SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS – BID ADDENDUM 1

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

Direct Digital Control System 230923

1.2 SUMMARY

A. This section includes control sequences for HVAC equipment.

B. Related section 230923 "Direct Digital Control System" contains requirements that relate to this Section.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – SEQUENCE OF OPERATION

3.1 GENERAL

A. For each system listed provide direct digital control for the sequence of operation as stated in this section.

B. Power Fail/Auto Restart.

1. Upon the restoration of power following a power loss, the EMS shall analyze the status of all controlled equipment, compare it with normal programmed scheduling and turn equipment on or off as necessary to resume normal operations.
2. The EMS shall provide an orderly, staggered and predefined scheduling of return-to-normal operation of controlled equipment. The order in which equipment (or groups of equipment) is started, along with the time delay between starts, shall be user definable.

C. Fire Alarm Shut Down: In an alarm condition, the Fire Alarm system shall shut down fans through direct interlock. The EMS shall not shut down the fans. The EMS contractor shall ensure that dampers and valves position to their fail-safe positions.

D. All suggested setpoints and settings shall be adjustable.

E. Provide lockable, tamper-proof, clear plastic protective guards on all room

temperature sensors and thermostats located in public spaces (vestibules, corridors, locker rooms, auditoriums, kitchens, cafeterias, etc.). Provide temperature sensors installed under flush mounted protective plates in bathrooms. Provide metal protective guards on all room temperature sensors and thermostats located in gymnasiums, mechanical equipment rooms, shipping and receiving areas, etc.

F. For all analog measurements provide high and low limit and fault alarm indication. For all fans, pumps, etc., provide status alarm indication.

G. Provide indication of system modes: i.e., Occupied, Unoccupied, Warmup, Cooldown, Pre-Occupancy Purge, Post Occupancy Flush, etc. Differentiate as appropriate for all systems controlled or interfaced to.

H. All analog, binary and time variables and point information and adjustments shall be accessible via the OWS, web browser, etc.

I. All adjustment and acknowledgment permissions shall be password-level dependent.

J. Replace existing controls, thermostats, actuators, etc., with new devices as necessary for incorporation into the new EMS control system.

3.2 ONE-TO-ONE HEAT PUMP SYSTEM

A. The system shall operate under the factory control package complete with all safeties and alarms. EMS contractor shall wire all units and sensors.

B. The EMS system shall interface with the factory control package to monitor status, all alarms and failures via BACnet.

C. The condensing unit and indoor unit shall connect to the EMS via BACnet.

D. The EMS system shall be able to interface with the factory controls to adjust set points, enable and disable the units, and provide occupied / unoccupied schedules. All write commands to be change of value only. All read commands to be no more than once a minute.

E. Occupied: The fan coil supply fan shall run continuously and the system shall cycle the heating and cooling to maintain space temperature setpoint. In offices with fin radiation (hydronic or electric), the EMS shall enable and modulate the radiation control as a second stage to maintain its space temperature setting.

F. Unoccupied: The fan coil supply fan shall be off. Where applicable, the EMS shall modulate the fin radiation control to maintain the reduced 62°F unoccupied

space temperature setpoint. In offices without fin radiation, if the space temperature drops below the night set back set point of 62°F, the unit shall start and run on full heating until the space temperature rises 2°F above the night set back set point. When the space temperature is satisfied the fan coil shall be off.

G. The EMS shall provide the system with individual room set points. The EMS shall monitor the actual room temperatures through the packaged control system.

H. The EMS shall open the motorized outside air damper during occupied mode and close the damper during unoccupied mode.

I. Point List (Typical each space)

1. Space temperature
2. OA damper position command
3. Fin Radiation (where applicable)
4. All unit points available through the BACnet connection shall be visible and adjustable through the EMS to the full capabilities of the system.

3.3 STEAM CABINET HEATER

A. When the vestibule temperature drops below the 60°F heating setpoint as sensed by a wall mounted sensor, the EMS shall modulate the steam control valve and cycle the unit heater fan as necessary to maintain its setpoint. The cabinet heater shall not operate when the outdoor air temperature is greater than 45°F.

B. The EMS shall use a current sensor to confirm the fan is in the commanded state (i.e., on or off) and generate an alarm if status deviates from the EMS start/stop command.

C. Point List

1. Space temperature
2. Outside air temperature
3. Control valve position command
4. Fan speed command
5. Fan fault alarm

3.4 EXISTING STEAM RADIATOR

A. When the vestibule temperature drops below the 60°F heating setpoint as sensed by a wall mounted sensor, the EMS shall modulate the steam control valve as necessary to maintain its setpoint. The radiator shall not operate when the outdoor air temperature is greater than 45°F.

B. Point List

1. Space temperature
2. Outside air temperature
3. Control valve position command

3.5 HYDRONIC CABINET HEATER

A. When the vestibule temperature drops below the 60°F heating setpoint as sensed by a wall mounted sensor, the EMS shall modulate the hot water control valve and cycle the unit heater fan as necessary to maintain its setpoint. The cabinet heater shall not operate when the outdoor air temperature is greater than 45°F.

B. The EMS shall use a current sensor to confirm the fan is in the commanded state (i.e., on or off) and generate an alarm if status deviates from the EMS start/stop command.

C. Point List

1. Space temperature
2. Outside air temperature
3. Control valve position command
4. Fan speed command
5. Fan fault alarm

3.6 ELECTRIC CABINET HEATER

A. When the vestibule temperature drops below the 60°F heating setpoint as sensed by a wall mounted sensor, the EMS shall modulate the electric heat control and cycle the unit heater fan as necessary to maintain its setpoint. The cabinet heater shall not operate when the outdoor air temperature is greater than 45°F.

B. The EMS shall use a current sensor to confirm the fan is in the commanded state (i.e., on or off) and generate an alarm if status deviates from the EMS start/stop command.

C. Point List

1. Space temperature
2. Outside air temperature
3. Electric heat command
4. Fan speed command
5. Fan fault alarm

3.7 ENERGY RECOVERY VENTILATOR

A. The EMS shall schedule operation of the ERV. The supply and return/exhaust fans

shall run continuously unless commanded off by the EMS. The EMS shall use current sensors to confirm the fans are in the commanded state (i.e., on or off) and generate an alarm if status deviates from the EMS start/stop command.

B. Occupied Mode: The EMS shall open the intake and exhaust shutoff dampers. After the dampers are open, the unit supply and return/exhaust fans shall run continuously unless manually or safety stopped.

C. Unoccupied Mode: The unit shall be off. All dampers shall be closed.

D. Above its setting, a differential pressure switch shall signal a dirty filter alarm condition to the EMS.

E. Point List

1. Unit start/stop command
2. Shutoff damper position command
3. Supply fan status/alarm
4. Return fan status/alarm
5. Dirty filter alarm

3.8 VARIABLE REFIGERANT FLOW SYSTEM

A. The system shall operate under the factory control package complete with all safeties and alarms. EMS contractor shall wire all units, sensors and gateways.

B. The EMS system shall interface with the VRF factory control package/gateway to monitor status, all alarms and failures via BACnet.

C. The VRF Condensing Unit and all indoor units shall connect to the BACnet gateway.

D. The EMS system shall be able to interface with the factory controls to adjust set points and enable and disable the units. All write commands to be change of value only. All read commands to be no more than once a minute.

E. VRF Condensing Unit: The EMS shall enable the system operation during occupied periods and on a call for heating and cooling during unoccupied times.

F. Indoor Fan Coil Units: Fan coil operation is controlled through factory VRF system controls. The EMS shall provide time clock scheduling.

1. Occupied: The fan coil supply fan shall run continuously and the VRF system shall cycle the heating and cooling to maintain space temperature setpoint.
2. Unoccupied: The fan coil supply fan shall be off. The VRF system shall

cycle the supply fan to maintain individual room setback temperatures in the heating or cooling mode. When the space temperature is satisfied the fan coil shall be off.

3. Any zone and system can be placed back into occupied mode (2-hour override) by pressing a button on the face of the room thermostat.
4. The EMS shall provide the VRF system with individual room set points. The EMS shall monitor the actual room temperatures through the VRF control system.

G. The control valve(s) on the steam fin tube radiation shall be controlled through the VRF system control for FCU in the room with the valve. In offices with steam fin radiation, the control valve shall be modulated as a second stage of heating to maintain space temperature setting.

H. Point List

1. All fan coil and condensing unit points available through the VRF BACnet gateway shall be visible and adjustable through the EMS to the full capabilities of the system.
2. Fan coil supply air temperature
3. Steam fin tube radiation control valve position

END OF SECTION 230993