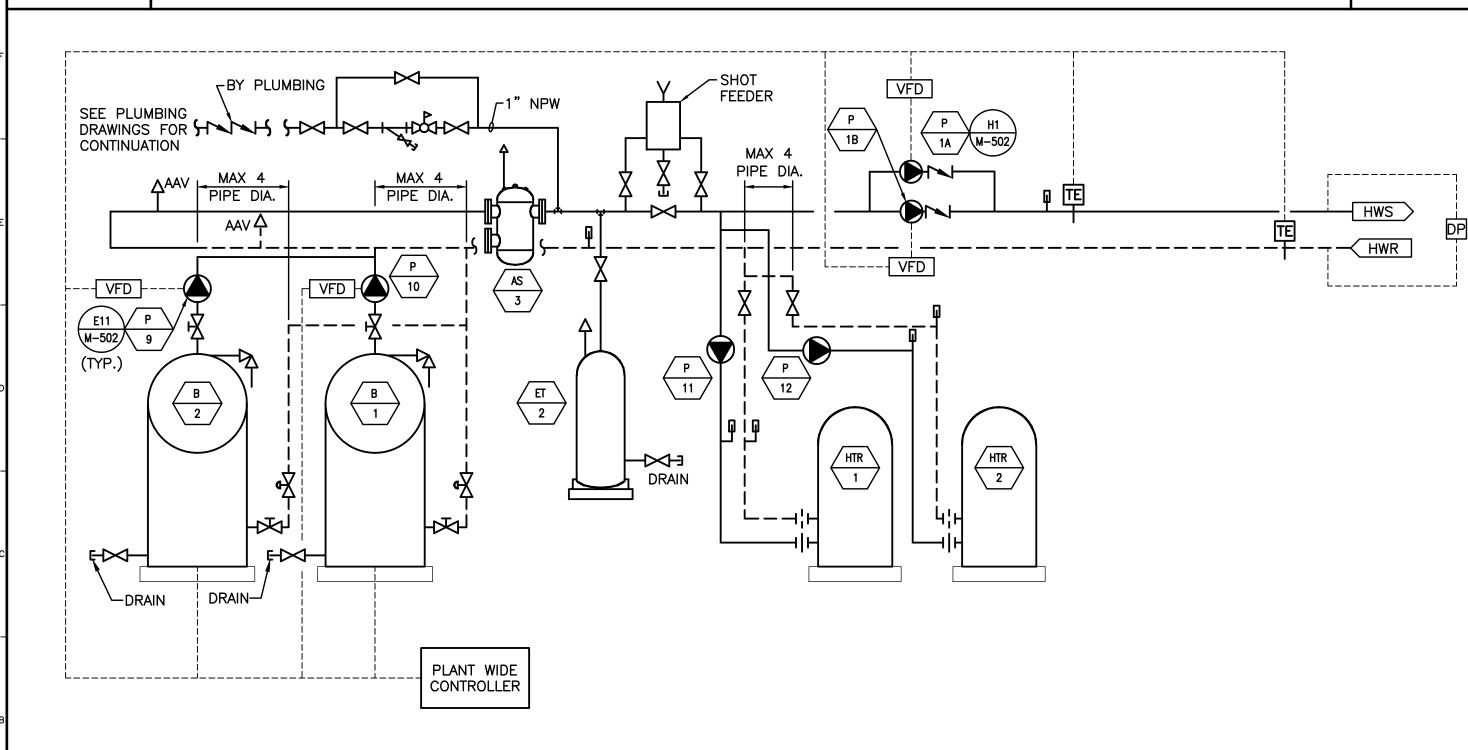


COMPUTER ROOM CHILLER SCHEMATIC

NOT TO SCALE

NOT TO SCALE



SEQUENCE OF OPERATION:

MODULATING LEAD/LAG CONTROLLER

HOT WATER BOILER PUMPS, AND PRIMARY PUMPS, AND DHW PRIORITY MODULATING LEAD/LAG CONTROLLER

SUPPLY A FULLY INTEGRATED BOILER CONTROL SYSTEM TO COORDINATE THE OPERATION OF TWO (SELECT UP TO SEVEN) FULLY MODULATING HOT WATER BOILERS AND BOILER PRIMARY WATER CIRCULATING PUMPS IN ORDER TO MAINTAIN THE HOT WATER SUPPLY (HWS) TEMPERATURE AT SETPOINT. THE CONTROL SYSTEM SHALL BE MICROPROCESSOR-BASED AND SUITABLE FOR WALL MOUNTING.

2. BOILER MODULATION

THE CONTROL SYSTEM SHALL INCORPORATE A HWS HEADER TEMPERATURE PID CONTROL SCHEME. BOILERS SHALL BE MODULATED IN "UNISON" (ALL AT THE SAME FIRING RATE). MODULATION SIGNALS SHALL BE 4-20 MADC OR 0-135 OHM (AS REQUIRED BY THE BOILER AND SHALL BE ELECTRICALLY ISOLATED CHANNEL-CHANNEL AND CHANNEL-GROUND.

3. HOT WATER SUPPLY (HWS) TEMPERATURE SETPOINT

WHEN THE HWS TEMPERATURE CONTROL LOOP IS IN THE "AUTOMATIC" MODE, THE CONTROL SYSTEM SHALL ESTABLISH THE HWS TEMPERATURE SETPOINT BASED ON THE TIME OF DAY, DAY OF THE WEEK AND THE OUTSIDE AIR TEMPERATURE. WHEN IN "MANUAL" MODE THE OPERATOR MAY SET THE HWS TEMPERATURE VIA A FRONT PANEL DISPLAY. ALL TEMPERATURES AND TIME/DATE DATA MUST BE FIELD ADJUSTABLE THROUGH "FILL-IN-THE-BLANKS" STYLE DISPLAYS. ALTERNATELY, THE CONTROL SYSTEM SHALL ACCEPT A 4-20 MADC OUTDOOR AIR TEMPERATURE RESET SETPOINT SIGNAL FROM AN EXTERNAL BUILDING AUTOMATION SYSTEM (BAS).

4. BOILER SEQUENCE

THE CONTROL SYSTEM SHALL UTILIZE BOTH HWS TEMPERATURE AND BOILER FIRING RATE PERCENT TO START AND STOP THE BOILERS AND SHALL MINIMIZE THE TOTAL NUMBER OF BOILERS IN OPERATION. THE CONTROLLER SHALL START AND STOP BOILERS WHEN THE HWS TEMPERATURE IS OUTSIDE THE ADJUSTABLE TEMPERATURE LIMIT FOR LONGER THAN THE ADJUSTABLE TIME DELAY. IN ORDER TO MINIMIZE HEADER TEMPERATURE DEVIATIONS, THE CONTROL SYSTEM SHALL START AND STOP THE NEXT BOILER WHEN THE "LEAD" BOILER IS AT AN ADJUSTABLE FIRING RATE LIMIT FOR LONGER THAN THE ADJUSTABLE TIME DELAY. THE CONTROL SYSTEM SHALL MONITOR BOTH BOILER LOCKOUT AND LIMIT CIRCUITS TO AUTOMATICALLY SKIP OVER THOSE BOILERS THAT ARE POWERED DOWN FOR MAINTENANCE, TRIPPED OR OTHERWISE WILL NOT START. THE LEAD BOILER SHALL EITHER AUTOMATICALLY ROTATE EVERY 1 TO 168 HOURS OR SHALL BE MANUALLY SELECTED BY THE OPERATOR. THE BOILER SHALL BE RUN AT LOW FIRE FOR WARM-UP FOR A PRESET LOW FIRE HOLD TIME. THE BASE LOAD RAMP RATE SHALL BE FIELD ADJUSTABLE. THE CONTROL SYSTEM SHALL REDUCE THE FIRING RATE TO A MINIMUM BEFORE STOPPING A BOILER TO PREVENT ACCUMULATION OF FUEL IN THE FURNACE.

5. BOILER PUMP SEQUENCE

INDEPENDENTLY OPERATED BOILER WATER PUMP CONTROL TO ALLOW VARIABLE SPEED OPERATION BASED UPON TEMPERATURE DIFFERENTIAL ACROSS THE BOILER. PROVIDE SEQUENCE TO WARM UP COLD BOILERS, AND ADJUSTABLE COOL DOWN PERIOD AFTER THE BOILER HAS STOPPED; THE PUMP SHALL IMMEDIATELY STOP IF ANY TRIPS OCCUR DURING PRE-PURGE, PILOT, OR MAIN FLAME TRIAL FOR IGNITION.

6. PRIMARY PUMP SEQUENCE

PRIMARY PUMPS TO BE ENERGIZED BY OUTDOOR AIR TEMPERATURE LIMIT SETPOINT. PUMP SPEED TO BE CONTROLLED BY A PRIMARY ZONE PRESSURE DIFFERENTIAL SENSOR. PRIMARY PUMP SEQUENCING PER LOAD DEMAND.

7. DOMESTIC HOT WATER PRIORITY

A TEMPERATURE SWITCH CONTACT CLOSURE INPUT WILL OVERRIDE THE OUTDOOR RESET AND SETBACK PORTION OF THE PROGRAM AND FORCE THE HWS TEMPERATURE SETPOINT TO A DOMESTIC HOT WATER SETPOINT. A RELAY OUTPUT SHALL START THE DOMESTIC HOT WATER PUMP.

8. COMMUNICATION

THE CONTROL SYSTEM SHALL INCLUDE SIMULTANEOUS COMMUNICATION TO A DATA ACQUISITION SYSTEM (DAS), BUILDING AUTOMATION SYSTEM (BAS) OR BUILDING MANAGEMENT SYSTEM (BMS) VIA RS485 MODBUS PROTOCOL AND TO A PERSONAL COMPUTER AND AN ALPHANUMERIC PAGER VIA STANDARD TELEPHONE LINES. THE INDIVIDUAL BOILER LIMITS, LOCKOUT, START/STOP, WARM STANDBY, AND FIRING RATE STATUS SHALL BE READABLE. HEADER SETPOINT, PLANT FIRING RATE, BOILER QUANTITY CALLED TO START, BOILER SELECTED AS LEAD AND ALL SETUP PARAMETERS SHALL BE READABLE AND WRITABLE.

MAINE TUR ADMINISTE GRAPHIC SCALE: SCALE: PROJECT MANAGER: SLB A/E OF RECORD: CAD FILE: $M-653-060^{\circ}$ PROJECT NO: 06016 SHEET TITLE: **SCHEMATICS**

M-653

HEATING SYSTEM SCHEMATIC