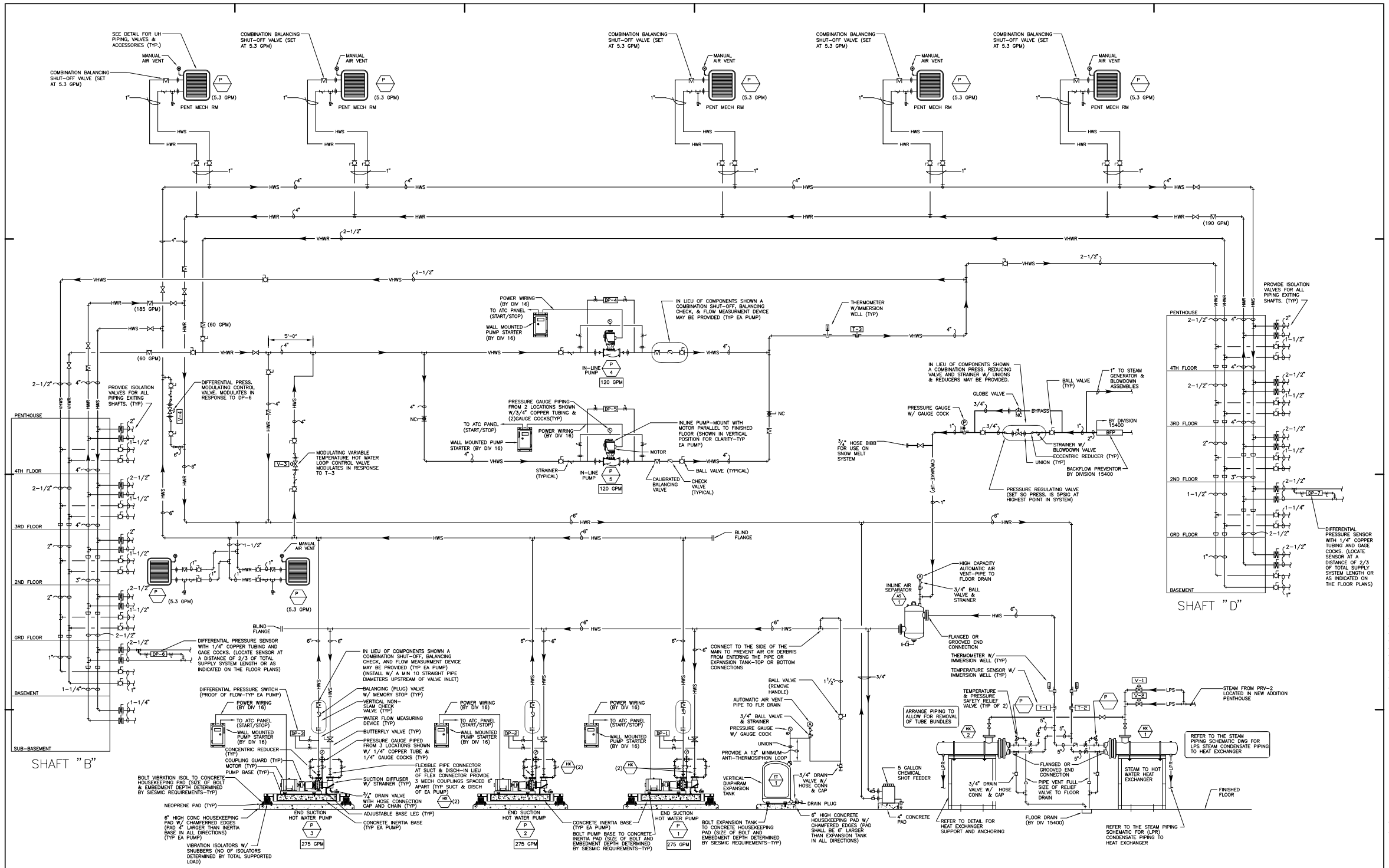
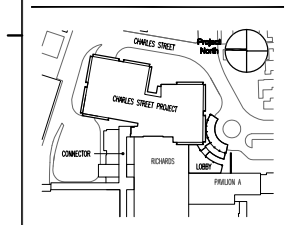


General Notes:

MARK	ISSUE DATE	DESCRIPTION
PERMIT	09/24/04	PERMIT SET - NOT FOR CONSTRUCTION

FOR PERMIT ONLY
NOT FOR CONSTRUCTION

Issue Log



Key Plan

TRO
Architecture
Planning
Engineering
Interior Design
The Fitchle Organization
80 Bridge Street
Newton, MA 02458-2134
617-965-9400

Maine Medical Center
Charles Street Project
Portland, Maine
MMC Project No. 21841

Drawing Title
HVAC HOT WATER SCHEMATIC AND SEQUENCE OF OPERATION

0' 0 0 0 0

Commission No.	4673
Scale	NTS
Drawn By	FWC
Approved By	CW
Filename	4673H002
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Date Issued
Sheet Number
H502

INPUT/OUTPUT SUMMARY TABLE - HVAC HOT WATER SYSTEMS

DESCRIPTION	INPUTS: ANALOG: ROOM TEMPERATURE	ANALOG: WATER TEMPERATURE	ANALOG: PRESSURE	ANALOG: F.C.W.	ANALOG: AIR TEMPERATURE	BINARY: SWITCH CLOSURE	BINARY: PRESSURE SWITCH	BINARY: FLOW SWITCH	BINARY: DAMPER POSITION	OUTPUTS: ANALOG: MODULATING ACTUATOR (I/P TRANSDUCER)	BINARY: COOLING RELAY	BINARY: START/STOP	BINARY: DAMPER MOD.	BINARY: SMOKE DETECTOR	BINARY: ACTUATOR CLOSED	BINARY: ACTUATOR RELAY	BINARY: FEED/BLEED SAV	3-POINT FLOATING	ALARMS: HIGH LIMIT	ALARMS: LOW LIMIT	ALARMS: MAINTENANCE	ALARMS: HIGH WATER ALARM	FEATURES: SUMMER/WINTER SETPOINT	FEATURES: SUMMER SETPOINT	FEATURES: DEMAND LIMITING	FEATURES: OCCUPANCY	FEATURES: ISOLATION RELAY	FEATURES: O.A. RESET W/O.A. TEMPERATURE	FEATURES: RESET W/O.A. TEMPERATURE	FEATURES: REMOTE MANO RESET	FEATURES: COLDWATER CONNECT	FEATURES: POWER LOSS/OUT	FEATURES: PUMP CONTROL
HOT WATER PUMP, P-1 (DP-1)								●													●	●			●							●	●
HOT WATER PUMP, P-2 (DP-2)								●													●	●			●							●	●
HOT WATER PUMP, P-3 (DP-3)								●													●	●			●							●	●
HOT WATER SUPPLY TEMP (T-1)		●																	●	●		●										●	●
HOT WATER RETURN TEMP (T-2)		●																	●	●		●										●	●
DIFF PRESS SENSOR (DP-4)				●															●	●												●	●
DIFF PRESS SENSOR (DP-7)				●															●	●												●	●
DIFF PRESS BYPASS VALVE (V-4)				●						●																						●	●
VARIABLE HW PUMP, P-4 (DP-4)								●						●							●	●			●							●	●
VARIABLE HW PUMP, P-5 (DP-5)								●						●							●	●			●							●	●
VARIABLE HW RETURN TEMP (T-3)		●																	●	●												●	●
OUTSIDE AIR TEMP (T-4)							●																						●			●	●
HW CONTROL VALVE (V-3)			●							●																						●	●
1/3 STEAM CONTROL VALVE (V-1)			●							●												●										●	●
2/3 STEAM CONTROL VALVE (V-2)			●							●												●										●	●

SEQUENCE OF OPERATION - HOT WATER SYSTEM

CONSTANT TEMPERATURE HOT WATER PUMPS (P-1, P-2 AND P-3)

THE HOT WATER PUMPS (P-1, P-2 & P-3) SHALL START AND STOP AUTOMATICALLY FROM THE DDC CONTROL SYSTEM WHEN THE "HAND/OFF/AUTO" SWITCH IS IN THE "AUTO" POSITION. THE PUMPS SHALL BE OPERATED MANUALLY WHEN THE "HOA" SWITCH IS IN THE "HAND" POSITION. (THE HOT WATER SYSTEM SHALL TYPICALLY BE ACTIVE ALL YEAR).

PROVIDE AN AUTOMATIC LEAD/LAG ALTERNATE SEQUENCE BY THE DDC SYSTEM TO EQUALIZE WEAR ON THE PUMPS. P-1 AND P-2 SHALL INITIALLY OPERATE AND P-3 SHALL INITIALLY BE SET UP AS THE STANDBY PUMP.

THE LEAD PUMP SHALL RUN CONTINUOUSLY. THE DIFFERENTIAL PRESSURE SENSORS (DP-6) AND (DP-7) SHALL MONITOR THE HOT WATER SYSTEM PRESSURE AND SHALL SIGNAL THE DDC CONTROL SYSTEM TO MODULATE THE NORMALLY CLOSED TWO-WAY DIFFERENTIAL PRESSURE CONTROL VALVE (V-4) TO MAINTAIN A CONSTANT PRESSURE DIFFERENTIAL BETWEEN THE HOT WATER SUPPLY AND RETURN PIPING. DIFFERENTIAL PRESSURE SENSORS (DP-6) AND (DP-7) SHALL INITIALLY BE SET AT 15 PSIG (ADJ). IF THE DIFFERENTIAL PRESSURE CONTROL VALVE (V-4) IS FULLY CLOSED AND THE DIFFERENTIAL PRESSURE SENSORS INDICATE LESS THAN 15 PSIG (ADJ) FOR A PERIOD OF 10 MINUTES (ADJ) THE LAG PUMP SHALL BE STARTED. UPON A RISE IN DIFFERENTIAL PRESSURE BETWEEN THE HOT WATER SUPPLY AND RETURN PIPING ABOVE 20 PSIG AS SENSED BY DIFFERENTIAL PRESSURE SENSORS (DP-6) AND (DP-7) FOR A PERIOD OF 10 MINUTES (ADJ) THE LAG PUMP SHALL BE DE-ENERGIZED.

THE DIFFERENTIAL PRESSURE READINGS FROM DIFFERENTIAL PRESSURE SENSORS (DP-6) AND (DP-7) SHALL BE CONTINUOUSLY COMPARED TO THEIR RESPECTIVE SETPOINTS. THE SENSOR WITH THE GREATEST ERROR (SETPOINT MINUS READING) SHALL BE THE CRITICAL SENSOR.

THE DDC SYSTEM SHALL MONITOR THE LEAD PUMP STATUS VIA THE DIFFERENTIAL PRESSURE SENSORS (DP-1 THRU DP-3). IF AFTER A PERIOD OF 60 SECONDS (ADJ) THE LEAD PUMP DOES NOT START, THE DDC SYSTEM WILL START THE LAG PUMP AND INITIATE AN ALARM.

VARIABLE TEMPERATURE HOT WATER PUMPS (P-4 & P-5)

THE VARIABLE TEMPERATURE/CONSTANT VOLUME HOT WATER SYSTEM SHALL TYPICALLY BE ACTIVE WHENEVER THE OUTSIDE AIR TEMPERATURE IS BELOW 60° (ADJ).

PUMP (P-4) SHALL BE INITIALLY SET AS THE LEAD PUMP AND (P-5) SHALL BE INITIALLY SET AS THE STANDBY PUMP. THE PUMPS SHALL BE ALTERNATED BETWEEN LEAD AND STANDBY ON A WEEKLY BASIS FOR EQUAL RUN TIME.

THE HOT WATER PUMP (P-4) SHALL START AND STOP AUTOMATICALLY FROM THE DDC CONTROL SYSTEM WHEN THE "HAND/OFF/AUTO" SWITCH IS IN THE "AUTO" POSITION. THE DDC SYSTEM SHALL MONITOR THE STATUS OF PUMP (P-4) VIA DIFFERENTIAL PRESSURE SENSOR (DP-4). IF FLOW IS NOT PROVEN IN THE PUMP AFTER A PERIOD OF 60 SECONDS (ADJ) THE DDC SYSTEM SHALL INITIATE AN ALARM AND SHALL START THE STANDBY PUMP.

THE LEAD PUMP SHALL BE ENERGIZED WHENEVER THE VARIABLE TEMPERATURE HOT WATER SYSTEM IS ACTIVATED. THE VARIABLE TEMPERATURE HOT WATER SUPPLY TEMPERATURE AS SENSED BY TEMPERATURE SENSOR (T-3) SHALL BE MAINTAINED AT SETPOINT BY MODULATING CONTROL VALVE (V-3). THE VARIABLE HOT WATER SUPPLY TEMPERATURE SETPOINT SHALL BE RESET BASED ON OUTSIDE AIR TEMPERATURE AS SCHEDULED BELOW:

VARIABLE TEMP HOT WATER RESET SCHEDULE	
O.A. TEMP	VHWS TEMP
20°F & BELOW	180°F
30°F	160°F
60°F	120°F

THE RESET SCHEDULE SHALL BE ADJUSTABLE AT THE DDC CONTROL SYSTEM FRONT END.

STEAM/HOT WATER HEAT EXCHANGERS (HX-1 AND HX-2)

TEMPERATURE SENSORS (T-1) AND (T-2) LOCATED IN THE CONSTANT TEMPERATURE HOT WATER SUPPLY AND RETURN PIPING SHALL SIGNAL THE DDC CONTROL SYSTEM TO MODULATE STEAM VALVES (V-1) AND (V-2) IN A 1/3-2/3 ARRANGEMENT TO MAINTAIN A CONSTANT DISCHARGE TEMPERATURE OF 180°F (ADJ). PROVIDE A HIGH LIMIT SAFETY CONTROLLER TO OVERRIDE STEAM VALVES (V-1) AND (V-2) CLOSED WHEN HOT WATER SUPPLY TEMPERATURE EXCEEDS 210°F.