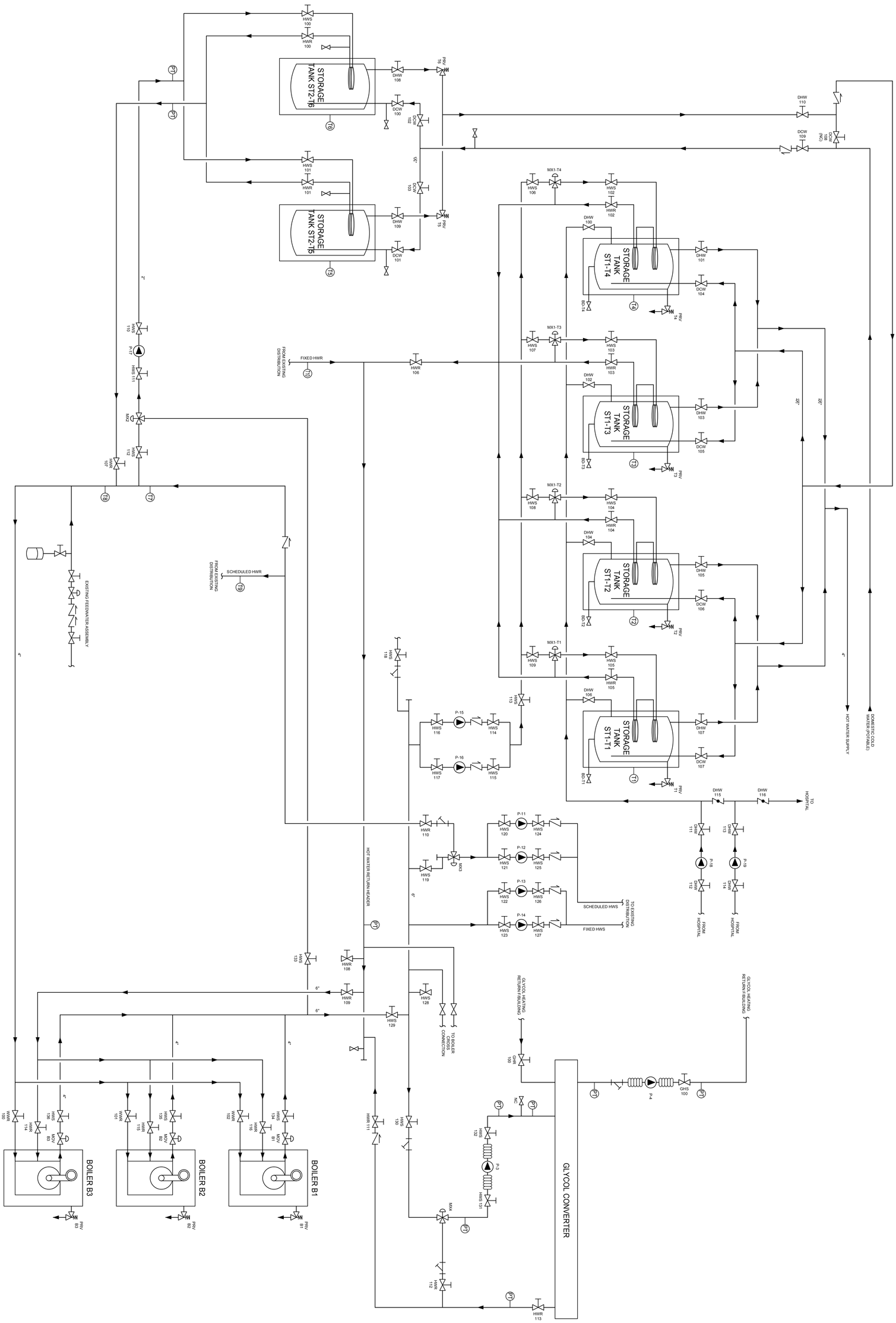

AS BUILT

M0.1	Water Schematic	**DATE ISSUE** Jan. 2018	**PROJECT** DELTA HOSPITAL BOILER UPGRADE
		DRAWN BY PDM	**CLIENT** FRASER HEALTH AUTHORITY
		PROJECT NO. P1712	

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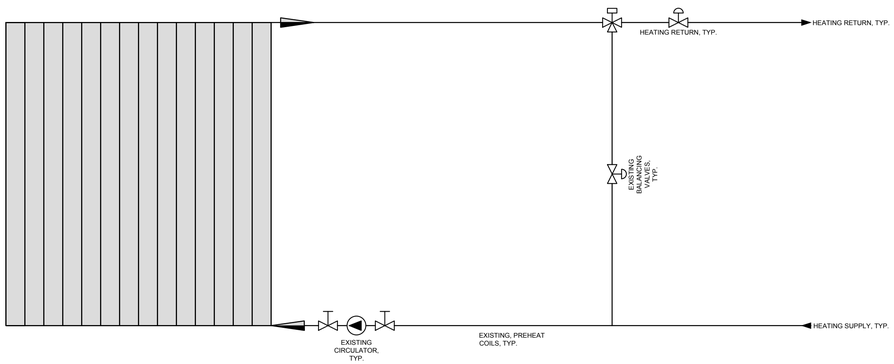

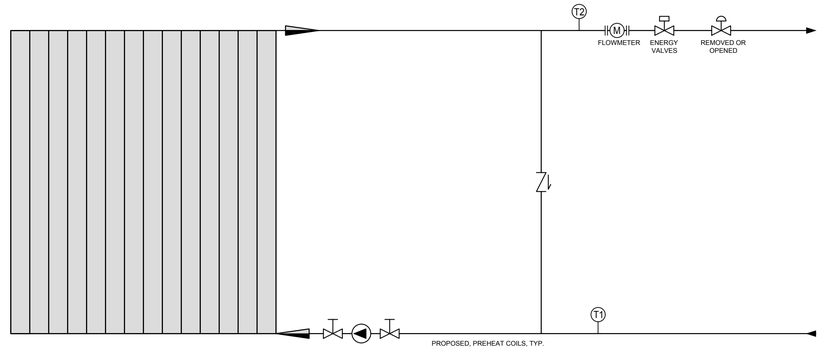

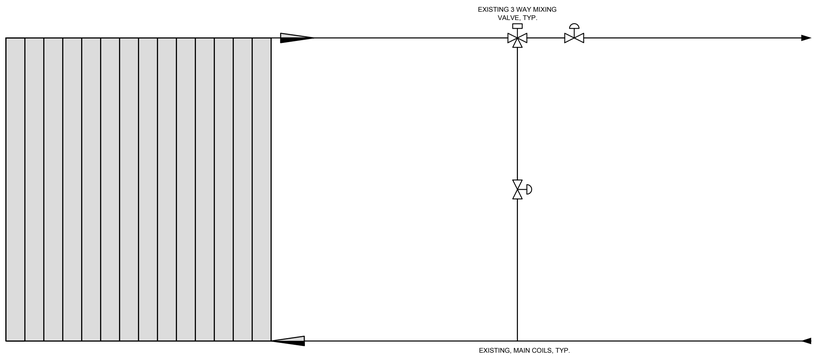

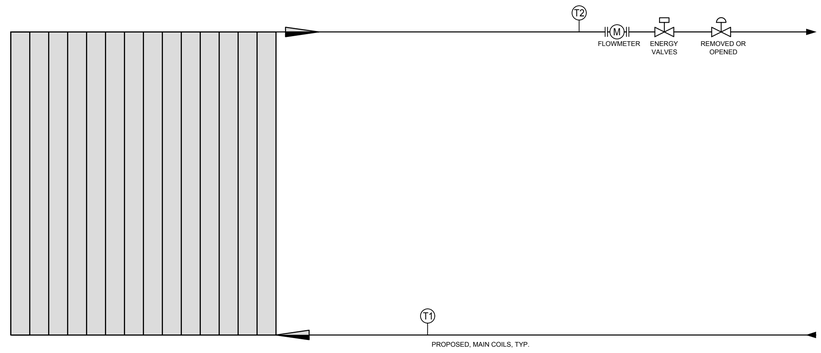

		ORIGINAL			ENERGY VALVE	
UNIT	COIL	NOM SIZE	MAX FLOWRATE	EV NOMINAL	VALVE	ACTUATOR
		INCH	GPM	INCH		
AHU1	HC1	1 1/4	21	1 1/4	EV125S-285	NRB24-EV
AHU2	HC2	1 1/2	30	1 1/2	EV150S-396	NRB24-EV
AHU3	HC3	1 1/4	17	1	EV100S-182	LRB24-EV
AHU4	HC4	1 1/4	22	1 1/4	EV125S-285	NRB24-EV
	HC5	1	11	1	EV100S-182	LRB24-EV
AHU5	HC6	1	15	1	EV100S-182	LRB24-EV
AHU7	HC7	3/4	3.7	1/2	EV050S-055	LRB24-EV
AHU8	HC8	1 1/2	25	1 1/4	EV125S-285	NRB24-EV
	HC9	1	12	1	EV100S-182	LRB24-EV
AHU9	HC10	3/4	6.5	3/4	EV075S-103	LRB24-EV
AHU10			62.4	2	EV150S-396	NRB24-EV
AHU11			29.7	1 1/2	EV150S-396	NRB24-EV

NOTE:
COMPONENT UNIONS AND ISOLATION VALVES NOT SHOWN CLARITY
ACTUATOR END SWITCH ON EXISTING PREHEAT COILS TO START PUMP ON FULL CLOSE OF ENERGY VALVE.

AS BUILT

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PROJECT
DELTA HOSPITAL BOILER UPGRADE

CLIENT
FRASER HEALTH AUTHORITY

DATE ISSUE
July 2018

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PDM

PROJECT NO.
P1712

Water Schematic

M0.2

DELTA HOSPITAL BOILER UPGRADE

Installation, connection, and commissioning of 3 new condensing gas boilers to supply Delta Hospital with potable and heating water.

New mechanical equipment to be connected to existing distribution system with some piping changes to accommodate modified system design.

Scope of Work:

Installation Prep
Install and paint 3 concrete housekeeping pads according to the layout provided

Pump Replacement
Remove 4 existing pumps (P11 & P12, P13 & P14)
Install 4 new wet rotor circulators (supplied by owner)
Install isolation valves according to schematic provided

DHW Preheat Pump Installation
Install new wet rotor circulator (supplied by owner)
Install isolation valves and check valve according to schematic provided

Boiler Installation
3 new Cleaver Brooks Model CF2500 condensing natural gas boilers (supplied by owner).

Each boiler to be installed according to the following:
Uncrate boilers and place on housekeeping pads
Boiler connections and pipework according to provided schematic
Sufficient valves to isolate each boiler for maintenance and repairs
Dielectric unions on all boiler connections
Install 1 motorized valve - MOV1 on each boiler supply
Install pressure relief valves with sufficient relief capacity for each boiler's maximum rated output.

Piping
Connect 3 new boilers in parallel reverse return to the existing 6"ø primary headers
3 new boiler Hot water supplies connected to old boiler supply on the primary header
3 new boiler Hot water returns connected to one old boiler return on the primary header
3 new boiler Warm water returns connected to the Scheduled Hot Water Return (SHWR)
4"ø connections for all boiler connections, stepping up to 6"ø pipe where multiple boiler flow paths are combined
Supply threaded steel pipe equivalent to existing piping
Thermal wells installed according to schematic

Venting
Appropriately sized flue venting in a common stack with no additional roof penetrations.

Condensate
All flue gas condensate to be plumbed into an accessible condensate neutralizer tank with refillable media.
Neutralized condensate liquid to be plumbed to drain.

Gas Supply
Connect to existing natural gas service with the appropriately sized line, shutoff and safety devices for each boiler.

Seismic
All equipment, pumps, and piping to be adequately constrained for seismic protection.

Insulation & Cladding
All exposed pipework and components to be insulated and cladded equivalent of existing piping.

Labelling
Pipework to be labelled with the fluid designation, flow direction, and color-coded according to building piping schedule.
Valves to be tagged according to mechanical schematic

Commissioning
Pressure test all piping and verify integrity

Measure and document gas flow to each boiler at 25%, 50%, 75%, and 100% firing rate to ensure proper operation

Excluded From Scope of Work
Supply of 3 new boilers
Supply of new wet rotor circulators
Control wiring
Electrical connection of Boilers to sub-panel, including wire, conduit, and circuit breakers.
Electrical connection of pumps to sub-panel, including wire, conduit, and circuit breakers.

Notes:

- Existing reverse backflow prevention assembly function to be verified
- Existing Antiscald devices to be verified
- Use of single-wall heat exchanger to be verified with local authorities
- Air separation, isolation valves, temperature and pressure relief, pressure reduction devices to be installed included in accordance with BCBC and local authorities
- Anti Legionella function shall be confirmed to be acceptable with the owner's infection control department
- Tank and boiler piping to be connected reverse return or balanced path length
- Check valves to be swing check
- Mechanical components to be connected via dielectric unions
- Tridicators to be located on all supply and return piping from source or heat exchanger

Sequence of Operations, Glycol Converter

Pumps:

P16 Glycol - Pump speed to be controlled based on pressure sensor output to a maintain a fixed pressure. Value to be set during commissioning. BAS to review bypass valves F1-7 and with no call for heat, ramp P16 to minimum, 20%. P15 Boiler - Pump speed to be controlled linearly with respect to MX4. As a requirement for heat decreases and MX4 closes, pump speed to decrease. As a requirement for heat increases and MX4 opens, pump speed to increase.

Mixing Valve:

MX4 - to be controlled based on T11. As T11 falls, MX4 to open, supplying additional heat. On the rise of T11 above setpoint, MX4 to close, bypassing and supplying less heat.

Temperature:

T11 - controlling input for MX3 PI loop. Temperature setpoint to be reset to OAT. Curve to be set during commissioning. Starting point 70C@-8C OAT and 45C@16C. T13, T14 & T15 - available on the graphics display, for information

Points

Additional points to be considered in the BAS system; Temperature - T13-T14. thermistor, 10k (Qty 2), T11 & T12 existing, to be verified Pump Speed - P15-P16. 0-10VDC. (Qty 2) Modulating Valve - MX4, (Qty 1), existing, pneumatic Pressure- P1, 0-10VDC/40-20mA (Qty1)

All virtual points available by VFD manufacturer control available via BACNet to be available on BAS including pump power and speed. Drives to be integrated.

Sequence of operations, Boiler System

Boilers:

Boiler protection, loading, rotation, sequencing, isolation valve, firing rate and communication to be controlled by the manufacturer control system. Points to be available to BAS via BACNet protocol by Ethernet. See manufacturer documentation for detail.

Domestic Hot Water:

Domestic hot water tanks to be maintained at setpoint by control thermistor T1-4 by controlling respective modulating valve MX1 by PI loop. Setpoint to be user adjustable, PI terms to be set during commissioning.

Pumps:

P11/12 - SHWS -Control of P11-P12 operation, alternating lead/lag pump on schedule. Pump speed to be varied based on heating return temperature T9 and OAT. Required return temperature to be continuously calculated based on OAT. Curve and setpoints to be determined during commissioning. Minimum pump speed 50% and to be verified and set during commissioning. Pump control signal to be 0-10VDC.

P13/14 - FHWS -Control of P13-P14 operation, alternating lead/lag pump on schedule. Pump speed to be varied based on heating return temperature T10. Maximum delta T to be maintained and controlled by reset via OAT. Curve and setpoints to be determined during commissioning. Minimum pump speed 50% and to be verified and set during commissioning. Pump control signal to be 0-10VDC. P15/16 - DHWS -Control of P15-P16 operation, alternating lead/lag pump on schedule. No call for heat from ST1-4, pumps P15-16 to shut off. Pump failure feedback via CT to BAS and switch to alternate pump automatically and trigger alarm. P17 - DHW Preheat Circulator - If T7 exceeds T5/T6 by user-configurable delta T, and heating loop is operating, transfer heat from return heating loop to DHW preheat tanks by running P17. If delta T falls below threshold, stop P17.

Existing mixing valve MX3 operation to be maintained.

Anti-Legionella Function -At owner determined intervals and in accordance with CSA Z317.1 standard, the control system will compare maximum temperature and time above a set threshold over the previous interval to a baseline. If the time and temperature exceed the baseline for pasteurization, nothing is done. If the time and temperature are below the baseline for pasteurization, diverting valve MX2 will actuate and pump P17 will run until the desired baseline temperature and time are met. An alarm function shall be configured to notify operators if the tank has not been successfully pasteurized to the commissioning parameters.

Sequence of Operations

A.04

Points

Additional points to be considered in the BAS system; Temperature - T1-T10. Thermistor, 10k (Qty 10) Pump Speed Control - P11-P14. 0-10VDC. (Qty 4) Pump On/Off - P15-P18 (Qty 4) 3 Way Modulating Valve Control - MX1, (Qty 4), 24VDC, 1-10VDC Discreet Valve Control - MX2 (Qty 1), MOV1 (Qty 3), 24VDC

All virtual points available by manufacturer control available via BACNet to be available on BAS. General

Boilers:

Boiler protection, loading, rotation, sequencing, isolation valve, firing rate and communication to be controlled by manufacturer control system. Points to be available to BAS via BACNet protocol by Ethernet. See manufacturer documentation for detail.

Domestic Hot Water:

Domestic hot water tanks to be maintained at setpoint by control thermistor T1-4 by controlling respective modulating valve MX1 by PI loop. Setpoint to be user adjustable, PI terms to be set during commissioning.

Pumps:

P11/12 - SHWS -Control of P11-P12 operation, alternating lead/lag pump on schedule. Pump speed to be varied based on heating return temperature T9 and OAT. Required return temperature to be continuously calculated based on OAT. Curve and setpoints to be determined during commissioning. Minimum pump speed 50% and to be verified and set during commissioning. Pump control signal to be 0-10VDC.

P13/14 - FHWS -Control of P13-P14 operation, alternating lead/lag pump on schedule. Pump speed to be varied based on heating return temperature T10. Maximum delta T to be maintained and controlled by reset via OAT. Curve and setpoints to be determined during commissioning. Minimum pump speed 50% and to be verified and set during commissioning. Pump control signal to be 0-10VDC. P15/16 - DHWS -Control of P15-P16 operation, alternating lead/lag pump on schedule. No call for heat from ST1-4, pumps P15-16 to shut off. Pump failure feedback via CT to BAS and switch to alternate pump automatically and trigger alarm. P17 - DHW Preheat Circulator - If T7 exceeds T5/T6 by user configurable delta T, and heating loop is operating, transfer heat from return heating loop to DHW preheat tanks by running P17. If delta T falls below threshold, stop P17.

Existing mixing valve MX3 operation to be maintained.

Anti-Legionella Function -At owner determined intervals and in accordance with CSA Z317.1 standard, the control system will compare maximum temperature and time above a set threshold over the previous interval to a baseline. If the time and temperature exceed the baseline for pasteurization, nothing is done. If the time and temperature are below the baseline for pasteurization, diverting valve MX2 will actuate and pump P17 will run until the desired baseline temperature and time are met. An alarm function shall be configured to notify operators if the tank has not been successfully pasteurized to the commissioning parameters.

Sequence of Operations

A.04

Points

Additional points to be considered in the BAS system; Temperature - T1-T10. Thermistor, 10k (Qty 10) Pump Speed Control - P11-P14. 0-10VDC. (Qty 4) Pump On/Off - P15-P18 (Qty 4) 3 Way Modulating Valve Control - MX1, (Qty 4), 24VDC, 1-10VDC Discreet Valve Control - MX2 (Qty 1), MOV1 (Qty 3), 24VDC

All virtual points available by manufacturer control available via BACNet to be available on BAS.

Valve Schedule				
Item	Manuf	Model	Quantity	Description
ST1	Ecokng	ISSWXX500	4	DHW storage tank
ST2	Viessman	119SC	2	Existing, DHW preheat tank
MX1	Belimo	24V, 0-10V	4	1' SS, 3W modulating mixing valve
MX2	Belimo	24V	1	1" SS, 3W discreet, diverting valve
P15-16	Grundfos	MAGNA	2	DHW pump
P18	Grundfos	MAGNA	1	Existing, recirculating
B1	Cleaver Brooks	CF2500	3	Condensing boiler
MOV1	Belimo	4", 24V SR	3	2W act. valve
P11-12	Grundfos	2.5 LM 8/8.0 U-G-A-BUBE	2	Variable speed pump, 0-10V
P13-14	Grundfos	UPS 80-160 F	2	Variable speed pump, 0-10V
P17	Grundfos	CI Circulator	1	DHW preheat circulator
ASV1	Honeywell	MX132/U	1	3" anti scald valve

AS BUILT

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PROJECT DELTA HOSPITAL BOILER UPGRADE

CLIENT FRASER HEALTH AUTHORITY

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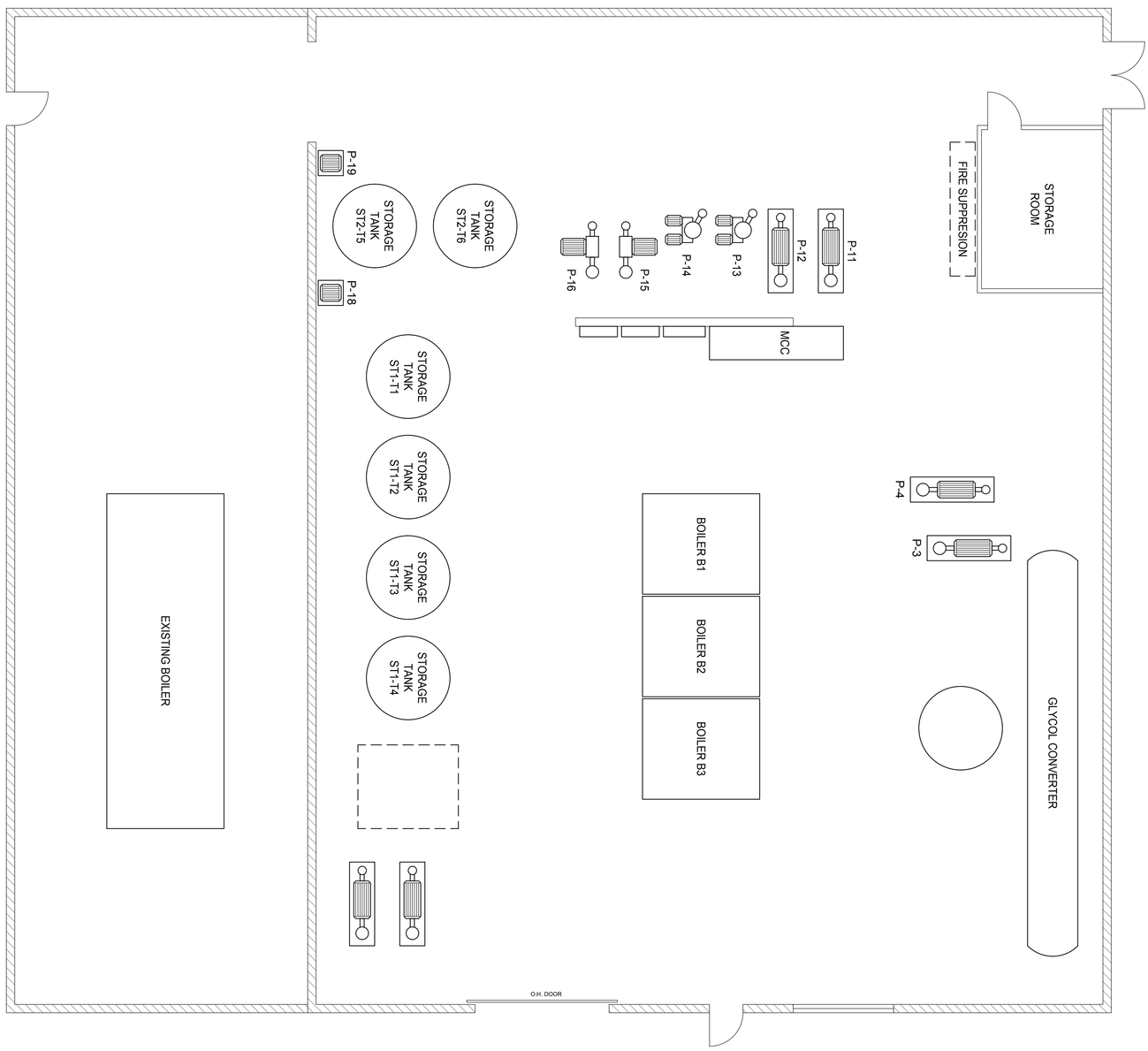
Sequence of Operations

M0.3



AS BUILT

M1.0	BOILER ROOM EQUIPMENT LAYOUT	**DATE ISSUE** Jan. 2018 **DRAWN BY** PDM **PROJECT NO.** P1712	**PROJECT** DELTA HOSPITAL BOILER UPGRADE **CLIENT** FRASER HEALTH AUTHORITY

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