

SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Related Sections include the following:
 - 1. Division 23 equipment Sections detailing package controllers.

PART 2 – PRODUCTS

2.1 SEQUENCES OF OPERATION

- A. System – Air handling unit for supply fan.
- B. The constant volume air handling unit shall be provided with factory furnished and installed controller as specified in the air handling unit specification.
 - 1. System Off - When the system is off:
 - a. The unit outside air damper shall be closed.
 - b. The supply air fan shall be off.
 - c. The return air damper shall be open.
 - d. The relief air damper shall be closed.
 - e. All control loops shall be disabled.
 - 2. Initiation of System Start-Up - System start-up shall be initiated:
 - a. Automatically by local thermostat based on temperature setpoint, night setup, time schedule, restart following a fire alarm, or restart following a power failure.
 - 3. System Operation - When system start-up has been initiated, the following sequences shall be implemented:
 - a. The supply air fan shall be controlled as follows:
 - 1) The Supply air fan shall start at its minimum speed. Following an operator assigned time delay, the supply fan speed shall be modulated to maintain the duct static pressure setpoint. The speed of the fan shall not be adjusted by more than 20 percent of its maximum speed in any one (1) minute period.
 - 2) The static pressure setpoint shall be reset downwards via a control algorithm to optimize the energy usage. The static pressure setpoint shall be reset down in operator defined increments at operator defined intervals until such time as the primary air flowrate to one of the associated fan powered terminal units has been below the required value for more than an operator established period of time which shall be set initially at 1 minute. If the

primary air flowrate has been below the required value for more than the operator established period of time, then the static pressure setpoint shall be reset up in operator defined increments at operator defined intervals until such time as the required primary air flowrate to all of the associated fan powered terminal units has been achieved.

- b. The outside air damper shall open to the minimum airflow. Outdoor air flow shall modulate between maximum and minimum airflow settings as required by a CO² sensor located in the return air duct of the unit.
- c. If the outside air temperature is between operator-defined limits, and the return air enthalpy is greater than the outside air enthalpy, then the unit shall operate in economizer mode. The outside air and return air dampers shall be modulated to maintain the supply air temperature setpoint. The relief dampers shall modulate to maintain the space pressure space pressure setpoint. If the return dampers are fully open and the supply air temperature cannot be maintained, then the chilled water coil shall maintain the supply air temperature setpoint.
- d. Unoccupied mode: During the unoccupied mode space sensors falls above the night setback temperature (cooling 78°) or below the night setback temperature (heating 68°) the AHU unit supply fan will energize as described per the occupied period sequence. The return fan shall be off. On a call for heating or cooling the AHU shall operate as described per the occupied sequence.

4. Setpoints - The setpoints for the system shall be determined as follows:

- a. The supply air temperature setpoint shall be set manually by the operator and shall be set initially at 55 Deg. F.
- b. The duct static pressure setpoint shall be set by the operator and shall be set initially at 0.75 inches w.g. and shall have reset limits of 0.25 to 1.0 inches w.g.
- c. The time delay for static pressure reset down shall be initially set at 10 minutes.
- d. The time delay for static pressure reset up shall be initially set at 5 minutes.
- e. The static pressure reset down interval shall be initially set at 0.05 inches. w.g.
- f. The static pressure reset up interval shall be initially set at 0.1 inches w.g.
- g. Freezestat setpoint shall be set at the device for 35 Deg. F.
- h. and relief air dampers shall remain in the last commanded positions.

B. SYSTEM – EXHAUST FANS

- 1. Exhaust Fan shall be controlled by the BAS time-clock. BAS shall monitor run status.

C. SYSTEM – CABINET UNIT HEATERS

- 1. Cabinet unit heater with unit mounted thermostat shall cycle fan “on” and energize electric heating element upon a drop in zone temperature and activate supply fan, upon a rise in zone temperature the opposite shall occur.

END OF SECTION 230993