# SEQUENCE OF OPERATION GUIDELINE

## MIXED AIR VAV-PREHEAT-COOLING-SINGLE FAN

**Document:** **Mixed Air VAV-Prht-Clg-Single Fan**
**Revision:** **1.0**
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NOTES:

1. THIS SEQUENCE IS INTENDED TO PROVIDE THE DESIGN PROFESSIONAL WITH A BASIC GUIDELINE OF MINIMUM REQUIREMENTS FOR A TYPICAL MIXED AIR SINGLE PATH AHU WITH A PREHEAT COIL, COOLING COIL AND SINGLE FAN. THIS SEQUENCE SHALL BE CAREFULLY REVIEWED AND EDITED WITH RESPECT TO APPLICATION-SPECIFIC PROJECT REQUIREMENTS AND PROPOSED MODIFICATIONS SHALL BE REVIEWED WITH FSU STAFF.
2. THE INTENT IS FOR THIS SEQUENCE TO BE INCLUDED IN THE CONTRACT DRAWINGS.
3. REFERENCE STANDARD CONTROL DIAGRAMS IC-7

PROVIDE THE FOLLOWING FOR AIR HANDLING UNIT.

1. PREHEAT COIL CONTROL
2. COOLING COIL CONTROL
3. VARIABLE FREQUENCY DRIVE WITH STATIC PRESSURE CONTROL
4. ISOLATION DAMPER CONTROL
5. MIXED AIR DAMPER CONTROL

SAFETY CONTROL SEQUENCES: PROVIDE THE FOLLOWING SAFETY FUNCTIONS.

1. HIGH STATIC PRESSURE LIMIT: PROVIDE A SEPARATE HIGH STATIC PRESSURE SWITCH (ADJ) TO STOP THE FAN WHEN STATIC PRESSURE RISES TO [###] IN W.G. WITH MANUAL RESET.
2. SMOKE DETECTORS: SMOKE DETECTORS SHALL BE INSTALLED IN THE SUPPLY AIR DUCT WHERE SHOWN ON THE DRAWINGS TO STOP FAN AND SIGNAL THE FIRE ALARM.
3. SMOKE DAMPER: PROVIDE SMOKE DAMPERS IN THE SUPPLY AIR DUCT WHERE SHOWN ON THE DRAWINGS. HARDWIRE SMOKE DAMPERS TO CLOSE UPON UNIT SHUTDOWN AND OPEN ON FAN START UP. SMOKE DAMPERS SHALL OPEN/CLOSE WITHOUT BAS SUPPORT.
4. FREEZSTAT: PROVIDE LOW TEMPERATURE SAFETY SWITCH DOWNSTREAM OF PRE-HEAT COIL TO STOP THE FAN WHEN PRE-HEAT COIL DISCHARGE TEMPERATURE DROPS BELOW 38°F (ADJ). MANUAL RESET

START-STOP SEQUENCES: PROVIDE THE FOLLOWING OPERATIONAL AND INTERLOCK FUNCTIONS WHEN THE AIR HANDLING UNIT FAN IS STARTED OR STOPPED, UNLESS OTHERWISE NOTED. THESE SEQUENCES SHALL BE FUNCTIONAL FOR ANY REASON THE FAN STARTS-STOPS IN ANY MODE OF OPERATION (ALL VFD MODES, ALL AUTOMATIC AND SAFETY FUNCTIONS, AND LOCAL MANUAL START-STOP).

1. OUTSIDE AIR AND RETURN AIR DAMPERS: OPEN RETURN DAMPERS AND ENABLE OA AIRFLOW CONTROLUPON FAN SIGNAL TO START. IF FAN FAILS TO START WITHIN 60 SECONDS AFTER DAMPERS ARE OPEN, CLOSE THE OUTSIDE AIR DAMPER, OPEN THE RETURN AIR DAMPER AND SIGNAL FAN FAILURE ALARM.
2. COOLING COIL CONTROL VALVE: ENABLE COOLING COIL CONTROL VALVE UPON PROOF OF FAN START. CLOSE VALVE TO COIL UPON PROOF OF FAN STOP.
3. PREHEAT COIL CONTROL VALVE: ENABLE PREHEAT COIL CONTROL VALVE UPON PROOF OF FAN START. CLOSE VALVE TO COIL UPON PROOF OF FAN STOP.

FAN SPEED CONTROL: PROVIDE STATIC PRESSURE SENSORS MOUNTED ON SUPPLY AIR DUCTS AS INDICATED ON FLOOR PLAN. CONTROL THE VARIABLE SPEED DRIVE TO MAINTAIN THE CALCULATED STATIC PRESSURE SET-POINT. IN THE EVENT THE REMOTE STATIC PRESSURE BECOMES UNRELIABLE, REVERT CONTROL TO THE STATIC PRESSURE SENSOR LOCATED AT THE AHU AND INITIATE AN ALARM.

STATIC PRESSURE RESET CONTROL: BAS SHALL POLL THE DAMPER POSITION OF ALL AIR TERMINAL BOXES. IF ALL DAMPERS ARE BELOW 60% AS INDICATED BY COMMAND SIGNAL, THE BAS SHALL RESET THE STATIC PRESSURE SET-POINT DOWN AT A RATE OF -0.1" WG. IF ANY VAV BOX DAMPER COMMAND SIGNAL IS ABOVE 90%, THE BAS SHALL RESET STATIC PRESSURE SET-POINT UP AT A RATE OF +0.25" WG. THE BAS SHALL POLL ALL AIR TERMINALS CONTINUOUSLY AND LIMIT RESET FREQUENCY TO NO MORE THAN ONCE EVERY 15 MINUTES. LIMIT THE RESET TO A MINIMUM STATIC OF [###] INWG AND A MAXIMUM OF [###] AS SETERMINED BY THE TEST, ADJUST AND BALANCE PROCEDURE.

COOLING COIL CONTROL: THE BAS SHALL MODULATE THE COOLING COIL CONTROL VALVE AS REQUIRED TO MAINTAIN SUPPLY AIR DISCHARGE AIR TEMPERATURE (AS SENSED DOWNSTREAM OF FAN) SET-POINT OF 55°F (ADJ).

PREHEAT COIL CONTROL: THE BAS SHALL MODULATE THE PREHEAT COIL CONTOL VALVE AS REQUIRED TO MAINTAIN PREHEAT SUPPLY TEMPERATURE AT 52 DEGF (ADJ).

OUTSIDE AIR CONTROL: PROVIDE AIRFLOW MONITORING STATION OUTSIDE AIR DUCT TO MODULATE OUTSIDE AIR DAMPER AND RETURN AIR DAMPER IN SEQUENCE TO MAINTAIN THE OUTSIDE AIRFLOW SET-POINT REGARDLESS OF FAN SPEED OR FILTER LOADING. WITH THE RETURN AIR DAMPER OPEN, MODULATE THE OUTSIDE AIR DAMPER OPEN/CLOSED AS REQUIRED TO MAINTAIN THE CALCULATED AIR FLOW SETPOINT. IN THE EVENT THE OUTSIDE AIR DAMPER IS FULLY OPEN (100%) AND THE OUTSIDE AIR VOLUME IS BELOW SET-POINT, BEGIN MODULATING THE RETURN AIR DAMPER TOWARDS ITS CLOSED POSITION BUT NOT LESS THAN 50% (ADJ).

OUTDOOR AIR FLOW RESET CONTROL: BAS SHALL CONTINUOUSLY POLL ALL CO2 SENSORS, AND PERFORM A HIGH SELECT FUNCTION TO DETERMINE A VIRTUAL CO2 CONTROL POINT USED IN THE RESET CONTROL. IF THE CO2 CONTROL POINT IS LOWER THAN 700 PPM THE BAS SHALL BEGIN RESETTING THE OUTDOOR AIRFLOW SET-POINT DOWN AT A RATE OF -100 CFM EVERY 5 MINUTES UNTIL THE CO2 LEVELS RISE ABOVE 900 PPM OR OUTDOOR AIRFLOW REACHES THE LOW LIMIT OF [###] CFM. IF THE CO2 CONTROL POINT IS HIGHER THAN 1000 PPM THE BAS SHALL RESET THE OUTDOOR AIRFLOW SET-POINT UP AT A RATE OF +250 CFM EVERY 5 MINUTES UNTIL THE CONTROL

POINT FALLS BELOW 900 PPM OR THE OUTDOOR AIRFLOW SET-POINT REACHES THE HIGH LIMIT OF [###] CFM.

| AHU #<br>TYPE: IC-7 | | | POINT TYPE | | ALARM CONDITION | | | INTEGRATED POINT | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| SHORT NAME | POINT DESCRIPTION | UNITS | ANALOG | DIGITAL | EQUIP ALARM | HIGH LIMIT | LOW LIMIT | | |
| bbb_AHxxSS | AIR HANDLER START/STOP | ON/OFF | | X | X | | | | |
| bbb_AHxxS | AIR HANDLER STATUS | ON/OFF | | X | X | | | | |
| bbb_AHxxSF_VFD | SUPPLY FAN VFD OUTPUT | % | X | | | | | | |
| | | | | | | | | | |
| bbb_AHxxUV_SS | UV LIGHT START/STOP | ON/OFF | | X | X | | | | |
| bbb_AHxxUV_S | UV LIGHT STATUS | ON/OFF | | X | X | | | | |
| | | | | | | | | | |
| bbb_AHxxRA | RETURN AIR TEMPERATURE | DEG F | X | | | X | X | | |
| bbb_AHxxRH | RETURN AIR RELATIVE HUMIDITY | %RH | X | | | | | | |
| bbb_AHxx_CO2 | RETURN AIR CO2 SENSOR | PPM | X | | | X | | | |
| bbb_AHxxRD | MODULATING RETURN AIR DAMPER | %OPEN | X | | | | | | |
| | | | | | | | | | |
| bbb_AHxxMA | MIXED AIR TEMPERATURE | DEG F | X | | | X | X | | |
| | | | | | | | | | |
| bbb_AHxxOD | MODULATING OUTDOOR AIR DAMPER | %OPEN | X | | | | | | |
| bbb_AHxxOAFLW | FRESH AIR FLOW | CFM | X | | | | | | |
| bbb_AHxxOAFLW_SP | FRESH AIR FLOW SETPOINT | CFM | X | | | | | | |
| bbb_AHxxOAFLTDP | STATIC PRESSURE ACROSS OA FILTERS | INWG | X | | | X | | | |
| | | | | | | | | | |
| bbb_AHxxPT | PREHEAT AIR TEMPERATURE | DEG F | | | | X | X | | |
| bbb_AHxxPT_SP | PREHEAT AIR TEMPERATURE SETPOINT | DEG F | X | | | | | | |
| bbb_AHxxPHV | PREHEAT VALVE OUTPUT | %OPEN | X | | | | | | |
| bbb_AHxxHWR | HOT WATER RETURN TEMPERATURE | DEG F | X | | | | | | |
| | | | | | | | | | |
| bbb_AHxxCT | COOLING COIL AIR TEMPERATURE | DEG F | X | | | X | X | | |
| bbb_AHxxCT_SP | COOLING COIL AIR TEMPERATURE SETPOINT | DEG F | X | | | | | | |
| bbb_AHxxCV | COOLING VALVE OUTPUT | %OPEN | X | | | | | | |
| bbb_AHxxCHWR | CHILLED WATER RETURN TEMPERATURE | DEG F | X | | | | | | |
| | | | | | | | | | |
| bbb_AHxxSA | SUPPLY AIR TEMPERATURE | DEG F | X | | | X | X | | |
| bbb_AHxxSA_SP | SUPPLY AIR TEMPERATURE SETPOINT | DEG F | X | | | | | | |
| | | | | | | | | | |
| bbb_AHxxSAFETY_HI | AIR HANDLER HIGH PRESSURE SAFETY SHUTDOWN STATUS | NML/ALM | | X | X | | | | |
| bbb_AHxxRDS | RETURN AIR SMOKE DAMPER STATUS | OPN/CLO | | X | X | | | | |
| bbb_AHxxSDS | SUPPLY AIR SMOKE DAMPER STATUS | OPN/CLO | | X | X | | | | |
| | | | | | | | | | |
| bbb_AHxxFLTDP | COMPOUND STATIC PRESSURE ACROSS FILTERS | INWG | X | | | X | | | |
| | | | | | | | | | |
| bbb_AHxxSP1 | SUPPLY STATIC AFTER FAN | INWG | X | | | X | X | | |
| bbb_AHxxSP2 | STATIC 2/3 IN DUCT | INWG | X | | | X | X | | |
| bbb_AHxxSP2_SP | STATIC 2/3 IN DUCT SETPOINT | INWG | X | | | | | | |
| bbb_AHxxSAFLW | SUPPLY AIR FLOW | CFM | X | | | | | | |
| | | | | | | | | | |
| bbb_AHxxSHZ | SUPPLY FAN VFD HERTZ | HZ | X | | | | | X | |
| bbb_AHxxSKW | SUPPLY FANVFD KW DEMAND | KW | X | | | | | X | |
| bbb_AHxxSA | SUPPLY FAN VFD ALARM | KW | | X | X | | | X | |
| | | | | | | | | | |
| bbb_AHxx_RH1 | SPACE HUMIDITY SENSOR-1 | %RH | X | | | X | X | | |
| bbb_AHxx_RH2 | SPACE HUMIDITY SENSOR-2 | %RH | X | | | X | X | | |
| | | | | | | | | | |
| bbb_AHxx_CO2 | SPACE CO2 SENSOR-1 | PPM | X | | | X | | | |
| bbb_AHxx_CO2 | SPACE CO2 SENSOR-2 | PPM | X | | | X | | | |