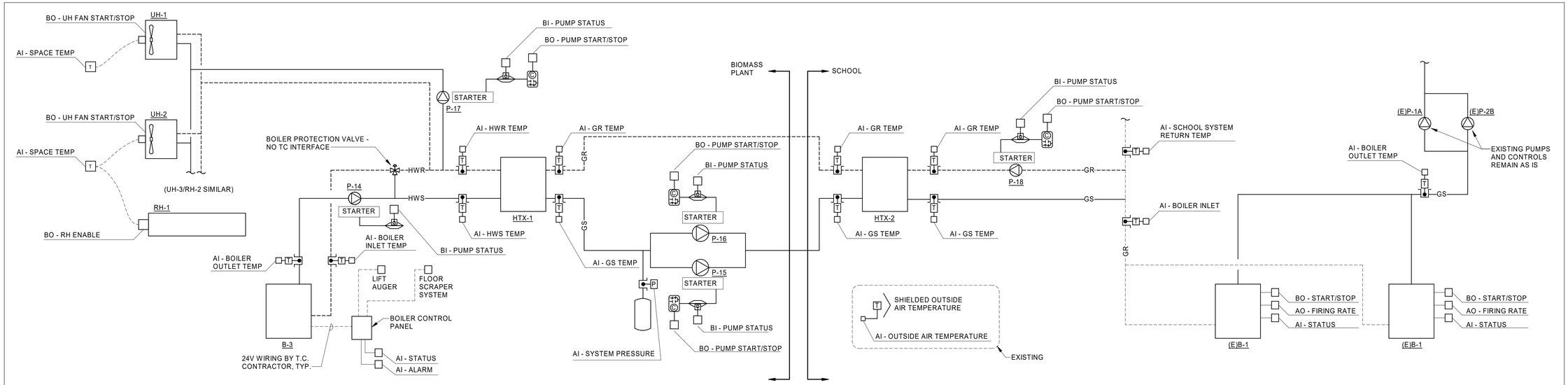

1 M4.0 HEATING WATER PLANT CONTROL SCHEMATIC

NOT TO SCALE

SEQUENCES OF OPERATION

BIOMASS BOILER PLANT

BOILER PUMP P-14

THIS PUMP IS MANUALLY STARTED WHEN THE BIOMASS BOILER IS READY TO FIRE. PROVIDE CURRENT SENSING RELAY TO MONITOR THE STATUS OF THE PUMP.

BIOMASS BOILER, B-3

THE BIOMASS BOILER IS MANUALLY STARTED. PROVIDE INPUTS TO MONITOR STATUS (ON/OFF) AND ALARM FROM THE THE BOILER CONTROL PANEL. THE INTENT IS FOR THIS BOILER TO ACT AS THE FIRST STAGE OF HEAT FOR THE SCHOOL AND THE SHOP BUILDING. PROVIDE TEMPERATURE SENSORS TO MONITOR BOILER INLET AND OUTLET TEMPERATURES.

GLYCOL HEATING WATER PUMPS, P-15 AND P-16

WHEN THE SCHOOL HEATING SYSTEM IS ENABLED, THE DDC SYSTEM SHALL ENABLE THE LEAD GLYCOL HEATING SYSTEM PUMP. PROVIDE CURRENT SENSING RELAYS TO MONITOR THE STATUS OF EACH PUMP. THE DDC SYSTEM SHALL OPERATE THE PUMPS IN A LEAD/LAG STRATEGY. UPON FAILURE OF THE LEAD HEATING WATER PUMP, THE DDC SYSTEM SHALL GENERATE AN ALARM AND ENABLE THE LAG PUMP. THE LEAD PUMP MUST BE COMPLETELY SHUT DOWN BEFORE THE LAG PUMP STARTS. THE LEAD PUMP WILL ALTERNATE BASED ON AN OWNER SUPPLIED SCHUDULE.

GLYCOL SYSTEM PRESSURE

A PRESSURE SENSOR LOCATED IN THE EXPANSION TANK LEG SHALL MONITOR SYSTEM PRESSURE. IF THE SYSTEM PRESSURE DROPS 3 PSI BELOW THE NORMAL OPERATING PRESSURE, THE DDC SYSTEM SHALL GENERATE AN ALARM.

HEAT EXCHANGER, HTX-1

HEAT EXCHANGER HTX-1 IS USED TO TRANSFER HEAT FROM THE BIOMASS BOILER TO THE GLYCOL LOOP. MONITOR HEATING WATER INLET AND OUTLET TEMPERATURES AND GLYCOL WATER INLET AND OUTLET TEMPERATURES.

SHOP HEATING PUMP, P-17

P-17 PROVIDES HEATING FLOW TO THE UNIT HEATERS IN THE SHOP. IF ANY UH-1, UH-2, OR UH-3 CALLS FOR HEAT, THE DDC SYSTEM SHALL ENABLE THE PUMP. PROVIDE A CURRENT SENSING RELAY TO MONITOR THE STATUS OF THE PUMP. UPON FAILURE OF THE PUMP, THE DDC SYSTEM SHALL GENERATE AN ALARM.

BOILER ROOM UNIT HEATER, UH-1

PROVIDE TEMPERATURE SENSOR TO MONITOR SPACE TEMPERATURE. ON A CALL FOR HEAT, ENABLE PUMP P-17 AND CYCLE ON THE UNIT HEATER FAN. IF SPACE TEMPERATURE DROPS BELOW 40F, THE DDC SYSTEM SHALL GENERATE AN ALARM, AND SHALL ENABLE PUMP P-17, THE LEAD GLYCOL PUMP (P-15 OR P-16) AND THE SCHOOL INJECTION HEAT PUMP, P-18 REGARDLESS IF BOILER B-3 IS OPERATING.

WOOD SHOP UNIT HEATERS AND RADIANT HEATERS, UH-2/RH-1 AND UH-3/RH-2

PROVIDE TEMPERATURE SENSORS TO MONITOR SPACE TEMPERATURE. ON A CALL FOR HEAT, ENABLE PUMP P-17 AND CYCLE ON THE RESPECTIVE UNIT HEATER FAN. IF HOT WATER HEAT IS NOT AVAILABLE, LOCK OUT PUMP P-17, AND ENABLE RESPECTIVE RADIANT HEATER. LIMIT TEMPERATURE SENSOR TO MAXIMUM OF 65F (ADJUSTABLE). IF SPACE TEMPERATURE DROPS BELOW 40F, THE DDC SYSTEM SHALL GENERATE AN ALARM. PROVIDE PROGRAMMING TO ALLOW A TOGGLE SWITCH TO ALLOW RADIANT HEAT ONLY (SUMMER OPERATION).

SEQUENCES OF OPERATION

SCHOOL BOILER PLANT

MONITOR OUTSIDE AIR TEMPERATURE. WHEN OUTSIDE AIR TEMPERATURE IS 75 DEG F AND ABOVE (ADJUSTABLE), LOCK OUT THE HEATING SYSTEMS. WHEN THE OUTSIDE AIR TEMPERATURE IS 65 DEG F OR BELOW ENABLE THE HEATING SYSTEM.

HEAT EXCHANGER, HTX-2

HEAT EXCHANGER HTX-2 IS USED TO TRANSFER HEAT FROM THE GLYCOL LOOP TO THE SCHOOL HEATING SYSTEM LOOP. MONITOR HEATING WATER INLET AND OUTLET TEMPERATURE AND GLYCOL WATER INLET AND OUTLET TEMPERATURE.

SCHOOL HEATING SYSTEM INJECTION PUMP P-18

THIS PUMP INJECTS HEAT FROM THE BIOMASS PLANT INTO SCHOOL HEATING LOOP VIA THE GLYCOL LOOP. THE INTENT IS FOR THIS TO BE THE FIRST STAGE OF HEAT FOR THE SCHOOL. WHEN THE SCHOOL HEATING SYSTEM IS ENABLED, THE DDC SYSTEM SHALL ENABLE THE INJECTION PUMP. PROVIDE A CURRENT SENSING RELAY TO MONITOR THE STATUS OF THE PUMP. UPON FAILURE OF THE PUMP, THE DDC SYSTEM SHALL GENERATE AN ALARM.

BOILERS, B-1 AND B-2 (EXISTING - ADD NEW CONTROLLER TO CONTROL BOILERS)

WHEN THE HEATING SYSTEM IS ENABLED, AND THE PRIMARY HEATING WATER PUMP HAS PROVED OPERATION, AND HTX-2 ADN P-18 CANNONT MAINTAIN THE SYSTEM SETPOINT, THE DDC SYSTEM SHALL ENABLE THE LEAD BOILER. THE BOILER SHALL MODULATE TO MAINTAIN THE SYSTEM MAIN HEATING WATER SETPOINT OF 170 DEG F (ADJUSTABLE). IF THE BOILER CANNOT MAINTAIN THE SETPOINT, ENABLE THE LAG BOILER. THE DDC SYSTEM SHALL OPERATE THE BOILERS IN A LEAD/LAG STRATEGY. UPON FAILURE OF THE LEAD BOILER, THE DDC SYSTEM SHALL GENERATE AN ALARM AND ENABLE THE LAG BOILER. THE LEAD BOILER WILL ALTERNATE BASED ON AN OWNER SUPPLIED SCHUDULE. PROVIDE TEMPERATURE SENSORS TO MONITOR BOILER INLET AND OUTLET TEMPERATURES AND THE SYSTEM RETURN TEMPERATURE JUST UPSTREAM OF THE HTX-2 INJECTION POINT.

NOTE

THE TEMPERATURE CONTROL SYSTEM SHALL BE AN EXTENSION OF THE EXISTING JOHNSON CONTROL, INC DIGITAL CONTROL SYSTEM.

TEMPERATURE CONTROL SYSTEM GENERAL NOTES

A. ALL CONTROL POINTS LISTED IN THE SEQUENCE OF OPERATION AND POINTS LIST SHALL BE ADJUSTABLE BY THE SYSTEM OPERATOR.

B. THE TEMPERATURE CONTROLS CONTRACTOR AND EQUIPMENT MANUFACTURERS SHALL COORDINATE ALL FACTORY FURNISHED CONTROL DEVICES. THE TEMPERATURE CONTROLS CONTRACTOR IS RESPONSIBLE FOR A COMPLETELY OPERATIONAL SYSTEM.

DDC TEMPERATURE CONTROL LEGEND

SD-1		SMOKE DETECTOR
D-1	NC	CONTROL DAMPER (NORMALLY CLOSED DAMPER INDICATED)
DA-1	M	CONTROL ACTUATOR
CD-1		CARBON DIOXIDE SENSOR
R-1		CONTROL RELAY
CS-1		CURRENT-SENSING STATUS SWITCH
V		MOTORIZED T.C. VALVE/2-WAY
V-1	NC C NO	3-WAY CONTROL VALVE (NORMALLY OPEN, NORMALLY CLOSED & COMMON PORTS INDICATED)
TE-1		AVERAGING TEMPERATURE SENSOR
TE-1		ROOM TEMPERATURE SENSOR
TE-1		WELL-MOUNTED INSERTION SENSOR
TE-1		DUCT-MOUNTED INSERTION SENSOR
TLL-1		LOW LIMIT TEMPERATURE SWITCH
PS-1		WELL-MOUNTED PRESSURE SENSOR
TS-1		WELL-MOUNTED TEMPERATURE SWITCH
TS-1		DUCT-MOUNTED TEMPERATURE SWITCH
DP-1		DIFFERENTIAL PRESSURE SENSOR
	AI	ANALOG INPUT
	AO	ANALOG OUTPUT
	BI	BINARY INPUT
	BO	BINARY OUTPUT
	EA	EXHAUST AIR
	RA	RETURN AIR
	OA	OUTDOOR AIR
	NC	NORMALLY CLOSED VALVE OR DAMPER
	NO	NORMALLY OPEN VALVE OR DAMPER

REVISIONS:

Craig City School District Biomass Project

STATUS:

Construction Documents

DRAWN BY: HERBST
CHECKED BY: RATZ
DATE: 12.09.22
PROJECT #: 182361

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SHEET DESCRIPTION:
TEMPERATURE CONTROLS

M4.0

SHEET:
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