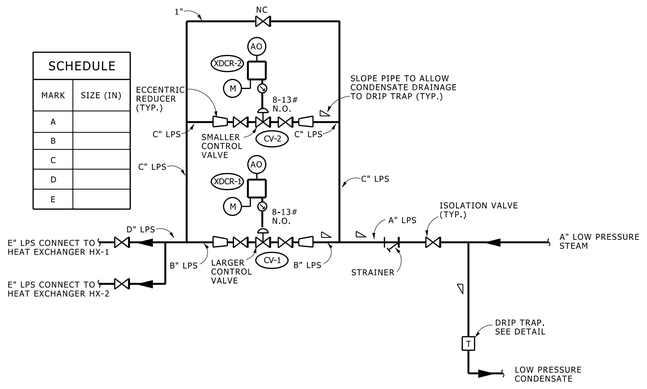


NON CRITICAL HEAT EXCHANGER STEAM CONTROL STATION DETAIL

NO SCALE

NON-CRITICAL HEAT EXCHANGER SYSTEM

DESIGN INTENT:

EACH HEAT EXCHANGER, STEAM CONTROL VALVE STATION, AND PUMP ARE SIZED TO HANDLE APPROXIMATELY <FILL IN PERCENT> OF THE PEAK DIVERSIFIED HWH LOAD.

ALL HEAT EXCHANGERS, STEAM CONTROL VALVES, AND PUMPS MUST BE IN SERVICE TO MEET THE PEAK DIVERSIFIED HWH LOAD.

HWH FLOWS PROPORTIONALLY AND CONTINUOUSLY THROUGH ALL HEAT EXCHANGERS.

MINIMUM <FILL IN GPM> HWH FLOW IS ATTAINED BY <BYPASS? THREE-WAY VALVES? INCLUDE IN SEQUENCE IF REQUIRED>

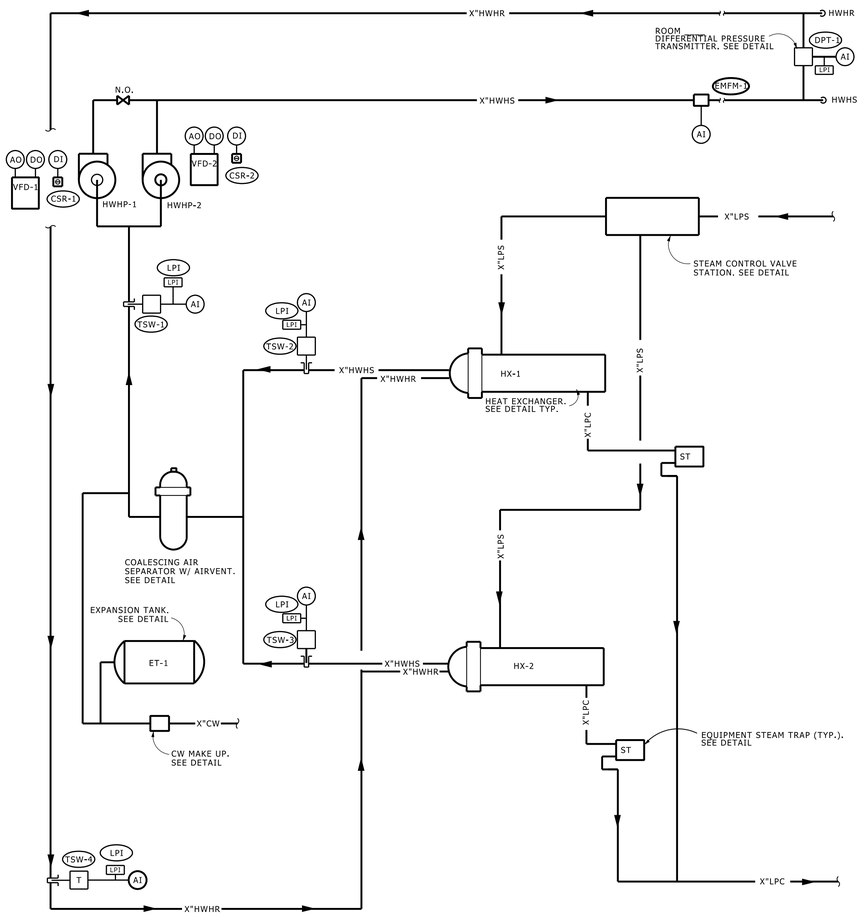
SEQUENCE OF OPERATION:

SUMMARY

1. ALL PUMPS AND HEAT EXCHANGERS WILL OPERATE.
2. ALL PUMPS AND HEAT EXCHANGERS SHALL HAVE THEIR MANUAL ISOLATION VALVES OPEN.
3. THE MANUAL VALVE IN THE COMMON PUMP CROSS-OVER HEADER SHALL BE OPEN.
4. THE MANUAL BYPASS VALVE AT THE STEAM CONTROL VALVES SHALL BE CLOSED.
5. THE SYSTEM SHALL OPERATE CONTINUOUSLY, OR BE SCHEDULED OFF AND ON AS DESCRIBED BELOW.
6. THE DDC SHALL SEQUENTIALLY CONTROL THE STEAM VALVE STATION (WHICH IS COMMON TO ALL HEAT EXCHANGERS) TO ACHIEVE THE SUPPLY WATER SETPOINT AT TSW-1 .
7. THE PUMPS SHALL BE CONTROLLED IN SEQUENCE TO ACHIEVE THE DPT-1 SETPOINT BY CONTROLLING PUMP SPEEDS.

DETAILED SEQUENCE

1. SYSTEM SHALL (OPERATE CONTINUOUSLY, AUTOMATICALLY START WHEN <DESIGNER TO COMPLETE THE SEQUENCE>.
2. ROTATING PUMP ORIENTATION
   - A. EACH PUMP SHALL BE ROTATED WEEKLY IN OR OUT OF SERVICE BY DDC TO EQUALIZE RUN TIME. PUMP ROTATION SHALL ALSO OCCUR WHEN INITIATED BY AN OPERATING CONDITION DESCRIBED IN OTHER SEQUENCE PARAGRAPHS.
   - B. TO ROTATE OPERATION, DDC SHALL FIRST START THE LAG PUMP. THE SPEED OF THE LAG PUMP WILL RAMP UP GRADUALLY (AS SET IN THE VFD) UNTIL IT MATCHES THE LEAD PUMP'S SPEED. AFTER A ONE MINUTE TIME DELAY (ADJ), DDC SHALL STOP THE LEAD PUMP. THE LAG PUMP WILL CONTINUE TO OPERATE AND BE CONSIDERED THE LEAD PUMP.
3. STEAM VALVE CONTROL
   - A. THE DDC SHALL SEQUENTIALLY MODULATE THE STEAM CONTROL VALVES TO PRODUCE THE REQUIRED SETPOINT AT TSW-1. THE TSW-1 SETPOINT CHANGES BASED ON THE INDICATED RESET SCHEDULE.
   - B. UPON AN INCREASE IN LOAD, FIRST MODULATE OPEN THE SMALLEST CONTROL VALVE. UPON CONTINUED INCREASE IN LOAD, MODULATE OPEN THE NEXT LARGER CONTROL VALVE. UPON A DECREASE IN LOAD, THE OPPOSITE SHALL OCCUR, FIRST MODULATING CLOSED THE LARGEST CONTROL VALVE.
   - C. IF TSW-1 IS ±10°F FROM SETPOINT AFTER TIME DELAY, DDC SHALL ALARM A FAULT.
   - D. IF THE TEMPERATURE AT TSW-1 TEMPERATURE TRANSMITTER EXCEEDS 220°F, DDC SHALL ALARM AT BAS (NO TIME DELAY).
4. PUMP CONTROL
   - A. THE MINIMUM PUMP OPERATING SPEED (PROGRAMMED INTO THE VFD) SHALL BE 12HZ.
   - B. DDC SHALL MODULATE THE LEAD AND LAG PUMP VFD IN SEQUENCE AS REQUIRED TO MEET THE DIFFERENTIAL PRESSURE SETPOINT AT DPT-1. THE INITIAL SETPOINT SHALL BE (FILL IN PSI). THE FINAL SETPOINT SHALL BE DETERMINED WITH THE WATER BALANCER DURING TEST AND BALANCE.
   - C. (DPT-1 SETPOINT CHANGES TO MAINTAIN WORST CASE TERMINAL VALVE AT 90% OF FULL OPENING DESIGNER TO EXPAND UPON THIS PART OF THE SEQUENCE IF THE DPT-1 SETPOINT IS TO BE RESET IN SOME WAY.)
   - D. IF DPT-1 FALLS TO 2 PSI BELOW SETPOINT FOR 5 MINUTES (ADJUSTABLE), OR IF LEAD PUMP IS OPERATING AT 50 HZ OR GREATER FOR 5 MINUTES (ADJUSTABLE), DDC SHALL START THE LAG PUMP. DDC SHALL MODULATE BOTH PUMPS AT EQUAL SPEEDS TO MEET THE DPT-1 SETPOINT.
   - E. DURING OPERATION OF BOTH PUMPS, WHEN THE FLOW RATE FALLS BELOW <DESIGNER TO FILL IN FLOW RATE, TYPICALLY HALF OF DESIGN FLOW RATE> GPM FOR 5 MINUTES (ADJUSTABLE), DDC SHALL GRADUALLY DECREASE THE LAG PUMP SPEED UNTIL IT REACHES MINIMUM SPEED. THEN, LAG PUMP SHALL STOP.
   - F. IF DPT-1 FALLS MORE THAN 2 PSI BELOW SETPOINT AFTER A 10 MINUTE (ADJ) TIME DELAY, DDC SHALL ALARM A FAULT.
5. ADDITIONAL BAS DDC ALARMS (AFTER AN APPROPRIATE TIME DELAY)
   - A. PUMP STATUS DOES NOT MATCH DDC COMMAND (AS DETECTED BY CSR)
6. BAS TREND LOGGING:
   - A. BTU/HR, 30 MINUTE READING (EMFM-1, TSW-1, TSW-4)
   - B. HWH GPM, 30 MINUTE READING (EMFM-1)
   - C. TSW-1, 2, 3, 4, 30 MINUTE READING
   - D. PUMP TOTAL RUN TIME, EACH PUMP



NON-CRITICAL STEAM TO WATER HEAT EXCHANGER P & ID

NO SCALE

CONTROLS EQUIPMENT LIST	
ITEM NO.	DESCRIPTION
DPT	DIFF. PRESSURE TRANSMITTER
XDCR	E/P TRANSDUCER
CV	CONTROL VALVE
TSW *	TEMPERATURE SENSOR, WATER
EMFM	ELECTROMAGNETIC FLOW METER
CSR	CURRENT SENSING RELAY
LPI	LOOP POWERED INDICATOR

* TSW1 & TSW4 ARE HIGH PRECISION MATCHED TEMPERATURE SENSOR ASSEMBLIES FOR BTU MEASUREMENT.

RESET SCHEDULE	
OA TEMP (DEG. F)	HWH SUPPLY TEMP (DEG. F)
>65	
65	
55	
0	

NOTES:

1. ALL REQUIRED COMPONENTS AND ACCESSORIES ARE NOT IDENTIFIED. REFER TO CONSTRUCTION DOCUMENTS, INCLUDING PLANS, ELEVATIONS, DETAILS AND SPECIFICATIONS, FOR ADDITIONAL REQUIREMENTS.

DESIGNER NOTES:

1. COMPLETE ALL MISSING INFORMATION.
2. REVIEW STEAM TO WATER HEAT EXCHANGER SYSTEM DESIGN GUIDELINE DG 235716 AND MASTER SPECIFICATION MS 235716 FOR ADDITIONAL INFORMATION.

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DESIGNED BY | REVIEWED BY

MARK	ISSUED FOR/REVISIONS	DATE
		07.08.15

Converter Standardization Committee

Steam to Water Heat Exchanger

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U OF M PROJECT NO. | BLDG NO.

SHEET TITLE **Mechanical**

Steam to Water Heat Exchangers P & ID - Non-Critical

MD 235716 002

SHEET NO. 1 OF 1 SHEET FILE NO. MD 235716 002.dgn