

HVAC CONTROLS SEQUENCE OF OPERATION, GENERAL CONTROL TYPES

1.01 GENERAL CONTROL TYPES

A. Motorized Damper Control:

1. When fan is commanded to start, first open its intake damper.
2. Provide end switch for open position of each damper.
3. Once damper is proved fully open, start respective fan.
4. Damper end switches shall stop respective fan if damper begins to close.
5. Close damper on fan shutdown.

B. Motor START/STOP Control:

1. Provide single contact closure for START/STOP control from HCP to each motor starter.
2. Contact shall be closed to START motor.
3. Contact shall be opened to STOP motor.
4. Provide terminal contacts for connection by Division 26, Electrical.
5. Hardwire ON and OFF poles of manual ON/OFF and ON/OFF/AUTO switches directly to terminal contacts, so that malfunction of microprocessor hardware does not prevent manual on and off override.
6. Coordinate with work of Division 26, Electrical.

C. Fan Failure and Ventilation Failure Alarms:

1. Work of Division 26, Electrical, includes provision of starter ON/OFF status signal to HCP for each fan motor controlled.
2. For controlled motors, initiate Fan Failure Alarm signal when motor is commanded to START and starter ON/OFF status indicates it is OFF.
3. In addition, provide differential pressure switch for each fan to determine actual flow failure. On lack of pressure differential, initiate Ventilation Failure Alarm. Include dual contacts at each differential pressure switch, one set for connection by Division 26, Electrical.

D. Lead/Lag Unit Control:

1. Operate designated units in lead/lag arrangement. Automatically alternate status on weekly basis.
2. If either lead or lag unit fails to operate on command, lock it out, reassign lag unit to replace it, and initiate Fan Failure Alarm.

- E. Low Temperature Shutdown:
1. Upon signal from Mixed Air or Discharge Temperature Sensors that temperature is below setpoint (38 degrees F adjustable), shut off fan, close outside air damper, open upstream heating coil control valve (if there is one), open cooling coil control valve (if there is one), and initiate Low Temperature Shutdown Alarm.
 2. Remain shutdown until manually reset or until temperature rises above 55 degrees F.
- F. Two-Speed Fan Control:
1. Provide adjustable time delay before engaging low speed when changing speed from high to low to allow fan to coast to lower rpm.
 2. Field adjust to time necessary for fan to slow from high speed down to halfway point between slow speed and stop.
- G. Common Alarm Output:
1. Initiate common alarm signal to SCADA process control system when alarm condition exists.
 2. Provide terminals for connection by Division 26, Electrical of alarm contact closure output signals.
 3. Contacts shall be rated for minimum of 2 amps at 120V ac.
 4. Coordinate with work of Division 26, Electrical, Section 40 90 00, Instrumentation and Control for Process Systems.
- H. Room Temperature Monitoring Output to SCADA System:
1. Provide 4 to 20 mA analog output signals to plant SCADA System for indicated room temperatures.
 2. Provide terminals at HVAC control panel (HCP) for connection by Division 26, Electrical.
- I. Change Filter Alarm: Unless otherwise indicated, sense filter pressure drop for each filter bank by means of differential pressure switch that closes electrical contact when filter pressure differential exceeds adjustable setpoint.
- J. Pump Failure Alarm:
1. Sense water flow for each pump by means of differential pressure switch or flow switch.
 2. Initiate Pump Failure Alarm when pump motor is commanded to START and no flow is detected.

K. Room Temperature Control:

1. Modulate heating coil control valve, or heating and cooling coil control valves in sequence with economizer cycle (where applicable) to maintain discharge temperature at set point.
2. Reset discharge temperature setpoint to maintain space temperature at set point.
3. Heating coil control valves shall fail normally open to coil, and cooling coil control valves shall fail normally closed to coil.

L. Occupied/Unoccupied Control:

1. Modes shall be determined by 7-day schedule with holiday calendar.
2. Provide momentary contact manual after-hours override switch at room temperature sensor.
3. Initially set after-hours override duration for 4 hours.

M. Freeze Protection Control:

1. Thermostat, with 20-foot length (minimum) capillary, secured to leaving heating coil face and responsive to coldest temperature shall stop fan, close outside air and exhaust dampers, stop associated supply and exhaust fans, and position heating valve for full flow through coil in event coil face temperature drops below 40 degrees F.
2. Freezestat shall be manually reset.
3. On blow-through units, locate freeze protection control in mixed air entering coil plenum.

N. Unit Heater Control:

1. Furnish separate ON/OFF/AUTO manual subbase selector switch with each room thermostat for each heater.
2. Room thermostat, through AUTO position of subbase switch, shall energize fan and burners to maintain space temperature indicated.
3. On shutdown, fan shall continue to operate until heat exchanger discharge temperature drops below 110 degrees F, as determined by heat dissipation thermostat located at heat exchanger discharge side.
4. In ON position, fan shall operate continuously and thermostat shall cycle burners.

END OF SECTION

