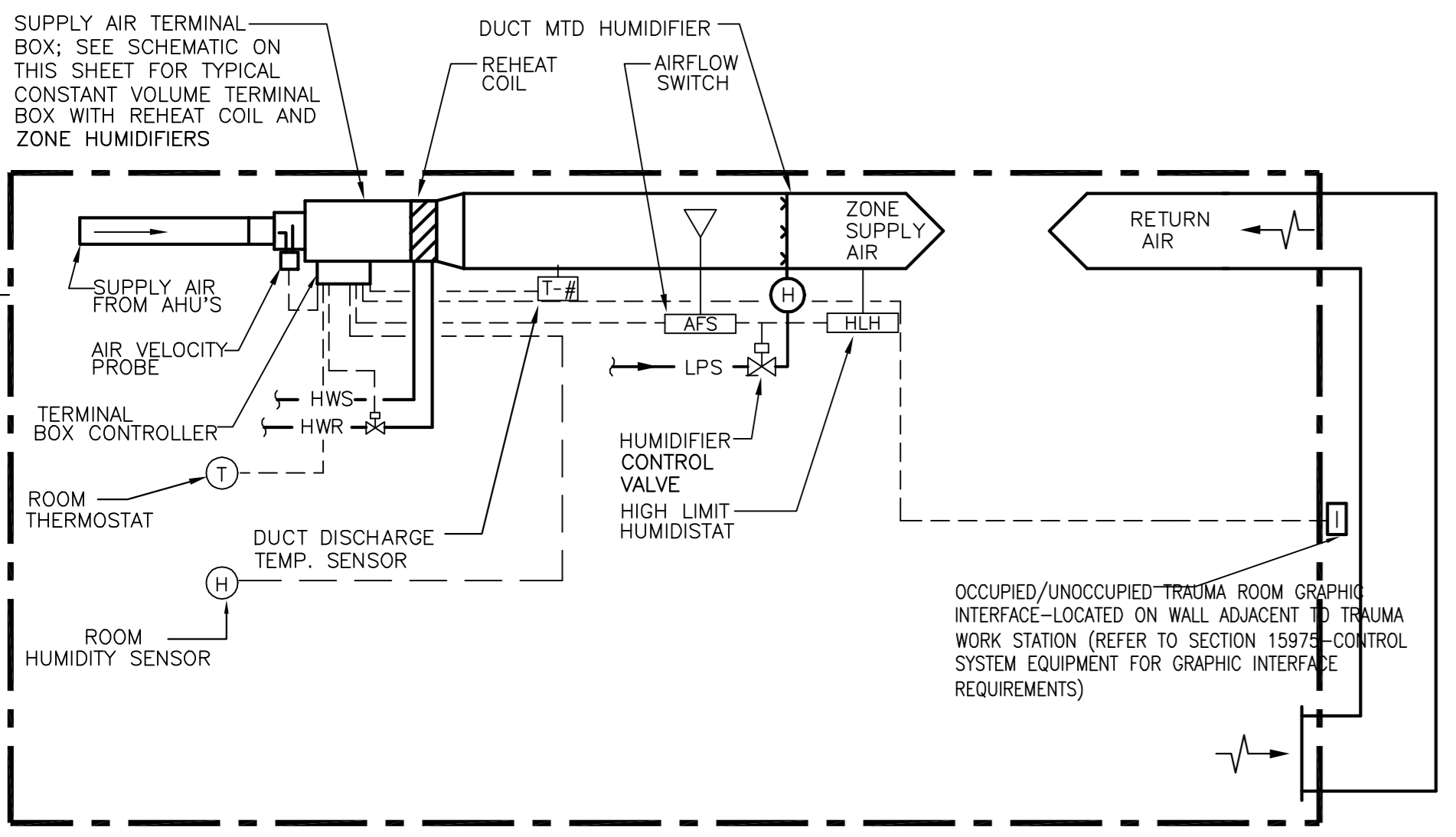
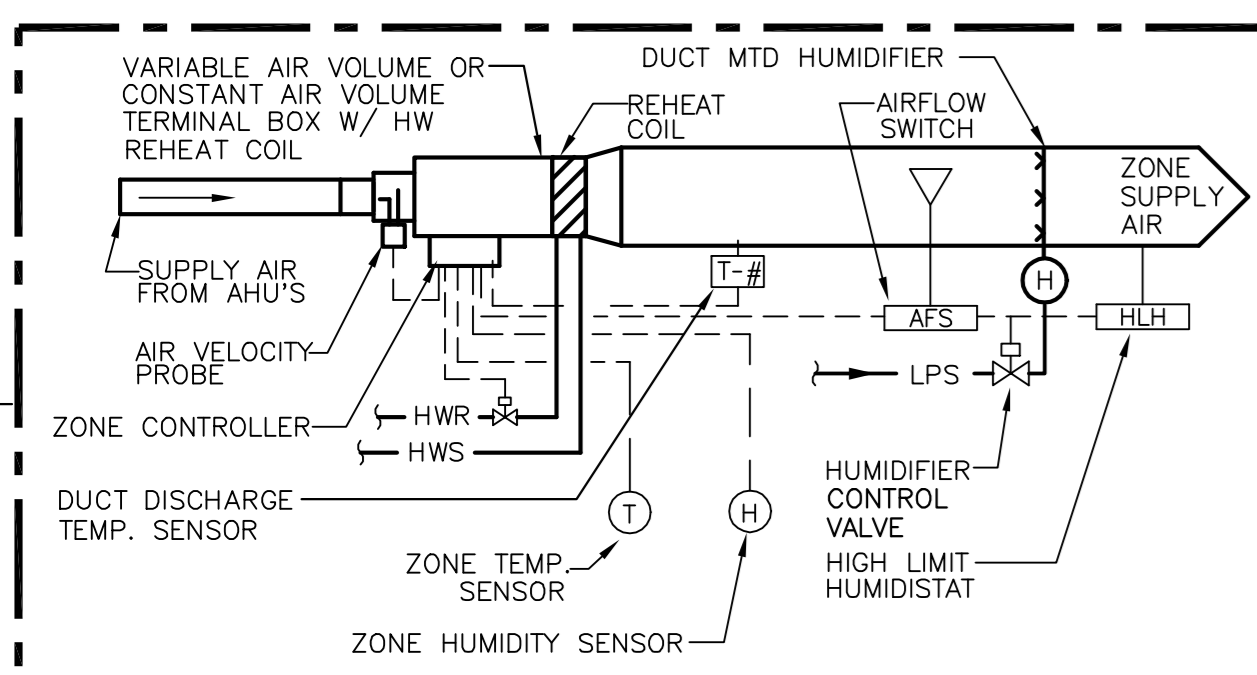


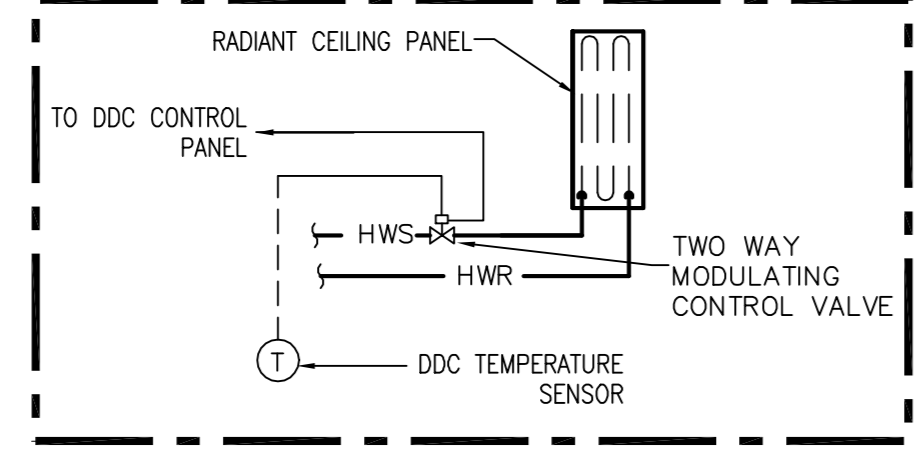
ISOLATION ROOM CONTROL SCHEMATIC



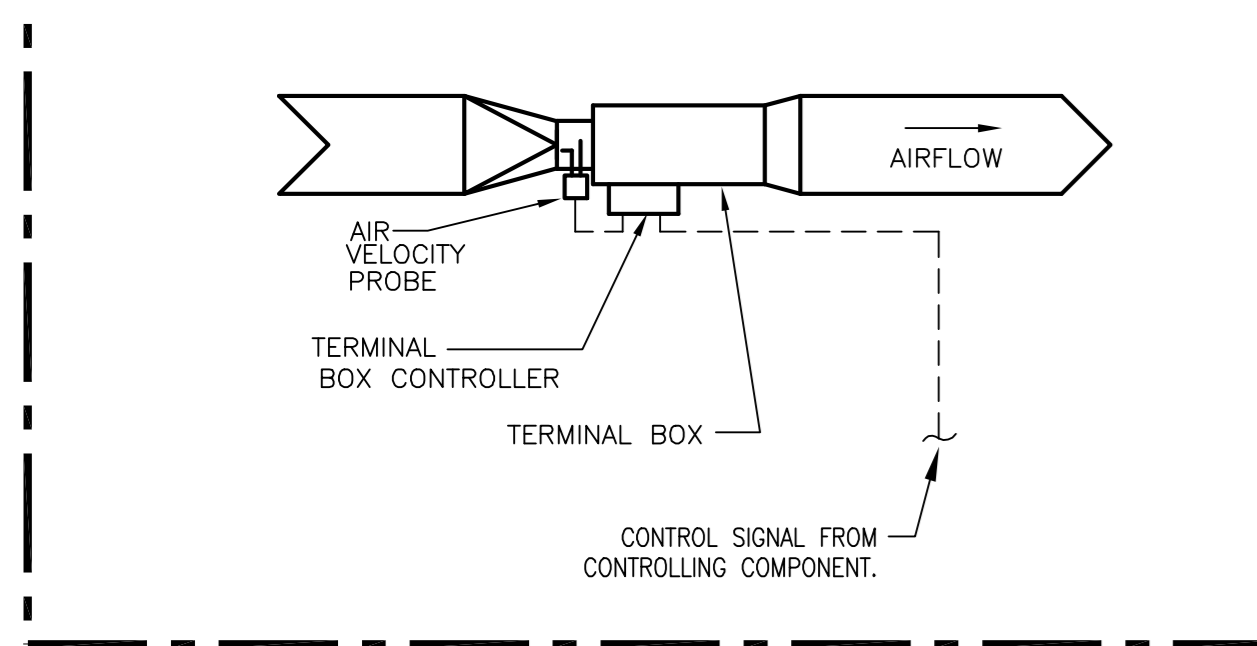
TRAUMA AND PROCEDURE ROOMS CONTROL DIAGRAM



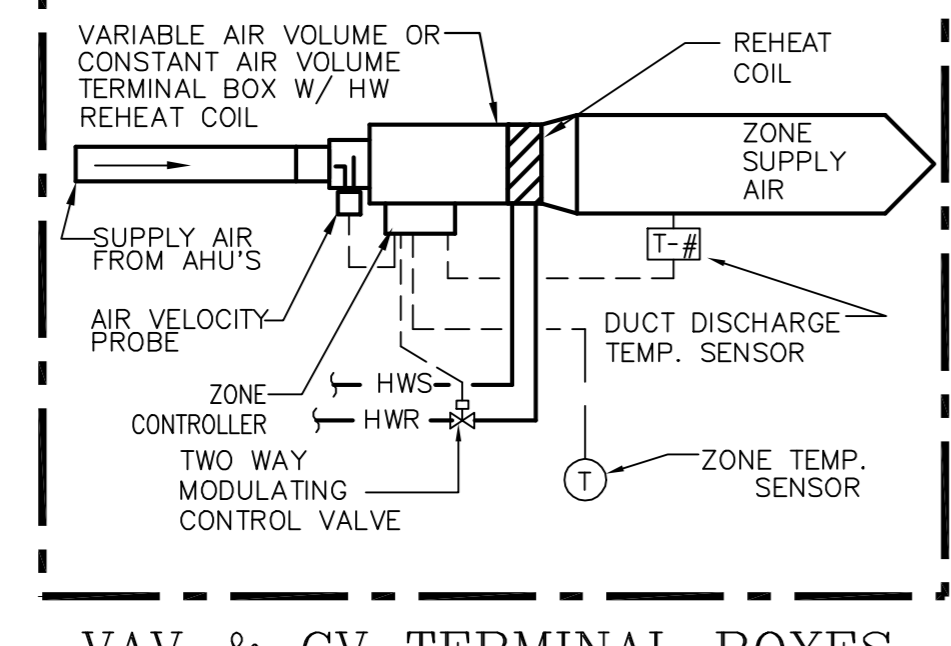
VAV & CV TERMINAL BOXES WITH HOT WATER REHEAT COILS AND ZONE HUMIDIFIERS



RADIANT CEILING PANEL CONTROL FOR TOILET B516 & B518



EXHAUST AND RETURN AIR VAV TERMINAL BOXES

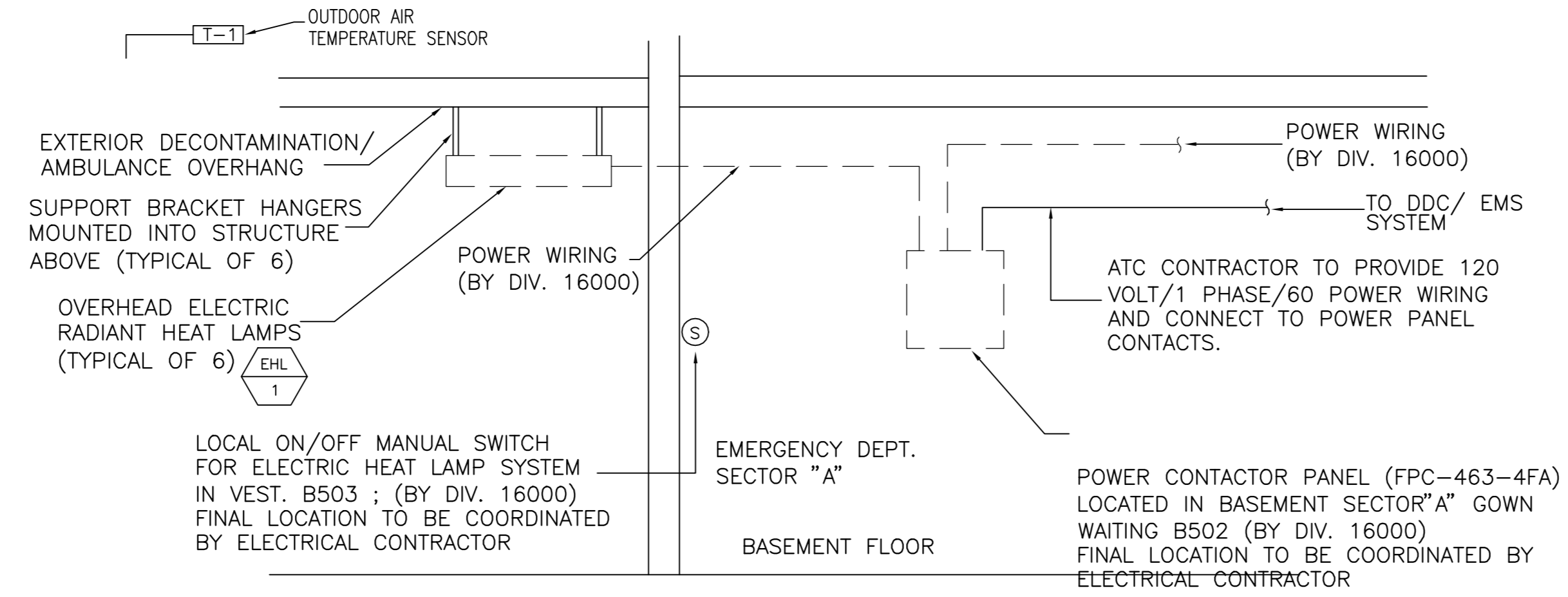


VAV & CV TERMINAL BOXES WITH HW REHEAT COILS

INPUT/OUTPUT SUMMARY TABLE- EXTERIOR DECONTAMINATION OVERHEAD ELECTRIC HEAT LAMPS

DESCRIPTION	INPUTS		OUTPUTS		ALARMS	FEATURES
	ANALOG	BINARY	ANALOG	BINARY		
EXT. OVERHEAD ELECTRIC HEAT LAMPS (T-1)						

NOTES: 1. ALL THE TEMPERATURE SENSORS AND ALL CONTROL SET POINTS SHALL BE ADJUSTABLE.

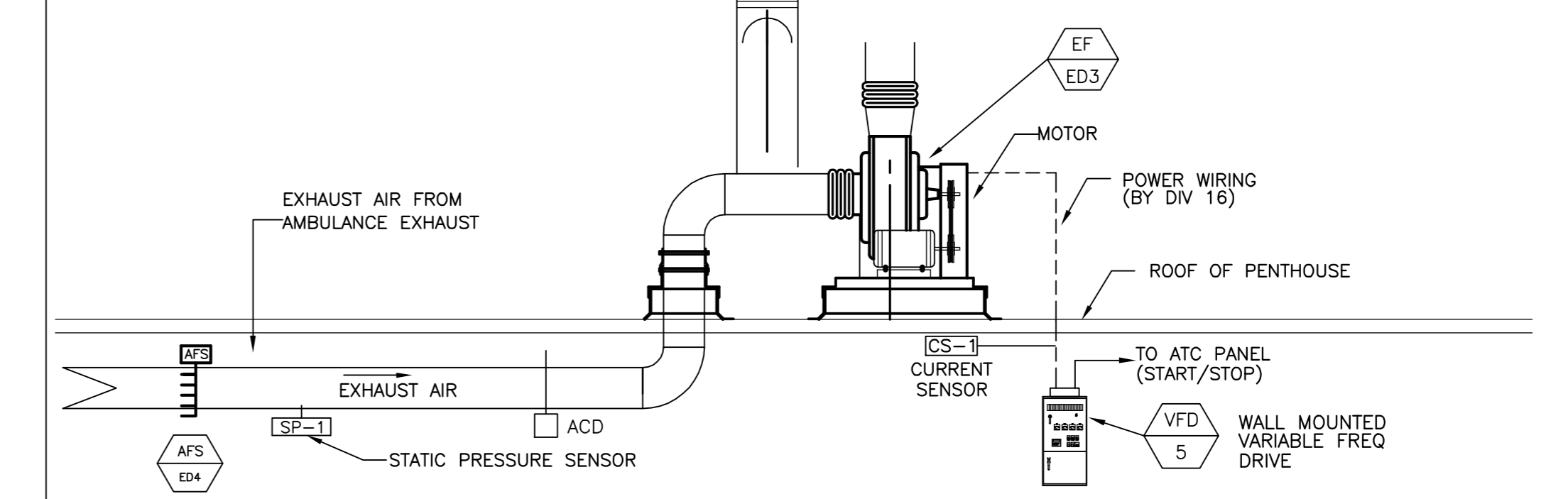


EXTERIOR DECONTAMINATION OVERHEAD ELECTRICAL HEAT LAMPS

- A. GENERAL
 - THE NEW EXTERIOR DECONTAMINATION OVERHEAD ELECTRICAL HEAT LAMP SYSTEM SHALL BE ENABLED AND DISABLED THROUGH THE DDC/EMS SYSTEM VIA A 120 VOLT/1 PHASE /60 WIRING FROM THE DDC/EMS SYSTEM TO THE POWER CONTACTOR PANEL (FPC-463-4FA) CONTACTS. THE ATC CONTRACTOR SHALL PROVIDE ALL POWER WIRING FOR CONTROLS, CONTROL WIRING, RELAY, TRANSFORMER, AND ALL DEVICES AS REQUIRED FOR A PROPER OPERATING SYSTEM.
 - THE DDC/EMS SYSTEM FRONT END SHALL HAVE THE CAPABILITY FOR AN OCCUPIED /UNOCCUPIED 7 DAY/ 24 HOUR PROGRAMMED SCHEDULE (ADJUSTABLE). THE ATC CONTRACTOR SHALL PROGRAM THE OCCUPIED AND UNOCCUPIED SCHEDULE (ADJUSTABLE) BASED UPON THE OWNERS DISCRETION AND INPUT.
- B. OPERATION MODE
 - WHENEVER, THE OUTSIDE AIR TEMPERATURE IS 45 F (ADJUSTABLE) OR BELOW, THE DDC/EMS SHALL SEND THE 120 VOLT SIGNAL TO ENERGIZE THE CONTACTS WITHIN THE POWER CONTACTOR PANEL, WHICH ENABLES THE OVERHEAD ELECTRICAL HEAT LAMPS. WHENEVER, THE OUTSIDE AIR TEMPERATURE RISES ABOVE 46 F (ADJUSTABLE) THE DDC/EMS SHALL DISABLE THE OVERHEAD ELECTRICAL HEAT LAMPS.
 - A LOCAL ON/OFF MANUAL SWITCH PROVIDED BY DIV. 16000 SHALL BE THE PRIMARY SWITCH USED BY THE MMC EMERGENCY DEPT. STAFF TO ENERGIZE AND DE-ENERGIZE THE OVERHEAD ELECTRICAL HEAT LAMP SYSTEM.
- C. UNOCCUPIED MODE
 - DURING THE UNOCCUPIED SCHEDULE THE DDC/EMS SHALL DISABLE THE OVERHEAD ELECTRICAL HEAT LAMP SYSTEM.

SEQUENCE OF OPERATION - TERMINAL BOXES

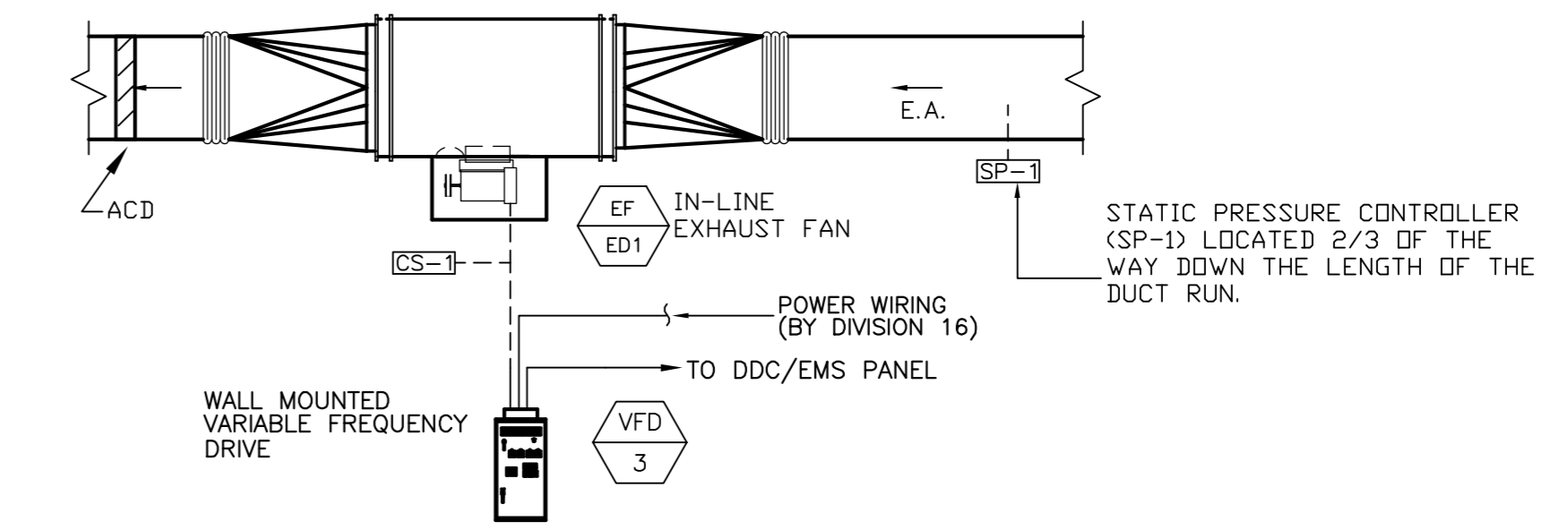
- A. GENERAL
 - VARIABLE AIR VOLUME AND CONSTANT AIR VOLUME TERMINALS WITH AND WITHOUT REHEAT COILS SHALL BE PRESSURE INDEPENDENT TYPE, USING AN INLET AIR VELOCITY PROBE TO MAINTAIN STEADY AIRFLOW AT STEADY STATE WITH SYSTEM UPSTREAM PRESSURE VARYING BETWEEN MINIMUM AND MAXIMUM RATED STATIC PRESSURE. ZONE CONTROLLER SHALL MODULATE VOLUME CONTROL DAMPER TO MAINTAIN AIR VELOCITY SETPOINT. THE ZONE CONTROLLER SHALL MAINTAIN SPACE TEMPERATURE SETPOINT (AS SENSED BY ZONE TEMPERATURE SENSOR) BY RESIZING THE AIR VELOCITY SETPOINT.
 - PROVIDE DISCHARGE TEMPERATURE SENSORS ON ALL SUPPLY TERMINAL BOXES WITH RE-HEAT COILS FOR MONITORING TERMINAL BOX DISCHARGE AIR TEMPERATURE.
- B. VARIABLE AIR VOLUME SUPPLY AIR TERMINAL BOXES WITHOUT HOT WATER REHEAT COILS
 - THE ZONE CONTROLLER SHALL INCREASE VAV TERMINAL BOX AIRFLOW ON A RISE IN SPACE TEMPERATURE. UPON A DROP IN SPACE TEMPERATURE BELOW THE SETPOINT, THE TERMINAL BOX SHALL MODULATE TOWARD ITS MINIMUM POSITION.
- C. VARIABLE AIR VOLUME EXHAUST AND RETURN AIR TERMINAL BOXES
 - THE ZONE CONTROLLER SHALL INCREASE VAV TERMINAL BOX AIRFLOW BASED ON THE INPUT CONTROL SIGNAL AS OUTLINED IN THEIR APPLICATION SPECIFIC SEQUENCES.
- D. VARIABLE AIR VOLUME TERMINAL BOXES WITH HOT WATER REHEAT COILS
 - THE ZONE CONTROLLER SHALL INCREASE VAV TERMINAL BOX AIRFLOW ON A RISE IN SPACE TEMPERATURE, UPON A DROP IN SPACE TEMPERATURE BELOW THE SETPOINT, THE TERMINAL BOX SHALL MODULATE TOWARDS ITS MINIMUM POSITION. UPON AN ADDITIONAL CALL FOR HEAT, THE ZONE CONTROLLER SHALL MODULATE THE ASSOCIATED HOT WATER REHEAT COIL VALVE OPEN.
- E. CONSTANT AIR VOLUME TERMINAL BOXES WITH HOT WATER REHEAT COILS
 - THE CONSTANT VOLUME TERMINAL BOX SHALL MAINTAIN A CONSTANT VOLUME OF AIR FLOW TO THE SPACE BY MODULATING THE TERMINAL CONTROL DAMPER IN RESPONSE TO AN AIRFLOW SENSOR SIGNAL UPON A DROP IN SPACE TEMPERATURE, THE ZONE CONTROLLER SHALL MODULATE THE HOT WATER REHEAT COIL VALVE OPEN.
- F. CONSTANT VOLUME OR VARIABLE VOLUME TERMINAL BOX WITH HUMIDIFIER AND REHEAT COIL
 - SUPPLY TERMINAL WITH REHEAT SHALL OPERATE AS DESCRIBED ABOVE. SPACE HUMIDITY SENSOR SHALL MAINTAIN SETPOINT BY MODULATING HUMIDIFIER ACTUATOR. AIRFLOW SWITCH (AFS) AND HIGH LIMIT DUCT HUMIDISTAT (HLH) SHALL AS THE PRESSURE IN THE ROOM DECREASES TO NEGATIVE -0.01" W.G. SETPOINT (ADJUSTABLE) OR BELOW AND SHALL MODULATE CLOSED TO MAX. CFM SETTING AS THE ROOM PRESSURE INCREASES TO NEGATIVE -0.01" W.G. OR HIGHER A ROOM PRESSURE MONITOR/CONTROLLER MOUNTED IN THE ANTE ROOM WALL (ADJACENT TO THE ISOLATION ROOM DOOR) SHALL DISPLAY ROOM PRESSURE AND SHALL PERFORM CONTROL FUNCTIONS INCLUDING SETPOINT ADJUSTMENT. THE PANEL SHALL SEND AND ALARM TO THE DDC OPERATOR WORKSTATION WHENEVER THE PRESSURE SETPOINT CANNOT BE MAINTAINED FOR A PERIOD GREATER THAN 30 SECONDS (ADJ.). THE EXHAUST TERMINAL BOXES SHALL LEAD AND THE SUPPLY TERMINAL BOXES SHALL FOLLOW.
- G. RADIANT CEILING PANEL CONTROL FOR TOILET B516 & B518
 - THE RADIANT CEILING PANELS SERVING TOILET ROOMS B516 & B518 WITH EACH RP SHALL HAVE A TWO WAY MODULATING CONTROL VALVE ; WHICH SHALL MODULATE THE FLOW OF HOT WATER TO MAINTAIN SET POINT OF 72 F (ADJUSTABLE).
- H. ISOLATION ROOM SUPPLY TERMINAL BOXES AND EXHAUST TERMINAL BOXES (ISOLATION ROOMS)
 - THE SUPPLY TERMINAL SHALL OPERATE AS A CONSTANT VOLUME AIR VOLUME TERMINAL WITH REHEAT COIL (SEE "E" ABOVE). IF THE EXHAUST FAN EF-ED1 FAILS OR ASSOCIATED TERMINAL BOX CLOSURES BELOW THE MINIMUM CFM SETTING THIS SHALL CAUSE THE SUPPLY TERMINAL BOX TO CLOSE. SUPPLY TERMINAL BOX FOLLOWS EXHAUST.
 - THE EXHAUST TERMINAL BOX SHALL MODULATE EXHAUST VOLUME BETWEEN THE MAX. CFM SETTING AND 100% OPEN TERMINAL BOX POSITIONS TO MAINTAIN A NEGATIVE PRESSURE OF 0.01" W.G. (ADJUSTABLE) AS SENSED BY ROOM PRESSURE SENSOR MOUNTED THROUGH THE ISOLATION ROOM WALL. THE EXHAUST TERMINAL BOX DAMPER SHALL OPEN AS THE PRESSURE IN THE ROOM DECREASES TO NEGATIVE -0.01" W.G. SETPOINT (ADJUSTABLE). THE HUMIDIFIER CONTROL SHALL BE INTERLOCKED WITH THE OPERATION OF THE AIR HANDLER TO PREVENT OPERATION OF THE HUMIDIFIER WHEN THE AHU IS DISABLED.
 - DDC ZONE CONTROLLER ON THE EXHAUST AIRFLOW TERMINAL BOX SHALL ISSUE AN ALARM TO THE DDC SYSTEM IN THE EVENT THAT THE CONTROLLER IS CALLING FOR INCREASED EXHAUST AND THE AIRFLOW CONTROL VALVE IS AT MAXIMUM OPEN POSITION.



INPUT/OUTPUT SUMMARY TABLE-SPECIAL EXHAUST FANS

DESCRIPTION	INPUTS		OUTPUTS		ALARMS	FEATURES
	ANALOG	BINARY	ANALOG	BINARY		
AMBULANCE EXH. FAN (EF-ED3)(VFD-5)(CS-1)						
STATIC PRESSURE SENSOR (SP-1)(EF-ED4)						
DAMPER (ACD-1) (EF-4ED)						
CARBON MONOXIDE SENSORS (CO) (TRP.2)						
AIR FLOW STATION						

- NOTES: 1. ALL SENSOR SETPOINTS AND ALL CONTROL DEVICES SHALL BE ADJUSTABLE.
- SEQUENCE OF OPERATION - AMBULANCE EXHAUST (EF-ED3) GENERAL:
 - THE EXHAUST FAN SHALL BE ENABLED AND DISABLED FROM THE DDC CONTROL PANEL. THE FANS SHALL TYPICALLY RUN CONTINUOUSLY.
 - DISABLED MODE:
 - WHEN THE FAN IS DISABLED, THE FAN SHALL RAMP DOWN VIA VFD DRIVE AT SAME SPEED AS IT RAMPED UP. THE FAN SHALL BE OFF AND THE MOTORIZED DAMPER (ACD) SHALL BE CLOSED.
 - NORMAL OPERATING MODE:
 - THE FAN SHALL START AND STOP ON COMMAND FROM THE DDC PANEL WHEN THE VARIABLE FREQUENCY DRIVE "HAND-OFF-AUTO" SWITCH IS IN THE "AUTO" POSITION.
 - THE EXHAUST FAN SHALL BE STARTED AND STOPPED MANUALLY WHEN THE VARIABLE FREQUENCY DRIVE "HAND-OFF-AUTO" SWITCH IS IN EITHER THE "HAND" OR "OFF" POSITION.
 - WHEN THE EXHAUST FAN IS STARTED, THE DDC SYSTEM SHALL COMMAND THE VFD DRIVE TO RAMP UP AT 0.5 HZ PER SECOND. AFTER A PERIOD TWO MINUTES, THE DDC SYSTEM SHALL HAVE RECEIVED THE STATIC PRESSURE REQUIREMENTS OF THE STATIC PRESSURE SENSOR. THE VARIABLE FREQUENCY DRIVE SHALL BE COMMANDED TO MAINTAIN A NEGATIVE STATIC PRESSURE IN THE EXHAUST DUCT. THE INITIAL STATIC PRESSURE SETPOINT SHALL BE 1.25" WG (ADJ.) AND SHALL BE ADJUSTED DURING THE FINAL BALANCING OF THE SYSTEM.
 - THE EXHAUST FAN SHALL TYPICALLY OPERATE AT 50 % SPEED UNLESS THE FOLLOWING CONDITIONS OCCUR. IF EITHER OF THE CARBON MONOXIDE (CO) SENSORS DETECT CO LEVELS ABOVE AN ADJUSTABLE 100 PARTS PER MILLION (PPM) SHALL CAUSE THE EXHAUST TO INCREASE ITS SPEED FROM 50% TO 100 % UNTIL THE CO SENSORS LOWER SET ADJUSTABLE LEVEL OF 75 PPM IS SATISFIED. THE OTHER CONDITION TO INCREASE THE EXHAUST FAN SPEED ABOVE 50% IS INFRARED DETECTORS WHICH REPORT BACK THRU DDC SYSTEM THAT ALL AMBULANCE BAYS ARE FILLED WITH AMBULANCES. THIS CONDITION SHALL CAUSE THE EXHAUST FAN TO INCREASE ITS SPEED TO 100%. THE DDC CONTROL SYSTEM SHALL RETURN THE EXHAUST FAN BACK TO 50% SPEED/ AIR VOLUME ONLY AFTER THE INFRARED DETECTORS SIGNAL A DECREASE IN AMBULANCE OCCUPANCY AND THE CO SENSOR DETECTED LEVELS HAVE DECREASED BACK TO LOW LEVELS.
 - WHEN THE FAN IS COMMANDED TO START, THE ASSOCIATED ACD SHALL OPEN. ONCE THE DAMPER HAS BEEN PROVED OPEN VIA THE ASSOCIATED END SWITCH, THE FAN SHALL START AND RAMP UP TO SPEED VIA VFD AT 0.5 HZ PER SECOND.
 - SAFETIES, MONITORING, AND ALARMS:
 - ANYTIME THE FAN IS ENABLED TO OPERATE AND THE STATIC PRESSURE SENSOR (SP-1) FOR EF-4ED FAILS TO DETECT A NEGATIVE PRESSURE, AN ALARM SHALL BE ISSUED. ANYTIME FAN EF-4ED ARE ENABLED TO OPERATE AND THE CURRENT SENSOR FAILS TO SENSE CURRENT THEN AN ALARM SHALL BE ISSUED.



SEQUENCE OF OPERATION - ISOLATION EXHAUST SYSTEMS (EF-ED1)

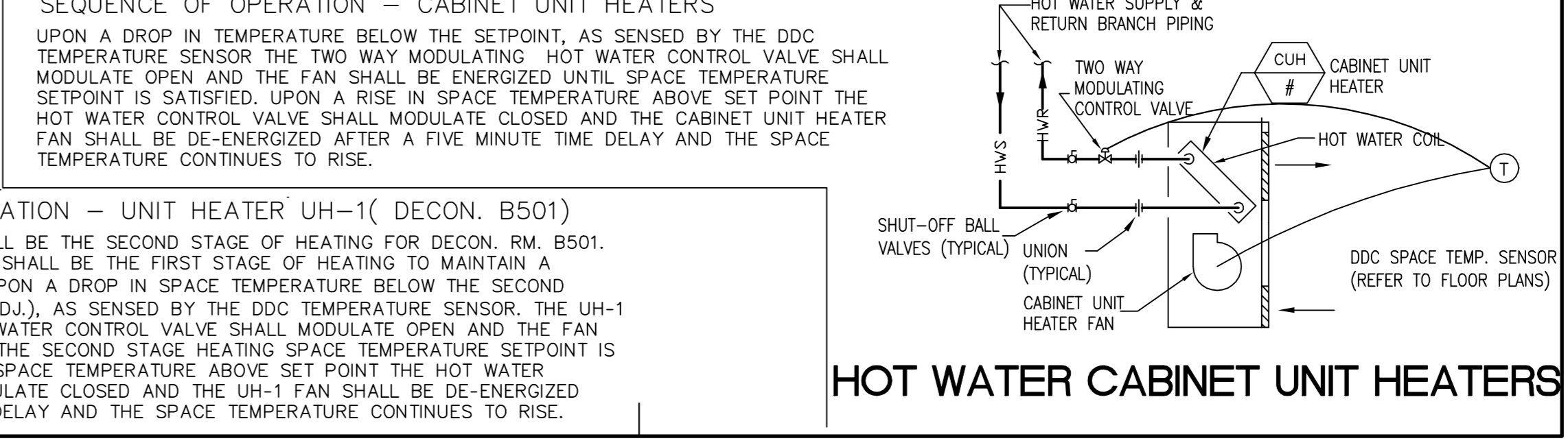
- A. THE ISOLATION ROOM EXHAUST FANS SHALL BE ENABLED AND DISABLED FROM THE DDC CONTROL PANEL. THE FAN SHALL TYPICALLY RUN CONTINUOUSLY.
- DISABLED MODE:
 - WHEN THE EXHAUST FANS EF-ED1 ARE DISABLED, THE FAN SHALL BE OFF AND THE AUTOMATIC CONTROL DAMPER (ACD) SHALL CLOSE.
- NORMAL OPERATING MODE:
 - WHEN THE FAN IS COMMANDED TO START, THE CONTROL DAMPER ACD SHALL OPEN. ONCE THE DAMPERS HAS BEEN PROVED OPEN VIA THE ASSOCIATED END SWITCH, THE EF-ED1 FAN SHALL START.
 - WHEN THE VFD-ED3 HAND/OFF/AUTOMATIC SWITCH (HOA) IS IN THE AUTO POSITION THEN THE EXHAUST FAN VARIABLE FREQUENCY DRIVE SHALL RAMP UP THE SPEED OF THE EF-ED1 FAN FROM 0HZ TO 60 HZ AT A RATE OF GREATER THAN 0.5 HZ PER SECOND. THE STATIC PRESSURE CONTROLLER SHALL BE SET DURING THE TESTING, ADJUSTING, & BALANCING BY THE TAB CONTRACTOR; INITIALLY SET FOR 2.0" IN. WC. WITH ADJUSTED BY TAB TO MAINTAIN 100 EXHAUST AIR FLOW WITH ALL EXHAUST TB BOXES 100% MAXIMUM. THE STATIC PRESSURE CONTROLLER SHALL HAVE AN ADJUSTABLE RANGE FROM 0.5" TO 3" IN. WC. WHENEVER THE VFD DRIVES HAND/OFF/AUTOMATIC HOA SWITCH IS IN THE HAND POSITION THE FAN WILL BE PLACED IN MANUAL OPERATION FULL DRIVE SPEED, AND WHENEVER THE (HOA) SWITCH IS PLACED IN OFF POSITION THE FAN SHALL BE DENERGIZED.
- SAFETIES, MONITORING, AND ALARMS:
 - THE DDC/EMS CONTROL SYSTEM SHALL MONITOR THE STATUS OF EACH EXHAUST FAN EF-ED1 VIA THE ASSOCIATED CURRENT SENSOR . IF ANYTIME THE EXHAUST FANS ARE STARTED AND AFTER A 20-SECOND DELAY THE CONTROL SYSTEM SENSES SENSES LOW OR ZERO CURRENT; THEN AN ALARM SHALL BE INITIATED. THE CURRENT SENSOR SHALL BE CONTINUOUSLY MONITORING AND SHALL INITIATE AN ALARM IF THERE IS A CHANGE IN FAN STATUS DURING THE NORMAL OPERATION.

INPUT/OUTPUT SUMMARY TABLE-ISOLATION ROOM EXHAUST FANS

DESCRIPTION	INPUTS		OUTPUTS		ALARMS	FEATURES
	ANALOG	BINARY	ANALOG	BINARY		
EXH. FAN (EF-ED1) (ACD) (CS-1) (VFD-3)						
DUCT STATIC PRESSURE SP-1						

NOTES: 1. ALL SENSOR SETPOINTS AND ALL CONTROL DEVICES SHALL BE ADJUSTABLE.

ISOLATION ROOM EXHAUST SYSTEMS CONTROL SCHEMATIC

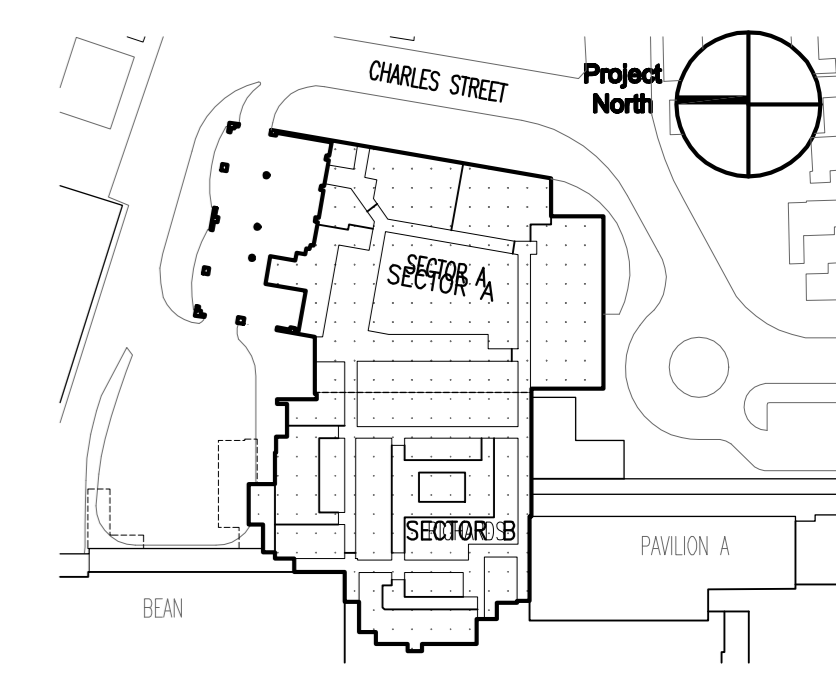


SEQUENCE OF OPERATION - UNIT HEATER UH-1 (DECON. B501)

- THE UNIT HEATER UH-1 SHALL BE THE SECOND STAGE OF HEATING FOR DECON. RW. B501. THE TERMINAL BOX TB-B-10 SHALL BE THE FIRST STAGE OF HEATING TO MAINTAIN A SETPOINT OF 70 F (ADJ.). UPON A DROP IN SPACE TEMPERATURE BELOW THE SECOND STAGE SETPOINT OF 67 F (ADJ.), AS SENSED BY THE DDC TEMPERATURE SENSOR, THE UH-1 TWO WAY MODULATING HOT WATER CONTROL VALVE SHALL MODULATE OPEN AND THE FAN SHALL BE ENERGIZED UNTIL THE SPACE TEMPERATURE SETPOINT IS SATISFIED. UPON A RISE IN SPACE TEMPERATURE ABOVE SET POINT THE HOT WATER CONTROL VALVE SHALL MODULATE CLOSED AND THE CABINET UNIT HEATER FAN SHALL BE DE-ENERGIZED AFTER A FIVE MINUTE TIME DELAY AND THE SPACE TEMPERATURE CONTINUES TO RISE.

HOT WATER CABINET UNIT HEATERS

MARK	ISSUE DATE	DESCRIPTION
A1	01/10/08	ADDENDUM NO. 1
BID	12/14/07	BID SET



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 ED Expansion and Renovation
 Portland, Maine MMC Project No. 21843

Drawing Title
HVAC CONTROL SEQUENCES AND POINTS LIST

Drawn By MJC Commission No. 4696
 Approved By MJC Date Issued 12/14/07

Phase / Package Number Sheet Number
H501