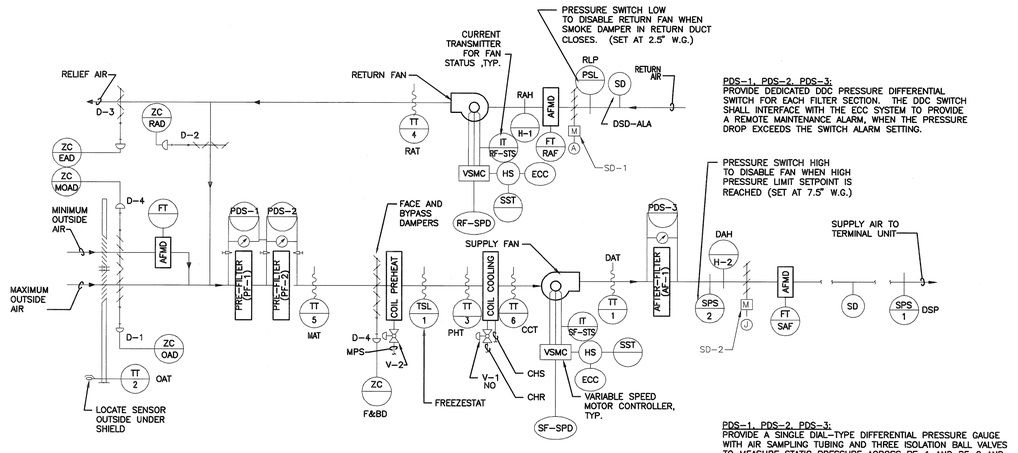
BUILDING AUTOMATION SYSTEM SHALL BE AN EXTENSION OF EXISTING NIAGRA-TRIDIUM SYSTEM. CONTROLS CONTRACTOR SHALL COORDINATE WITH THE VA AND SYSTEMS INTEGRATOR FOR FULL DDC SYSTEM FUNCTIONALITY AT THE ENGINEERING CONTROL CENTER (ECC)



PDS-1, PDS-2, PDS-3:
PROVIDE DEDICATED DDC PRESSURE DIFFERENTIAL SWITCH FOR EACH FILTER SECTION. THE DDC SWITCH SHALL INTERFACE WITH THE ECC SYSTEM TO PROVIDE A REMOTE MAINTENANCE ALARM, WHEN THE PRESSURE DROP EXCEEDS THE SWITCH ALARM SETTING.

PRESSURE SWITCH HIGH TO DISABLE FAN WHEN HIGH PRESSURE LIMIT SETPOINT IS REACHED (SET AT 7.5" W.G.)

PDS-1, PDS-2, PDS-3:
PROVIDE A SINGLE DIAL-TYPE DIFFERENTIAL PRESSURE GAUGE WITH AIR SAMPLING TUBING AND THREE ISOLATION BALL VALVES TO MEASURE STATIC PRESSURE ACROSS PF-1 AND PF-2 AND THE TOTAL STATIC PRESSURE DROP ACROSS BOTH PRE-FILTER SECTIONS.

PROVIDE A SINGLE DIAL-TYPE DIFFERENTIAL PRESSURE GAUGE AT AFTER-FILTER.

C6 TYPICAL VARIABLE AIR VOLUME AIR HANDLING UNIT AIR CONTROLS
SCALE: NONE

JOB: RENOVATE 13A FOR ENDOSCOPY SUITE
BUILDING: 13

SYSTEM: AHU-13A

SYSTEM COMPONENT:	POINT ID	ABBREVIATION	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	
DUCT STATIC PRESSURE	AI-8	DSP	
DISCHARGE AIR HUMIDITY	AI-9	DAH	
SUPPLY AIR FLOW (CFM)	AI-10	SAF	
OUTSIDE AIR TEMPERATURE	AI-11	OAT	
PRE-FILTER (PF-1) PDS	AI-12	PDS-1	
PRE-FILTER (PF-2) PDS	AI-13	PDS-2	
AFTER-FILTER (AF-1) PDS	AI-14	PDS-3	
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	
SUPPLY FAN VSMC ALARM	BI-7	SF-ALA	
RETURN FAN VSMC ALARM	BI-8	RF-ALA	
RETURN AIR SMOKE DETECTOR	BI-9	DSD-ALA	
FREEZE THERMOSTAT	BI-10	FZ-ALA	
RETURN FAN VSMC	AO-1	RF-SPD	FULL COMMUNICATION
SUPPLY FAN VSMC	AO-2	SF-SPD	FULL COMMUNICATION
OUTSIDE AIR DAMPER	AO-3	OAD	
RETURN AIR DAMPER	AO-4	RAD	
RELIEF 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	
FACE & BYPASS DAMPER	AO-10	FB&D	
RETURN FAN START/STOP	BO-1	RF-SST	
SUPPLY FAN START/STOP	BO-2	SF-SST	

POINT LEGEND — SYSTEM OUTPUTS: BINARY, ANALOG — SYSTEM INPUTS: BINARY, ANALOG — SYSTEM SOFTWARE/CONTROL: ALARM PROCESSING, APPLICATION/FUNCTION — PAGE:

NOTE: ALL CONTROLS POINTS REQUIRED, WHETHER SCHEDULED ABOVE, SHOWN IN THE SYSTEM SCHEMATIC, OR REQUIRED TO MAKE THE SEQUENCE WORK, SHALL BE PROVIDED.

SEQUENCE OF OPERATION FOR VARIABLE AIR VOLUME AIR HANDLING UNIT WITH ECONOMIZER

1. OCCUPIED MODE

1.1. HOURS OF OCCUPANCY SHALL BE DETERMINED BY THE VA DUBLIN COTR.

1.2. UNIT IS NORMALLY STARTED AND STOPPED REMOTELY AT THE ENGINEER CONTROL CENTER (ECC). H-0-A SWITCH SHALL BE KEPT IN THE "AUTO" POSITION. "HAND" AND "OFF" POSITIONS SHALL BE USED ONLY FOR MAINTENANCE. WHEN THE UNIT IS "OFF" DAMPERS D-1, D-3 AND D-4, SHALL BE FULLY CLOSED. WHEN THE UNIT IS "ON" MINIMUM OUTSIDE AIR DAMPER, D-4, SMOKE DAMPERS, SD-1, AND SD-2 SHALL BE FULLY OPEN. DAMPERS D-1, D-2 AND D-3 SHALL MODULATE IN ACCORDANCE WITH THE FOLLOWING SEQUENCE.

2. TEMPERATURE CONTROL

2.1. SUPPLY AIR TEMPERATURE (SAT), SENSED BY TT-1, SHALL BE MAINTAINED AT A SET POINT VIA DIGITAL CONTROL PANEL (DCP) BY MODULATING COILING COIL VALVE, V-1 OR DAMPERS, D-2 AND D-3 OR PRE-HEAT COIL VALVE, V-2 IN SEQUENCE.

2.2. WHEN THE OUTSIDE AIR TEMPERATURE (OAT), AS SENSED BY TT-2, IS ABOVE 75°F (ADJUSTABLE); THE DCP SHALL PREVENT THE MODULATION OF DAMPERS, D-2 AND D-3 AND SHALL ASSUME THE MINIMUM OUTSIDE AIR POSITION. THE DCP SHALL MODULATE V-1 TO MAINTAIN THE SAT SENSED BY TT-1.

2.3. WHEN THE OAT, AS SENSED BY TT-2, IS BETWEEN 65°F AND THE SAT, AS SENSED BY TT-1, DAMPER D-2 SHALL FULLY CLOSE AND D-1 AND D-3 SHALL BE FULLY OPEN (MAXIMUM OUTSIDE AIR POSITION). THE DCP SHALL MODULATE V-1 TO MAINTAIN SAT SENSED BY TT-1.

2.4. WHEN THE OAT, AS SENSED BY TT-2, IS BELOW THE SAT, AS SENSED BY TT-1; DAMPERS D-1, D-2 AND D-3 SHALL MODULATE TO MAINTAIN SCHEDULED SUPPLY AIR TEMPERATURE. IF D-2 IS OPEN AND D-3 IS IN MINIMUM OUTSIDE AIR POSITION, V-2 SHALL MODULATE OPEN TO MAINTAIN THE SAT, AS SENSED BY TT-1.

3. AIR FLOW CONTROL

3.1. THE SUPPLY AIR FLOW (SAF) SHALL BE CONTROLLED BY THE DCP MODULATING THE SUPPLY FAN VARIABLE SPEED MOTOR CONTROLLER TO MAINTAIN 1.0" (ADJUSTABLE) OF DUCT STATIC PRESSURE, SENSED BY SPS-1. RESET STATIC PRESSURE BASED ON ACTUAL BUILDING LOAD BY POLLING ALL AIR TERMINAL UNITS.

3.2. THE DCP, USING TOTAL SUPPLY AIR AND RETURN AIR FLOW SIGNALS, SHALL RESET THE RETURN AIR FAN VSMC TO MAINTAIN A CONSTANT AIR FLOW DIFFERENCE BETWEEN THE SUPPLY AIR AND THE RETURN AIR EQUAL TO MINIMUM OUTSIDE AIR. (OUTSIDE AIR CFM IS GREATER THAN EXHAUST AIR CFM TO MAINTAIN BUILDING PRESSURIZATION, DIFFERENCE BETWEEN OUTSIDE AIR AND EXHAUST AIR SHALL BE RELIEVED AT UNIT).

3.3. HIGH PRESSURE SENSOR, SPS-2 LOCATED AT THE SUPPLY FAN DISCHARGE, SHALL PREVENT THE SUPPLY FAN FROM DEVELOPING OVER 7.5" (ADJUSTABLE) OF STATIC PRESSURE. IF THE STATIC PRESSURE AT SPS-2 DOES EXCEED 7.5", THE SUPPLY AIR FAN SHALL STOP. SPS-2 SHALL BE HARDWIRED TO THE SUPPLY FAN VSMC AND THE UNIT SHALL BE SHUTDOWN IN HAND, AUTO OR BYPASS MODE. SPS-2 SHALL REQUIRE MANUAL RESET AT THE DEVICE. IF THE SUPPLY AIR FAN IS STOPPED, THE RETURN AIR FAN SHALL BE STOPPED.

3.4. THE LOW PRESSURE SENSOR, PSL LOCATED NEAR THE RETURN AIR FAN INLET SHALL SHUTDOWN THE RETURN FAN AND SUPPLY FAN WHEN ITS SETPOINT IS REACHED.

4. PRE-HEAT COIL

4.1. PRE-HEAT COIL WITH MODULATING STEAM CONTROL VALVE SHALL BE CONTROLLED BY DISCHARGE AIR TEMPERATURE (DAT) TRANSMITTER, TT-3. THE CONTROL VALVE SHALL OPEN ONLY AFTER IT HAS PROOF OF THE SAF BEING ENERGIZED. ON A RISE IN TEMPERATURE ABOVE TT-3 SETPOINT, TT-3 SHALL, THROUGH THE ECC, MODULATE CLOSED THE CONTROL VALVE TO MAINTAIN ITS SETPOINT. ON A FALL IN TEMPERATURE BELOW TT-3 SETPOINT, TT-3 SHALL, THROUGH THE ECC, MODULATE OPEN THE STEAM CONTROL VALVE TO MAINTAIN ITS SETPOINT. TT-3 SHALL ALARM THE ECC WHENEVER THE DISCHARGE TEMPERATURE IS TOO HIGH OR LOW.

5. UNOCCUPIED MODE AND OPTIMAL START

5.1. UNOCCUPIED MODE – THE SUPPLY AND RETURN FANS SHALL BE INDEXED OFF AND WILL REMAIN OFF UNTIL THE START OF NIGHT HIGH LIMIT, NIGHT LOW LIMIT, MORNING WARM-UP, MORNING COOL-DOWN, OR OCCUPIED MODE. THE RETURN AIR DAMPER SHALL REMAIN OPEN AND THE OUTSIDE AIR AND RELIEF AIR DAMPERS SHALL CLOSE. ALL EXHAUST FANS INTERLOCKED WITH AIR HANDLING UNIT SHALL BE DE-ENERGIZED. SPACE TEMPERATURE SET POINTS SHALL BE 60°F (ADJUSTABLE) HEATING SEASON AND 85°F (ADJUSTABLE) COOLING SEASON.

5.2. NIGHT LOW LIMIT MODE – ON A REQUEST FROM NIGHT LOW LIMIT OPERATION FROM A MINIMUM OF 3 (ADJUSTABLE) VAV ZONES THE SUPPLY AND RETURN FAN VSMC AND SUPPLY AIR TEMPERATURE CONTROL SHALL BE ENABLED. DURING NIGHT LOW LIMIT MODE THE SUPPLY AIR TEMPERATURE SET POINT SHALL BE SET TO THE WARM-UP SUPPLY AIR TEMPERATURE SET POINT 70°F (ADJUSTABLE). WHEN THE NUMBER OF VAV ZONES REQUESTING NIGHT LOW LIMIT MODE DROPS BELOW REQUIRED (3-ADJUSTABLE) OR OCCUPIED MODE BECOMES ACTIVE NIGHT LOW LIMIT MODE SHALL BE DISABLED.

5.3. NIGHT HIGH LIMIT MODE – ON A REQUEST FROM NIGHT HIGH LIMIT OPERATION FROM A MINIMUM OF 3 (ADJUSTABLE) VAV ZONES THE SUPPLY AND RETURN FAN VSMC AND SUPPLY AIR TEMPERATURE CONTROL SHALL BE ENABLED. WHEN THE NUMBER OF VAV ZONES REQUESTING NIGHT HIGH LIMIT MODE DROPS BELOW REQUIRED (3-ADJUSTABLE) OR OCCUPIED MODE BECOMES ACTIVE, NIGHT HIGH LIMIT MODE SHALL BE DISABLED.

5.4. MORNING WARM-UP – AN OPTIMUM START ALGORITHM AT THE ECC SHALL DETERMINE HOW EARLY THE AIR HANDLING UNIT SHALL BE ENERGIZED TO SATISFY OCCUPIED HEATING SET POINT BEFORE THE SCHEDULED OCCUPIED MODE BEGINS. DURING MORNING WARM-UP, THE OUTSIDE AIR AND RELIEF AIR DAMPERS SHALL REMAIN CLOSED. THE RETURN AIR DAMPER SHALL REMAIN FULLY OPEN AND ALL INTERLOCKED EXHAUST FANS SHALL REMAIN DE-ENERGIZED. OPEN CHILLED WATER CONTROL VALVE IF RETURN AIR TEMPERATURE RISES ABOVE 72°F (ADJUSTABLE). WHEN OCCUPIED MODE BECOMES ACTIVE WARM-UP MODE WILL BE DISABLED AND THE UNIT WILL BEGIN OCCUPIED MODE CONTROL.

5.5. MORNING COOL-DOWN – AN OPTIMUM START ALGORITHM AT THE ECC SHALL DETERMINE HOW EARLY THE AIR HANDLING UNIT SHALL BE ENERGIZED TO SATISFY OCCUPIED COOLING CONDITIONS. DURING MORNING COOL-DOWN, THE OUTSIDE AIR AND RELIEF AIR DAMPERS SHALL REMAIN CLOSED. THE RETURN AIR DAMPER SHALL REMAIN FULLY OPEN AND ALL INTERLOCKED EXHAUST FANS SHALL REMAIN DE-ENERGIZED. WHEN OCCUPIED MODE BECOMES ACTIVE, COOL-DOWN MODE WILL BE DISABLED AND THE UNIT WILL BEGIN OCCUPIED MODE CONTROL.

6. FREEZE PROTECTION

6.1. IF THE AIR TEMPERATURE AS SENSED BY TT-3 FALLS BELOW 45°F, AN ALARM SIGNAL SHALL INDICATE AT THE DCP AND ECC. IF THIS TEMPERATURE FALLS BELOW 40°F, AS SENSED BY THE TSL, THE SUPPLY AND RETURN FANS SHALL SHUT DOWN AND A CRITICAL ALARM SHALL INDICATE AT THE DIGITAL CONTROL PANEL AND ECC. TSL SHALL BE HARDWIRED TO THE SUPPLY FAN VSMC AND THE UNIT SHALL BE SHUTDOWN IN HAND, AUTO OR BYPASS MODE. TSL SHALL REQUIRE MANUAL RESET AT THE DEVICE.

7. AUTOMATIC SHUTDOWN/RESTART

7.1. WHEN SMOKE IS DETECTED BY EITHER THE RETURN AIR OR SUPPLY AIR SMOKE DETECTORS, 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.

7.2. 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.

8. EMERGENCY CONSTANT SPEED OPERATION

8.1. UPON FAILURE OF THE VSMC, THE SUPPLY AND RETURN FANS SHALL BE STARTED/STOPPED MANUALLY AT THE DIGITAL CONTROL PANEL OR THE ECC THROUGH THE BYPASS STARTER. FANS SHALL THEN OPERATE AT CONSTANT SPEED.

9. UNIT SHUTDOWN TEMPERATURE CONTROL

9.1. HOT WATER CONTROL VALVE SHALL BE NORMALLY OPEN. USE TT-6 TO MODULATE HOT WATER CONTROL VALVE WHEN AIR HANDLING UNIT IS SHUTDOWN TO MAINTAIN 50°F – 80°F INSIDE THE UNIT.

100% SUBMITTAL

REVISION NO.	REVISION DESCRIPTION		
Revisions		By	Date

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Recommended Approvals:	
1. MEDICAL DIRECTOR	6. OPERATIONS SERVICE LINE MANAGER
2. ASSOCIATE DIRECTOR	7. INFECTION CONTROL SAFETY MANAGER
3. CHIEF OF STAFF	8. SAFETY MANAGER
4. ASSOC. DIRECTOR	9. GENERAL ENGINEER
5. SERVICE LINE MGRS.	10. COTR

Drawing Title: MECHANICAL CONTROL SCHEMATICS

FULLY SPRINKLERED

Project Title: RENOVATE 13A FOR ENDOSCOPY SUITE

Date: June 10, 2011
Project Number: 557-10-108

Drawn	Building Number	AutoCAD File Name
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Checked	Reviewed	Const. Contract No.
LEH/HLH		

DRAWING No. M-602

Veterans Affairs