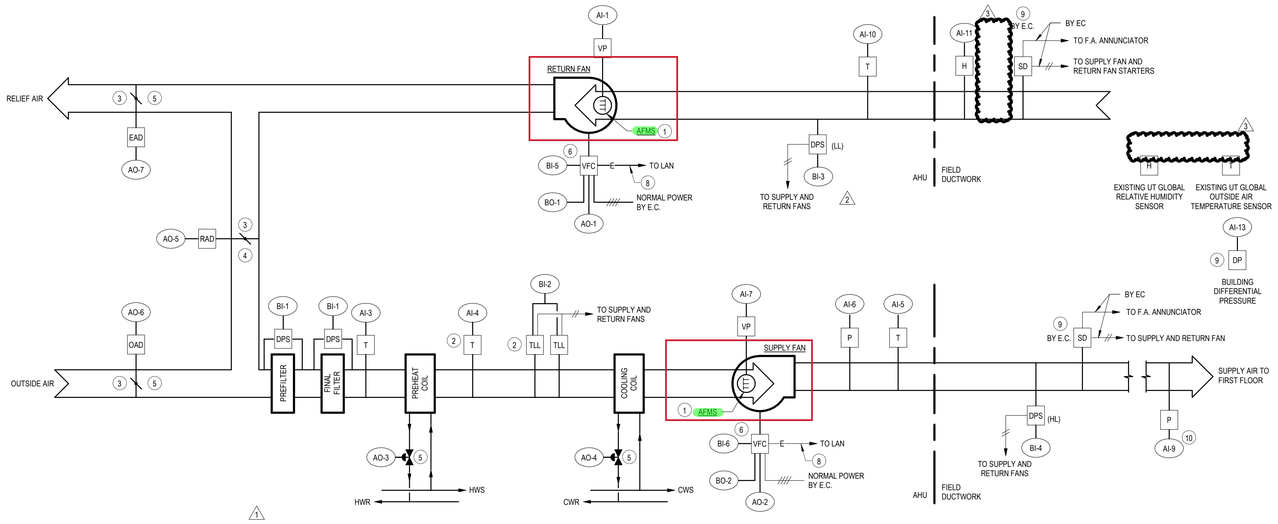
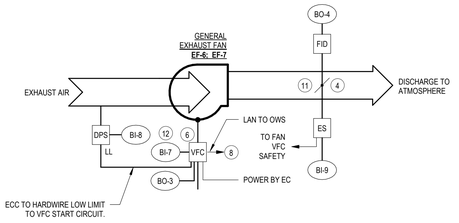


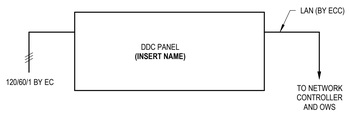


SCHEDULE OF DDC POINTS

ID	DESCRIPTION	TREND	ALARM	GRAPHIC
AI-1	RETURN FAN VOLUME	X		X
AI-3	MIXED AIR TEMPERATURE	X	X	X
AI-4	PREHEAT COIL DISCHARGE TEMPERATURE	X	X	X
AI-5	SUPPLY AIR TEMPERATURE	X	X	X
AI-6	SUPPLY AIR STATIC PRESSURE (AT UNIT)	X		X
AI-7	SUPPLY FAN VOLUME	X		X
AI-9	STATIC PRESSURE 90% THRU SYSTEM	X		X
AI-10	RETURN AIR TEMPERATURE	X		X
AI-11	RETURN AIR HUMIDITY	X		X
AI-13	BUILDING DIFFERENTIAL PRESSURE	X		X
AO-1	RETURN FAN VFC	X		X
AO-2	SUPPLY FAN VFC	X		X
AO-3	PREHEAT COIL VALVE	X		X
AO-4	COOLING COIL VALVE	X		X
AO-5	RETURN AIR DAMPER	X		X
AO-6	OUTDOOR AIR DAMPER	X		X
AO-7	RELIEF AIR DAMPER	X		X
BI-1	PREFILTER ALARM	X	X	X
BI-1	FINAL FILTER ALARM	X	X	X
BI-2	SAFETY LOW LIMIT STAT ALARM	X	X	X
BI-3	SUPPLY AIR HIGH STATIC ALARM	X	X	X
BI-4	SUPPLY AIR HIGH STATIC ALARM	X	X	X
BI-5	RETURN FAN STATUS	X	X	X
BI-6	SUPPLY FAN STATUS	X	X	X
2 BI-7	EXHAUST FAN STATUS	X	X	X
BI-8	EXHAUST FAN DIFFERENTIAL PRESSURE SWITCH	X	X	X
BI-9	EXHAUST FAN DAMPER END SWITCH	X	X	X
BO-1	RETURN FAN START-STOP			X
BO-2	SUPPLY FAN START-STOP			X
BO-3	EXHAUST FAN START-STOP	X		X
BO-4	EXHAUST FAN ISOLATION DAMPER	X		X

SETUP ALL TRENDS IN 15 MINUTE INTERVALS AND STORE FOR MINIMUM 45 DAYS.

INCLUDE TRENDS FOR THE ASSOCIATED COMMAND AND/OR SETPOINT IN ADDITION TO POINT LISTED ABOVE.
PROVIDE CHANGE OF VALUE AND INTERVAL TRENDS FOR BI AND BO POINTS.



3 AIR HANDLING UNIT WITH RETURN FAN CONTROL SCHEMATIC
NOSCALE

PLAN NOTES

1. AIRFLOW PIEZOMETER INTEGRAL TO FAN (ELECTRA-FLO/CM THERMAL AIRFLOW STATION BY AIR MONITOR), PROVIDED BY FAN MANUFACTURER. TRANSDUCER BY ECC.
2. LOCATE 3" FROM COOLING COIL INLET.
3. DAMPERS TO BE INTEGRAL WITH AHU, ACTUATORS BY ECC.
4. SPRING RETURN OPEN UPON LOSS OF POWER.
5. SPRING RETURN CLOSED UPON LOSS OF POWER.
6. VARIABLE FREQUENCY CONTROLLER FURNISHED, INSTALLED, WIRED, AND COMMISSIONED BY EC.
7. NOT USED.
8. LAN TO OWS, THRU THE LAN, VFC TO TRANSMIT TO BAS STATUS AND ALARMS OF ALL DATA AVAILABLE SUPPLIER TO FURNISH INTEGRAL COMMUNICATION CARD. ECC TO MAP ALL OWNER REQUESTED INFORMATION POINTS. NOTE THAT START/STOP SIGNAL AND SPEED CONTROL ARE HARD WIRED TO DDC TO ENSURE OPERATION ON FAN LOSS.
9. REFER TO PLANS FOR LOCATIONS.
10. HARD WIRE DUCT STATIC SENSOR TO THE SAME DDC CONTROLLER WHICH CONTROLS THE FAN.
11. CONTROL DAMPERS TO BE DUCT MOUNTED; DAMPERS AND ACTUATORS BY ECC.
12. ECC TO PROVIDE CURRENT SENSING AND CONTROL LOGIC FOR FAN FAULT DETERMINATION.

3

SEQUENCE OF OPERATION:

1. ALL SETPOINTS TO BE ADJUSTABLE. SETPOINTS TO BE EXPOSED ON GRAPHIC DISPLAY OR HIDDEN BASED ON OWNER REQUEST.
2. ENABLE: AIR HANDLER IS STARTED FROM DDC PANEL OR FROM COMMAND OF FACILITY MANAGEMENT SYSTEM. AIR HANDLER TO RUN 24/7 TO MAINTAIN ZONE SETPOINTS.

OCCUPIED MODE:

1. STARTUP: ON UNIT STARTUP, SUPPLY AND RETURN FANS START. SUPPLY FAN SPEED CONTROL AND SUPPLY AIR TEMPERATURE CONTROL LOOPS ARE ACTIVE. RETURN AIR DAMPER IS FULLY OPEN, OUTDOOR AIR AND RELIEF DAMPERS FULLY CLOSED FOR 5 MIN. (ADJ) WITH RETURN FAN TRACKING CFM SETPOINT SET TO NULL (ADJ).
2. NORMAL OPERATION: AFTER STARTUP, OUTDOOR AIR DAMPER TO OPEN FULLY (ADJ) ON PROVED FAN OPERATION AND RETURN FAN CFM TRACKING OFFSET TO INCREASE TO SETPOINT. (ALARM IF FIXED DIFFERENTIAL AIR FLOW CFM SETPOINT IS NOT MET.)
3. SUPPLY AIR TEMPERATURE:THE SUPPLY AIR CONTROL LOOP SHALL PERFORM AS DESCRIBED BELOW:
   a. THE SUPPLY AIR TEMPERATURE SETPOINT SHALL BE RESET USING TRIM AND RESPOND LOGIC. THE INITIAL SUPPLY AIR TEMPERATURE SETPOINT, SP0, AT FAN START UP SHALL BE 57.5°F (MIDWAY BETWEEN A SET POINT MINIMUM, SPmin, OF 55°F (ADJ.) AND A SET POINT MAXIMUM, SPmax, OF 60°F (ADJ.)). AFTER AN INITIAL TIME DELAY, Td, AT START UP OF 10 MINUTES (ADJ.), THE SUPPLY AIR SET POINT SHALL MODULATE BASED ON THE NUMBER OF REQUESTS FOR MORE COOLING, R, FROM THE VAVS. IF R IS GREATER THAN THE NUMBER OF REQUESTS TO IGNORE, I, OF 2 (ADJ.) AFTER A TIME STEP INTERVAL, T, OF 15 MINUTES (ADJ.), THE SET POINT SHALL RESET DOWN BY THE SET POINT RESPOND AMOUNT, SPres, OF 1°F (ADJ.). IF R IS LESS THAN OR EQUAL TO I AFTER A TIME STEP INTERVAL T, THE SET POINT SHALL TRIM UP BY THE SETPOINT TRIM, SPtrim, AMOUNT OF 0.5°F. R SHALL BE TRENDED.
   b. BELOW 70°F (ADJ) OAT AND BELOW 26 BTU/LB OUTSIDE AIR ENTHALPY, ECONOMIZER MODE SHALL BE ENABLED:
      1. THE OUTSIDE AIR DAMPER SHALL BE 100% OPEN. THE RETURN AIR DAMPER SHALL MODULATE TO MAINTAIN THE MIXED AIR TEMPERATURE AT THE SUPPLY AIR TEMPERATURE SET POINT MINUS 2°F. THE RELIEF AIR DAMPER SHALL MODULATE OPPOSITE OF THE RETURN AIR DAMPER.
      2. IF THE RETURN DAMPER IS FULLY CLOSED, MODULATE THE COOLING COIL CONTROL VALVE TO MAINTAIN THE SUPPLY AIR SET POINT
      3. IF THE RETURN AIR DAMPER IS FULLY OPEN AND THE MIXED AIR TEMPERATURE IS BELOW THE SUPPLY AIR TEMPERATURE SETPOINT MINUS 2°F, MODULATE THE OUTDOOR AIR DAMPER CLOSED TOWARDS THE MINIMUM OUTDOOR AIRFLOW SETPOINT TO MAINTAIN THE MIXED AIR TEMPERATURE AT THE SUPPLY AIR TEMPERATURE SETPOINT MINUS 2°F.
   c. PREHEAT: ONCE THE OUTDOOR AIR DAMPER IS AT THE MINIMUM POSITION AND THE PREHEAT TEMPERATURE REMAINS BELOW SET POINT, THE PREHEAT COIL CONTROL VALVE SHALL BE MODULATED OPEN TO MAINTAIN PREHEAT AIR TEMPERATURE AT SETPOINT OF 50°F (ADJ.)
   d. ABOVE 72°F (ADJ) OAT OR ABOVE 27 BTU/LB OUTSIDE AIR ENTHALPY:THE ECONOMIZER MODE SHALL BE DISABLED, THE DAMPERS SHALL RETURN TO NORMAL OPERATION, AND THE COOLING COIL VALVE SHALL MODULATE TO MAINTAIN THE SUPPLY AIR TEMPERATURE
4. SAFETIES: FURNISH SAFETIES AS FOLLOWS TO PROVIDE ALARM AND SHUT DOWN UNIT.
   a. COOLING COIL INLET TO HAVE TWO (2) OR MORE SAFETY LOW LIMIT THERMOSTATS WIRED IN SERIES TO BREAK BELOW 38°F (ADJ). ON ALARM, CHILLED WATER CONTROL VALVES OPEN 100% (ADJ).
   b. SUPPLY HIGH LIMIT STATIC PRESSURE SWITCH SET TO 3.0" W.G. (ADJ).
   c. RETURN DUCT LOW LIMIT STATIC SENSOR SWITCH SET TO (-) 2.0" W.G. (ADJ).
   d. IN THE EVENT OF SMOKE (AHU SUPPLY OR RETURN DUCT DETECTOR).
5. SUPPLY FAN SPEED: STATIC PRESSURE SENSOR LOCATED 90% OF DISTANCE THROUGH SUPPLY DUCT AND FAN DISCHARGE STATIC PRESSURE SENSOR LOCATED IN AHU DISCHARGE TO FUNCTION WITH SUPPLY FAN VFC CONTROL LOOP TO MODULATE SUPPLY FAN SPEED TO ACHIEVE DUCT STATIC PRESSURE SET AT 1.25" W.G. (ADJ), NOT TO EXCEED DISCHARGE PRESSURE OF 3.9" W.G. (ADJ) OR FALL BELOW A MINIMUM PRESSURE OF 0.5" W.G. (ADJ.) FINAL SETPOINT DETERMINED BY TAB CONTRACTOR AND APPROVED BY ENGINEER.
   a. THE STATIC PRESSURE SETPOINT SHALL BE RESET USING TRIM AND RESPOND LOGIC. THE INITIAL STATIC PRESSURE SET POINT SETPOINT, SP0, AT FAN START UP SHALL BE 1.25" WG. AFTER AN INITIAL TIME DELAY, Td, AT START UP OF 10 MINUTES (ADJ.), THE STATIC PRESSURE SET POINT SHALL MODULATE BASED ON THE NUMBER OF REQUESTS FOR MORE AIR, R, FROM THE VAVS. IF R IS LESS THAN OR EQUAL TO THE NUMBER OF REQUESTS TO IGNORE, I, OF 2 (ADJ.) AFTER A TIME STEP INTERVAL, T, OF 5 MINUTES (ADJ.), THE SET POINT SHALL RESET DOWN BY THE SET POINT RESPOND AMOUNT, SPres, OF 0.1" WG (ADJ.). IF R IS GREATER THAN TO I AFTER A TIME STEP INTERVAL T, THE SET POINT SHALL TRIM UP BY THE SETPOINT TRIM, SPtrim, AMOUNT OF 0.1" WG. R SHALL BE TRENDED.
6. RETURN FAN SPEED: RETURN FAN VSC SPEED TO MODULATE TO MAINTAIN A BUILDING PRESSURE CONTROL OF +0.05" WG (ADJ). THIS SHOULD BE BASED ON A SLIDING 5 MINUTE AVERAGE WITH A 15 SECOND SAMPLING RATE. IF RETURN AIR FAN IS AT MINIMUM SPEED AND BUILDING PRESSURE IS LESS THAN SETPOINT, MODULATE RETURN DAMPER TO MAINTAIN BUILDING PRESSURE SETPOINT.
7. FILTER SWITCH: FILTER DIFFERENTIAL PRESSURE SWITCHES ALARM AS NOTED – PRE-FILTER: 1.0" WG (ADJ).
8. SHUTDOWN: ON AHU SHUTDOWN SUPPLY AND RETURN FANS STOP, OUTDOOR AND RELIEF DAMPERS CLOSE, AND RETURN DAMPER OPENS. MAINTAIN PREHEAT AIR SETPONT OF 50°F (ADJ) BY MODULATING PREHEAT COIL VALVE. LOSS OF A SINGLE FAN SHALL NOT SHUT DOWN THE UNIT. CLOSE COOLING COIL VALVE EXCEPT ON LOW LIMIT SAFETY SHUTDOWN.

UNIT SHUTDOWN:
1. IN THE EVENT OF BOTH SUPPLY AND RETURN FANS COMMANDED OFF OR MANUALLY TURNED OFF, OUTSIDE AND RELIEF DAMPERS SHALL CLOSE. RETURN DAMPER SHALL FULLY OPEN.

1

EXHAUST FAN SEQUENCE OF OPERATION:

1. ALL SETPOINTS TO BE ADJUSTABLE. SETPOINTS TO BE EXPOSED ON GRAPHIC DISPLAY OR HIDDEN BASED ON OWNER REQUEST.
2. NORMAL OPERATION MODE:
   a. EXHAUST FAN IS STARTED FROM DDC PANEL OR FROM COMMAND OF FACILITY MANAGEMENT SYSTEM. EXHAUST FAN SHALL BE INTERLOCKED AND RUN ON THE SAME SCHEDULE AS THE AIR HANDLING UNIT.
   b. STARTUP: ON AIR-HANDLING UNIT STARTUP, THE ASSOCIATED EXHAUST FAN IS ENABLED WHEN REACHING A PERCENTAGE OF THE AIRFLOW TRACKING DIFFERENTIAL SETPOINT (SEE AHU CONTROL SCHEMATIC). ENGAGE VFC AND SIMULTANEOUSLY BEGIN TO OPEN FAN ISOLATION DAMPER. IF ISOLATION DAMPER IS NOT FULLY OPEN WITHIN 30 SECONDS THEN DISABLE FAN AND SIGNAL AN ALARM.
   c. EXHAUST FAN SPEED: ANALOG VFC CONTROL INPUT TO MODULATE EXHAUST FAN SPEED TO ACHIEVE SCHEDULED FAN SPEED (FINAL SETPOINT BY TAB). THIS IS AN ANALOG SIGNAL WITH THE VFC OPERATING IN "AUTO", NOT "HAND" OPERATION WITH SPEED ENTERED DIRECTLY INTO THE VFC.
3. SAFETIES:
   a. FURNISH SAFETY LOW LIMIT HARD WIRED TO FAN TO DISABLE FAN IF LOW LIMIT EXCEEDS **3.0"** W.G. FURNISH A BINARY ALARM INPUT TO THE BAS.

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SEAY BUILDING ADDITION

CLIENT PROJECT NO. - CPC 102-1219

CONSTRUCTION DOCUMENTS

MARK	DATE	DESCRIPTION
1	11/15/2019	ADDENDUM 001
2	12/11/2019	ADDENDUM 003
3	12/11/2020	PR-07

2020-12-11

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TEMPERATURE CONTROL SCHEMATICS

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