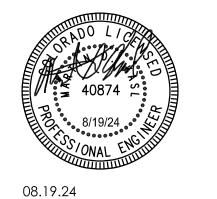
A. FIELD VERIFY EXISTING CONDITIONS AND LOCATIONS OF ALL THERMOSTATS. EXISTING THERMOSTATS TO BE REPLACED WITH NEW THERMOSTAT SENSORS IN CURRENT LOCATION. # SHEET NOTES 1. PROVIDE BACNET INTERFACE AT ROOFTOP AND NEW CONTROLS SYSTEM. CONSULTANTS: ETI Project No: 2024-039 MORGAN COUNTY ADMINISTR BUILDING 1 RTU 1 RTU PROJECT #
DATE: 8.19.24 DRAWN: RJH / RS CHECKED: JH REVISIONS © 2024 COPYRIGHT JOSEPH R. HEWGLEY & ASSOCIATES, Inc. MEMBER AMERICAN INSTITUTE of ARCHITECTS **ROOF PLAN - HVAC**

GENERAL NOTES







DATE DESCRIPTION	



PART 1 GENERAL

1.1 SECTION INCLUDES

C. Software.

A. HVAC control programs.

B. Control equipment.

1.2 RELATED REQUIREMENTS

1.3 REFERENCE STANDARDS

1.4 SYSTEM DESCRIPTION

A. NFPA 70 - National Electrical Code.

A. Section 230913 - Instrumentation and Control Devices for HVAC.

C. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units .

B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.

B. Section 230993 - Sequence Of Operations for HVAC Controls.

A. Maintain on site one set of the following record documents; record actual revisions to the Work:

1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

3. Change Orders and other modifications to the Contract.

D. Record information concurrent with construction progress

3. Field changes of dimension and detail.

3.2 OPERATION AND MAINTENANCE DATA

B. Ensure entries are complete and accurate, enabling future reference by Owner.

F. Record Drawings: Legibly mark each item to record actual construction including:

C. Store record documents separate from documents used for construction.

1.5 SUBMITTALS A. See Section 013000 - Administrative Requirements for submittal procedures. B. Product Data: Provide data for each system component and software module. 1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors. 2. List connected data points, including connected control unit and input device. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration digital media containing graphics. 4. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections. 5. Indicate description and sequence of operation of operating, user, and application software D. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. 1. Revise shop drawings to reflect actual installation and operating sequences. E. Operation and Maintenance Data: Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices. 2. Include keyboard illustrations and step-by-step procedures indexed for each operator function. 3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances 1.6 QUALITY ASSURANCE Perform work in accordance with NFPA 70. B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience. 1.7 WARRANTY A. See Section 017800 - Closeout Submittals for additional warranty requirements. B. Correct defective Work within a one year period after Substantial Completion. PART 2 PRODUCTS 2.1 MANUFACTURERS A. Honeywell International, Inc: www.honeywell.com/#sle. B. Johnson Controls, Inc: www.johnsoncontrols.com/#sle. C. Schneider Electric: www.schneider-electric.us/#sle. 2.2 CONTROLLERS A. Building Controllers: a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers. b. Provide sufficient memory to support controller's operating system, database, and programming requirements. d. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms. e. Utilize real-time clock for scheduling. Continuously check processor status and memory circuits for abnormal operation. controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation. . Communication with other network devices to be based on assigned protocol. Communication: a. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol. b. Perform routing when connected to a network of custom application and application specific controllers. c. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol. 3. Anticipated Environmental Ambient Conditions a. Outdoors and/or in Wet Ambient Conditions Mount within waterproof enclosures 2) Rated for operation at 40 to 150 degrees F b. Conditioned Space: 1) Mount within dustproof enclosures 2) Rated for operation at 32 to 120 degrees F. Provisions for Serviceability: a. Diagnostic LEDs for power, communication, and processor. b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable. 5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours. 6. Power and Noise Immunity: a. Maintain operation at 90 to 110 percent of nominal voltage rating. b. Perform orderly shutdown below 80 percent of nominal voltage c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet. B. Application Specific Controllers: General: a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment b. Customized for operation within the confines of equipment served. c. Communication with other network devices to be based on assigned protocol. Communication: a. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol. 3 Provisions for Serviceability: a. Diagnostic LEDs for power, communication, and processor b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable. 4. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours. C. Input/Output Interface: 1. Hardwired inputs and outputs tie into the DDC system through building, custom application, or application specific controllers. All Input/Output Points: a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration. b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties. 3 Rinary Inputs: a. Allow monitoring of On/Off signals from remote devices. b. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise. Sense dry contact closure with power provided only by the controlled 4. Pulse Accumulation Input Objects: Comply with all requirements of binary input objects and accept up to 10 pulses per second. a. Allow for monitoring of low voltage 0 to 10 VDC, 4 to 20 mA current, or resistance signals (thermistor, RTD). Compatible with and field configurable to commonly available sensing devices. a. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control. b. Outputs provided with three position (On/Off/Auto) override switches. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation a. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control. b. Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers. Drift to not exceed 0.4 percent of range per year. 8. Tri State Outputs: a. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback. b. Limit the use of three point, floating devices to the following zone and terminal unit control applications Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking a. System size to be expandable to twice the number of input output objects required by providing additional controllers, including associated devices and wiring. b. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions 2.3 LOCAL AREA NETWORK (LAN) A. Provide communication between control units over local area network (LAN). B. LAN Capacity: Not less than 60 stations or nodes C. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration. D. LAN Data Speed: Minimum 19.2 Kb E. Communication Techniques: Allow interface into network by multiple operation stations and by auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems. F. Web Server: Monitor of control system through internet IP address at any remote web browser. Passwords given to Owner and Engineer to provide system operation/monitoring access. G. Transmission Median: Fiber optic or single pair of solid 24 gage twisted, shielded copper cable. H. Network Support: Time for global point to be received by any station, shall be less than 3 seconds. Provide automatic reconfiguration if any station is added or lost. If transmission cable is cut, reconfigure two sections with no disruption to system's 2.4 HVAC CONTROL PROGRAMS A. Optimal Run Time: 1. Control start-up and shutdown times of HVAC equipment for both heating and cooling. 2. Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature. 3. Start-up systems by using outside air temperature, room mass temperatures, and adaptive model prediction for how long building takes to warm up or cool down under different conditions. 4. Use outside air temperature to determine early shut down with ventilation override. 5. Analyze multiple building mass sensors to determine seasonal mode and worse case condition for each day B. Supply Air Reset: 1. Monitor heating and cooling loads in building spaces, terminal reheat systems, unit discharge temperatures. 2. Adjust discharge temperatures to most energy efficient levels satisfying measured load by: Raising cooling temperatures to highest possible value Reducing heating temperatures to lowest possible level. C. Enthalpy Switchover: 1. Calculate outside and return air enthalpy using measured temperature and relative humidity; determine energy expended and control outside and return air dampers. PART 3 EXECUTION 3.1 EXAMINATION A. Verify existing conditions before starting work. B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices and wiring is installed prior to installation proceeding. A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration. B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 230993. C. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26. A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation. B. Provide basic operator training for Owner on data display, alarm and status descriptors, requesting data, execution of commands and request of logs. Include a minimum of 16 hours dedicated instructor time. Provide training on site. 3.4 DEMONSTRATION AND INSTRUCTIONS A. Demonstrate complete and operating system to Owner. 3.5 MAINTENANCE A. Provide service and maintenance of energy management and control systems for one years from Date of Substantial Completion. END OF SECTION 230923 SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS PART 1 GENERAL 1.1 SECTION INCLUDES A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections. B. Sequence of operation for: Central heating and cooling systems Central fan systems. Air handling units. 1.2 RELATED REQUIREMENTS A. Section 230913 - Instrumentation and Control Devices for HVAC 1.3 SUBMITTALS A. See Section 013000 - Administrative Requirements for submittal procedures. B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment. C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled. E. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings. PART 2 PRODUCTS - NOT USED PART 3 EXECUTION 3.1 SCHEDULING OF EQUIPMENT OPERATION 1. Setup schedule for equipment to operate at daytime setpoints and night setback setpoints. Daytime settings shall occur prior to occupancy schedule to allow systems to recover space temperatures, without ventilation systems in operation. Night setback schedule start would typically occur at the same time as the end of the occupancy schedule. 1. Occupancy schedule for ventilation equipment (minimum fresh air dampers, exhaust fans, energy recovery ventilators, etc.) to operate, corresponding to normal building occupied hours Additional schedule may be added through software interface by Owner for holidays, weekends, special event dates to override occupancy scheduling. 2. Additional operation schedules may be shown on Drawings in Air Balance Schedules or within Equipment Schedules that will dictate equipment operation for specific situations.

1. Individual equipment enables shall be issued by control system with starts staggered over a short period of time to spread out electrical demand on system. Global start commands are not acceptable.

1. Freeze Protection: Stop fans, open coil temperature control valves and close outside air dampers if temperature downstream of preheat coil is below 37 degrees F; signal paging alarm. At start up, test emergency shutdown mode to ensure a freeze

1. Maintain discharge air temperature of 55 degrees F by energizing heat pump during a call for cooling and cycling to satisfy room temperature sensor. Energize reversing valve on heat pump for heating and cycle to satisfy room temperature sensor.

A. Time Schedule: Start and stop supply fan. Determine fan status by current sensing devices. If fan fails to start as commanded, signal alarm.

2. Smoke Detector: Stop fans, close outside dampers, and close smoke dampers if smoke is detected by fire alarm system; signal alarm.

2. When supply fan is running, dampers are controlled and operate with outside and relief dampers opening, and return damper closing.

1. When supply fan is not running, outside and relief dampers are closed and return damper is open.

3. When building is in an occupied mode, outside air damper shall be opened to a minimum position.

3.2 CENTRAL FAN SYSTEMS (AIR HANDLING UNITS)

D. Outside, Return, and Relief Dampers

C. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.

E. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

D. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

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4. For cooling and outside air temperatures below 55 degrees F, modulate dampers to maintain mixed air temperature of 55 degrees F or higher.
5. For cooling and outside air temperatures above 55 degrees F outside and relief dampers are open and return damper is closed.
6. For cooling and outside air temperatures above 55 degrees F compare return and outside air temperatures. If return air temperature is lower, drive outside damper to minimum, close relief damper, and open return damper.
7. For heating, drive outside damper to minimum, close relief damper, and open return damper.
8. Relief damper in system shall be modulated to maintain the building static pressure setpoint.
E. Display:

1. System graphic.
2. System on/off indication.
3. System fan on/off indication.
4. Outside air temperature indication.
5. Mixed air temperature indication.
6. Fan discharge air temperature indication.
7. Fan discharge temperature control point adjustment.
8. Coll control valve indications.
9. Return humidity control point adjustment.
10. Building static pressure indication.
11. Building static pressure indication.

A. All control points shall be addressed according to actual mechanical equipment identification numbers and room numbers.

END OF SECTION 230993
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MINISTRATIONS G

COLORADO

FORT

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