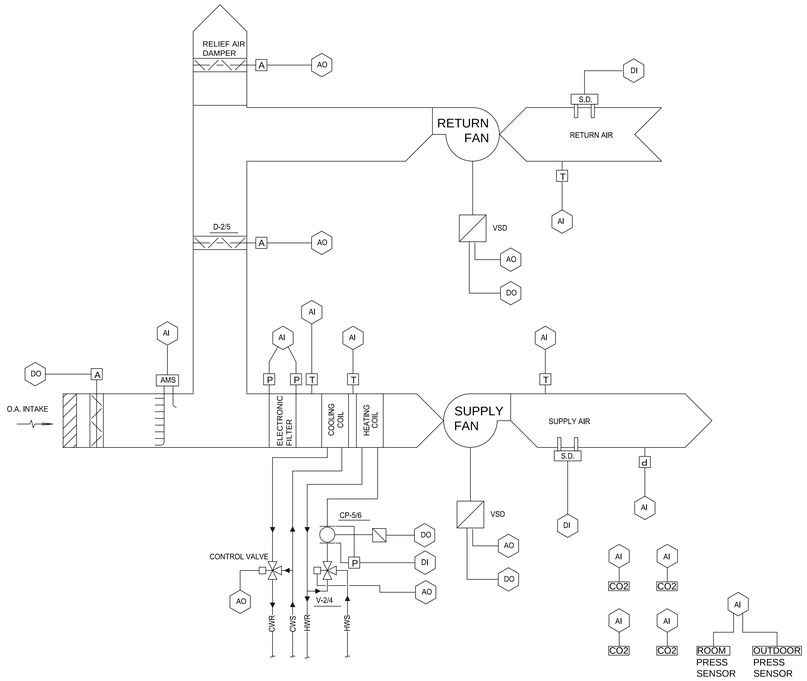


AHU CONTROL SCHEMATIC
SCALE: NOT TO SCALE

1

SYSTEM SEQUENCE OF OPERATION - AIR HANDLING:

AIR HANDLING UNITS (AHU)/FAN POWERED VARIABLE AIR VOLUME UNITS (FPVAV):

THE PLANT SHALL CONTAIN TWO AHU; EACH CONSISTING OF A RETURN FAN WITH VFD, RELIEF SECTION, INTAKE/ECONOMIZER SECTION, PREFILTER RACK, ELECTRONIC AIR CLEANER, CHILLED WATER COIL, HOT WATER COIL, SUPPLY FAN WITH VFD AND AN AIRFLOW MONITORING STATION. THE AHU COMPONENTS SHALL BE CONTAINED IN A PENTHOUSE ENCLOSURE WITH ACCESS DOORS AND SPACE FOR COIL PIPING. THE FPVAV UNITS SHALL CONSIST OF AN A VENTILATION/COOLING AIR INLET VOLUME DAMPER, AIRFLOW MONITORING STATION, FILTER SECTION, FAN, AND HOT WATER COIL. THE AHU AND FPVAV SHALL OPERATE AS FOLLOWS:

MORNING WARMUP:

THE AHU SUPPLY AND RETURN FANS SHALL START AND RUN CONTINUOUSLY AND THE OUTDOOR AIR/ RELIEF AIR DAMPERS SHALL BE SET TO THE MINIMUM POSITION. THE SUPPLY AND RETURN FANS SHALL BE SET AT 1/3 OF MAXIMUM AIRFLOW. THE FPVAV FANS SHALL RUN CONTINUOUSLY. IF ANY FPVAV SPACE SENSOR IS CALLING FOR HEATING. THE ASSOCIATED FPVAV AHU SUPPLY DAMPER SHALL OPEN AND THE AHU HEATING COIL SHALL DELIVER AIR AT A TEMPERATURE OF 90 DEG F TO THE FPVAV BOX. WHEN ALL THE ASSOCIATED SPACES ARE UP TO THE OCCUPIED TEMPERATURE OF 74 DEG F. (ADJUSTABLE) THE AHU HEATING COIL CONTROL VALVE SHALL CLOSE. DURING THIS CYCLE, THE BAGGAGE SCREENING SUPPLY AIR CONTROL DAMPER SHALL MODULATE TO MAINTAIN A SPACE TEMPERATURE OF 75 DEG F.

OCCUPIED OPERATION:

THE AHU SUPPLY AND RETURN FANS SHALL RUN CONTINUOUSLY. THE SUPPLY FAN SHALL MODULATE TO MAINTAIN PRESSURE SET POINTS AS FOLLOWS: 1. FROM A SENSOR MOUNTED 2/3 OF THE WAY DOWN THE SUPPLY DUCT, THE RETURN FAN SHALL TRACK WITH THE SUPPLY FAN. 2. IN RESPONSE TO A VERIS SERIES PXP (OR APPROVED EQUAL) PRESSURE DIFFERENTIAL SENSOR LOCATED IN A ROOM SERVED BY THE AIR HANDLER. THE OUTDOOR AIR/ RELIEF AIR DAMPERS SHALL BE MODULATED IN RESPONSE TO CO2 SENSORS IN SELECTED SPACES AND IN THE RETURN DUCTWORK. ON A CALL TO INCREASE THE OUTDOOR AIR VOLUME, THE AHU OUTDOOR AIR DAMPER SHALL SLOWLY OPEN UNTIL THE CO2 PPM DIFFERENTIAL BETWEEN THE HIGHEST READING CO2 SPACE SENSOR AND THE RETURN DUCT SENSOR REACHES A SET POINT OF 700 PPM (ADJUSTABLE) OR THE RETURN AIR DUCT CO2 SENSOR READS 1000 PPM. (ADJUSTABLE) WHEN THE OUTDOOR AIR TEMPERATURE IS BELOW 55 DEG F. (ADJUSTABLE) THE AHU ECONOMIZER CONTROLS SHALL PROVIDE COOLING FROM OUTDOOR AIR ALONE AND THE CHILLED WATER SYSTEM SHALL BE LOCKED OUT. WHEN THE OUTDOOR AIR TEMPERATURE IS ABOVE 55 DEG F. (ADJUSTABLE) THE AHU OUTDOOR AIR/RELIEF DAMPERS SHALL MODULATE FROM THE CO2 CONTROLS AS NOTED ABOVE AND THE CHILLED WATER COIL CONTROL VALVES SHALL MODULATE TO MAINTAIN A SUPPLY AIR TEMPERATURE SET POINT OF 55 DEG F. (ADJUSTABLE) THE FPVAV BOX FANS SHALL RUN CONTINUOUSLY. IF ANY SPACE SENSOR IS CALLING FOR HEATING, THE ASSOCIATED FPVAV SUPPLY DAMPER SHALL OPEN AND THE AHU HEATING COIL SHALL DELIVER AIR AT A TEMPERATURE OF 90 DEG F TO THE FPVAV BOX. IF ANY SPACE SENSOR IS CALLING FOR COOLING. THE ASSOCIATED FPVAV SUPPLY DAMPER SHALL OPEN AND THE AHU SHALL DELIVER AIR AT A TEMPERATURE OF 55 DEG F TO THE FPVAV BOX. THE BAGGAGE SCREENING SUPPLY AIR CONTROL DAMPER SHALL MODULATE TO MAINTAIN A SPACE TEMPERATURE OF 75 DEG F. IF THE SPACE TEMPERATURE DROPS BELOW 70 DEG F, THE CONTROL DAMPER SHALL CLOSE TO 5% OF FULL OPEN.

UNOCCUPIED OPERATION:

THE AHU SUPPLY AND RETURN FANS SHALL CYCLE IN RESPONSE TO A CALL FOR UNOCCUPIED COOLING FROM ANY FPVAV SPACE TEMPERATURE SENSOR. THE OUTDOOR AIR/RELIEF AIR DAMPERS SHALL BE CLOSED UNLESS THE OUTDOOR AIR TEMPERATURES ARE SUITABLE FOR ECONOMIZER COOLING. THE FPVAV FANS SHALL CYCLE IN RESPONSE TO THEIR ASSOCIATED SPACE TEMPERATURE SENSORS AND THE HOT WATER COIL CONTROL VALVES SHALL CYCLE TO MAINTAIN UNOCCUPIED SPACE TEMPERATURES OF 55 DEG F HEATING (ADJUSTABLE) AND 85 DEG F COOLING (ADJUSTABLE) THE BAGGAGE SCREENING SUPPLY AIR CONTROL DAMPER SHALL MODULATE TO MAINTAIN A SPACE TEMPERATURE OF 70 DEG F. IF THE SPACE TEMPERATURE DROPS BELOW 65 DEG F, THE CONTROL DAMPER SHALL CLOSE.

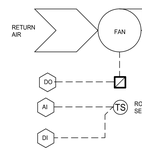
ALARM CONDITIONS:

THE AHU SUPPLY AND RETURN FANS SHALL STOP AND THE OUTDOOR AIR/RELIEF AIR DAMPERS SHALL CLOSE UPON A SIGNAL FROM THE ASSOCIATED DUCT MOUNTED SMOKE DETECTOR OR FROM ANY FIRE DAMPER MICROSWITCH. THE DDC SYSTEM SHALL SEND AN ALARM TO THE DESIGNATED MAINTENANCE REPRESENTATIVE.

THE DDC SYSTEM SHALL SEND AN ALARM TO THE DESIGNATED MAINTENANCE REPRESENTATIVE WHEN A SIGNAL IS GENERATED FROM AN AUTOMATIC-RESET FREEZESTAT WITH A SET POINT OF 38 DEG F (ADJUSTABLE) MOUNTED ON THE DISCHARGE OF THE CHILLED WATER COIL. AT A TEMPERATURE OF 38 DEG F (ADJUSTABLE BY SOFTWARE) A MIXED AIR SENSOR SHALL STOP THE FAN MOTORS, OPEN THE HEATING COIL CONTROL VALVE AND CLOSE THE MIXED AIR DAMPERS. WHEN THE MIXED AIR TEMPERATURE RISES TO 40 DEG F (ADJUSTABLE BY SOFTWARE) THE FAN MOTORS SHALL START AND RAMP UP, THE HEATING VALVE SHALL BE CONTROLLED TO NORMAL PROTOCOL AND THE MIXED AIR DAMPERS SHALL RETURN TO THEIR PROPER SETTINGS. MANUAL FREEZESTATS SHALL ONLY SHUT DOWN THE FAN MOTORS WHEN THE COOLING COIL DOWNSTREAM AIR TEMPERATURE REACHES A SETPOINT OF 34 DEG F. AT THIS POINT THE FAN MOTORS SHALL STOP; THE OUTDOOR AND RELIEF AIR DAMPERS SHALL CLOSE AND THE HEATING COIL CONTROL VALVE SHALL MODULATE TO MAINTAIN A TEMPERATURE OF 50 DEG F IN THE COIL SPACE.

THE DDC SYSTEM SHALL DISPLAY THE DIFFERENTIAL PRESSURE ACROSS THE FILTERS WHEN THE AHU STATUS SCREEN IS DISPLAYED. THE DDC SYSTEM SHALL SEND AN ALARM TO THE DESIGNATED MAINTENANCE REPRESENTATIVE WHEN THE DIFFERENTIAL PRESSURE REACHES THE ALARM SETPOINT.

THE DDC SYSTEM SHALL SEND AN ALARM TO THE DESIGNATED MAINTENANCE REPRESENTATIVE WHEN THE ATFP VENTILATION CUTOFF BUTTON IS ACTIVATED. THIS BUTTON SHALL CAUSE THE AHU OUTDOOR AIR INTAKE AND RELIEF DAMPERS TO CLOSE.



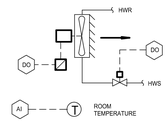
SEQUENCE OF OPERATION

UNIT HEATERS/CABINET UNIT HEATERS

A WALL-MOUNTED ELECTRIC THERMOSTAT SHALL OPEN A TWO WAY CONTROL VALVE IN THE SUPPLY PIPE AND SHALL CYCLE THE UNIT FAN TO MAINTAIN THE SPACE AIR TEMPERATURE SET POINT. A PIPE MOUNTED AQUASTAT SHALL PREVENT THE FAN FROM OPERATING IF THE SUPPLY WATER TEMPERATURE IS BELOW 130 DEG F. (ADJUSTABLE)

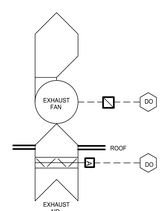
CABINET UNIT HTR CONTROL SCHEMATIC
SCALE: NOT TO SCALE

5



UH CONTROL SCHEMATIC
SCALE: NOT TO SCALE

2



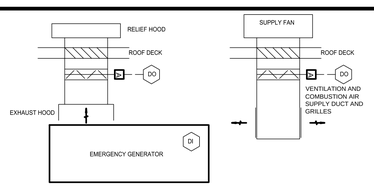
SEQUENCE OF OPERATION

BATHROOM EXHAUST FANS:

BATHROOM EXHAUST FANS SHALL BE CONTROLLED BY THE DDC SYSTEM ON AN OCCUPIED/UNOCCUPIED SCHEDULE.

BATHROOM EXHAUST FAN CONTROL SCHEMATIC
SCALE: NOT TO SCALE

8

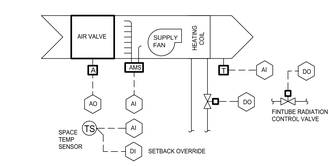


SEQUENCE OF OPERATION

IN AN EMERGENCY, THE GENERATOR PLANT SHALL START AUTOMATICALLY; AS SOON AS THE GENERATOR MOTOR STARTS, THE INTAKE AND RELIEF DAMPERS SHALL OPEN. THE EMERGENCY GENERATOR "RUN" CONTACTS SHALL CLOSE AND THE DDC SYSTEM SHALL ALARM AND SWITCH TO FREEZE PROTECTION MODE.

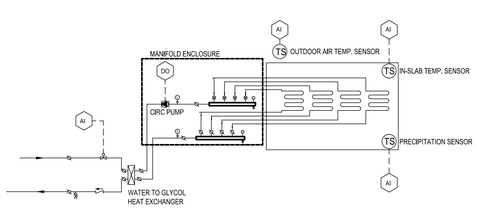
EMERGENCY GEN. CONTROL SCHEMATIC
SCALE: NOT TO SCALE

6



VAV BOX CONTROL SCHEMATIC
SCALE: NOT TO SCALE

3



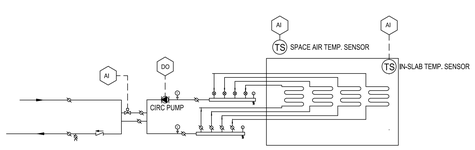
SEQUENCE OF OPERATION

SNOW MELT SYSTEM

THE DDC SYSTEM SHALL START AND STOP SNOW MELT SYSTEM CIRCULATION PUMPS TO DISTRIBUTE A PROPYLENE GLYCOL/WATER SOLUTION THROUGH A SYSTEM OF POLYETHYLENE PIPING BURIED IN CONCRETE ROOF OR AREAWAY SLABS. A SMALL PLATE AND FRAME HEAT EXCHANGER SHALL SEPARATE THE HYDRONIC WATER SYSTEM FROM THE GLYCOL/WATER SNOW MELT SYSTEM PIPING. AN OUTDOOR AIR TEMPERATURE SENSOR SHALL START THE SNOW MELT CIRCULATION PUMPS WHEN THE OUTDOOR AIR TEMPERATURE DROPS BELOW 38 DEG F (ADJUSTABLE). EACH PUMP SHALL BE CYCLED TO MAINTAIN A SLAB SET POINT CONTROLLED BY A SENSOR BURIED IN THE ASSOCIATED SLAB. A PRECIPITATION SENSOR SHALL SHIFT THE SYSTEM FROM "IDLE" TO "SNOWMELT" MODE.

SNOW MELT CONTROL SCHEMATIC
SCALE: NOT TO SCALE

9



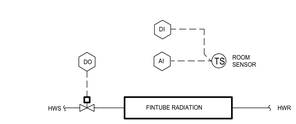
SEQUENCE OF OPERATION

RADIANT FLOORS

THE DDC SYSTEM SHALL START AND STOP RADIANT FLOOR CIRCULATION PUMPS TO DISTRIBUTE WATER THROUGH A SYSTEM OF POLYETHYLENE PIPING BURIED IN CONCRETE FLOOR SLABS. EACH PUMP SHALL BE CYCLED TO MAINTAIN A FLOOR SLAB SET POINT CONTROLLED BY A SENSOR BURIED IN THE ASSOCIATED SLAB. A SPACE TEMPERATURE SENSOR SHALL ACT AS A HIGH LIMIT.

RADIANT FLOOR CONTROL SCHEMATIC
SCALE: NOT TO SCALE

7



SEQUENCE OF OPERATION

FINNED RADIATION

THE DDC SYSTEM SHALL CYCLE TWO WAY CONTROL VALVES TO CONTROL FLOW THROUGH PEDESTAL MOUNTED FINNED RADIATION MOUNTED ALONG THE EXTERIOR WALLS. THE VALVES SHALL CYCLE TO MAINTAIN A SPACE TEMPERATURE SET POINT FROM A WALL MOUNTED THERMOSTAT.

FINTUBE RADIATION CONTROL SCHEMATIC
SCALE: NOT TO SCALE

4

SHEET NOTES

GENERAL NOTES

A SEE SHEET M00.00 FOR LEGEND AND GENERAL NOTES.

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	Issue	Date & Issue Description	By	Check
	01	12/03/08	PWZ	RHB
		75% DESIGN DEVELOPMENT		
	02	01/23/09	PWZ	RHB
		95% CONTRUCTION DOCUMENTS		
	03	10/26/09	PWZ	RHB
		ISSUED FOR PERMIT		
1	04	11/12/09	PWZ	RHB
		ADDENDUM #2		
5	05	01/25/10	PWZ	RHB
		BULLETIN #2 - TSA COMMENTS REVIEW		
6	06	03/30/11	PWZ	RHB
		BULLETIN 87		
10	07	09/01/11	PWZ	RHB
		ISSUED FOR CONSTRUCTION		

Seal/Signature

STATE OF MAINE REGISTERED PROFESSIONAL ENGINEER ROBERT H. BROWN No. 4602

09/01/11

Project Name
PWM Terminal Enhancement

Project Number
09.6395.000

CAD File Name
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Description
MECHANICAL CONTROL DIAGRAMS

Scale
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M12.04