

**PROJECT NAME: IN145 SERVICE BLDG – REPLACE AHUS 1&2, ADD DCC CONTROLS TO EXHAUST FANS, REPLACE  
ATS**  
**OWNER NAME: INDIANA UNIVERSITY**  
**IU PROJECT NO. 20230575 / CES PROJECT NO. 2024-008.145**  
**ADDENDUM NO. 1**  
**DATED: NOVEMBER 13, 2024**

This Addendum consists of 15 Addendum pages and 2 attachment pages totaling 17 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.

**BIDDER QUESTIONS AND ANSWERS:**

1. Question: Is temporary heating and cooling systems required of the bidding contractor?
  - a. Answer: No. The contractors will not be required to provide temporary heating or cooling systems.
2. Question: What are the requirements for project phasing?
  - a. Answer: The contractor will be responsible for establishing a work phasing plan and will submit the plan to the owner and engineer for review prior to project mobilization. The contractor's plan should minimize down time of the critical systems including existing building management system and air handling. The project site is IU staff only building and therefore the owner can and will work with the contractor and the owner will understand that some down time will be required when the AHU are removed and replaced.
3. Question: Are shop drawings for the mezzanine steel required?
  - a. Answer: Yes, steel shop drawings are required for review prior to release and fabrication, as specified.
4. Question: What finish is required for the new mezzanine steel?
  - a. Answer: One (1) coat shop primer and one (1) coat finish paint (color to be selected by the Owner)

**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 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS**

A. Document 000000 “**NOTICE TO BIDDERS**”

1. MODIFY Subparagraph Bid Date as follows:  
“Revise bid date to: December 4, 2024 at 2PM”

**1.2 DIVISION 26 – ELECTRICAL**

A. **Section 262923 “VARIABLE-FREQUENCY MOTOR CONTROLLERS”**

1. ADD Document in its entirety.

**PART 2 - CHANGES TO THE DRAWINGS**

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

**2.1 E-SERIES DRAWINGS**

A. **Drawing Number E601**

1. DELETE AND REPLACE Drawing in its entirety.  
Changed Division 23 to Division 26 for the variable frequency drives.

**END OF ADDENDUM NO. 1**

**PRE-BID ATTENDANCE**

The following Pre-Bid Sign-In Sheet is being made available to Bidders for informational purposes only and is not a part of the Addendum.

## NOTICE TO BIDDERS

Notice is hereby given that electronic bids will be received:

By: The Trustees of Indiana University  
Bloomington, Indiana

For: IN145 Service Bldg - Replace AHUs 1 & 2 Add DDC Controls Replace ATS  
Indiana University Indianapolis. IU 20230575

At: Office of the Vice President for Capital Planning and Facilities

In accordance with Indiana Code 4-13-18 Drug Testing of Employees of Public Works  
Contractors and IC 5-16 Public Works

Via electronic bid submission on [www.iuplanroom.com](http://www.iuplanroom.com). Bidders must be registered on  
the plan room, and signed into the plan room, in order to submit a bid.

Bids will be electronically opened via Zoom: <https://iu.zoom.us/j/82623978895>  
Meeting ID: 826 2397 8895  
Join By Telephone: 312-626-6799

Until: 2:00 P.M. Eastern Time, on December 4, 2024.

Bids received after that time will not be accepted. Bid results will be published on  
[www.iuplanroom.com](http://www.iuplanroom.com).

A Unified Bid is requested for all work in this project, including General, Mechanical, and  
Electrical Construction work.

See project specifications for electronic bid submission instructions.

All bid proposals shall be in full accord with the Bidding Documents, which are on file with the  
Owner and may be examined by prospective Bidders:

VPCPF Support Resources – Construction Procurement  
Indiana University  
[bidtab@iu.edu](mailto:bidtab@iu.edu)  
812-855-5294

Bidding documents will be available October 31, 2024. Please contact the Eastern Engineering  
Distribution Department, 9901 Allisonville Road, Fishers, Indiana 46038, Ph. 317-598-0661,  
[www.iuplanroom.com](http://www.iuplanroom.com) for deposit and purchase information.

Each bid must be accompanied by:

- a completed Minority, Women's and Veteran's Business Enterprise Participation Plan,  
detailing the good faith efforts of the contractor to include minority, women and veteran-  
owned enterprises as subcontractors or material suppliers on the Project;

- a bid security for 5% of the total bid; and
- the contractor's written drug testing program, which must be in full compliance with IC 4-13-18.

The Owner reserves the right to accept or reject any bid and to waive any irregularities in bidding. The Owner may consider a bid to be incomplete if it does not provide the required documentation as described in this Notice, including but not limited to the Minority, Women's and Veteran's Business Enterprise Participation Plan. The Base Bid may be held for a period not to exceed sixty days before awarding Contracts. All Alternate Bids may be held for a period not to exceed ninety days before award and incorporation into the contract by proper Change Directive.

Should a successful Bidder withdraw his bid or fail to execute a satisfactory Contract within 10 days after notice of acceptance of bid, the Owner may declare the Bid Security forfeited as liquidated damages, not as penalty.

A Pre-bid meeting is scheduled for 2:00 pm Eastern Time, on November 5, 2024. All interested parties should assemble at 901 Wilson St., SE Entrance on the Indiana University Indianapolis campus.

IN145 Service Bldg - Replace AHUs 1 & 2 Add DDC Controls Replace ATS  
Indiana University Indianapolis  
IU 20230575

## **SECTION 262923 - VARIABLE-FREQUENCY MOTOR CONTROLLERS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes separately enclosed, pre-assembled, combination VFCs, rated 600 V and less, for speed control of three-phase, squirrel-cage induction motors.
- B. Related Sections:
  - 1. Division 26 Section "Motor-Control Centers" for VFCs installed in motor-control centers.

#### **1.3 ACTION SUBMITTALS**

- A. LEED Submittals:
  - 1. Product Data for Credit EA 5: For continuous metering equipment for energy consumption.
- B. Product Data with Shop Drawings:
  - 1. Product Data: For each type and rating of VFC indicated. Include features, performance, electrical ratings, operating characteristics, shipping and operating weights, and furnished specialties and accessories.
  - 2. Shop Drawings: For each VFC indicated. Include dimensioned plans, elevations, and sections; and conduit entry locations and sizes, mounting arrangements, and details, including required clearances and service space around equipment.
    - a. Show tabulations of installed devices, equipment features, and ratings. Include the following:
      - 1) Each installed unit's type and details.
      - 2) Factory-installed devices.
      - 3) Enclosure types and details.
      - 4) Nameplate legends.
      - 5) Short-circuit current (withstand) rating of enclosed unit.
      - 6) Features, characteristics, ratings, and factory settings of each VFC and installed devices.
      - 7) Specified modifications.
    - b. Schematic and Connection Wiring Diagrams: For power, signal, and control wiring.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate, full-load currents.
- B. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that switch settings for motor-running overload protection suit actual motors to be protected.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For VFCs to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
  - 1. Manufacturer's written instructions for testing and adjusting thermal-magnetic circuit breaker and MCP trip settings.
  - 2. Manufacturer's written instructions for setting field-adjustable overload relays.
  - 3. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.
  - 4. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.

#### 1.6 DESCRIPTION / QUALITY ASSURANCE

- A. Source Limitations: Obtain VFDs of a single type through one source from local manufacturer representative. All VFDs on the jobsite shall be furnished from one VFD manufacturer and have a common user interface (control panel).
- B. Drives that are manufactured by a third party and "brand labeled" shall not be acceptable. Drive manufacturers who do not build their own power boards and assemblies, or do not have full control of the power board manufacturing and quality control, shall be considered as a "brand labeled" drive.
- C. Manufacturer Qualifications: Maintain, within 100 miles of project site, an independent factory certified sales and service center capable of performing certified start up, commissioning, warranty service, training, parts, emergency maintenance and repairs.
- D. The VFD and all Electrical Components, Devices, and Accessories must be UL Listed and labeled.
- E. This specification is intended to supplement a drive schedule. The drive schedule identifies the optimized BOM for the project and includes quantity, size, voltage, enclosure rating, options, and harmonic mitigation requirements of the drives. IEEE 519-2014 is an electrical system standard for harmonic mitigation and not intended to be applied to an individual piece of equipment.

#### 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation, capable of driving full load without derating, under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than 14 deg F and not exceeding 104 deg F.
2. Ambient Storage Temperature: Not less than minus 4 deg F and not exceeding 140 deg F)
3. Humidity: Less than 95 percent (noncondensing).
4. Altitude: 0 to 3,300 feet above sea level.

## 1.8 COORDINATION

- A. Coordinate features of motors, load characteristics, installed units, and accessory devices to be compatible with the following:
  1. Torque, speed, and horsepower requirements of the load.
  2. Ratings and characteristics of supply circuit and required control sequence.
  3. Ambient and environmental conditions of installation location.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases.
- C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace VFCs that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: Two years from date of Substantial Completion.
  2. Warranty Coverage: At a minimum provide coverage for: Parts, on-site labor, and travel time and costs, or replacement of the complete drive as determined by the drive manufacturer's technical support.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURED UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. ABB Model ACH by Fuller Engineering.
- B. Application: variable torque.
- C. Design and Rating: Match load type, such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.
- D. Output Rating: Three-phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.
- E. Unit Operating Requirements:

1. Input AC Voltage Tolerance: Plus 10 and minus 10 percent of VFC input voltage rating.
  2. Input AC Voltage Unbalance: Not exceeding 3 percent.
  3. Ambient Temperature Rating: Not less than 14 deg F and not exceeding 104 deg F.
  4. Ambient Storage Temperature Rating: Not less than minus 4 deg F and not exceeding (140 deg F)
  5. Humidity Rating: Less than 95 percent (noncondensing).
- F. Isolated Control Interface: Allows VFCs to follow remote-control signal over a minimum 40:1 speed range.
1. Signal: Electrical.
- G. Internal Adjustability Capabilities:
1. Minimum Speed: 25 percent of maximum rpm.
  2. Maximum Speed: 100 percent of maximum rpm.
  3. Acceleration: 0.1 to 999.9 seconds.
  4. Deceleration: 0.1 to 999.9 seconds.
  5. Current Limit: 30 to minimum of 150 percent of maximum rating.
- H. Self-Protection and Reliability Features:
1. Input transient protection by means of surge suppressors to provide three-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.
  2. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
  3. Under- and overvoltage trips.
  4. Inverter overcurrent trips.
  5. VFC and Motor Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFCs and motor thermal characteristics, and for providing VFC overtemperature and motor overload alarm and trip; settings selectable via the keypad; NRTL approved.
  6. Critical frequency rejection, with three selectable, adjustable deadbands.
  7. Instantaneous line-to-line and line-to-ground overcurrent trips.
  8. Loss-of-phase protection.
  9. Reverse-phase protection.
  10. Short-circuit protection.
  11. Motor overtemperature fault.
- I. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts.
- J. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped, unless "Bidirectional Autospeed Search" feature is available and engaged.
- K. Bidirectional Autospeed Search: Capable of starting VFC into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.
- L. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.



- M. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.
- N. Integral Input Disconnecting Means and OCPD: NEMA AB 1, instantaneous-trip circuit breaker with pad-lockable, door-mounted handle mechanism.
  - 1. Disconnect Rating: Not less than 115 percent of VFC input current rating.
  - 2. Disconnect Rating: Not less than 115 percent of NFPA 70 motor full-load current rating or VFC input current rating, whichever is larger.
  - 3. Auxiliary Contacts: NO/NC, arranged to activate before switch blades open.
  - 4. Auxiliary contacts "a" and "b" arranged to activate with circuit-breaker handle.
  - 5. NO alarm contact that operates only when circuit breaker has tripped.

## 2.2 CONTROLS AND INDICATION

- A. Status Lights: Door-mounted LED indicators displaying the following conditions:
  - 1. Power on.
  - 2. Run.
  - 3. Overvoltage.
  - 4. Line fault.
  - 5. Overcurrent.
  - 6. External fault.
- B. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.
  - 1. Keypad: In addition to required programming and control keys, include keys for HAND, OFF, and AUTO modes.
  - 2. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: View only; view and operate; and view, operate, and service.
    - a. Control Authority: Supports at least four conditions: Off, local manual control at VFC, local automatic control at VFC, and automatic control through a remote source.
- C. Historical Logging Information and Displays:
  - 1. Real-time clock with current time and date.
  - 2. Running log of total power versus time.
  - 3. Total run time.
  - 4. Fault log, maintaining last four faults with time and date stamp for each.
- D. Indicating Devices: Digital display mounted flush in VFC door and connected to display VFC parameters including, but not limited to:
  - 1. Output frequency (Hz).
  - 2. Motor speed (rpm).
  - 3. Motor status (running, stop, fault).
  - 4. Motor current (amperes).
  - 5. Motor torque (percent).

6. Fault or alarming status (code).
7. PID feedback signal (percent).
8. DC-link voltage (V dc).
9. Set point frequency (Hz).
10. Motor output voltage (V ac).

E. Control Signal Interfaces:

1. Electric Input Signal Interface:

- a. A minimum of two programmable analog inputs: 0- to 10-V dc 4- to 20-mA dc.
- b. A minimum of six multifunction programmable digital inputs.

2. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the BAS or other control systems:

- a. 0- to 10-V dc.
- b. 4- to 20-mA dc.

3. Output Signal Interface: A minimum of one programmable analog output signal(s) (0- to 10-V dc), which can be configured for any of the following:

- a. Output frequency (Hz).
- b. Output current (load).
- c. DC-link voltage (V dc).
- d. Motor torque (percent).
- e. Motor speed (rpm).
- f. Set point frequency (Hz).

4. Remote Indication Interface: A minimum of two programmable dry-circuit relay outputs (120-V ac, 1 A) for remote indication of the following:

- a. Motor running.
- b. Set point speed reached.
- c. Fault and warning indication (overtemperature or overcurrent).
- d. PID high- or low-speed limits reached.

F. PID Control Interface: Provides closed-loop set point, differential feedback control in response to dual feedback signals. Allows for closed-loop control of fans and pumps for pressure, flow, or temperature regulation.

1. Number of Loops: One.

G. BAS Interface: Factory-installed hardware and software to enable the BAS to monitor, control, and display VFC status and alarms and energy usage. Allows VFC to be used with an external system within a multidrop LAN configuration; settings retained within VFC's nonvolatile memory.

1. Network Communications Ports: Ethernet and RS-422/485.
2. Embedded BAS Protocols for Network Communications: ASHRAE 135 BACnet Echelon LonWorks; protocols accessible via the communications ports. Provide protocol to be compatible with BMS provider.

## 2.3 LINE CONDITIONING AND FILTERING

- A. Input Line Conditioning: The VFC shall have internal 5% impedance reactors to reduce harmonics to the power line and to add protection from AC transients. The 5% impedance may be from dual (positive and negative DC bus) reactors, or 5% AC line reactors. VFD's with only one DC reactor shall add AC line reactors. The VFC shall include a coordinated AC transient protection system consisting of 4 - 120 joule rated MOV's (phase to phase and phase to ground), a capacitor clamp and 5% impedance reactors.
- B. Output Filtering: If the motor load is located more than 100 ft. from VFC, provide output line. Size output line reactor to properly handle and protect the load.
- C. Remote manual disconnect: If a remote disconnect is used on the load side of the VFC, an auxiliary set of contacts will be provided in that disconnect wired to disable the VFC. Run disable control wiring in separate conduit from power feed.

## 2.4 ENCLOSURES

- A. VFC Enclosures: NEMA 250, to comply with environmental conditions at installed location.
  - 1. Dry and Clean Indoor Locations: Type 1.
  - 2. Outdoor Locations: Type 3R.
  - 3. Other Wet or Damp Indoor Locations: Type 4.
  - 4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.
- B. Plenum Rating: UL 1995; NRTL certification label on enclosure, clearly identifying VFC as "Plenum Rated."

## 2.5 ACCESSORIES

- A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in VFC enclosure cover unless otherwise indicated.
  - 1. Push Buttons, Pilot Lights, and Selector Switches: Standard-duty, type.
    - a. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.
- B. NO bypass contactor auxiliary contact(s).
- C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.
- D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.
  - 1. Current Transformers: Continuous current rating, basic impulse insulating level (BIL) rating, burden, and accuracy class suitable for connected circuitry. Comply with IEEE C57.13.
- E. Supplemental Digital Meters:

1. Elapsed-time meter.
  2. Kilowatt meter.
  3. Kilowatt-hour meter.
- F. Breather and drain assemblies, to maintain interior pressure and release condensation in NEMA 250, Type 4 Type 4X Type 12 enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.
- G. Space heaters, with NC auxiliary contacts, to mitigate condensation in NEMA 250, Type 3R Type 4X Type 12 enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.
- H. Cooling Fan and Exhaust System: For NEMA 250, Type 12; UL 508 component recognized: Supply fan, with stainless steel intake and exhaust grills and filters; 120 -V ac; obtained from integral CPT.
- I. Sun shields installed on fronts, sides, and tops of enclosures installed outdoors and subject to direct and extended sun exposure.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas, surfaces, and substrates to receive VFCs, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance.
- B. Examine VFC before installation. Reject VFCs that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFC installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Coordinate layout and installation of VFCs with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Wall-Mounting Controllers: Install VFCs on walls with tops at uniform height and with disconnect operating handles not higher than **79 inches** above finished floor unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Division 26 Section "Hangers and Supports for Electrical Systems."
- C. Floor-Mounting Controllers: Install VFCs on **4-inch** nominal thickness concrete base. Comply with requirements for concrete base specified in Division 03 Section "Cast-in-Place Concrete."
  1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on **18-inch** centers around the full perimeter of concrete base.

2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
  3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Roof-Mounting Controllers: Install VFC on roofs with tops at uniform height and with disconnect operating handles not higher than **79 inches** above finished roof surface unless otherwise indicated, and by bolting units to curbs or mounting on freestanding, lightweight, structural-steel channels bolted to curbs. Seal roof penetrations after raceways are installed.
1. Curbs and roof penetrations are specified in Division 07 Section "Roof Accessories."
  2. Structural-steel channels are specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- F. Install fuses in each fusible-switch VFC.
- G. Install fuses in control circuits if not factory installed. Comply with requirements in Division 26 Section "Fuses."
- H. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.
- I. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.
- J. Comply with NECA 1.

### 3.3 IDENTIFICATION

- A. Identify VFCs, components, and control wiring. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  2. Label each VFC with engraved nameplate.
- B. Operating Instructions: Frame printed operating instructions for VFCs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of VFC units.

### 3.4 CONTROL WIRING INSTALLATION

- A. Install wiring between VFCs and remote devices and facility's central-control system. Comply with requirements in Division 26 Section "Control-Voltage Electrical Power Cables."
- B. Bundle, train, and support wiring in enclosures.
- C. Connect selector switches and other automatic control devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic control devices that have no safety functions when switches are in manual-control position.
2. Connect selector switches with control circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Tests and Inspections:
  1. Inspect VFC, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
  2. Verify that voltages at VFC locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Architect before starting the motor(s).
  3. Test each motor for proper phase rotation.
  4. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  5. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  6. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. VFCs will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies the VFC and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

### 3.6 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
  1. Complete installation and startup checks according to manufacturer's written instructions.

### 3.7 ADJUSTING

- A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

### 3.8 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until controllers are ready to be energized and placed into service.

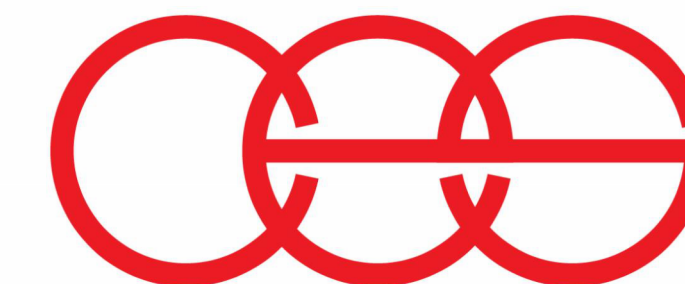
Creative Engineering Solutions, Inc.

- B. Replace VFCs whose interiors have been exposed to water or other liquids prior to Substantial Completion.

### 3.9 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, reprogram, and maintain VFCs.

**END OF SECTION**

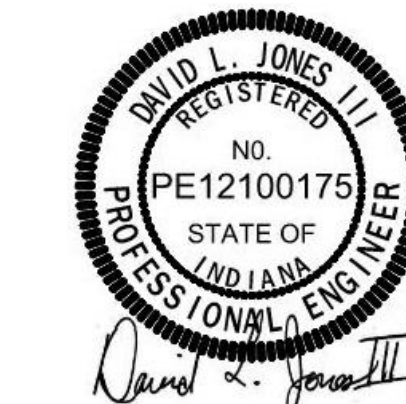


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**GENERAL LIGHT FIXTURE SCHEDULE...**

- A REFER TO ELECTRICAL SYMBOLS AND ABBREVIATIONS SHEET E-001 FOR ADDITIONAL INFORMATION.
- B PROVIDE FACTORY INSTALLED DISCONNECTS FOR ALL LINEAR FIXTURES.
- C PROVIDE SELF-DIAGNOSTICS AND SELF-TESTING FOR ALL LIFE SAFETY FIXTURES (EXIT FIXTURES, WALL PACKS, INVERTERS/BALLASTS, ETC.)
- D PROVIDE CLIPS AND CABLE SUPPORTS FOR EACH LIGHT FIXTURE.

INTERIOR/EXTERIOR/EMERGENCY & EXIT LIGHT FIXTURES SCHEDULE											
LABEL	DESCRIPTION	VOLTAGE	SOURCE				MOUNTING	LENS/REFLECTOR	CERTIFICATIONS	ACCEPTABLE MANUFACTURERS	LABEL
			TYPE	LUMENS	WATTS	CCT					
A	4' LENSED LED STRIP LIGHT, 22 GAUGE STEEL, 0-10V DIMMING, WHITE FINISH	120/277 V	LED	5,000 LM	45 W	3500 K	SURFACE MOUNTED	DIFFUSE ACRYLIC LENS	N/A	LITHONIA LIGHTING CSS SERIES METALUX LIGHTING SMX SERIES COLUMBIA LIGHTING CSL SERIES HE WILLIAMS LIGHTING FS SERIES	A
AX	4' LENSED LED STRIP LIGHT, 22 GAUGE STEEL, 0-10V DIMMING, WHITE FINISH, INTEGRAL 10W BATTERY INVERTER	120/277 V	LED	5,000 LM	45 W	3500 K	SURFACE MOUNTED	DIFFUSE ACRYLIC LENS	N/A	LITHONIA LIGHTING CSS SERIES METALUX LIGHTING SMX SERIES COLUMBIA LIGHTING CSL SERIES HE WILLIAMS LIGHTING FS SERIES	AX
X	LED EXIT LIGHT, ACRYLIC HOUSING, SINGLE STENCIL FACE, RED LETTERS, TAMPER RESISTANT SCREWS, ACRYLIC FACE, WITH INTEGRAL INVERTER	120/277 V	LED	N/A	5 W	N/A	UNIVERSAL	N/A	N/A	LITHONIA LIGHTING WLTE SERIES COOPER SURE-LITE LPXW SERIES CURRENT DUAL-LITE SEWL SERIES LIFE SAFETY LIGHTING LSW SERIES	X

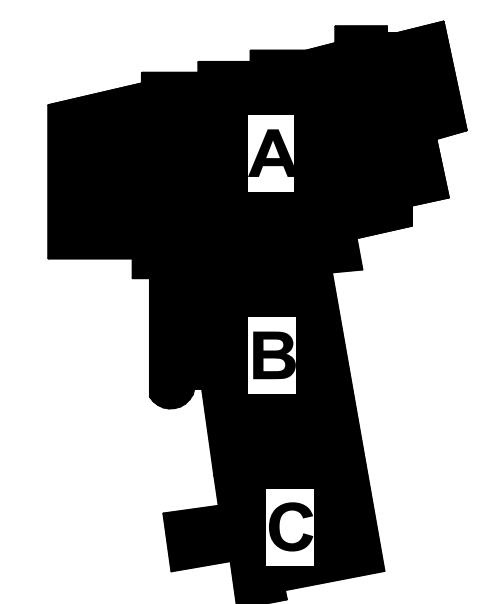
ENCLOSED & VARIABLE-FREQUENCY MOTOR CONTROLLERS SCHEDULE												
LABEL	EQUIPMENT SERVED	EQUIPMENT RATINGS				NEMA ENCL	STARTER		DISCONNECT SWITCH		REMOTE CAPACITOR	REMARKS
		VOLTAGE	PHASE	HP	FLA		TYPE	NEMA SIZE	TYPE	FUSE SIZE		
MS-1	CP-1	480 V	3	3	4.8 A	1	FVNR	1	FUSIBLE	8	-	COORDINATE WITH DIVISION 23 FOR CONTROL POINTS.
VFD-1	CHP-1	480 V	3	10	14.0 A	1	VFD	-	-	-	-	PROVIDED BY DIVISION 26, INSTALLED BY DIVISION 26.
VFD-2	CHP-2	480 V	3	10	14.0 A	1	VFD	-	-	-	-	PROVIDED BY DIVISION 26, INSTALLED BY DIVISION 26.
VFD-3	HWP-1	480 V	3	3	4.8 A	1	VFD	-	-	-	-	PROVIDED BY DIVISION 26, INSTALLED BY DIVISION 26.
VFD-4	HWP-2	480 V	3	3	4.8 A	1	VFD	-	-	-	-	PROVIDED BY DIVISION 26, INSTALLED BY DIVISION 26.
VFD-5	AHU-2 SF	480 V	3	20	27.0 A	1	VFD	-	-	-	-	PROVIDED BY DIVISION 26, INSTALLED BY DIVISION 26.
VFD-6	AHU-2 RF	480 V	3	7.5	11.0 A	1	VFD	-	-	-	-	PROVIDED BY DIVISION 26, INSTALLED BY DIVISION 26.

ENCLOSED SWITCHES & CIRCUIT BREAKERS SCHEDULE										
LABEL	EQUIPMENT SERVED	EQUIPMENT RATINGS				FUSE SIZE	NEMA ENCL	ACCESSORIES		REMARKS
		VOLTAGE	POLES	AMPERAGE	FUSED			AUX. CONTACTS	SOLID NEUTRAL	
DS-1	CHP-1	600 V	3	30 A	Yes	20	1	(1) N.O. / N.C.	No	MOUNT ON UNISTRUT RACK WITH VFD'S
DS-2	CHP-2	600 V	3	30 A	Yes	20	1	(1) N.O. / N.C.	No	MOUNT ON UNISTRUT RACK WITH VFD'S
DS-3	VFD-3	600 V	3	30 A	Yes	10	1	(1) N.O. / N.C.	No	
DS-4	VFD-4	600 V	3	30 A	Yes	10	1	(1) N.O. / N.C.	No	
DS-5	HWP-1	600 V	3	30 A	Yes	10	1	(1) N.O. / N.C.	No	
DS-6	HWP-2	600 V	3	30 A	Yes	10	1	(1) N.O. / N.C.	No	
DS-7	AHU-2 SF	600 V	3	100 A	Yes	50	1	(1) N.O. / N.C.	No	
DS-8	AHU-2 RF	600 V	3	30 A	Yes	20	1	(1) N.O. / N.C.	No	
DS-9	MS-1	600 V	3	30 A	Yes	10	1	(1) N.O. / N.C.	No	

20230575 - IN145 - AHU AND ATS  
REPLACEMENT  
INDIANA UNIVERSITY - INDIANAPOLIS  
901 Wilson St.  
Indianapolis, IN 46202



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KEY PLAN

#	REVISION	DATE
1	ADDENDUM 1	11/13/2024

JOB NO. 2024-008.145  
PRODUCED BY BJV / DLJ  
DATE 10/23/2024

ELECTRICAL SCHEDULES

E601

END ELECTRICAL SCHEDULES  
 DRAWN BY: DAVID L. JONES  
 CHECKED BY: DAVID L. JONES  
 DATE: 11/13/2024



### Meeting Sign-In Sheet

<b>Project:</b>	20230575: IN145 Service Bldg - Replace AHUs 1 & 2 Add DDC Controls Replace ATS	<b>Meeting Date:</b>	11/5/2024
<b>Facilitator:</b>	Indiana University	<b>Place/Room:</b>	SE Entrance

Name	Title	Company	Cell	E-Mail
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