

November 1, 2016

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ADDENDUM NUMBER 3
TO THE DRAWINGS AND SPECIFICATIONS

PROJECT: McLean County Unit District No. 5 Parkside Jr.H.S. Geothermal Conversion

FOR: McLean Co. Unit District No. 5
1809 W. Hovey Ave.
Normal, IL 61761

A/E PROJECT NO: 21522215

ISSUE DATE: November 1, 2016

BID OPENING: Wednesday, November 9, 2016, 1:30 p.m. prevailing time
Maintenance Office, 1999 Eagle Road, Normal, IL 61761

Upon receipt of this ADDENDUM, insert same into the documents, which were issued to you. Hereafter, said ADDENDUM shall be as much a part of the said documents as though originally set forth therein.

17. To the SPECIFICATION SECTION 09 90 00 Painting 1.1.A: Add subparagraph "5) All painting will be spot painting not painting to corner, ceiling and floor."
18. To the SPECIFICATION SECTION 00 70 00 GENERAL & SUPPLEMENTARY GENERAL CONDITIONS, Paragraph 2.1.H.4): Remove requirement for \$10,000,000 policy umbrella and insert \$5,000,000 for umbrella policy.
19. To the DRAWING SHEET M1.4: Add Detail 01 HVAC Demolition of Fan Room M2-- Remove one Powers Pneumatic Control Panel on West Wall. Detail 02 HVAC Demolition Fan Room M1 – Remove three Powers Pneumatic Control Panels – one on West Wall, one on East Wall and one on North Wall. Detail 03 HVAC Demolition Fan Room M3 – Remove two Power Pneumatic Control Panels, both on West Wall.
20. DRAWING SHEETS M2-1, M2.2, M2.3 AND M2.4: Delete the sentence in Note 4: "Pipingin wall cavities where required, and isolate with a shut-off valve and dielectric union." Add: "Remove domestic water pipes to walls. Abandon pipes in walls. Install new copper drops and provide metal cover as indicated on Sheet M3.1 Detail 08.
21. To the DRAWING SHEET M2.1 and M2.2: The restrooms 166, 164, 129, and 105 have previously had the piping to the lavatories replaced with copper piping. No further work one to these lavatories. Pipe drops to toilets and urinals need to be done.

22. To the DRAWING SHEET M1-2: In Classrooms 138, 144 and 146 there is a newer HVAC pipe and stainless cover on the surface adjacent to the outside wall. These pipes and covers to be removed.
23. SPECIFICATIONS: Add, delete or modify as noted.
 1. Add SPECIFICATION SECTION 26 2923 Variable-Frequency Drives to the project manual. Also add SECTION 26 2923 Variable-Frequency Drives to the Table of Contents. (See Attachment: Section 26 2923 Variable-Frequency Drives)
 2. Section 23 3700 –Krueger is an approved manufacturer for grilles and diffusers.
 3. Section 23 34233 – Aerovent is an approved manufacturer for exhaust fans.
 4. Section 23 7223 – Aaon is an approved manufacturer for energy recovery units.
24. DRAWINGS: Add, delete or modify as noted.
 1. Mechanical and Electrical Demolition scope of work: It is the intent of the project to remove all existing HVAC systems with the exception of some ductwork and diffusers indicated to remain. The mechanical and electrical contractors shall be responsible for removing all HVAC equipment, piping, associated controls, associated fire alarm devices, associated power feeds, associated ductwork (other than that indicated to remain), and associated supply/return diffusers/grilles (other than those indicated to remain). This shall include all heating hot water systems and cooling chilled water systems throughout the building including all chillers, boilers, associated piping, pumps, power, and controls. Major equipment, piping, and ductwork to be removed as indicated with heavy dashed lines on the demolition drawings M1.1, M1.2, M1.3, and M1.4.
 2. M1.1 through M1.6 – The thermostats for all console heat pumps shall be mounted on the unit. No drawing attached.
 3. M1.5 – Eliminate the intake and vent piping for water heater WH-3 from the project. No drawing attached.
 4. M1.5 – Delete the extra thermostat for HP-184 indicated in storage 178. No drawing attached.
 5. M1.5 – Locate the thermostat for HP-101 on the North wall of 101 near the entry. No drawing attached.
 6. M1.6 - Locate the thermostat for HP-102 on the West wall of 102A near the entry. No drawing attached.
 7. M1.6 – Locate the thermostat for HP-105 on the North wall of the entry to the restroom. No drawing attached.

8. M1.6 – Locate the thermostat for HP-150 on the East wall of 150 at the entry. No drawing attached.
9. M1.7 – The thermostat for HP-200 shall be located on the wall in Lobby 200 where the thermostat labeled HP-101 is currently located. No unit mounted thermostat is required on HP-200. No drawing attached.
10. M2.3 – Revise the hot and cold water piping in Restrooms 164 and 166. Also eliminate water heater WH-3, storage tank ST-3, and RCP-2. See attached revised drawing M2.3.
11. M2.4 – Revise the hot and cold water piping in Restrooms 105 and 129. See attached revised drawing M2.4.
12. M3.1 – Delete the motorized outside/fresh air dampers and CO2 sensors indicated in details 05 and 09. No drawing attached.
13. M3.1 – Delete the Respicaire filter and the requirement for 24V wiring to the filter from detail 05. No drawing attached.
14. M3.1 – The sequence of operation for the HP-ERU heat pumps is indicated on detail 10. No drawing attached.
15. M3.1 – The circulation pumps shown on details 4 and 5 are indicated in the schedules to be factory installed. No drawing attached.
16. M3.2 – Wessels is approved as a manufacturer for the Air Separator and the Glycol Fill Tank indicated in Notes 16 and 20 on drawing M3.2. No drawing attached.
17. M3.2 – Vector is approved as a manufacturer for the Pot Feeder/Bypass Filter indicated in Note 5 on drawing M3.2. No drawing attached.
18. M3.2 – The CO2 sensors for the ERU-1, ERU-2, ERU-3, ERU-4, ERU-5, and ERU-6 shall be located in the ERU return air duct. No drawing attached.
19. M3.2 – Locate the alarm pump failure alarm light in a clearly visible location in office 100. No drawing attached.
20. M3.2 – The motorized return air damper referenced in the ERU-1 sequence of operation is indicated on drawing M1.5 in the 26x22 return air duct above room 94. No drawing attached.
21. M3.3 – Revise the hot/cold water riser to add piping sizing. Revise the gas pipe riser to eliminate the gas piping for WH-3. See attached revised drawing M3.3.
22. M4.2 – Revise heatpumps HP-190A and HP-190B. See attached revised drawing M4.2.
23. E1.1 – Eliminate the power circuit for WH-3 from the project. No drawing attached.

24. E1.2 – Provide power for exhaust fans EF-1 and EF-2. Circuit to P3-48, 50, 52 circuit with MUA-1. Provide weatherproof fused disconnects at EF-1 and EF-2 on roof fused at 15 amps. MUA-1, EF-1, and EF-2 shall be connected to the Melink variable volume kitchen hood controls being provided and installed on the existing kitchen hood. Coordinate installation requirements with the Melink installing contractor. No drawing attached.
25. E1.4 – Add two fire alarm smoke detectors in Fan Room M3. Also, add twelve fire alarm relays to shut down the ERU's and HP's in this space when smoke detectors in this area activate the fire alarm system. No drawing attached.
26. E1.4 – Add two fire alarm smoke detectors in Fan Room M2. Also, add four fire alarm relays to shut down the ERU's and HP's in this space when smoke detectors in this area activate the fire alarm system. No drawing attached.
27. E1.4 – Add two fire alarm smoke detectors in Fan Room M1. Also, add seven fire alarm relays to shut down the ERU's and HP's in this space when smoke detectors in this area activate the fire alarm system. No drawing attached.
28. E4.1 – Revise panel P5 to be a 400 amp panel. See attached revised drawing E4.1.

Attachment: Section 26 2923 Variable-Frequency Drives

END ADDENDUM NO. 3

SECTION 26 2923
VARIABLE-FREQUENCY DRIVES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes AC Motor Variable Frequency Drives rated 600 V and less.

1.03 REFERENCES

- A. ANSI/UL Standard 508.
- B. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- C. IEEE Standard 519-1981 - Guide for Harmonic Control and Reactive Compensation of Static Power Converters.
- D. FCC Rules and Regulations, Part 15, Subpart J - Radio Frequency Interference.

1.04 DEFINITIONS

- A. BAS: Building automation system.
- B. CPT: Control power transformer.
- C. EMI: Electromagnetic interference.
- D. IGBT: Insulated-gate bipolar transistor.
- E. LAN: Local area network.
- F. LED: Light-emitting diode.
- G. MCP: Motor-circuit protector.
- H. NC: Normally closed.
- I. NO: Normally open.
- J. OCPD: Overcurrent protective device.
- K. PCC: Point of common coupling.
- L. PID: Control action, proportional plus integral plus derivative.
- M. PWM: Pulse-width modulated.
- N. RFI: Radio-frequency interference.
- O. TDD: Total demand (harmonic current) distortion.
- P. THD(V): Total harmonic voltage demand.
- Q. VFD: Variable-frequency drive

1.05 SUBMITTALS

- A. Product Data: Provide catalog sheets showing voltage, Drive size, ratings, and size of switching and overcurrent protective devices, short circuit ratings, dimensions and enclosure details.
 - 1. Shop Drawings: Include front and side views of enclosure with overall dimensions and weights shown; conduit entrance locations and requirements; and nameplate legends.
 - 2. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Each installed unit's type and details.
 - b. Factory-installed devices.
 - c. Enclosure types and details.
 - d. Nameplate legends.
 - e. Short circuit current (withstand) rating of enclosed unit.

- f. Features, characteristics, ratings and factory settings of each VFC and installed devices.
- 3. Schematic and Connection Wiring Diagrams: For power, signal and control wiring.
- B. Manufacturer's installation instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation and starting of Product.

1.06 OPERATION AND MAINTENANCE DATA

- A. Operation and Maintenance Data: For VFDs 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.
- B. 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.
- C. Shop Drawings for each VFD.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide VFD's from manufacturers regularly engaged in the manufacture of equipment of the types and capacities indicated, with such products in satisfactory use in similar service for not less than 5 years. Manufacturer shall maintain, within 100 miles of the project site, a service center capable of providing training, parts and emergency maintenance and repairs.
- B. Single-source Responsibility: Obtain VFD's from a single manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site in accordance with Conditions of Contract, Division 01 and Division 26 Specifications.
- B. Accept drives on-site in original packing. Inspect for damage.
- C. Store in a clean and dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect each drive from dirt, water, construction debris and traffic.
- D. Handle in accordance with manufacturer's written instructions. Lift only with lugs approved for the purpose. Handle carefully to avoid damage.

1.09 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Power Fuses: Equal to three (3) of each size and type.
 - 2. Control Power Fuses: Equal to two (2) of each size and type.
 - 3. Air filter: Equal to two (2) of each size.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace VFDs that fail in materials or workmanship within specified warranty period. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURED UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Basis of Design: Toshiba International Corporation, Model Q9 or FS1.
 - 2. Danfoss
 - 3. Eaton
- B. General Requirements for VFDs: Comply with NEMA ICS 7, NEMA ICS 61800-2 and UL 508C.
- C. Application: Variable torque.
- D. VFD Description: Variable-Frequency Drive (rectifier, D.C. bus and IGBT, PWM inverter) factory-packaged in an enclosure; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency. No neutral conductor shall be used to supply the VFD.
 - 1. Units suitable for standard NEMA Design B squirrel cage 1.15 service factor induction motors without requiring any modifications to the motor or the drive.
 - 2. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to Authorities Having Jurisdiction.
- E. Features
 - 1. Display: Provide integral digital display to indicate all protection faults and drive status (including overcurrent, overvoltage, undervoltage, ground fault, over-temperature, phase loss, input power ON, output voltage, output frequency and output current.
 - 2. Protection:
 - a. Input transient protection by means of surge suppressors.
 - b. Snubber networks to protect against malfunctions due to system transients,
 - c. Under- and over-voltage trips; inverter over-temperature, overload and overcurrent trips.
 - d. Motor thermal overload relay(s) adjustable and capable of NEMA 250 and sized per motor nameplate data.
 - e. Notch filter to prevent operation of the controller-motor-load combination at a natural frequency of the combination.
 - f. Instantaneous line-to-line and line-to-ground overcurrent trips on input and output.
 - g. Loss-of-phase protection.
 - h. Reverse-phase protection.
 - i. Short-circuit protection (fuses or circuit breaker).
 - j. Motor over-temperature fault.
 - 3. Acceleration Rate Adjustment: 0.5 to 30 seconds.
 - 4. Deceleration Rate Adjustment: 1 to 30 seconds.
 - 5. Minimum Adjustment Range for the Lower Output Frequency shall be: 0 to 40 Hertz.
 - 6. Minimum Adjustment Range for the Upper Output Frequency Range shall be: 40 to 90 Hertz.
 - 7. Minimum Volts/Hertz Range: 3.7 to 8.6 volts/Hertz.
 - 8. Provide MANUAL-OFF-AUTOMATIC selector switch and manual analog speed control mounted on the front of the enclosure.
 - 9. Safety Interlocks: Provide terminals for remote contact to inhibit starting under both manual and automatic mode.
 - 10. Control Interlocks: Provide terminals for remote contact to allow starting in automatic mode.
 - 11. Provide adjustable skip frequencies on the drive output (minimum of three ranges).
 - 12. Automatic Reset/Restart: Attempt three restarts after controller fault or on return of power after an interruption, and before shutting down for manual reset or fault correction. Bi-directional autospeed search shall be capable of starting into rotating loads spinning in

- either direction and returning motor to set speed in proper direction, without damage to controller, motor or load.
13. Power-Interruption Protection: After a power interruption, it prevents the motor from reenergizing until the motor has stopped.
 14. 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.
 15. 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.
 16. Status Lights: Door-mounted LED indicators shall indicate the following conditions:
 - a. Power on.
 - b. Run.
 - c. Overvoltage.
 - d. Line fault.
 - e. Overcurrent.
 - f. External fault.
 17. Panel-Mounted Operator Station: Start-stop and auto-manual selector switches with manual speed control potentiometer and elapsed time meter.
 18. Indicating Devices: Meters or digital readout devices and selector switch, mounted flush in controller door and connected to indicate the following controller parameters:
 - a. Output frequency (Hz).
 - b. Motor speed (rpm).
 - c. Motor status (running, stop, fault).
 - d. Motor current (amperes).
 - e. Motor torque (percent).
 - f. Fault or alarming status (code).
 - g. PID feedback signal (percent).
 - h. DC-link voltage (VDC).
 - i. Set-point frequency (Hz).
 - j. Motor output voltage (V).
 19. Control Signal Interface:
 - a. ELECTRIC INPUT SIGNAL INTERFACE: A MINIMUM OF TWO (2) ANALOG INPUTS (0 TO 10 V OR 0/4-20 MA) AND 6 PROGRAMMABLE DIGITAL INPUTS.
 - b. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the BMS or other control systems:
 - 1) 0 to 10-V dc.
 - 2) 0-20 or 4-20 mA.
 - 3) Potentiometer using up/down digital inputs.
 - 4) Fixed frequencies using digital inputs.
 - 5) RS485.
 - 6) Keypad display for local hand operation.
 - c. Output Signal Interface:
 - 1) A minimum of one (1) analog output signal (0/4-20 mA), which can be programmed to any of the following:
 - (a) Output frequency (Hz).
 - (b) Output current (load).
 - (c) DC-link voltage (VDC).
 - (d) Motor torque (percent).
 - (e) Motor speed (rpm).
 - (f) Set-point frequency (Hz).
 - d. Remote Indication Interface: A minimum of two (2) dry circuit relay outputs (120-V a.c., 1A) for remote indication of the following:
 - 1) Motor running.
 - 2) Set-point speed reached.

- 3) Fault and warning indication (over-temperature or overcurrent).
 - 4) PID high- or low-speed limits reached.
20. Communications: Provide a communications card to interface VFD with Building Automation System (BAS). Coordinate interface requirements with the BAS. Interface shall allow all parameter settings of VFD to be programmed via BAS control and displayed on BAS operator workstation. Provide capability for VFD to retain these settings within the nonvolatile memory.
21. Bypass is not required unless otherwise noted on the drawings.
22. Two-Contactor Manual Bypass:
- a. Provide contactors, motor running overload protection, under-voltage and loss of phase protection, and short circuit protection for full voltage, non-reversing operation of the motor. Include isolation switch to allow maintenance of inverter during bypass operation.
 - b. All bypass circuitry shall be located within the same enclosure as the variable frequency drive.
 - c. All fire alarm and/or smoke control interconnections (e.g., air-handling unit shutdown) shall apply regardless of whether control is through VFD or bypass.
 - d. Provide a Drive-Bypass Selector Switch.
 - e. Provide nameplate with instructions for switching from drive-to-bypass and from bypass-to-drive.
23. Control:
- a. With the "Manual-Off-Auto" switch in the "Manual" position and, if applicable, the "Drive-Bypass" in the "Drive" position, the drive shall be controlled by the manual speed potentiometer on the drive door.
 - b. With the "Manual-Off-Auto" switch in the "Auto" position and, if applicable, the "Drive-Bypass" in the "Drive" position, the drive shall be controlled by the input signal from an external source.
 - c. If applicable, with the "Drive-Bypass" in the "Bypass" position, regardless the position of the "Manual-Off-Auto" switch, the motor shall be connected across the lines and shall be run at full speed.
 - d. With the "Manual-Off-Auto" switch in the "Off" position, if applicable, the drive run circuit shall be open and the VFD shall not operate.
 - e. If applicable, signal from the fire alarm control panel shall shut down VFD and bypass.
 - f. All disconnect switches between VFD and motor(s) shall include an auxiliary contact interlock wired to the VFD fault trip input to shut down the drive upon opening of the disconnect main contacts.
24. Auxiliary Contacts: NO/NC, arranged to activate before switch blades open.
- F. 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.
- G. 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.

2.02 LINE CONDITIONING AND FILTERING

- A. Input Line Conditioning: Provide input filtering, as required, to limit TDD and THD(V) at the defined PCC per IEEE 519.

2.03 OPTIONAL FEATURES

- A. Multiple-Motor Capability: VFD suitable for variable-speed service to multiple motors. Overload protection shuts down VFD and motors served by it, and generates fault indications, when overload protection activates.

1. Configure to allow two or more motors to operate simultaneously at the same speed; separate overload relay for each controlled motor.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

- A. Coordinate layout and installation of VFDs 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: Install VFDs 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."
- C. Install fuses in control circuits if not factory installed. Comply with requirements in Division 26 Section "Fuses."
- D. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.
- E. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.
- F. Comply with NECA 1.

3.03 IDENTIFICATION

- A. Identify VFDs, 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 VFD with engraved nameplate.
 3. Label each enclosure-mounted control and pilot device.

3.04 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to be present at start up and inspect, test, and adjust components, assemblies, and equipment installations, including connections.

3.05 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.
- B. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

- C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to six times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Engineer before increasing settings.

END OF SECTION