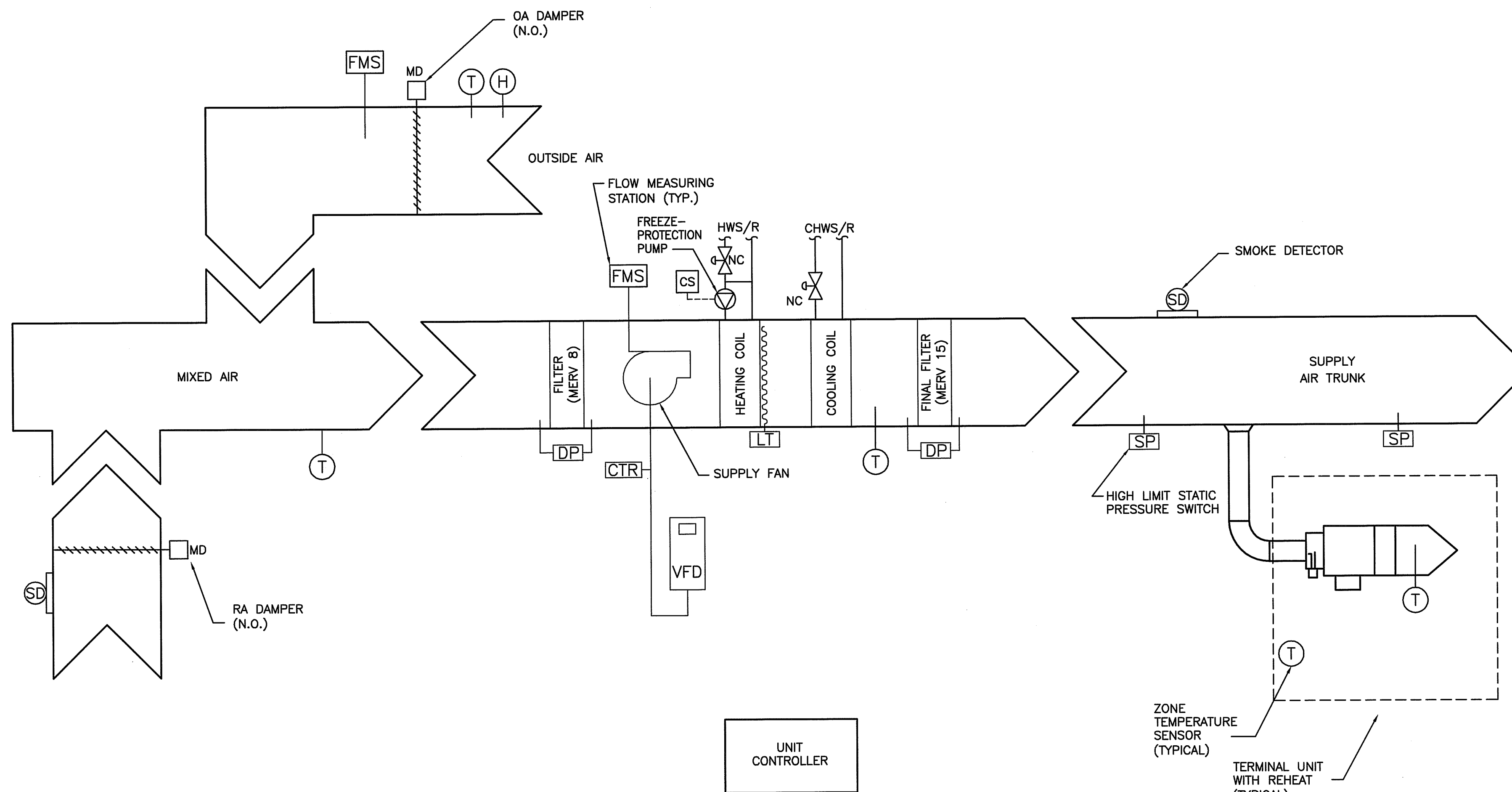


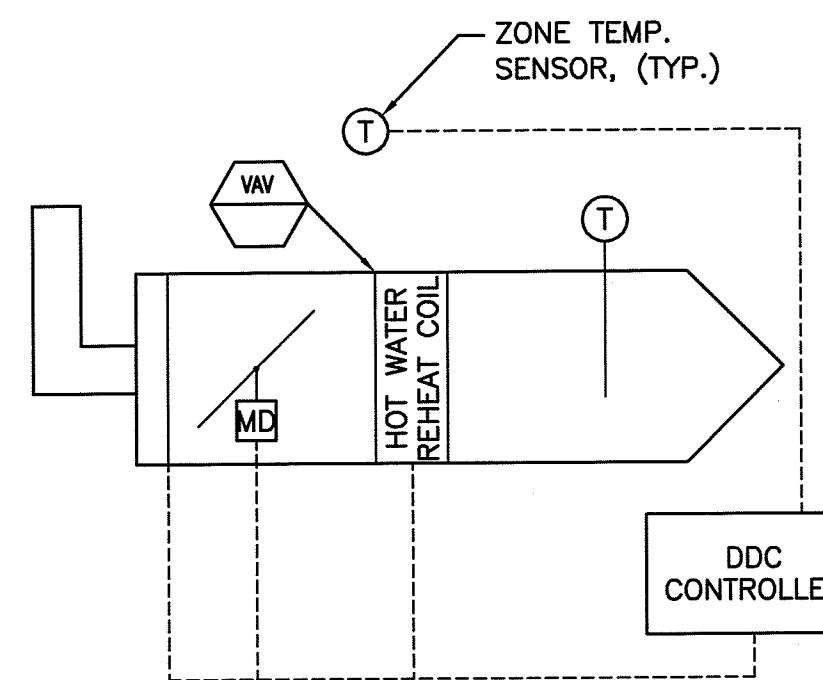
CONSTANT VOLUME AIR HANDLER WITH CHILLED WATER COOLING AND HOT WATER HEATING SEQUENCE OF OPERATION

- A. GENERAL: WITH THE H-O-A SWITCH IN THE "AUTO" POSITION, THE SYSTEM SHALL START THROUGH THE BAS SYSTEM PROVIDED THE SAFETIES HAVE BEEN SATISFIED. THE START/STOP CONTROL OF FANS SHALL BE BASED ON A USER DEFINED OCCUPANCY SCHEDULE. THE SYSTEM START/STOP SHALL INCORPORATE AN OPTIMUM START/STOP ROUTINE AUTOMATICALLY CALCULATING THE HEAT UP OR COOL DOWN TIME FOR THE SPACES SERVED AND SHALL PROVIDE THE SPACES AT THE PROPER TEMPERATURE WHEN THE AREA REACHES THE OCCUPIED PERIOD. WHEN THE AHU IS IN THE OCCUPIED MODE, THE SUPPLY FAN SHALL OPERATE CONTINUOUSLY, THE CHILLED WATER COOLING SHALL CYCLE, THE HOT WATER COIL VALVE AND OUTSIDE DAMPERS SHALL MODULATE IN SEQUENCE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE.
- B. UNOCCUPIED: WHEN THE AHU IS IN THE NIGHT SETBACK MODE, THE SUPPLY FAN AND HEATING COIL VALVE SHALL CYCLE TO MAINTAIN THE UNOCCUPIED SETTING.
- C. WARM-UP: WHEN THE AHU IS IN THE UNOCCUPIED TO OCCUPIED WARM UP MODE, THE SUPPLY FAN SHALL OPERATE, THE OUTSIDE AIR DAMPER SHALL BE AT ITS MINIMUM POSITION AND THE CHILLED WATER COOLING SHALL BE OFF. THE RETURN DAMPER SHALL BE OPEN AND THE HEATING COIL VALVE SHALL MODULATE TO ACHIEVE THE OCCUPIED SET POINT.
- D. COOL DOWN: WHEN THE AHU IS IN THE UNOCCUPIED TO OCCUPIED COOL DOWN MODE, THE SUPPLY FAN SHALL OPERATE, THE OUTSIDE AIR DAMPER SHALL BE SET TO ITS MINIMUM POSITION AND THE HEATING VALVE SHALL BE CLOSED. FOR OUTSIDE AIR CONDITION THAT ARE SUITABLE FOR FREE COOLING, THE OUTSIDE AIR DAMPER SHALL MODULATE OPEN AND THE RETURN AIR DAMPER SHALL MODULATE CLOSED TO MAINTAIN THE DISCHARGE AIR SET POINT TO OBTAIN THE OCCUPIED SPACE SENSOR SET POINT. WHEN THE UNIT IS IN THE FREE COOLING MODE OF OPERATION THE CHILLED WATER COOLING SHALL BE OFF. WHEN THE OUTSIDE AIR CONDITIONS ARE NOT SUITABLE FOR FREE COOLING THE CHILLED WATER COIL SHALL CYCLE TO MEET THE OCCUPIED SET POINT.
- E. COOLING: AS THE RETURN AIR TEMPERATURE OR THE SPACE SENSOR REQUIRE COOLING THE UNIT SHALL ENTER THE COOLING MODE OF OPERATION. THE BAS SHALL COMPARE THE RETURN AIR TEMPERATURE AND THE OUTSIDE AIR TEMPERATURE AND EVALUATE THE SUITABILITY OF FREE COOLING. IF THE OUTSIDE AIR IS SUITABLE FOR FREE COOLING, ACTIVATE THE FIRST STAGE OF COOLING BY MODULATING OPEN THE OUTSIDE AIR DAMPERS BEYOND THE MINIMUM POSITION UP TO A MAXIMUM OF 100% OUTSIDE AIR AND MODULATE THE RETURN AIR DAMPER FROM ITS MAXIMUM DOWN TO ITS CLOSED POSITION. THE UNIT HEATING COIL CONTROL VALVE SHALL BE CLOSED AND THE COOLING COIL SHALL BE OFF. THE BAS SHALL MAINTAIN A SUPPLY AIR TEMPERATURE RESET TO THE COOLING SET POINT IN THE SPACE. WHEN THE OUTSIDE AIR IS NO LONGER SUITABLE FOR FREE COOLING OR THE RETURN AIR AND SPACE TEMPERATURES CONTINUE TO RISE, THE UNIT SHALL ENTER THE SECOND STAGE OF COOLING MODE. THE SECOND STAGE OF COOLING SHALL MODULATE THE OUTSIDE AIR DAMPER TO THE MINIMUM AIR FLOW AND ENERGIZE THE COOLING SYSTEM. THE COOLING COIL MODULATE TO MAINTAIN THE SPACE SET POINT.
- F. HEATING: IN THE HEATING MODE THE AHU SHALL OPERATE WITH THE OUTSIDE AIR DAMPER IN THE MINIMUM POSITION AND THE RETURN DAMPER AT THE HEATING AIRFLOW POSITION. THE HEATING VALVE SHALL MODULATE TO MAINTAIN THE SPACE SET POINT.
- G. VENTILATION: DURING THE OCCUPIED MODE, THE OUTSIDE AIR DAMPER SHALL OPEN TO ALLOW A MINIMUM 850 CFM OF OUTSIDE AIR INTO THE UNIT.
- H. HOT WATER COIL FREEZE PROTECTION PUMP: AT OUTDOOR AIR TEMPERATURES BELOW 45°F (ADJ.), OR ON A CALL FOR HEATING, THE COIL FREEZE PROTECTION PUMP SHALL OPERATE. ALARM SHALL ENABLE IF PUMP STATUS INDICATES A FAILURE AND THE UNIT SHALL BE DISABLED.
- I. SAFETY DEVICES:
- a. SMOKE DETECTOR(S) LOCATED IN THE SUPPLY DUCTS SHALL STOP THE UNIT FANS AND CLOSE THE OUTSIDE AIR DAMPERS IF SMOKE IS DETECTED. THE CONTROLLER SHALL SIGNAL THE APPROPRIATE ALARMS.
  - b. SERPENTINE FREEZE PROTECTION ON THE COIL FACE SHALL STOP THE FAN(S), CLOSE THE OUTSIDE AIR AND RELIEF DAMPERS, DRIVE THE HEATING COIL VALVE TO THE FULL HEATING POSITION AND SET AN ALARM.
- J. OTHER DEVICES: THE UNIT AIR FILTER STATUS SHALL BE MEASURED AND INDICATED ON THE GRAPHICAL INTERFACE TO INDICATE THE STATIC PRESSURE DROP ACROSS THE UNIT FILTERS AND PROVIDE NOTIFYING CONDITION INDICATING THE NEED FOR FILTER CHANGE OUT.



G1 AHU-23 SEQUENCE OF OPERATION

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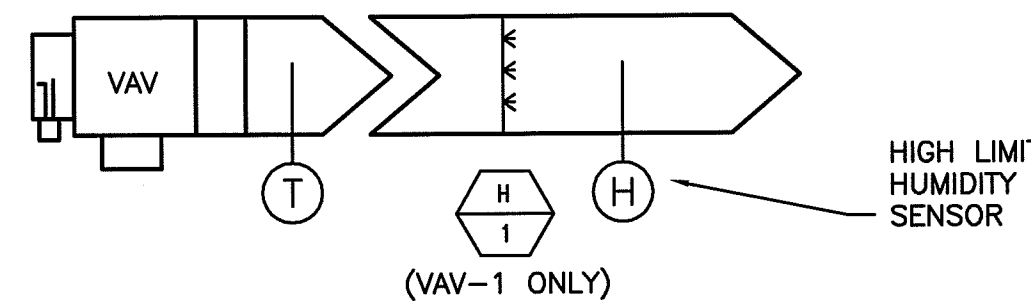


CONSTANT AIR VOLUME BOX SEQUENCE OF OPERATION

1. SPACE CAV CONTROL: DUAL TEMPERATURE THERMOSTAT SET AT 75°F (ADJUSTABLE) MAINTAINS CONSTANT SPACE TEMPERATURE BY MODULATING THE HOT WATER REHEAT COIL. THE VAV TERMINAL UNIT SHALL MAINTAIN ITS MAXIMUM CFM. AS THE SPACE TEMPERATURE FALLS BELOW THE HEATING SET POINT (70°F ADJUSTABLE), THE CONTROL VALVE ON THE HEATING COIL SHALL MODULATE TO MAINTAIN TEMPERATURE AT SETPOINT BETWEEN THE COOLING AND HEATING SETPOINTS, THE REHEAT VALVE SHALL MODULATE TO MAINTAIN THE CAV DISCHARGE TEMPERATURE EQUAL TO THE ROOM TEMPERATURE SETPOINT (ADJ.).
2. PROVIDE NIGHT SETBACK AND MORNING WARM-UP AS REQUIRED BY THE ASSOCIATED SYSTEM.

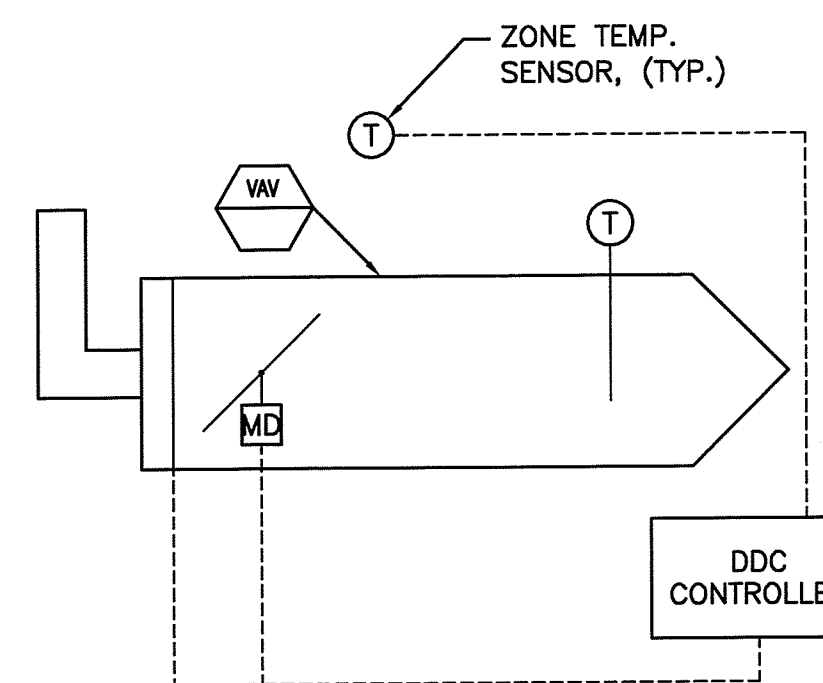
HUMIDITY CONTROL

1. HUMIDISTAT SHALL MAINTAIN HUMIDITY (45% RH ADJ) BY MODULATING THE NORMALLY CLOSED STEAM VALVE.
2. SPACE HUMIDITY SHALL BE DETERMINED BY THE SPACE HUMIDITY SENSORS LOCATED IN SPEC/CT #2 (SEE DRAWING MP101 FOR LOCATION).
3. THE CONTROL VALVE SHALL BEGIN TO MODULATE DOWN WHEN THE RELATIVE HUMIDITY REACHES 85% IN THE DUCT AND AS THE HIGH LIMIT HUMIDITY LEVEL (90% RH) IS APPROACHED. THE CONTROL VALVE SHALL CLOSE ON A HIGH LIMIT HUMIDITY.



D1 CONSTANT AIR VAV BOX SEQUENCE OF OPERATION (WITH REHEAT)

NOT TO SCALE



VARIABLE AIR VOLUME BOX SEQUENCE OF OPERATION

1. SPACE VAV CONTROL: THERMOSTAT SET AT 75°F (ADJUSTABLE) MAINTAINS CONSTANT SPACE TEMPERATURE BY MODULATING THE VARIABLE AIR VOLUME DAMPER OPERATOR. ON A RISE OF TEMPERATURE ABOVE THE COOLING SET POINT (75°F ADJUSTABLE), THE VAV TERMINAL UNIT SHALL MODULATE TO ITS MAXIMUM CFM. AS THE TEMPERATURE DROPS BELOW THE COOLING SET POINT, THE TERMINAL UNIT SHALL MODULATE TO ITS MINIMUM CFM.
2. PROVIDE NIGHT SETBACK AND MORNING WARM-UP AS REQUIRED BY THE ASSOCIATED SYSTEM.

D8 HUMIDIFIER SEQUENCE OF OPERATION

NOT TO SCALE

EXHAUST FAN SEQUENCE OF OPERATION

- A. EF-91: EXHAUST FANS SHALL BE ENABLED/DISABLED VIA BMS. THE EXHAUST FAN SHALL RUN AT CONTINUOUSLY TO MAINTAIN CONSTANT DUCT STATIC PRESSURE AS MEASURED DURING TESTING AND BALANCING. OPERATOR STATION DISPLAY: INDICATE THE FOLLOWING ON THE OPERATOR WORKSTATION DISPLAY TERMINAL.
  1. SYSTEM GRAPHIC.
  2. FAN ON/OFF INDICATION.
  3. FAN FAIL ALARM.3
  4. VFD STATUS
- B. FAN STATUS (ALL FANS): CURRENT SENSORS AND STATIC PRESSURE SENSORS ON THE FAN SUCTION SHALL ALARM UPON FAN FAILURE. (ALL FANS). STATIC PRESSURE SETPOINT SHALL BE ADJ.
- C. VFD TO BE UTILIZED FOR TESTING AND BALANCING PURPOSES.

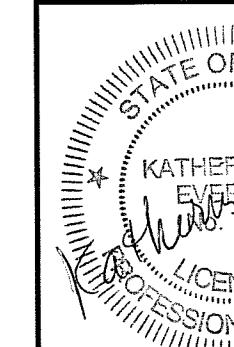
A13 EXHAUST FAN SEQUENCE OF OPERATION

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3-13-14

REV	DESCRIPTION	DATE
0	ISSUED FOR CONSTRUCTION	3-13-14

GRAPHIC SCALE:  
0" 1"

SCALE:	NOT TO SCALE
PROJECT MANAGER:	DJV
JC/DRAWN BY:	FV
A/E OF RECORD:	KME
CAD FILE:	M-651-1312B
PROJECT NO.:	1312B
DATE:	3-13-14
SHEET TITLE:	CONTROL DIAGRAMS & SEQUENCES OF OPERATIONS

CONTROL DIAGRAMS & SEQUENCES OF OPERATIONS

SHEET No. M-651

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