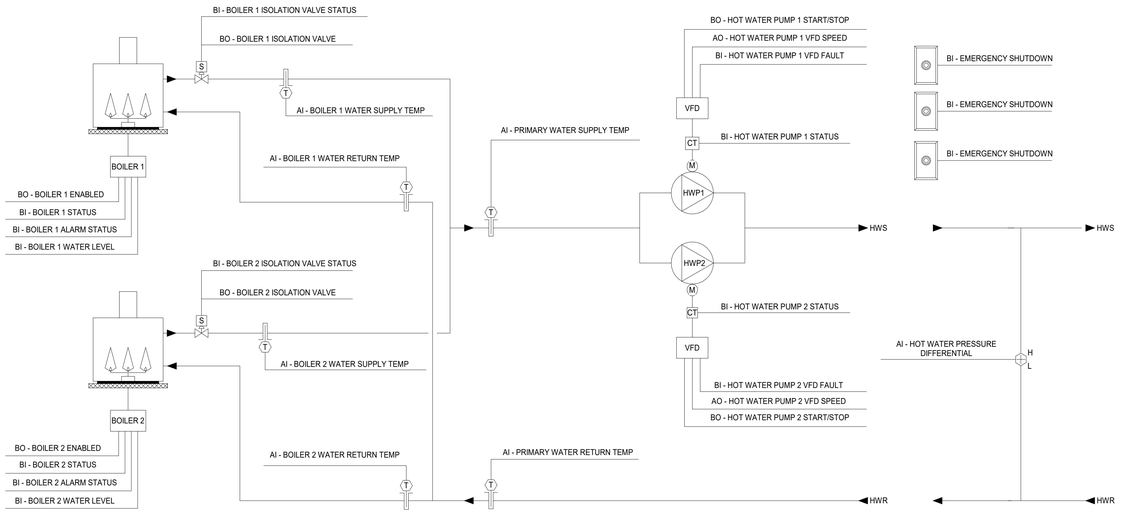


1) BOILER SYSTEM - RUN CONDITIONS:
- THE BOILER SYSTEM SHALL BE ENABLED TO RUN WHENEVER OUTSIDE AIR TEMPERATURE IS LESS THAN 65°F (ADJ.).
- A USER DEFINABLE NUMBER OF HOT WATER COILS NEED HEATING.

TO PREVENT SHORT CYCLING, EACH BOILER SHALL RUN FOR AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE), UNLESS SHUTDOWN ON SAFETIES OR OUTSIDE AIR CONDITIONS.

EACH BOILER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.

THE BOILER SYSTEM SHALL ALSO RUN FOR FREEZE PROTECTION WHENEVER THE OUTSIDE AIR TEMPERATURE IS LESS THAN 38°F (ADJ.).

2) EMERGENCY SHUTDOWN:
THE BOILER SHALL SHUTDOWN AND GENERATE AN ALARM GENERATED UPON RECEIVING AN EMERGENCY SHUTDOWN STATUS VIA CENTRAL WORKSTATION OR BOILER EMERGENCY SHUTDOWN SWITCHES.

3) BOILER ISOLATION VALVE:
THE VALVE SHALL OPEN ANYTIME THE BOILER IS CALLED TO RUN.

A) THE VALVE SHALL OPEN PRIOR TO THE BOILER BEING ENABLED AND SHALL CLOSE ONLY AFTER THE BOILER IS DISABLED. THE VALVE SHALL THEREFORE HAVE:
I) A USER ADJUSTABLE DELAY ON START.
II) AND A USER ADJUSTABLE DELAY ON STOP.

B) THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY BOILER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

C) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) FAILURE: VALVE COMMANDED OPEN BUT THE STATUS INDICATES CLOSED.
II) OPEN IN HAND: VALVE COMMANDED CLOSED BUT THE STATUS INDICATES OPEN.

4) BOILER SAFETIES:
A) THE FOLLOWING SAFETIES SHALL BE MONITORED:
I) BOILER ALARM.
II) LOW WATER LEVEL.

B) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) BOILER ALARM.
II) LOW WATER LEVEL ALARM.

5) HOT WATER PUMP LEAD/LAG OPERATION:
THE TWO HOT WATER PUMPS SHALL OPERATE IN A LEAD/LAG FASHION.

· THE LEAD PUMP SHALL RUN FIRST.
· ON FAILURE OF THE LEAD PUMP, THE LAG PUMP SHALL RUN AND THE LEAD PUMP SHALL TURN OFF.
· ON DECREASING HOT WATER DIFFERENTIAL PRESSURE, THE LAG PUMP SHALL STAGE ON AND RUN IN UNISON WITH THE LEAD PUMP TO MAINTAIN HOT WATER DIFFERENTIAL PRESSURE SETPOINT.

A) THE DESIGNATED LEAD PUMP SHALL ROTATE UPON ONE OF THE FOLLOWING CONDITIONS (USER SELECTABLE):
I) MANUALLY THROUGH A SOFTWARE SWITCH
II) DAILY
III) WEEKLY
IV) MONTHLY

B) HOT WATER PUMPS ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
II) RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
III) VFD FAULT.

6) HOT WATER DIFFERENTIAL PRESSURE CONTROL:
THE CONTROLLER SHALL MEASURE HOT WATER DIFFERENTIAL PRESSURE AND MODULATE THE HOT WATER PUMP VFDS IN SEQUENCE TO MAINTAIN ITS HOT WATER DIFFERENTIAL PRESSURE SETPOINT.

THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS SHALL BE FIELD ADJUSTED TO MEET THE REQUIREMENTS OF ACTUAL FIELD CONDITIONS.

THE CONTROLLER SHALL MODULATE HOT WATER PUMP SPEEDS TO MAINTAIN A HOT WATER DIFFERENTIAL PRESSURE OF 12LBF/IN2 (ADJ.). THE VFDS MINIMUM SPEED SHALL NOT DROP BELOW 28% (ADJ.).

A) ON DROPPING HOT WATER DIFFERENTIAL PRESSURE, THE VFDS SHALL STAGE ON AND RUN TO MAINTAIN SETPOINT AS FOLLOWS:
I) THE CONTROLLER SHALL MODULATE THE LEAD VFD TO MAINTAIN SETPOINT.
II) IF THE LEAD VFD SPEED IS GREATER THAN A SETPOINT OF 90% (ADJ.), THE LAG VFD SHALL STAGE ON.
III) THE LAG VFD SHALL RAMP UP TO MATCH THE LEAD VFD SPEED AND THEN RUN IN UNISON WITH THE LEAD VFD TO MAINTAIN SETPOINT.

B) ON RISING HOT WATER DIFFERENTIAL PRESSURE, THE VFDS SHALL STAGE OFF AS FOLLOWS:
I) IF THE VFD SPEEDS DROPS BACK TO 60% (ADJ.) BELOW SETPOINT, THE LAG VFD SHALL STAGE OFF.
II) THE LEAD VFD SHALL CONTINUE TO RUN TO MAINTAIN SETPOINT.

C) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) HIGH HOT WATER DIFFERENTIAL PRESSURE: IF 25% (ADJ.) GREATER THAN SETPOINT.
II) LOW HOT WATER DIFFERENTIAL PRESSURE: IF 25% (ADJ.) LESS THAN SETPOINT.

7) BOILER LEAD/LAG OPERATION:
THE TWO BOILERS SHALL OPERATE IN A LEAD/LAG FASHION.

I) THE LEAD BOILER SHALL RUN FIRST.
II) ON FAILURE OF THE LEAD BOILER, THE LAG BOILER SHALL RUN AND THE LEAD BOILER SHALL TURN OFF.
III) AS HOT WATER TEMPERATURE DROPS BELOW A SETPOINT OF 140°F (ADJ.). THE LAG BOILER SHALL STAGE ON AND RUN IN UNISON WITH THE LEAD BOILER TO MAINTAIN HOT WATER TEMPERATURE SETPOINT.
IV) AS HOT WATER TEMPERATURE RISES BACK TO 20°F (ADJ.) ABOVE SETPOINT, THE LAG BOILER SHALL STAGE OFF.

A) THE DESIGNATED LEAD BOILER SHALL ROTATE UPON ONE OF THE FOLLOWING CONDITIONS: (USER SELECTABLE):
I) MANUALLY THROUGH A SOFTWARE SWITCH
II) IF BOILER RUNTIME (ADJ.) IS EXCEEDED
III) DAILY
IV) WEEKLY
V) MONTHLY

B) BOILER ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
II) RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
III) RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.
IV) LEAD BOILER FAILURE: THE LEAD BOILER IS IN FAILURE AND THE STANDBY BOILER IS ON.

8) PRIMARY HOT WATER SUPPLY TEMPERATURE SETPOINT:
THE PRIMARY HOT WATER TEMPERATURE SETPOINT SHALL RESET BASED ON OUTSIDE AIR TEMPERATURE.

AS OUTSIDE AIR TEMPERATURE RISES FROM 0°F (ADJ.) TO 70°F (ADJ.) THE HOT WATER SUPPLY TEMPERATURE SETPOINT SHALL RESET DOWNWARDS FROM 140°F (ADJ.) TO 110°F (ADJ.).

A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) HIGH PRIMARY HOT WATER SUPPLY TEMP: IF GREATER THAN 200°F (ADJ.).
II) LOW PRIMARY HOT WATER SUPPLY TEMP: IF LESS THAN 100°F (ADJ.).

9) PRIMARY HOT WATER TEMPERATURE MONITORING:
THE FOLLOWING TEMPERATURES SHALL BE MONITORED:

I) PRIMARY HOT WATER SUPPLY.
II) PRIMARY HOT WATER RETURN.

A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) HIGH PRIMARY HOT WATER SUPPLY TEMP: IF GREATER THAN 200°F (ADJ.).
II) LOW PRIMARY HOT WATER SUPPLY TEMP: IF LESS THAN 100°F (ADJ.).

10) BOILER 1 HOT WATER TEMPERATURE MONITORING:
THE FOLLOWING TEMPERATURES SHALL BE MONITORED:

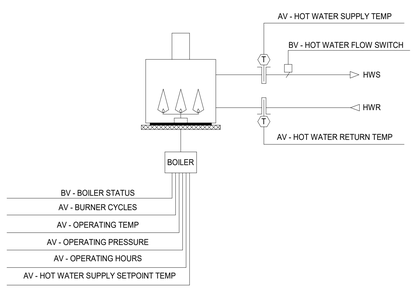
I) BOILER 1 HOT WATER SUPPLY.
II) BOILER 1 HOT WATER RETURN.

A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) HIGH HOT WATER SUPPLY TEMP: IF GREATER THAN 200°F (ADJ.).
II) LOW HOT WATER SUPPLY TEMP: IF LESS THAN 100°F (ADJ.).

11) BOILER 2 HOT WATER TEMPERATURE MONITORING:
THE FOLLOWING TEMPERATURES SHALL BE MONITORED:
I) BOILER 2 HOT WATER SUPPLY.
II) BOILER 2 HOT WATER RETURN.

A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) HIGH HOT WATER SUPPLY TEMP: IF GREATER THAN 200°F (ADJ.).
II) LOW HOT WATER SUPPLY TEMP: IF LESS THAN 100°F (ADJ.).

1 **HYDRONIC HOT WATER HEATING CONTROL SCHEMATIC**
SCALE: N.T.S.



1) BOILER INTERFACE MONITORING:

CURRENT BOILER STATUS AND OPERATING CONDITIONS SHALL BE MONITORED THROUGH ITS COMMUNICATION INTERFACE PORT. THE INTERFACE SHALL MONITOR AND TREND THE POINTS SHOWN.

NOTE:
THIS BOILER INTERFACE SCHEMATIC MAY NOT REFLECT THE ACTUAL SENSORS AND POINTS AS SUPPLIED BY THE BOILER MANUFACTURER. ALL INTERFACE POINTS SHALL BE COORDINATED WITH THE BOILER SUPPLIER.

2 **BOILER MONITORING CONTROLS SCHEMATIC**
SCALE: N.T.S.

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DLZ INDIANA, LLC

12/08/21
JOSHUA R. APKING
REGISTERED
PE 10100024
STATE OF INDIANA
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

DRAWN: SSB CHK'D: ESA
DESIGNED: SSB
APPRV'D: JRA
DATE: DECEMBER 20, 2021

PROJECT NUMBER
2063-1048-90

SULLIVAN COUNTY SHERIFF'S OFFICE AND CORRECTIONAL FACILITY
2357 NORTH SECTION STREET SULLIVAN, INDIANA 47882

CONTROL SCHEMATICS - II

DRAWING NUMBER
M7.2

MECHANICAL