

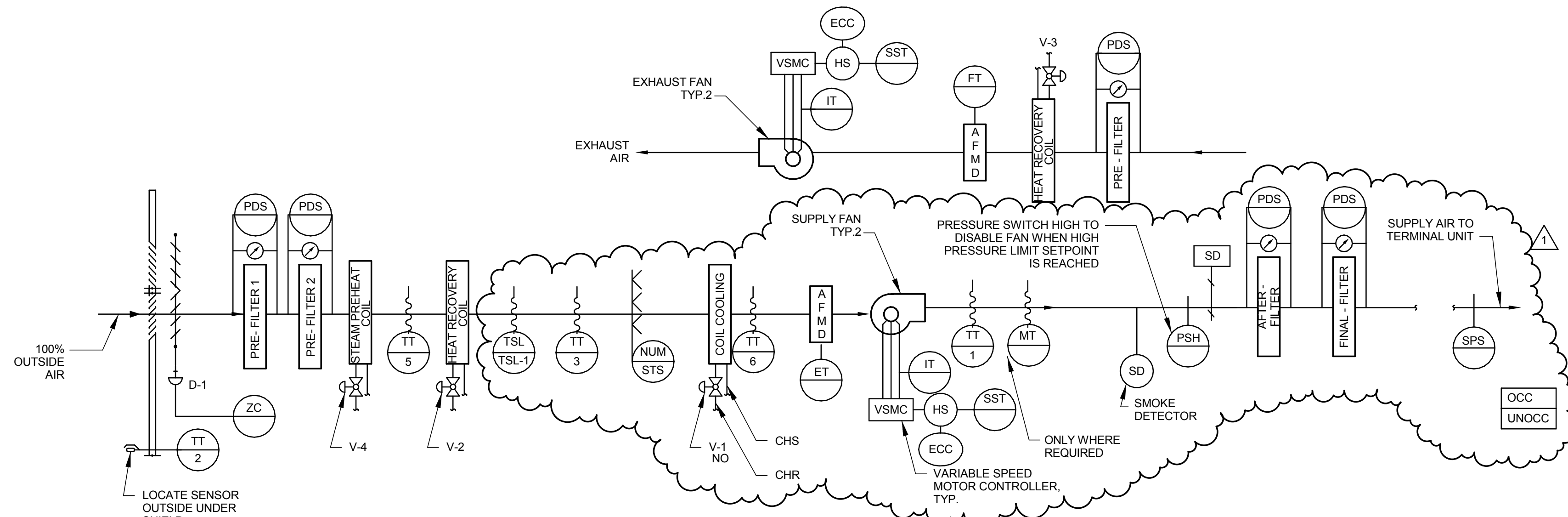
POINTS LIST FOR VAV AIR COOLED CHILLER

JOB:	POINT	SYSTEM	SYSTEM	SYSTEM	PAGE:
BUILDING: VA CATH LAB	LEGEND	OUTPUTS	INPUTS	SOFTWARE/CONTROL	
		BINARY	BINARY	ALARM	
		ANALOG	ANALOG	PROCESSING	
				APPLICATION/FUNCTION	
SYSTEM:					
AIR COOLED CHILLER					
SYSTEM COMPONENT:	POINT ID	ABBREVIATION	DESCRIPTION	REMARKS	
CHILLER-1 POWER	AI-1	COMM	CHILLER-1 POWER		
CHILLER-1 CAPACITY	AI-2	COMM	CHILLER-1 CAPACITY		
CHW RETURN TEMP	AI-3	TT-1	CHW RETURN TEMP		
CHILLER-1 CHW SUPPLY TEMP	AI-4	TT-2	CHILLER-1 CHW SUPPLY TEMP		
CHILLER-1 CKT-1 SUCTION TEMP	AI-5	COMM	CHILLER-1 CKT-1 SUCTION TEMP		
CHILLER-1 CKT-2 SUCTION TEMP	AI-6	COMM	CHILLER-1 CKT-2 SUCTION TEMP		
CHILLER-1 CKT-1 DISCHARGE TEMP	AI-7	COMM	CHILLER-1 CKT-1 DISCHARGE TEMP		
CHILLER-1 CKT-2 DISCHARGE TEMP	AI-8	COMM	CHILLER-1 CKT-2 DISCHARGE TEMP		
CHILLER-1 CKT-1 SUCTION PRESSURE	AI-9	COMM	CHILLER-1 CKT-1 SUCTION PRESSURE		
CHILLER-1 CKT-2 SUCTION PRESSURE	AI-10	COMM	CHILLER-1 CKT-2 SUCTION PRESSURE		
CHILLER-1 CKT-1 DISCHARGE PRESSURE	AI-11	COMM	CHILLER-1 CKT-1 DISCHARGE PRESSURE		
CHILLER-1 CKT-2 DISCHARGE PRESSURE	AI-12	COMM	CHILLER-1 CKT-2 DISCHARGE PRESSURE		
CHILLER-1 START/STOP	BI-1	COMM	CHILLER-1 START/STOP		
CHILLER-1 COMP 1A STATUS	BI-2	COMM	CHILLER-1 COMP 1A STATUS		
CHILLER-1 COMP 1B STATUS	BI-3	COMM	CHILLER-1 COMP 1B STATUS		
CHILLER-1 COMP 2A STATUS	BI-4	COMM	CHILLER-1 COMP 2A STATUS		
CHILLER-1 COMP 2B STATUS	BI-5	COMM	CHILLER-1 COMP 2B STATUS		
CHILLER-1 ALARM	BI-6	COMM	CHILLER-1 ALARM		
CHILLER-1 FAN STATUS	BI-7	TT-1	CHILLER-1 FAN STATUS		
CHILLER-1 FLOW	BI-8	COMM	CHILLER-1 FLOW		
CHILLER-1 COMP 1C STATUS	BI-9	COMM	CHILLER-1 COMP 1C STATUS		
CHILLER-1 COMP 2C STATUS	BI-10	COMM	CHILLER-1 COMP 2C STATUS		
CHILLER-1 COMP 1C ALARM	BI-11	COMM	CHILLER-1 COMP 1C ALARM		
CHILLER-1 COMP 2C ALARM	BI-12	COMM	CHILLER-1 COMP 2C ALARM		
CHILLER-1 CHWST SETPOINT	AO-1	COMM	CHILLER-1 CHWST SETPOINT		
CHILLER-1 ISOLATION VALVE	BO-1	V-1	CHILLER-1 ISOLATION VALVE		
VALVE V-1	BO-2	V-2	VALVE V-1		
VALVE V-2	BO-3	V-3	VALVE V-2		
VALVE V-3	BO-4	V-4	VALVE V-3		
VALVE V-4	AO-2	V-5	VALVE V-4		
VALVE V-5					

SEQUENCE OF OPERATION FOR AIR COOLED CHILLER

- AIR COOLED CHILLER**
 - DURING NORMAL OPERATION CHILLER WILL BE OFF. CHILLED WATER WILL BE PROVIDED TO AIR HANDLER BY THE HOUSE CHILLED WATER SYSTEM. AFTER ISOLATION VALVE V-1 & V-2 ARE COMPLETELY CLOSED, ISOLATION VALVES V-3 & V-4 WILL BE OPENED.
 - UPON SIGNAL FROM BMS THAT HOUSE CHILLED WATER SYSTEM CAN NOT SUPPORT LOAD ISOLATION VALVES V-3 & V-4 SHALL CLOSE. ISOLATION VALVES V-1 & V-2 SHALL OPEN AND CHILLER SHALL ACTIVATE AS NOTED BELOW.
 - CHILLER - RUN CONDITIONS:
 - THE CHILLER SHALL BE ENABLED TO RUN WHENEVER:
 - SIGNAL FROM BMS INDICATES HOUSE CHW SYSTEM CAN NOT MEET LOAD
 - AND THE OUTSIDE AIR TEMPERATURE IS GREATER THAN 54°F (ADJ.).
 - TO PREVENT SHORT CYCLING, THE CHILLER SHALL RUN FOR AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE), UNLESS SHUTDOWN ON SAFETIES OR OUTSIDE AIR CONDITIONS.
 - THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.
 - EMERGENCY SHUTDOWN: THE CHILLER SHALL SHUT DOWN AND AN ALARM GENERATED UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL STATUS.
 - CHILLER WATER PUMP:
 - THE CHILLED WATER PUMP SHALL RUN ANYTIME THE CHILLER IS CALLED TO RUN.
 - THE CHILLED WATER PUMP SHALL START PRIOR TO THE CHILLER BEING ENABLED AND SHALL STOP ONLY AFTER THE CHILLER IS DISABLED. THE CHILLED WATER PUMP SHALL THEREFORE HAVE:
 - A USER ADJUSTABLE DELAY ON START.
 - AND A USER ADJUSTABLE DELAY ON STOP.
 - THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.
 - ALARMS SHALL BE PROVIDED AS FOLLOWS:
 - CHILLED WATER PUMP FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
 - CHILLED WATER PUMP RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
 - CHILLED WATER PUMP RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
 - CHILLED WATER PUMP VFD FAULT.
 - CHILLED WATER PUMP SPEED CONTROL: WHILE THE CHILLER IS ON:
 - THE CHILLED WATER PUMP VFD WILL BE SET TO PROVIDE CHW FLOW AS SHOWN IN EQUIPMENT SCHEDULE. IF ONE PUMP GOES DOWN ON FAILURE, THE REMAINING PUMP SHALL RUN.
- CHILLER: THE CHILLER SHALL BE ENABLED AFTER A USER ADJUSTABLE TIME AFTER PUMP STATUSES ARE PROVEN ON. THE CHILLER SHALL THEREFORE HAVE A USER ADJUSTABLE DELAY ON START.
 - THE DELAY TIME SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.
 - THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.
 - ALARMS SHALL BE PROVIDED AS FOLLOWS:
 - CHILLER FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
 - CHILLER RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
 - CHILLER RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
- CHILLED WATER TEMPERATURE MONITORING: THE FOLLOWING TEMPERATURES SHALL BE MONITORED:
 - CHILLED WATER SUPPLY.
 - CHILLED WATER RETURN.
 - ALARMS SHALL BE PROVIDED AS FOLLOWS:
 - HIGH CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS GREATER THAN 50°F (ADJ.).
 - LOW CHILLED WATER SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS LESS THAN 38°F (ADJ.).
- CHILLER BYPASS VALVE V-5 SHALL MODULATE TO MAINTAIN THE MINIMUM FLOW THROUGH THE CHILLER WHENEVER THE CHILLER OPERATES.

AIR COOLED CHILLER - CONTROLS DIAGRAM



POINTS LIST FOR VAV AIR HANDLING UNIT WITH 100% OUTSIDE AIR

JOB:	POINT	SYSTEM	SYSTEM	SYSTEM	PAGE:
BUILDING: VA GENOMICS RESEARCH BUILDING	LEGEND	OUTPUTS	INPUTS	SOFTWARE/CONTROL	
		BINARY	BINARY	ALARM	
		ANALOG	ANALOG	PROCESSING	
				APPLICATION/FUNCTION	
SYSTEM:					
VAV AIR HANDLER					
AHU-1					
SYSTEM COMPONENT:	POINT ID	ABBREVIATION	DESCRIPTION	REMARKS	
RE-HEAT TEMPERATURE	AI-1	PHT	RE-HEAT TEMPERATURE		
COOLING COIL TEMPERATURE	AI-2	OCT	COOLING COIL TEMPERATURE		
DISCHARGE AIR TEMPERATURE	AI-3	OAT	DISCHARGE AIR TEMPERATURE		
DISCHARGE STATIC PRESSURE	AI-4	DASP	DISCHARGE STATIC PRESSURE		
DISCHARGE AIR HUMIDITY	AI-5	DAH	DISCHARGE AIR HUMIDITY		
EXH AIR FLOW (CFM)	AI-6	EXAF	EXH AIR FLOW (CFM)		
OUTSIDE AIR TEMPERATURE	AI-7	OAT	OUTSIDE AIR TEMPERATURE		
SUPPLY AIRFLOW (CFM)	AI-8	SAAF	SUPPLY AIRFLOW (CFM)		
SUPPLY FAN 1 STATUS	BI-1	SF-ST5	SUPPLY FAN 1 STATUS		
SUPPLY FAN 2 STATUS	BI-2	SF-ST5	SUPPLY FAN 2 STATUS		
STATIC PRESSURE HIGH LIMIT	BI-5	SPS-2	STATIC PRESSURE HIGH LIMIT		
HUMIDITY HIGH LIMIT	BI-6	HHL	HUMIDITY HIGH LIMIT		
SUPPLY FAN 1 VSMC ALARM	BI-7	SF-ALA	SUPPLY FAN 1 VSMC ALARM		
SUPPLY FAN 4 VSMC ALARM	BI-10	SF-ALA	SUPPLY FAN 4 VSMC ALARM		
HUMIDIFIER STATUS	BI-11	HUM-ST5	HUMIDIFIER STATUS		
EXH FAN 1 STATUS	BI-12	EF-ST5	EXH FAN 1 STATUS		
EXH FAN 2 STATUS	BI-13	EF-ST5	EXH FAN 2 STATUS		
EXH FAN 1 VSMC ALARM	BI-14	EF-ALA	EXH FAN 1 VSMC ALARM		
EXH FAN 2 VSMC ALARM	BI-15	EF-ALA	EXH FAN 2 VSMC ALARM		
SUPPLY HUMIDITY LOW ALARM	BI-16	HUM-ALA	SUPPLY HUMIDITY LOW ALARM		
SUPPLY HUMIDITY HIGH ALARM	BI-17	HUM-ALA	SUPPLY HUMIDITY HIGH ALARM		
SUPPLY FAN 1 VSMC	AO-1	SF-SPD	SUPPLY FAN 1 VSMC		
SUPPLY FAN 2 VSMC	AO-2	SF-SPD	SUPPLY FAN 2 VSMC		
OUTSIDE AIR DAMPER	AO-5	OAD	OUTSIDE AIR DAMPER		
HEAT RECOVERY VALVE V-2	AO-6	HR-V2	HEAT RECOVERY VALVE V-2		
HEAT RECOVERY VALVE V-3	AO-6	HR-V3	HEAT RECOVERY VALVE V-3		
PREHEAT COIL VALVE V-4	AO-7	HR-V4	PREHEAT COIL VALVE V-4		
COOLING VALVE V-1	AO-7	CLG-V1	COOLING VALVE V-1		
EXH FAN 1 VSMC	AO-8	EF-SPD	EXH FAN 1 VSMC		
EXH FAN 2 VSMC	AO-9	EF-SPD	EXH FAN 2 VSMC		
SUPPLY FAN 1 START/STOP	BO-1	SF-SST	SUPPLY FAN 1 START/STOP		
SUPPLY FAN 2 START/STOP	BO-2	SF-SST	SUPPLY FAN 2 START/STOP		
EXH FAN 2 START/STOP	BO-6	EF-SST	EXH FAN 2 START/STOP		
EXH FAN 1 START/STOP	BO-5	EF-SST	EXH FAN 1 START/STOP		
ZONE UNOCCUPIED	BI-16	Z-UNOCC	ZONE UNOCCUPIED		
ZONE OCCUPIED	BI-17	Z-OCC	ZONE OCCUPIED		

SEQUENCE OF OPERATION FOR VARIABLE AIR VOLUME AIR HANDLING UNIT WITH 100% OUTSIDE AIR

- GENERAL**
 - 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 SHALL BE FULLY CLOSED. WHEN THE UNIT IS "ON" D-1 SHALL BE FULLY OPEN.
- TEMPERATURE CONTROL**
 - SUPPLY AIR TEMPERATURE, SENSED BY TT-1, SHALL BE MAINTAINED AT SETPOINT VIA DIGITAL CONTROL PANEL BY MODULATING V-1, V-2, V-3 OR V-4 IN SEQUENCE.
 - WHEN THE TEMPERATURE OF THE OUTSIDE AIR, SENSED BY TT-2, IS BELOW 45°F (ADJ.), PREHEAT COIL V-4 SHALL MODULATE TO MAINTAIN TT-5 ABOVE 45°F.
 - WHEN THE TEMPERATURE OF THE OUTSIDE AIR, SENSED BY TT-3, IS BELOW THE SUPPLY AIR TEMPERATURE, SENSED BY TT-1, V-2 SHALL MODULATE OPEN TO MAINTAIN THE SUPPLY AIR TEMPERATURE, SENSED BY TT-1.
 - SUPPLY AIR TEMPERATURE SETPOINT SHALL BE RESET USING A TRIM AND RESPOND LOGIC FROM INITIAL SETPOINT OF 55°F TO 65°F BASED ON VAV BOX DAMPER POSITION.
- AIR FLOW CONTROL**
 - THE SUPPLY AIR FLOW SHALL BE CONTROLLED BY THE DIGITAL CONTROL PANEL MODULATING THE SUPPLY FANS VARIABLE SPEED MOTOR CONTROLLER TO MAINTAIN 1.5" (25mm) OF DUCT STATIC PRESSURE (FIELD ADJUSTABLE), SENSED BY SPS-1. RESET STATIC PRESSURE BASED ON ACTUAL BUILDING LOAD BY POLLING ALL VAV BOXES.
 - THE DIGITAL CONTROL PANEL, WILL MONITOR TOTAL SUPPLY AIR FLOW.
 - USING HIGH 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 VSMC AND UNIT SHALL BE SHUTDOWN IN HAND, AUTO OR BYPASS MODE. SPS-2 WILL REQUIRE MANUAL RESET AT THE DEVICE.
 - THE EXHAUST FANS SHALL MODULATE SPEED TO TRACK THE SAME EXHAUST CFM AS SUPPLY CFM, USING THE SUPPLY AIR FLOW MEASUREMENT, EXHAUST AIRFLOW MEASUREMENT DEVICES AND ROOM PRESSURE CONTROLLER.
 - SUPPLY AIRFLOW CFM SHALL VARY BASED ON "OCCUPIED" MODE SETTING. OCCUPIED/UNOCCUPIED COMMAND SHALL BE PROGRAMMABLE THROUGH THE BMS FRONT END OR VIA A REMOTE SURGERY WALL MOUNT SWITCH. WHEN THE AHU IS IN UNOCCUPIED MODE THE SUPPLY AIR CFM SHALL DECREASE TO THE MINIMUM AMOUNT SHOWN ON THE AHU SCHEDULE.
- HUMIDITY CONTROL**
 - SYSTEM SHALL MONITOR DISCHARGE AIR HUMIDITY USING DAH-1. ISSUE ALARM ON HIGH HUMIDITY LEVEL (ADJ.).
 - SYSTEM SHALL ACTIVATE DUCT HUMIDIFIER UPON LOW SYSTEM HUMIDITY LEVEL (ADJ.). IF DUCT IS ON FOR 10 MINUTES AND SUPPLY DUCT HUMIDITY SETPOINT IS NOT MET, ISSUE ALARM.
- FREEZE PROTECTION**
 - WHEN THE TEMPERATURE OF THE OUTSIDE AIR, SENSED BY TT-2, IS BELOW 45°F (ADJ.), PREHEAT COIL V-4 SHALL MODULATE TO MAINTAIN TT-5 ABOVE 45°F.
- AUTOMATIC SHUTDOWN/RESTART**
 - 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.
 - 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.
- EMERGENCY CONSTANT SPEED OPERATION**
 - 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 BY-PASS STARTER. FANS SHALL THEN BE OPERATED AT CONSTANT SPEED.
- OA DAMPER**
 - OA DAMPER WILL CLOSE WHENEVER AHU IS SHUT OFF.

VARIABLE AIR VOLUME AIR HANDLING UNIT WITH 100% OUTSIDE AIR CONTROL DIAGRAM

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AMENDMENT 1	09.05.2014
Revisions:	Date

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MECHANICAL CONTROLS

Approved: Project Director

Project Title
**VA PALO ALTO B-100
CATH LAB RENOVATION
AND HYBRID OR**

Location
**VAPAHCS - PALO ALTO CAMPUS
3801 MIRANDA AVE, PALO ALTO, CA 94304**

Date
08.22.2014

Checked
OR

Drawn
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Project Number

640-13-134

Building Number

100

Drawing Number

M1703

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Management

