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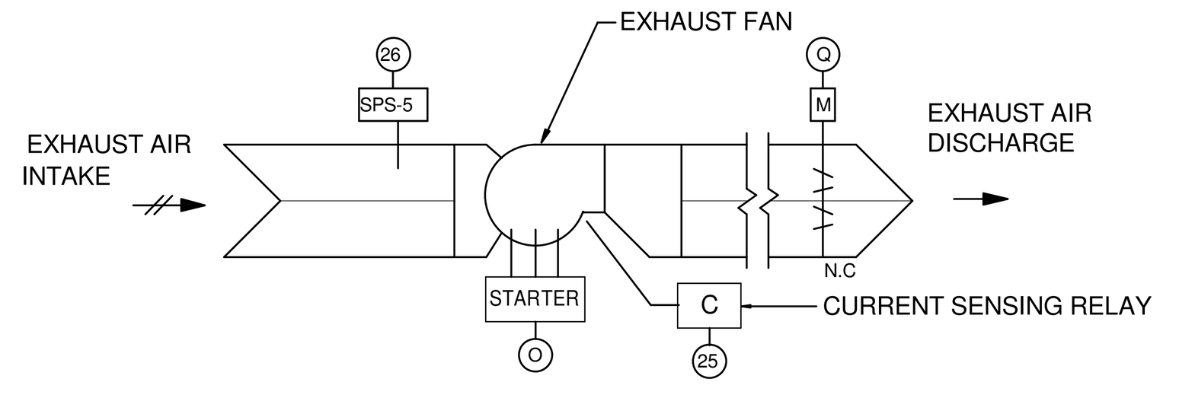

(302-EF1 & 2)

GENERAL EXHAUST FANS

1 EXHAUST FAN CONTROLS

1.1 EXHAUST FAN SHALL BE STARTED AND STOPPED BY THE DCP OR REMOTELY AT THE ECC. EACH FAN SHALL BE SOFTWARE INTERLOCKED TO OPERATE WITH ITS RESPECTIVE AIR HANDLING UNIT (302-EF1 WITH 302-AHU2 AND 302-EF2 WITH 302-AHU3). H-O-A SWITCH SHALL BE KEPT IN THE "AUTO" POSITION. "HAND" AND "OFF" SHALL BE USED ONLY FOR MAINTENANCE.

1.2 THE DCP, USING HIGH PRESSURE SENSOR SPS-5 LOCATED AT THE EXHAUST FAN INLET, SHALL PREVENT THE EXHAUST FAN FROM DEVELOPING OVER 2 INCHES OF NEGATIVE STATIC PRESSURE (FIELD ADJUSTABLE). IF STATIC PRESSURE AT SPS-5 EXCEEDS 2 INCHES OF NEGATIVE STATIC PRESSURE, THE FAN SHALL BE SHUT OFF AND AN ALARM SHALL BE SENT TO THE ECC.

GENERAL NOTES

1 A COMPLETE SYSTEM OF AUTOMATIC TEMPERATURE CONTROLS SHALL BE INSTALLED UNDER THIS CONTRACT AS REQUIRED TO ACCOMPLISH THE SEQUENCE OF CONTROL FOR VARIOUS ITEMS OF EQUIPMENT AND SYSTEMS AS DESCRIBED HEREINAFTER. THE SYSTEM SHALL BE A DIRECT DIGITAL CONTROL SYSTEM UTILIZING ELECTRIC ACTUATION.

2 ELECTRICAL WORK INCLUDES A POWER SOURCE TO THE MOTOR STARTERS. ALL HVAC POWER SOURCES REQUIRED BEYOND THESE STARTERS OR BEYOND SOURCES EXPLICITLY SHOWN ON THE ELECTRICAL DRAWINGS, SHALL BE PROVIDED UNDER THE ATC WORK. THIS WORK SHALL INCLUDE BUT NOT BE LIMITED TO WIRING, CONDUIT, TRANSFORMERS, RELAYS AND FUSES.

3 BULB WELLS FOR TEMPERATURE SENSING AS INDICATED SHALL BE FURNISHED UNDER THE ATC WORK AND INSTALLED AS PART OF THE HVAC PIPING WORK. PIPING WORK SHALL INCLUDE PROPERLY SIZED WELDOLET OR THREADOLET FITTINGS PLACED AS DIRECTED BY THE CONTROL SYSTEM SUPPLIER.

4 POINTS LIST IS SHOWN AS AN AID TO THE CONTRACTOR INDICATING THE MINUMUM POINTS REQUIRED FOR CONTROL AND MONITORING. ALL INPUT AND OUTPUT POINTS, AND THEIR REQUIRED INTERFACE AND ACCESSORY HARDWARE, SHALL BE PROVIDED FOR A COMPLETE AND FUNCTIONAL CONTROL SYSTEM. IF OR WHEN ADDITIONAL POINTS ARE REQUIRED TO ACCOMPLISH THE SEQUENCES OF CONTROL SPECIFIED, THESE POINTS, ALONG WITH ADDITIONAL DIRECT DIGITAL CONTROL PANEL(S) (IF REQUIRED), SHALL ALSO BE PROVIDED.

5 DIAGRAMS, SEQUENCES, AND POINTS LIST SHOWN ON THIS SHEET ARE INTENDED TO REPRESENT A SINGLE TYPICAL AIR HANDLING SYSTEM. NOT ALL SYSTEMS HAVE THE SAME QUANTITY OF POINTS. REFER TO FLOOR PLANS FOR MORE INFORMATION.

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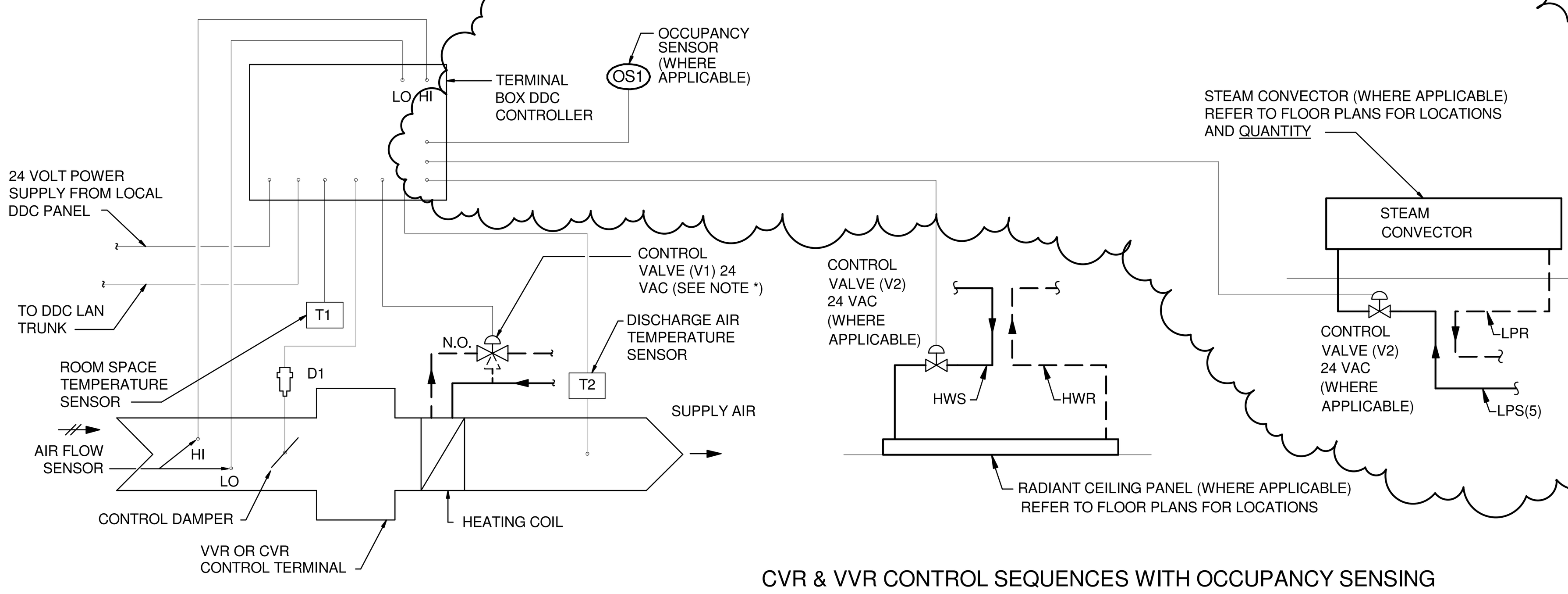
SEQUENCE OF OPERATION FOR 302-AHU1

1. 302-AHU1 CONTROLS ARE EXISTING TO REMAIN. UNIT SHALL CONTINUE TO OPERATE AS CURRENTLY DESIGNED.



* REFER TO AIR TERMINAL UNIT SCHEDULE ON SHEET H0.3 FOR VALVE TYPE (2-WAY OR 3-WAY)

CVR AND VVR TERMINAL CONTROLS

1

VV CONTROL SEQUENCES WITH OCCUPANCY SENSING

1 VARIABLE VOLUME TERMINAL CONTROL

1.1 DURING THE OCCUPIED MODE OF OPERATION, WHEN ROOM TEMPERATURE AT T1 IS BELOW SETPOINT, THE CONTROL DAMPER ACTUATOR, D1 SHALL MODULATE THE DAMPER TO REDUCE AIRFLOW TO THE SUMMER MINIMUM SETTING.

1.2 EACH TERMINAL UNIT SHALL INCLUDE AN AIRFLOW SENSOR FOR CALCULATING CFM, AND A DISCHARGE AIR TEMPERATURE SENSOR

1.3 EXTEND 24 VOLT POWER TO THE TERMINAL BOX CONTROLLER FROM THE ASSOCIATED AIR HANDLING UNIT DDC CONTROL PANEL.

1.4 ROOM SPACE TEMPERATURE SET POINT SHALL BE ADJUSTABLE FROM THE FRONT END COMPUTER INTERFACE.

1.5 OCCUPANCY SENSOR OS1 PROVIDED UNDER DIV. 26 SHALL DETERMINE OCCUPIED/UNOCCUPIED MODES OF OPERATION. TO INVOKE UNOCCUPIED SEQUENCE (1.6 BELOW), OCCUPANCY SENSORS FOR GIVEN TERMINAL UNIT ZONE MUST SATISFY THIS CONDITION. EXTEND LOW VOLTAGE WIRING FROM ALL APPLICABLE OCCUPANCY SENSOR(S) TO THE TERMINAL BOX CONTROLLER.

1.6 DURING THE UNOCCUPIED MODE OF OPERATION, THE CONTROL DAMPER ACTUATOR D1 SHALL POSITION TO THE UNOCCUPIED AIRFLOW SETTING (REFER TO AIR TERMINAL UNIT SCHEDULE, SHEET H0.3).

1.7 DURING THE UNOCCUPIED MODE OF OPERATION, WHEN THE ROOM TEMPERATURE AT T1 IS ABOVE THE UNOCCUPIED COOLING SETPOINT (REFER TO HVAC DESIGN DATA SCHEDULE, SHEET H0.2), THE CONTROL SHALL INDEX TO THE OCCUPIED COOLING MODE OF OPERATION. THE CONTROL SHALL REVERT TO UNOCCUPIED OPERATION (SEE 2.7 ABOVE) WHEN ROOM TEMPERATURE T1 REDUCES 2 DEGREES (ADJUSTABLE) BELOW THE UNOCCUPIED COOLING SETPOINT.

DATA ROOM TEMPERATURE MONITORING

1 ROOM TEMPERATURE MONITORING

1.1 ROOM TEMPERATURE SHALL BE MONITORED IN EACH OF THE FOUR DATA ROOMS (SEE FLOOR PLANS).

1.2 IF TEMPERATURE RISES ABOVE 80 DEG. AN ALARM SIGNAL SHALL INDICATE AT THE DCP AND ECC.

2 TRENDING

2.1 ROOM TEMPERATURE SHALL BE CONTINUOUSLY TRENDED FOR EACH DATA ROOM. (15 MINUTE INTERVALS)

CVR & VVR CONTROL SEQUENCES WITH OCCUPANCY SENSING

1 CONSTANT VOLUME REHEAT TERMINAL CONTROL

1.1 DURING THE OCCUPIED MODE OF OPERATION, WHEN ROOM TEMPERATURE AT T1 IS BELOW SETPOINT, HOT WATER VALVE V1 AND V2 (WHERE APPLICABLE) SHALL MODULATE OPEN TO COIL TO MAINTAIN TEMPERATURE SETPOINT. BOX DAMPER D1 SHALL REMAIN AT CONSTANT MAXIMUM CFM.

1.2 EACH TERMINAL UNIT SHALL INCLUDE AN AIRFLOW SENSOR FOR CALCULATING CFM, AND A DISCHARGE AIR TEMPERATURE SENSOR.

1.3 EXTEND 24 VOLT POWER TO THE TERMINAL BOX CONTROLLER FROM THE ASSOCIATED AIR HANDLING UNIT DDC CONTROL PANEL.

1.4 ROOM SPACE TEMPERATURE SET POINT SHALL BE ADJUSTABLE FROM THE FRONT END COMPUTER INTERFACE.

1.5 OCCUPANCY SENSOR OS1 PROVIDED UNDER DIV. 26 SHALL DETERMINE OCCUPIED/UNOCCUPIED MODES OF OPERATION. TO INVOKE UNOCCUPIED SEQUENCE (1.6 BELOW), OCCUPANCY SENSORS FOR ALL SPACES ON A GIVEN TERMINAL UNIT ZONE MUST SATISFY THIS CONDITION. EXTEND LOW VOLTAGE WIRING FROM ALL APPLICABLE OCCUPANCY SENSOR(S) TO THE TERMINAL UNIT CONTROLLER.

1.6 DURING THE UNOCCUPIED MODE OF OPERATION, THE CONTROL DAMPER ACTUATOR D1 SHALL POSITION TO THE UNOCCUPIED AIRFLOW SETTING (REFER TO AIR TERMINAL UNIT SCHEDULE, SHEET H0.3).

1.7 DURING THE UNOCCUPIED MODE OF OPERATION, WHEN THE ROOM TEMPERATURE AT T1 IS BELOW THE UNOCCUPIED HEATING SETPOINT (REFER TO HVAC DESIGN DATA SCHEDULE, SHEET H0.2), THE CONTROL SHALL INDEX TO THE OCCUPIED HEATING MODE OF OPERATION. THE CONTROL SHALL REVERT TO UNOCCUPIED OPERATION (SEE 1.6 ABOVE) WHEN ROOM TEMPERATURE T1 RISES 2 DEGREES (ADUSTABLE) ABOVE THE UNOCCUPIED HEATING SETPOINT.

1.8 DURING THE UNOCCUPIED MODE OF OPERATION, WHEN THE ROOM TEMPERATURE AT T1 IS ABOVE THE UNOCCUPIED COOLING SETPOINT (REFER TO HVAC DESIGN DATA SCHEDULE, SHEET H0.2), THE CONTROL SHALL INDEX TO THE OCCUPIED COOLING MODE OF OPERATION. THE CONTROL SHALL REVERT TO UNOCCUPIED OPERATION (SEE 1.6 ABOVE) WHEN ROOM TEMPERATURE T1 REDUCES 2 DEGREES (ADJUSTABLE) BELOW THE UNOCCUPIED COOLING SETPOINT.

2 VARIABLE VOLUME REHEAT TERMINAL CONTROL

2.1 DURING THE OCCUPIED MODE OF OPERATION, WHEN ROOM TEMPERATURE AT T1 IS BELOW SETPOINT, THE CONTROL DAMPER ACTUATOR, D1 SHALL MODULATE THE DAMPER TO REDUCE AIRFLOW TO THE SUMMER MINIMUM SETTING. ON A FURTHER DROP IN ROOM TEMPERATURE AT T1, THE CONTROL DAMPER SHALL BE MODULATED UPWARD TO THE WINTER MINIMUM AIRFLOW AND THE HOT WATER VALVE V1 AND V2 (WHERE APPLICABLE) SHALL MODULATE OPEN TO COIL TO MAINTAIN TEMPERATURE SETPOINT.

2.2 DURING THE OCCUPIED MODE OF OPERATION, AS ROOM TEMPERATURE RISES ABOVE SETPOINT, HOT WATER VALVE V1 SHALL CLOSE. IF THE ROOM TEMPERATURE CONTINUES TO RISE ABOVE SETPOINT, DAMPER D1 SHALL MODULATE FROM SUMMER (COOLING) MINIMUM AIRFLOW TO MAXIMUM AIRFLOW TO MAINTAIN ROOM TEMPERATURE.

2.3 EACH TERMINAL UNIT SHALL INCLUDE AN AIRFLOW SENSOR FOR CALCULATING CFM, AND A DISCHARGE AIR TEMPERATURE SENSOR

2.4 EXTEND 24 VOLT POWER TO THE TERMINAL BOX CONTROLLER FROM THE ASSOCIATED AIR HANDLING UNIT DDC CONTROL PANEL.

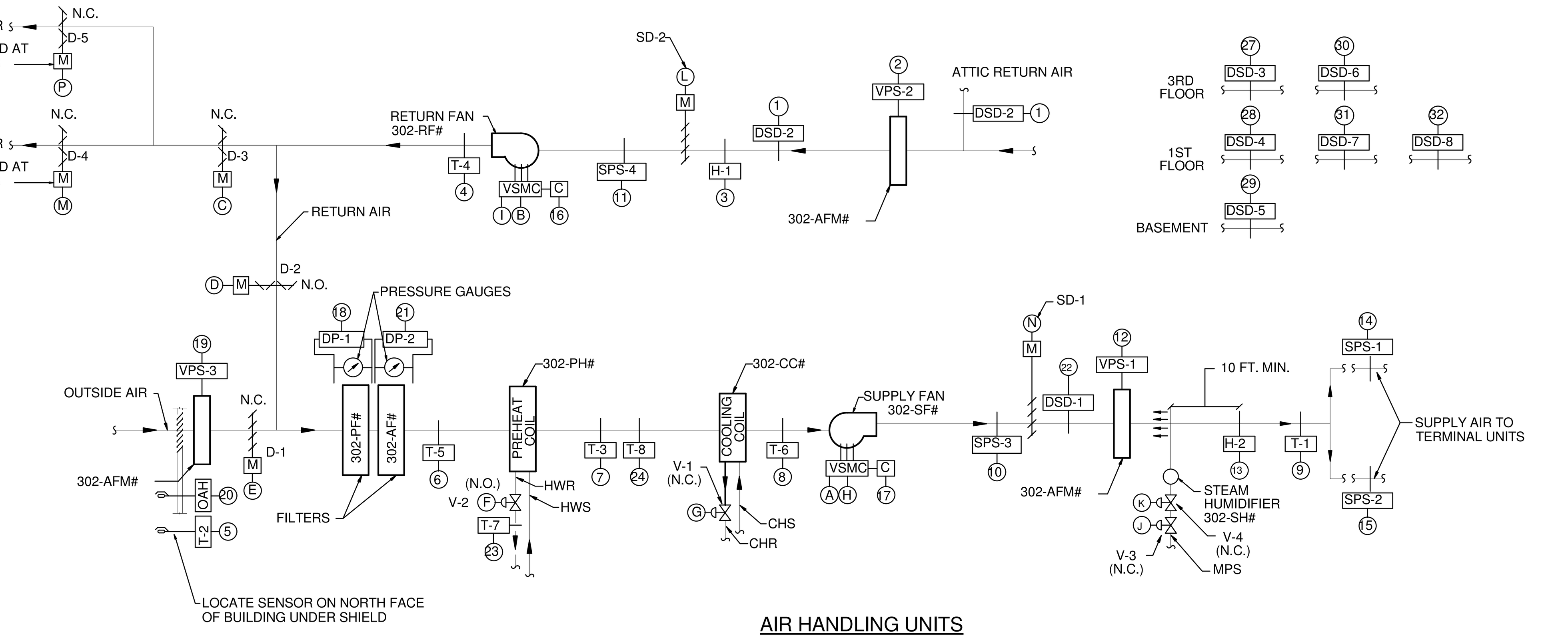
2.5 ROOM SPACE TEMPERATURE SET POINT SHALL BE ADJUSTABLE FROM THE FRONT END COMPUTER INTERFACE.

2.6 OCCUPANCY SENSOR OS1 PROVIDED UNDER DIV. 26 SHALL DETERMINE OCCUPIED/UNOCCUPIED MODES OF OPERATION. TO INVOKE UNOCCUPIED SEQUENCE (2.7 BELOW), OCCUPANCY SENSORS FOR ALL SPACES ON A GIVEN TERMINAL UNIT ZONE MUST SATISFY THIS CONDITION. EXTEND LOW VOLTAGE WIRING FROM ALL APPLICABLE OCCUPANCY SENSOR(S) TO THE TERMINAL BOX CONTROLLER.

2.7 DURING THE UNOCCUPIED MODE OF OPERATION, THE CONTROL DAMPER ACTUATOR D1 SHALL POSITION TO THE UNOCCUPIED AIRFLOW SETTING (REFER TO AIR TERMINAL UNIT SCHEDULE, SHEET H0.3).

2.8 DURING THE UNOCCUPIED MODE OF OPERATION, WHEN THE ROOM TEMPERATURE AT T1 IS BELOW THE UNOCCUPIED HEATING SETPOINT (REFER TO HVAC DESIGN DATA SCHEDULE, SHEET H0.2), THE CONTROL SHALL INDEX TO THE OCCUPIED HEATING MODE OF OPERATION. THE CONTROL SHALL REVERT TO UNOCCUPIED OPERATION (SEE 2.7 ABOVE) WHEN ROOM TEMPERATURE T1 RISES 2 DEGREES (ADJUSTABLE) ABOVE THE UNOCCUPIED HEATING SETPOINT.

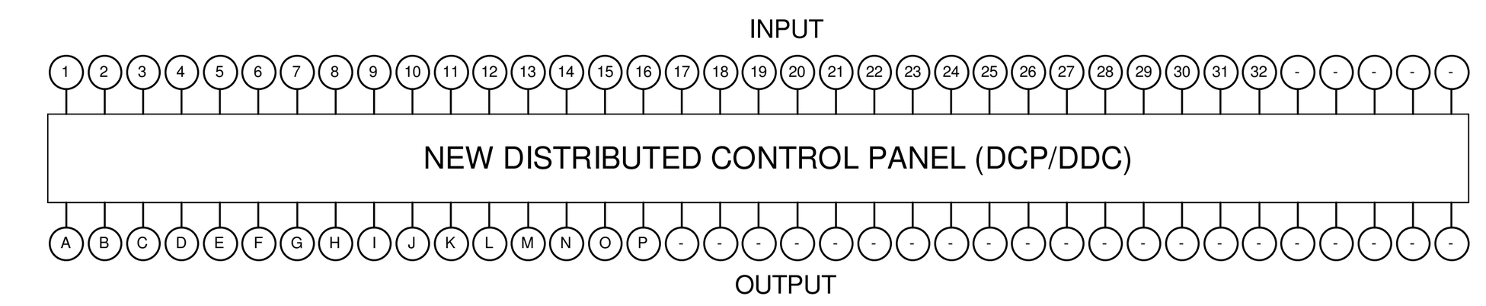
2.9 DURING THE UNOCCUPIED MODE OF OPERATION, WHEN THE ROOM TEMPERATURE AT T1 IS ABOVE THE UNOCCUPIED COOLING SETPOINT (REFER TO HVAC DESIGN DATA SCHEDULE, SHEET H0.2), THE CONTROL SHALL INDEX TO THE OCCUPIED COOLING MODE OF OPERATION. THE CONTROL SHALL REVERT TO UNOCCUPIED OPERATION (SEE 2.7 ABOVE) WHEN ROOM TEMPERATURE T1 REDUCES 2 DEGREES (ADJUSTABLE) BELOW THE UNOCCUPIED COOLING SETPOINT.



AIR HANDLING UNITS 302-AHU2 & 3

LEGEND (APPLIES TO AIR HANDLING UNITS 302-AHU2 & 3)

AFM	AIR FLOW MEASURING DEVICE	MONITORS AIR FLOW RATE AND PROVIDES VELOCITY PRESSURE FOR TRANSMITTAL TO DCP
C	CURRENT SENSING RELAY	TRANSMITS MOTOR CURRENT TO DCP TO INDICATE STATUS OF FANS.
D-1	MODULATING OUTSIDE AIR DAMPER	PROPORTIONS FLOW OF OUTSIDE AIR IN RESPONSE TO DCP AND CLOSES WHEN SUPPLY FAN STOPS
D-2	MODULATING RETURN AIR DAMPER	PROPORTIONS FLOW OF RETURN AIR IN RESPONSE TO DCP AND OPENS WHEN SUPPLY FAN STOPS
D-3	MODULATING RELIEF AIR DAMPER	PROPORTIONS FLOW OF RELIEF AIR IN RESPONSE TO DCP AND CLOSES WHEN SUPPLY FAN STOPS
D-4 D-5 D-6	TWO POSITION RELIEF/EXHAUST AIR DAMPER	CLOSES WHEN THE UNIT IS OFF
DCP	DIRECT DIGITAL CONTROL PANEL	CONTROLS OPERATION OF AIR HANDLING UNIT IN ACCORDANCE WITH THE SEQUENCE OF OPERATION
DP-1 DP-2	DIFFERENTIAL PRESSURE SENSOR	TRANSMITS DIFFERENTIAL PRESSURE TO DCP TO INDICATE FILTER CONDITION
DSD	DUCT SMOKE DETECTORS (FURNISHED AND WIRED TO FIRE ALARM PANEL BY ELECTRICAL)	PROVIDE SMOKE SIGNAL TO DCP
ECC	ENGINEERING CONTROL CENTER	LOCATED IN ENGINEERING BUILDING FOR MONITORING OF SYSTEM OPERATIONS
H-1 H-2	SUPPLY/RETURN AIR HUMIDITY SENSOR	SENSES AND TRANSMITS SUPPLY/RETURN AIR HUMIDITY TO DCP FOR CONTROL AND INDICATION
SD-1 SD-2	SUPPLY/RETURN DUCT ISOLATION SMOKE DAMPER	CLOSES WHEN THE UNIT IS OFF
SPS-1 SPS-2	SUPPLY DUCT STATIC PRESSURE SENSOR	SENSES AND TRANSMITS DUCT STATIC PRESSURE TO DCP FOR CONTROL AND INDICATION
SPS-3 SPS-4 SPS-5	DUCT HIGH LIMIT STATIC PRESSURE SENSOR	SENSES AND TRANSMITS DUCT STATIC PRESSURE NEAR SUPPLY FAN TO DCP
T-1	SUPPLY AIR TEMPERATURE SENSOR	SENSES AND TRANSMITS SUPPLY AIR DRY BULB TEMPERATURE TO DCP FOR CONTROL AND INDICATION
T-2	OUTSIDE AIR TEMPERATURE SENSOR	SENSES AND TRANSMITS OUTSIDE AIR DRY BULB TEMPERATURE TO DCP FOR CONTROL AND INDICATION
T-3	PREHEAT COIL LEAVING AIR TEMPERATURE SENSOR	SENSES AND TRANSMITS PREHEAT AIR DRY BULB TEMPERATURE TO DCP FOR CONTROL AND INDICATION
T-4	RETURN AIR TEMPERATURE SENSOR	SENSES AND TRANSMITS RETURN AIR DRY BULB TEMPERATURE TO DCP FOR INDICATION ONLY
T-5	MIXED AIR TEMPERATURE SENSOR	SENSES AND TRANSMITS MIXED AIR DRY BULB TEMPERATURE TO DCP FOR CONTROL AND INDICATION
T-6	COOLING COIL LEAVING AIR TEMPERTURE	SENSES AND TRANSMITS COOLING COIL DISCHARGE AIR TEMPERATURE TO DCP FOR INDICATION ONLY
T-7	PREHEAT COIL LEAVING WATER TEMPERATURE SENSOR	SENSES AND TRANSMITS PREHEAT COIL LEAVING WATER TEMPERATURE TO DCP FOR CONTROL AND INDICATION
T-8	FREEZESTAT	SHUTS DOWN SUPPLY FAN UPON SENSING FREEZE CONDITION.
V-1	MODULATING CHILLED WATER CONTROL VALVE	PROPORTIONS FLOW OF CHILLED WATER TO COOLING COIL IN RESPONSE TO DCP
V-2	MODULATING HOT WATER CONTROL VALVE	PROPORTIONS FLOW OF HOT WATER TO PREHEAT COIL IN RESPONSE TO DCP
V-3	TWO-POSITION ISOLATION STEAM CONTROL VALVE	CONTROLS STEAM FLOW TO HUMIDIFIER
V-4	MODULATING STEAM CONTROL VALVE	PROPORTIONS FLOW OF STEAM TO HUMIDIFIER IN RESPONSE TO DCP
VPS	VELOCITY PRESSURE SENSOR	SENSES AND TRANSMITS VELOCITY PRESSURE TO DCP
VSMC	VARIABLE SPEED MOTOR CONTROLLER WITH MOTOR STARTER	CONTROLS SUPPLY AND RETURN FAN MOTOR SPEEDS IN RESPONSE TO DCP
OAH	OUTSIDE AIR HUMIDITY SENSOR	SENSES AND TRANSMITS OUTSIDE AIR ENTHALPY TO DCP FOR CONTROL AND INDICATION.



ATTIC CONTROL PANELS 302-AHU2 & 3

ATTIC CONTROL PANELS 302-AHU2 & 3 POINTS LIST

POINT ID	DEVICE TAG	DEVICE DESCRIPTION	POINT TYPE DI	DO	AI	AO
1	DSD-2	RETURN AIR DUCT SMOKE DETECTOR (FIRE SYSTEM SHUTDOWN)	X			
2	VPS-2	RETURN AIR FLOW MEASURING STATION			X	
3	H-1	RETURN AIR HUMIDITY SENSOR			X	
4	T-4	RETURN AIR TEMPERATURE SENSOR			X	
5	T-2	OUTSIDE AIR TEMPERATURE SENSOR (GLOBAL POINT)			X	
6	T-5	MIXED AIR TEMPERATURE SENSOR			X	
7	T-3	PREHEAT COIL LEAVING AIR TEMPERATURE SENSOR			X	
8	T-6	COOLING COIL LEAVING AIR TEMPERATURE SENSOR			X	
9	T-1	SUPPLY AIR TEMPERATURE SENSOR			X	
10	SPS-3	SUPPLY DUCT HIGH STATIC SAFETY	X			
11	SPS-4	RETURN DUCT HIGH STATIC SAFETY	X			
12	VPS-1	SUPPLY AIR FLOW MEASURING STATION			X	
13	H-2	SUPPLY AIR HUMIDITY SENSOR (HIGH LIMIT)			X	
14	SPS-1	SUPPLY AIR STATIC PRESSURE SENSOR			X	
15	SPS-2	SUPPLY AIR STATIC PRESSURE SENSOR			X	
16	C	RETURN FAN STATUS CURRENT SWITCH	X			
17	C	SUPPLY FAN STATUS CURRENT SWITCH	X			
18	DP-1	PRE FILTER PRESSURE DROP			X	
19	VPS-3	OUTSIDE AIR FLOW MEASURING STATION			X	
20	OAH	OUTSIDE AIR HUMIDITY (GLOBAL POINT)			X	
21	DP-2	AFTER FILTER PRESSURE DROP			X	
22	DSD-1	SUPPLY AIR DUCT SMOKE DETECTOR (FIRE SYSTEM SHUTDOWN)	X			
23	T-7	PREHEAT COIL 302-PH# LEAVING WATER TEMPERATURE SENSOR			X	
24	T-8	FREEZESTAT	X			
25	C	EXHAUST FAN 302-EF# STATUS CURRENT SWITCH	X			
26	SPS-5	EXHAUST FAN 302-EF# EXHAUST DUCT HIGH STATIC SAFETY	X			
27	DSD-3	RETURN AIR DUCT SMOKE DETECTOR (FIRE SYSTEM SHUTDOWN)	X			
28	DSD-4	RETURN AIR DUCT SMOKE DETECTOR (FIRE SYSTEM SHUTDOWN)	X			
29	DSD-5	RETURN AIR DUCT SMOKE DETECTOR (FIRE SYSTEM SHUTDOWN)	X			
30	DSD-6	RETURN AIR DUCT SMOKE DETECTOR (FIRE SYSTEM SHUTDOWN)	X			
31	DSD-7	RETURN AIR DUCT SMOKE DETECTOR (FIRE SYSTEM SHUTDOWN)	X			
32	DSD-8	RETURN AIR DUCT SMOKE DETECTOR (FIRE SYSTEM SHUTDOWN)	X			
A	VSMC	SUPPLY FAN START-STOP		X		
B	VSMC	RETURN FAN START-STOP		X		
C	D-3	MODULATING RELIEF AIR DAMPER				X
D	D-2	MODULATING RETURN AIR DAMPER				X
E	D-1	MODULATING OUTSIDE AIR DAMPER				X
F	V-2	MODULATING PREHEAT COIL VALVE				X
G	V-1	MODULATING COOLING COIL VALVE				X
H	VSMC	SUPPLY FAN VARIABLE SPEED MOTOR CONTROLLER				X
I	VSMC	RETURN FAN VARIABLE SPEED MOTOR CONTROLLER				X
J	V-3	TWO POSITION ISOLATION STEAM HUMIDIFIER VALVE		X		
K	V-4	MODULATING STEAM HUMIDIFIER VALVE				X
L	SD-2	RETURN DUCT ISOLATION SMOKE DAMPER		X		
M	D-4	TWO-POSITION RELIEF AIR DAMPER		X		
N	SD-1	SUPPLY DUCT ISOLATION SMOKE DAMPER		X		
O	S	EXHAUST FAN 302-EF# START-STOP		X		
P	D-5	TWO-POSITION RELIEF AIR DAMPER		X		
Q	D-6	TWO-POSITION EXHAUST AIR DAMPER		X		

NOTE: DDC ZONE CONTROL IS SPECIFIED. PROVIDE ZONE TEMPERATURE SENSOR AND MODULATING OUTPUT FOR EACH ZONE, AS SHOWN IN VVR AND CVR CONTROL TERMINAL DIAGRAM ON THIS SHEET.

SEQUENCE OF OPERATION FOR 302-AHU2 & 3

1. GENERAL

1.1 UNIT IS NORMALLY STARTED AND STOPPED BY THE DCP OR REMOTELY AT THE ECC. H-O-A SWITCH SHALL BE KEPT IN THE "AUTO" POSITION. "HAND" AND "OFF" POSITIONS SHALL BE USED ONLY FOR MAINTENANCE.

1.2 WHEN THE UNIT IS "OFF" FOR ANY REASON, OUTSIDE AIR DAMPER D-1, RELIEF AIR DAMPERS D-3, D-4 AND D-5, AND ISOLATION SUPPLY AND RETURN AIR SMOKE DAMPERS SD-1 AND SD-2 SHALL BE FULLY CLOSED, RETURN AIR DAMPER D-2 SHALL BE FULLY OPEN, AND SUPPLY AND RETURN FANS SHALL BE OFF.

1.3 WHEN THE UNIT IS "ON", ISOLATION SMOKE DAMPERS SD-1 AND SD-2 AND RELIEF DAMPERS D-4 AND D-5 SHALL OPEN, AND ONCE PROVED OPEN, SUPPLY AND RETURN FANS SHALL START, AND D-1, D-2 AND D-3 SHALL MODULATE IN ACCORDANCE WITH THE FOLLOWING SEQUENCE.

2. TEMPERATURE CONTROL

2.1 SUPPLY AIR TEMPERATURE, SENSED BY T-1, SHALL BE MAINTAINED AT SETPOINT OF 54.5 DEG. F. VIA DCP BY MODULATING COOLING COIL VALVE V-1 OR ECONOMIZER DAMPERS D-1, D-2 AND D-3 OR PREHEAT COIL VALVE V-2, IN SEQUENCE. SEPARATE CONTROL LOOPS SHALL BE UTILIZED FOR ECONOMIZER COOLING, MECHANICAL COOLING, AND HEATING FUNCTION.

2.2 WHEN THE AIR HANDLING UNIT IS OFF UNDER NORMAL OPERATION, AND THE OUTSIDE AIR TEMPERATURE IS BELOW 40 DEG. F, V-2 SHALL MODULATE TO MAINTAIN COIL LEAVING WATER TEMPERATURE, AS SENSED BY T-7, AT 70 DEG. F. IF THE UNIT SHUTS DOWN ON ALARM, V-2 SHALL GO FULL OPEN TO THE COIL. COOLING COIL VALVE V-1 SHALL BE FULLY CLOSED BEFORE V-2 OPENS.

3. ENTHALPY ECONOMIZER CONTROL

3.1 OUTSIDE AIR TEMPERATURE AND HUMIDITY, AND RETURN AIR TEMPERATURE AND HUMIDITY SHALL BE MEASURED, AND THE ENTHALPY OF EACH DETERMINED. IF THE ENTHALPY OF THE OUTSIDE AIR IS LESS THAN THE ENTHALPY OF THE RETURN AIR, THE ECONOMIZER SHALL BE ENABLED. WHEN THE OUTSIDE AIR ENTHALPY IS HIGHER THAN THE RETURN AIR ENTHALPY AND MECHANICAL COOLING IS AVAILABLE, THE ECONOMIZER SHALL BE DISABLED.

4. ECONOMIZER CYCLE

4.1 WHEN THE UNIT OPERATES IN THE OCCUPIED MODE, MINIMUM OUTSIDE AIR SHALL BE PROVIDED BY OPENING AND MODULATING OUTSIDE AIR DAMPERS D-1 IN RESPONSE TO AIR FLOW CONTROL DESCRIBED IN PARAGRAPH 5.2 TO SUPPLY MINIMUM OUTSIDE AIR. THE RETURN AIR DAMPERS D-2 SHALL OPEN FULL AND RELIEF AIR DAMPERS D-3 SHALL REMAIN CLOSED. THIS CONDITION IS THE NORMAL POSITION AND SHALL BE MAINTAINED DURING THE OCCUPIED MODE EXCEPT DURING THE "ECONOMIZER" CYCLE. DURING THE "ECONOMIZER" CYCLE, THE AMOUNT OF OUTSIDE AIR AND RELIEF AIR SHALL BE INCREASED AS REQUIRED TO MAINTAIN THE UNIT DISCHARGE AIR TEMPERATURE SETPOINT, AS SENSED BY T-1. PROVIDE A MIXED AIR SENSOR AND LOW LIMIT CONTROL (T-5) SET AT 50 DEGREES F. TO PREVENT OVER-OPENING OF THE ECONOMIZER OUTSIDE AIR DAMPERS. ALL CONTROL SETPOINTS SHALL BE FULLY ADJUSTABLE TO MEET JOB CONDITIONS.

5. AIR FLOW CONTROL

5.1 THE SUPPLY AIR FLOW SHALL BE CONTROLLED BY THE DCP MODULATING THE SUPPLY FAN VARIABLE SPEED MOTOR CONTROLLER (VSMC) TO MAINTAIN 1.0" OF DUCT STATIC PRESSURE (FIELD ADJUSTABLE), SENSED BY SPS-1 AND SPS-2 LOCATED 2/3 DISTANCE DOWN THE SUPPLY DUCTS.

5.2 THE DCP, USING TOTAL SUPPLY AIR AND OUTSIDE AIR FLOW SIGNALS (VPS-1 AND VPS-3), SHALL RESET THE RETURN AIR FAN VARIABLE SPEED MOTOR CONTROLLER (VSMC) USING RETURN AIR FLOW SIGNAL (VPS-2) TO MAINTAIN A CONSTANT AIR FLOW DIFFERENCE BETWEEN THE SUPPLY AIR AND THE RETURN AIR EQUAL TO MINIMUM OUTSIDE AIR.

5.3 VARIABLE SPEED MOTOR CONTROLLERS SHALL RESPOND TO START/STOP COMMANDS AND ALL SAFETIES (FREEZE, SMOKE, ETC.) WHETHER IN THE HAND, AUTOMATIC OR BYPASS MODES.

5.4 THE DCP, USING HIGH PRESSURE SENSOR SPS-3 LOCATED AT THE SUPPLY FAN DISCHARGE, SHALL PREVENT THE SUPPLY FAN FROM DEVELOPING OVER 4 INCHES OF POSITIVE STATIC PRESSURE (FIELD ADJUSTABLE). IF STATIC PRESSURE AT SPS-3 EXCEEDS 4 INCHES OF POSITIVE PRESSURE, THE SUPPLY AND RETURN FANS SHALL STOP.

5.5 THE DCP, USING HIGH PRESSURE SENSOR SPS-4 LOCATED AT THE RETURN FAN INLET, SHALL PREVENT THE RETURN FAN FROM DEVELOPING OVER 2 INCHES OF NEGATIVE STATIC PRESSURE (FIELD ADJUSTABLE). IF STATIC PRESSURE AT SPS-4 EXCEEDS 2 INCHES OF NEGATIVE PRESSURE, THE SUPPLY AND RETURN FANS SHALL STOP.

6. HUMIDITY CONTROL

6.1 WHEN THE DCP IS NOT CALLING FOR HUMIDITY, SENSED BY RETURN AIR HUMIDITY SENSOR H-1, 2-WAY "ON-OFF" CONTROL VALVE V-3 SHALL REMAIN CLOSED. WHEN THE DCP IS CALLING FOR HUMIDITY, V-3 SHALL REMAIN OPEN.

6.2 RETURN AIR HUMIDITY, SENSED BY H-1, SHALL BE MAINTAINED AT SETPOINT (30 PERCENT RH, ADJUSTABLE) VIA DCP BY MODULATING HUMIDIFIER CONTROL VALVE V-4 TO MAINTAIN THE DESIRED HUMIDITY. THE DCP SHALL OVERRIDE THIS CONTROL TO MAINTAIN A MAXIMUM HUMIDITY LEVEL OF 80 PERCENT AS SENSED BY H-2. DCP SHALL CLOSE VALVE V-3 WHENEVER THE SUPPLY FAN IS OFF.

6.3 ON-OFF CONTROL VALVE V-3 SHALL REMAIN CLOSED WHENEVER THE OUTSIDE AIR TEMPERATURE IS ABOVE 55 DEG. F.

7. FREEZE PROTECTION

7.1 IF THE PREHEAT COIL DISCHARGE AIR TEMPERATURE AS SENSED BY T-3 FALLS BELOW 45 DEG.F, AN ALARM SIGNAL SHALL INDICATE AT THE DCP AND ECC. IF THE PREHEAT COIL DISCHARGE TEMPERATURE FALLS BELOW 40 DEG.F AS SENSED BY FREEZESTAT T-8, THE SUPPLY AND RETURN FANS SHALL SHUT DOWN AND A CRITICAL ALARM SHALL INDICATE AT THE DCP AND ECC. T-8 SHALL BE HARDWIRED TO THE SUPPLY FAN VSMC TO SHUT DOWN THE UNIT IN THE HAND, AUTOMATIC OR BYPASS MODES. T-8 SHALL REQUIRE MANUAL RESET AT THE DEVICE.

8. AUTOMATIC SHUTDOWN / RESTART

8.1 WHEN SMOKE IS DETECTED BY ANY DUCT SMOKE DETECTOR, THE SUPPLY AND RETURN AIR FANS AND INTERLOCKED EXHAUST FANS SHALL SHUT "OFF", A SUPERVISORY SIGNAL SHALL BE TRANSMITTED TO THE FIRE ALARM SYSTEM, AND A SUPERVISORY SIGNAL SHALL INDICATE AT THE DCP AND ECC. SUPPLY AND RETURN FANS AND INTERLOCKED EXHAUST FANS SHALL RESTART AND SMOKE DAMPERS SHALL OPEN WHEN WHEN THE FIRE ALARM CIRCUIT IS RESET.

9. DISCHARGE AIR RESET

9.1 THE AIR HANDLING UNIT CONTROLS SHALL PROVIDE DISCHARGE AIR TEMPERATURE CONTROL BASED ON ZONE DEMAND DEVIATION FROM SETPOINT. ALL ZONES SHALL BE SAMPLED AND THE ZONE FURTHEST FROM SETPOINT SHALL GOVERN. AS THE DEVIATION FROM SETPOINT DECREASES, THE DISCHARGE AIR SHALL BE RESET. 54.5 DEG. F AND 62 DEG. F SHALL BE THE LOW AND HIGH RESET LIMITS, RESPECTIVELY. ALL CONTROL SETPOINTS (INCLUDING HIGH AND LOW SET POINTS FOR DISCHARGE AIR TEMPERATURE) SHALL BE FULLY ADJUSTABLE TO MEET JOB CONDITIONS.

10. NIGHT SETBACK, MORNING WARM-UP AND INITIAL START

10.1 INITIAL SCHEDULE - UNIT SHALL OPERATE 5 DAYS A WEEK 7:00 AM TO 5:00 PM. UNIT SHALL BE OFF AFTER SCHEDULED HOURS AND DURING HOLIDAYS. COORDINATE EXACT SCHEDULE WITH COR.

10.2 SPACE SENSORS SHALL BE EQUIPPED WITH IN-SPACE USER OVERRIDE SWITCH TO CYCLE UNIT TO OCCUPIED MODE FOR 1.5 HOURS (ADJUSTABLE) FOR AFTER-HOURS OPERATION.

10.3 NIGHT SETBACK - DURING THE OCCUPIED MODE, THE TEMPERATURE CONTROLS SHALL FUNCTION AS SPECIFIED. DURING THE UNOCCUPIED MODE, WHEN THE SPACE TEMPERATURE DROPS BELOW 60 DEGREES F., THE UNIT SHALL CYCLE ON TO HEAT THE SPACE UP TO 63 DEGREES F. AND THEN TURN OFF, WHEN THE SPACE TEMPERATURE RISES ABOVE 82 DEGREES F., THE UNIT SHALL CYCLE ON TO COOL THE SPACE DOWN TO 79 DEGREES F. AND THEN TURN OFF. WHEN UNIT RUNS DURING UNOCCUPIED MODE, THE AIR HANDLING UNIT CONTROLS SHALL FUNCTION AS SPECIFIED EXCEPT OUTSIDE AIR SHALL BE USED FOR COOLING FIRST (UNLESS THE ECONOMIZER IS LOCKED OUT), OTHERWISE THE OUTSIDE AIR DAMPERS SHALL REMAIN CLOSED AND RETURN AIR DAMPERS SHALL REMAIN OPEN.

10.4 COOLING SETUP CONTROL AND COOL DOWN - AN OPTIMAL START PROGRAM SHALL START THE UNIT IN ADVANCE OF OCCUPIED TIME TO ENSURE PROPER SPACE TEMPERATURES AT OCCUPANCY TIME. DURING SET UP OR COOL DOWN OPERATION, IF THE ECONOMIZER IS INACTIVE, THE ASSOCIATED RELIEF AND OUTSIDE AIR DAMPERS SHALL REMAIN CLOSED.

10.5 MORNING WARM-UP AND INITIAL START - AIR HANDLING SYSTEM SHALL ENTER A MORNING WARM-UP MODE IN ADVANCE OF THE OCCUPIED TIME VIA AN OPTIMAL START SEQUENCE. THE OUTSIDE AND RELIEF AIR DAMPERS SHALL REMAIN COMPLETELY CLOSED, THE RETURN DAMPERS SHALL REMAIN FULLY OPEN AND THE EXHAUST FANS SHALL BE OFF. THIS MODE SHALL CONTINUE UNTIL THE RETURN TEMPERATURE RISES ABOVE 68 DEGREES F., AT WHICH TIME THE ECONOMIZER DAMPERS SHALL BE POSITIONED TO MINIMUM OUTSIDE AIR OPERATION. ECONOMIZER DAMPER CONTROL SHALL BE DELAYED TWO MINUTES DURING START-UP TO PREVENT CABINET HEAT FROM FALSE LOADING THE SYSTEM.

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3023.00

Revisions	Date
1. ADDENDUM 3	8/27/14

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Revised By:

Drawing Title: CONTROLS AND AUTOMATION

Project Title: MODERNIZE MENTAL HEALTH SERVICES

Date: 05/29/2014

Project No.: 552-14-103

Approved: Project Manager: CHRIS MOORHEAD

Building Number: 302

Checked: DLE

Drawn: WJS

Drawing No.: H0.10

Approved: Service Chief: PHILIP KIRK

Location: 4100 WEST THIRD STREET DAYTON, OH 45428

VAMC, DAYTON

Department of Veterans Affairs

VA

VA FORM 08-6231, OCT 1978

8/27/2014 3:19:08 PM

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