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 PROJECT: 21502.10

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RENOVATIONS TO THE
 STEVENS AVENUE ARMORY

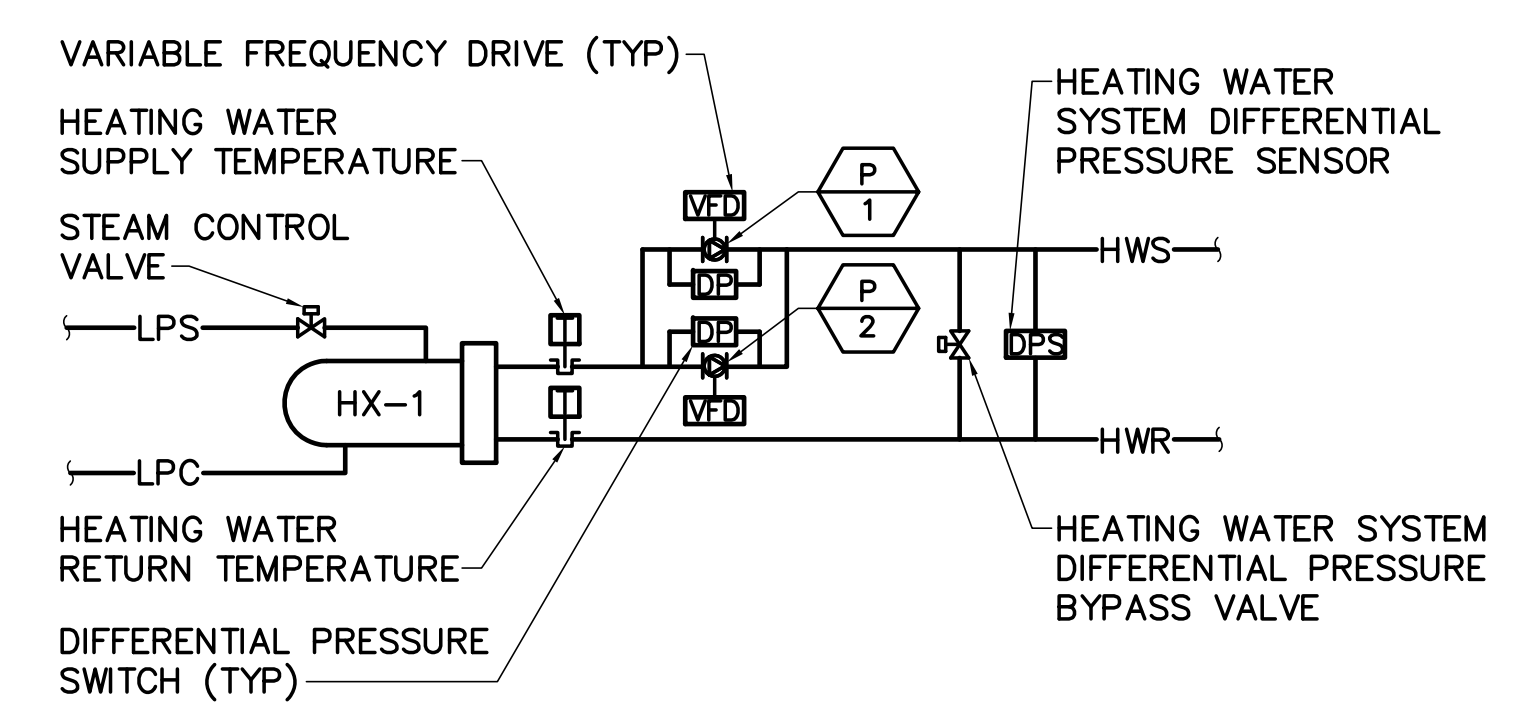
CONTROL
 DIAGRAMS 3

SCALE: AS NOTED

DATE: 05-24-16

DWG. **M-703**

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SEQUENCE OF OPERATION -- HEATING WATER SYSTEM

THE HEATING WATER SYSTEM SHALL BE ENABLED WHENEVER THE OUTSIDE AIR TEMPERATURE IS BELOW 60°F (ADJUSTABLE) AND SHALL BE DISABLED OTHERWISE.

THE STEAM CONTROL VALVE SHALL MODULATE TO MAINTAIN THE HEATING WATER SUPPLY SET POINT ACCORDING TO THE FOLLOWING USER ADJUSTABLE RESET SCHEDULE:

OUTSIDE AIR	HEATING WATER SUPPLY
50°F	140°F
30°F	180°F

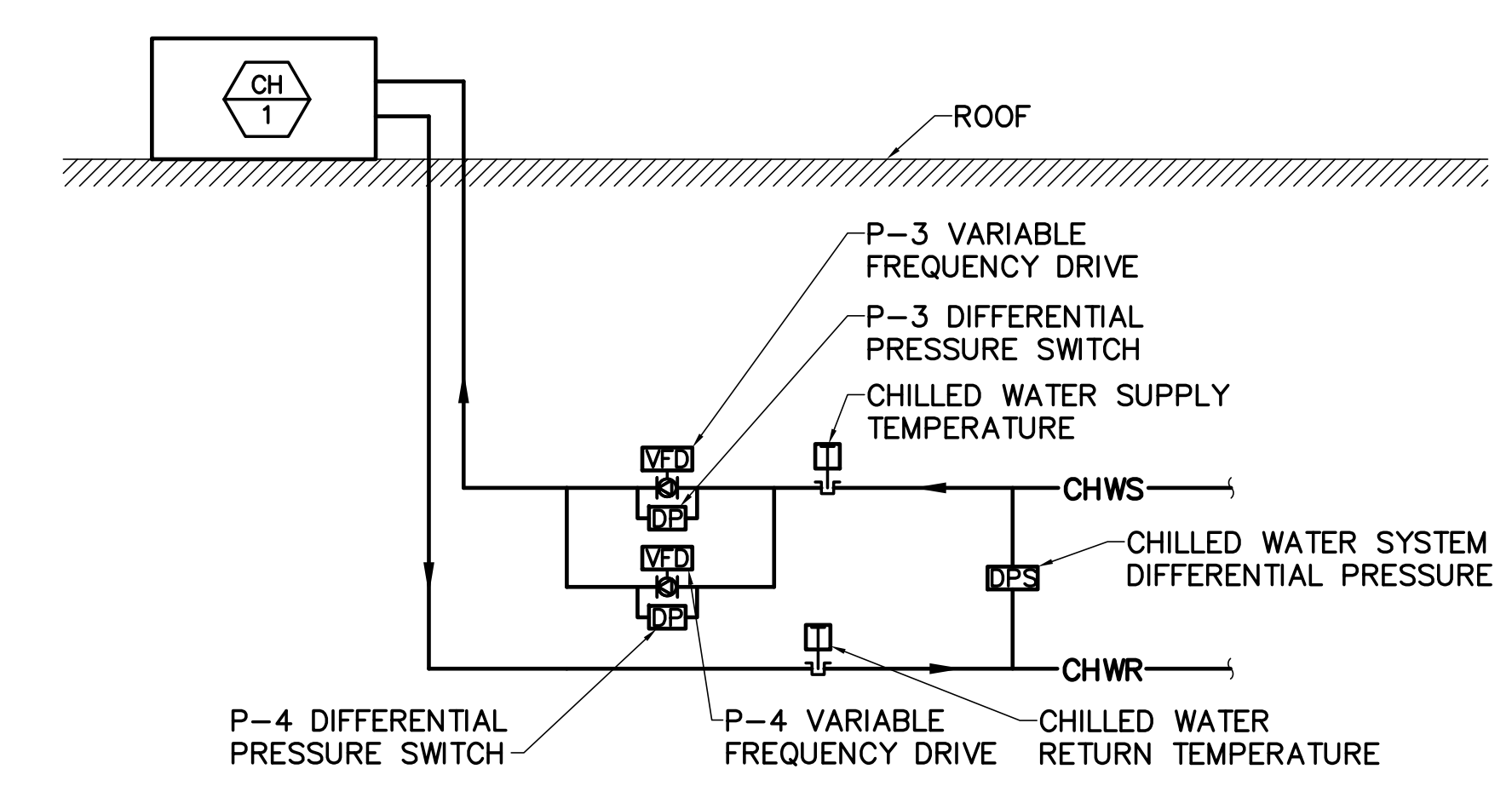
THE HEATING WATER PUMPS P-1 AND P-2 SHALL OPERATE IN A LEAD/LAG ARRANGEMENT. THE LEAD PUMP SHALL SWITCH MONTHLY. IF THE LEAD PUMP FAILS TO SHOW PROOF OF FLOW OR THE LEAD PUMP VARIABLE FREQUENCY DRIVE (VFD) INDICATES AN ALARM CONDITION THE LEAD PUMP SHALL STOP AND THE LAG PUMP SHALL AUTOMATICALLY START.

THE LEAD PUMP SPEED SHALL MODULATE TO MAINTAIN THE HEATING WATER SYSTEM DIFFERENTIAL PRESSURE SETPOINT OF 30 PSI (ADJUSTABLE). THE PUMPS SHALL NOT OPERATE BELOW MINIMUM SPEED (25% OF FULL SPEED). IF THE LEAD PUMP VFD SIGNAL DROPS BELOW 30% THE HEATING WATER SYSTEM BYPASS VALVE SHALL SLOWLY (5 MINUTES FROM MINIMUM POSITION) TO OPEN, (TYPICAL) OPEN UNTIL THE VFD SIGNAL REACHES 40%. ONCE THE VFD SIGNAL REACHES 40% THE BYPASS VALVE SHALL MAINTAIN ITS POSITION (I.E. STOP MODULATING) AND THE VFD SHALL CONTINUE TO MODULATE. AFTER THE VFD SIGNAL RISES ABOVE 70% THE BYPASS SHALL SLOWLY CLOSE AND REMAIN CLOSED UNTIL THE VFD SIGNAL DROPS BELOW 30% AGAIN.

HEATING WATER SYSTEM POINTS LIST	SYSTEM POINT DESCRIPTION							NOTES
	GRAPHIC	ANALOG INPUT	ANALOG OUTPUT	BINARY INPUT	BINARY OUTPUT	ALARM	ANALOG VARIABLE	
STEAM CONTROL VALVE	x	x						
HEATING WATER SUPPLY TEMPERATURE	x	x				x	x	1
HEATING WATER RETURN TEMPERATURE	x	x						
P-1 VFD ENABLE	x			x				
P-1 VFD SIGNAL	x	x						
P-1 VFD ALARM	x			x				2
P-1 PUMP STATUS (DIFFERENTIAL PRESSURE)	x			x				3
P-2 VFD ENABLE	x			x				
P-2 VFD SIGNAL	x	x						
P-2 VFD ALARM	x			x				2
P-2 PUMP STATUS (DIFFERENTIAL PRESSURE)	x			x				3
HW SYSTEM BYPASS VALVE	x	x						
HW SYSTEM DIFFERENTIAL PRESSURE	x	x						

NOTES:
 1. GENERATE AN ALARM IF THE SUPPLY WATER TEMPERATURE FALLS 15°F (ADJUSTABLE) BELOW SETPOINT.
 2. GENERATE ALARM IF VFD INDICATES AN ALARM CONDITION.
 3. GENERATE AN ALARM IF PUMP FAILS TO SHOW PROOF OF FLOW.

1 HEATING WATER SYSTEM CONTROL DIAGRAM
 M-703 NOT TO SCALE



SEQUENCE OF OPERATION -- CHILLED WATER SYSTEM

THE CHILLED WATER SYSTEM SHALL BE ENABLED WHENEVER THE OUTSIDE AIR TEMPERATURE IS ABOVE 50°F (ADJUSTABLE) AND SHALL BE DISABLED OTHERWISE. THE CHILLERS SHALL BE OPERATED BY CHILLER PACKAGED CONTROLS PROVIDED WITH THE CHILLER TO MAINTAIN THE CHILLER DISCHARGE WATER TEMPERATURE AT 45°F (ADJUSTABLE).

THE CHILLED WATER SUPPLY SET POINT SHALL BE 45°F (ADJUSTABLE). THE CHILLER SHALL START WHEN THE CHWS TEMPERATURE RISES 5°F (ADJUSTABLE) ABOVE THE CHWS SET POINT AND SHALL RUN CONTINUOUSLY UNTIL THE SET POINT IS SATISFIED.

THE CHILLED WATER PUMPS P-3 AND P-4 SHALL OPERATE IN A LEAD/LAG ARRANGEMENT. THE LEAD PUMP SHALL SWITCH MONTHLY. IF THE LEAD PUMP FAILS TO SHOW PROOF OF FLOW OR THE LEAD PUMP VARIABLE FREQUENCY DRIVE (VFD) INDICATES AN ALARM CONDITION THE LEAD PUMP SHALL STOP AND THE LAG PUMP SHALL AUTOMATICALLY START.

THE LEAD PUMP SPEED SHALL MODULATE TO MAINTAIN THE CHILLED WATER SYSTEM DIFFERENTIAL PRESSURE SETPOINT OF 30 PSI (ADJUSTABLE). THE PUMPS SHALL NOT OPERATE BELOW MINIMUM SPEED (25% OF FULL SPEED).

CHILLED WATER SYSTEM POINTS LIST	SYSTEM POINT DESCRIPTION							NOTES
	GRAPHIC	ANALOG INPUT	ANALOG OUTPUT	BINARY INPUT	BINARY OUTPUT	ALARM	ANALOG VARIABLE	
CH-1 ENABLE	x							
CH-1 STATUS	x			x				
P-3 VFD ENABLE	x			x				
P-3 VFD SIGNAL	x	x						
P-3 VFD ALARM	x			x				2
P-3 DIFFERENTIAL PRESSURE SWITCH	x			x				3
P-4 VFD ENABLE	x			x				
P-4 VFD SIGNAL	x	x						
P-4 VFD ALARM	x			x				2
P-4 DIFFERENTIAL PRESSURE SWITCH	x			x				3
CHILLED WATER SUPPLY TEMPERATURE	x	x				x	x	1
CHILLED WATER RETURN TEMPERATURE	x	x						
CHILLED WATER SYSTEM DIFFERENTIAL PRESSURE	x	x						
CHILLED WATER SETPOINT	x							
CH-1 ALARM	x			x				4

NOTES:
 1. GENERATE ALARM IF CHILLER SUPPLY TEMPERATURE IS NOT WITHIN± 10% OF SET POINT FOR MORE THAN 30 MINUTES (ADJUSTABLE).
 2. GENERATE ALARM IF VFD INDICATES A FAULT.
 3. GENERATE ALARM IF PUMP FAILS TO SHOW PROOF OF FLOW.
 4. GENERATE ALARM IF CHILLER INDICATES AN ALARM OR FAULT CONDITION.

2 CHILLED WATER SYSTEM CONTROL DIAGRAM
 M-703 NOT TO SCALE