SEQUENCE OF OPERATION GUIDELINE

100% OA VAV PREHEAT-COOLING-HUMIDIFIER-FAN ARRAY

Document: **100% OA VAV Htg-Clg-hum-Fan array**
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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 100% OA AHU WITH A PREHEAT COIL, COOLING COIL, HUMIDIFIER AND FAN ARRAY. 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-2

PROVIDE THE FOLLOWING FOR AIR HANDLING UNIT.

1. HEATING AND COOLING COIL CONTROL
2. HUMIDIFIER CONTROL WITH SPACE SENSORS AND HIGH LIMIT DEVICES
3. VARIABLE FREQUENCY DRIVE WITH STATIC PRESSURE CONTROL
4. ISOLATION 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 ARRAY WHEN STATIC PRESSURE RISES TO [###] IN W.G. WITH MANUAL RESET.
2. LOW STATIC PRESSURE LIMIT: PROVIDE A SEPARATE LOW STATIC PRESSURE SWITCH (ADJ) TO STOP THE FAN ARRAY WHEN STATIC PRESSURE DROPS BELOW [###] IN W.G. WITH MANUAL RESET.
3. SMOKE DETECTORS: SMOKE DETECTORS SHALL BE INSTALLED IN THE SUPPLY AIR DUCT WHERE SHOWN ON THE DRAWINGS TO STOP FAN ARRAY AND SIGNAL THE FIRE ALARM.
4. 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 ARRAY START UP. SMOKE DAMPERS SHALL OPEN/CLOSE WITHOUT BAS SUPPORT.
5. OUTSIDE AIR ISOLATION DAMPER: PROVIDE OUTSIDE AIR CONTROL DAMPERS IN THE OUTSIDE AIR SECTION WHERE SHOWN ON THE DRAWINGS. HARDWIRE OA CONTROL DAMPER TO CLOSE UPON UNIT SHUTDOWN AND OPEN ON FAN ARRAY START UP. OA CONTROL DAMPER SHALL OPEN/CLOSE WITHOUT BAS SUPPORT.
6. FREEZSTAT: PROVIDE LOW TEMPERATURE SAFETY SWITCH DOWNSTREAM OF PRE-HEAT COIL TO STOP THE FAN ARRAY WHEN PRE-HEAT COIL DISCHARGE TEMPERATURE DROPS BELOW 38°F (ADJ). MANUAL RESET
7. HIGH HUMIDITY LIMIT: PROVIDE HIGH HUMIDITY LIMITING DEVICE TO CLAMP THE CONTROL SIGNAL UPON REACHING THE HIGH LIMIT THRESHOLD.

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

1. OUTSIDE AIR AND SUPPLY AIR DAMPERS: OPEN OA AND SMOKE DAMPERS TO 100% UPON FAN ARRAY SIGNAL TO START. IF FAN ARRAY FAILS TO START WITHIN 60 SECONDS AFTER DAMPERS ARE OPEN, CLOSE DAMPERS AND SIGNAL FAN ARRAY FAILURE ALARM.
2. COOLING COIL CONTROL VALVE: ENABLE COIL CONTROL VALVE UPON PROOF OF FAN ARRAY START. CLOSE VALVE TO COIL UPON PROOF OF FAN ARRAY STOP.
3. PRE-HEATING COIL CONTROL VALVE: ENABLE COIL CONTROL VALVE UPON PROOF OF FAN ARRAY START. CLOSE VALVE TO COIL UPON PROOF OF FAN ARRAY STOP.
4. HUMIDIFIER: ENABLE HUMIDIFIER CONTROL UPON PROOF OF FAN ARRAY START. DISABLE HUMIDIFIER UPON PROOF OF FAN ARRAY STOP.

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

PREHEAT COIL CONTROL: BAS SHALL MODULATE THE PREHEAT COIL CONTROL VALVE AS REQUIRED TO MAINTAIN PREHEAT AIR TEMPERATURE (AS SENSED DOWNSTREAM OF PREHEAT COIL) SET-POINT OF 50°F (ADJ).

HUMIDIFIER CONTROL: BAS SHALL MODULATE THE HUMIDIFIER CONTROL VALVE AS NEEDED TO MAINTAIN THE CALCULATED SUPPLY AIR HUMIDITY SETPOINT (AS SENSED DOWNSTREAM OF HUMIDIFIER). MONITOR THE SPACE HUMIDITY SENSORS AND DETERMINE THE HIGHEST AVERAGE HUMIDITY VALUE.   THE SUPPLY AIR HUMIDITY SETPOINT SHALL BE RESET ACCORDING TO THE FOLLOWING RESET SCHEDULE.

1. SUPPLY HUMIDITY SETPOINT = 60%RH (ADJ) WHEN THE SPACE HUMIDITY IS 45%RH (ADJ);

2. SUPPLY AIR HUMIDITY SETPOINT =85%RH WHEN THE SPACE HUMIDITY IS 30%RH (ADJ). EVALUATE EVERY 10 MINUTES (ADJ)
3. DISABLE HUMIDIFIER CONTROL WHEN THE COOLING VALVE EXCEEDS 25% (ADJ).

AHU # TYPE: IC-2			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_AHxxFW1S	AIR HANDLER FAN WALL #1 STATUS	ON/OFF		X	X				
bbb_AHxxFW2S	AIR HANDLER FAN WALL #2 STATUS	ON/OFF		X	X				
bbb_AHxxFW3S	AIR HANDLER FAN WALL #3 STATUS	ON/OFF		X	X				
bbb_AHxxFW4S	AIR HANDLER FAN WALL #4 STATUS	ON/OFF		X	X				
bbb_AHxxFW5S	AIR HANDLER FAN WALL #5 STATUS	ON/OFF		X	X				
bbb_AHxxFW6S	AIR HANDLER FAN WALL #6 STATUS	ON/OFF		X	X				
bbb_AHxxFW7S	AIR HANDLER FAN WALL #7 STATUS	ON/OFF		X	X				
bbb_AHxxFW8S	AIR HANDLER FAN WALL #8 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_AHxxPT	PREHEAT AIR TEMPERATURE					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_AHxxSH	SUPPLY AIR RELATIVE HUMIDITY	%RH	X						
bbb_AHxxHV	HUMIDIFIER VALVE OUTPUT	%OPEN	X						
bbb_AHxxFZ	FREEZE SAFETY	NML/ALM		X	X				
bbb_AHxxSAFETY_	AIR HANDLER HIGH PRESSURE SAFETY SHUTDOWN STATUS	NML/ALM		X	X				
bbb_AHxxSAFETY_	AIR HANDLER LOW PRESSURE SAFETY SHUTDOWN STATUS	NML/ALM		X	X				
bbb_AHxxODS	OUTSIDE 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		