

**NOTES:**

- THIS SYSTEM APPLIES TO HIGH PRESSURE STEAM BOILERS ONLY.
- ECONOMIZERS ARE FURNISHED PAINTED BY C-B AND INCLUDE SQUARE AND ROUND MATING FLANGE GASKETS AND TWO .75" NPT RELIEF VALVES SET AT 300 PSIG. ECONOMIZER FLANGES ARE DESIGNED TO SUPPORT A MAXIMUM OF 500 LBS. STACK/ECONOMIZER SUPPORT BY OTHERS.
- DEAERATOR TO BE EQUIPPED WITH CONTINUOUS OPERATION BOILER FEED PUMP(S), SUCTION AND DISCHARGE PIPING, SPRAYMASTER DEAERATOR SHOWN BUT UNIT CAN ALSO BE A TRAWMASTER OR BOILERMATE STYLE.
  - A DEAERATOR IS REQUIRED FOR SYSTEM OPERATION.
  - (1) ADDITIONAL TAPPING MAY BE REQUIRED ON THE DEAERATOR BELOW THE WATER LINE FOR FIRST STAGE BYPASS. FOR EXISTING DEAERATORS, THE INSTALLING CONTRACTOR MUST ADD THIS CONNECTION TO THE TANK. (PIPE, FITTING & INSTALLATION BY OTHERS).
  - FOR NEW DEAERATORS, THIS CONNECTION MUST BE ADDED TO THE TANK BY THE REPRESENTATIVE SALES PERSON PLACING THE DEAERATOR ORDER.
- THE SIZE OF VALVE #3 IS BASED ON QUANTITY OF CONDENSATE EXPECTED TO MAINTAIN PROPER FLOW AND VELOCITY. SEE CHART FOR APPROPRIATE PART NUMBER. INSTALLATION NOTE: SYSTEM FLOW DOES NOT FOLLOW ARROW ON VALVE BODY.
- DEAERATOR LEVEL CONTROLS ARE NOT INCLUDED IN THE PACKAGE PRICING. EXISTING VALVES AND/OR CONTROLS MAY BE USED PROVIDED THE VALVE IS A MODULATING TYPE. IF NEW VALVES AND/OR CONTROLS ARE REQUIRED, SEE DEAERATOR PRICE SHEETS, SECTION 130-10 FOR INFORMATION ON HOW TO SIZE THE VALVES BASED ON MAKE-UP FLOW RATE AND INLET WATER PRESSURE.
- CONTROL PANEL IS SHIPPED LOOSE FOR FIELD MOUNTING TO WALL OR STAND (BY OTHERS). CEC102 CONTROL IS INCLUDED IN THE BASE PRICING. CEC202 TOUCH SCREEN CONTROL IS AN OPTIONAL UPGRADE.
- CONDENSING ECONOMIZERS ARE DESIGNED FOR SYSTEMS FIRING PRIMARILY NATURAL GAS AND/OR PROPANE (VALVES AS SHOWN) WITH #2 FUEL OIL AS AN OPTIONAL BACK-UP FUEL ONLY (SEE SEQUENCE OF OPERATION). OTHER FUEL TYPES ARE NOT SUPPORTED. FOR GAS ONLY SYSTEMS, VALVES "D" & "E" ARE NOT REQUIRED.
- A MODULATING FEEDWATER VALVE IS REQUIRED ON ALL SYSTEMS. A THREE VALVE BYPASS IS RECOMMENDED BUT NOT PART OF THE BASE PRICING.
- ECONOMIZER CONDENSATE OUTLET CONNECTION MUST BE PIPED TO DRAIN. REFER TO LOCAL CODES AND REGULATIONS FOR CONDENSATE NEUTRALIZATION REQUIREMENTS.

ITEM	QTY	PART NO.	DESCRIPTION
1	1	949-00437-000	VALVE #1, MODULATING MAKE-UP BYPASS, 1/2" NPT, N.C.
2	2	235-0067-000	VALVE #2, FLOW BALANCING, MODULATING, FULL PORT, S.S.
3	1	SEE TABLE	VALVE #3, 3-WAY BYPASS
4	2	SEE TABLE	VALVE #4, FEEDWATER VALVE, N.C.
5	2	941-00040-000	VALVE #5, MANUAL BYPASS, GLOBE, 1/2" NPT.
6			N/A.
7	1	283-03584-000	PLC VALVE & PUMP CONTROL, BASIC (CEC102)
8	2	283-03585-000	PLC VALVE & PUMP CONTROL, INTERMEDIATE (CEC202)
9	4	817-03944-000	ECONOMIZER, 2-STAGE CONDENSING
10	4	817-03943-000	FLUE GAS THERMOCOUPLE TRANSMITTER
11	4	817-03943-000	MAKE-UP WATER THERMOCOUPLE TRANSMITTER
11	4	817-03943-000	FEEDWATER THERMOCOUPLE TRANSMITTER

TABLE FOR ITEM 8

BOILER	ECONOMIZER P/N	1ST STAGE WATER CONNECTIONS
250-300HP LE & 4WI	611-00128-000	2" NPT.
350HP LE	611-00129-000	2" NPT.
350HP 4WI	611-00137-000	2" NPT.
400HP LE & 4WI	611-00137-000	2" NPT.
500HP LE & 4WI	611-00130-000	2-1/2" NPT.
600HP LE & 4WI	611-00131-000	2-1/2" NPT.
700HP LE & 4WI	611-00132-000	2-1/2" NPT.
800HP LE & 4WI	611-00133-000	2-1/2" NPT.

TABLE FOR ITEM 3

VALVE 2 SIZE	VALVE P/N
1/2"	949-00477-000
1"	949-00474-000
1-1/4"	949-00475-000
1-1/2"	949-00476-000

TABLE FOR ITEM 4

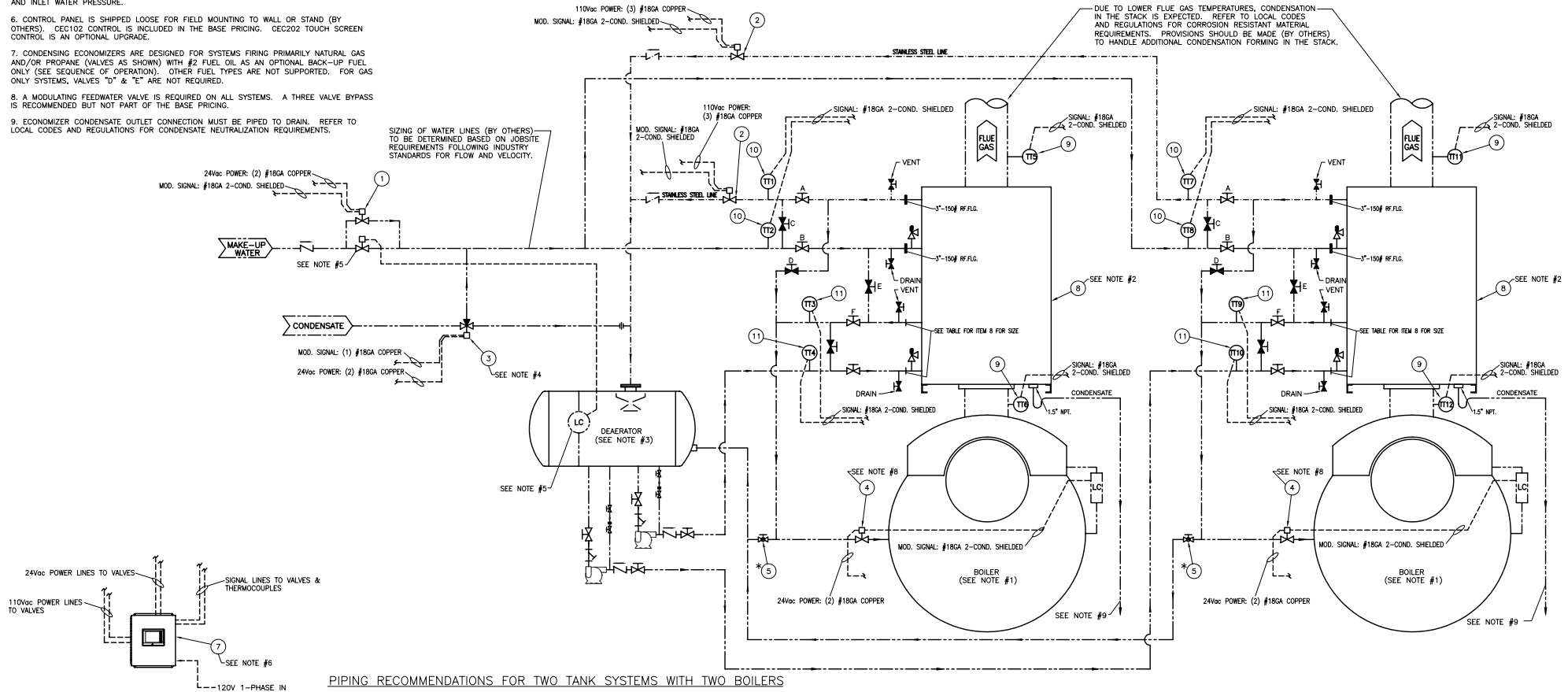
BOILER HP	SIZE	VALVE P/N
250	3/4"	949-00438-000
300-350	1"	949-00439-000
400-500	1-1/4"	949-00440-000
700-800	1-1/2"	949-00441-000

**SEQUENCE OF OPERATION**

- COMMON OPERATION:**
- DEAERATOR LEVEL CONTROL SENDS SIGNAL TO MAKE-UP VALVE TO MAINTAIN LEVEL IN THE DEAERATOR.
  - SENDING MAKE-UP WATER THROUGH THE SECOND STAGE OF THE ECONOMIZER AND INTO THE DEAERATOR.
  - VALVE 3 NORMALLY SENDS ALL CONDENSATE RETURN DIRECTLY TO THE DEAERATOR.
  - IF SECOND STAGE OUTLET WATER TEMPERATURE CONTROL SENSES STEAMING, VALVE 3 MODULATES TO DIVERT CONDENSATE THROUGH THE SECOND STAGE OF THE ECONOMIZER THEREBY INCREASING FLOW.
  - IF SECOND STAGE OUTLET WATER TEMPERATURE CONTROL CONTINUES TO SENSE STEAMING, VALVE 1 IS OPENED TO ADD MORE COLD MAKE-UP WATER.
  - BOILER LEVEL CONTROL SENDS SIGNAL TO VALVE 4 TO MAINTAIN LEVEL IN THE BOILER.
  - VALVES 1, 2 & 4 ARE MODULATING VALVES, ALL OTHER ARE NOT.
  - VALVES BV1 & BV2 BALANCE THE FLOW THROUGH EACH ECONOMIZER IN PROPORTION TO THE FIRING RATE OF EACH BOILER AND CAN ALSO BE TRIMMED BY THE SECOND STAGE OUTLET WATER TEMPERATURE.

**#2 OIL FIRING PROVISIONS:**

- UNDER ANY MAKEUP WATER CONDITION:
  - VALVES "A" & "B" MUST BE CLOSED WHILE VALVE "C" IS OPENED TO DIVERT MAKE-UP WATER DIRECTLY TO THE DEAERATOR. BY-PASSING THE SECOND STAGE PREVENTS CONDENSATION WITHIN THE ECONOMIZER.
  - VALVE "E" MUST BE CLOSED WHILE VALVES "D" & "F" ARE OPENED TO ROUTE FEEDWATER THRU THE SECOND STAGE TO PREVENT STEAMING IN THE SECOND STAGE COILS.
- WHEN SWITCHING BACK TO NATURAL GAS FIRING, RETURN VALVES "A" THRU "F" BACK TO THEIR ORIGINAL POSITIONS FOR OPTIMAL EFFICIENCY GAIN.



PIPING RECOMMENDATIONS FOR TWO TANK SYSTEMS WITH TWO BOILERS

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REVISIONS  
 ENR 39969  
 DATE 02/03/09  
 DRAWN BY  
 CHECKED BY  
 UPDATED TO LATEST  
 ENR 39869-A  
 DATE 05/05/09  
 DRAWN BY  
 CHECKED BY  
 POWER SIGNAL  
 ENR 39869-B

ALL PIPING IS BY OTHERS  
 ALL VALVES BY OTHERS (UNLESS OTHERWISE NOTED)  
 --- CONTROL SIGNAL (WIRING BY OTHERS)  
 \* DENOTES OPTIONAL EQUIPMENT  
 ☒ NORMALLY CLOSED VALVE  
 ☒ NORMALLY OPEN VALVE

ALL DIMENSIONS SHOWN ON BILL OF MATERIALS ARE FOR REFERENCE ONLY. DIMENSIONS SHOWN IN PARENTHESES ARE TOLERANCES UNLESS OTHERWISE SPECIFIED.  
 FUNCTIONAL TOLERANCES:  
 HOLE DIMENSIONS: ±.010  
 DRILLED, PUNCHED OR SLOTTED HOLES: ±.010  
 SHT 01 OF 01

SCALE  
 N.T.S.  
 DATE  
 03/24/09  
 DRAWN BY  
 DJM  
 CHECKED BY  
 DJM  
 SIZE  
 D  
**CLEAVER-BROOKS**  
 The power of commitment  
**SCHEMATIC, (2) LE/4WI BOILERS  
 W/ COND. ECON AND DEA**  
 DRWG. NO. 722-05004-000 02