR WORKSTATION:

ANALOG INPUTS
SPACE TEMPERATURE (ZN-T)
AIR VALVE POSITION AS A PERCENT OPEN (DPR-O)
TEMPERATURE CONTROL VALVE POSITION AS A PERCENT OPEN (RH-VLV)
EXHAUST AIRFLOW VALUE FOR EXHAUST VALVES AND EXHAUST TERMINAL UNITS (EXH-CFM)
SUPPLY AIRFLOW VALUE FOR SUPPLY TERMINAL UNITS (SA-CFM)
DISCHARGE AIR TEMPERATURE FOR SUPPLY TERMINAL UNITS (DA-T)

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

SIEMENS

SIEMENS INDUSTRY INC.
SMART INFRASTRUCTURE DIVISION

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FAX: 317-293-0374

BL065 OPTOMETRY SCH-LAB RENO
IU PROJECT #20241256, IN

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
HB	HB		05/09/25	05/09/25

1SAV-1EAV-FAST-LCM BOM & SOO

440P398851
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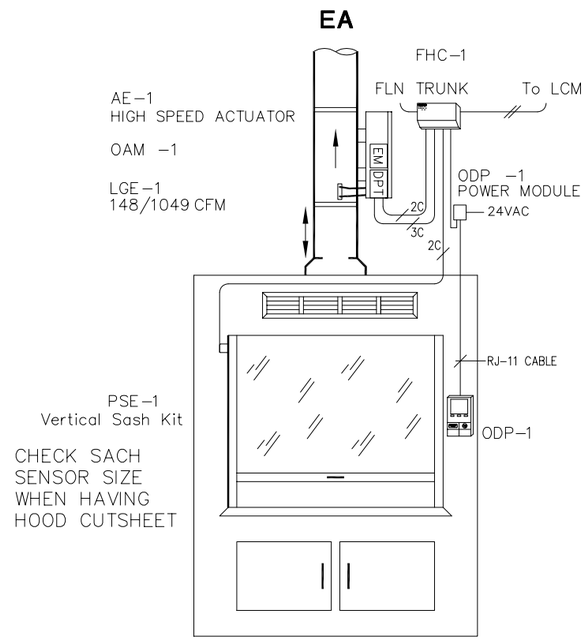
410B

INSTALLATION NOTES:

1. LAB AIR TERMINAL INSTALLED BY MECHANICAL CONTRACTOR WITH 3 TO 5 STRAIGHT DUCT DIAMETERS UPSTREAM OF AIR TERMINAL TO PROVIDE PROPER FLOW SENSING
2. FHC-1 IS FACTORY MOUNTED IN MANUFACTURER SUPPLIED CONTROLLER ENCLOSURE.
3. REFER TO BUILDING POWER TRUNK DRAWING FOR 24 VAC POWER
4. OAM-1 IS FACTORY MOUNTED AT ASSOCIATED LAB AIR TERMINAL.
5. SEE ASSOCIATED WIRING DIAGRAM FOR DETAILS ON NEXT PAGE(S).



1/420 FUME HOOD CONTROL

TYPICAL OF Q'TY : (1)
LOCATION: SEE THE LAB ROOM SCHEDULE
SERVES: SEE THE LAB ROOM SCHEDULE
BASE APPLICATION NUMBER: 2941

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

SIEMENS

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BL065 OPTOMETRY SCH-LAB RENO
IU PROJECT #20241256, IN

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FUME HOOD CONTROL

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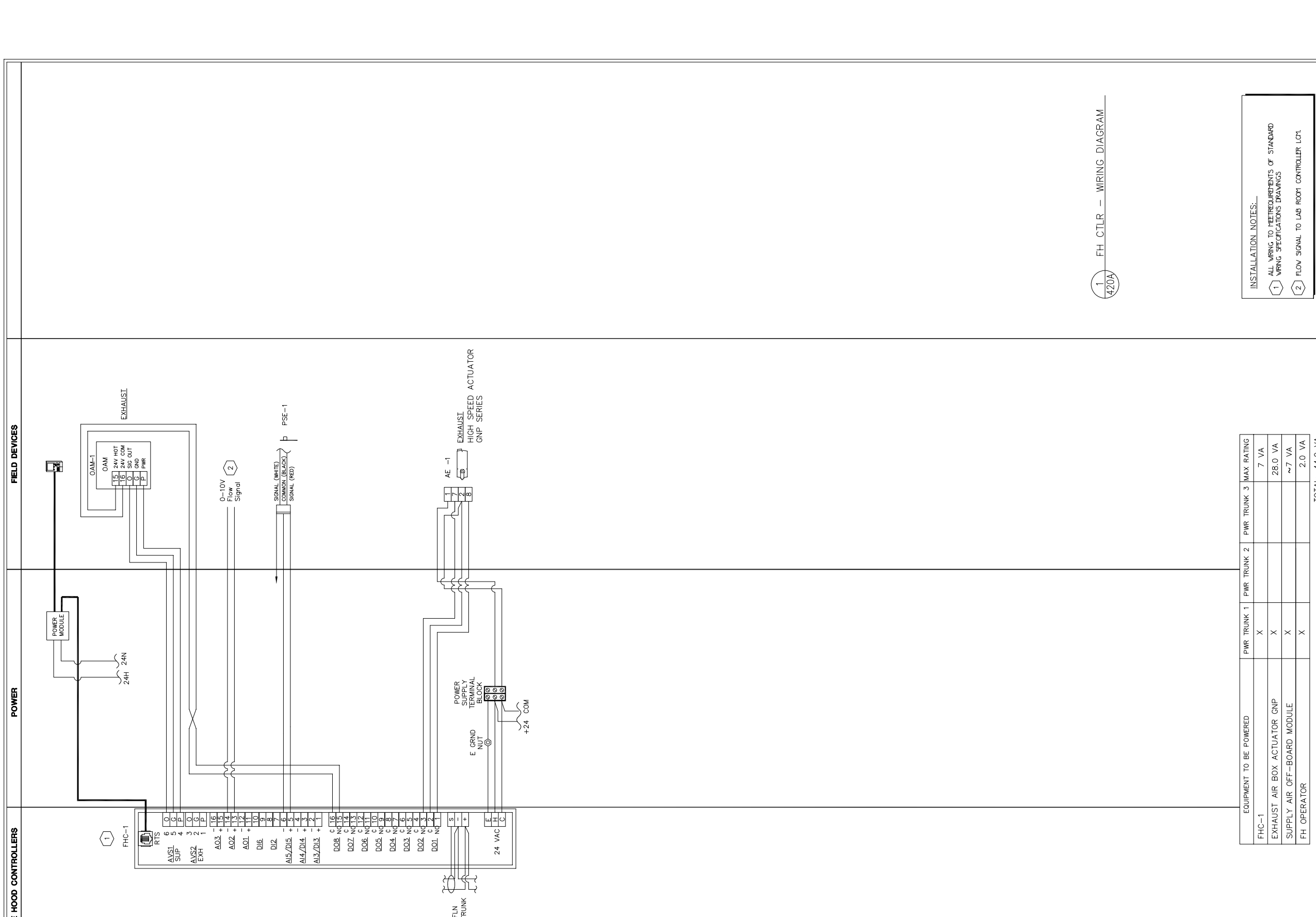
420



EQUIPMENT TO BE POWERED	PWR TRUNK 1	PWR TRUNK 2	PWR TRUNK 3	MAX RATING
FHC-1	X			7 VA
EXHAUST AIR BOX ACTUATOR GNP	X			28.0 VA
SUPPLY AIR OFF-BOARD MODULE	X			~7 VA
FH OPERATOR	X			2.0 VA
			TOTAL:	44.0 VA

REVISION HISTORY

00	5/9/2025	HB	SUBMITTAL SET

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BL065 OPTOMETRY SCH-LAB RENO
IU PROJECT #20241256, IN

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FH CONTROL ELEC. WIRING

440P398851
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Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
AE 1	1	PART OF LGE-1			LAB CONTROLS
FHC 1	1	PART OF LGE-1			LAB CONTROLS
OAM 1	1	PART OF LGE-1			LAB CONTROLS
ODP 1	1	575-820A	SIEMENS		FUME HOOD OPERATOR DISPLAY PANEL PTEC
	1	AQM2200	SIEMENS		POWER MODULE
PSE 1	1	546-00488	SIEMENS	149269	VERT UNI-TRAK TOP ASSY,35"

LABORATORY AIRFLOW SEQUENCE OF OPERATION

A. GENERAL
1. CONTROL OF AIRFLOW TO AN FROM EACH LABORATORY SPACE AND CONTROL OF SPACE TEMPERATURE WITHIN THE LABORATORY SPACE SHALL BE ACCOMPLISHED BY THE LABORATORY AIRFLOW CONTROL SYSTEM (LACS). THE LACS SHALL UTILIZE DDC
MICROPROCESSOR BASED LOGIC TO ACHEIVE ALL CONTROL FUNCTIONS.

2. OPERATE EXHAUST VALVE TO MAINTAIN REQUIRED DESIGN AIRFLOW RATE FOR EACH FUMEHOOD WITH SASH OPEN AND MINIMUM REQUIRED AIRFOW FOR EACH FUMEHOOD WITH SASH CLOSED.

B. AIRFLOW CONTROL
1. SUPPLY AIR TERMINAL UNIT WITH REHEAT (SAV-401): MODULATE SUPPLY TERMINAL UNIT DAMPER TO MAINTAIN OFFSET WITH EXHAUST AIRFLOW. MODULATE HEATING COIL TEMPERATURE CONTROL VALVE TO MAINTAIN SPACE TEMPERATURE SETPOINT.

2. FUME HOOD EXHAUST VALVE (HEV-401): MODULATE EXHAUST AIR VALVE TO MAINTAIN 80 FPM WHEN LABORATORY IS OCCUPIED.

3. GENERAL EXHAUST VALVE (EAV-401): MODULATE GENERAL EXHAUST TERMINAL UNIT DAMPER TO MAINTAIN TOTAL EXHAUST AIRFLOW (FUME HOODS, & GENERAL EXHAUST VALVE) AT 6 AC/HR CONTINUOUSLY (24/7). GENERAL EXHAUST IS THE DIFFERENCE BETWEEN THE TOTAL REQUIRED EXHAUST AIRFLOW FOR THE SPACE AND THE EXHAUST AIRFLOW FROM FUME HOOD AND IN THE LABORATORY SPACE.

GRAPHICALLY DISPLAY THE FOLLOWING POINTS, AT A MINIMUM, AT THE OPERATOR WORKSTATION:

ANALOG INPUTS
SPACE TEMPERATURE (ZN-T)
AIR VALVE POSITION AS A PERCENT OPEN (DPR-O)
TEMPERATURE CONTROL VALVE POSITION AS A PERCENT OPEN (RH-VLV)
EXHAUST AIRFLOW VALUE FOR EXHAUST VALVES AND EXHAUST TERMINAL UNITS (EXH-CFM)
SUPPLY AIRFLOW VALUE FOR SUPPLY TERMINAL UNITS (SA-CFM)
DISCHARGE AIR TEMPERATURE FOR SUPPLY TERMINAL UNITS (DA-T)

REVISION HISTORY

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BL065 OPTOMETRY SCH-LAB RENO
IU PROJECT #20241256, IN

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FH CONTROL BOM & SOO

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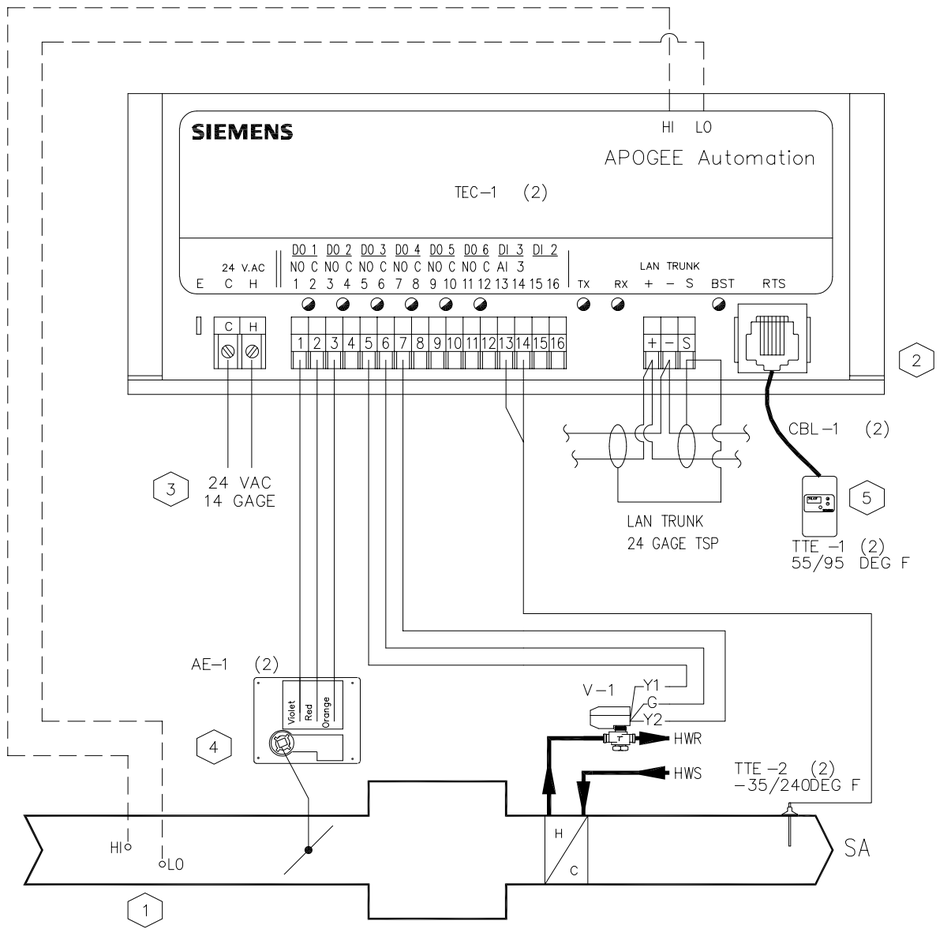

INSTALLATION NOTES:

1. VAV BOX INSTALLED BY MECHANICAL CONTRACTOR WITH 3 TO 5 STRAIGHT DUCT DIAMETERS UPSTREAM OF BOX TO PROVIDE PROPER FLOW SENSING.
2. TEC–1 TO BE MOUNTED IN MANUFACTURER SUPPLIED CONTROLLER ENCLOSURE. CIC FIELD MOUNTED ALL CONTROL DEVICES.
3. REFER TO BUILDING POWER TRUNK DRAWING FOR 24 VAC POWER
4. MOUNT ACTUATOR WITH DAMPER IN FULL OPEN POSITION. VERIFY TEC–1 AND ACTUATOR REQUIREMENT WITH THE BOX MANUFACTURER
5. LOCATE AS SHOWN ON FLOOR PLANS/CONTRACT DOCUMENTS

VA POWER DRAW (TYPICAL)

DEVICE	Q'TY	VA
DAMPER ACTUATOR	1	2.3 VA
CONTROLLER - TEC	1	6.0 VA
HEATING VALVE	1	1.0 VA
T-STAT - QAA	1	2.0 VA
	TOTAL	11.3 VA

1/430 VAV W/ HW REHEAT

TYPICAL OF Q'TY: (2)
LOCATION: SEE THE LAB ROOM SCHEDULE
SERVES: SEE THE LAB ROOM SCHEDULE
BASE APPLICATION: 2023

REVISION HISTORY

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HB	HB		05/09/25	05/09/25

VAV w/HW REHEAT

440P398851
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430

Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
AE 1	2	GDE131.1P	SIEMENS	154 011	ACT NSR PLENUM 24/108L 5Nm
CBL 1	2	588-100A	SIEMENS		6-WIRE 2-RJ11 RS CABLE 25'PLMN
TEC 1	2	540-100N	SIEMENS	1491014	TERM BOX CTLR ELEC OUT
TTE 1	2	QAA2280.FWSC	SIEMENS	149820	RTS, TEC/RJ-11, FULL HMI
TTE 2	2	536-811	SIEMENS	149 134	DCT PT TMP, 100K OHM, 4", BRACKET MNT

VAV BOX WITH REHEAT SEQUENCE OF OPERATION

DISCHARGE AIR TEMPERATURE SENSOR: TCC SHALL PROVIDE A SUPPLY AIR TEMPERATURE SENSOR (SA-T) FOR MONITORING PURPOSES.

OCCUPIED MODE: WHEN THE ZONE TEMPERATURE (ZN-T) IS BETWEEN THE HEATING AND COOLING SETPOINTS, THE PRIMARY AIR DAMPER (DPR-O) WILL BE AT THE MINIMUM CFM (SA-CFM) AND THE REHEAT VALVE (RH-VLV) SHALL BE FULLY CLOSED. ON A RISE IN ZONE TEMPERATURE ABOVE THE COOLING SETPOINT, THE PRIMARY AIR DAMPER SHALL INCREASE THE CFM AND THE REHEAT VALVE SHALL REMAIN FULLY CLOSED. ON A DROP IN TEMPERATURE BELOW THE HEATING SETPOINT, THE REHEAT VALVE SHALL MODULATE OPEN AND THE PRIMARY AIR DAMPER SHALL MAINTAIN MINIMUM CFM. SPACE SENSORS SHALL HAVE SETPOINT ADJUSTMENT AND UNOCCUPIED CYCLE OVERRIDE (SOFTWARE SELECTABLE AS DETERMINED BY THE OWNER).

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VAV w/HW REHEAT BOM & SOO

440P398851
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430A

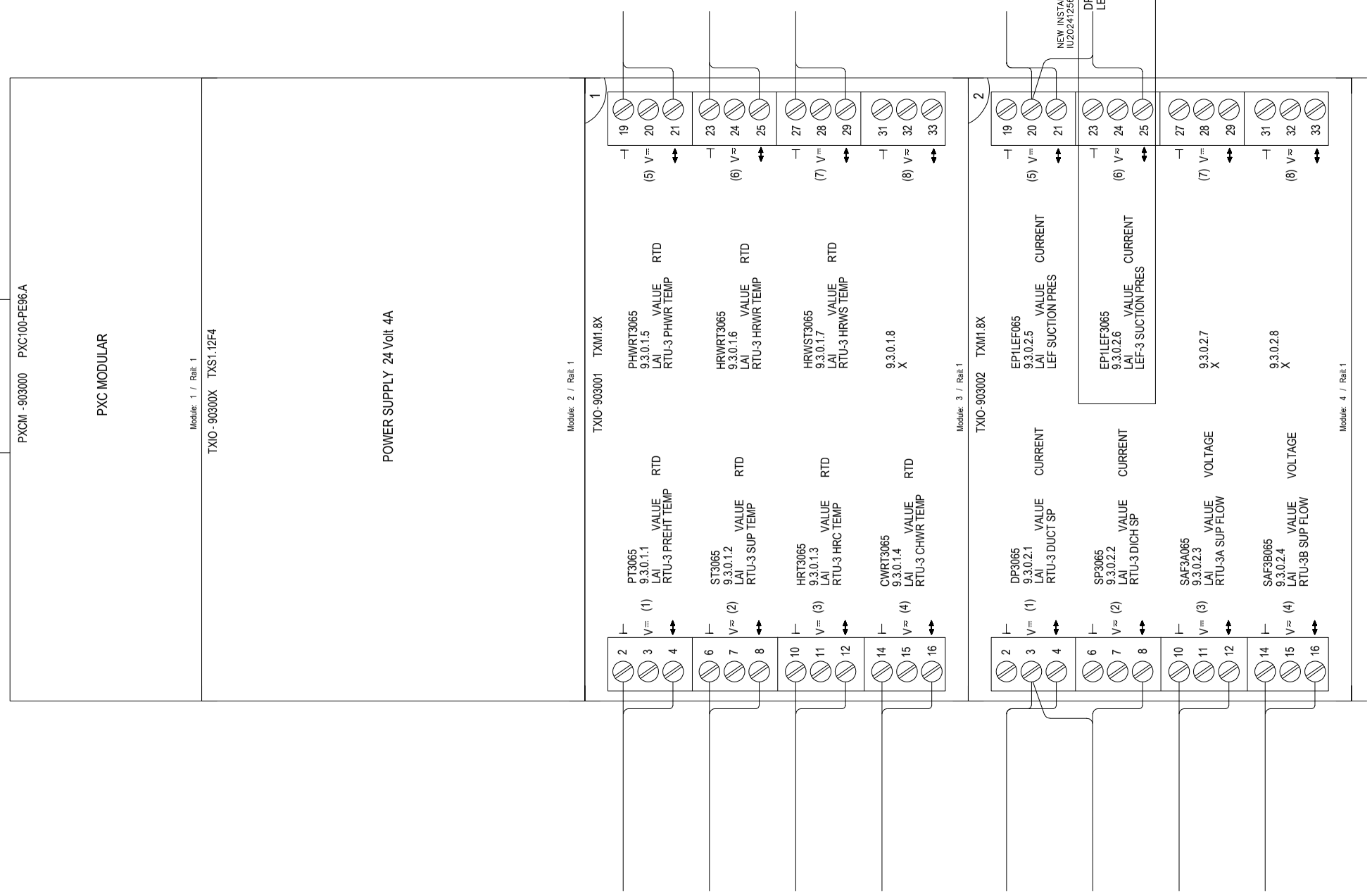
PXCM - 903000 PXC100-PE96.A

PXC MODULAR

Module: 1 / Rail: 1

TXIO - 90300X TXS1.12F4

POWER SUPPLY 24 Volt 4A



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W. 4th Fl. Labs

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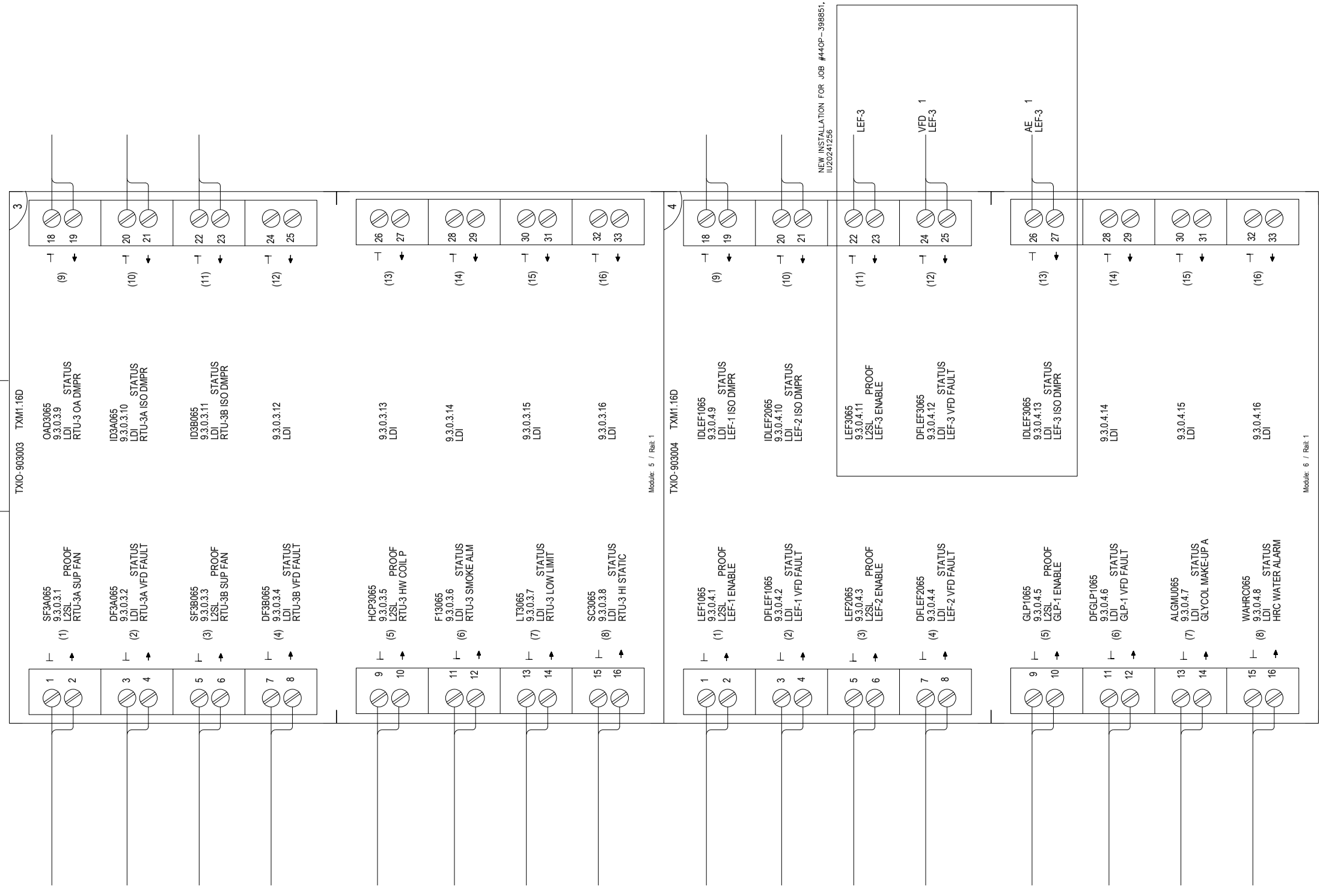

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SIEMENS

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IU PROJECT #20241256, IN

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Optometry RTU-3 Node 3p002

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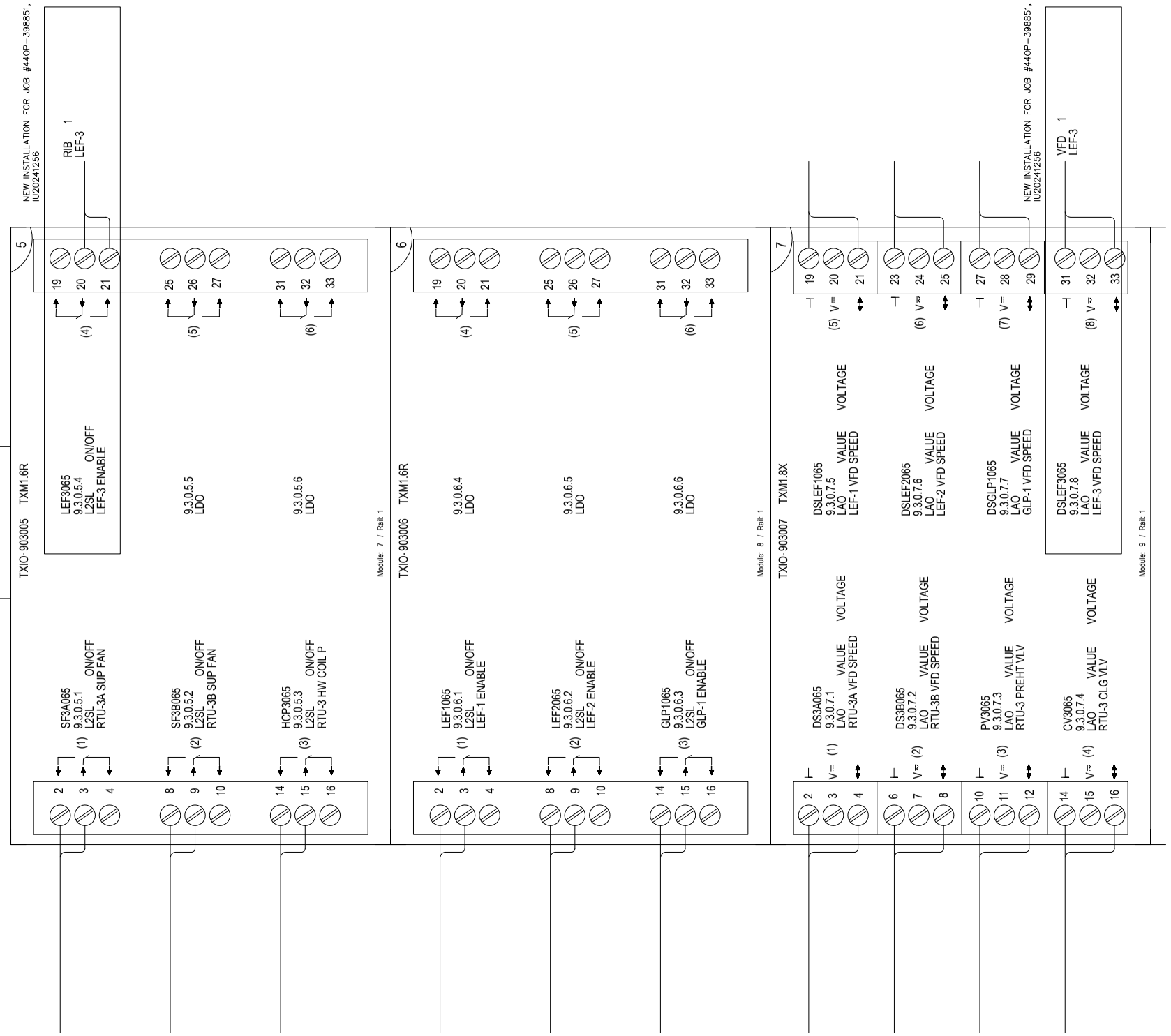

REVISION HISTORY

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SIEMENS

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BL065 OPTOMETRY SCH-LAB RENO
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HB	HB		05/09/25	05/09/25

Optometry RTU-3 Node 3p003

440P398851
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900B

GENERAL DEMOLITION NOTES

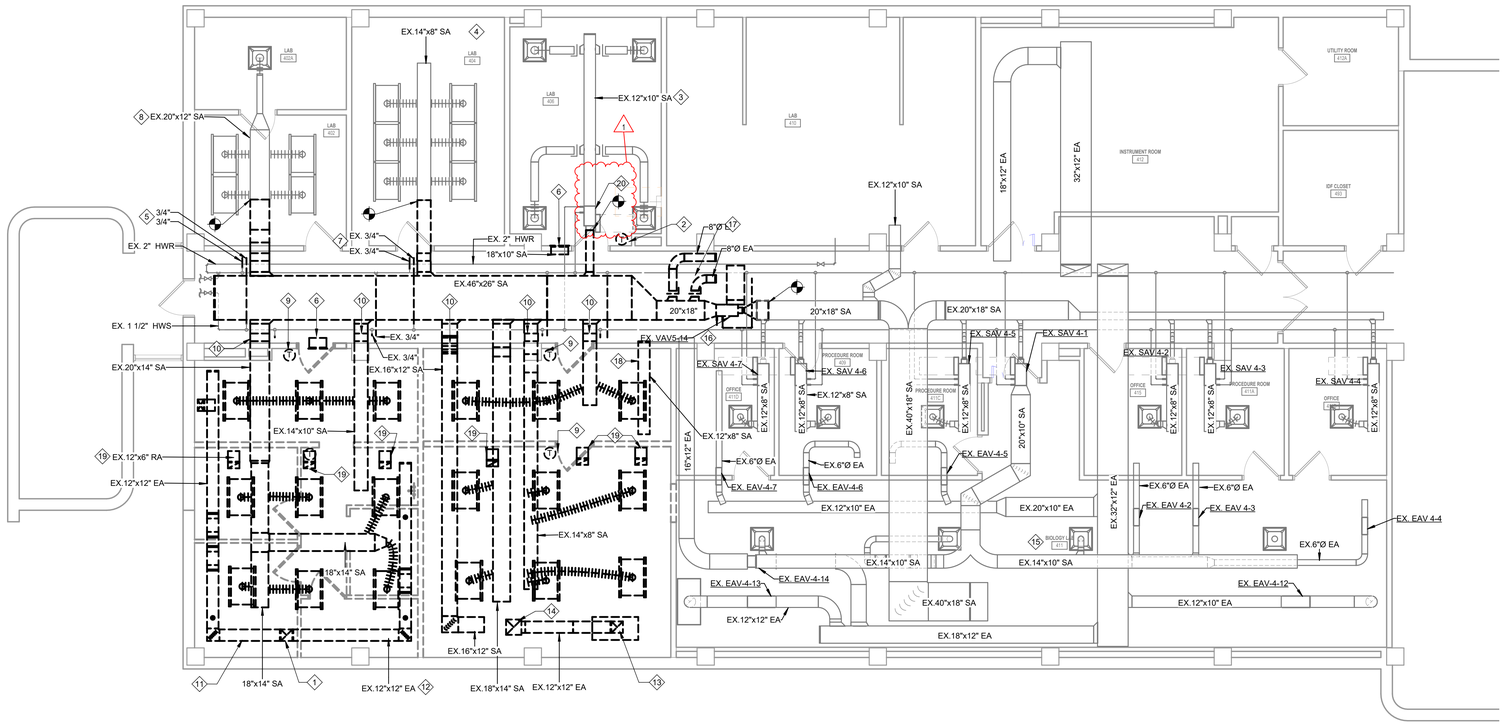
A. DARK DASHED LINES INDICATE EXISTING MECHANICAL EQUIPMENT, DUCTWORK, PIPING, AND/OR MECHANICAL ACCESSORIES DEMOLISHED COMPLETE. CONTRACTOR TO FIELD VERIFY ACTUAL EXISTING CONDITIONS PRIOR TO BIDDING AND DEMOLITION. CONTRACTOR TO INCLUDE ALL COST TO REMOVE ITEMS MADE OBSOLETE DUE TO NEW HVAC WORK.

B. LIGHT SOLID LINES INDICATE EXISTING MECHANICAL EQUIPMENT, DUCTWORK, PIPING, AND/OR MECHANICAL ACCESSORIES TO REMAIN AS-IS. CONTRACTOR TO FIELD VERIFY ACTUAL EXISTING CONDITIONS PRIOR TO DEMOLITION AND BIDDING.

C. REMOVE ALL ABANDONED DUCT, INCLUDING ALL ASSOCIATED HANGERS, SUPPORTS, AND INSULATION ABOVE ALL CEILING IN LAB 407, LAB 407A, LAB407D, AND ALL SUPPORTED SPACES.

DEMOLITION HVAC PLAN NOTES

1. REMOVE DUCT COMPLETE UP THROUGH ROOF. REMOVE EXHAUST FAN ON ROOF. PROVIDE ROOF CURB CAP PER DETAIL '3/M601'.
2. REMOVE SPACE TEMPERATURE SENSOR COMPLETE.
3. DIFFUSERS, DUCT, AND VAV TERMINAL UNIT LOCATED IN LAB 406 REMAIN.
4. DIFFUSERS AND DUCT IN ROOM 404 REMAIN.
5. DISCONNECT HWS/R PIPING FROM DUCT REHEAT COIL AND REMOVE BACK TO MAIN. REMOVE DUCT REHEAT COIL AND A PORTION OF DUCT IN ROOM 402 TO POINT INDICATED. PREPARE REMAINING DUCT AND HWS/R PIPING FOR CONNECTION TO NEW.
6. REMOVE TRANSFER GRILLE AND DUCT COMPLETE.
7. DISCONNECT HWS/R PIPING FROM DUCT REHEAT COIL AND REMOVE BACK TO MAIN. REMOVE DUCT REHEAT COIL AND A PORTION OF DUCT IN ROOM 402 TO POINT INDICATED. PREPARE REMAINING DUCT AND HWS/R PIPING FOR CONNECTION OF NEW.
8. DIFFUSERS AND DUCT IN ROOM 402 AND ROOM 402A REMAIN.
9. REMOVE SPACE TEMPERATURE SENSOR AND ASSOCIATED WIRING/PNEUMATIC TUBING BACK TO SOURCE.
10. DISCONNECT HWS/R PIPING FROM DUCT REHEAT COIL. REMOVE PIPE BACK TO MAIN. REMOVE DUCT REHEAT COIL COMPLETE.
11. REMOVE EXHAUST DUCT AND ASSOCIATED GRILLES, SUPPORT, AND HANGERS COMPLETE BACK TO RISER.
12. REMOVE ABANDONED 12x12 EXHAUST DUCT AND ASSOCIATED HANGERS AND SUPPORTS COMPLETE.
13. DISCONNECT 12x12 DUCT FROM FUME HOOD AND REMOVE TO POINT INDICATED. PREPARE REMAINING DUCT FOR CONNECTION OF NEW.
14. REMOVE DUCT COMPLETE UP THROUGH ROOF. REMOVE EXHAUST FAN ON ROOF. PROVIDE ROOF CURB CAP PER DETAIL '3/M601'.
15. ALL DUCT, PIPING, INSULATION, AND TERMINAL UNITS SERVING LAB 411 AND ALL SUPPORT SPACES REMAIN.
16. DISCONNECT HWS/R PIPING FROM VAV TERMINAL UNIT HEATING COIL. REMOVE VAV TERMINAL UNIT COMPLETE.
17. REMOVE SUPPLY DUCT IN CORRIDOR AND ALL ASSOCIATED HANGERS, SUPPORTS AND INSULATION COMPLETE.
18. REMOVE ADANDONED 12x8 DUCT AND ASSOCIATED HANGERS AND SUPPORTS COMPLETE.
19. REMOVE ABANDONED 12x6 DUCT TO JUST BELOW FLOOR ABOVE AND CAP. SEAL AIR TIGHT.
20. REMOVE CONTROL VALVE ACTUATOR. VALVE BODY REMAINS.



1 **MECHANICAL DEMOLITION FOURTH FLOOR PLAN**
3/16" = 1'-0"

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DELV DESIGN

INDIANA UNIVERSITY

IU20241256 BL065
OPTOMETRY SCHOOL - LAB RENOVATION ROOMS 401, 406 & 407

ARCHITECT
DELV Design
212 W 10th St, STE F125
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mechanical • electrical • plumbing
602 N. Capitol Ave., Suite 200
Indianapolis, IN 46204 • 463-777-8182
www.creativeng.net

4th FLOOR KEY PLAN

CONSTRUCTION DOCUMENTS

GABRIEL S. CURRIER REGISTERED NO. PE10808972 STATE OF INDIANA PROFESSIONAL ENGINEER

No.	Description	Date
1	Addendum #01	05.13.2025

CLIENT PROJ. #: IU20241256
PROJECT #: 24-065
ISSUE DATE: 05/01/2025
DRW: MP | CHK: JR

MECHANICAL DEMOLITION FOURTH FLOOR PLAN

MD101

GENERAL HVAC NOTES

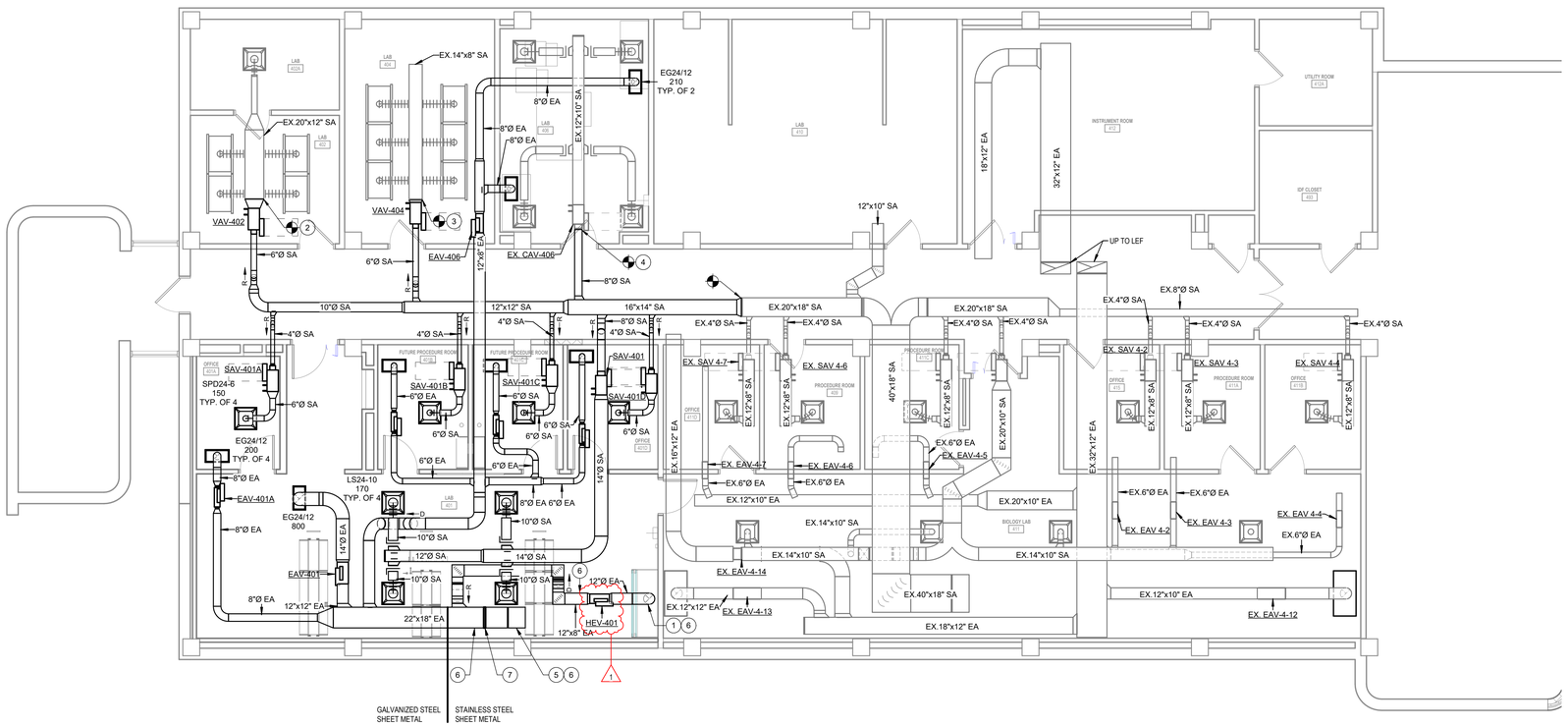
A. DARK LINES INDICATE NEW WORK.

B. LIGHT SOLID LINES INDICATE EXISTING MECHANICAL EQUIPMENT, DUCTWORK, PIPING, AND/OR MECHANICAL ACCESSORIES TO REMAIN AS-IS. CONTRACTOR TO FIELD VERIFY ACTUAL EXISTING CONDITIONS PRIOR TO BIDDING.

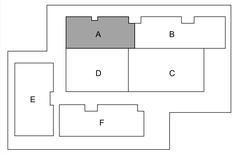
C. REFERENCE M701 FOR REBALANCING OF EXISTING DUCT SYSTEMS CONNECTED TO AND EFFECTED BY THE NEW WORK.

MECHANICAL HVAC PLAN NOTES

1. 12" EA DOWN TO FUME HOOD. PROVIDE TRANSITION TO HOOD CONNECTION AS REQUIRED.
2. CONNECT VAV-402 INTO EXISTING 20x12 SA DUCT.
3. CONNECT VAV-404 INTO EXISTING 14x8 SA DUCT.
4. CONNECT 8" SA TO EXISTING CAV-406.
5. 22x18 EA UP THROUGH ROOF AND TRANSITION TO LEF-3.
6. PROVIDE STAINLESS STEEL DUCT.
7. PROVIDE STAINLESS STEEL FILTER FRAME AND 2" MERV 8 FILTER. PROVIDE FILTER ACCESS DOOR ON SIDE OF DUCT FOR FILTER REMOVAL AND INSTALLATION.



1 MECHANICAL HVAC FOURTH FLOOR PLAN
3/16" = 1'-0"



4th FLOOR KEY PLAN

DELV DESIGN

INDIANA UNIVERSITY

IU20241256 BL065
OPTOMETRY SCHOOL
- LAB RENOVATION
ROOMS 401, 406 & 407

ARCHITECT
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mechanical • electrical • plumbing
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CONSTRUCTION DOCUMENTS

GABRIEL S. CURRIER
REGISTERED
NO. PE10808972
STATE OF
INDIANA
PROFESSIONAL ENGINEER

No.	Description	Date
1	Addendum #01	05.13.2025

CLIENT PROJ. #: IU20241256
PROJECT #: 24-065
ISSUE DATE: 05/01/2025
DRW: MP | CHK: JR

MECHANICAL HVAC FOURTH FLOOR PLAN

MH101

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GENERAL PIPING NOTES

A. DARK LINES INDICATE NEW WORK.

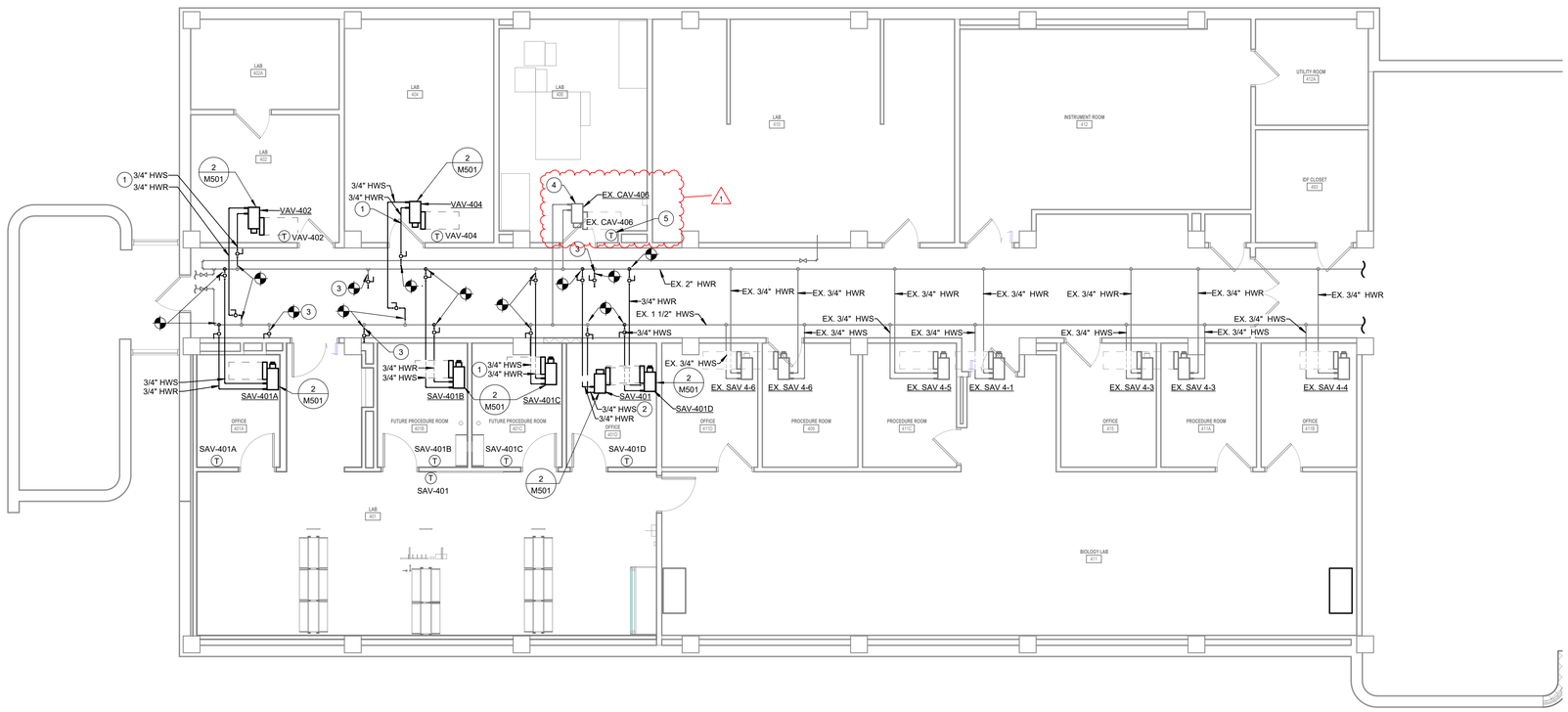
B. LIGHT SOLID LINES INDICATE EXISTING MECHANICAL EQUIPMENT, DUCTWORK, PIPING, AND/OR MECHANICAL ACCESSORIES TO REMAIN AS-IS. CONTRACTOR TO FIELD VERIFY ACTUAL EXISTING CONDITIONS PRIOR TO BIDDING.

C. PROVIDE SHUTOFF VALVES AT EVERY BRANCH CONNECTION TO A MAIN.

D. REFER TO DETAIL '2/M501' FOR TERMINAL UNIT PIPING.

MECHANICAL PIPING PLAN NOTES

1 CONNECT 3/4"HWS/R PIPING TO EXISTING TAPS.
2 CONNECT 3/4"HWS PIPING TO EXISTING TAP.
3 PROVIDE SHUT-OFF VALVE AND CAP.
4 NEW HEATING WATER TEMPERATURE CONTROL VALVE ACTUATOR FURNISHED BY SIEMENS AND INSTALLED BY CIC.
5 NEW TEMPERATURE SENSOR FURNISHED BY SIEMENS INSTALLED BY CIC.



1 **MECHANICAL PIPNG FOURTH FLOOR PLAN**
3/16" = 1'-0"

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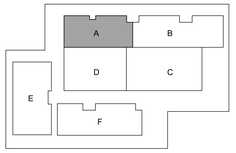

4th FLOOR KEY PLAN

CONSTRUCTION DOCUMENTS

GABRIEL S. CURRIER
REGISTERED
NO.
PE10808972
STATE OF
INDIANA
PROFESSIONAL ENGINEER

No.	Description	Date
1	Addendum #01	05.13.2025

CLIENT PROJ. #: IU20241256
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DRW: MP | CHK: JR

MECHANICAL PIPING
FOURTH FLOOR PLAN

MP101

EXHAUST FAN SCHEDULE - 23 34 23

IDENTITY DATA				WEIGHT	FAN DATA						SOUND CRITERIA			ELECTRICAL DATA	
MARK	MANUFACTURER	MODEL	SERVICES	(LBS)	FAN TYPE	DRIVE TYPE	AIRFLOW (CFM)	ESP (IN-WG)	RPM	HP/BHP	SONES	DBA	UNIT CONTROL	VOLT/PH/HZ	NOTES
LEF-3	GREENHECK	VECKTOR-H-18-12	LAB/OFFICE	645	HIGH PLUME EXHAUST	DIRECT	2,500	2.00	1,689	3/1.78	23	73	VFD	460/3/60	1-2

EXHAUST FAN SCHEDULE NOTES:

1. DISCONNECT BY MANUFACTURER. PROVIDE AUXILLIARY CONTACT AT DISCONNECT TO DE-ENERGIZE OUTPUT POWER FROM VFD.
2. VFD FURNISHED BY MC, INSTALLED BY EC/CIC.

SUPPLY AIR TERMINAL BOX WITH HOT WATER REHEAT SCHEDULE

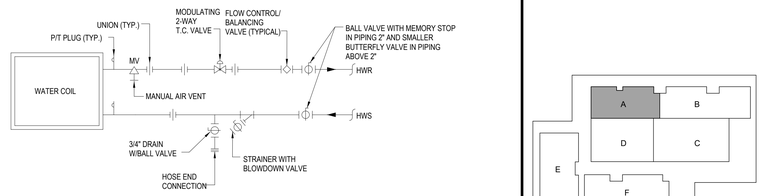
IDENTITY DATA				AIRFLOW DATA				NOISE DATA		REHEAT COIL DATA							
MARK	MANUFACTURER	MODEL	INLET DIAMETER	COOLING MAX (CFM)	HEATING MAX (CFM)	OCC. MIN. (CFM)	SPI (IN-WG)	MAX DISCH.	MAX RAD.	CAPACITY (BTUH)	EAT/LAT (°F)	APD (IN-WG)	FLOW (GPM)	EWT/LWT (°F)	WPD (FT-WG)	ROWS	VALVE TYPE	NOTES
SAV-401	PRICE	SDV	10"	880	880	880	1.0	25	25	35,000	55 / 91.7	0.4	3.5	140 / 120	1.93	2	2-WAY	-
SAV-401A	PRICE	SDV	4"	150	150	75	1.0	25	25	6,000	55 / 91.9	0.06	0.6	140 / 120	0.05	2	2-WAY	-
SAV-401B	PRICE	SDV	4"	150	150	75	1.0	25	25	6,000	55 / 91.9	0.06	0.6	140 / 120	0.05	2	2-WAY	-
SAV-401C	PRICE	SDV	4"	680	340	75	1.0	25	25	6,000	55 / 91.9	0.06	0.6	140 / 120	0.05	2	2-WAY	-
SAV-401D	PRICE	SDV	4"	260	225	75	1.0	25	25	6,000	55 / 91.9	0.06	0.6	140 / 120	0.05	2	2-WAY	-
VAV-402	PRICE	SDV	6"	260	260	100	1.0	25	25	10,000	55 / 90.4	0.16	1.0	140 / 120	0.12	2	2-WAY	-
VAV-404	PRICE	SDV	6"	260	260	100	1.0	25	25	10,000	55 / 90.4	0.16	1.0	140 / 120	0.12	2	2-WAY	-
EX. CAV-406	PRICE	SDV	8"	420	420	420	-	-	-	-	-	-	-	-	-	-	-	-

VARIABLE VOLUME EXHAUST TERMINAL BOX SCHEDULE

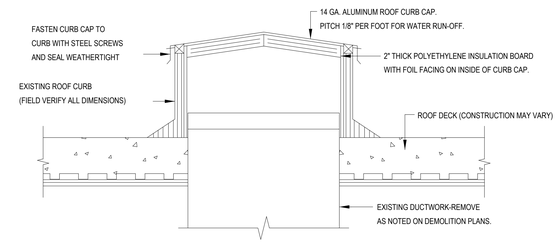
IDENTITY DATA						AIRFLOW DATA			NOISE DATA		
MARK	MANUFACTURER	MODEL	SERVICE	SPACE SERVED	INLET DIAMETER	MIN AIRFLOW (CFM)	MAX AIRFLOW (CFM)	SPI (IN-WG)	MAX DISCH.	MAX RAD.	NOTES
EAV-401	PRICE	LDV	GENERAL EXHAUST	LAB 401	10	200	800	1.00	25	25	-
HEV-401	SIEMENS	LGE	FUME HOOD EXHAUST	LAB 401 FUME HOOD	10	300	600	1.00	25	25	-
EAV-401A	PRICE	LDV	GENERAL EXHAUST	OFFICE 401A	4	125	200	1.00	25	25	-
EAV-401B	PRICE	LDV	GENERAL EXHAUST	PROCEDURE ROOM	4	125	200	1.00	25	25	-
EAV-401C	PRICE	LDV	GENERAL EXHAUST	PROCEDURE ROOM	4	125	200	1.00	25	25	-
EAV-401D	PRICE	LDV	GENERAL EXHAUST	OFFICE 401D	4	125	200	1.00	25	25	-
EAV-406	PRICE	LDV	GENERAL EXHAUST	LAB 406	8	420	420	1.00	25	25	-

233713 DIFFUSERS, REGISTERS, AND GRILLES

IDENTITY DATA				NECK SIZE (IN)	MODULE SIZE		
MARK	DESCRIPTION	MANUFACTURER	MODEL	Ø	W	L	NOTES
EG24/12	LOUVER FACE GRILLE EXHAUST	PRICE	630		12"	24"	
LS24-10	LABSOX METAL-PAN DIFFUSER	DUCTSOX	DT200	10"	24"	24"	PROVIDE METAL BACK PAN WITH DIFFUSION PLATE. COLOR: SILVER
SPD24-6	SQUARE PLAQUE DIFFUSER	PRICE	SPD	6"	24"	24"	



2 WATER COIL PIPING DETAIL 2-WAY VALVE CONTROL
NOT TO SCALE



1 CURB CAP DETAIL
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4th FLOOR KEY PLAN

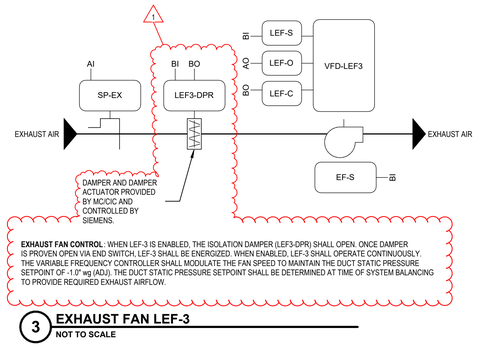
CONSTRUCTION DOCUMENTS

No.	Description	Date
1	Addendum #01	05.13.2025

CLIENT PROJ. #: IU20241256
PROJECT #: 24-065
ISSUE DATE: 05/01/2025
DRW: MP | CHK: JR

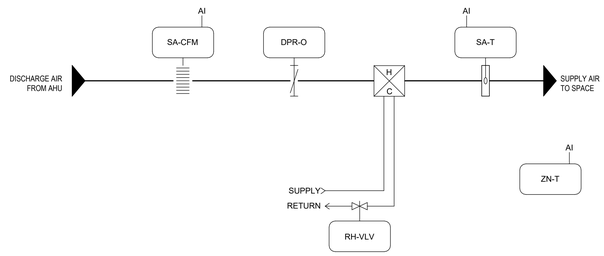
MECHANICAL SCHEDULES, DETAILS, AND DIAGRAMS

M-601



EXHAUST FAN CONTROL: WHEN LEF-3 IS ENABLED, THE ISOLATION DAMPER (LEF3-DPR) SHALL OPEN. ONCE DAMPER IS PROVEN OPEN VIA END SWITCH, LEF-3 SHALL BE ENERGIZED. WHEN ENABLED, LEF-3 SHALL OPERATE CONTINUOUSLY. THE VARIABLE FREQUENCY CONTROLLER SHALL MODULATE THE FAN SPEED TO MAINTAIN THE DUCT STATIC PRESSURE SETPOINT OF -1.0" wg (ADJ). THE DUCT STATIC PRESSURE SETPOINT SHALL BE DETERMINED AT TIME OF SYSTEM BALANCING TO PROVIDE REQUIRED EXHAUST AIRFLOW.

3 EXHAUST FAN LEF-3
NOT TO SCALE

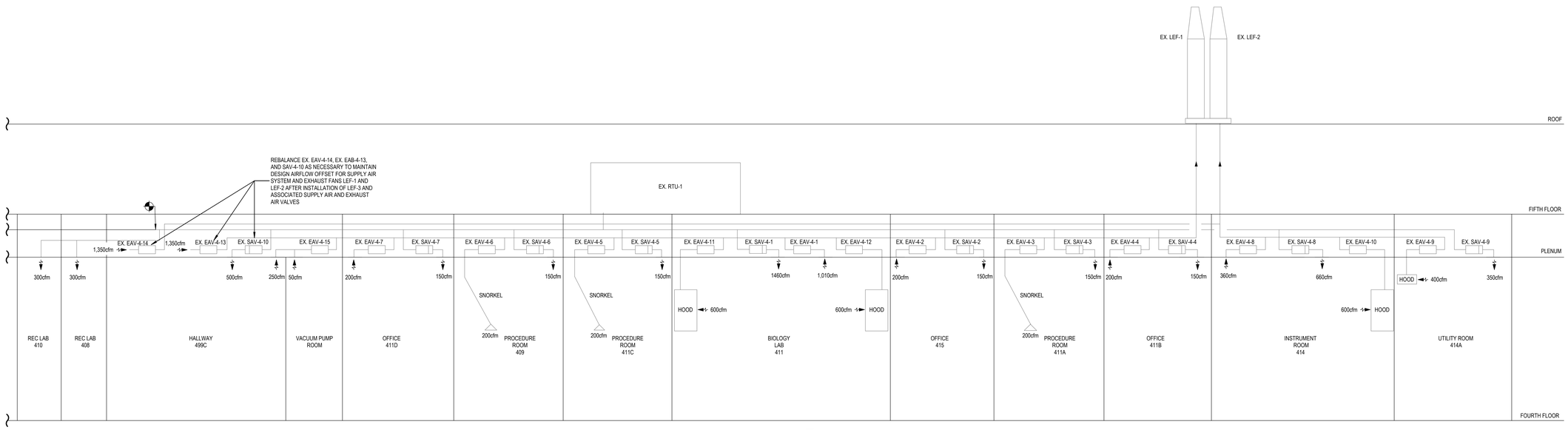


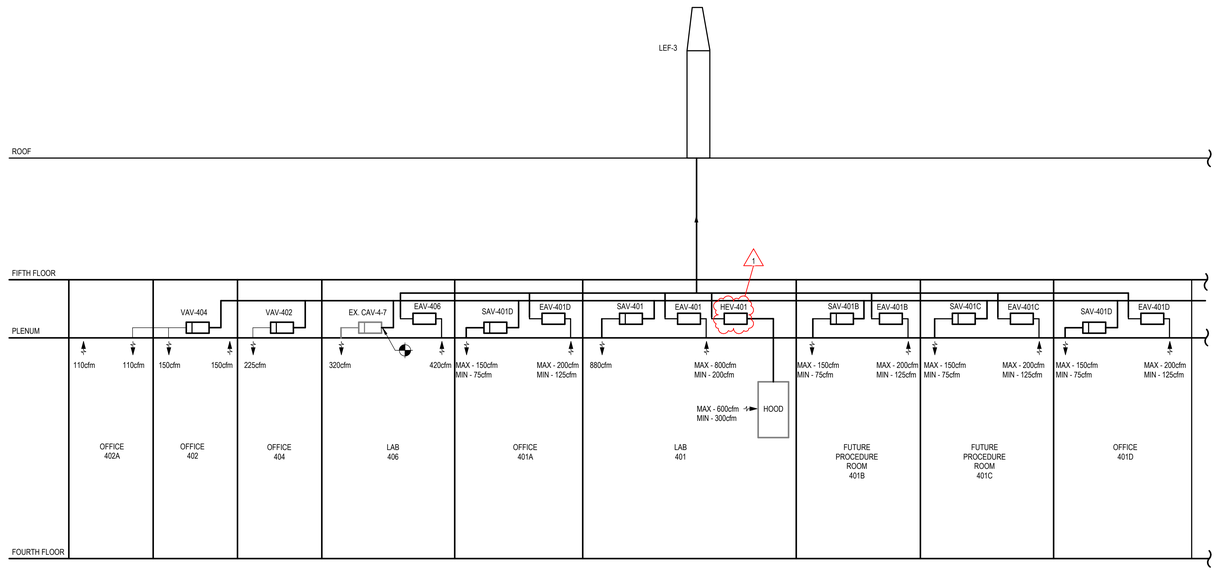
VAV BOX WITH REHEAT SEQUENCE OF OPERATION

DISCHARGE AIR TEMPERATURE SENSOR: DISCHARGE AIR TEMPERATURE SENSOR FURNISHED BY SIEMENS, INSTALLED BY CIC.

WHEN THE ZONE TEMPERATURE (ZN-T) IS BETWEEN THE HEATING AND COOLING SETPOINTS, THE PRIMARY AIR DAMPER (DPR-O) WILL BE AT THE MINIMUM CFM (SA-CFM) AND THE REHEAT VALVE (RH-VLV) SHALL BE FULLY CLOSED. ON A RISE IN ZONE TEMPERATURE ABOVE THE COOLING SETPOINT, THE PRIMARY AIR DAMPER SHALL INCREASE THE CFM AND THE REHEAT VALVE SHALL REMAIN FULLY CLOSED. ON A DROP IN TEMPERATURE BELOW THE HEATING SETPOINT, THE REHEAT VALVE SHALL MODULATE OPEN AND THE PRIMARY AIR DAMPER SHALL MAINTAIN MINIMUM CFM. SPACE SENSORS SHALL HAVE SETPOINT ADJUSTMENT AND UNOCCUPIED CYCLE OVERRIDE (SOFTWARE SELECTABLE AS DETERMINED BY THE OWNER).

2 TERMINAL BOX WITH REHEAT (VAV-402,VAV-404)
NOT TO SCALE





1 RTU-1 AF&ID
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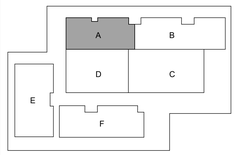

4th FLOOR KEY PLAN

CONSTRUCTION DOCUMENTS

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STATE OF
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PROFESSIONAL ENGINEER

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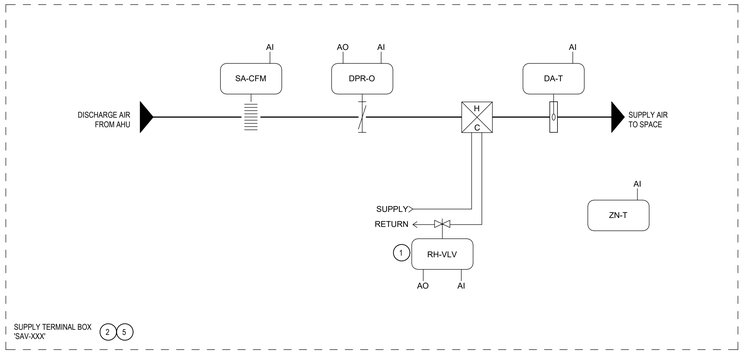
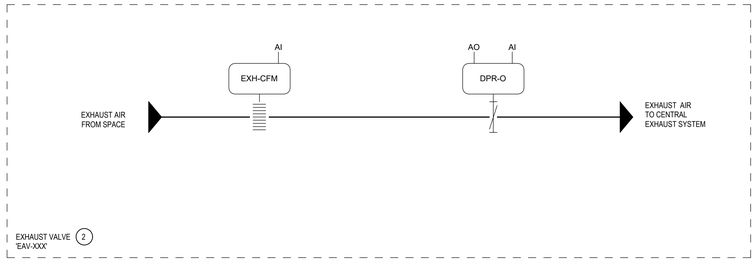
M-701





LABORATORY AIRFLOW SEQUENCE OF OPERATION

A. GENERAL

1. CONTROL OF AIRFLOW TO AN FROM EACH LABORATORY SPACE AND CONTROL OF SPACE TERMPERATURE WITHIN THE LABORATORY SPACE SHALL BE ACCOMPLISHED BY THE LABORATORY AIRFLOW CONTROL SYSTEM (LACS). THE LACS SHALL UTILIZE DDC MICROPROCESSOR BASED LOGIC TO ACHEIVE ALL CONTROL FUNCTIONS.

B. AIRFLOW CONTROL

1. SUPPLY AIR TERMINAL UNIT WITH REHEAT (SAV-XXX): MODULATE SUPPLY TERMINAL UNIT DAMPER TO MAINTAIN OFFSET WITH EXHAUST AIRFLOW. MODULATE HEATING COIL TEMPERATURE CONTROL VALVE TO MAINTAIN SPACE TEMPERATURE SETPOINT.

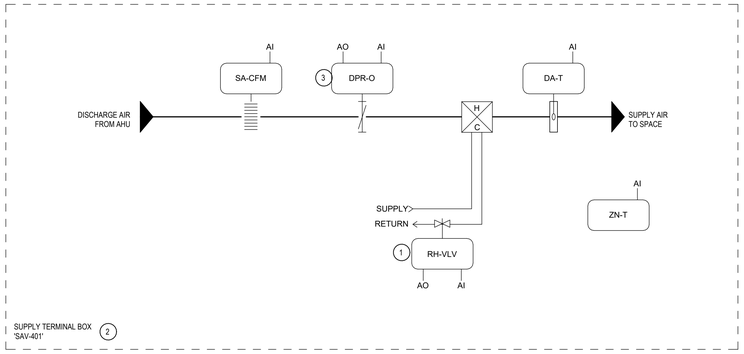
2. EXHAUST VALVE (EAV-XXX): MODULATE EXHAUST AIR VALVE TO MAINTAIN MAXIMUM EXHAUST WHEN LABORATORY IS OCCUPIED.

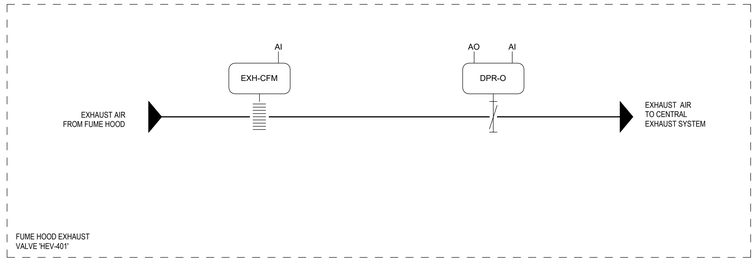
GRAPHICALLY DISPLAY THE FOLLOWING POINTS, AT A MINIMUM, AT THE OPERATOR WORKSTATION:

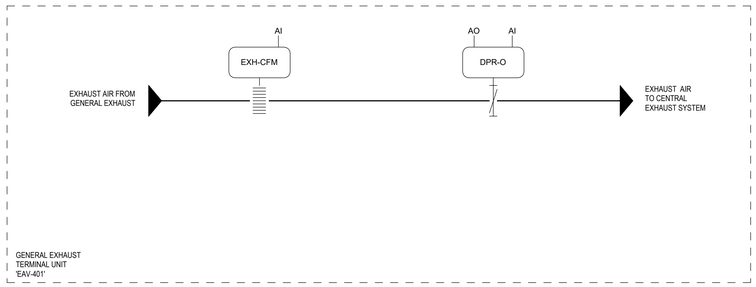
ANALOG INPUTS

SPACE TEMPERATURE (ZN-T)
AIR VALVE POSITION AS A PERCENT OPEN (DPR-O)
TEMPERATURE CONTROL VALVE POSITION AS A PERCENT OPEN (RH-VLV)
EXHAUST AIRFLOW VALUE FOR EXHAUST VALVES AND EXHAUST TERMINAL UNITS (EXH-CFM)
SUPPLY AIRFLOW VALUE FOR SUPPLY TERMINAL UNITS (SA-CFM)
DISCHARGE AIR TEMPERATURE FOR SUPPLY TERMINAL UNITS (DA-T)

LABORATORY AIRFLOW DIAGRAM- 401A, 401B, 401C, 401D, AND 406
2 NOT TO SCALE







AIRFLOW DIAGRAM NOTES:

1. CONTROL VALVE AND ACTUATOR FURNISHED BY SIEMENS, INSTALLED BY MC/CIC.

2. TERMINAL UNIT CONTROLLER FURNISHED BY SIEMENS, INSTALLED BY CIC.

3. FUME HOOD EXHAUST VALVE AND CONTROLLER FURNISHED BY SIEMENS, INSTALLED BY CIC.

4. LABORATORY AIRFLOW CONTROL HARDWARE FURNISHED BY SIEMENS, INSTALLED BY CIC.

1 5. SUPPLY AIR TERMINAL UNIT FOR 406 IS EXISTING. REMOVE AND REPLACE EXISTING HYDRONIC CONTROL VALVE ACTUATOR. CONTROL VALVE BODY REMAINS. REUSE EXISTING DAMPER ACTUATOR. PROVIDE NEW SPACE SENSOR FOR TERMINAL BOX CONTROL.

6. LABORATORY FUME HOOD OPERATOR DISPLAY PANEL FURNISHED BY SIEMENS AND INSTALLED ON FACE OF FUME HOOD AND WIRED TO FUME HOOD CONTROLLER BY CIC.

LABORATORY AIRFLOW SEQUENCE OF OPERATION

A. GENERAL

1. CONTROL OF AIRFLOW TO AN FROM EACH LABORATORY SPACE AND CONTROL OF SPACE TERMPERATURE WITHIN THE LABORATORY SPACE SHALL BE ACCOMPLISHED BY THE LABORATORY AIRFLOW CONTROL SYSTEM (LACS). THE LACS SHALL UTILIZE DDC MICROPROCESSOR BASED LOGIC TO ACHEIVE ALL CONTROL FUNCTIONS.
2. OPERATE EXHAUST VALVE TO MAINTAIN REQUIRED DESIGN AIRFLOW RATE FOR EACH FUMEHOOD WITH SASH OPEN AND MINIMUM REQUIRED AIRFOW FOR EACH FUMEHOOD WITH SASH CLOSED.

B. AIRFLOW CONTROL

1. SUPPLY AIR TERMINAL UNIT WITH REHEAT (SAV-401): MODULATE SUPPLY TERMINAL UNIT DAMPER TO MAINTAIN OFFSET WITH EXHAUST AIRFLOW. MODULATE HEATING COIL TEMPERATURE CONTROL VALVE TO MAINTAIN SPACE TEMPERATURE SETPOINT.

2. FUME HOOD EXHAUST VALVE (HEV-401): MODULATE EXHAUST AIR VALVE TO MAINTAIN 80 FPM WHEN LABORATORY IS OCCUPIED.

3. GENERAL EXHAUST VALVE (EAV-401): MODULATE GENERAL EXHAUST TERMINAL UNIT DAMPER TO MAINTAIN TOTAL EXHAUST AIRFLOW (FUME HOODS, & GENERAL EXHAUST VALVE) AT 6 AC/HR CONTINUOUSLY (24/7). GENERAL EXHAUST IS THE DIFFERENCE BETWEEN THE TOTAL REQUIRED EXHAUST AIRFLOW FOR THE SPACE AND THE EXHAUST AIRFLOW FROM FUME HOOD AND IN THE LABORATORY SPACE.

GRAPHICALLY DISPLAY THE FOLLOWING POINTS, AT A MINIMUM, AT THE OPERATOR WORKSTATION:

ANALOG INPUTS
SPACE TEMPERATURE (ZN-T)
AIR VALVE POSITION AS A PERCENT OPEN (DPR-O)
TEMPERATURE CONTROL VALVE POSITION AS A PERCENT OPEN (RH-VLV)
EXHAUST AIRFLOW VALUE FOR EXHAUST VALVES AND EXHAUST TERMINAL UNITS (EXH-CFM)
SUPPLY AIRFLOW VALUE FOR SUPPLY TERMINAL UNITS (SA-CFM)
DISCHARGE AIR TEMPERATURE FOR SUPPLY TERMINAL UNITS (DA-T)

LABORATORY AIRFLOW DIAGRAM- LABORATORY 401
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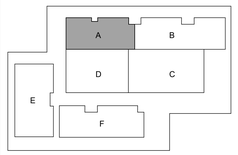

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