

1 VARIABLE AIR VOLUME AIR HANDLING UNIT CONTROL DIAGRAM

NTS

SEQUENCE OF OPERATION FOR VARIABLE AIR VOLUME AIR HANDLING UNIT AH-1-BN10RF-01

1. GENERAL

- 1.1 UNIT IS NORMALLY STARTED AND STOPPED REMOTELY AT THE ECC. H-0-A SWITCH SHALL BE KEPT IN THE "AUTO" POSITION. "HAND" AND "OFF" POSITIONS SHALL BE USED ONLY FOR MAINTENANCE. WHEN THE UNIT IS "OFF" D-1, D-3, SHALL BE FULLY CLOSED. WHEN THE UNIT IS "ON" D-1, SD-1 AND SD-2 SHALL BE FULLY OPEN. D-2 AND D-3 SHALL MODULATE IN ACCORDANCE WITH THE FOLLOWING SEQUENCE:

2. TEMPERATURE CONTROL

- 2.1 SUPPLY AIR TEMPERATURE, SENSED BY TT-1, SHALL BE MAINTAINED AT SETPOINT VIA DIGITAL CONTROL PANEL BY MODULATING V-1 OR D-2 AND D-3 OR V-2 IN SEQUENCE.
- 2.2 WHEN THE TEMPERATURE OF THE OUTSIDE AIR, SENSED BY TT-2, IS ABOVE 75°F [23.9°C], THE DIGITAL CONTROL PANEL SHALL PREVENT THE MODULATION OF D-2 AND D-3 AND SHALL ASSUME THE MINIMUM OUTSIDE AIR POSITION (D-2 FULLY OPENED AND D-3 FULLY CLOSED). THE DIGITAL CONTROL PANEL SHALL MODULATE V-1 TO MAINTAIN THE SUPPLY AIR TEMPERATURE, SENSED BY TT-1.
- 2.3 WHEN THE TEMPERATURE OF THE OUTSIDE AIR, SENSED BY TT-2, IS BETWEEN 65°F [18.3°C] AND THE SUPPLY AIR TEMPERATURE SENSED BY TT-1, DAMPER D-2 SHALL FULLY CLOSE AND D1 AND D3 SHALL BE FULLY OPEN (MAXIMUM OUTSIDE AIR POSITION). THE DIGITAL CONTROL PANEL SHALL MODULATE V-1 TO MAINTAIN THE SUPPLY AIR TEMPERATURE, SENSED BY TT-1.
- 2.4 WHEN THE TEMPERATURE OF THE OUTSIDE AIR, SENSED BY TT-2, IS BELOW THE SUPPLY AIR TEMPERATURE, SENSED BY TT-1, DAMPERS D1, D-2 AND D-3 SHALL MODULATE TO MAINTAIN THE SCHEDULED SUPPLY AIR TEMPERATURE. IF D-2 IS OPEN AND D-3 IS CLOSED TO MINIMUM OUTSIDE AIR, V-2 SHALL MODULATE OPEN TO MAINTAIN THE SUPPLY AIR TEMPERATURE, SENSED BY TT-1.

3. AIR FLOW CONTROL

- 3.1 THE SUPPLY AIR FLOW SHALL BE CONTROLLED BY THE DIGITAL CONTROL PANEL MODULATING THE SUPPLY FAN ADJUSTABLE SPEED MOTOR CONTROLLER TO MAINTAIN 1.0" [25mm] OF DUCT STATIC PRESSURE (FIELD ADJUSTABLE), SENSED BY SPS-1. RESET STATIC PRESSURE BASED ON ACTUAL BUILDING LOAD BY POLLING ALL ATU.
- 3.2 THE DIGITAL CONTROL PANEL, USING TOTAL SUPPLY AIR AND RETURN AIR FLOW SIGNALS, SHALL RESET THE EXHAUST AIR FAN ASD TO MAINTAIN A CONSTANT AIR FLOW DIFFERENCE BETWEEN THE SUPPLY AIR AND THE RETURN AIR EQUAL TO MINIMUM OUTSIDE AIR.
- 3.3 USING HIGH PRESSURE SENSOR SPS-2 LOCATED AT THE SUPPLY FAN DISCHARGE, SHALL PREVENT THE SUPPLY FAN FROM DEVELOPING OVER 3" [75mm] OF STATIC PRESSURE (FIELD ADJUSTABLE). IF STATIC PRESSURE AT SPS-2 DOES EXCEED 3" [75mm] THE SUPPLY AIR FAN SHALL STOP. SPS-2 SHALL BE HARDWIRED TO THE SUPPLY FAN UFD AND UNIT SHALL BE SHUTDOWN IN HAND/AUTO OR BYPASS MODE. SPS-2 WILL REQUIRE MANUAL RESET AT THE DEVICE.

4. HUMIDITY CONTROL

- 4.1 WHEN THE DIGITAL CONTROL PANEL IS NOT CALLING FOR HUMIDITY, SENSED BY RETURN AIR HUMIDITY H-1, 2-WAY "ON-OFF" CONTROL VALVE V-3 SHALL REMAIN CLOSED. WHEN THE DIGITAL CONTROL PANEL IS CALLING FOR HUMIDITY, V-3 SHALL REMAIN OPEN.
- 4.2 RETURN AIR HUMIDITY SHALL BE MAINTAINED AT SETPOINT OF 35% RH (A/D) VIA DIGITAL CONTROL PANEL BY MODULATING CONTROL VALVE V-4 TO MAINTAIN THE DESIRED HUMIDITY. THE DCP SHALL OVERRIDE THIS CONTROL TO MAINTAIN HUMIDITY OF 80% AS SENSED BY H-2. DCP SHALL CLOSE VALVE V-3 WHENEVER THE SUPPLY FAN IS OFF. VALVE V-4 SHALL BE INTERLOCKED WITH A TEMPERATURE SWITCH TO KEEP THE HUMIDIFIER OFF UNTIL CONDENSATE TEMPERATURE APPROACHES STEAM TEMPERATURE.

5. FREEZE PROTECTION

- 5.1 IF THE AIR TEMPERATURE AS SENSED BY TT-3 FALLS BELOW 45°F [7°C], AN ALARM SIGNAL SHALL INDICATE AT THE DCP AND ECC. IF THIS TEMPERATURE FALLS BELOW 40°F [4.4°C], AS SENSED BY THE TSL THE SUPPLY AND RETURN FANS SHALL SHUT DOWN AND A CRITICAL ALARM SHALL INDICATE AT THE DIGITAL CONTROL PANEL AND ECC. TSL SHALL BE HARDWIRED TO THE SUPPLY FAN UFD AND UNIT SHALL BE SHUTDOWN IN HAND/AUTO OR BYPASS MODE. TSL WILL REQUIRE MANUAL RESET AT THE DEVICE.

6. AUTOMATIC SHUTDOWN/RESTART

- 6.1 WHEN SMOKE IS DETECTED BY DUCT SMOKE DETECTOR, SD, THE SUPPLY AND RETURN FANS SHALL SHUT "OFF" AND AN ALARM SIGNAL SHALL BE TRANSMITTED TO THE FIRE ALARM SYSTEM. ALL SMOKE DAMPERS IN THE SUPPLY AND RETURN DUCTS SHALL CLOSE.
- 6.2 EXHAUST FANS SERVING AREA OF THE SUPPLY FAN SHALL CONTINUE TO RUN. SUPPLY AND RETURN FANS SHALL RESTART AND SMOKE DAMPERS SHALL OPEN WHEN FIRE ALARM CIRCUIT IS RESET.

7. EMERGENCY CONSTANT SPEED OPERATION

- 7.1 UPON FAILURE OF THE VFD, THE SUPPLY AND RETURN FANS SHALL BE STARTED/STOPPED MANUALLY AT THE DIGITAL CONTROL PANEL OR THE ECC THROUGH THE BY-PASS STARTER. FANS SHALL THEN BE OPERATED AT CONSTANT SPEED.

			POINT LEGEND	SYSTEM OUTPUTS		SYSTEM INPUTS		SYSTEM SOFTWARE/CONTROL																												
				BINARY	ANA- LOG	BINARY	ANALOG	ALARM PROCESSING	APPLICATION/FUNCTION																											
SYSTEM: VAV AIR HANDLER	Point ID	Abbreviation	RETURN AIR TEMPERATURE	RETURN AIR HUMIDITY	RETURN AIR FLOW (CFM)	MIXED AIR TEMPERATURE	PRE-HEAT TEMPERATURE	COOLING COIL TEMPERATURE	DISCHARGE AIR TEMPERATURE	DISCHARGE STATIC PRESSURE	DISCHARGE AIR HUMIDITY	SUPPLY AIR FLOW (CFM)	OUTSIDE AIR TEMPERATURE	RETURN LOW PRESSURE	RETURN FAN STATUS	SUPPLY FAN STATUS	MIXED AIR LOW LIMIT	STATIC PRESSURE HIGH LIMIT	HUMIDITY HIGH LIMIT	SUPPLY FAN VFD ALARM	EXHAUST FAN VFD ALARM	EXHAUST FAN VFD	SUPPLY FAN VFD	OUTSIDE AIR DAMPER	RETURN AIR DAMPER	EXHAUST AIR DAMPER	MINIMUM OUTSIDE AIR DAMPER	PRE-HEAT VALVE V-2	COILING VALVE V-1	STEAM HUMIDIFIER VALVE V-4	EXHAUST FAN START/STOP	SUPPLY FAN START/STOP	STEAM ISOLATION VALVE V-3	REMARKS		
SYSTEM COMPONENT:																																				
Return air Temperature	AI-1	RAT																																		
Return Air Humidity	AI-2	RAH																																		
Return Air Flow (cfm)	AI-3	SAF																																		
Mixed Air Temperature	AI-4	MAT																																		
Pre-Heat Temperature	AI-5	PHT																																		
Cooling Coil Temperature	AI-6	CCT																																		
Discharge Air Temperature	AI-7	DAT																																		
Discharge Static Pressure	AI-8	DASP																																		
Discharge Air Humidity	AI-9	DAH																																		
Supply Air Flow (cfm)	AI-10	SAF																																		
OUTSIDE AIR TEMPERATURE	AI-11	OAT																																		
RETURN LOW PRESSURE	BI-1	RLP																																		
RETURN FAN STATUS	BI-2	RF-ST5																																		
SUPPLY FAN STATUS	BI-3	SF-ST5																																		
MIXED AIR LOW LIMIT	BI-4	TSL-1																																		
STATIC PRESSURE HIGH LIMIT	BI-5	SPS-2																																		
HUMIDITY HIGH LIMIT	BI-6	HHL																																		
SUPPLY FAN VFD ALARM	BI-7	SF-ALA																																		
EXHAUST FAN VFD ALARM	BI-8	RF-ALA																																		
EXHAUST FAN VFD	AO-1	RF-SPD																																		FULL COMMUNICATION
SUPPLY FAN VFD	AO-2	SF-SPD																																		FULL COMMUNICATION
OUTSIDE AIR DAMPER	AO-3	OAD																																		
RETURN AIR DAMPER	AO-4	RAD																																		
EXHAUST AIR DAMPER	AO-5	EAD																																		
MINIMUM OUTSIDE AIR DAMPER	AO-7	MIN-OAD																																		
PRE-HEAT VALVE V-2	AO-8	PHT-V1																																		
COILING VALVE V-1	AO-9	CLG-V1																																		
STEAM HUMIDIFIER VALVE V-4	AO-10	HUM-V4																																		
EXHAUST FAN START/STOP	BO-1	RF-SST																																		
SUPPLY FAN START/STOP	BO-2	SF-SST																																		
STEAM ISOLATION VALVE V-3	BO-3	HUM-ISO-V3																																		

POINTS LIST FOR VAV AIR HANDLING UNIT WITH MINIMUM OUTSIDE AIR AND ERV

2

NTS

SEQUENCE OF OPERATION FOR SURGE MODE

- 1.1 UPON ACTIVATION OF SURGE MODE, EF2-1E SHALL ENERGIZE, WD2-1E SHALL OPEN IN FULL POSITION, AND WD1-1E SHALL BE FULLY CLOSED. SURGE MODE SHALL BE ACTIVATED VIA CENTRAL CONTROL IN BOILER ROOM.
- 1.2 AHU OUTSIDE AIR DAMPER SHALL BE SWITCHED TO POSITION 3 WHEN SURGE MODE IS ACTIVATED.

CONTROLS SYMBOLS

T	ROOM THERMOSTAT
M	ROOM HUMIDISTAT
TT	TEMPERATURE TRANSMITTER
TT	TEMPERATURE TRANSMITTER, AVERAGING ELEMENT
MT	MOISTURE (HUMIDITY) TRANSMITTER
PT	PRESSURE TRANSMITTER
SPS	STATIC PRESSURE SENSOR
FT	FLOW TRANSMITTER
IT	CURRENT TRANSMITTER
CT	CONDUCTIVITY TRANSMITTER
SD	SMOKE DETECTOR
M	ELECTRIC OPERATED CONTROL DAMPER/OR VALVE
dPT	DIFFERENTIAL PRESSURE TRANSMITTER
HS	HAND SWITCH (HAND-OFF-AUTO SWITCH)
KC	TIME CLOCK CONTROLLING EQUIPMENT ON A SCHEDULE
ZC	VALVE OR DAMPER POSITION CONTROLLER
KR	LOCAL RECORDING TIME CLOCK (RUNTIME)
TSL	TEMPERATURE SWITCH, LOW (FREEZE/STAT)
LC	LEVEL CONTROLLER
LT	LEVEL TRANSMITTER
PSH	PRESSURE SWITCH HIGH
KR	LOCAL RECORDING TIME CLOCK (RUNTIME)
S20	INSTRUMENT OR CONTROL AIR AT 20-PSIG
EPT	ELECTRONIC TO PNEUMATIC TRANSDUCER
AT _{CO2}	CARBON DIOXIDE TRANSMITTER
AT _{CO}	CARBON MONOXIDE TRANSMITTER
AT _{OC}	OCCUPANCY SENSOR
LTGP	LOCAL TEMPERATURE CONTROL PANEL
HVAC	HVAC CONTROL PANEL
ASD	ADJUSTABLE SPEED DRIVE
AFMD	AIR FLOW MEASURING DEVICE
ECC	INTEGRATE CONTROL POINT ON REMOTE GRAPHICS WORKSTATION AT ENERGY CONTROL CENTER
TC	TEMPERATURE CONTROLLER. SEE SEQUENCE OF OPERATION
PC	PRESSURE CONTROLLER. SEE SEQUENCE OF OPERATION
SC	SPEED CONTROLLER. SEE SEQUENCE OF OPERATION
FC	FLOW CONTROLLER. SEE SEQUENCE OF OPERATION
⊗	MOTOR STARTER
FS	FLOW SWITCH
tee	TEMPERATURE SENSING ELEMENT FOR TRANSMITTING TEMPERATURE TO EMCS (PROVIDE 12 INCHES [300mm] MINIMUM LENGTH IN DUCT WHEN SPACE PERMITS.)
tee A	SENSOR WITH AVERAGING ELEMENT TO TRANSMIT TEMPERATURE TO EMCS
M	CONTROL AIR MAIN
EP	ELECTRO-PNEUMATIC (EP) SWITCH

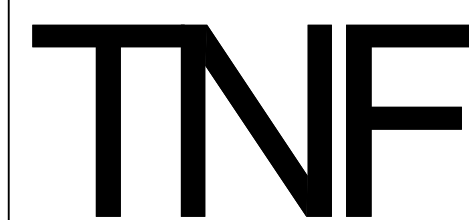
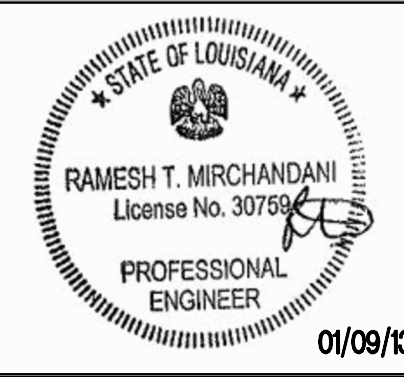
NOTE: NOT ALL SYMBOLS ABOVE ARE USED

CONSULTANTS:



The Estopinal Group
820 Jordan Street, Suite 507 tel. 318.424.3700
Shreveport, LA 71101 fax 318.424.3764

PROJECT MANAGERS AND ENGINEERS:



3 EXECUTIVE COURT, UNIT 4
SOUTH BARRINGTON, IL 60010

A VETERAN OWNED COMPANY

Drawing Title

MECHANICAL CONTROL DETAILS
& SEQUENCE OF OPERATIONS

Approved Project Director

Project Title

RENOVATE ED + PRIMARY CARE

Location

SHREVEPORT VAMC
510 EAST STONER AVE

Date

01/09/13

Checked

RM

Drawn

SL

Project Number

667-10-100

Building Number

1N, 1E

Drawing Number

M7.1

Dwg. 74 of 112

Office of
Construction
and Facilities
Management



Scale: AS NOTED