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PROJECT NAME: BL071 CHEMISTRY – GROUND & FIRST FLOORS TEACHING LABS RENOVATION
OWNER NAME: INDIANA UNIVERSITY BLOOMINGTON
IU PROJECT NO. 20231351 / CES PROJECT NO. 2024-003.IUL
ADDENDUM NO. 1
DATED: 11/25/2024

This Addendum consists of two (2) Addendum page(s) and fifty-five (55) attachment pages totaling fifty-seven (57) pages. This Addendum shall supplement, amend, and become part of the Bid Documents. All Bids shall be based on these modifications. Bidders shall acknowledge the receipt of this addendum on their Bid Form.

PART 1 - CHANGES TO THE PROJECT MANUAL

Modifications described herein shall be incorporated in the Project Manual. All other Work shall remain unchanged.

1.1 DIVISION 11 – EQUIPMENT

A. **Section 115313 "LABORATORY FUME HOODS"**

1. DELETE AND REPLACE the two (2) Sections 115313 in their entirety and replace with the attached.

1.2 DIVISION 12 – FURNISHINGS

A. **Section 123552.13 "METAL LABORATORY CASEWORK"**

1. ADD Subparagraph 2.01, A., 4. as follows:

   4. ICI Scientific, Inc.

B. **Section 123553.19 "WOOD LABORATORY CASEWORK"**

1. ADD Subparagraph 2.01, A., 4. as follows:

   4. ICI Scientific, Inc.

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

A. **Section 230900 "HVAC INSTRUMENTATION AND CONTROLS"**

1. DELETE AND REPLACE Section 230900 its entirety and replace with the attached.

PART 2 - AVAILABLE PROJECT INFORMATION

2.1 PRE-BID MEETING MINUTES & SIGN IN SHEET

A. See Attachment

2.2 BIDDER QUESTIONS AND ANSWERS:

1. Question: Is there any additional information on the ground face block to be used for infilling block walls?

    a. Answer: Infill block should match existing. Design team does not have access to the project manual for the original construction project for the building. Selected ground face block styles should be compared to existing block on site to find a match.

2. Question: When are final questions due?

    a. Answer: December 5, 2024

3. Question: Are substitutions allowed for metal and wood lab casework?

    a. Answer: Yes, substitutions will be considered. Refer to Project Manual sections 123553.13 and 123553.19 for required substitution information. Substitution requests to follow IU standard process.

4. Question: The Project Manual does not contain the Division 27 Spec's. Do you know if they will be published or is this "Rough-In" only?

    a. Answer: Specification section 270000 COMMUNICATIONS covers all of the scope.

5. Question: I noticed in the project manual they have two 115313 spec sections. Which one are we to use?

    a. Answer: Delete both sections and replace with attached, per the addendum 1.

END OF ADDENDUM NO. 1

SECTION 115313
LABORATORY FUME HOODS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Standard laboratory fume hoods.

B. Fume hood base cabinets and stands.

C. Work surfaces.

D. Laboratory cup sinks in fume hoods.

E. Service fittings and outlets.

F. Airflow indicators and alarms.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Blocking and nailers for anchoring fume hoods.

B. Section 092116 - Gypsum Board Assemblies: Reinforcements in metal-framed partitions for anchoring fume hoods.

C. Section 096500 - Resilient Flooring: Resilient base applied to base cabinets.

D. Section 123553.13 - Metal Laboratory Casework: Additional requirements for base cabinets for fume hoods.

E. Section 123553.19 - Wood Laboratory Casework: Additional requirements for base cabinets for fume hoods.

F. Section 230593 - Testing, Adjusting, and Balancing for HVAC: Field quality-control testing of fume hoods.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 110 - Methods of Testing Performance of Laboratory Fume Hoods; 2016, with Errata.

B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2023a.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.

E. SEFA 1 - Laboratory Fume Hoods; 2010.

F. SEFA 2 - Installations; 2010.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate installation of fume hoods with laboratory casework and other laboratory equipment.

B. Preinstallation Meeting: Conduct preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide fume hood exterior and interior dimensions and construction, utility and service requirements and locations.

C. Shop Drawings: Indicate locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, clearances required, locations and types of service fittings.

D. Samples: Submit two samples of exterior, interior, and work top finish surfaces, 6"x6" in size illustrating color and finish.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements. Provide documentation of successful Factory Acceptance Testing.

F. Operation Data: Include description of equipment operation and required adjusting and testing.

G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

H. Project Record Documents: Record actual locations of concealed utility connections.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

C. Preconstruction Testing: Factory-test each type of hood as per referenced standard.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

1.08 FIELD CONDITIONS

A. Ambient Conditions: Maintain temperature and relative humidity at occupancy levels during and after installation of fume hoods.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide one year manufacturer warranty for manufacturer's standard items (listed by part number in manufacturer's official publication).

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Laboratory Fume Hoods:
   1. Kewaunee Scientific Corp: www.kewaunee.com/.
   2. Labconco Corporation: www.labconco.com/. Basis of Design.
   3. Air Master Systems
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 VARIABLE AIR VOLUME (VAV) FUME HOODS

A. Restricted-Bypass Fume Hoods:
   1. Provide a compensating bypass arrangement above the sash to open after sash is closed to less than 20 percent open. Bypass to maintain exhaust capacity of at least 25 CFM per square foot (127 L/s per square meter) of work surface regardless of sash position.
   2. Provide an electronic control unit designed to use input from a sensor that monitors face velocity or sash position to modulate a dedicated exhaust damper in order to maintain a near-constant fume hood face velocity.

a. Provide control unit with outputs for interfacing with building's HVAC control system.

2.03 SOURCE LIMITATIONS

A. Obtain laboratory fume hoods from single manufacturer.

B. Obtail laboratory fume hoods from same source/subcontractor as laboratory casework.

2.04 PERFORMANCE REQUIREMENTS

A. Fume hoods complying with the following when tested in accordance with ASHRAE Std 110:
1. As-Manufactured (AM) Rating: AM 0.01 (0.01 ppm).
2. As-Installed (AI) Rating: AI 0.10 (0.10 ppm).
3. Average Face Velocity: Allow for a minimum of 80 fpm velocity and a maximum of 100 fpm velocity with proper containment maintained within that range of air flow.
4. Face-Velocity Variation: Not more than 10 percent of average face velocity across the face opening with sash(es) fully open.
5. Release Rate: 4.0 L/min.
6. Static-Pressure Loss: Not more than 1/2-inch w.g. (124 Pa) at 100 FPM (0.51 m/s) face velocity with sash fully open when measured at four locations 90 degrees apart around the exhaust duct and at least three duct diameters downstream from duct collar.

2.05 FUME HOODS

A. General Requirements:
1. Comply with SEFA 1.

B. Type 1 - First and Ground Floor Common Hood , Fume Hood:
1. Basis of Design: Labconco Protector Premier.
2. Ventilation: Variable Air Volume (VAV).
3. Configuration: Standing-height; bench mounted and Bench mounted, ADA Compliant (34" counter).
4. Nominal Interior Height: 48 inches (1219 mm).
5. Sash Type: Vertical rising.
   a. Configuration: As indicated on drawings.
   b. Leak-free enclosure box, manufacturer's standard construction, for vertical rising sash.
   c. Glazing: Laminated safety glass.
   d. Sash Guides: Corrosion-resistant polyvinyl chloride (PVC) track.
   e. Vertical Sash mechanism: Designed to prevent sash drop in case of mechanism failure.
      1) Notched belt and sprocket sash system or chain and sprocket system.
   f. Vertical Sash Pull: Type 316 stainless steel, with No.4 finish.
6. Top Front Panel: Standard integral grille stamped into panel of same materials as fume hood exterior.
7. Exterior: Sheet steel.
   a. Color/Finish: As indicated on Drawings.
8. Interior Lining: 3/16" thick glass fiber reinforced polyester.
   a. Color/Finish: White.
9. Service Fittings and Fixtures:
   a. Cup Sink: Drop-in Polyethylene, complete with removable stainer and waste fitting, mounted at back of hood, 2 cup sinks, 1 on either side of hood.
      1) Shape: Oval.
      2) Size: 3 inches by 6 inches (75 by 150 mm).
   b. Natural Gas Fitting Assembly: 1 turret per hood.
   c. Nitrogen Gas Fitting Assembly: 1 turret per hood.
   d. Water Outlet Fitting Assembly: CW fixture on either side of each hood, this varies at ADA locations.

e. Vacuum-Breaker Assembly: Not required.
f. Backflow Preventer Assembly: refer to MEP drawings and specs for details.Escutcheons: Stainless steel.
g. Duplex Outlet: 1 receptacle on either side of hood, See specification section 262726.33.
h. Variable heat and power controller: Varister power panel at top panel of casework, refer to MEP drawings and specs for details.

10. ADA hoods as indicated on Drawings, these have knee space in lieu of cabinets and cup sinks are mounted to the rear and front; justified to one side only. All controls should be within ADA reach guidelines.
11. All plumbing fittings shall be factory installed and piped between the valve and the outlet. Inlet piping shall be carried to a point 6" above the fume hood roof or 6" below the work top rear corner depending on the rough-in locations shown in the drawings. Points of final service connection by other trades shall be at the stub provided by the fume hood manufacturer.
12. Access Panels: Provide removable panels on both sides hood exterior and interior lining panels.
13. Provide ceiling shroud that stops 1" short of finished ceiling condition.
14. Work Surface:
    a. Work Top for Fume Hoods Other Than Floor-mounted Type: Epoxy resin.
        1) Edge: Raised rim with rounded edges and corners.

C. Type 2 - First Floor Student Hoods , Fume Hood:
1. Basis of Design: Labconco Protector Classmate (Glass back and sides).
2. Ventilation: Variable Air Volume (VAV).
3. Configuration: Standing-height; bench mounted and Bench mounted, ADA Compliant (34" counter).
4. Nominal Interior Height: 48 inches (1219 mm).
5. Sash Type: Vertical rising.
    a. Configuration: As indicated on drawings.
    b. Leak-free enclosure box, manufacturer's standard construction, for vertical rising sash.
    c. Glazing: Laminated safety glass.
    d. Sash Guides: Corrosion-resistant polyvinyl chloride (PVC) track.
    e. Vertical Sash Mechanism: Design to prevent sash drop in case of mechanism failure.
        1) Notched belt and sprocket sash system or chain and sprocket system.
    f. Vertical Sash Pull: Type 316 stainless steel, with No.4 finish.
6. Top Front Panel: Standard integral grille stamped into panel of same materials as fume hood exterior.
7. Exterior: Sheet steel.
    a. Color/Finish: As indicated on Drawings.
8. Interior Lining: 3/16 inch thick glass fiber reinforced polyester.
    a. Color/Finish: White.
9. Service Fittings and Fixtures:
    a. Cup Sink: Drop-in polyethylene, complete with removable stainer and waste fitting, mounted at back of hood, 2 cup sinks, 1 on either side of hood.
        1) Shape: Oval.
        2) Size: 3 inches by 6 inches (75 by 150 mm).
    b. Natural Gas Fitting Assembly: 1 turret per hood.
    c. Nitrogen Gas Fitting Assembly: 1 turret per hood.
    d. Compressed Air Outlet Fitting Assembly: 1 turret per hood.
    e. Vacuum Outlet Fitting Assembly: Vacuubrand model VCL AK-A, ADA compliant fume hood valve and Vacuubrand model VCL A A5/C9 turret for inside fume hood. Valve

and turret to be factory installed and tested. Provide single point PTFE tubing connection, coordinate with Vacuubrand.

f. In lab 141, provide pass-through into bottom of hood that will allow vacuum piping to enter hood from cabinet below. To occur in 6 locations selected by User/Owner. Pass-through placement also to be confirmed by User/Owner.
g. Water Outlet Fitting Assembly: CW fixture on either side of each hood. This varies at ADA locations.
h. Vacuum-breaker Assembly: Not required.
i. Backflow Preventer Assemblyrefer to MEP drawings and specs for details
j. Duplex Outlet: 1 receptacle on either side of hood, See specification section 262726.33.
k. Variable heat and power controller: Varister power panel at top panel of casework, refer to MEP drawings and specs for details.

10. Latticework Experiment Racks: Installed at back of hood, Stainless steel construction of rods, Nickel-plated zinc connectors and lab frame feet; installed at Lab 141 only.
11. ADA hoods as indicated on Drawings, these have knee space in lieu of cabinets and cup sinks are mounted to the rear and front; justified to one side only. All controls should be within ADA reach guidelines.
12. All plumbing fittings shall be factory installed and piped between the valve and the outlet. Inlet piping shall be carried to a point 6" above the fume hood roof or 6" below the work top rear corner depending on the rough-in locations shown in the drawings. Points of final service connection by other trades shall be at the stub provided by the fume hood manufacturer.
13. Access Panels: Removable panels on both sides hood exterior and interior lining panels.
14. Provide ceiling shroud that stops 1" short of finished ceiling condition.
15. Work Surface:
    a. Work Top for Fume Hoods Other Than Floor-mounted Type: Epoxy resin.
        1) Edge: Raised rim with rounded edges and corners.

D. Fume Hood Base Cabinets:
1. See Section 123553.13 - Metal Laboratory Casework.
2. See Section 123553.19 - Wood Laboratory Casework.
3. Exterior construction: Type indicated on drawings.
    a. Standard storage cabinets with plastic lining similar to acid or solvent cabinet.
    b. Vacuum pump cabinets.
4. Material: Sheet steel.
5. Color/Finish: As indicated on drawings.

E. Fume Hood Base Stands:
1. Leg Shoes: Manufacturer's standard.
2. Structural Performance: Capable of withstanding 50 pounds per foot (74 kg/m) work top, 75 pounds per foot (112 kg/m) on work top, plus weight of hood, without permanent deformation or excessive deflection.
3. Structural Performance of Fume Hood Base Stands for Radioisotope Hoods: Capable of withstanding 50 pounds per foot (74 kg/m) work top, 200 pounds per foot (297 kg/m) on work top, plus weight of hood, without permanent deformation or excessive deflection.
4. Knee Space: Clear floor space not less than 36 inches (915 mm) wide by 25 inches (635 mm) front-to-back by 27 inches (685 mm) high, unless otherwise indicated.

F. Light Fixtures: UL labeled, LED light fixtures. Number and length of fixtures as necessary for fume hood width. Mounted above sealed safety glass panel. White baked-enamel finish on fixture interior.

2.06 FABRICATION

A. General: Assemble fume hoods in factory to greatest extent possible. Disassemble fume hoods only as necessary for shipping and handling limitations, or as necessary to permit movement through a 35 inches by 79 inches (889 mm by 2007 mm) clear door opening.

B. Ends: Fabricated with double-wall end panels. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.

C. Lining Assembly: Unless otherwise indicated, assembled with stainless-steel fasteners or epoxy adhesive, concealed where possible. Joints sealed by filling with chemical-resistant sealant during assembly.
   1. Punched fume hood lining side panels for service fittings and remote controls. Removable plug buttons for holes not used for indicated fittings.

D. Rear Baffle: Same material as fume hood lining, unless otherwise indicated, at rear of hood with openings at top and bottom, with corrosion-resistant fasteners. Fabricated for removal to facilitate cleaning behind baffle.

E. Exhaust Plenum: Full width of fume hood, sized and configured to provide uniform airflow, of same material as hood lining, and with duct stub for exhaust connection.
   1. Duct-Stub Material: stainless steel, unless otherwise indicated.

F. Airfoil: At bottom of fume hood face opening, with 1 inch (25.4 mm) gap between bottom of airfoil and work top. Sash to close on top of airfoil. Designed to direct airflow across work.
   1. Fabricated from 14 gauge, 0.0781 inch (1.98 mm) stainless steel with No.4 finish.

G. Comply with requirements of other sections for factory installation of water and laboratory gas service fittings, piping, electrical devices, and wiring. Securely anchor fittings, piping, and conduit to fume hoods, unless otherwise indicated.

2.07 MATERIALS

A. Steel Sheet: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A1008/A1008M; matte finish; suitable for exposed applications.

B. Stainless-Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

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

D. Fasteners: Stainless-steel, where exposed to fumes.

2.08 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Factory testing of each type of fume hood.

C. Non-Complying Work: See Section 014000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Locate concealed framing, blocking, and reinforcements that support fume hoods by field measurements before being enclosed, and indicate measurements on Shop Drawings.

B. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fume hoods.

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

3.02 INSTALLATION

A. General: Install fume hoods according to manufacturer's written instructions. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and

adjacent laboratory casework. Securely attach access panels but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Comply with indicated requirements for installing water and laboratory gas service fittings, and electrical and telecommunications devices.
   1. Install fittings in accordance with shop drawings, installation requirements in SEFA 2, and manufacturer's written instructions. Set bases and flanges of sink and work top-mounted fittings in sealant recommended by manufacturer of sink or work-top material. Securely anchor fittings to fume hoods.

3.03 FIELD TESTING

A. Field test installed fume hoods according to "Flow Visualization and Velocity Procedure" requirements in ASHRAE 110.

B. Field test installed fume hoods according to ASRAE 110 to verify compliance with performance requirements
   1. Adjust fume hoods, hood exhaust fans, and building's HVAC system, or replace hoods and make other corrections until tested hoods perform as specified.
   2. After making corrections, retest fume hoods that failed to perform as specified.

3.04 FIELD QUALITY CONTROL

A. Field test fume hoods as specified below.
   1. General: Test fume hoods as installed to assess airflow velocity. Perform tests with static mode (set sash position) conditions. Conduct testing as outlined below for 100% of the hoods provided in the Project.
   2. Preparation:
      a. Inspect each fume hood to confirm its installation complies with drawings and specifications.
      b. Inspect laboratory space to verify that construction complies with drawings and specified requirements.
      c. Do not proceed with fume hood testing until an acceptable TAB report has been received.
      d. Verify that proper temperature and pressurization of the lab space can be maintained, with door(s) to the space in closed and open positions.
      e. Adjust non-complying physical and control systems until conditions favorable to testing fume hoods are present.
   3. Operating Conditions Tests:
      a. Conduct face velocity tests to confirm that target velocities are being achieved within acceptable tolerances.
      b. Conduct airflow indicator/monitor tests to confirm acceptable variation from corresponding measured value. Calibrate and adjust device to function within specified accuracy parameters.
      c. Conduct exhaust flow and static pressure tests of the HVAC system and its controls to confirm flow volume and static pressures are within acceptable tolerances.
      d. In projects with VAV lab ventilation systems, conduct response time and stability tests to confirm how the HVAC supply and exhaust systems respond to different sash opening positions.
      e. Conduct tests of alarm device by shutting off the fume hood exhaust and verify that the individual fume hood alarm activates and operates in specified manner.
      f. Conduct tests of individual controls provided at the fume hood (such as unoccupied cycle override, alarm override, etc.) to verify they operate in specified manner.

B. Reporting Requirements: Comply with Section 5 of NEBB Fume Hood Testing (FHT) Standard, current edition. Organize and include, at a minimum, the following information:
   1. Report title.

2. Report certification.
3. Table of contents.
4. Report summary/ remarks.
5. Appropriate forms.
6. Instrument calibration.
7. List of abbreviations used.
8. A room layout drawing for each tested item. Identify: walls; doors; fume hood(s); other present environmental enclosures (e.g. biological safety cabinet(s), laminar flow hood(s), canopy hood(s), etc.); location and airflow pattern of all air supply, return, and exhaust grilles, registers and diffusers.

3.05 CLEANING

A. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

3.06 DEMONSTRATION

A. Demonstrate proper operation of fume hoods and their accessories to Owner's designated representative.

3.07 FUME HOOD SCHEDULE

A. See drawings for Fume Hood Schedule.

END OF SECTION

SECTION 230900 - HVAC INSTRUMENTATION AND CONTROLS

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 230100 "Basic Mechanical Requirements," and Section 230500 "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

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

3.1 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

SIEMENS

Indianapolis
Smart Infrastructure

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Indianapolis, IN 46268
USA

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11/20/24

FOR INFORMATION CONTACT
ERIC HUGHES

ENGINEERING DATA FOR
IU Chemistry Gnd-1st Flr Labs

IU PROJECT #20231351,

44OP-387655

ARCHITECT

CREATIVE ENGINEERING SOLUTIONS
ENGINEER

CONTRACTOR

DWG	DESCRIPTION
	GENERAL
	Cover Sheet
	SCHEDULES
	Valve Submittal
	HEV/CEV Submittal
	GENERAL
GEN	GENERAL NOTES
LEG	Legend & Abbreviations
ABAC	Anixter Building Auto. Cables
DWIR1	DXR Wiring Specification
DWIR2	DXR Wiring Specification2
	CONTROL DRAWINGS
001–003	System Architecture
004–005	LRC – Fast Act Dmpr Sup Only
006–008	LRC – Fast Act Dmpr Sup & Exh
009–010	FUME HOOD CONTROLLER
011–012	SNORKEL EXHAUST
013–014	VAV w/HW Reheat
015–017	RPC – Slow Act Damper Sup/Exh

REVISION HISTORY

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IU Chemistry Gnd-1st Flr Labs
IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH			11/20/24

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Indianapolis

Smart Infrastructure

Valve Submittal - Water

LOCATION:

JOB NO: 44OP-387655

ENGR: WLH

PROJECT NAME: IU Chemistry Gnd-1st Flr Labs

DATE: 11/15/24

PAGE: 1

REV:

GENERAL NOTES:

1. All valves 2-1/2" and larger have flanged ends, 2" and smaller have screwed ends.
2. All control valves and wells shall be installed by the mechanical contractor.
3. Standard abbreviations used on control valves are:

BODY TYPES: 3W - Three way; 2W - Two way; A - Angle; N.C. - Normally Closed; N.O. - Normally Open; NOC - Ball Valve can be N.O. or N.C.; BF - Butterfly Valve; DS - Double Seated;

UNITS:

Steam inlet pressure, actual pressure drop, and shut off pressure indicated in PSIG.

ACTUATOR TYPES: SR - Spring Return; NSR - No Spring Return CR - Capacitor Driven Return; DA - Double Acting

Valve ID/ Location	Qty	Product Number	Valve Size	Body Type	Body Style	Actual Cv	Actuator Type	Design P. Drop (psi)	Required Flow (gpm)	Min (gpm)	Max (gpm)	Preset (gpm)	Steam Inlet	Press Drop (psi)	Valve Spec Sheet	Shut Off	ANSI Class	Comment
Mechanical System: LCM-1													LRC - Fast Act Damper w HW Rht					
V-1	1	259-02038	0.50	2W	Globe	2.50	NO-NSR	5.00	4.80	N/A	N/A	N/A	--	3.69	154 010	65	250	VAV-041A
V-2	1	259-02038	0.50	2W	Globe	2.50	NO-NSR	5.00	4.80	N/A	N/A	N/A	--	3.69	154 010	65	250	VAV-041B
V-3	1	259-02038	0.50	2W	Globe	2.50	NO-NSR	5.00	5.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-045A
V-4	1	259-02038	0.50	2W	Globe	2.50	NO-NSR	5.00	5.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-045B
V-5	1	259-02038	0.50	2W	Globe	2.50	NO-NSR	5.00	5.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-047A
V-6	1	259-02038	0.50	2W	Globe	2.50	NO-NSR	5.00	5.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-047B
V-7	1	259-02038	0.50	2W	Globe	2.50	NO-NSR	5.00	5.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-049A
V-8	1	259-02038	0.50	2W	Globe	2.50	NO-NSR	5.00	5.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-049B
V-9	1	259-02041	0.50	2W	Globe	4.00	NO-NSR	5.00	8.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-141A
V-10	1	259-02041	0.50	2W	Globe	4.00	NO-NSR	5.00	8.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-141B
V-11	1	259-02041	0.50	2W	Globe	4.00	NO-NSR	5.00	8.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-141C
V-12	1	259-02041	0.50	2W	Globe	4.00	NO-NSR	5.00	8.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-145A

NOTES: All control valves and wells shall be installed by the heating contractor.

Indianapolis
Smart Infrastructure

Valve Submittal - Water

LOCATION:
JOB NO: 44OP-387655
ENGR: WLH

PROJECT NAME: IU Chemistry Gnd-1st Flr Labs

DATE: 11/15/24
PAGE: 2
REV:

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UNITS:
Steam inlet pressure, actual pressure drop, and shut off pressure indicated in PSIG.

ACTUATOR TYPES: SR - Spring Return; NSR - No Spring Return CR - Capacitor Driven Return; DA - Double Acting

Valve ID/ Location	Qty	Product Number	Valve Size	Body Type	Body Style	Actual Cv	Actuator Type	Design P. Drop (psi)	Required Flow (gpm)	Min (gpm)	Max (gpm)	Preset (gpm)	Steam Inlet	Press Drop (psi)	Valve Spec Sheet	Shut Off	ANSI Class	Comment
Mechanical System: LCM-1													LRC - Fast Act Damper w HW Rht					
V-13	1	259-02041	0.50	2W	Globe	4.00	NO-NSR	5.00	8.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-145B
V-14	1	259-02041	0.50	2W	Globe	4.00	NO-NSR	5.00	8.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-145C
V-15	1	259-02041	0.50	2W	Globe	4.00	NO-NSR	5.00	8.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-147A
V-16	1	259-02041	0.50	2W	Globe	4.00	NO-NSR	5.00	8.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-147B
V-17	1	259-02041	0.50	2W	Globe	4.00	NO-NSR	5.00	8.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-147C
V-18	1	259-02041	0.50	2W	Globe	4.00	NO-NSR	5.00	8.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-149A
V-19	1	259-02041	0.50	2W	Globe	4.00	NO-NSR	5.00	8.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-149B
V-20	1	259-02041	0.50	2W	Globe	4.00	NO-NSR	5.00	8.00	N/A	N/A	N/A	--	4.00	154 010	65	250	VAV-149C
Mechanical System: VAV													14023 - VAV w/HW					
V-1	1	259-02030	0.50	2W	Globe	0.40	NO-NSR	5.00	0.50	N/A	N/A	N/A	--	1.56	154 010	120	250	VAV-041C
V-2	1	259-02030	0.50	2W	Globe	0.40	NO-NSR	5.00	0.50	N/A	N/A	N/A	--	1.56	154 010	120	250	VAV-141B2

NOTES: All control valves and wells shall be installed by the heating contractor.

VALVE	UNIT REFERENCE		UNIT TYPE	FLOOR	MARK	TYPE	DESIGN MAX FLOW	ACTUAL MAX FLOW	DESIGN MIN FLOW	ACTUAL MIN FLOW	VOLUMETRIC CONTROL APP	VALVE BODY SIZE	PRESSURE RANGE	MOUNTING OPTION	CONSTRUCTION CODE	CONTROL PACKAGE	CONTROLLER MODEL	ACTUATOR	FAILSAFE	FLOW TRANSMITTER	PART NUMBER
LAB FUME HOOD EXHAUST BOX																					
1	HEV	-	041-1	GND	HEV-041-1	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
2	HEV	-	041-2	GND	HEV-041-2	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
3	HEV	-	041-3	GND	HEV-041-3	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
4	HEV	-	041-4	GND	HEV-041-4	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
5	HEV	-	045-1	GND	HEV-045-1	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
6	HEV	-	045-2	GND	HEV-045-2	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
7	HEV	-	045-3	GND	HEV-045-3	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
8	HEV	-	045-4	GND	HEV-045-4	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
9	HEV	-	047-1	GND	HEV-047-1	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
10	HEV	-	047-2	GND	HEV-047-2	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
11	HEV	-	047-3	GND	HEV-047-3	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
12	HEV	-	047-4	GND	HEV-047-4	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
13	HEV	-	049-1	GND	HEV-049-1	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
14	HEV	-	049-2	GND	HEV-049-2	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
15	HEV	-	049-3	GND	HEV-049-3	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
16	HEV	-	049-4	GND	HEV-049-4	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
17	HEV	-	141-1	1ST	HEV-141-1	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
18	HEV	-	141-2	1ST	HEV-141-2	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
19	HEV	-	141-3	1ST	HEV-141-3	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
20	HEV	-	141-4	1ST	HEV-141-4	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
21	HEV	-	141-5	1ST	HEV-141-5	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
22	HEV	-	141-6	1ST	HEV-141-6	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
23	HEV	-	141-7	1ST	HEV-141-7	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
24	HEV	-	141-8	1ST	HEV-141-8	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
25	HEV	-	141-9	1ST	HEV-141-9	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
26	HEV	-	141-10	1ST	HEV-141-10	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
27	HEV	-	141-11	1ST	HEV-141-11	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
28	HEV	-	141-12	1ST	HEV-141-12	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
29	HEV	-	141-13	1ST	HEV-141-13	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
30	HEV	-	141-14	1ST	HEV-141-14	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
31	HEV	-	141-15	1ST	HEV-141-15	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
32	HEV	-	145-1	1ST	HEV-145-1	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
33	HEV	-	145-2	1ST	HEV-145-2	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
34	HEV	-	145-3	1ST	HEV-145-3	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
35	HEV	-	145-4	1ST	HEV-145-4	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
36	HEV	-	145-5	1ST	HEV-145-5	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
37	HEV	-	145-6	1ST	HEV-145-6	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
38	HEV	-	145-7	1ST	HEV-145-7	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
39	HEV	-	145-8	1ST	HEV-145-8	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
40	HEV	-	145-9	1ST	HEV-145-9	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
41	HEV	-	145-10	1ST	HEV-145-10	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
42	HEV	-	145-11	1ST	HEV-145-11	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
43	HEV	-	145-12	1ST	HEV-145-12	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
44	HEV	-	145-13	1ST	HEV-145-13	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11

Note: All valves and wels will be installed by Mechanical Contractor

VALVE	UNIT REFERENCE		UNIT TYPE	FLOOR	MARK	TYPE	DESIGN MAX FLOW	ACTUAL MAX FLOW	DESIGN MIN FLOW	ACTUAL MIN FLOW	VOLUMETRIC CONTROL APP	VALVE BODY SIZE	PRESSURE RANGE	MOUNTING OPTION	CONSTRUCTION CODE	CONTROL PACKAGE	CONTROLLER MODEL	ACTUATOR	FAILSAFE	FLOW TRANSMITTER	PART NUMBER
LAB FUME HOOD EXHAUST BOX																					
45	HEV	-	145-14	1ST	HEV-145-14	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
46	HEV	-	145-15	1ST	HEV-145-15	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
47	HEV	-	145-16	1ST	HEV-145-16	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
48	HEV	-	145-17	1ST	HEV-145-17	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
49	HEV	-	145-18	1ST	HEV-145-18	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
50	HEV	-	145-19	1ST	HEV-145-19	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
51	HEV	-	147-1	1ST	HEV-147-1	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
52	HEV	-	147-2	1ST	HEV-147-2	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
53	HEV	-	147-3	1ST	HEV-147-3	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
54	HEV	-	147-4	1ST	HEV-147-4	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
55	HEV	-	147-5	1ST	HEV-147-5	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
56	HEV	-	147-6	1ST	HEV-147-6	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
57	HEV	-	147-7	1ST	HEV-147-7	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
58	HEV	-	147-8	1ST	HEV-147-8	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
59	HEV	-	147-9	1ST	HEV-147-9	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
60	HEV	-	147-10	1ST	HEV-147-10	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
61	HEV	-	147-11	1ST	HEV-147-11	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
62	HEV	-	147-12	1ST	HEV-147-12	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
63	HEV	-	147-13	1ST	HEV-147-13	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
64	HEV	-	147-14	1ST	HEV-147-14	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
65	HEV	-	147-15	1ST	HEV-147-15	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
66	HEV	-	147-16	1ST	HEV-147-16	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
67	HEV	-	147-17	1ST	HEV-147-17	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
68	HEV	-	147-18	1ST	HEV-147-18	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
69	HEV	-	147-19	1ST	HEV-147-19	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
70	HEV	-	149-1	1ST	HEV-149-1	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
71	HEV	-	149-2	1ST	HEV-149-2	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
72	HEV	-	149-3	1ST	HEV-149-3	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
73	HEV	-	149-4	1ST	HEV-149-4	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
74	HEV	-	149-5	1ST	HEV-149-5	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
75	HEV	-	149-6	1ST	HEV-149-6	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
76	HEV	-	149-7	1ST	HEV-149-7	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
77	HEV	-	149-8	1ST	HEV-149-8	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
78	HEV	-	149-9	1ST	HEV-149-9	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
79	HEV	-	149-10	1ST	HEV-149-10	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
80	HEV	-	149-11	1ST	HEV-149-11	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
81	HEV	-	149-12	1ST	HEV-149-12	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
82	HEV	-	149-13	1ST	HEV-149-13	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
83	HEV	-	149-14	1ST	HEV-149-14	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
84	HEV	-	149-15	1ST	HEV-149-15	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
85	HEV	-	149-16	1ST	HEV-149-16	EXH	580	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
86	HEV	-	149-17	1ST	HEV-149-17	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
87	HEV	-	149-18	1ST	HEV-149-18	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11
88	HEV	-	149-19	1ST	HEV-149-19	EXH	625	1000	190	60	AVV	110	M	H	HSO	EO11	DXR2.E17C-103B	GNP191.1P	NO	DXA.S04P1	AVV110MHHSOEO11

Note: All valves and wels will be installed by Mechanical Contractor

VALVE	UNIT REFERENCE		UNIT TYPE	FLOOR MARK		TYPE	DESIGN MAX FLOW	ACTUAL MAX FLOW	DESIGN MIN FLOW	ACTUAL MIN FLOW	VOLUMETRIC CONTROL APP	VALVE BODY SIZE	PRESSURE RANGE	MOUNTING OPTION	CONSTRUCTION CODE	CONTROL PACKAGE	CONTROLLER MODEL	ACTUATOR	FAILSAFE	FLOW TRANSMITTER	PART NUMBER
SNORKEL HOOD EXHAUST BOX																					
89	CEV	-	041-1	GND	CEV-041-1	EXH	1200	1700	0	0	AVZ	210	M	H	HSO	MO11	DXR2.E17C-103B	GMA151.1P	NO	DXA.S04P1	AVZ210MHHSOMO11
90	CEV	-	045-1	GND	CEV-045-1	EXH	1600	2400	0	0	AVZ	212	M	H	HSO	MO11	DXR2.E17C-103B	GMA151.1P	NO	DXA.S04P1	AVZ212MHHSOMO11
91	CEV	-	047-1	GND	CEV-047-1	EXH	1600	2400	0	0	AVZ	212	M	H	HSO	MO11	DXR2.E17C-103B	GMA151.1P	NO	DXA.S04P1	AVZ212MHHSOMO11
92	CEV	-	049-1	GND	CEV-049-1	EXH	1600	2400	0	0	AVZ	212	M	H	HSO	MO11	DXR2.E17C-103B	GMA151.1P	NO	DXA.S04P1	AVZ212MHHSOMO11

Note: All valves and wels will be installed by Mechanical Contractor

GENERAL NOTES FOR CONTROLS INSTALLATION CONTRACTOR (CIC)

All work shall be performed in accordance with the contract documents and all applicable codes and standards.

Provide and install all wiring, conduit, circuit breakers, mounting hardware to install control devices/panels (brackets, extensions, stands, etc.) for a complete installation.

Mount, wire and pipe (control pneumatics) all devices including air compressor, air dryer, panels, sensors, relays, actuators, switches, thermostats, etc. for a complete installation. All installation of the energy management system and components is by the CIC unless noted otherwise.

Indiana University, through Siemens Industry, Inc., will provide all system controllers, relays, transformers, sensors, prefabricated auxiliary component panels and devices unless otherwise noted. The CIC will provide all installation materials necessary to mount, install, and wire all control devices.

CIC shall receive, handle and store, as needed, all material to be installed under their contract. CIC shall be responsible for verification of quantity received. Any discrepancies shall be reported in writing to Siemens Industry, Inc. within 48 hours of delivery. The CIC is responsible for the security of all materials received and stored. The CIC will replace, at their expense, any materials missing or damaged.

All devices to be installed according to manufacturer's recommendations and the contract documents. Field verify exact locations of all devices/equipment and insure access where required for service of equipment.

The pump Variable Frequency Drives (VFD) will be provided by Siemens Industry, Inc. and installed by the CIC. CIC. shall be responsible for interlock wiring between VFDs and local disconnect switches, where applicable.

CIC shall coordinate their work with all Contractors, other Subcontractors, and the Owner.

All control devices and panels that require 120V power that are not powered by the division 26 contractor shall require a dedicated circuit from its own breaker. Provide breakers and power wiring where required. Mount panels on racks when wall space is not available. Actual panel locations are to be coordinated with the contractors and owner.

All line voltage wiring shall be installed in conduit.

All wiring in mechanical rooms, concealed and inaccessible locations shall be installed in conduit. Minimum conduit size: 3/4".

Open cable and poly shall be installed only where space is concealed and accessible. In these cases, both cable and poly shall be rated for space they occupy.

Any conductor carrying voltage greater than 24VAC shall not occupy the same conduit as low voltage wiring. Pneumatic tubing and electrical conductors shall not occupy the same length of conduit.

All pneumatic tubing in mechanical rooms and in inaccessible places shall be installed in conduit or piped in hard copper in a neat and workmanlike manner. Air main supply to auxiliary panels shall be 1/2" O.D. Air branch lines shall be no less than 1/4" O.D.

Exposed conduit shall be EMT with steel compression fittings unless specified differently. Conduits installed outdoors or encased in concrete shall be rigid.

Refer to the project specifications and IU Control Design Standards document for conduit use and installation requirements.

CIC shall use control wire according to the following schedule and from the following vendor only. This wiring has special labeling and must be used for identification purposes:

Plenum Cables

Description	Cable P/N	Application	Jacket
HVAC CBL 18AWG,STR,1TP,CMP	H-TP18-CMP	DI, DO, AI, AO low voltage	Blue
HVAC CBL 20AWG,STR,1TP,CMP	H-TP20-CMP	DI, DO, AI, AO low voltage	Blue
HVAC CBL 18AWG,STR,3COND,CMP	H-3C18-CMP	TEC actuators, transducers	Blue
HVAC CBL 20AWG,STR,3COND,CMP	H-3C20-CMP	TEC actuators, transducers	Blue
HVAC CBL 14AWG,STR,2COND,CL3P	H-2C14-CL3P	Low Voltage Power	Drk Blue
HVAC BLN24AWG,STR,TSP,LOCAP,CMP	H-B-TSP24LC-CMP	BLN	Orange
HVAC BLN24AWG,STR,TSP,LOCAP,CMP	H-F-TSP24LC-CMP	FLN	Org/Blu Strp

Contact: Anixter, Inc.
1471 Business Center Drive
Mount Prospect, IL 60056

Phone: (888) 479-3830
Fax: (888) 479-3834

Alisa Corsi (Account Manager) – ext. 24711
Hours: 7AM – 7PM (Central), Monday – Friday

Provide as built record drawings of installation of the system. Record drawings shall include routing and sizing of main air runs, communications and power trunk runs, transformer locations, field device locations.

REVISION HISTORY

SIEMENS
Indianapolis
Smart Infrastructure

3502 Woodview Trace
Indianapolis, IN 46268
USA
Phone: 317 293-8880
Fax: 866 814-3089

IU Chemistry Gnd-1st Flr Labs
IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH	RM	11/01/24	11/15/24

GENERAL NOTES

440P-387655

GEN

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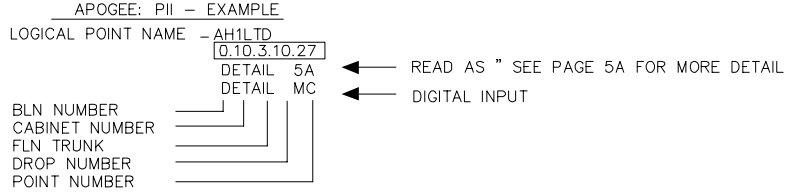
CONTROL SYMBOL	CONTROL SYMBOL DESCRIPTION
AC	AIR COMPRESSOR
AD	AIR DRYER
ADXR	ACTUATOR DXR
AE	ACTUATOR ELECTRIC
AEM	APOGEE ETHERNET MICROSERVER
AF	AIR FILTER
AFS	AIR FLOW STATION
AOP	ANALOG OUTPUT, PNEUMATIC
AP	ACTUATOR PNEUMATIC
APS	AUX. POWER SUPPLY
AT	AUTOMATIC TRAP
ATD	AUTO TANK DRAIN
ATEC	ACTUATOR 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

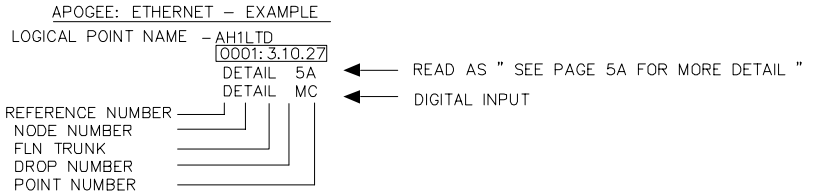
CONTROL SYMBOL	CONTROL SYMBOL DESCRIPTION
HHC	HAND-HELD OPERATOR'S TERMINAL
HL	HIGH LIMIT
HMI	GAMMA TOUCH PANEL
HOA	HAND-OFF-AUTO SWITCH
HORN	HORN
HPC	HEAT PUMP CONTROLLER
HTD	HIGH TEMPERATURE DETECTOR
HTE	HUMIDITY TRANSMITTER ELECTRIC
HTP	HUMIDITY TRANSMITTER PNEUMATIC
INT	INTERCOM
KWM	ELECTRIC KILOWATT 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

CONTROL SYMBOL	CONTROL SYMBOL DESCRIPTION
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

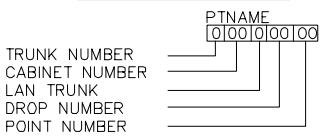
APOGEE: PII – EXAMPLE



APOGEE: ETHERNET – EXAMPLE



DDC ELECTRICAL POINT



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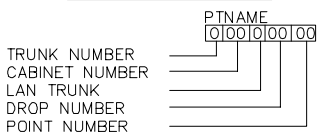
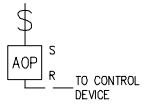
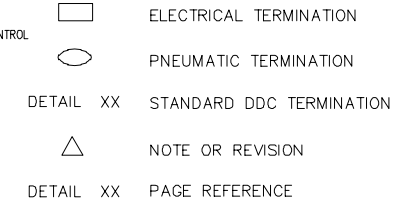




DETAILS



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IU PROJECT #20231351,

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WLH	WLH			11/15/24

Legend & Abbreviations

440P-387655

LEG

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Anixter Building Automation Cables

Non-Plenum

SBT Part Number	Description	Print Legend
H-TP20-CM	20AWG,STR,1TP,CM,BLUE JACKET	NORTHFLEX ® H-TP20-CM “DI, DO, AI, AO” (Mfg E#) 20AWG 1P 75°C CM (UL) C(UL)
H-3C20-CM	20AWG,STR,3COND,CM,BLUE JACKET	NORTHFLEX ® H-3C20-CM “TEC V/D” (Mfg E#) 20 AWG 3C 75°C CM (UL) C(UL)
H-TP18-CMR	18AWG,STR,1TP,CMR,BLUE JACKET	NORTHFLEX ® H-TP18-CMR “DI, DO, AI, AO” (Mfg E#) 18AWG 1P 75°C CMR (UL) C(UL)
H-3C18-CMR	18AWG,STR,3COND,CMR,BLUE JACKET	NORTHFLEX ® H-3C18-CMR “TEC V/D” (Mfg E#) 18 AWG 3C 75°C CMR (UL) C(UL)
H-2C14-CL3R	14AWG,STR,2COND,CL3R,DARK BLUE JACKET	H-2C14-CL3R “LV POWER” (Mfg E#) 14 AWG 2C 75°C CL3R (UL) C(UL)
H-B-TSP24LC-CM	BLN24AWG,STR,TSP,LOCAP,CM,ORANGE JACKET	H-B-TSP24LC-CM “BLN” (Mfg E#) 24 AWG 1P 75°C CM (UL) C(UL)
H-F-TSP24LC-CM	FLN24AWG,STR,TSP,LOCAP,CM,ORANGE JACKET W/ BLUE STRIPE	NORTHFLEX ® H-F-TSP24LC-CM “FLN” (Mfg E#) 24 AWG 1P 75°C CM (UL) C(UL)
H-3P24-CMR	24AWG,SOL,3P,CMR,BLUE JACKET	NORTHFLEX ® H-3P24-CMR “TEC STAT” (Mfg E#) 24 AWG 3P 75°C CMR (UL) C(UL)
LON-1PS22-CM	22AWG,STR,1PAIR,OAS,CM,ORANGE JACKET W/ WHITE STRIPE	NORTHFLEX ® LON-1PS22-CM “LON FLN” (Mfg E#) 22AWG 1P 75O C CM (UL) C(UL)
LON-2PS22-CM	22AWG,STR,2PAIR,OAS,CM,ORANGE JACKET W/ WHITE STRIPE	NORTHFLEX ® LON-2PS22-CM “LON FLN” (Mfg E#) 22AWG 2P 75O C CM (UL) C(UL)
E-4TP24CAT5-CM	24AWG,SOL,4TP,CAT5,CM	NORTHFLEX ® E-4TP24CAT5-CM “ETHERNET” (Mfg E#) 24AWG 4P 75O C CM (UL C(UL)
H-A-1.5TSP24LC-CM	ALN485, 24AWG, STR, TP+1C, OAS, LOCAP, CM	NORTHFLEX ® H-A-1.5TSP24LC-CM "ALN485" 24 AWG 1P+1C 75°C CM (UL) C(UL) (Mfg E#)
H-F-1.5TSP24LC-CM	FLN485, 24AWG, STR, TP+1C, OAS, LOCAP, CM	NORTHFLEX ® H-A-1.5TSP24LC-CM "FLN485" 24 AWG 1P+1C 75°C CM (UL) C(UL) (Mfg E#)

Plenum

SBT Part Number	Description	Print Legend
H-TP20-CMP	20AWG,STR,1TP,CMP,BLUE JACKET	NORTHFLEX ® H-TP20-CMP “DI, DO, AI, AO” (Mfg E#) 20 AWG 2C 75°C CMP (UL) C(UL)
H-3C20-CMP	20AWG,STR,3COND,CMP,BLUE JACKET	NORTHFLEX ® H-3C20-CMP “TEC V/D” (Mfg E#) 20 AWG 3C 75°C CMP (UL) C(UL)
H-TP18-CMP	18AWG,STR,1TP,CMP,BLUE JACKET	NORTHFLEX ® H-TP18-CMP “DI, DO, AI, AO” (Mfg E#) 18 AWG 2C 75°C CMP (UL) C(UL)
H-3C18-CMP	18AWG,STR,3COND,CMP,BLUE JACKET	NORTHFLEX ® H-3C18-CMP “TEC V/D” (Mfg E#) 18 AWG 3C 75°C CMP (UL) C(UL)
H-2C14-CL3P	14AWG,STR,2COND,CL3P,DARK BLUE JACKET	NORTHFLEX ® H-2C14-CL3P “LV POWER” (Mfg E#) 14 AWG 2C 75°C CL3P (UL) C(UL)
H-B-TSP24LC-CMP	BLN24AWG,STR,TSP,LOCAP,CMP,ORANGE JACKET	NORTHFLEX ® H-B-TSP24LC-CMP “BLN” (Mfg E#) 24 AWG TSP 75°C CMP (UL) C(UL)
H-F-TSP24LC-CMP	FLN24AWG,STR,TSP,LOCAP,CMP,ORANGE JACKET W/ BLUE STRIPE	NORTHFLEX ® H-F-TSP24LC-CMP “FLN” (Mfg E#) 24 AWG TSP 75°C CMP (UL) C(UL)
H-3P24-CMP	24AWG,SOL,3PAIR,CMP,BLUE JACKET	NORTHFLEX ® H-3P24-CMP “TEC STAT” (Mfg E#) 24 AWG 3P 75°C CMP (UL) C(UL)
KNX-TSP20LC-CMP	20AWG,SOL,1TSP,CMP,ORNGE/GRN STRIPE	NORTHFLEX ® KNX-TSP20LC-CMP “KNX PL-LINK” 20AWG SOL 1TSP 75° C CM (UL) C(UL) E179333
LON-1P22-CMP	22AWG,STR,1PAIR,CMP,ORANGE JACKET W/ WHITE STRIPE	NORTHFLEX ® LON-1P22-CMP “LON FLN” (Mfg E#) 22AWG 1P 75O C CMP (UL) C(UL)
LON-2P22-CMP	22AWG,STR,2PAIR,CMP,ORANGE JACKET W/ WHITE STRIPE	NORTHFLEX ® LON-2P22-CMP “LON FLN” (Mfg E#) 22AWG 2P 75O C CMP (UL) C(UL)
LON-1PS22-CMP	22AWG,STR,1PAIR,OAS,CMP,ORANGE JACKET W/ WHITE STRIPE	NORTHFLEX ® LON-1PS22-CMP “LON FLN” (Mfg E#) 22AWG 1P 75O C CMP (UL) C(UL)
LON-2PS22-CMP	22AWG,STR,2PAIR,OAS,CMP,ORANGE JACKET W/ WHITE STRIPE	NORTHFLEX ® LON-2PS22-CMP “LON FLN” (Mfg E#) 22AWG 2P 75O C CMP (UL) C(UL)
E-4TP24CAT5-CMP	24AWG,SOL,4TP,CAT5,CMP	NORTHFLEX ® E-4TP24CAT5-CMP “ETHERNET” (Mfg E#) 24AWG 4P 75O C CMP (UL
H-A-1.5TSP24LC-CMP	ALN485, 24AWG, STR, TP+1C, OAS, LOCAP, CMP	NORTHFLEX ® H-A-1.5TSP24LC-CM "ALN485" 24 AWG 1P+1C 75°C CM (UL) C(UL) (Mfg E#)
H-F-1.5TSP24LC-CMP	FLN485, 24AWG, STR, TP+1C, OAS, LOCAP, CMP	NORTHFLEX ® H-A-1.5TSP24LC-CM "FLN485" 24 AWG 1P+1C 75°C CM (UL) C(UL) (Mfg E#)

Assemblies

Part Number	Description	Print Legend
550-827	CABLE ASSEMBLY TEC TO SSB 3 POS 10 FT	N
550-828	CABLE ASSEMBLY TEC TO SSC 3 POS 10 FT	N

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Anixter Building Auto. Cables

440P-387655

ABAC

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Important Safety Information
System-specific:
The electrical safety for building automation and control systems by Siemens Building Technologies is essentially based on safely separating low voltage from mains voltage.
Application as per SELV or PELV pursuant to HD 384 "Electrical installation of buildings" depending on the grounding (24V AC) of the low voltage:
Ungrounded = Safety Extra-Low Voltage (SELV).
Grounded = Protection by Extra Low Voltage (PELV).
Device-related safety is guaranteed, among others, by:
1. Low-voltage power supply 24V AC per SELV or PELV
2. Comply with specific regulations for electrical wiring per the following sections.
3. Observe the following points when grounding 24V AC (system neutral):
4. Operating voltage of 24V AC is permitted in principle for both grounded as well as non-grounded system neutral. Local regulations and customers apply accordingly.
5. Grounding may be required or not allowed for functional reasons.
6. 24V AC systems are generally grounded unless disadvised by the manufacturer.
7. In order to avoid ground loops, connect systems with PELV to the ground at one location only (especially for transformers), if no other indication exists.

Mains and operating voltage:

Operating voltage 24V AC:
1. It must meet requirements for SELV or PELV. Permitted deviation for nominal voltage 24V AC on the device: -10 +/- 20%.

Transformer specification 24V AC:
1. Use safety insulating transformers as per EN 61558 with double insulation designed for 100% duty to supply SELV or PELV circuits..
2. Power taken from the transformer should be at least 50% of nominal load for efficiency reasons (effectiveness).
3. Transformer nominal power should be at least 25VA. For smaller transformers, the ratio of open circuit voltage to full load is unfavorable (> + 20%).

Operational voltage fuse 24V AC:
Transformers on the secondary side correspond to the actual load of all connected devices as per transformer sizing:
1. 24V AC line (system potential) must always be fused.
2. There required, also line (system neutral).

Mains filter:

Spikes and high-frequency interference may occur in areas with high levels of interference. The disturbances not only impact the transformer on the primary side, but may also influence secondary connected components.
A mains filter should be attached on the primary transformer if such interference is anticipated. Mains filters should be installed as close to the network transformer as possible and grounded.

Device-specific :

Devices using different power circuits:
Devices must have the required insulation of the power circuits from each other to be able to connect them directly without additional insulation.

Interfaces for different voltage circuits :
Connections via interfaces increase the risk of distributing dangerous voltage through the building. Ensure that the required insulation is available at all times and installed per applicable regulations.

DXR2 with 24V AC supply:
1. A class 2 transformer or an external T4 A fuse is compulsory.
2. Max. 100VA per transformer / per fuse circuit.

Installation:

Mounting position:
Recommended:
1. Wall, horizontal from left to right or from right to left.
2. Wall, vertical from bottom to top.
3. Ambient temperature 23 to 122°F (-5 to 50 °C)

AC 24V power lines:

1. DXR2 room automation stations with 24V AC supply are limited to a consumption of 4A/100VA.
2. Supply: Class 2 transformer OR external 4A fuse OR transformer >100VA for more than one DXR2. (In this case a separate 4A fuse is required for every 100VA).
3. DXR2 room automation stations with 24V AC supply can only be wired in star topology.
4. An external power supply of field devices should be fused separately for secure operation.

24V AC Transformer :

Operating voltage :
1. The operating voltage is 24V AC. It must comply with SELV or PELV to HD 60364-4-41 (2007-01-01) requirements.
2. The acceptable deviation of the 24V AC nominal voltage connected to the transformer is +20%/-10%. This means that after taking account of the cable and contact resistances, a tolerance of +/-20% for the field device supply can be guaranteed in the field devices.

Specification for 24V AC transformers:
1. Double-insulated safety transformers to EN 61558, designed for continuous operation, to supply SELV or PELV circuits.
2. The rated transformer output must be at least 50VA. In smaller transformers the ratio of no-load voltage to full-load voltage is unfavorable (> +20%).
3. For reasons of power efficiency the rated transformer output should not exceed 200 % of the maximum load.

Wiring DXR2:
The 24V AC can only be wired in star distribution for the DXR2 room automation stations. 24V AC must be fused with max. 4A (or Class 2 transformer).

Power consumption DXR2 24V AC:
Max. permissible input current 24V AC (through terminals 5 and 6) = Total max. 4A.

Base load (without loading by field devices)
DXR2.M11, DXR2.x12P 9VA
DXR2.M18 11VA
DXR2.E18 13VA
KNX PL-Link supply 5VA/3W
29V DC / Max. 50 mA
The bus supply can be switched off manually via tool if not used. Transit power 24V AC
Field supply 24V AC Max. 6VA
Field supply 24V DC (DXR2.E18 only)Max. 2.4W
Digital output (triac active) 6VA (250mA)
Note: Certain applications ensure that only one triac at a time is active: No simultaneous heating and cooling. Two heating outputs are alternatively on 50% of the time, the same with two cooling outputs. This can be considered in the transformer sizing.
Unconfigured triac 6VA (250mA)

Cable lengths 24V AC

The permissible voltage drop of 0.6 V on the power wire between the transformer and the most distant power point (room automation station, power module, bus interface module) is the basis for calculations.

Permissible load [VA]

	Cable length for 24V AC (SI)				
Cable X-section	2.5m	5.0m	10m	20m	50m
AWG16	200VA	100VA	50VA	25VA	10VA
AWG14	320VA	160VA	80VA	40VA	16VA

	Cable length for 24V AC (US)				
Cable X-section	8.2ft	16.4ft	32.8ft	65.6ft	164ft
AWG16	200VA	100VA	50VA	25VA	10VA
AWG14	320VA	160VA	80VA	40VA	16VA

Notes :
1. The supply wire (24V AC) and return lines can each have the indicated lengths.
2. Power is added together for multiple back-to-back looped PXC3 or DXR2 ("daisy chain") which reduces the cable length accordingly.
3. Each supply point (room automation stations/power module/bus interface module) is either connected separately to the transformer's terminal block (star wiring) or looped via the room automation station.
4. Cables may be wired in parallel to increase the cross section.

Wiring of field devices (without bus)
As a rule, comply with local regulations for electrical installations. These take precedence over any notes in this document.

Wiring for Triac outputs 24V AC.
The following applies for wiring to actuating devices such as valves, damper actuators or protection connected to the Triac outputs:
1. Use stranded, 2 or multiple core round cables, screened (standard off-the-shelf installation cable).
2. Single wires may not be used.
3. Wiring may be laid together with power lines (230V AC). They must be isolated from the power lines per regulations. Isolation must meet PELV requirements.
4. Wiring can not be led in the same cable as the power lines.
5. See table below for maximum single cable lengths. However, the length must not exceed 984ft (300m) (EM interference). DXR2: 262ft (80m).

DXR2 room automation stations with 24V AC supply:

Use cable cross section suited for 4A according to local regulations (T 4A fuse external / Class 2 transformer). Cable cross section >= AWG18. Triacs are not protected and are destroyed if overloaded.
2. Cable length <= 262ft (80m)

Signal wiring
The following applies in common for signal wiring of field devices such as temperature sensors, window switches, presence detectors, dew point sensors or electrical buttons:

1. Use stranded, 2 or multiple core round cables, without screen (standard off-the-shelf installation cable).
2. Single wires or ribbon cables may not be used.
3. Signal wiring may be laid together with power lines (230V AC). They must be isolated from the power lines per regulations. Isolation must meet PELV requirements.
4. Signal wiring can not be led in the same cable as the power lines.
5. The length must not exceed the following value (measuring errors, EM interference): DXR2: 262ft (80m).
6. All system neutral terminals of a device are interconnected. TX-I/O: The connection is not in the terminal base but in the plug-in module. When this unit is unplugged there is no connection.
7. The system neutral of a digital input can be connected to any signal neutral terminal of the device.
8. It is also permissible to combine the system neutral conductors of several digital inputs in order to save wire. TX-I/O: However, system ground must be connected at least once per module.
9. With analog inputs and outputs, the measuring neutral must always be connected to the terminal associated with that specific I/O point to avoid possible measurement errors.
10. 0 to 10V DC actuators with 0 to 10V DC feedback: System neutral of output and feedback may be in the same conductor due to the small current of the U10 and Y10 signals. However, output and feedback must be on the same device and there is no 24V DC supply current admissible on the system neutral conductor.

Relay outputs

1. External fuse of max. 10A for protection of the PCB tracks.
2. Relays have volt-free relay contacts. The mains voltage / switching voltage (230V AC / 24V AC/DC) must be supplied as an external voltage to the terminals.
3. The maximum load of the relay contracts must be observed (see data sheets for the corresponding devices)
4. The sizing and fusing of the power lines are oriented to overall connected load and local regulations.
5. The fused electrical values must therefore be reviewed in the data sheets for the corresponding devices.
6. The lines must be secured on the device with strain relief.
7. Cable length: as per load and local regulations.
8. The maximum current of the relays is limited to 4 (3)A.

Inputs and Outputs

Digital inputs

Cable length
The permissible length of the cables connected to the status contacts, regardless of the thickness of the wire (min. diameter 0.024in / 0.6mm) is restricted to 262ft (80m).

Common conductor with multiple contacts:
When several status or counter contacts are to be connected, a common conductor may be used. This saves wiring. However, system ground must be connected at least once per module. Digital inputs are not electrically isolated from the system electronics. Mechanical contacts must be volt-free. Electronic switches must comply with SELV or PELV standards.

Analog inputs

Cable length:
The maximum permissible cable length for passive resistance sensors and transmitters depends on the permissible measuring error due to the line resistance. The maximum cable length for DXR2 is 262ft (80m).

Active sensors 0 - 10V DC

Cable length:
The maximum cable length for DXR2 is 262ft (80m). The permissible length of 10V DC cables for measured signals, and of the cables to supply the sensors from the TRA device, have to be calculated on the following basis for each active sensor.
1. Max. 7% voltage drop (1.68V) on the cables due to the sensor supply current. Reason: to ensure sufficient voltage for the sensor supply.
2. Measuring error of max. 0.5% of the measuring range due to line resistance on the measuring conductor (not critical, as the measuring current is only 0.1mA)
3. Longer cables are permissible provided larger measuring errors are acceptable.
4. If the active sensor is supplied locally from a transformer, the sensor cable can be up to 984ft (300m) long (DXR2: 262ft (80m)) with a wire diameter of greater than or equil to 0.024in (0.6mm). The local transformer MUST NOT be earthed (earth loop)!
5. In case of active sensors with 24V AC supply, use cable cross section suited for 10A according to local regulations .
6.

Digital outputs (relays, triacs)

Cable length:
The cable between the switching outputs and the equipment to be switched may be up to 262ft (80m) for DXR2.
The permissible lengths of the cables between the relay outputs / triacs and the actuators depend on the type of actuator in use and are calculated as follows:
Relays: Voltage drop of max. 7% (1.68V) on the 24V AC operating voltage for the actuator.
Triacs: Voltage drop of max. 3% (0.72V) on the 24V AC operating voltage for the actuator (the triac itself has already 4% voltage drop).

Analog outputs

Cable length
The permissible cable lengths for 0 - 10V DC control signals and for the 24V AC operating voltage are given in the data sheets of the individual actuators.
Where the actuators are supplied locally with 24V AC, the control signal cable may be up to 984ft (300m) long (DXR2: 262ft (80m)) with a diameter of greater than or equil to 0.024in (0.6mm).
The local transformer MUST NOT be earthed (earth loop)!
0 - 10V DC actuators with 0 - 10V DC feedback: System neutral of output and feedback may be in the same conductor due to the small current. However, output and feedback must be on the same device.

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DXR Wiring Specification

440P-387655

DWIR1

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Ethernet network:

Network topologies
1. Star topology (general).
2. Line topology (for room automation).
3. DXR2 and PXC3 can be mixed.
4. The number of room automation stations is limited to 20 for a line topology (daisy chain).
5. The next device has no 24V AC power when a room automation station is removed. The connection exists only on the board, but not on the terminal block.
6. The Ethernet switch is inactive when a room automation station has no 24V AC power. The next devices, if in line topology, are disconnected from the network. For secure operation of the system it is recommended to supply each room automation station separately with 24V AC.

Cables – Room automation stations are connected to one another via switches and Ethernet cables with RJ45 connectors. The following conditions must be met:
1. Standard Ethernet cable min. category 5
2. Shielded or unshielded STP (Shielded Twisted Pair) or UTP (Unshielded Twisted Pair).
3. Length between switch and Room automation station max. 328ft (100m).
4. Length between Room automation stations Max. 328ft (100m).
5. Number of devices under a line topology max. 20.
6. Standard IT product at 100MB or 1GB.

Power over Ethernet (PoE) – Power over Ethernet (PoE) is a simple solution to supply power to room operator units consuming only little power. This saves a power cable and associated installation costs. PoE allows for installing Ethernet devices also in hard–to–access locations or areas where too many cables are an issue. In PoE, power sourcing equipment (PSE) supplies power to powered devices (PD, here: end devices). Voltage is supplied via the RJ45 plugs and a twisted–pair cable (TP) to the devices either:
1. Via data transmission lines
2. Or via unused lines of the RJ45 connection.
PoE requires a star topology. Standard PoE switches have between 4 and 16 outputs. In large plants (e.g. different rooms in a hotel) require use of multiple switches in a line topology.

Specifications:

Standard Ethernet cable	min category 5
Screened or unscreened	STP / UTP

STP (Shielded Twisted Pair)
or UTP (Unshielded Twisted Pair)
Distance between switch and station = max 328ft (100m).
Distance between switch and end unit = max 328ft (100m).

MS/TP networks:

Network topologies – MS/TP networks for Desigo TRA can only be wired in line topology. The network distance for a fully or partially loaded network is 4000ft (1220m) at a maximum network speed of 76,800 bps. Lower speeds do not mean longer network sections are possible. DXR2 controller support up to 115,200 bps. Network repeaters can be used to extend this distance.
To determine how many devices can be on a network section, add up all the loading numbers and do not exceed 32. Many third–party devices have full load interfaces. Check the manufacturer's literature for network loading information. The RS–485 specification allows 32 full load devices on a section of network cable before a repeater is required. Desigo TRA devices are 1/8 load devices, so, in theory, you could place 256 on a network section.

Response times normally limit the maximum number of devices on a network to lower values of around 96 devices.
1. Two 1200hm ½W resistors between + and – at BOTH ends of the network section.
2. OneSpecial PTC thermistor between Reference () and earth at ONE end of the network section. This prevents the cable from being damaged by high ground currents that may occur if the reference wire is accidentally grounded to earth ground at a second location.

Technical data BACnet MS/TP – Inter–node protocol communications on BACnet MS/TP networks take place over RS–485 physical media.
Desigo TRA devices use the 3–wire interface.
1. By providing the RS–485 ground signal of the interface to the network termination plug, all node communication ports can be referenced together providing a high degree of noise immunity.
2. The RS–485 common reference wire is terminated at one point (and only one point) to earth ground.
3. An overall foil shield and drain wire provide additional noise protection.
4. The decision to use the orange jacket cable or orange jacket with blue stripe cable is up to the user/customer. The only difference in the cables is the addition of the blue stripe, which can be useful to indicate a different protocol usage (e.g. Automatic level vs. floor level network).

Cable Specifications

Transmission medium (bus cable)	1.5–Pair (1 TP & 1 conductor) with overall Shield and drain wire
Gauge (pair)	24 AWG (0.25 mm2) stranded
Capacitance conductor to conductor	12.5 pF/foot (41 pF/m)
conductor to shield	24 pF/foot (79 pF/m)
Impedance	120 Ohm
Twists	min. 4 per foot (13 per m)
Reference wire	24 AWG (0.25 mm2) stranded, 3 inch lay with twisted pair
Shield	100% overall foil with drain wire
NEC class	UL listed, CM, CMP (167°F (75°C or higher)
CEC class	FT4, FT6 (167°F (75°C) or higher)

KNX PL–Link room bus:

1. The KNX PL–Link bus must be conducted inside the building. The cables must never leave the building.
2. The KNX PL–Link bus facilities communications from the PXC3 room automation station to a maximum 64 devices on the KNX bus devices for various manufacturers.
3. Note: The number of devices is also limited by the number of data points and the available bus power. Data points and bus power are incremented during engineering with the ABT tool.
4. The KNX PL–Link bus basic version comprises one cable and two stranded bus wires.
5. The PXC3 has one internal bus power supply of 160mA.
6. The DXR2 has one internal bus power supply of 50mA.
7. The PXC3 also includes an 24V AC / 2A output for devices with increased power consumption that is supplied via 24V AC rather than via the KNX PL–Link bus.
8. The KNX PL–Link is physically based on the KNX bus (Konnex).
9. In KNX networks area/line couplers and IP routers are not admitted.
10. Interconnection of room automation stations via KNX PL–Link is not admissible; the connection is done exclusively via Ethernet switches (Section 9).
11. The polarity of the KNX PL–Link bus conductors must be respected (KNX terminals + and –).

Bus power supply – A bus power supply is required for bus communications. Throttled voltage 29V DC is used.

Internal KNX PL–Link Power Supply:
The room automation stations have an internal bus power supply. which is switched on by default. If an external supply is used, the internal supply must be switched off manually in the ABT (KNX PL–Link rail properties), as parallel operation is not permitted.
Bus power and the KNX bus are electrically isolated from device electronics for devices with bus power.
Parallel operation of the internal KNX PL–Link bus supply with an external bus power supply is not permitted.
The internal bus power supply must be switched off in the tool when an external bus power supply is used.

External bus supply:
An external bus power supply unit (PSU) is required when the 160mA of the PXC3 / the 50mA of the DXR2 is insufficient to cover the power demand of the connected devices.
Power supply units for 160, 320 and 640mA available in specialty stores. The total power supply for the devices must be calculated to determine the appropriate size. Comply with the corresponding details in the datasheet.
A 640mA power supply unit suffices for a line featuring 64 devices on the KNX bus with an average power demand of 10mA each.

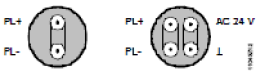
(Parallel operation)
5. In principle, parallel operation of external bus supplies among themselves is possible. However, check if the specific PSU is allowed to be operated in parallel with other PSUs. Refer to the technical specifications. The below mentioned Siemens devices are not submitted to this restriction.
6. A minimum cable distance is required between two PSU.

Bus topologies – Up to 64 devices with KNX PL–Link can be installed on one line (main line as well). No restrictions apply to the type mix.

Note:
1. There is no need to calculate the bus load number E for up to 64 devices.
2. A maximum of 64 devices may be installed even if devices requiring less power are used.

Permissible bus topologies are: Tree, line, and star topologies. These topologies can be mixed as needed. However, ring topologies are not allowed. The tree topology is advantageous if a large network must be created.

Cables
The bus lines (= wired pair) are connected via PL+ (red) and PL– (black).



24V AC can be provided in the same (2 x 2 stands) or in a separate cable.

Bus cable screening : In TRA plants, bus cables without screen are permitted. The screens available for bus cables do not need to be connected. If interference is expected on the KNX bus, use a cable with screen. Connect the screen as per standard installation rules.

Network with internal power supply: Comply with the following distances for a KNX network with the internal power supply from the room automation station:

1. Distance between device and internal supply, max 262ft (80m).
2. Distance between devices, max 262ft (80m).
3. Total length of all lines on one line, max 262ft (80m).

Network with external power supply: Comply with the following distances for a KNX network with external bus power supply (PSU)

1. Distance PSU to PXC3 with switched off internal supply, Min. 0ft (0m).
2. Distance device to next PSU, Max. 1148ft (350m).
3. Distance between two PSU operated in parallel Min. 656ft (200m), (Min. 0ft (0m) for the new Siemens power supply modules.).
4. Distance between devices, Max. 2297ft (700m).
5. Total length of all lines on one line, Max. 3281ft (1000m).

Polarity: Important – The bus conductors must NOT be inverted. (KNX terminals + and –).

Permissible load [VA] :

	Cable length for 24V AC				
AWG	32.8ft	65.6ft	164ft	328ft	656ft
AWG20	48VA	30VA	12VA	6VA	3VA
AWG18	48VA	48VA	20VA	10VA	5VA
AWG16	48VA	48VA	32VA	16VA	8VA
AWG14	48VA	48VA	48VA	24VA	12VA

Permissible load [VA] (SI):

	Cable length for AC 24V				
AWG	10m	20m	50m	100m	200m
AWG20	48VA	30VA	12VA	6VA	3VA
AWG18	48VA	48VA	20VA	10VA	5VA
AWG16	48VA	48VA	32VA	16VA	8VA
AWG14	48VA	48VA	48VA	24VA	12VA

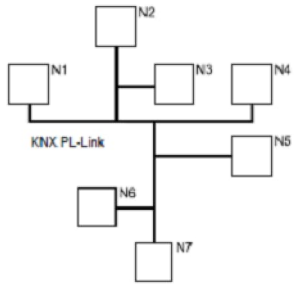
KNX PL–Link Technical data
KNX bus :
1. Transmission medium (bus cable),TP (twisted pair)
2. Baud rate, 9.6 kbps (fixed for TP)
3. Bus line polarity, PL+, PL– (not interchangeable)
4. Bus terminating resistor, Not required.

KNX bus cable:
1. Cable type, 20AWG two conductor, solid, communication cable (Anixter KNX–TSP20LC–CMP or similar).
2. Wire diameter, Min. 0.8 mm (AWG20), Max. 1.0 mm (AWG18).
3. Line resistance, 20 to 75 Ω/km.
4. Specific capacity, 10 to 100 nF/km at 10 kHz.
5. Specific inductivity, 450 to 850 µH/km at 10 kHz.
6. Screens, Not required.

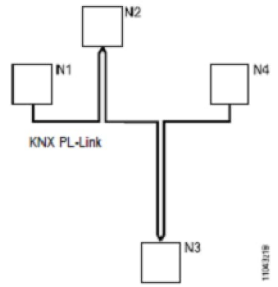
Bus power supply: DXR2 is 30V DC, 50mA for max. 5 KNX devices with 10mA each .

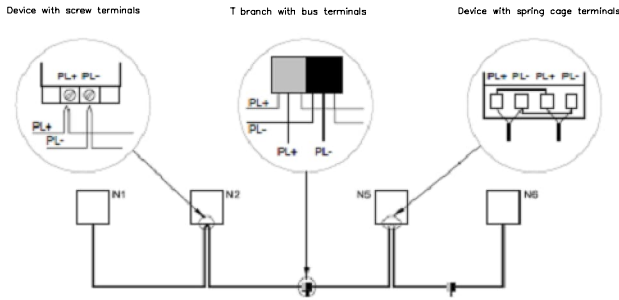
Max. number of devices: 64 devices in a KNX PL–Link network.

Tree Topology(with stub lines)



Line Topology (with loops)





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IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH			11/15/24

DXR Wiring Specification2

440P-387655

DWIR2

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Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
AUX 1	1	567-352	SIEMENS	155 272	#3 PNEU PANEL 24X24X9
PNL 1	1	PXA-ENC34	SIEMENS	149475	ENCLOSURE ASSY 34
	1	PXA-SB115V192VA	SIEMENS	588783	SERVICE BOX 115V, 24VAC, 192VA
PWR 1-15	15	PSH500A	FUNCTIONAL DEVICES	1208cut143	PS FIVE 100VA C2 120-24VAC ENC
PWR 16	1	PSH500A	FUNCTIONAL DEVICES	1208cut143	PS FIVE 100VA C2 120-24VAC ENC
Panel Mounted Devices					
SW 1	1	C1000-16T-2G-L	CISCO	N/A	CATALYST 1000 16 PORT SWITCH

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WLH	WLH		11/01/24	11/20/24

System Architecture

440P-387655

001

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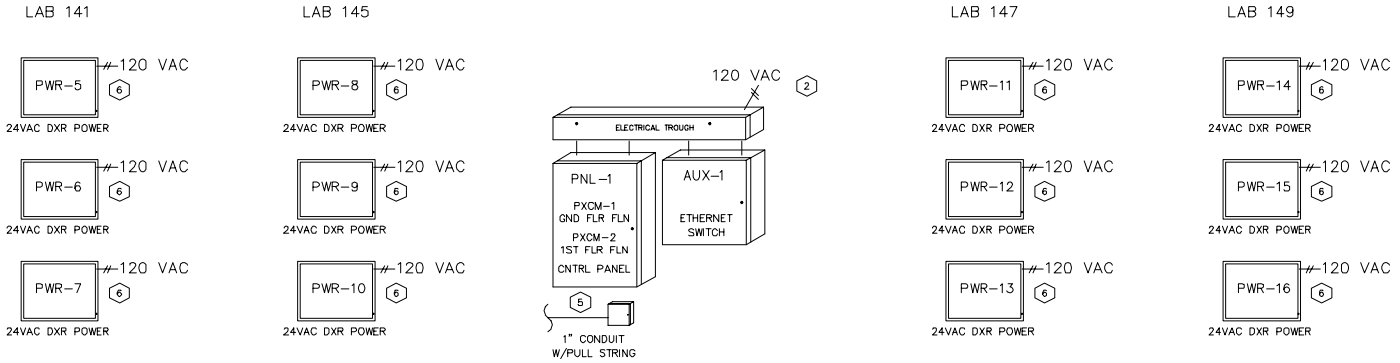
INSTALLATION NOTES:

1. REFER TO PLANS FOR MORE DETAIL ON CONTROL PANEL LOCATIONS.
2. POWER TO DDC PANELS BY DIVISION 26 ELECTRICAL AS STATED IN CONTRACT DOCUMENTS. POWER THAT IS NOT INDICATED IN CONTRACT DOCUMENTS BUT IS REQUIRED FOR BUILDING AUTOMATION SYSTEM (BAS) SHALL BE THE RESPONSIBILITY OF THE CONTROLS INSTALLATION CONTRACTOR (CIC).
3. CIC TO PROVIDE BARRIER FOR SEPARATION WITHIN THE ELECTRIC TROUGH OF LOW VOLTAGE WIRE AND 120V POWER WIRING.
4. REFER TO TX-I/O WIRING SPECIFICATION DRAWING TWR FOR PXCM COMMUNICATION TERMINATION DETAILS.
5. CIC TO PROVIDE A DEDICATED 1" CONDUIT WITH A PULL STRING FROM IDF/MDF ROOM TO A JUNCTION BOX (MINIMUM 6"X6"X4") LOCATED NEXT TO SIEMENS PANEL WITH A RACEWAY FOR PATCH CABLE CONNECTION TO PXCM CONTROLLER. COORDINATE WITH IU FOR LOCATION OF IDF/MDF ROOM. IF 2-4 ETHERNET CABLES ARE NEEDED A 1 1/4" CONDUIT IS REQUIRED.
6. TRANSFORMER PANELS TO BE LOCATED IN SERVICE COORIDOR AS SHOWN. REFER TO ELECTRICAL DRAWINGS FOR EXACT LOCATOIN. MOUNTING AND FIELD WIRING BY CIC, POWER WIRING BY EC.

1ST FLR

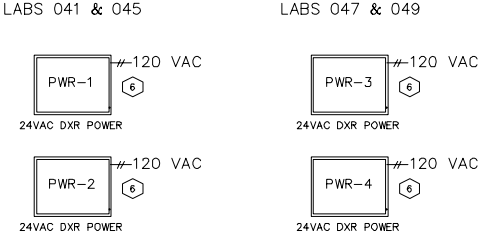
1ST FLR SERVICE COORIDOR



(3) ETHERNET DATA DROPS REQUIRED
PXCM-1, PXCM-2, AND ETHERNET SWITCH

GROUND

GND FLR SERVICE COORIDOR



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ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH		11/01/24	11/11/24

System Architecture

440P-387655

002

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INSTALLATION NOTES:

(1) SIEMENS FLOOR LEVEL NETWORK CABLE TO BE CONNECTED TO AN ETHERNET SWITCH (SW-1) LOCATED IN THE AUX PANEL FOR PXCM-1 IN THE 1ST FLOOR SERVICE COORIDOR.

(2) POWER TRUNK XFMR TO BE LOCATED PER CONTRACT DOCUMENTS. 120V POWER PROVIDED BY E.C. MOUNTING AND FIELD WIRING BY C.I.C.

LOOP	UNIT TYPE		UNIT NUM	LEVEL	AHU	PRINT	ROOM NUM	ROOM DESC	POWER SUPPLY
1	VAV	-	041-A	GND	1-4	MH102	041	GENERAL CHEMISTRY	1 CKT 1
1	VAV	-	041-B	GND	1-4	MH102	041	GENERAL CHEMISTRY	1 CKT 2
1	HEV	-	041-1	GND	1-4	MH102	041	GENERAL CHEMISTRY	1 CKT 3
1	HEV	-	041-2	GND	1-4	MH102	041	GENERAL CHEMISTRY	1 CKT 3
1	HEV	-	041-3	GND	1-4	MH102	041	GENERAL CHEMISTRY	1 CKT 4
1	HEV	-	041-4	GND	1-4	MH102	041	GENERAL CHEMISTRY	1 CKT 4
1	CEV	-	041-1	GND	1-4	MH102	041	GENERAL CHEMISTRY	1 CKT 5
1	VAV	-	045-A	GND	1-4	MH102	045	GENERAL CHEMISTRY	2 CKT 1
1	VAV	-	045-B	GND	1-4	MH102	045	GENERAL CHEMISTRY	2 CKT 2
1	HEV	-	045-1	GND	1-4	MH102	045	GENERAL CHEMISTRY	2 CKT 3
1	HEV	-	045-2	GND	1-4	MH102	045	GENERAL CHEMISTRY	2 CKT 3
1	HEV	-	045-3	GND	1-4	MH102	045	GENERAL CHEMISTRY	2 CKT 4
1	HEV	-	045-4	GND	1-4	MH102	045	GENERAL CHEMISTRY	2 CKT 4
1	CEV	-	045-1	GND	1-4	MH102	045	GENERAL CHEMISTRY	2 CKT 5
1	VAV	-	041C	GND	1-4	MH102	041C	OFFICE	1 CKT 5
1	VAV	-	043	GND	1-4	MH102	043	ELECTRICAL	2 CKT 5

LOOP	UNIT TYPE		UNIT NUM	LEVEL	AHU	PRINT	ROOM NUM	ROOM DESC	POWER SUPPLY
2	VAV	-	047-A	GND	1-4	MH101	047	GENERAL CHEMISTRY	3 CKT 1
2	VAV	-	047-B	GND	1-4	MH101	047	GENERAL CHEMISTRY	3 CKT 2
2	HEV	-	047-1	GND	1-4	MH101	047	GENERAL CHEMISTRY	3 CKT 3
2	HEV	-	047-2	GND	1-4	MH101	047	GENERAL CHEMISTRY	3 CKT 3
2	HEV	-	047-3	GND	1-4	MH101	047	GENERAL CHEMISTRY	3 CKT 4
2	HEV	-	047-4	GND	1-4	MH101	047	GENERAL CHEMISTRY	3 CKT 4
2	CEV	-	047-1	GND	1-4	MH101	047	GENERAL CHEMISTRY	3 CKT 5
2	VAV	-	049-A	GND	1-4	MH101	049	GENERAL CHEMISTRY	4 CKT 1
2	VAV	-	049-B	GND	1-4	MH101	049	GENERAL CHEMISTRY	4 CKT 2
2	HEV	-	049-1	GND	1-4	MH101	049	GENERAL CHEMISTRY	4 CKT 3
2	HEV	-	049-2	GND	1-4	MH101	049	GENERAL CHEMISTRY	4 CKT 3
2	HEV	-	049-3	GND	1-4	MH101	049	GENERAL CHEMISTRY	4 CKT 4
2	HEV	-	049-4	GND	1-4	MH101	049	GENERAL CHEMISTRY	4 CKT 4
2	CEV	-	049-1	GND	1-4	MH101	049	GENERAL CHEMISTRY	4 CKT 5

LOOP	UNIT TYPE		UNIT NUM	LEVEL	AHU	PRINT	ROOM NUM	ROOM DESC	POWER SUPPLY
3	VAV	-	141-A	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	5 CKT 1
3	VAV	-	141-B	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	5 CKT 2
3	VAV	-	141-C	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	5 CKT 3
3	HEV	-	141-1	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	5 CKT 4
3	HEV	-	141-2	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	5 CKT 4
3	HEV	-	141-3	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	5 CKT 5
3	HEV	-	141-4	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	5 CKT 5
3	HEV	-	141-5	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	6 CKT 1
3	HEV	-	141-6	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	6 CKT 1
3	HEV	-	141-7	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	6 CKT 2
3	HEV	-	141-8	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	6 CKT 2
3	HEV	-	141-9	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	6 CKT 3
3	HEV	-	141-10	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	6 CKT 3
3	HEV	-	141-11	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	6 CKT 4
3	HEV	-	141-12	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	6 CKT 4
3	HEV	-	141-13	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	6 CKT 5
3	HEV	-	141-14	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	6 CKT 5
3	HEV	-	141-15	1ST	1-4	MH104	141	ORGANIC CHEMISTRY	7 CKT 1
3	VAV	-	141B	1ST	1-4	MH104	141B	OFFICE	7 CKT 2
3	VAV	-	143	1ST	1-4	MH104	143	ELECTRICAL	7 CKT 3

LOOP	UNIT TYPE		UNIT NUM	LEVEL	AHU	PRINT	ROOM NUM	ROOM DESC	POWER SUPPLY
5	VAV	-	147-A	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	11 CKT 1
5	VAV	-	147-B	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	11 CKT 2
5	VAV	-	147-C	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	11 CKT 3
5	HEV	-	147-1	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	11 CKT 4
5	HEV	-	147-2	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	11 CKT 4
5	HEV	-	147-3	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	11 CKT 5
5	HEV	-	147-4	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	11 CKT 5
5	HEV	-	147-5	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	12 CKT 1
5	HEV	-	147-6	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	12 CKT 1
5	HEV	-	147-7	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	12 CKT 2
5	HEV	-	147-8	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	12 CKT 2
5	HEV	-	147-9	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	12 CKT 3
5	HEV	-	147-10	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	12 CKT 3
5	HEV	-	147-11	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	12 CKT 4
5	HEV	-	147-12	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	12 CKT 4
5	HEV	-	147-13	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	12 CKT 5
5	HEV	-	147-14	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	12 CKT 5
5	HEV	-	147-15	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	13 CKT 1
5	HEV	-	147-16	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	13 CKT 1
5	HEV	-	147-17	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	13 CKT 2
5	HEV	-	147-18	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	13 CKT 2
5	HEV	-	147-19	1ST	1-4	MH103	147	ORGANIC CHEMISTRY	13 CKT 3

LOOP	UNIT TYPE		UNIT NUM	LEVEL	AHU	PRINT	ROOM NUM	ROOM DESC	POWER SUPPLY
4	VAV	-	145-A	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	8 CKT 1
4	VAV	-	145-B	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	8 CKT 2
4	VAV	-	145-C	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	8 CKT 3
4	HEV	-	145-1	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	8 CKT 4
4	HEV	-	145-2	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	8 CKT 4
4	HEV	-	145-3	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	8 CKT 5
4	HEV	-	145-4	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	8 CKT 5
4	HEV	-	145-5	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	9 CKT 1
4	HEV	-	145-6	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	9 CKT 1
4	HEV	-	145-7	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	9 CKT 2
4	HEV	-	145-8	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	9 CKT 2
4	HEV	-	145-9	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	9 CKT 3
4	HEV	-	145-10	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	9 CKT 3
4	HEV	-	145-11	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	9 CKT 4
4	HEV	-	145-12	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	9 CKT 4
4	HEV	-	145-13	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	9 CKT 5
4	HEV	-	145-14	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	9 CKT 5
4	HEV	-	145-15	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	10 CKT 1
4	HEV	-	145-16	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	10 CKT 1
4	HEV	-	145-17	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	10 CKT 2
4	HEV	-	145-18	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	10 CKT 2
4	HEV	-	145-19	1ST	1-4	MH104	145	ORGANIC CHEMISTRY	10 CKT 3

LOOP	UNIT TYPE		UNIT NUM	LEVEL	AHU	PRINT	ROOM NUM	ROOM DESC	POWER SUPPLY
6	VAV	-	149-A	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	14 CKT 1
6	VAV	-	149-B	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	14 CKT 2
6	VAV	-	149-C	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	14 CKT 3
6	HEV	-	149-1	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	14 CKT 4
6	HEV	-	149-2	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	14 CKT 4
6	HEV	-	149-3	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	14 CKT 5
6	HEV	-	149-4	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	14 CKT 5
6	HEV	-	149-5	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	15 CKT 1
6	HEV	-	149-6	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	15 CKT 1
6	HEV	-	149-7	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	15 CKT 2
6	HEV	-	149-8	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	15 CKT 2
6	HEV	-	149-9	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	15 CKT 3
6	HEV	-	149-10	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	15 CKT 3
6	HEV	-	149-11	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	15 CKT 4
6	HEV	-	149-12	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	15 CKT 4
6	HEV	-	149-13	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	15 CKT 5
6	HEV	-	149-14	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	15 CKT 5
6	HEV	-	149-15	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	16 CKT 1
6	HEV	-	149-16	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	16 CKT 1
6	HEV	-	149-17	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	16 CKT 2
6	HEV	-	149-18	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	16 CKT 2
6	HEV	-	149-19	1ST	1-4	MH103	149	ORGANIC CHEMISTRY	16 CKT 3

SW -1 (1)

1ST FLR SERVICE COORIDOR

AUX-1

440P-387655

003

IU Chemistry Gnd-1st Flr Labs
IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH	VK	11/01/24	11/15/24

System Architecture

3502 Woodview Trace
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SIEMENS

Indianapolis
Smart Infrastructure

REVISION HISTORY

C:\JOBS\440P-387655_IU_CHEMISTRY\MDT\RISERA.DWG

Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
AE 1	16	GNP191.1P	SIEMENS	154083	FAIL SAFE, 50 LB-IN, 2 SEC. RUN
DPTE 1	16	DXA.S04P1	SIEMENS	N/A	AIR FLOW PRES SENSOR 1"
DXR 1	16	DXR2.E17C-103B	SIEMENS	N/A	DXR2.E17C-103B AUTOMATION STATION
TTE 1	4	QMX3.P30-1WSB	SIEMENS	N/A	QMX3 ROOM TEMP ONLY (COO=USA)
TTE 2	16	QAM2030.010	SIEMENS	149915	DUCT POINT TEMP, 10K OHM TYPE 2, 4"
V					SEE VALVE SUBMITTAL

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 (VAV-XXX): 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-XXX): MODULATE FAST-ACTING EXHAUST AIR VALVE TO MAINTAIN 80 FPM WHEN LABORATORY IS OCCUPIED. GENERATE AN ALARM AT OPERATOR WORKSTATION IF LOW FLOW CONDITION EXISTS AT FUME HOOD.
3. GENERAL EXHAUST VALVE (GEV-XXX): MODULATE GENERAL EXHAUST TERMINAL UNIT DAMPER TO MAINTAIN TOTAL MINIMUM AIRFLOW (FUME HOODS, SNORKELS, & 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 ALL FUME HOODS AND SNORKELS 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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IU Chemistry Gnd-1st Flr Labs
IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH		11/01/24	11/15/24

LRC - Fast Act Damper w HW Rht

440P-387655

004

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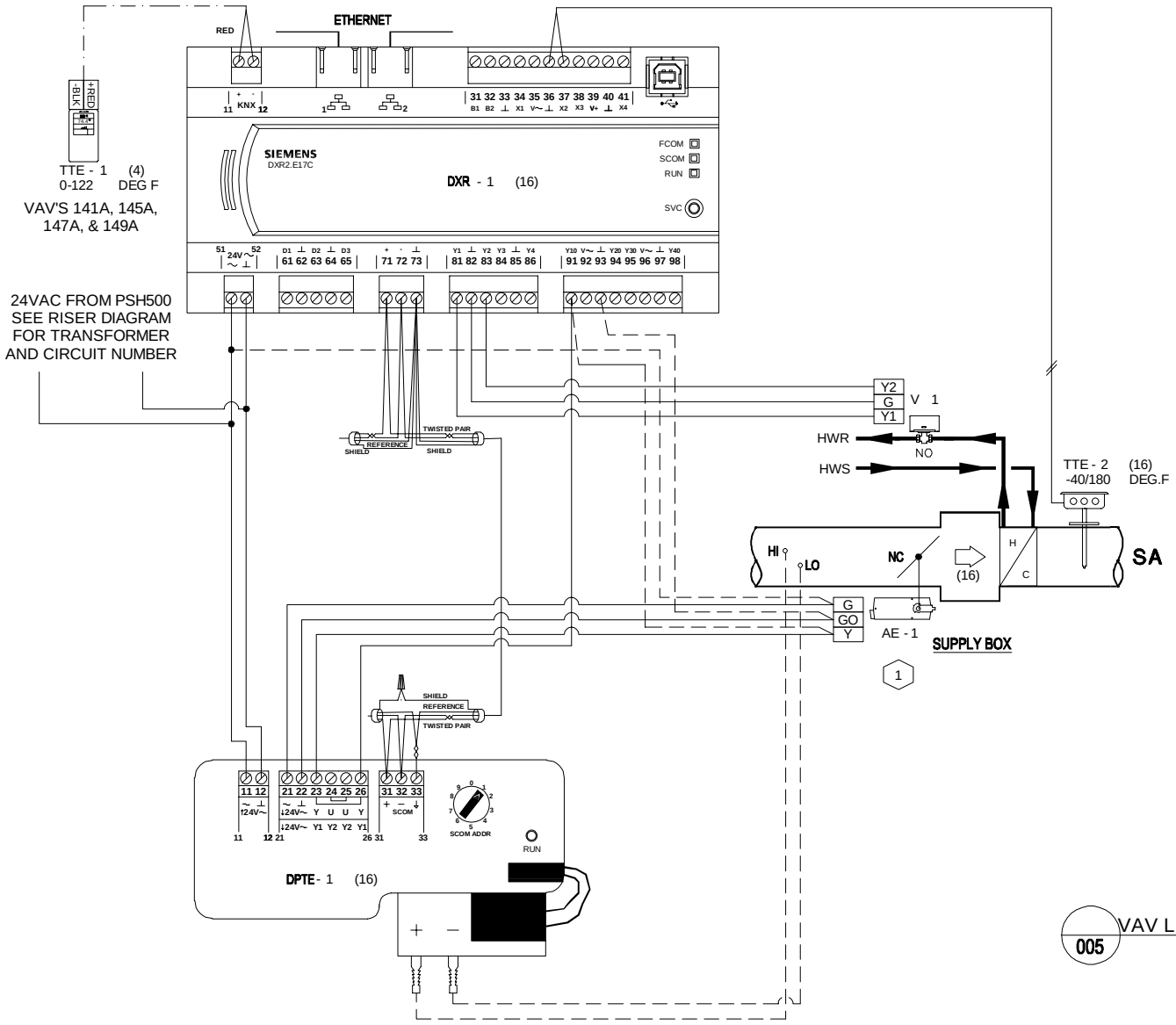

INSTALLATION NOTES:

1. DAMPER ACTUATOR MAY BE WIRED EITHER DIRECTLY FROM THE DXR OR FROM THE DXR TO THE APS (DPTE) THEN TO THE DAMPER ACTUATOR.

DATA POINTS (30 MAX)	
PHYSICAL	4
KNX	3
TOTAL	7

KNX LOADS (50mA MAX)	
TTE-1	10mA
TOTAL	10mA

24 VAC LOADS	
DXR-1	8VA
OCCB-1	X
V-1	X
TOTAL	8VA

005 VAV LRC - FAST ACT DAMPER HW Rht

TYPICAL OF (16)
VAV'S 041B, 045B, 047B, 049B,
141A, 141B, 141C, 145A, 145B, 145C,
147A, 147B, 147C, 149A, 149B, & 149C

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WLH	WLH		11/01/24	11/15/24

LRC - Fast Act Damper w HW Rht

440P-387655

005

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Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
AE 1-2	8	GNP191.1P	SIEMENS	154083	FAIL SAFE, 50 LB-IN, 2 SEC. RUN
DPTE 1-2	8	DXA.S04P1	SIEMENS	N/A	AIR FLOW PRES SENSOR 1"
DXR 1	4	DXR2.E17C-103B	SIEMENS	N/A	DXR2.E17C-103B AUTOMATION STATION
OCC 1	4	CI-24	WATT STOPPER	1011cut029	OCCUPANCY SENS CEILNG MT 24VAC
TTE 1	4	QMX3.P30-1WSB	SIEMENS	N/A	QMX3 ROOM TEMP ONLY (COO=USA)
TTE 2	4	QAM2030.010	SIEMENS	149915	DUCT POINT TEMP, 10K OHM TYPE 2, 4"
V					SEE VALVE SUBMITTAL

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 (VAV-XXX): 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-XXX): MODULATE FAST-ACTING EXHAUST AIR VALVE TO MAINTAIN 80 FPM WHEN LABORATORY IS OCCUPIED. GENERATE AN ALARM AT OPERATOR WORKSTATION IF LOW FLOW CONDITION EXISTS AT FUME HOOD.
3. GENERAL EXHAUST VALVE (GEV-XXX): MODULATE GENERAL EXHAUST TERMINAL UNIT DAMPER TO MAINTAIN TOTAL MINIMUM AIRFLOW (FUME HOODS, SNORKELS, & 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 ALL FUME HOODS AND SNORKELS 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)

DIGITAL INPUTS

OCCUPANCY STATUS (OCC-XXX)

REVISION HISTORY

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IU Chemistry Gnd-1st Flr Labs
IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH		11/01/24	11/15/24

LRC - Fast Act Damper w HW Rht

440P-387655

006

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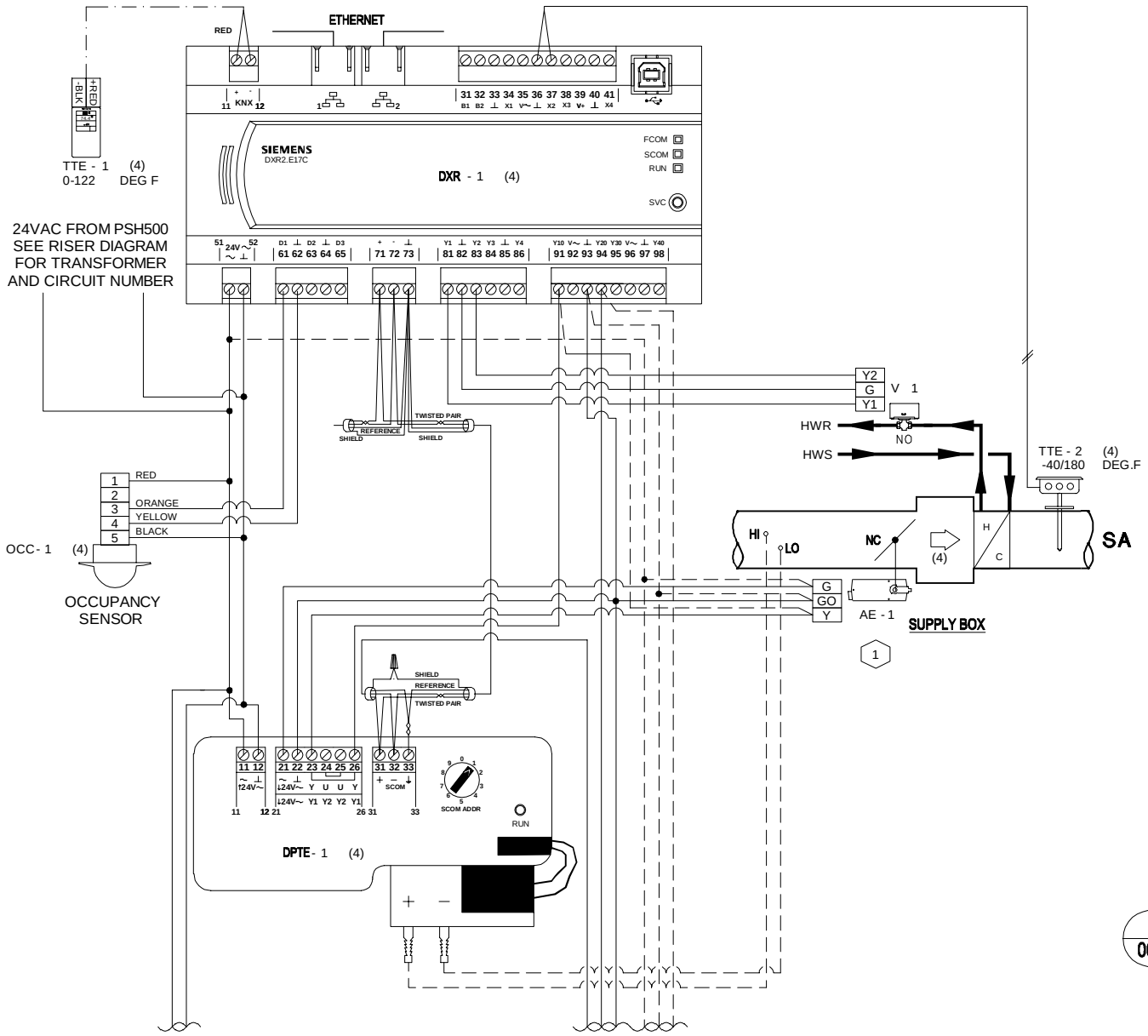

INSTALLATION NOTES:

1. DAMPER ACTUATOR MAY BE WIRED EITHER DIRECTLY FROM THE DXR OR FROM THE DXR TO THE APS (DPTE) THEN TO THE DAMPER ACTUATOR.

DATA POINTS (30 MAX)	
PHYSICAL	4
KNX	3
TOTAL	7

KNX LOADS (50mA MAX)	
TTE-1	10mA
TOTAL	10mA

24 VAC LOADS	
DXR-1	8VA
OCCB-1	X
V-1	X
TOTAL	8VA

007 VAV LRC - FAST ACT DAMPER HW Rht

TYPICAL OF (4) VAV/GEV PAIRS
VAV-041A / GEV-041-1
VAV-045A / GEV-045-1
VAV-047A / GEV-047-1
VAV-049A / GEV-049-1

REVISION HISTORY

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IU Chemistry Gnd-1st Flr Labs
IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH		11/01/24	11/15/24

LRC - Fast Act Damper w HW Rht

440P-387655

007

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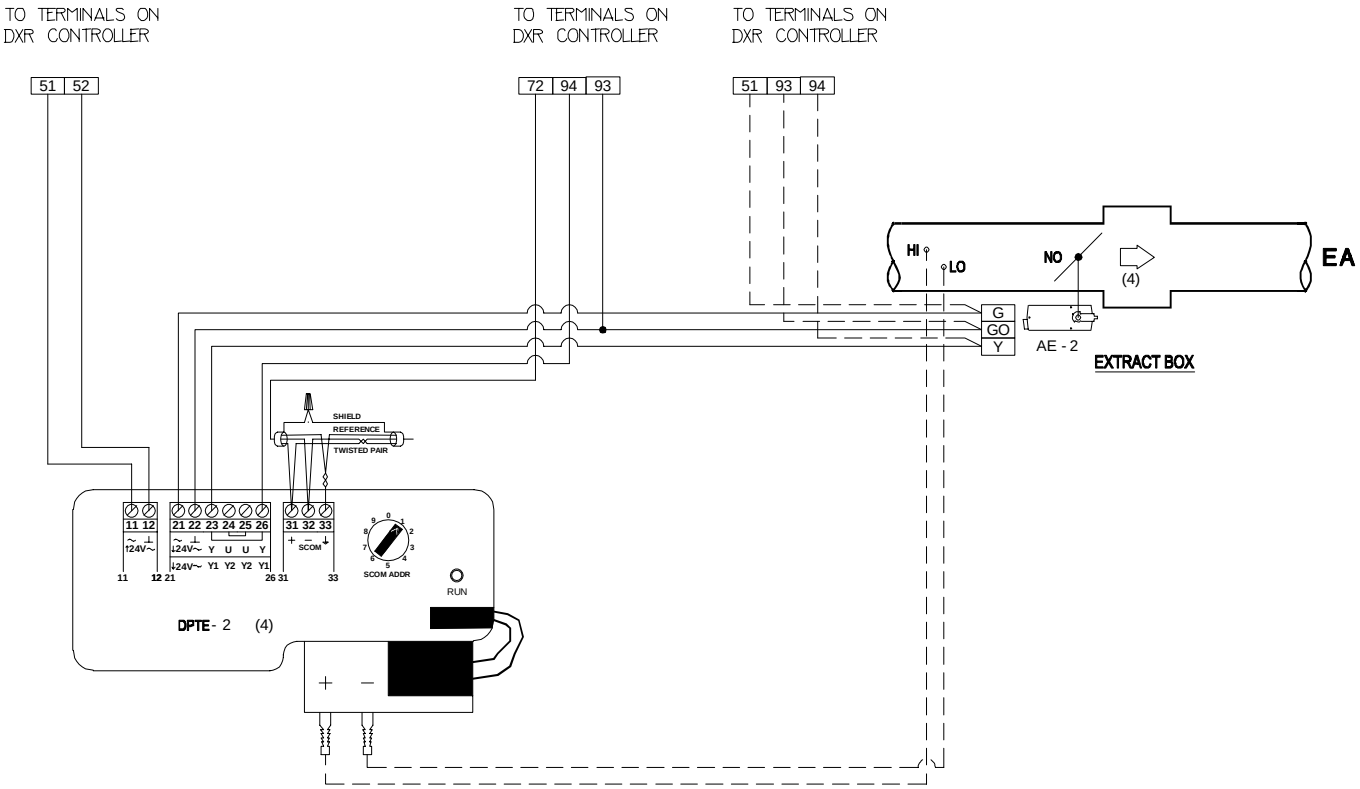
DEVICES CONTINUED FROM
PREVIOUS PAGE



REVISION HISTORY

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IU Chemistry Gnd-1st Flr Labs
IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH		11/01/24	11/15/24

LRC - Fast Act Damper w HW Rht

440P-387655

008

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Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
AE 1	88				SEE HEV SCHEDULE
AVV 1	88				SEE HEV SCHEDULE
DPTE 1	88				SEE HEV SCHEDULE
DXR 1	88				SEE HEV SCHEDULE
ODP 1	88	QMX3.P87-1WSC	SIEMENS	N/A	WALL MOUNT FUME HOOD ODP (PL-LINK)
***PSE 1	88	S55376-C159	SIEMENS	N/A	DXA.B200 SASH SENSOR

*** Confirm Sash Sensor Sizing Before Ordering

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 (VAV-XXX): 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-XXX): MODULATE FAST-ACTING EXHAUST AIR VALVE TO MAINTAIN 80 FPM WHEN LABORATORY IS OCCUPIED. GENERATE AN ALARM AT OPERATOR WORKSTATION IF LOW FLOW CONDITION EXISTS AT FUME HOOD.
   3. GENERAL EXHAUST VALVE (GEV-XXX): MODULATE GENERAL EXHAUST TERMINAL UNIT DAMPER TO MAINTAIN TOTAL MINIMUM AIRFLOW (FUME HOODS, SNORKELS, & 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 ALL FUME HOODS AND SNORKELS 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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IU Chemistry Gnd-1st Flr Labs
IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH		11/01/24	11/15/24

FUME HOOD CONTROLLER

440P-387655

009

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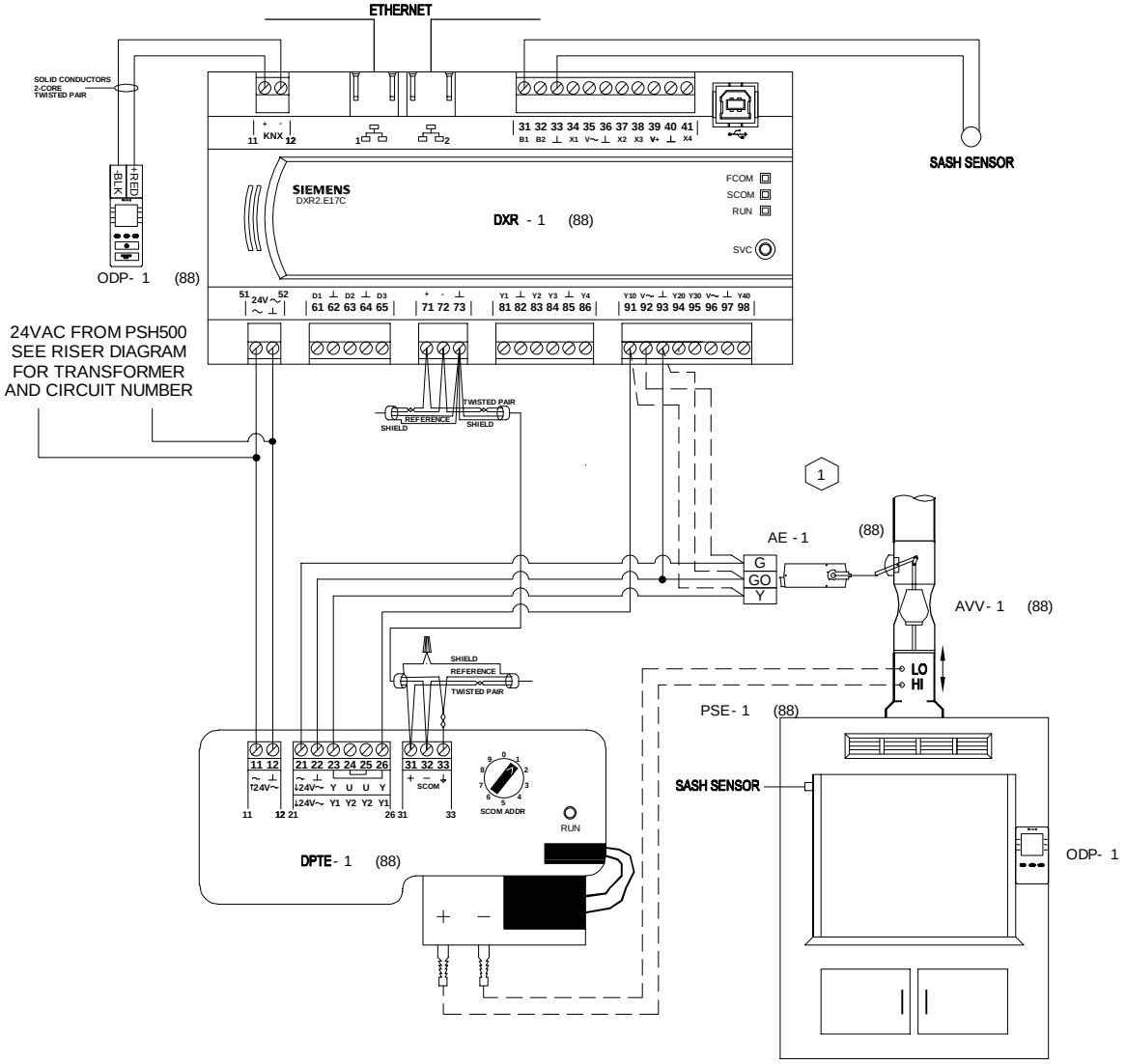

INSTALLATION NOTES:

1. DAMPER ACTUATOR MAY BE WIRED EITHER DIRECTLY FROM THE DXR OR FROM THE DXR TO THE AP'S (DPTE) THEN TO THE DAMPER ACTUATOR.

DATA POINTS (30 MAX)	
PHYSICAL	4
KNX	3
TOTAL	7

KNX LOADS (50mA MAX)	
ODP-1	8mA
TOTAL	8mA

24 VAC LOADS	
DXR-1	8VA
AE-1	X
OCCB-1	X
TOTAL	8VA

010 CV2 FHC - MODULATING VENTURI

TYPICAL OF (88) SINGLE VERTICAL FUME HOODS

REVISION HISTORY

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IU Chemistry Gnd-1st Flr Labs

IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH		11/01/24	11/15/24

FUME HOOD CONTROLLER

440P-387655

010

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Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
AE 1	4				SEE CEV SCHEDULE
AVV 1	4				SEE CEV SCHEDULE
DPTE 1	4				SEE CEV SCHEDULE
DXR 1	4				SEE CEV SCHEDULE
ODP 2	4	QMX3.P87-1WSC	SIEMENS	N/A	WALL MOUNT FUME HOOD ODP (PL-LINK)

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 (VAV-XXX): 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-XXX): MODULATE FAST-ACTING EXHAUST AIR VALVE TO MAINTAIN 80 FPM WHEN LABORATORY IS OCCUPIED. GENERATE AN ALARM AT OPERATOR WORKSTATION IF LOW FLOW CONDITION EXISTS AT FUME HOOD.
3. GENERAL EXHAUST VALVE (GEV-XXX): MODULATE GENERAL EXHAUST TERMINAL UNIT DAMPER TO MAINTAIN TOTAL MINIMUM AIRFLOW (FUME HOODS, SNORKELS, & 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 ALL FUME HOODS AND SNORKELS 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)

DIGITAL INPUTS

MANUAL PUSH BUTTON STATUS (PB-1)

REVISION HISTORY

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IU Chemistry Gnd-1st Flr Labs
IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH		11/01/24	11/15/24

SNORKEL EXHAUST

440P-387655

011

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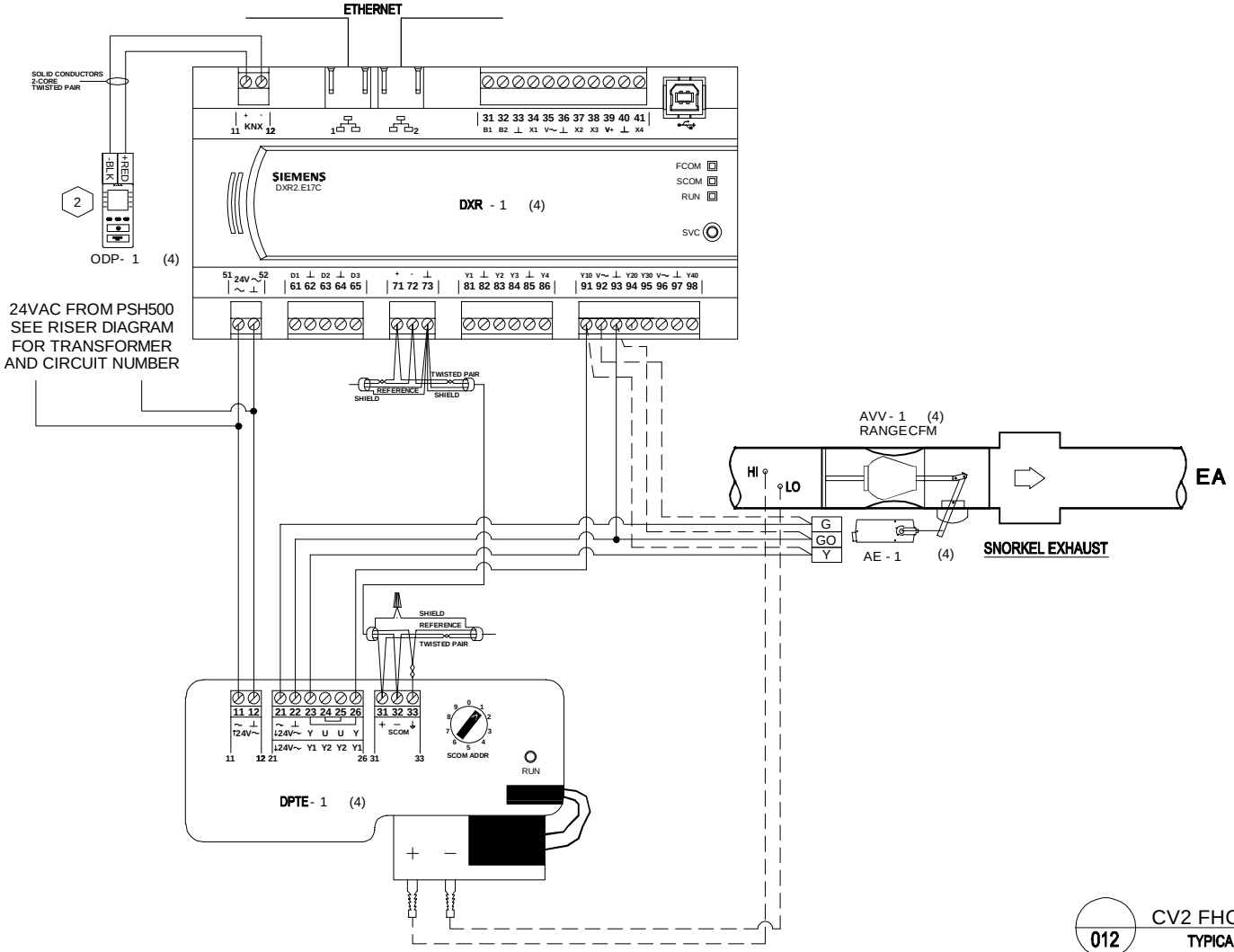

INSTALLATION NOTES:

1. DAMPER ACTUATOR MAY BE WIRED EITHER DIRECTLY FROM THE DXR OR FROM THE DXR TO THE AP'S (DPTE) THEN TO THE DAMPER ACTUATOR.
2. PROVIDE WALL MOUNTED SWITCH WITH PILOT LIGHT TO CONTROL SNORKEL EXHAUST TERMINAL BOX. PROVIDE ENGRAVED LAMINATE SIGNAGE THAT READS 'SNORKEL EXHAUST CONTROL' ABOVE SWITCH.

012 CV2 FHC - MODULATING VENTURI

TYPICAL OF (4) SNORKEL EXHAUST VALVES
CEV'S 041-1, 045-1, 047-1, & 049-1

DATA POINTS (30 MAX)	
PHYSICAL	4
KNX	3
TOTAL	7

KNX LOADS (50mA MAX)	
ODP-1	8mA
TOTAL	8mA

24 VAC LOADS	
DXR-1	8VA
AE-1	X
OCCB-1	X
TOTAL	8VA

REVISION HISTORY

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IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH		11/01/24	11/15/24

SNORKEL EXHAUST

440P-387655

012

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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
DXR 1	2	DXR2.E12P-102B	SIEMENS	A6V10502844	DXR2.E12P Room Automation Station
TTE 1	2	QMX3.P30-1WSB	SIEMENS	N/A	QMX3 ROOM TEMP ONLY (COO=USA)
TTE 2	2	QAM2030.010	SIEMENS	149915	DUCT POINT TEMP, 10K OHM TYPE 2, 4"
V					SEE VALVE SUBMITTAL

VAV Boxes (Air Terminal Units)

The air terminal unit manufacturer shall provide the box with velocity sensor and air flow taps for use in the temperature controls. Provide all other control components. Reheat boxes shall be provided with a 2-way modulating hot water valve as indicated on the drawings. Also refer to drawings for listed cfm set points as described below.VAV Hot Water Reheat and Heating Control

Fixed Set Points (adjustable):

Cooling Maximum CFM - Refer to Air Terminal Unit schedule for specified Cooling Maximum CFM set point.

Minimum CFM - Refer to Air Terminal Unit schedule for specified Minimum CFM.

Heating Maximum CFM - Refer to Air terminal Unit schedule for specified Heating Maximum CFM.

Active Set Points (adjustable):

Supply Air CFM set point

Maximum Discharge Air Temperature Limits:

Discharge air temperature shall be limited to 95 deg F.

Air Terminal Unit Damper Control - Modulate damper position to maintain current Supply Air CFM set point.

Cooling Sequence - If space temperature rises above the cooling setpoint, reset the Supply Air CFM set point between the listed Minimum CFM and the listed Cooling Maximum CFM to satisfy the space cooling setpoint.

Deadband Mode - If the space temperature is in the dead band between heating and cooling set points, the Supply Air CFM set point shall be set to the listed Minimum CFM.

Reheat / Heating Sequence:

If space temperature drops below the heating setpoint, and heating hot water is available, the air terminal unit shall control as follows:

Reheat modulate the reheat to maintain the space heating set point, with the reheat or heating discharge air temperature high limit defined above. Supply Air CFM set point shall remain at Minimum CFM. When the reheat valve is 100% open, reset the Supply Air CFM set point between the Minimum CFM and the Maximum Heating CFM while maintaining the active discharge air temperature high limit.

Reverse the sequence when space heating setpoint is reached.

REVISION HISTORY

SIEMENS
Indianapolis
Smart Infrastructure

3502 Woodview Trace
Indianapolis, IN 46268
USA
Phone: 317 293-8880
Fax: 866 814-3089

IU Chemistry Gnd-1st Flr Labs
IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH		11/01/24	11/15/24

14023 - VAV w/HW

440P-387655

013

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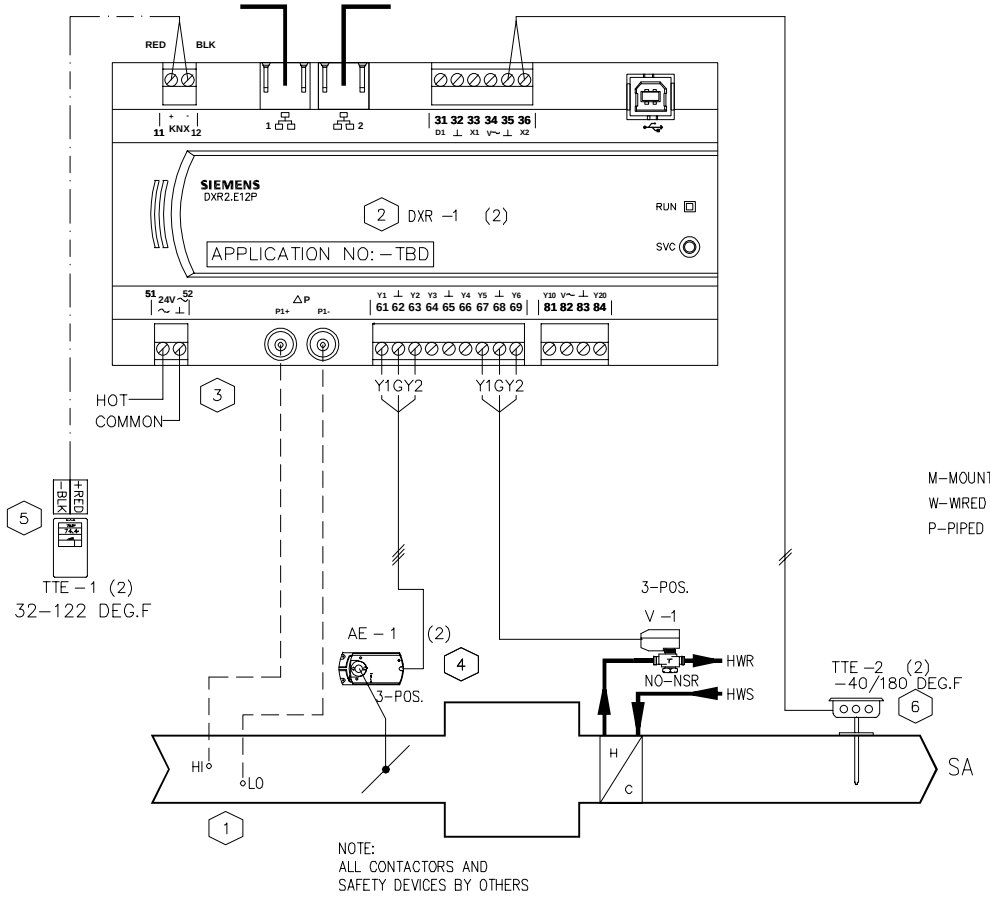

NOTE:
ALL CONTACTORS AND
SAFETY DEVICES BY OTHERS

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. DXR2–1 TO BE MOUNTED IN MANUFACTURER SUPPLIED CONTROLLER ENCLOSURE
3. REFER TO BUILDING POWER TRUNK DRAWING FOR 24 VAC POWER
4. MOUNT ACTUATOR WITH DAMPER IN FULL OPEN POSITION. VERIFY DXR–1 AND ACTUATOR REQUIREMENT WITH THE BOX MANUFACTURER
5. LOCATE AS SHOWN ON FLOOR PLANS/CONTRACT DOCUMENTS
6. 4" SENSOR SELECTED AS DEFAULT. SIZE AS APPROPRIATE.

M–MOUNTED
W–WIRED
P–PIPED

DEVICE	SIEMENS		MANUFACTURER	DIVISION 16	DIVISION 15
	FITTER	ELEC.			
TTE–1/2		M,W			
AE–1		M,W			
DXR2–1		M,W,P			
COMMS		W			
POWER (24VAC)		W			

DATA POINTS (30 MAX)	
PHYSICAL	3
KNX	3
TOTAL	6

KNX LOADS (50mA MAX)	
TTE–1	10mA
TOTAL	10mA

24VAC LOADS	
DXR–1	6VA
AE–1	2.3VA
V–1	
TOTAL	8.3VA

014 VAV w/HW RHT (14023)
TYPICAL OF (2) OFFICES
041C AND 141B

REVISION HISTORY

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IU Chemistry Gnd-1st Flr Labs
IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH		11/01/24	11/15/24

14023 - VAV w/HW

440P-387655

014

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Control Device	Qty	Product Number	Manufacturer	Document Number	Description
Field Mounted Devices					
AE 1-2	4	GMA151.1P	SIEMENS	154004	ACTUATOR, SR, 2-10V,62 LB-IN,PLENUM
DPTE 1-2	4	DXA.S04P1	SIEMENS	N/A	AIR FLOW PRES SENSOR 1"
DXR 1	2	DXR2.E17C-103B	SIEMENS	N/A	DXR2.E17C-103B AUTOMATION STATION
TTE 1	2	QMX3.P30-1WSB	SIEMENS	N/A	QMX3 ROOM TEMP ONLY (COO=USA)

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Fax: 866 814-3089

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IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH		11/01/24	11/15/24

RPC - Slow Act Damper Sup/Exh

440P-387655

015

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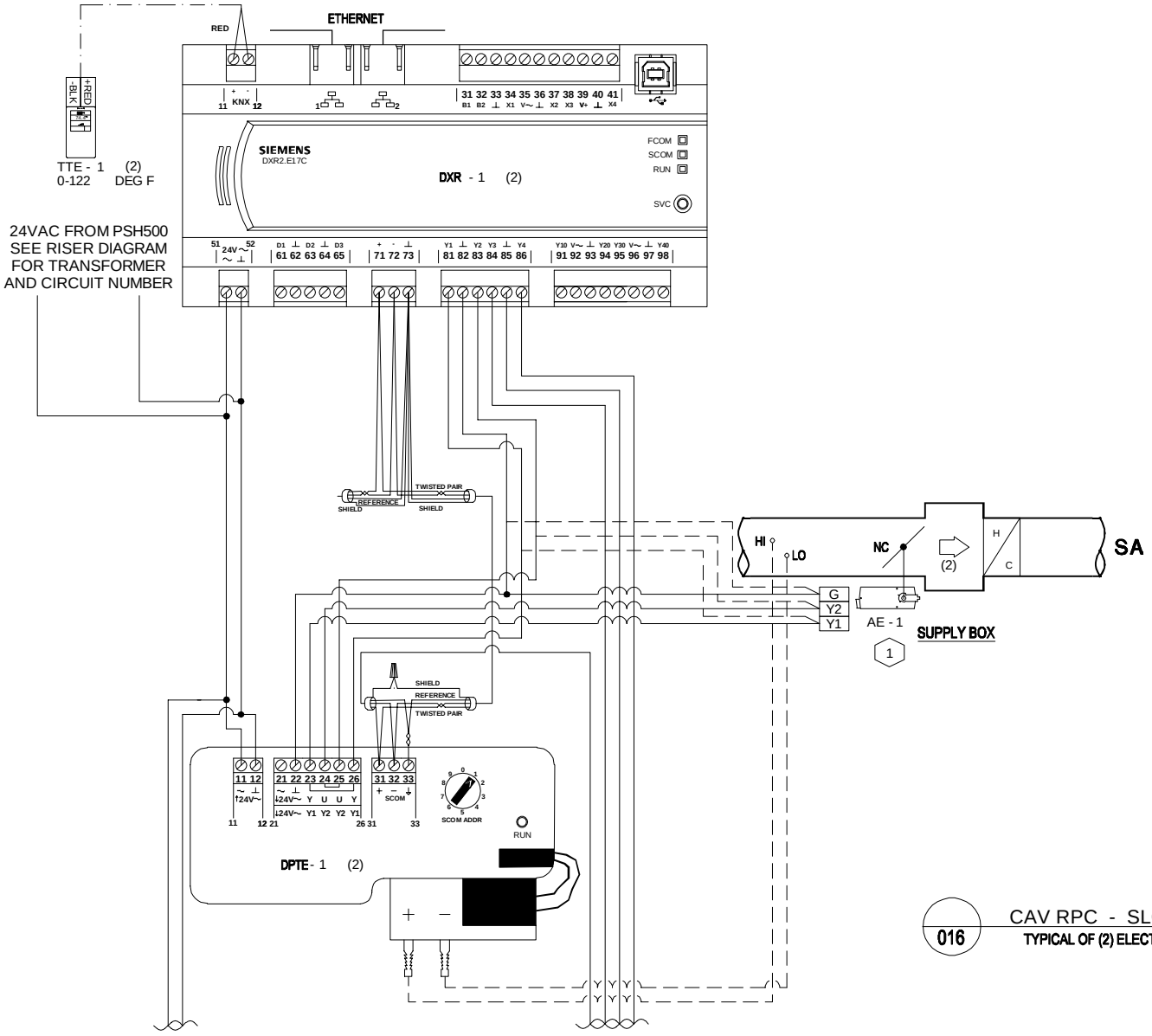

INSTALLATION NOTES:

1. DAMPER ACTUATORS MAY BE WIRED EITHER DIRECTLY FROM THE DXR OR FROM THE DXR TO THE APS (DPTE) THEN TO THE DAMPER ACTUATOR.

DATA POINTS (30 MAX)	
PHYSICAL	6
KNX	3
TOTAL	9

KNX LOADS (50mA MAX)	
TTE-1	10mA
TOTAL	10mA

24 VAC LOADS	
DXR-1	8VA
AE-1	X
AE-2	X
TOTAL	22VA

016 CAV RPC - SLOW ACT DAMPER SUP/EXH

TYPICAL OF (2) ELECTRICAL ROOMS 043 & 143

REVISION HISTORY

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IU Chemistry Gnd-1st Flr Labs
IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH		11/01/24	11/15/24

RPC - Slow Act Damper Sup/Exh

44OP-387655

016

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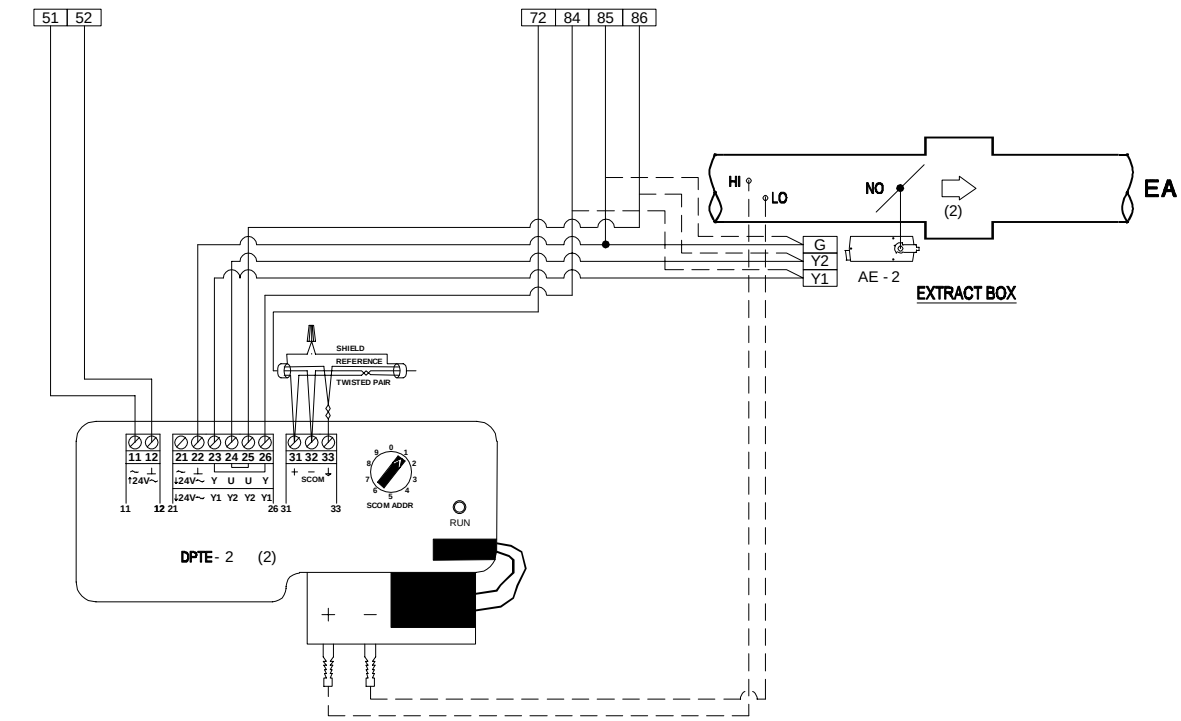
DEVICES CONTINUED FROM
PREVIOUS PAGE

TO TERMINALS ON
DXR CONTROLLER

TO TERMINALS ON
DXR CONTROLLER



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IU Chemistry Gnd-1st Flr Labs
IU PROJECT #20231351,

ENGINEER	DRAFTER	CHECKED BY	INITIAL RELEASE	LAST EDIT DATE
WLH	WLH		11/01/24	11/15/24

RPC - Slow Act Damper Sup/Exh

440P-387655

017

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Meeting Minutes

Location: Virtual

Meeting Date: 11/20/2024

Meeting Time: 8:00 am

Subject: 20231351 - BL071 IU Chemistry Teaching Labs Renovations – Pre Bid Meeting Minutes

Attendees:
Charlie Wilson - CES
Shih-Ping Lin - IU
David Riffel - IU
Chad Schaeffer - IU
Kelley Miller – DELV Design

Discussion Items:

1. A sign-in sheet was distributed and signed and is attached.
2. The contractors asked for the vacuum systems vendor's contact information.
    a. **John Kalinowski**
    VACUU-LAN Sales Manager
    BRANDTECH Scientific | Direct: (860) 581-1648
3. The contractors asked for the contact information of the person responsible for gaining access to the building if their sub-contractors needed to walk the space.
    a. David Riffel
    dariffel@iu.edu
    812-855-6571
4. It was noted that there contractors will be allowed to park on the BL071 Chemistry Building site.
5. David Riffel commented that IU engineering may not allow the PTFE vacuum tubing for vacuum. CES to verify.
6. The design team and contractors toured the building and the spaces affected by construction and the existing teaching labs.
7. A Power Point presentation was reviewed and is attached.

Meeting adjourned.

INDIANA UNIVERSITY - BLOOMINGTON

20231351 - BL071 CHEMISTRY GROUND & FIRST FLOORS TEACHING LABS RENOVATIONS

800 E KIRKWOOD AVE,
BLOOMINGTON, IN 47405

2024-003.IUL

11/12/2024

Owner:

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DELV DESIGN

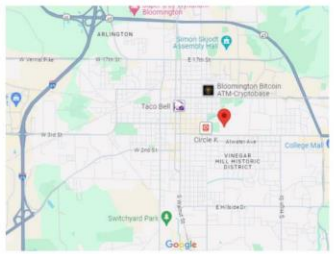
DESIGN 27 TECHNOLOGY + ACOUSTICS

David Jones, PE
Principal - Senior Electrical Engineer
317-748-5252

Gabriel Currier, PE
Principal - Director of Mechanical Engineering
317-605-1648

Vicinity Map

Thoroughfare Map



SHEET TABLE

Number	Sheet Name
1 - Architecture	
A011	GENERAL NOTES & INTERIOR ASSEMBLIES
A081	DEMOLITION PLANS
A101	OVERALL PLANS
A111	ARCHITECTURAL PLAN - GROUND FLOOR - UNIT A
A112	ARCHITECTURAL PLAN - GROUND FLOOR - UNIT B
A113	ARCHITECTURAL PLAN - FIRST FLOOR - UNIT A
A114	ARCHITECTURAL PLAN - FIRST FLOOR - UNIT B
A121	LABORATORY PLAN - GROUND FLOOR - UNIT A
A122	LABORATORY PLAN - GROUND FLOOR - UNIT B
A123	LABORATORY PLAN - FIRST FLOOR - UNIT A
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A131	REFLECTED CEILING PLAN - GROUND FLOOR - UNIT A
A132	REFLECTED CEILING PLAN - GROUND FLOOR - UNIT B
A133	REFLECTED CEILING PLAN - FIRST FLOOR - UNIT A
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A420	INTERIOR ELEVATIONS
A421	INTERIOR ELEVATIONS
A422	INTERIOR ELEVATIONS
A423	INTERIOR ELEVATIONS
A880	OPENING SCHEDULE
A700	FINISH SPECIFICATIONS
A711	INTERIOR FINISH PLANS - GROUND FLOOR - UNIT A
A712	INTERIOR FINISH PLANS - GROUND FLOOR - UNIT B
A713	INTERIOR FINISH PLANS - FIRST FLOOR - UNIT A
A714	INTERIOR FINISH PLANS - FIRST FLOOR - UNIT B
A720	INTERIOR + MILLWORK DETAILS - TYPICAL
A721	INTERIOR + MILLWORK DETAILS - INSTRUCTOR STATIONS
A722	INTERIOR + MILLWORK DETAILS - GEN CHEM
A723	INTERIOR + MILLWORK DETAILS - ORG CHEM
A724	INTERIOR + MILLWORK DETAILS - ORG CHEM
A725	INTERIOR + MILLWORK DETAILS - ORG CHEM
A726	INTERIOR + MILLWORK DETAILS - ORG CHEM
A730	FUME HOOD DETAILS
G010	LIFE SAFETY
G011	CONSTRUCTION PHASING AND ACCESS PLAN
7 - Mechanical	
M-001	MECHANICAL SYMBOLS AND ABBREVIATIONS
MD101	MECHANICAL DEMOLITION GROUND FLOOR PLAN - UNIT A
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MD103	MECHANICAL DEMOLITION FIRST FLOOR PLAN - UNIT A
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FP001	FIRE PROTECTION PLANS
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PP103	PLUMBING FIRST FLOOR PLAN - UNIT A
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TD000	GROUND FLOOR OVERALL DEMOLITION PLAN
TD001	GROUND FLOOR DEMOLITION PLAN
TD010	FIRST FLOOR OVERALL DEMOLITION PLAN
TD011	FIRST FLOOR DEMOLITION PLAN

- **CES Project Manager: Charlie Wilson**
- **IU Project Manager: Shih-Ping Lin**
- **Bid Date: December 12, 2024**
- **Time: 2:00 pm**
- **Submit bids to: www.iuplanroom.com**
- **Unified Bid**
- **Construction Schedule**
    - **Phase 1 First Floor:**
    - **Commence: March 17, 2025**
    - **Substantial Completion: September 17, 2025**

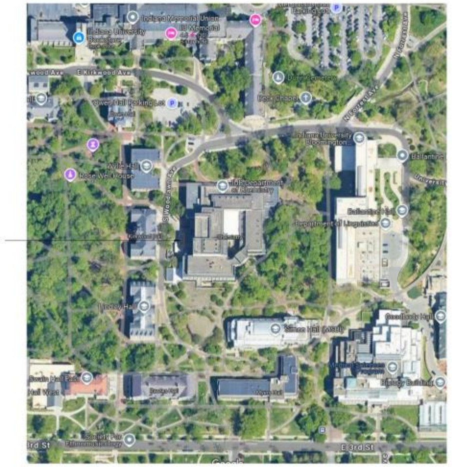
    - **Phase 2 Ground Floor**
    - **Commence: March 16, 2026**
    - **Substantial Completion: September,18 2026**

PHASED CONSTRUCTION SCHEDULE

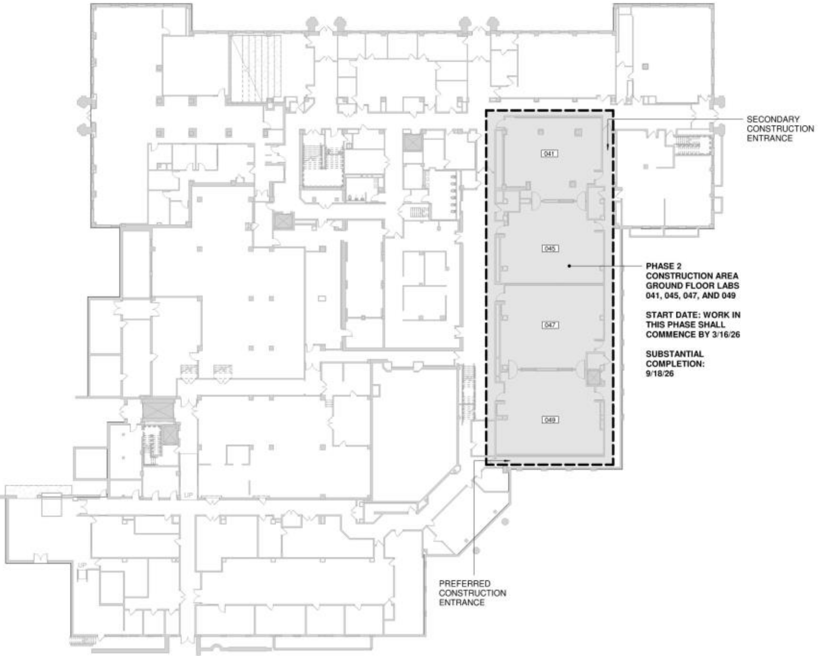
A. THE WORK SHALL BE CONDUCTED IN TWO PHASES, WITH EACH PHASE SUBSTANTAILLY COMPLETE AS INDICATED.

1. PHASE 1 - COMPLETE RENOVATION OF THE FIRST FLOOR TEACHING LABS
    a) COMMENCEMENT OF CONSTRUCTION
        1) NOTICE TO PROCEED: WORK OF THIS PHASE SHALL COMMENCE WITHIN 30 DAYS AFTER THE NOTICE TO PROCEED.
        2) START DATE: WORK OF THIS PHASE SHALL COMMENCE NO EARLIER THAN 3/17/25.
    b) SUBSTANTIAL COMPLETION:
        1) BY 9/17/25.
2. PHASE 2 - COMPLETE RENOVATION OF THE GROUND FLOOR TEACHING LABS
    a) COMMENCEMENT OF CONSTRUCTION
        1) NOTICE TO PROCEED: WORK OF THIS PHASE SHALL COMMENCE WITHIN 30 DAYS AFTER THE NOTICE TO PROCEED.
        2) START DATE: WORK OF THIS PHASE SHALL COMMENCE NO EARLIER THAN 3/16/26.
    b) SUBSTANTIAL COMPLETION:
        1) BY 9/18/26.

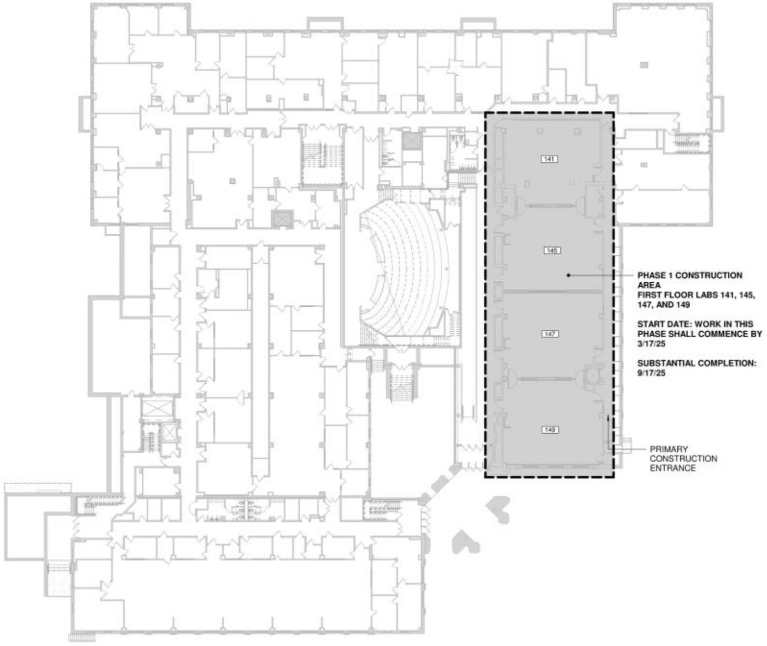
DUMPSTER LOCATION



CONSTRUCTION ACCESS MAP



2 GROUND FLOOR PLAN (PHASE 2)
3/64" = 1'-0"



1 LEVEL 01 FLOOR PLAN (PHASE 1)
3/64" = 1'-0"

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DELV DESIGN

CHRISTOPHER W. LAKE
REGISTERED
No. AR10400187
STATE OF
INDIANA
ARCHITECT

20231351 - BL071 CHEMISTRY GROUND & FIRST FLOORS TEACHING LAB RENOVATIONS

IU BLOOMINGTON

800 E KIRKWOOD AVE,
BLOOMINGTON, IN 47405

KEY PLAN

#	REVISION	DATE

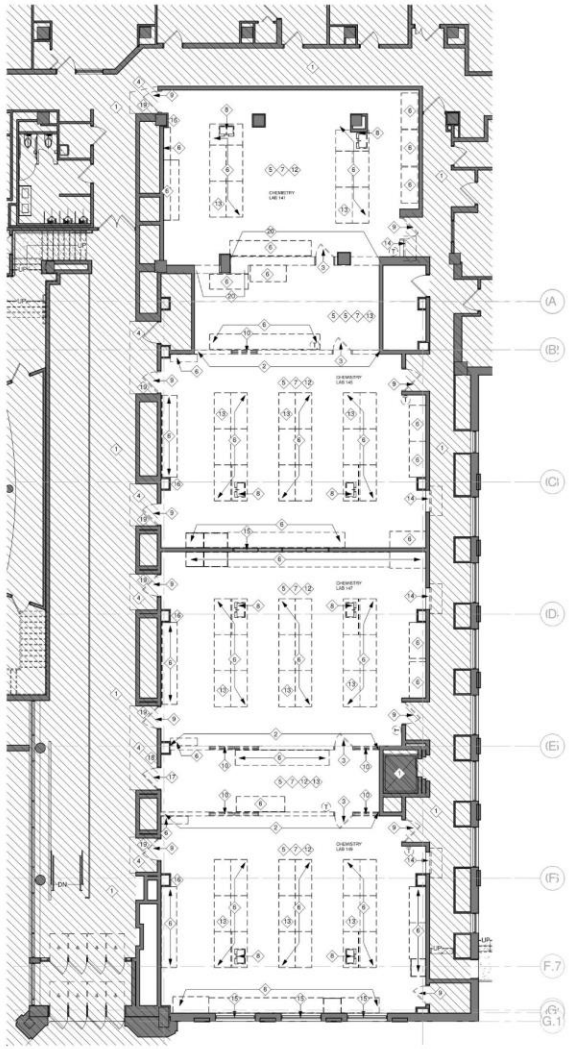
JOB NO. 2024-003.IUL
PRODUCED DS / DS
DATE 11/12/2024

CONSTRUCTION PHASING AND ACCESS PLAN

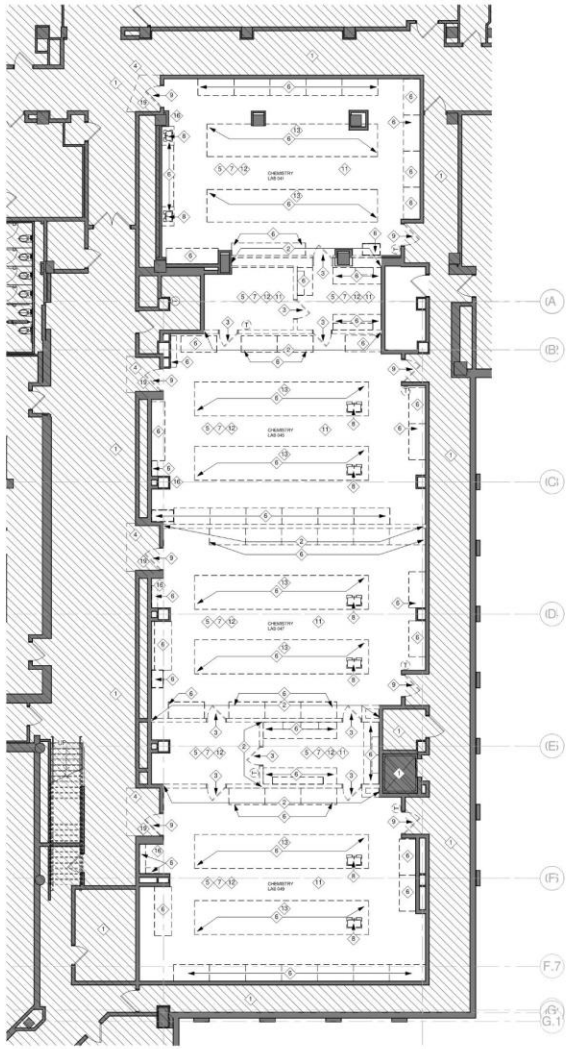
G011

Arch Demo

- IU to demo existing fume hoods (asbestos).
- Demo existing ceiling.
- Demo existing interior walls.
- Demo existing doors.



2 LEVEL 01 - DEMOLITION PLAN
1/8" = 1'-0"



1 GROUND - DEMOLITION PLAN
1/8" = 1'-0"

GENERAL DEMOLITION NOTES

A. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY PARTITIONS AND TEMPORARY DOORS AS DEEMED NECESSARY BY THE ARCHITECT, ENGINEER AND OWNER TO CONTROL DUST, DEBRIS AND ACCESS TO THE PROJECT SITE. THEY SHALL BE WELL MAINTAINED AND ANY DAMAGE REPAIRED IMMEDIATELY.
B. THE CONTRACTOR SHALL COORDINATE ALL DEMOLITION WORK IN OCCUPIED SPACES AND SHALL NOTIFY THE OWNER TWO WEEKS PRIOR TO COMMENCING WORK. SUCH SPACES ARE TO REMAIN OCCUPIED DURING DEMOLITION AND ALL WORK SHALL BE PERFORMED IN SUCH A MANNER TO MINIMIZE DISRUPTIONS TO OCCUPANTS. PROTECT EXISTING FLOOR FINISHES FROM CONSTRUCTION TRAFFIC THROUGH OCCUPIED AREAS. EXISTING WALL, FLOOR AND CEILINGS FINISHES TO REMAIN SHALL BE PROTECTED AND ANY DAMAGE RESULTING FROM DEMOLITION WORK SHALL BE REPAIRED.
C. WHEN DEMOLITION CAUSES DAMAGE TO FLOOR, WALL OR CEILING SURFACES THAT WILL REMAIN EXPOSED IN THE FINISHED WORK, SUCH DAMAGE SHALL BE REPAIRED AS REQUIRED TO RECEIVE NEW FINISHES.
D. THE CONTRACTOR SHALL COVER AND PROTECT OWNER'S EQUIPMENT WHICH CANNOT BE REMOVED FROM THE PROJECT AREA.
E. ALL EQUIPMENT REMOVED FROM PROJECT AREA SHALL BE RETURNED TO THE OWNER, UNLESS DIRECTED OTHERWISE BY OWNER. NOTES ON DEMOLITION PLAN FOR REMOVAL SHALL NOT BE CONSTRUED AS A DIRECTIVE TO DISPOSE OF EQUIPMENT.
F. CONTRACTOR SHALL COORDINATE ALL DEMOLITION WITH ANY PHASING REQUIRED TO COMPLETE THE WORK.
G. MAKE ALL DEMOLITION CLEAN AND COMPLETE AND IN A MANNER SUITABLE TO ACCEPT NEW FINISHES AND/OR SURFACES.
H. REMOVE ALL EXISTING WALL MOUNTED ITEMS WITHIN THE PROJECT LIMIT AREA WHICH ARE NOT NOTED TO REMAIN. THE CONTRACTOR SHALL DISPOSE OF THESE ITEMS AFTER INSPECTION BY THE OWNER FOR FUTURE RE-USE. IF ITEMS ARE REMOVED FROM WALLS THAT ARE TO REMAIN, THE CONTRACTOR SHALL PATCH WALLS AS REQUIRED TO RECEIVE NEW FINISHES AND/OR SURFACES.
I. DEMOLITION FOR BUILDING SERVICES AND UTILITIES SHALL BE PERFORMED BY THE TRADE RESPONSIBLE FOR THAT UTILITY. FOR EXAMPLE, PLUMBING FIXTURES SHALL BE DEMOLISHED BY THE MECHANICAL CONTRACTOR. OPENINGS FOR DEMOLISHED UTILITIES SHALL BE INFILLED BY TRADE RESPONSIBLE FOR PIPING, DUCT OR CONDUIT DEMOLITION. OPENINGS THROUGH FIRE-RATED CONSTRUCTION SHALL BE PATCHED TO MATCH EXISTING CONSTRUCTION AND/OR BE FIRESTOPPED.
J. THE INTENT OF THE DEMOLITION NOTES IS TO PROVIDE A GENERAL OUTLINE FOR THE CONTRACTOR OF ITEMS TO BE REMOVED AND TO ALLOW FOR THE NEW CONSTRUCTION AS OUTLINED ELSEWHERE IN THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DEMOLITION AND REMOVAL OF ITEMS TO ALLOW FOR NEW CONSTRUCTION SHOWN OR NOT SHOWN ON DEMOLITION PLANS AS MAY BE REQUIRED.
K. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL PATCHING AND REPAIRING DUE TO DEMOLITION AND/OR REMOVAL OF EQUIPMENT TO CREATE A FLUSH, SMOOTH SURFACE PROPERLY PREPARED TO RECEIVE NEW FINISHES AS INDICATED. CONTRACTOR SHALL SOAP IN NEW CMU AT HOLES AND VOIDS LARGER THAN 2" DIAM. TO MATCH EXISTING ADJACENT AREAS AND PATTERNS.
L. REFER TO MECHANICAL AND/OR ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR SPECIFIC REQUIREMENTS PERTAINING TO THE REMOVAL, RELOCATION AND/OR MODIFICATION OF ITEMS RELATED TO EXISTING MECHANICAL AND ELECTRICAL SYSTEMS.
M. SHOULD THE CONTRACTOR ENCOUNTER ANY MATERIALS DURING SELECTIVE DEMOLITION AND NEW WORK WHICH ARE SUSPECTED BY THE CONTRACTOR TO BE OF AN UNKNOWN OR QUESTIONABLE COMPOSITION WITH RESPECT TO CONTAINING CONTAMINANTS WHICH MAY BE HAZARDOUS TO HUMAN HEALTH, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER OF SUCH FINDINGS.

DEMOLITION KEYNOTES

1 NO ARCHITECTURAL WORK IN THIS AREA.
2 REMOVE CMU WALLS COMPLETE WHERE INDICATED OR SHOWN. REMOVE TO BELOW SLAB AT CMU LOCATIONS WHERE NEEDED. INFILL WITH CONCRETE FOR FLUSH, CONTINUOUS FLOOR CONDITION.
3 REMOVE DOOR AND FRAME COMPLETE; PREP FOR WALL INFILL WHERE APPLICABLE.
4 CONTRACTOR TO CONSTRUCT TEMPORARY PARTITION AT THIS LOCATION TO PROTECT STUDENTS FROM WORK BEING COMPLETED.
5 REMOVE EXISTING CEILING COMPLETE.
6 REMOVE CASEWORK AND ASSOCIATED COMPONENTS AS REQUIRED. FUME HOODS CONTAIN ASBESTOS AND ARE PART OF OWNER'S ABATEMENT SCOPE.
7 REMOVE EXISTING FLOOR FINISHES AND BASE. CLEAN AND PREPARE SLAB TO RECEIVE NEW FLOOR FINISHES. SEE FINISH SCHEDULE.
8 REMOVE EXISTING PLUMBING FIXTURES COMPLETE. COORDINATE WITH MEP DRAWINGS.
9 REMOVE DOOR, SLAB, AND HARDWARE COMPLETE, PREP FOR IN-KIND REPLACEMENT IN NEW CONSTRUCTION. REFER TO DOOR SCHEDULE FOR FURTHER INFORMATION.
10 REMOVE EXISTING WINDOW COMPLETE.
11 REMOVE CONCRETE AS REQUIRED FOR INSTALLATION OF NEW PLUMBING, REFER TO PLUMBING DRAWINGS FOR EXTENT OF SAWCUTTING.
12 OWNER TO REMOVE EXISTING LOOSE FURNITURE (WORKSTATIONS, DESKS, HAIRS, TEACHING STATIONS, ETC.)
13 PATCH AND REPAIR SLAB WHERE DAMAGED AFTER REMOVAL OF CASEWORK, TYPICAL WHERE APPLICABLE THROUGHOUT PROJECT.
14 REMOVE ROLL UP DOOR, OPENING TO BE UTILIZED AS GLAZING IN NEW CONSTRUCTION.
15 EXISTING WINDOW TO REMAIN. PROTECT UNTIL CONSTRUCTION IS COMPLETE.
16 SALVAGE FIRE BLANKET CABINET AND WALL MOUNTED FIRE EXTINGUISHER FOR REINSTALLATION IN NEW CONSTRUCTION PHASE. REFER TO ARCH PLANS FOR NEW LOCATIONS.
17 REMOVE DOOR, FRAME, AND HARDWARE COMPLETE AT THIS LOCATION, PREP FOR BLOCK WALL INFILL IN NEW CONSTRUCTION.
18 REMOVE SIGNAGE WHERE FORMER DOOR LOCATION IS TO BE INFILLED. REMOVE ANY ASSOCIATED ADHESIVE FROM FACE OF BLOCK.
19 ALTERNATE BID: ELECTRICAL PANEL BEING REMOVED AND REPLACED WITHIN GROUND FACED BLOCK INFILL. MASON TO TOOTH-IN BLOCK TO NEAREST FULL UNIT JOINT AS REQUIRED IN NEW CONSTRUCTION PHASE.
20 REMOVE DRYWALL WALLS COMPLETE WHERE INDICATED OR SHOWN.

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DELV DESIGN

No. AR10400187 STATE OF INDIANA REGISTERED ARCHITECT

202231351 - BL071 CHEMISTRY GROUND & FIRST FLOORS TEACHING LAB RENOVATIONS
IU BLOOMINGTON
800 E KIRKWOOD AVE, BLOOMINGTON, IN 47405

KEY PLAN

#	REVISION	DATE

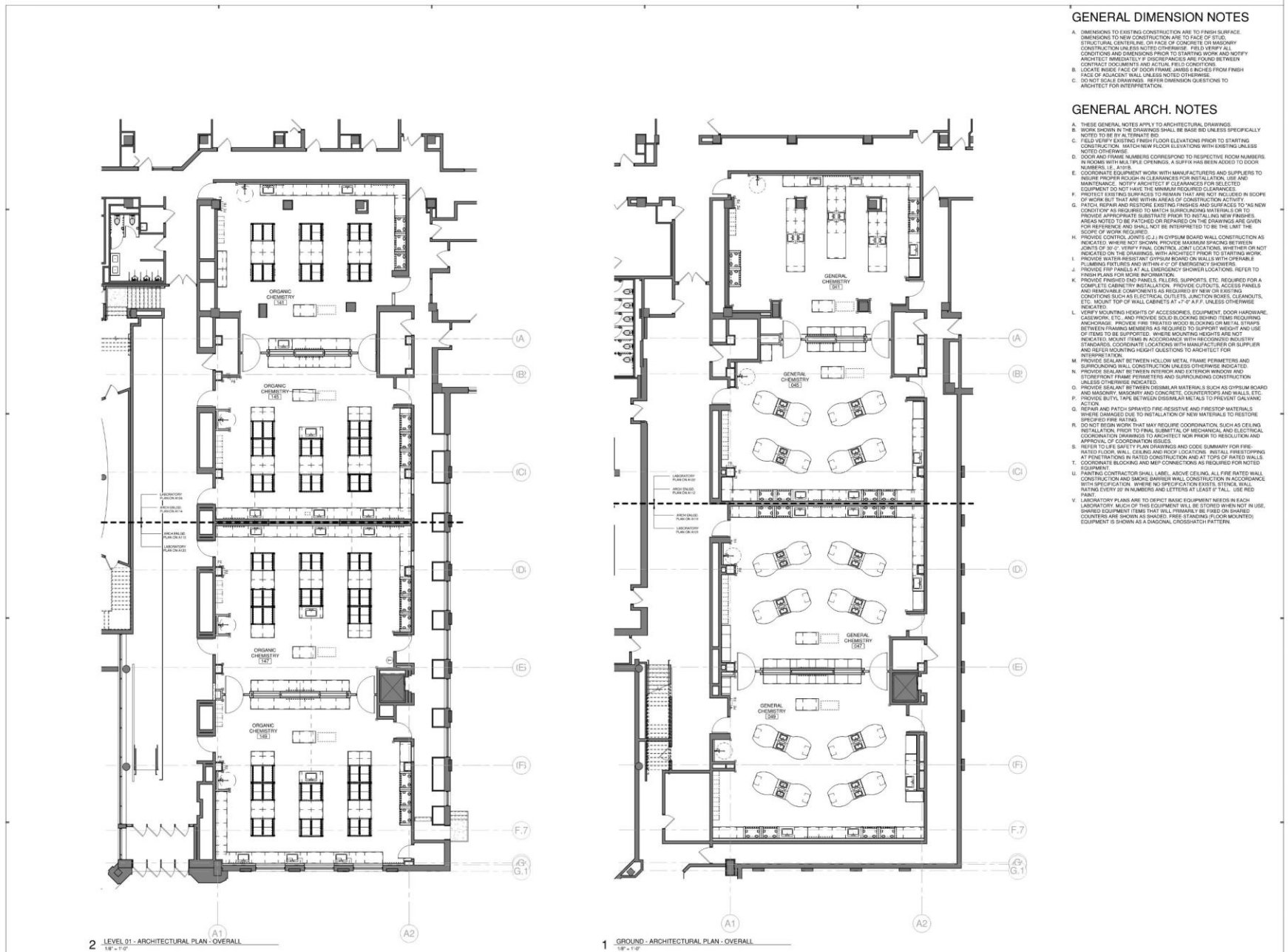
JOB NO. 2024-003.IUL
PRODUCED DS / DS
DATE 11/12/2024

DEMOLITION PLANS

A091

Architecture

- New fume hoods, student hoods, common hoods.
- New ceiling and flooring.
- New doors at corridor and between labs.
- Ground Floor student stations “Bowties”
- Epoxy counter tops with integral sinks.
- Emergency showers with privacy curtains.
- Extensive casework.



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OVERALL PLANS

A101

MEP Highlights

Mechanical

- Demo exiting exhaust at fume hoods.
- Reconnect to existing exhaust riser ducts.
- Demo existing supply ducts.
- Reconnect to existing supply riser ducts.
- New exhaust valves at each fume hood.
- New exhaust snorkels at “Bowtie” student stations, single point of control for all snorkels.
- Existing controls – TSI.
- New controls – Siemens.
- Controls installation contractor will be subcontractor to mechanical contractor.

Electrical

- Demo and replace existing power & lighting.
- Demo and replace existing panel boards and provide informational pricing.
- Red lights in Organic Chemistry 141.

Plumbing

- Demo and replace existing domestic cold water, domestic hot water, domestic hot water return, RO/DI water, nitrogen, acid waste, acid vent.
- Provide new nitrogen meters.
- Provide new vacuum system(s) in each lab.
- Provide piped gas systems to gas chromatographs, helium, hydrogen, medical air.
- Piping in ground floor labs in trench system with removable cover.
- Emergency fixtures with mixing valves.
- RPZ backflow preventer for cold water to fume hoods.
- Modify sprinkler piping to accommodate ne architectural floor plan.

Questions?

Pre-Bid/Walkthrough Meeting Sign in Sheet

BL071 Chemistry – Ground & First Floors Teaching Labs Renovation

IU # 20231351

Nov. 20, 2024

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