



#### 7. EXHAUST FAN EF-135-2 CONTROL (FAN INTEGRAL TO AHU)

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| 7.1 | STARTUP, HARDWARE PROTECTION SHALL PREVENT EXHAUST FAN FROM RAMPING UP UNTIL DAMPERS ARE POSITIONED EITHER FOR PRE-COOLING MODE OR VENTILATION MODE. ALL AUTO DAMPER POSITIONS SHALL BE PROVEN BY END SWITCHES. |
| 7.2 | DURING SYSTEM DISABLE, VSMC FOR THE EXHAUST FAN SHALL RAMP DOWN AND STOP.   |
| 7.3 | DURING SYSTEM ENABLE IN VENTILATION MODE, VSMC FOR THE EXHAUST FAN SHALL MODULATE TO MAINTAIN SPACE STATIC PRESSURE $-0.2"$ $(-5\text{MM})$ ADJ.  |
| 7.4 | DURING SYSTEM ENABLE IN PRE-COOLING MODE, THE EXHAUST FAN SHALL NOT OPERATE.  |

## 8. TEMPERATURE CONTROL

- 8.1 SUPPLY AIR TEMPERATURE, SENSED BY TT-1, SHALL BE MAINTAINED VIA DIGITAL CONTROL PANEL BY OPERATING THE DX REFRIGERATION COOLING SYSTEM MODULATING COMPRESSORS AND RECIRCULATING HOT GAS MIXTURE. SETPOINT SHALL BE AS REQUIRED BY MODE OF OPERATION.
- 8.2 PRE-COOLING MODE: WHEN THE TEMPERATURE OF THE OUTSIDE AIR, SENSED BY TT-EXOA, IS ABOVE 75°F (23.9°C) (ADD), BY MODULATING THE DX REFRIGERATION COOLING SYSTEM WITH CONSTANT AIRFLOW OF AHU-1352-1, IF IN PRE-COOL MODE AND AHU-1351 STATUS IF OFF, CHANGE TO VENTILATION MODE.
- 8.3 VENTILATION MODE: ROOM SPACE TEMPERATURE, SENSED BY SPACE THERMOSTAT 1 IN ROOM 201, SHALL BE MAINTAINED AT SETPOINT 80°F (27°C) (ADD), BY MODULATING THE DX REFRIGERATION COOLING SYSTEM.
- 8.4 VENTILATION MODE: WHEN THE TEMPERATURE OF THE OUTSIDE AIR, SENSED BY TT-EXOA, IS ABOVE 75°F (23.9°C) (ADD), DAMPERS D1 AND D-2 SHALL INDEX TO THE FULL RETURN AIR POSITION, THE SUPPLY FAN OF AHU-1352 SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE, SENSED BY 1-IN ROOM 201.
- 8.5 VENTILATION MODE: WHEN THE TEMPERATURE OF THE OUTSIDE AIR, SENSED BY TT-EXOA, IS ABOVE 65°F (18.3°C) AND THE SUPPLY AIR TEMPERATURE SENSED BY TT-1, DAMPERS D1 AND D-2 SHALL INDEX TO FULL OUTSIDE AIR POSITION, THE SUPPLY FAN OF AHU-1352 SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE, SENSED BY 1-IN ROOM 201.
- 8.6 VENTILATION MODE: WHEN THE TEMPERATURE OF THE OUTSIDE AIR, SENSED BY TT-EXOA, IS BELOW THE SUPPLY AIR TEMPERATURE, SENSED BY TT-1, DAMPERS D1 AND D-2 SHALL MODULATE TO MAINTAIN THE SCHEDULED SUPPLY AIR TEMPERATURE.
- 8.7 AHU-1352 SHALL BE LOCKED OUT WHEN OUTDOOR AIR TEMPERATURE, SENSED BY TT-EXOA, IS BELOW 45°F (7°C) (ADD).
- 8.8 HEATING OF UPPER STORAGE ROOM SHALL BE BY EXISTING STEAM SYSTEMS. ADJUST ASSOCIATED EXISTING THERMOSTATS TO MAINTAIN 60°F (16.3°C) (ADD). EXISTING STEAM UNIT HEATERS ARE NOT TIED INTO THE BUILDING AUTOMATION SYSTEM.

## 9. HUMIDITY CONTROL

- 9.1 NEW UNIT AHU-135-2 HAS NO HUMIDIFIER.
- 9.2 DEHUMIDIFICATION IS A BY-PRODUCT OF THE DX REFRIGERATION SYSTEM IN CONJUNCTION WITH THE HOT GAS REHEAT COIL.
- 9.3 WHEN SUPPLY AIR HUMIDITY, SENSED BY TT-1, IS SATISFIED BUT HUMIDITY, SENSED BY MT-1, EXCEEDS SETPOINT OF 60% RH (ADJ.), THE COMPRESSORS WILL CONTINUE TO OPERATE WHILE MODULATING HOT GAS REHEAT VALVE TO MAINTAIN SETPOINT OF TT-1 AND MT-1.
10. FREIZEE PROTECTION

### 10.1 IF THE AIR TEMPE

- (17.C), AS SENSED BY TSL-1 THE SUPPLY FANS SHALL SHUT DOWN AND A CRITICAL ALARM SHALL INDICATE AT THE DIGITAL CONTROL PANEL AND ECC. TSL-1 SHALL BE HARDWIRED TO THE VSMC (Q) SUPPLY FAN AND EXHAUST FAN AND AHU-13-2 SHALL BE SHUTDOWN IN HAND, AUTO OR BYPASS MODE. TSL-1 WILL REQUIRE MANUAL RESET AT THE DEVICE.
11. **AUTOMATIC SHUTDOWN / RESTART**
- 11.1 WHEN SMOKE IS DETECTED BY EITHER DUCT SMOKE DETECTOR (SD), AHU-13-2 SHALL SHUTDOWN PER SECTION 3.6 AND AN ALARM SIGNAL SHALL BE TRANSMITTED TO THE FIRE ALARM SYSTEM. A MANUAL RESET WILL BE REQUIRED.
12. **EMERGENCY CONSTANT SPEED OPERATION**
- 12.1 UPON FAILURE OF THE VSMC, THE SUPPLY FAN SHALL BE STARTED/STOPPED MANUALLY AT THE DIGITAL CONTROL PANEL OR BY TSL-1 THROUGH THE BYPASS STARTER. FAN SHALL THEN BE OPERATED AT CONSTANT SPEED IN THE PRE-COOLING MODE.

## 1. SCOPE

1. PROJECT INVOLVES COMPLETE CONTROL INSTALLATION ON NEW ROOFTOP AIR HANDLING UNIT AHU-135-2, ALONG WITH NEW DUCT MOUNTED DAMPERS AND INTERFACING WITH EXISTING CONTROLS OF AHU-135-1.
2. GENERAL
- 2.1 SYSTEM CONSISTS OF NEW ROOFTOP AIR HANDLING UNIT AHU-135-2 HAVING TWO MODES OF OPERATION - NOT OCCURRING SIMULTANEOUSLY.  
- PRE-COOLING MODE WILL SUPPLY PRE-COOLED OUTSIDE AIR INTO AHU-135-1.  
- VENTILATION MODE WILL SUPPLY AND RETURN AIR TO RECEIVING 201 & 202.  
AHU-135-2 WILL OPERATE EITHER IN PRE-COOLING MODE OR VENTILATION MODE WITH PRE-COOLING MODE HAVING PRIORITY - AVAILABLE 24/7.
- 2.2 THE NEW UNIT AHU-135-2 WILL NOT HAVE OCCUPANCY CONTROL.
- 2.3 EXISTING UNIT AHU-135-1 IS A CONSTANT VOLUME, 100% OUTSIDE AIR UNIT SUPPLYING WITH 22,000 CFM 24/7.
3. AHU-135-2 ENABLE/DISABLE
- 3.1 AHU-135-2 IS NORMALLY ENABLED WHEN OUTDOOR AIR TEMPERATURE, SENSED BY TT-EXOA, IS ABOVE 45°F [7°C](ADJ.).
- 3.2 AHU-135-2 TO OPERATE IN PRE-COOLING MODE WHEN OUTDOOR AIR SENSED BY TT-EXOA IS GREATER THAN 75°F [25.6°C] (ADJ.) OR CALCULATED OUTDOOR ENTHALPY IS MORE THAN 25 BTU/LB (J) OF MOIST AIR USING MOISTURE TRANSMITTANCE MT-EXRH AND TT-EXOA. DAMPERS D-1 AND D-4 OPEN, DAMPERS D-2 AND D-3 CLOSED.
- 3.3 AHU-135-2 TO OPERATE IN PRE-COOLING MODE DURING HEATING SEASON WHEN CHILLER COMMAND IS "OFF" AND OUTDOOR AIR SENSED BY TT-EXOA IS GREATER THAN 55°F [25.6°C] (ADJ.).
- 3.4 AHU-135-2 TO OPERATE IN VENTILATION MODE WHEN THE SPACE TEMPERATURE SENSED BY T-1 IN ROOM 201 IS GREATER THAN 78°F [25.6°C] (ADJ.) AND PRE-COOLING MODE IS NOT REQUIRED. DAMPERS D-1 AND D-4 CLOSED, DAMPERS D-2 AND D-3 OPEN.
- 3.5 AHU-135-2 IS DISABLED WHEN THE UNIT SWITCH AT THE PRIMARY CONTROLLER IS TURNED OFF OR THE SYSTEM ENABLE/DISABLED VIRTUAL POINT IS SWITCH TO 'DISABLE'.
- 3.6 DURING SOFTWARE SHUTDOWN (DISABLE) OF AHU-135-2, ALL FANS SHALL STOP, DX REFRIGERATION COOLING SYSTEM SHALL STOP, DAMPERS D-1 AND D-4 CLOSED, DAMPERS D-2 AND D-3 OPEN, FAN SHALL SHUT DOWN, EVEN IF IN HAND.
- 3.7 DURING PRE-COOLING MODE, UPON OBSERVED "OFF" FAN STATUS OF AHU-135-1, IMMEDIATELY SWITCH AHU-135-2 TO VENTILATION MODE.
4. AHU-135-2 HARDWARE SHUTDOWN
- 4.1 AUTOMATIC HARDWARE SHUTDOWN SHALL RESULT FROM TEMPERATURE LOW LIMIT TSL-1, DUCT SMOKE DETECTOR(S), LOW STATIC PRESSURE PSL-1 (0.5"), HIGH STATIC PRESSURE PSH-1 (2"), FIRE ALARM PANEL CONNECTION.
- 4.2 DURING A HARDWARE SHUTDOWN, AHU-135-2 SHALL SHUTDOWN PER SECTION 3.6.
- 4.3 PROVIDE A MANUAL RESET BUTTON TO OVERRIDE AND AUTOMATICALLY STARTUP AND RESUME NORMAL OPERATION OF AHU-135-2.
5. NOT USED.
6. SUPPLY FAN SAF-135-2 CONTROL (FAN INTEGRAL TO UNIT)
- 6.1 STARTUP: HARDWARE PROTECTION SHALL PREVENT SUPPLY FAN FROM RAMPING UP UNTIL DAMPERS ARE POSITIONED EITHER FOR PRE-COOLING MODE OR VENTILATION MODE. ALL AUTO DAMPER POSITIONS SHALL BE PROVEN BY END SWITCHES.
- 6.2 DURING SYSTEM DISABLE, VSMC FOR THE SUPPLY FAN SHALL RAMP DOWN AND STOP PER PARAGRAPH 3.6.
- 6.3 DURING SYSTEM ENABLE, VSMC FOR THE SUPPLY FAN SHALL MAINTAIN CONSTANT SPEED FOR EITHER PRE-COOLING AIRFLOW OR VENTILATING AIRFLOW - DEPENDING ON MODE OF OPERATION.
- 6.4 DURING OPERATION OF VSMC IN BYPASS, INDEX DAMPERS TO PRE-COOLING MODE POSITION.

DDC POINT CHARTS				INPUTS				OUTPUTS				SYSTEM FEATURES															
Zablocki VA Medical Center Install EMS Bldg 102	ANALOG				DIGITAL				ANALOG				DIGITAL				ALARMS	MISCELLANEOUS				NOTES					
	TEMPERATURE	RELATIVE HUMIDITY	PRESSURE	FLOW	SETPOINT ADJUST	OTHER	STATUS	ALARM	OVERIDE	OTHER	ELECTRIC MODULATING	OTHER	ENABLE/DISABLE	START/STOP	OPEN/CLOSE	ON/OFF	OTHER	HIGH ANALOG	LOW ANALOG	OFF NORMAL	RUNTIME		TREND	SYSTEM GRAPHIC	KW/KWH	OTHER	OTHER
AIR HANDLING UNIT AHU-135-2 (See Sequences for applicable points)																						X					
Space Conditions [T-1 & PDT-1]	X		X			X												X	X		X	X					
Outdoor Air [TT-EX-0A]	X	X																X	X		X	X					
Unit Return Air [TT-4]	X			X														X	X		X	X					
Unit Mixed Air [TT-3 & PSL-1]	X		X		X		X	X													X	X					
Unit Discharge Air [TT-1 & PSH-1]	X		X		X		X	X										X	X		X	X					
DX Coil Discharge Air [TT-2]	X				X																X	X					
Outdoor Air Damper [ZC/D-1]							X				X			X							X	X				w/ End Switches	
Return Air Damper [ZC/D-2]							X				X			X							X	X				w/ End Switches	
Ventilation Mode Damper [ZC/D-3]							X				X			X							X	X				w/ End Switches	
Pre-Cooling Mode Damper [ZC/D-4]							X				X			X												w/ End Switches	
Fire Alarm Shutdown [SD]							X	X													X	X				Fire Alarm Override	
Filter Differential [PDS-1]			X					X										X			X	X					
Freeze-Stat [TSL-1]							X	X														X	X				
Supply Fan [IT]							X	X			X			X							X	X					
Supply Fan VSMC						X	X	X			X										X	X	X			Full Communication	
Exhaust Fan [IT]							X	X			X			X							X	X					
Exhaust Fan VSMC						X	X	X			X										X	X				Full Communication	
Run Mode						X																X	X				
Service Mode									X													X	X				
Economizer Mode						X																X	X				
DX Compressor			X				X	X			X		X					X	X		X	X				Each Compressor	
Unit Alarms							X	X													X	X				All Unit Alarms	
AIR HANDLING UNIT AHU-135-1 Mixed Intake Air [TT-5]	X			X														X	X		X	X					
Discharge Air [TT-EX-0A]	X			X														X	X		X	X					
PROVIDE ADDITIONAL CONTROLS POINTS AS DESCRIBED IN THE SEQUENCE OF OPERATION AND UNIT CONTROLS SCHEMATIC DRAWING.																											

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