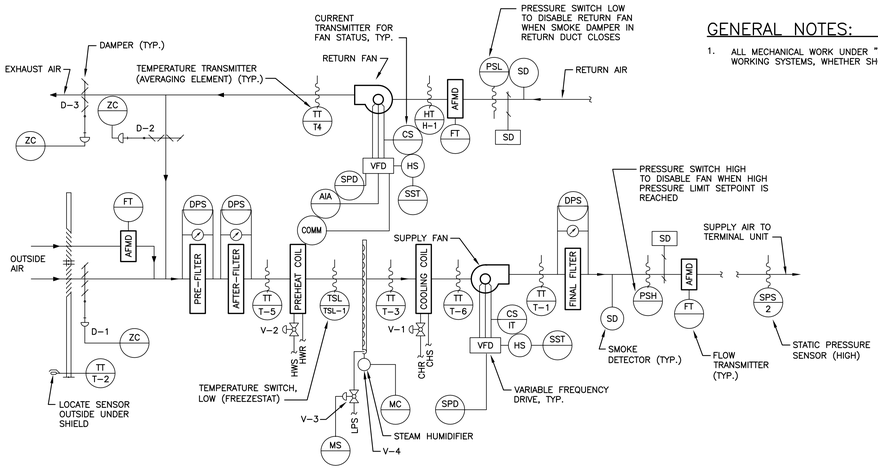
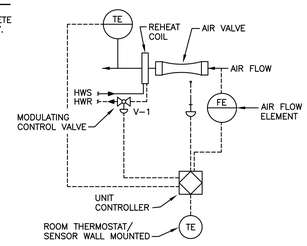


VARIABLE AIR VOLUME AIR HANDLING UNIT (AHU-ED) WITH MINIMUM OUTSIDE AIR CONTROL DIAGRAM

NO SCALE

GENERAL NOTES:

1. ALL MECHANICAL WORK UNDER "M" DRAWINGS SHALL BE COMPLETE WORKING SYSTEMS, WHETHER SHOWN OR NOT IN THEIR ENTIRETY.



UPON FALL IN SPACE TEMPERATURE BELOW SET POINT VALVE V-1 WILL MODULATE TO MAINTAIN SET POINT ± .5°, THE ADJUSTABLE TOLERANCE OF ± .5° HAS BEEN SELECTED TO PREVENT VALVE HUNTING.

THE REVERSE SHALL OCCUR ON RISE IN SPACE TEMPERATURE.

OCCUPIED/UNOCCUPIED MODE SHALL BE SENSED FROM AN AUXILIALLY CONTACT IN THE LIGHTING OCCUPANCY SENSOR PROVIDED BY EC.

SUPPLY AIR VALVE WILL ADJUST THE LEVEL OF AIR INTRODUCED INTO THE ROOM BASED ON THE SPACE OCCUPANCY SENSOR. IN THE UNOCCUPIED MODE, THE SUPPLY AIR VALVE SHALL MODULATE TO MAINTAIN UNOCCUPIED SETPOINT TEMPERATURE. IN THE OCCUPIED MODE, THE SUPPLY AIR VALVE SHALL OPEN TO THE PRESET FLOW INDICATED ON THE DRAWINGS.

EXHAUST AIR WILL TRACK THE SUPPLY AIR VALVE IN ORDER TO MAINTAIN PRESSURIZATION REQUIREMENTS FOR THE SPACE.

AIR TERMINAL UNIT CONTROL DIAGRAM

NO SCALE

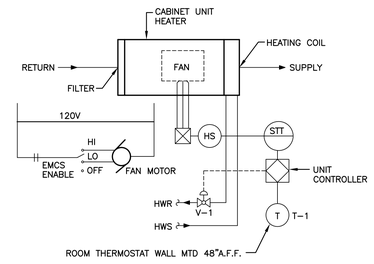
JOB: 528A8-09-802
BUILDING: VA PACU

PAGE:

SYSTEM: VAV AIR HANDLER — SYSTEM COMPONENT:	POINT ID	ABBREVIATION	POINT LEGEND: DISCRETE/ANALOG I/O; SYSTEM OUTPUTS: BINARY; SYSTEM OUTPUTS: ANALOG; SYSTEM INPUTS: BINARY; SYSTEM INPUTS: ANALOG; SYSTEM SOFTWARE/CONTROL: ALARM PROCESSING; SYSTEM SOFTWARE/CONTROL: APPLICATION/FUNCTION	REMARKS
Return Air Temperature	AI-1	RAT		
Return Air Humidity	AI-2	RAH		
Return Air Flow (cfm)	AI-3	RAF		
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-STS		
Supply Fan Status	BI-3	SF-STS		
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		
Return Fan VFD Alarm	BI-8	RF-ALA		
Return 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		
Cooling Valve V-1	AO-9	CLG-V1		
Return Fan Start/Stop	BO-1	RF-SST		
Supply Fan Start/Stop	BO-2	SF-SST		
Outside Air Duct Damper	AO-10	OADD		
Heat Recovery Coil Damper	AO-11	HRCD		

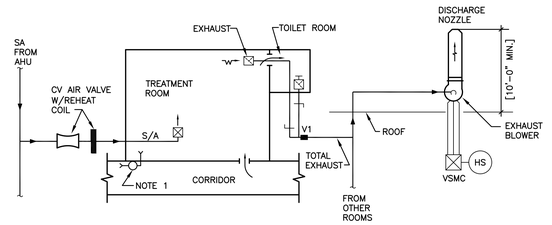
POINTS LIST FOR VARIABLE AIR VOLUME AIR HANDLING UNIT (AHU-ED) WITH MINIMUM OUTSIDE AIR

NO SCALE



HOT WATER CABINET HEATER CONTROLS

NO SCALE (TYPICAL FOR AIR CURTAINS)



GENERAL NOTES:

1. MAINTAIN NEGATIVE AIR PRESSURE (0.01 INCH WATER COLUMN [2.5 PASCAL]) BETWEEN THE ISOLATION ROOM AND THE CORRIDOR BY MODULATING VALVE V1. ISOLATION ROOM SHALL HAVE A PERMANENTLY INSTALLED DEVICE AND/OR MECHANISM TO CONSTANTLY MONITOR THE DIFFERENTIAL AIR PRESSURE BETWEEN THE ISOLATION ROOM AND THE CORRIDOR. A LOCAL VISUAL MEANS SHALL BE PROVIDED TO INDICATE WHENEVER NEGATIVE DIFFERENTIAL PRESSURE IS NOT MAINTAINED.
2. MAINTAIN THE ATTACHED TOILET ROOM, IF ANY, AT NEGATIVE AIR PRESSURE WITH RESPECT TO THE ISOLATION ROOM. HOWEVER, THE DESIGN NEED NOT INCLUDE A PRESSURE DIFFERENTIAL SENSOR FOR VERIFICATION.
3. LOCATE EXHAUST AIR REGISTER OVER THE PATIENT BED ON THE CEILING. AS AN ALTERNATE, THE EXHAUST AIR REGISTER CAN BE LOCATED ON THE WALL NEAR THE PATIENT HEAD, IF FEASIBLE.
4. LOCATE THE SUPPLY AIR OUTLET TO BLOW AIR TOWARDS THE OCCUPIED AREA.
5. PROVIDE A DEDICATED EXHAUST SYSTEM FOR THE ISOLATION ROOMS WITHOUT MIXING IT WITH ANY OTHER EXHAUST.

AIR SYSTEM FOR AIRBORNE INFECTIOUS ISOLATION ROOM (WITHOUT ANTEROOM)

NO SCALE (NEGATIVE PRESSURE)

SEQUENCE OF OPERATIONS

VARIABLE AIR VOLUME AIR HANDLING UNIT WITH MINIMUM OUTSIDE AIR

1. GENERAL

1.1 UNIT IS NORMALLY STARTED AND STOPPED 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. 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 (ADJ.) 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 OUTSIDE AIR DUCT DAMPER (OADD1) SHALL BE CLOSED. THE DAMPER AT HRC2 SHALL BE OPEN. 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 (ADJ.) 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 OUTSIDE AIR DUCT DAMPER (OADD1) SHALL ALSO OPEN TO THE MAXIMUM 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 D-1, D-2 AND D-3 SHALL MODULATE TO MAINTAIN THE SCHEDULED SUPPLY AIR TEMPERATURE. THE OUTSIDE AIR DUCT DAMPER (OADD1) SHALL BE CLOSED. THE DAMPER AT HRC2 SHALL BE OPEN. 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 RETURN AIR FAN ADJUSTABLE SPEED DRIVE TO MAINTAIN A CONSTANT AIR FLOW DIFFERENCE BETWEEN THE SUPPLY AIR AND THE RETURN AIR EQUAL TO MINIMUM OUTSIDE AIR.

3.3 USING HIGH STATIC 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. FREEZE PROTECTION

4.1 IF THE AIR TEMPERATURE AS SENSED BY TT-3 FALLS BELOW 45°F [7°C], AN ALARM SIGNAL SHALL INDICATE AT THE DIGITAL CONTROL PANEL (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 DCP 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.

5. AUTOMATIC SHUTDOWN/RESTART

5.1 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.

5.2 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.

6. EMERGENCY CONSTANT SPEED OPERATION

6.1 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.

7. MEDICAL EMERGENCY OPERATION (100% OA)

7.1 UPON THE ONSET OF A MEDICAL EMERGENCY CAUSED BY A POSSIBLE EPIDEMIC OF CONTAGIOUS DISEASE, THE AHU SHALL HAVE THE CAPABILITY TO OPERATE AT 100% VENTILATION MODE. THE OUTDOOR AIR MODE SHALL BE ACTIVATED MANUALLY BY WAY OF A WALL MUSHROOM PUSHBUTTON. TEMPERATURE CONTROLS SHALL BE COMPATIBLE FOR BOTH NORMAL AND EMERGENCY MODES.

7.2 WHEN WALL MUSHROOM PUSHBUTTON STATION IS ENGAGED THE SUPPLY FAN VFD AND RETURN FAN VFD/EXHAUST FAN VFD SHALL GO TO 100% OPERATION THROUGH A HARD WIRED CONNECTION. THE TEMPERATURE CONTROL SYSTEM SHALL ALSO TAKE AN INPUT OF PUSHBUTTON STATUS. UPON PUSHBUTTON ENGAGEMENT THE TEMPERATURE CONTROL SYSTEM SHALL USE SOFTWARE ALGORITHMS TO CONTROL TEMPERATURE (DISCHARGE OR SPACE).

AIR VALVE UNIT WITH REHEAT AND PERIMETER HEATING

CASE 1: NO PERIMETER HEATING.

A. HOT WATER VALVE ENABLED AT ALL TIMES.
B. HOT WATER VALVE OPENS IF ROOM TEMPERATURE IS LESS THAN LOWER DEADBAND LIMIT.

CASE 2: WITH RADIANT CEILING PANEL SYSTEM.

A. RADIANT PANEL CONTROL VALVE ENABLED BELOW A SPECIFIED OUTSIDE AIR TEMPERATURE.
B. IF AIR VALVE HOT WATER VALVE IS 100% OPEN AND ROOM TEMPERATURE IS LESS THAN SETPOINT, RADIANT CEILING PANEL HOT WATER VALVE MODULATES OPEN TO MAINTAIN ROOM TEMPERATURE SETPOINT.

1

EXHAUST FAN (EF1)

1. OCCUPIED

1.1 IN OCCUPIED MODE, EXHAUST FAN (EF1) AND DAMPER (EADD1) SHALL BE INTERLOCKED WITH AIR HANDLING UNIT SUPPLY AIR FAN. ON A SIGNAL FOR THE AIR HANDLING UNIT TO OPERATE, EXHAUST AIR DAMPER (EADD1) SHALL OPEN AND EXHAUST FAN (EF1) SHALL OPERATE.

2. UNOCCUPIED

2.1 IN UNOCCUPIED MODE, EXHAUST FAN (EF1) SHALL BE OFF AND EXHAUST AIR DAMPER SHALL BE CLOSED.

ROOF VENTILATOR (RV2) (SERVING EXISTING MORGUE)

1. OCCUPIED

1.1 IN OCCUPIED MODE, ROOF VENTILATOR'S (RF2) OUTSIDE AIR DAMPER SHALL OPEN UPON ACTIVATION OF EXISTING AIR HANDLING UNIT SERVING EXISTING MORGUE. EXISTING AIR HANDLING UNIT TO BE INTERLOCKED WITH NEW ROOF VENTILATOR'S OUTSIDE AIR DAMPER.

1. UNOCCUPIED

1.1 IN UNOCCUPIED MODE, ROOF VENTILATOR'S (RF2) OUTSIDE AIR DAMPER SHALL BE CLOSED.

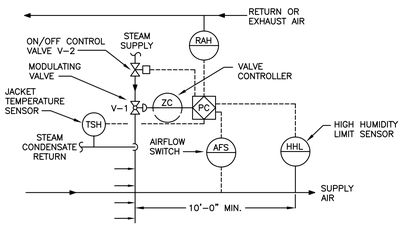
ROOF VENTILATOR (RV3) (SERVING EXISTING WAREHOUSE)

1. OCCUPIED

1.1 IN OCCUPIED MODE, ROOF VENTILATOR'S (RF3) OUTSIDE AIR DAMPER SHALL OPEN UPON ACTIVATION OF EXISTING AIR HANDLING UNIT SERVING EXISTING MORGUE. EXISTING AIR HANDLING UNIT TO BE INTERLOCKED WITH NEW ROOF VENTILATOR'S OUTSIDE AIR DAMPER.

1. UNOCCUPIED

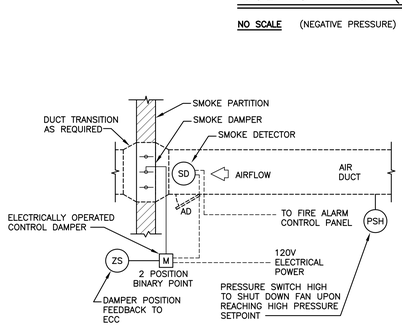
1.1 IN UNOCCUPIED MODE, ROOF VENTILATOR'S (RF3) OUTSIDE AIR DAMPER SHALL BE CLOSED.



STEAM HUMIDIFIER SEQUENCE:
RETURN AIR HUMIDITY (RAH) SHALL BE MONITORED. ON A CALL FOR HUMIDIFICATION, HUMIDIFIER VALVE V-1 SHALL MODULATE TO MAINTAIN THE RETURN AIR HUMIDITY SET POINT TO 30% (ADJUSTABLE). PRIOR TO ACTIVATION OF V-1, THE ON/OFF CONTROL VALVE V-2 SHALL BE ENABLED THROUGH ECC AND JACKET TEMPERATURE SENSED (TSH) SHALL BE WARM ENOUGH TO PREVENT CONDENSATION. THE HIGH LIMIT HUMIDITY SENSOR (HHL), LOCATED IN THE SUPPLY AIR DUCT 10 FEET AWAY FROM THE HUMIDIFIER SHALL DISABLE THE HUMIDIFIER AND GIVE AN ALARM SIGNAL TO THE ECC, IF THE SUPPLY AIR HUMIDITY EXCEEDS 90% RH (ADJUSTABLE). THE AIRFLOW SWITCH (AFS) SHALL PROVE AIRFLOW BEFORE HUMIDITY CONTROLS ARE ACTIVATED.

STEAM HUMIDIFIER CONTROL DIAGRAM

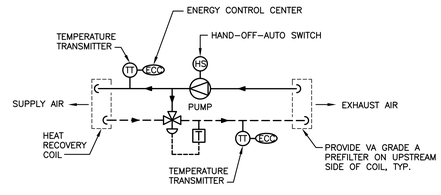
NO SCALE



SEQUENCE:
UPON DETECTION OF SMOKE BY THE SMOKE DETECTOR, THE SMOKE DAMPER SHALL CLOSE & SEND AN ALARM TO THE ECC.

SMOKE DAMPER CONTROL DIAGRAM

NO SCALE



NOTES:

1. TO PREVENT ICING ON EXHAUST COIL, MAINTAIN TEMPERATURE OF SOLUTION ENTERING EXHAUST AIR COIL ≥ 35°F BY MODULATING 3-WAY VALVE.
2. DISCONTINUE HEAT RECOVERY IF OUTSIDE AIR TEMPERATURE ≥ BETWEEN 60 TO 80° F (ADJUSTABLE) FOR ECONOMIZER MODE. DAMPER (D1) TO OPEN DURING ECONOMIZER AND PURGE MODES. SEE DRAWING M-2
3. INTEGRATE CONTROL POINT ON REMOTE GRAPHICS WORKSTATION AT ENERGY CONTROL CENTER.

RUN-AROUND HEAT RECOVERY COIL DETAIL

NO SCALE

FINAL DESIGN (100%)
FULLY SPRINKLERED

FFA #7451

Revisions	Date
1 ADDENDUM #1	7/24/12

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