SEQUENCE OF OPERATION GUIDELINE

100% OA VAV PREHEAT-COOLING-ER-SINGLE FAN

Document: **100% OA VAV Htg-Clg-ER-Single Fan**
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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, ENERGY RECOVERY UNIT 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-3

PROVIDE THE FOLLOWING FOR AIR HANDLING UNIT.

1. HEATING AND COOLING COIL CONTROL
2. ENERGY RECOVERY SYSTEM CONTROL
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 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 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 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 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 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 WHEN PRE-HEAT COIL DISCHARGE TEMPERATURE DROPS BELOW 38°F (ADJ). MANUAL RESET
7.

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

ENERGY RECOVERY CONTROL: BAS SHALL ENABLE THE ENERGY RECOVERY WHEEL WHEN THE OUTDOOR AIR TEMPERATURES ARE BELOW 48 DEGF (ADJ) AND ABOVE 75 DEGF (ADJ). THE ENERGY RECOVERY WHEEL SHALL REMAIN OFF AT ALL OTHER CONDITIONS.

EXHAUST FAN CONTROL: INTERLOCK THE EXHAUST FAN TO RUN WHENEVER THE SUPPLY FAN IS RUNNING. THE EXHAUST FAN SPEED SHALL RUN IN PARALLEL WITH THE SUPPLY FAN SPEED BUT AT A PREDEFINED OFFSET ESTABLISHED THROUGH THE TEST ADJUST AND BALANCE PROCESS PROCEDURE.

AHU # TYPE: IC-3 SHORT NAME	POINT DESCRIPTION	UNITS	POINT TYPE		ALARM CONDITION			INTEGRATED POINT	NOTES
			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_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_HI	AIR HANDLER HIGH PRESSURE SAFETY SHUTDOWN STATUS	NML/ALM		X	X				
bbb_AHxxSAFETY_LO	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_EFxxSS	EXHAUST FAN START/STOP	ON/OFF		X	X				
bbb_EFxxS	EXHAUST FAN STATUS	ON/OFF		X	X				
bbb_EFxxSF_VFD	EXHAUST FAN VFD OUTPUT	%	X						
bbb_HWxxSS	HEAT WHEEL START/STOP	ON/OFF		X	X				
bbb_HWxxS	HEAT WHEEL STATUS	ON/OFF		X	X				
bbb_HWxxSF_VFD	HEAT WHEEL VFD OUTPUT	%	X						
bbb_HWxx_EAH	EXHAUST AIR TEMPERATURE ENTERING HW	DEG F	X			X	X		
bbb_HWxx_EAT	EXHAUST AIR RELATIVE HUMIDITY ENTERING HW	%RH	X						

bbb_EFxxEAFLW	EXHAUST AIR FLOW	CFM	X						
bbb_EFxxFLTDP	COMPOUND STATIC PRESSURE ACROSS FILTERS	INWG	X						
bbb_HWxx_LAH	EXHAUST AIR TEMPERATURE LEAVING HW	DEG F	X			X	X		
bbb_HWxx_LAT	EXHAUST AIR RELATIVE HUMIDITY LEAVING HW	%RH	X						
bbb_AHxx_EAH	SUPPLY AIR TEMPERATURE ENTERING HW	DEG F	X			X	X		
bbb_AHxx_EAT	SUPPLY AIR RELATIVE HUMIDITY ENTERING HW	%RH	X						
bbb_AHxx_LAH	SUPPLY AIR TEMPERATURE LEAVING HW	DEG F	X			X	X		
bbb_AHxx_LAT	SUPPLY AIR RELATIVE HUMIDITY LEAVING HW	%RH	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	NML/ALM		X	X			X	
bbb_EFxxHZ	EXHAUST FAN VFD HERTZ	HZ	X					X	
bbb_EFxxKW	EXHAUST FANVFD KW DEMAND	KW	X					X	
bbb_Efxx_A	EXHAUST FAN VFD ALARM	NML/ALM		X	X			X	
bbb_HWxxHZ	HEAT WHEEL FAN VFD HERTZ	HZ	X					X	
bbb_HWxxKW	HEAT WHEEL FANVFD KW DEMAND	KW	X					X	
bbb_HWxx_A	HEAT WHEEL FAN VFD ALARM	NML/ALM		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		