AERCO

INSTRUCTION No. HE-108

AERCO INTERNATIONAL, INC., NORTHVALE, NEW JERSEY 07647, U.S.A.

INSTALLATION, OPERATION, and MAINTENANCE INSTRUCTIONS

HELITHERM HEAT EXCHANGERS

MODEL SW3E-PLUS
STEAM TO WATER

A N D

MODEL WW3E-PLUS
WATER TO WATER

Printed in U.S.A

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SAFETY PRECAUTIONS

Installing or operating personnel must, at all times, observe all safety regulations. The following warnings are general and must be given the same attention as specific precautions included in the instructions.

WARNING!

FLUIDS UNDER PRESSURE MAY CAUSE INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT WHEN RELEASED.

SHUT OFF ALL INCOMING AND OUTGOING STEAM/HIGH TEMPERATURE (BOILER) WATER AND SECONDARY WATER STOP VALVES AND CAREFULLY DECREASE ALL TRAPPED PRESSURES TO ZERO (see SHUTDOWN in OPERATING PROCEDURES) BEFORE PERFORMING ANY MAINTENANCE.

WARNING!

LIVE STEAM CAN CAUSE SEVERE BURNS. HIGH TEMPERATURE (BOILER) WATER MAY FLASH INTO STEAM WHEN RELEASED.

NEVER SEARCH FOR LEAKAGE IN A STEAM OR HIGH TEMPERATURE (BOILER) WATER LINE BY SIGHT ALONE OR BY "FEEL". USE A MIRROR OR OTHER SUITABLE POLISHED OBJECT ALSO, ALWAYS WEAR GLOVES AND LONG SLEEVES.

GENERAL INFORMATION

This instruction covers AERCO Heltherm Series E-PLUS Steam to Water and Water to Water Packaged Heat Exchangers. Steam or high temperature hot water (boiler water, condensate, waste water, etc.) is the primary or tube side fluid. The water or other fluid being heated is the secondary or shell side Fluid

The number of coils in a particular Heat Exchanger is denoted by the last two digits in the Heat Exchanger Model Number. That is, 03 = 3 coils, 08 = 8 coils, 11 = 11 coils, 16 = 16 coils, 20 = 20 coils, etc.

The "Style" designation for a Heat Exchanger denotes materials of construction for the various components of the assembly. If this information is required for a specific Heat Exchanger, either refer to AERCO Product Specification covering the E-PLUS Exchanger or contact the nearest AERCO Sales Representative.

ACCESSORIES

Accessories included in the AERCO E-PLUS Heat Exchanger Package Assembly are (see Figures HE-108-1, HE-108-2, HE-108-3, HE-108-11, HE-108-13, HE-108-14, and HE-108-15)

COMMON TO EACH HEATER

- Pressure and Temperature Relief Valve -- installed in Heater head.
- Shell Hot Water Outlet Temperature Gage -- mounted below Control Box.
- Over-Temperature Limit System, including the following
  - Temperature Switch -- installed in the Control Box
  - Solenoid Valves --
    - Water -- installed in Heater top head
    - Air -- installed in Control Box when Air Operated Control Valve is furnished
    - Steam -- installed on Self-Contained Control Valve when such is furnished
  - Indicator Lights -- "Power On" and "Tripped" -- installed in Control Box

Included with STEAM TO WATER HEATER

- Compound Steam Pressure Gage -- mounted below Control Box
- Steam Flow Control Valve -- either Air-Operated or Self-Contained as ordered, sized as required for the service
- Temperature Controller -- installed in the Control Box when an Air-Operated Control Valve is furnished
- Union Orifice -- located in the Condensate Outlet -- required in place of a steam trap to insure complete condensation of the steam within the Heater
- Check Valve -- located in the Condensate Outlet

Included with WATER TO WATER HEATER

- Inlet and Outlet High Temperature Water Temperature Gages -- mounted below the Control Box
- Two-Way Water Flow Control Valve -- either Air-Operated or Self-Contained as ordered, sized as required for the service
  OR
  Three-Way Water Flow Control Valve -- Air-Operated, sized as required for the service
- Temperature Controller -- installed in the Control Box when an Air-Operated Control Valve is furnished

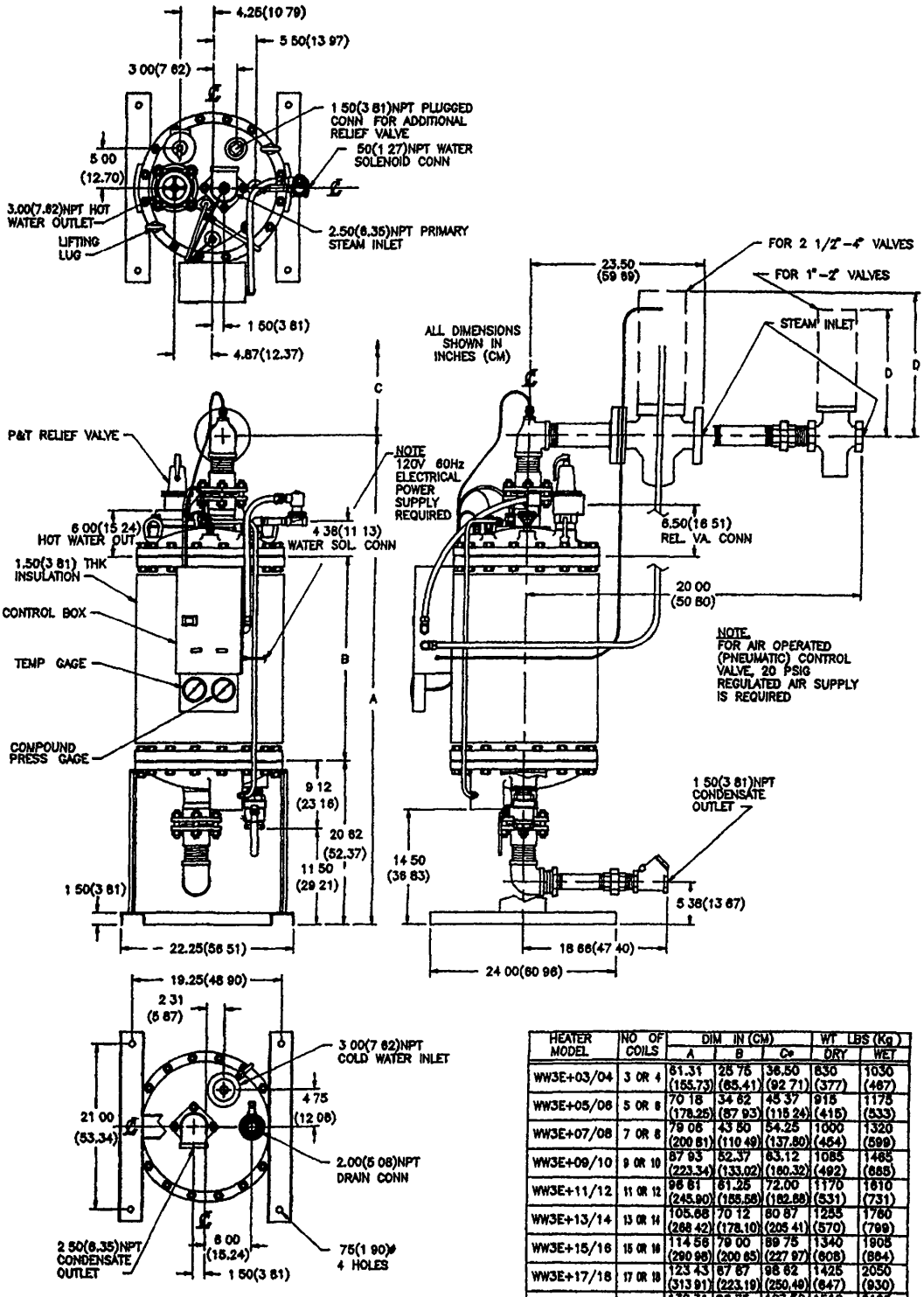
All other items -- stop valves, check valves, strainers, pressure gages, unions or flanges, and other piping and fittings as shown in Figures HE-108-4, HE-108-4, or HE-108-5 -- are to be furnished by others.

NOTE

The AERCO Heltherm Heat Exchanger carries the standard AERCO warranty against defective material and workmanship HOWEVER, AERCO cannot honor its warranty if the installer or user deviates in any way from the instructions and precautions included herein or makes any alteration of the equipment or assembly from that as originally furnished without the written approval of AERCO.

NOTE

THIS INSTRUCTION COVERS ONLY THE HEAT EXCHANGER PORTION OF THF MODEL E-PLUS PACKAGED HEATER ASSEMBLY. SEPARATE INSTRUCTIONS ARE INCLUDED IN THIS PACKAGE COVERING THE STEAM OR HIGH TEMPERATURE WATER CONTROL VALVE, THE OVER-TEMPERATURE LIMIT SYSTEM AND ITS COMPONENTS, AND THE OTHER ACCESSORIES INCLUDED IN THE HEATER PACKAGE.



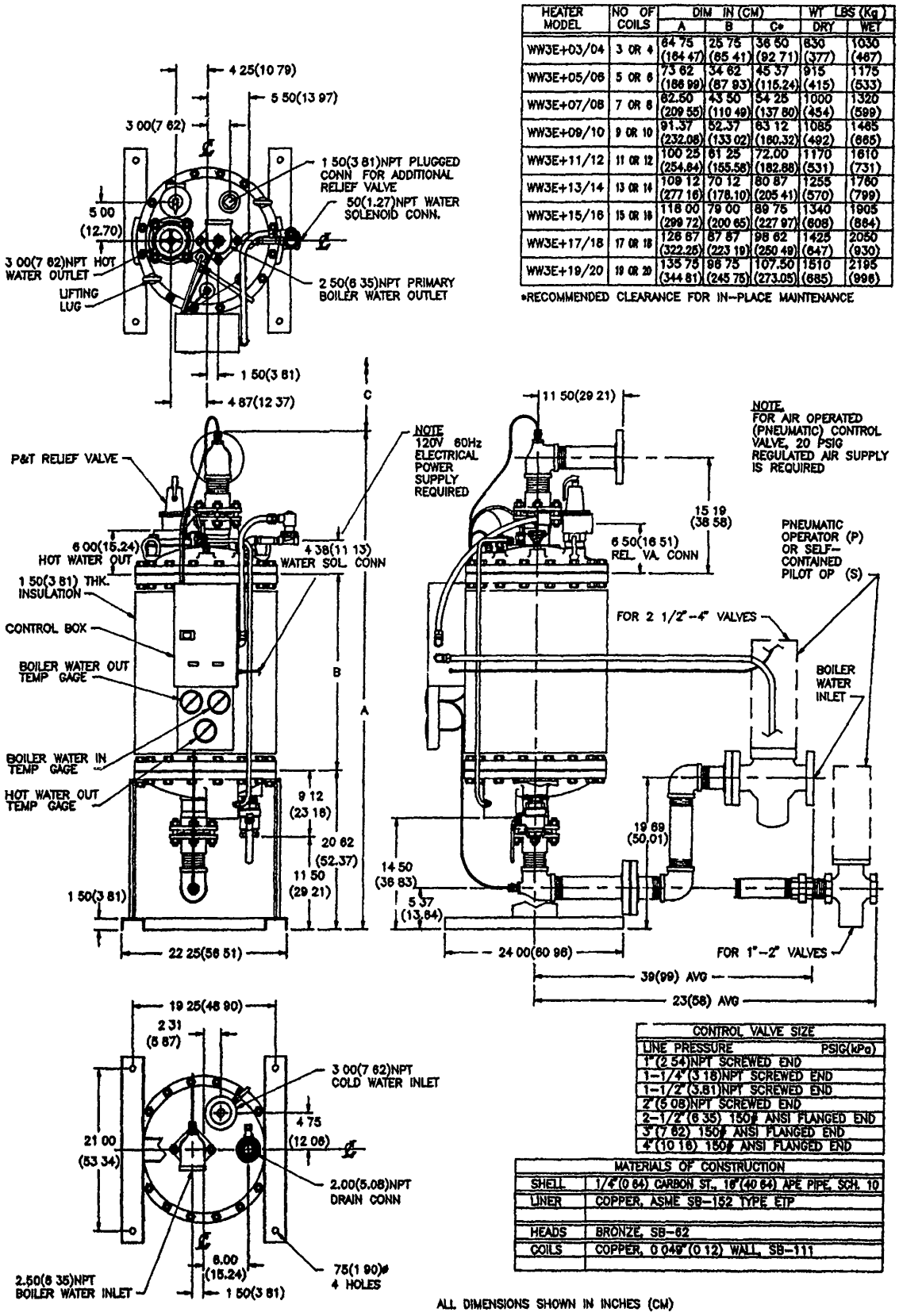
HEATER MODEL	NO. OF COILS	DIM. IN (CM) A	B	C*	WT. LBS (Kg) DRY	WET
WW3E+03/04	3 OR 4	61.31 (155.73)	25.75 (65.41)	36.50 (92.71)	630 (377)	1030 (467)
WW3E+05/06	5 OR 6	70.18 (178.25)	34.62 (87.93)	45.37 (115.24)	915 (415)	1175 (533)
WW3E+07/08	7 OR 8	79.06 (200.81)	43.50 (110.49)	54.25 (137.80)	1000 (454)	1320 (599)
WW3E+09/10	9 OR 10	87.93 (223.34)	52.37 (133.02)	63.12 (160.32)	1085 (492)	1465 (665)
WW3E+11/12	11 OR 12	96.81 (245.90)	61.25 (155.58)	72.00 (182.88)	1170 (531)	1610 (731)
WW3E+13/14	13 OR 14	105.68 (268.42)	70.12 (178.10)	80.87 (205.41)	1255 (570)	1760 (799)
WW3E+15/16	15 OR 16	114.56 (290.98)	79.00 (200.65)	89.75 (227.97)	1340 (608)	1905 (864)
WW3E+17/18	17 OR 18	123.43 (313.91)	87.87 (223.19)	98.62 (250.49)	1425 (647)	2050 (930)
WW3E+19/20	19 OR 20	132.31 (336.07)	96.75 (245.75)	107.50 (273.05)	1510 (685)	2195 (996)

*RECOMMENDED CLEARANCE FOR IN-PLACE MAINTENANCE

CONTROL VALVE SIZE	"D" DIMENSION IN (CM)	
LINE PRESSURE PSIG(kPa)	CXT-S	CXT-P
1" (2.54) NPT SCREWED END	15.75 (40.00)	16.62 (42.21)
1-1/4" (3.18) NPT SCREWED END	15.75 (40.00)	16.62 (42.21)
1-1/2" (3.81) NPT SCREWED END	16.50 (41.91)	16.62 (42.21)
2" (5.08) NPT SCREWED END	15.75 (40.00)	16.62 (42.21)
2-1/2" (6.35) 150# ANSI FLANGED END	21.62 (54.91)	18.00 (45.72)
3" (7.62) 150# ANSI FLANGED END	22.50 (57.15)	21.75 (55.25)
4" (10.16) 150# ANSI FLANGED END	22.50 (57.15)	21.87 (55.56)

MATERIALS OF CONSTRUCTION	
SHELL	1/4" (0.64) CARBON ST., 16" (40.64) APE PIPE, SCH. 10
LINER	COPPER, ASME SB-152 TYPE ETP
HEADS	BRONZE, SB-62
COILS	COPPER, 0.049" (0.12) WALL, SB-111

Figure HE-108-1 -- AERCO Steam to Water Packaged Heater, Model SW3E-PLUS



HEATER MODEL	NO OF COILS	DIM IN (CM) A	B	C*	WT LBS (Kg) DRY	WET
WW3E+03/04	3 OR 4	64 75 (164 47)	25 75 (65 41)	36 50 (92 71)	830 (377)	1030 (467)
WW3E+05/06	5 OR 6	73 62 (186 99)	34 62 (87 93)	45 37 (115.24)	915 (415)	1175 (533)
WW3E+07/08	7 OR 8	82.50 (209 55)	43 50 (110 49)	54 25 (137 80)	1000 (454)	1320 (599)
WW3E+09/10	9 OR 10	91.37 (232.08)	52.37 (133 02)	63 12 (160.32)	1085 (492)	1465 (665)
WW3E+11/12	11 OR 12	100 25 (254.64)	61 25 (155.58)	72.00 (182.88)	1170 (531)	1610 (731)
WW3E+13/14	13 OR 14	109 12 (277 16)	70 12 (178.10)	80 87 (205 41)	1255 (570)	1760 (799)
WW3E+15/16	15 OR 16	118 00 (299 72)	79 00 (200 65)	89 75 (227 97)	1340 (608)	1905 (864)
WW3E+17/18	17 OR 18	126 87 (322.25)	87 87 (223 19)	98 62 (250 49)	1425 (647)	2050 (930)
WW3E+19/20	19 OR 20	135 75 (344 81)	96 75 (245 75)	107.50 (273.05)	1510 (685)	2195 (996)

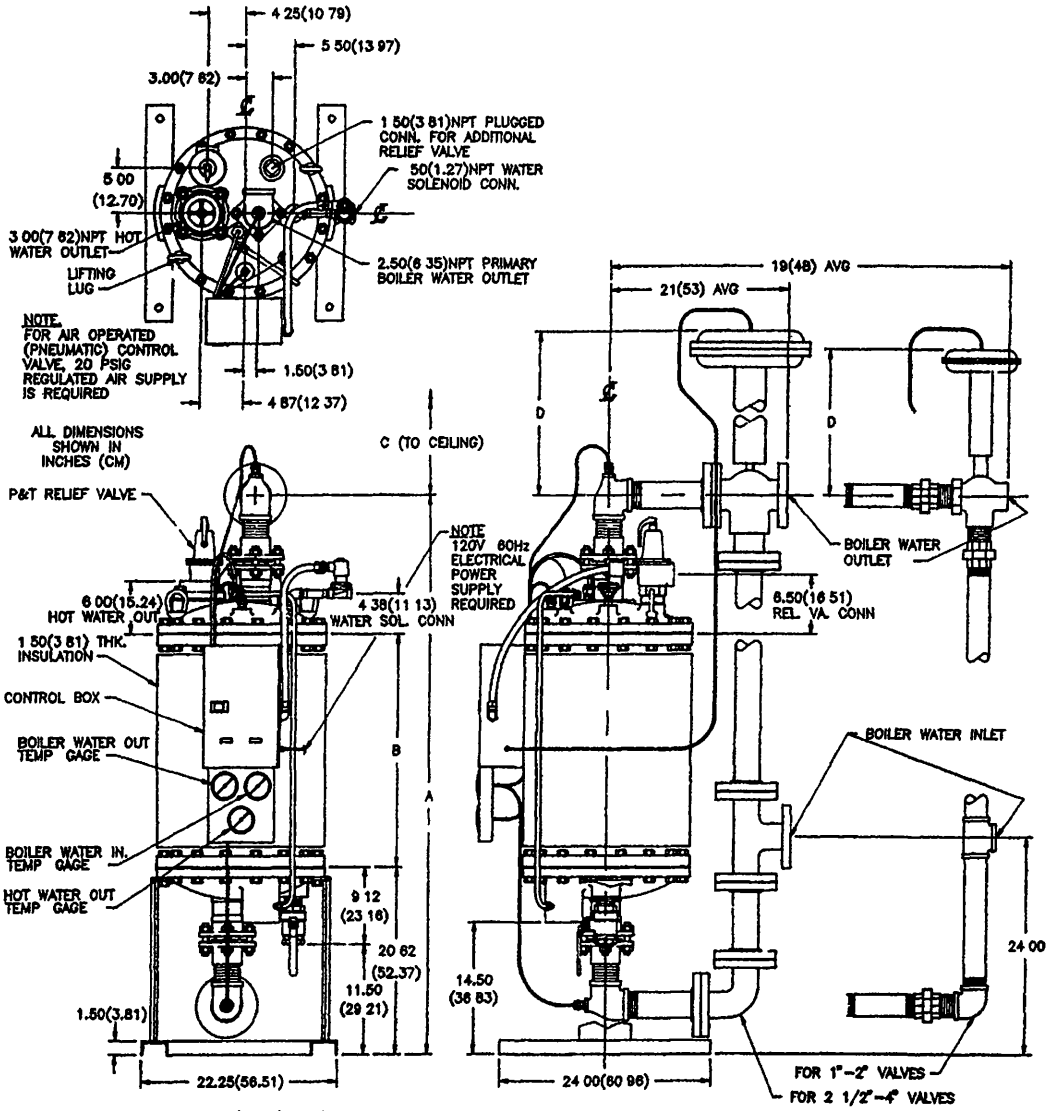
*RECOMMENDED CLEARANCE FOR IN-PLACE MAINTENANCE

CONTROL VALVE SIZE
LINE PRESSURE PSIG(kPa)
1" (2 54) NPT SCREWED END
1-1/4" (3 18) NPT SCREWED END
1-1/2" (3.81) NPT SCREWED END
2" (5 08) NPT SCREWED END
2-1/2" (6 35) 150# ANSI FLANGED END
3" (7 62) 150# ANSI FLANGED END
4" (10 16) 150# ANSI FLANGED END

MATERIALS OF CONSTRUCTION	
SHELL	1/4" (0 64) CARBON ST., 16" (40 64) APE PIPE, SCH. 10
LINER	COPPER, ASME SB-152 TYPE ETP
HEADS	BRONZE, SB-62
COILS	COPPER, 0 049" (0 12) WALL, SB-111

ALL DIMENSIONS SHOWN IN INCHES (CM)

Figure HE-108-2 -- AERCO Water to Water Packaged Heater, Model WW3E-PLUS, with 2-Way Control Valve



HEATER MODEL	NO. OF COILS	DIM. IN.(CM) A	B	C*	WT. LBS (Kg) DRY	WET
WW3E+03/04	3 OR 4	61.31 (155.73)	25.75 (65.41)	36.50 (92.71)	800 (364)	1000 (455)
WW3E+05/06	5 OR 6	70.18 (178.25)	34.62 (87.93)	45.37 (115.24)	885 (402)	1145 (520)
WW3E+07/08	7 OR 8	79.06 (200.81)	43.50 (110.49)	54.25 (137.80)	970 (441)	1290 (586)
WW3E+09/10	9 OR 10	87.93 (223.34)	52.37 (133.02)	63.12 (160.32)	1055 (480)	1435 (652)
WW3E+11/12	11 OR 12	96.81 (245.90)	61.25 (155.58)	72.00 (182.88)	1140 (518)	1580 (718)
WW3E+13/14	13 OR 14	105.68 (268.42)	70.12 (178.10)	80.87 (205.41)	1225 (557)	1730 (786)
WW3E+15/16	15 OR 16	114.56 (290.98)	79.00 (200.65)	89.75 (227.97)	1310 (596)	1875 (852)
WW3E+17/18	17 OR 18	123.43 (313.91)	87.87 (223.19)	98.62 (250.49)	1395 (634)	2020 (918)
WW3E+19/20	19 OR 20	132.31 (336.07)	96.75 (245.75)	107.50 (273.05)	1480 (673)	2165 (984)

*RECOMMENDED CLEARANCE FOR IN-PLACE MAINTENANCE

MATERIALS OF CONSTRUCTION	
SHELL	1/4" (0.64) CARBON ST., 16" (40.64) APE PIPE, SCH. 10
LINER	COPPER, ASME SB-152 TYPE ETP
HEADS	BRONZE, SB-62
COILS	COPPER, 0.049" (0.12) WALL, SB-111

CONTROL VALVE SIZE LINE PRESSURE PSIG(kPa)	D
1" (2.54) NPT SCREWED END	15.19(38.58)
1-1/4" (3.18) NPT SCREWED END	15.50(39.37)
1-1/2" (3.81) NPT SCREWED END	15.75(40.00)
2" (5.08) NPT SCREWED END	16.12(40.94)
2-1/2" (6.35) 150# ANSI FLANGED END	24.50(62.23)
3" (7.62) 150# ANSI FLANGED END	24.88(63.20)
4" (10.16) 150# ANSI FLANGED END	25.62(65.07)

Figure HE-108-3 -- AERCO Water to Water Packaged Heater, Model WW3E-PLUS, with 3-Way Control Valve

INSTALLATION

1. Dimensions for an AERCO Heat Exchanger (Heater) Model SW3E-PLUS (Steam to Water) are shown in Figure HE-108-1. For Model WW3E-PLUS with 2-Way Control Valve are shown in Figure HE-108-2 For Model WW3E-PLUS with 3-Way Control Valve are shown in Figure HE-108-3.

2. Uncrate the Heater carefully. Using a block and tackle or hoist attached to the lifting lugs on the top head of the Heater (see Figure HE-108-12), set the Heater upright. Always use the lifting lugs to lift and/or move the Heater.

3. If possible, for easy in-place maintenance, locate the Heater where there is at least two feet clearance all around the Heater and where the head room clearance distance is at least equal to the dimension given for the Heater Model furnished.

4. It is suggested that the Heater stand assembly be secured to the floor. However, any other means for securing the Heater may be used. If piping is used to secure the Heater, the piping must include ample provision for expansion.

5. Make all piping connections as instructed in step 6 below and in accordance with the appropriate Figure listed here·

   Steam to Water -- Figure HE-108-4

   Water to Water with 2-Way Control Valve -- Figure HE-108-5

   Water to Water with 3-Way Control Valve -- Figure HE-108-6

6. For best Heater performance, observe the following very carefully in making the piping installation·

   a. Do not use cement or red lead in making up pipe joints.

   b. For Heater connection types, sizes, and exact locations, see Figure HE-108-1, HE-108-2, or HE-108-3 as appropriate for the Heater Model furnished.

   c. All piping to the Heater top head should be provided with unions or flanges which are located beyond the outside diameter of the Heater head to permit removal of the head and shell for in-place maintenance.

   d. Except for items furnished in the Heater package assembly (see Accessories under GENERAL INFORMATION), include all of the stop valves, check valves, steam traps, pressure gages, and other elements in the piping as shown in the Figure HE-108-4, HE-108-5, or HE-108-6 which applies to your installation, or as separately specified by AERCO. Note that the check valve shown at the Heater in the Condensate return line is furnished in the piping package assembly by AERCO.

   e. For a Steam to Water Heater, the Condensate Return piping should be arranged to permit Condensate to drain freely by gravity from the Heater bottom head. Failure to do so may result in Heater improper operation and/or in damage to the Heater Steam/Condensate system.

   f For a Water to Water Heater where the Primary Fluid (HTH Water) temperature is high enough to cause significant flashing, AERCO recommends the use of "double block and bleed" valving (shown dotted in Figures HE-108-5 anf HE-108-6) in both the Primary supply and return lines to permit safe access to the equipment for maintenance.

   g. All drain discharges -- Relief Valve in the top head of the Heater, outlet of the Water Solenoid Valve in the top head of the Heater, and Drain Valve in the bottom head of the Heater -- should be piped directly to a convenient floor drain.

   h. The 3/8" bleed line shown in Figure HE-108-5 from the Primary supply line to the Primary return line is required to provide a constant circulation of High Temperature Hot Water and, thus, constant Hot Primary Water in the supply line to the Heater

   i The piping line shown in Figure HE-108-6 from the Primary supply line to the B port of the 3-Way Control Valve is required to assure constant and adequate circulation of the Primary Hot Water where such is necessary

7. Before making final piping connections to and from the Heater and Control Valve, blow out all piping thoroughly.

8. If an air-operated Control Valve is furnished in the Heater package, make the necessary supply air connection to the connector through the side of the Control Box (see Item 14 in Figure HE-108-11). An in-line air filter is furnished loose in the Control Box. Install the air filter in the air supply line, with the arrow pointing in the direction of air flow, as close the the Control Box connector as possible. NOTE that the supply air pressure must be maintained at 20 psig.

9 Connect 110 V 60 Hz power supply wiring through the side of the Control Box to the electrical junction box, Item 5 in Figure HE-108-11.

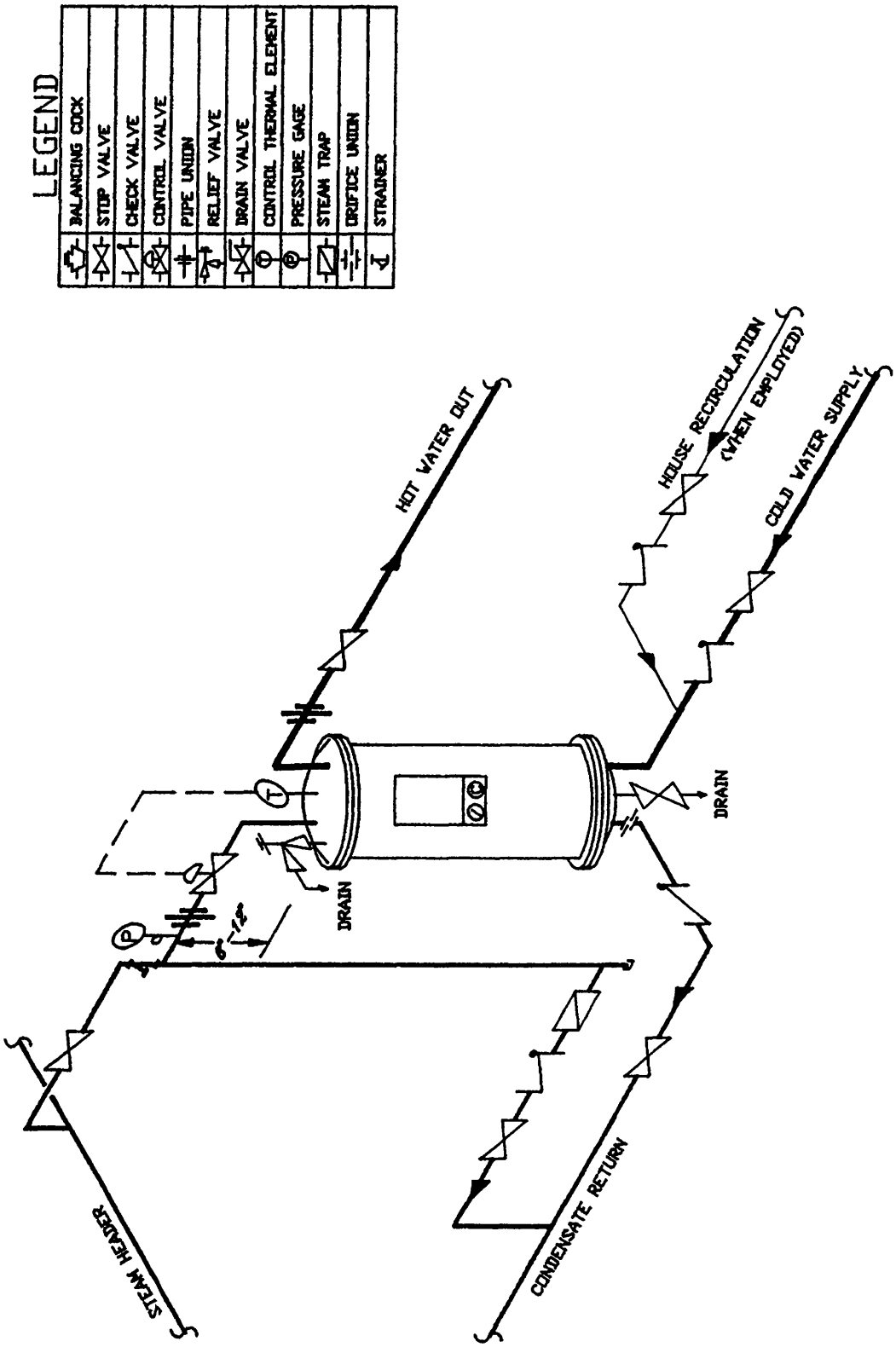


Figure HE-108-4 -- Piping Required for Steam to Water Packaged Heater, Model SW3E-PLUS

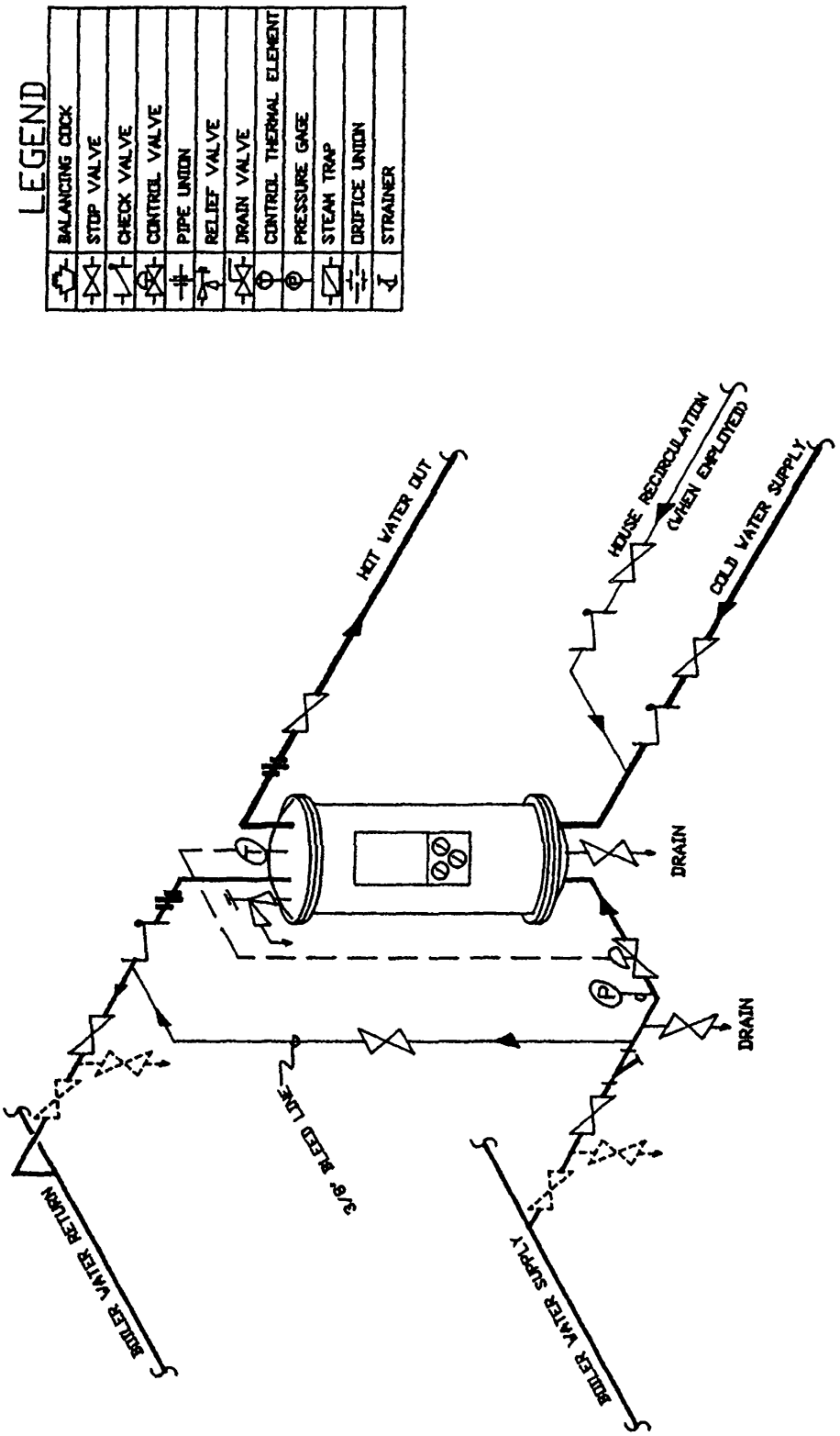


Figure HE-108-5 -- Piping Required for Water to Water Packaged Heater, Model WW3E-PLUS, with 2-Way Control Valve

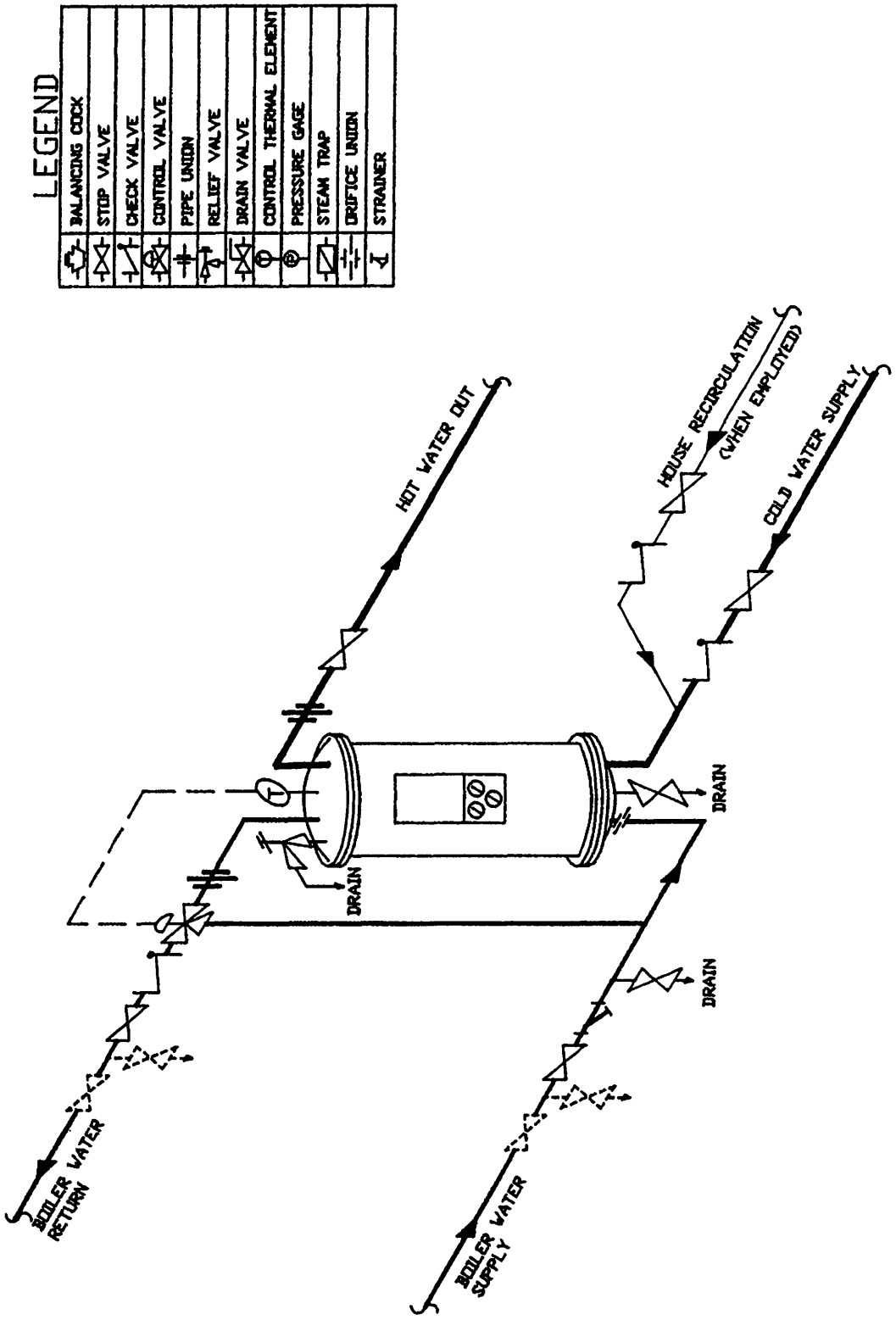


Figure HE-108-6 -- Piping Required for Water to Water Packaged Heater, Model WW3E-PLUS, with 3-Way Control Valve

PRINCIPLE OF OPERATION

The AERCO Series E Heat Exchanger (Heater) consists of three principal parts (see Figure HE-108-7)

1. Shell with Upper and Lower Heads
2. Coils assembled to Primary Heating Fluid Risers
3. Integral Demand Anticipator Temperature Control Unit

Cold Water (or other liquid being heated) enters the Heater through the inlet connection and orifice in the bottom head and strikes the deflector The orifice serves to divert some Cold Water into the shunt tube, whereas the deflector disperses the incoming Cold Water evenly into the bottom of the shell. The Cold Water in the shell, then, flows upward among the coils (heating surfaces) and, heated, is discharged through the Spring Check Valve and Hot Water outlet connection in the top head.

When Steam is the primary heating fluid, it enters at its inlet connection in the upper Heater head and is fed down through the Steam riser to the inlet of each coil unit. The Steam then flows through each coil unit, simultaneously in parallel, leaves as Condensate from each coil unit, enters the Condensate return, and leaves the Heater through the Condensate outlet connection in the lower Heater head.

When High Temperature Hot Water (boiler water, condensate, etc.) is the primary heating fluid, it enters at its inlet connection in the lower Heater head and is fed up through the HTH Water riser to the inlet of each coil unit. The HTH Water then flows through each coil unit, simultaneously in parallel, leaves through each coil unit, enters the HTH Water return riser, and leaves the Heater through the HTH Water outlet connection in the upper Heater head.

As noted above, the Cold Water being heated flows through the Heater from bottom to top. In addition, heated Water, being of less density than cold Water, migrates to the top of the shell by convection. These actions result in the hottest Water always being at the top of the Heater -- at the Heater outlet and at the Hot Water inlet to the Anticipator sensing tube (see Figure HE-108-7).

Hot Water from the top of the Heater shell enters the lower open end of the sensing tube and Cold Water enters the sensing tube from the shunt tube at a rate proportional to the load (call for Hot Water) on the Heater. The mixture of Hot and Cold Water in the sensing tube creates an average temperature which necessarily will be cooler than the temperature of the Hot Water in the top of the Heater shell.

The temperature sensing element "reads" the average temperature of the Water in the sensing tube at any given moment and signals the Primary Heating Fluid control valve to modulate between full open and closed as necessary to maintain the required Heater Hot Water outlet temperature. With no demand or load on the Heater, the temperature sensing element reads only the temperature of the Water in the top of the Heater and at the Heater outlet. If the Water is at the required temperature or above, the sensing element signals the Primary Fluid control valve to close

However, the moment that there is a demand for Hot Water, Cold Water flows from the shunt tube to mix with the Hot Water in the sensing tube, cooling the sensing element so that it signals the Primary Fluid control valve to open. The need for Primary Hot Fluid (heat) to the coils is satisfied at once, incoming Cold Water passing through the coils is heated, and the Heater Hot Water outlet temperature does not fall below that required.

The Anticipator Unit, therefore, as its name implies, is constantly alert to load conditions and changes, as well as to changes in the temperature of the incoming Cold Water, and provides FEED FORWARD temperature control at all times.

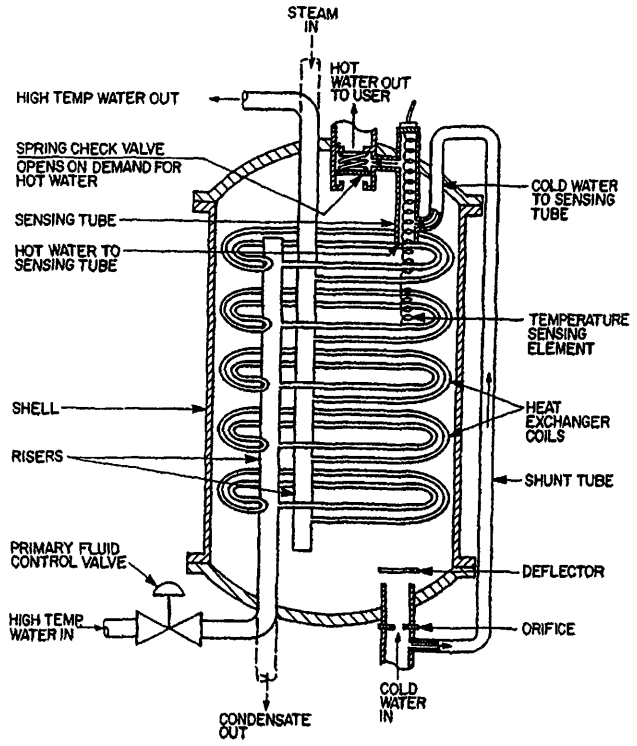


Figure HE-108-7 -- Series E-PLUS Heater Operation Schematic

OPERATING PROCEDURES

ADJUST THE SYSTEM

OP1. With the installation entirely completed, including

.....all piping connections have been made,
.....all connecting piping has been cleaned (blown) out,
.....all connections per steps 8 and 9 under INSTALLATION have been made,

open the stop valve in the Cold Water inlet line and hold the relief valve in the Heater top head open to allow air to come out (otherwise an air pocket will be built up and the Heater will not fill). When water flows out of the Relief valve, the Heater is full.

OP2. Temporarily set the Over-Temperature Limit System Temperature Switch (item 3 in Figure HE-108-11) in the Control Box to its high temperature limit.

OP3. If the Primary Fluid (Steam or HTH Water) Control Valve furnished is air-operated, and there is a Temperature Controller (item 2 in Figure HE-108-11) in the Control Box, set the Controller at the temperature desired to be held at the Heater Hot Water outlet.

OP4. Open the stop valve in the Hot Water outlet line. Open a hot water faucet or faucets in the building or process to insure a flow of water through the Heater. For best results in adjusting the temperature control, a water flow of 10% to 25% of Heater rating is desirable.

OP5. Slowly open all shutoff (stop) valves in the Primary Fluid (Steam, HTH Water, etc.) input and output lines. If double block and bleed valving is used for HTH Water, make sure that the drain (bleed) valve is closed tight.

OP6. Follow the instructions furnished with the Temperature Controller and Control Valve or Self-Contained Temperature Regulator Valve, and:

a. Introduce the Primary Heating Fluid (Steam or HTH Water, etc.) to the Heater.

b. Adjust the air-operated Temperature Controller or self-contained Temperature Regulator Valve until the Heater Hot Water outlet temperature is being held steady at the desired temperature. If the Hot Water outlet temperature is erratic, see step OP7 below.

c Close the hot water faucet or faucets opened in step OP4. Open any stop valves in the building or process recirculation system if such is included in the Heater installation

OP7. If the Hot Water outlet temperature is erratic, especially during load changes.

a. Put a load on the Heater by opening a hot water faucet or faucets in the building or process as quickly as possible.

b. Adjust the Temperature Controller or self-operated Temperature Regulator Valve to provide best response on load changes. See the instructions furnished with the Controller or Regulator.

OP8. Adjust the Over-Temperature Limit System Temperature Switch in the Control Box to its proper setting in accordance with the instructions furnished which cover the Over-Temperature Limit System -- usually 15°F to 20°F higher than the desired Hot Water outlet temperature.

OP9. The Heater installation is now set for operation. No further procedure is necessary unless or until further temperature control adjustments may be required. If so, repeat steps OP4, OP5, OP6, and, if necessary, step OP7.

START UP THE SYSTEM

OP10. With the Heater shell filled per step OP1 and all control adjustments having been made, open the stop valves in the following order:

(1) stop valve in the Cold Water inlet line,
(2) any stop valve in the recirculation line, if such is included,
(3) stop valve in the Hot Water outlet line, and
(4) stop valves in the Steam inlet and Condensate outlet lines or HTH Water inlet and outlet lines.

SHUT DOWN THE SYSTEM

OP11. a. Close all stop valves in the Primary Fluid (Steam, HTH Water, etc.) inlet and outlet lines.

b. In this order, close the stop valves in
(1) the Hot Water outlet line,
(2) the recirculation line, if included, and
(3) the Cold Water inlet line.

c. If the system includes an accumulator or a stratified storage tank, do not shut off the Cold Water until the Heater has cooled down. If the system is allowed to cool while the Cold Water is shut off, the Heater liner may collapse because of the formation of a vacuum.

OP12. For DRAINING THE HEATER, see the instructions included under ROUTINE MAINTENANCE.

OP13. To START UP again after draining the Heater, fill the shell per step OP1 above and follow the procedure outlined in step OP10. After each startup, check the temperature control. If necessary, make adjustments per steps OP4 through OP8 above.

ROUTINE MAINTENANCE

The constant flexure of the coils under varying load conditions automatically provides a descaling action and prevents a buildup of brittle scale A periodic blowdown (draining) is required to remove accumulated solids.

After the first 3 months of initial operation, drain the Heater as outlined below. Examine the water being drained.

(a) If the amount of solids appears to be heavy, set a schedule to drain the Heater every 3 months.

(b) If the amount of solids appears to be light, set a schedule to drain the Heater every 6 months.

(c) Even if the amount of solids appears to be very light, drain the Heater at least once a year.

(d) Also see TROUBLESHOOTING and CORRECTIVE MAINTENANCE below. If DESCALING BY THERMAL SHOCK is required, schedule that procedure in your Routine Maintenance.

DRAIN THE HEATER as follows

RM1 Shut down the system per step OP11 under OPERATING PROCEDURES.

RM2. Carefully open the relief valve on the upper Heater head to relieve pressure in the Heater shell. If water continues to flow from the relief valve, one of the Cold Water shutoff valves either leaks or is not shut off tight. This must be remedied until there is no more flow from the relief valve.

RM3. With the relief valve being held open to prevent creating a vacuum in the shell, open the drain valve in the bottom head and drain the Heater completely.

RM4. To refill the Heater and place it back into operation, close the drain valve and proceed through step OP13 under OPERATING PROCEDURES.

TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSES & REMEDY "CORRECTIVE MAINTENANCE" ITEM NO.
A. Heater does not maintain required temperature at rated capacity	CM1, CM9, CM11, CM14, CM15, CM16, CM17, CM20, CM21, CM23
B. Heater overheats	CM1, CM4, CM5, CM8, CM10, CM11, CM18
C. Heated Water outlet temperature fluctuates widely	CM8, CM9, CM10, CM11, CM14, CM16, CM17, CM18, CM20, CM21, CM22
D Insufficient Water being heated through Heater	CM2, CM12
E. Excess Primary Fluid (Condensate, HTH Water, etc.) being returned from Heater	CM14, CM18
F. Primary Fluid (Steam, Condensate, HTH Water, etc.) being discharged from Heater at too high a temperature	CM15, CM16
G. Pressure/Temperature Relief Valve pops	CM3, CM4, CM5, CM6, CM7, CM8, CM10, CM11, CM13
H. Loud banging in Heater or in Primary Fluid piping -- not to be confused with a normal clicking noise	CM7, CM18, CM19
I. Insufficient Primary Fluid (Condensate, HTH Water, etc.) being returned from Heater	CM14, CM18

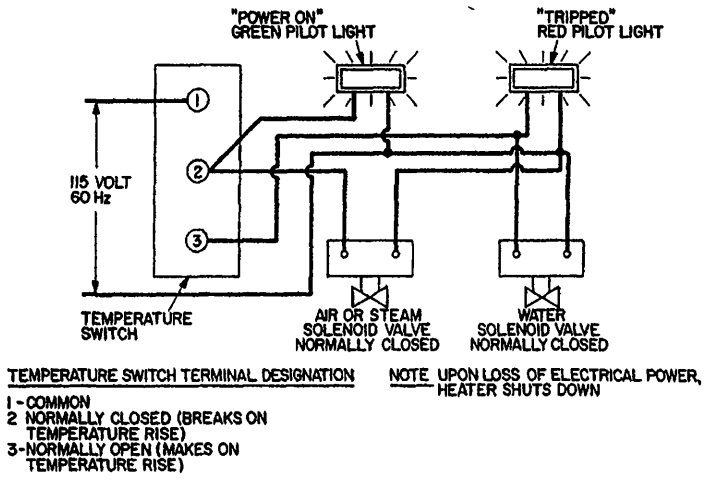


Figure HE-108-8 -- Over-Temperature Limit System Wiring Diagram

CORRECTIVE MAINTENANCE

Refer to TROUBLESHOOTING. The following are probable causes and remedies for incorrect action of the Heater.

CM1. Thermometer or gages read wrong. Check by replacing each gage with one which is known to be correct.

CM2. Cold Water pressure is too low. Check and correct, if necessary, the Cold Water pressure to the Heater.

CM3. Static pressure of Cold Water is too high Make corrections necessary to bring the Water pressure below that for which the relief valve is set.

CM4. Cold Water to be heated is preheated too hot. Reduce the preheating to a temperature at least 10°F below the desired Hot Water temperature at the Heater outlet.

CM5. Leaking stop valve in bypass line (if any) around the Control Valve. Maintain the bypass line stop valve to shut tight.

CM6. Lack of expansion capability in the Hot Water system. Insert an expansion tank in the Hot Water outlet line near the Heater.

CM7. Insufficient shock absorbers. Insert shock absorbers (water hammer arresters) in both the Cold and Hot Water systems as needed to eliminate shock waves.

CM8. The Primary Fluid (Steam, HTH Water, etc.) Control Valve does not close. Check instructions for the Valve.

CM9. The Primary Fluid (Steam, HTH Water, etc.) Control Valve does not open. Check the instructions for the Valve.

CM10. The temperature control thermal element (connected to the air-operated Temperature Controller or the self-contained Control Valve and located in the Heater top head) has failed. Refer to the instructions covering the Temperature Controller or Control Valve.

CM11. The Anticipator Unit system is not operating properly. Check to make sure that the temperature sensing element has not failed (see CM10 above), that the shunt tube (item 70 in Figures HE-108-13, HE-108-14, and HE-108-15) has not become clogged, and that the check valve at the Hot Water outlet is working properly. Make any necessary corrections.

CM12. The Anticipator Check Valve at the Heater Hot Water outlet is not working properly. Disassemble and inspect the Check Valve, clean the Valve, and repair or replace any parts as necessary per steps D1 through D5 under DISASSEMBLY below.

CM13. The Over-Temperature Limit System is out of adjustment or some component of the system has failed. Check out the system setting per step OP8 under OPERATING PROCEDURES above Inspect and repair or replace each component as necessary.

CM14. There is a leak in the Heater coil(s) or riser(s), causing water from the shell to leak into the coils, or Steam or HTH Water from the coils to leak into the shell. To verify such a leak, shut off the Primary Fluid (Steam, HTH Water, etc) supply and break a connection in the Primary Fluid outlet line -- carefully to avoid being burned. Condensate or HTH Water will drain from the coils initially, but the flow should stop after a minute or two. If the flow continues, water is leaking from the pressurized shell side to the tube side of the Heater. Disassemble, inspect, repair (if possible), and reassemble the Heater as outlined below under DISASSEMBLY and REASSEMBLY below.

CM15. The Heater coils are scaled up. Descale the Heater by thermal shock in the manner outlined below under DESCALING BY THERMAL SHOCK METHOD.

CM16. The Heater is being utilized at a rate higher than its design capacity. Contact the nearest AERCO Representative for advice in remedying this problem.

WHERE STEAM IS THE PRIMARY FLUID

CM17. Steam pressure is too low. Check the supply pressure gage ahead of the Steam Control Valve. If the reading is low, adjust the Steam supply pressure to that which is required. If there is a restriction in the Steam supply line, the gage reading will drop excessively when the Heater calls for full Steam even though the pressure seems to be normal when the load is light. If the Steam supply pressure is correct, the compound gage pressure reading should reach design pressure for Steam in the coils as the Heater outlet temperature drops. If it does not, check the operation of the Control Valve.

CM18. The check valve in the Condensate return line is not working properly. Repair or replace the check valve.

9. The Steam supply line is not properly trapped. Install a trap as indicated in Figure HE-108-4.

CM20. The Condensate return piping has not been installed so that the Condensate drains freely by gravity and/or the Condensate check valve leaks or has failed. If necessary, rearrange the Condensate return piping per step 6e under INSTALLATION above. Inspect the check valve and replace it if it is leaking or has failed. Also check to make sure that there is no restriction in the Condensate drain line.

WHERF HTH WATER, ETC., IS THE PRIMARY FLUID

CM21. The HTH Water temperature is too low. Check the reading of the HTH Water inlet temperature gage. If it reads lower than the temperature for which the Heater is designed, make the necessary adjustment to bring the temperature up to that which is required.

CM22. No HTH Water bleed line between the Heater inlet and outlet piping. See Figures HE-108-5 and HE-108-6. HTH Water in the inlet line cools when the Control Valve is closed for any length of time. Add the bleed line as shown.

CM23. Insufficient capacity of HTH Water supply. Check to make sure that all supply and return shutoff valves are full open. It is possible that the HTH Water pump does not have sufficient capacity. Check with the nearest AERCO Representative.

DESCALING BY THERMAL SHOCK

Where, under certain conditions of continuous steady usage, the Water being heated is so hard or alkaline that normal flexure of the coils (see ROUTINE MAINTENANCE above) and routine blowdown (draining the Heater shell) will not remove scale buildup on the coils, the heating surfaces (coils) may be thoroughly shocked, without damage to any part of the Heater, to dislodge scale solids.

To administer Thermal Shock, proceed as follows

TS1. Drain the Heater per steps RM1 through RM3 under ROUTINE MAINTENANCE above. However, instead of holding the Relief Valve open in step RM3, remove the Relief Valve from the Heater upper head and open the Heater drain valve. Leave the drain valve open until step TS7.

TS2. Insert a source of cold water (for example, a hose from a cold water faucet) into the Relief Valve connection.

TS3. Open the shutoff (stop) valves in the Primary Fluid (Steam, HTH Water, etc.) inlet line and allow Steam or HTH Water to the Heater. After about 30 seconds or until the Steam is blowing out of the Condensate drain line or the HTH Water has thoroughly heated the coils, close the stop valve in the Condensate drain line or in the HTH Water outlet line. Leave the Steam or HTH Water inlet stop valve open for about 2 minutes longer, then close the inlet stop valve.

CAUTION: Steam may be generated and escape through the Relief Valve opening.

TS4. Inject a flow of cold water through the Relief Valve connection for about two minutes. Then shut off the cold water and open the Condensate drain line or HTH Water outlet line stop valve.

TS5. Repeat steps TS3 and TS4 several times until the water coming from the Heater drain appears to be relatively free of solids.

TS6 Remove the cold water source from the Relief Valve connection. Open the stop valve in the main Cold Water inlet line and allow a complete flushing of the Heater shell.

TS7 After the Heater shell has been completely drained, close the Heater drain valve, replace the Relief Valve in the Heater upper head, and place the Heater back into operation per steps OP1, OP10, and OP14 under OPERATING PROCEDURES.

TS8 If Cold Water conditions are so severe that thermal shocking does not remove scale deposits, contact the nearest AERCO Representative for advice.

DISASSEMBLY

Reference Illustrations --

HE-108-9	Anticipator Check Valve Assembly
HE-108-11	Heater Control Box Assembly
HE-108-12	Bare Heater Assembly
HE-108-13	Steam to Water Heater Assembly
HE-108-14	Water to Water Heater Assembly with 2-Way Control Valve
HE-108-15	Water to Water Heater Assembly with 3-Way Control Valve

Special Tools Required

Torque wrench for 5/8" nuts
Block and tackle or ratchet or winch hoist is recommended for lifting off the Heater upper head and shell, or for lifting and moving the Heater.

To Remove Check Valve Assembly

See Figure HE-108-9.

D1. Shut down the Heater in accordance with step OP11 under OPERATING PROCEDURES above. Manually (and carefully) open the Relief Valve in the Heater upper head to relieve any pressure in the Heater shell.

D2. Disconnect the union in the Hot Water outlet piping (the one located beyond the outside diameter of the Heater top head). Then remove the Nuts (35) and the Outlet Flange (26) and outlet piping.

D3. Separately, lift out the Spring Plate Assembly (28), the Gasket (27), the Spring (29), the Washer (30), and the Valve Plug (31).

D4 Clean all parts and gasket surfaces thoroughly, and repair or replace any part necessary to make the Check Valve operate properly (open on Water flow through the Heater.

D5. See REASSEMBLY below for reassembly of the Check Valve into the Heater upper head

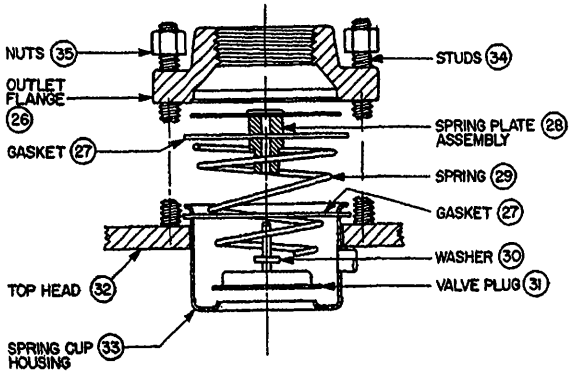


Figure HE-108-9 -- Exploded Anticipator Check Valve Assembly

To Remove Heater Head and Shell

NOTE that all part item numbers given in parentheses (00) in the instructions below refer to those parts shown as follows in the Figures noted
Items (1) through (25) are shown in HE-108-11
Items (26) through (50) are shown in HE-108-12
Items (50) and up are shown in HE-108-13, -14, and -15

D6. Shut down and drain the Heater in accordance with steps RM1 through RM3 under ROUTINE MAINTENANCE above

D7. Make the following disconnections

(a) For Steam to Water Heaters -- HE-108-13, disconnect the Copper Tubing (57) from the elbow of Spool Piece (56).

(b) For Water to Water Heaters -- HE-108-14 and -15, disconnect the capillary-connected thermal elements (57) from the elbows of Spool Pieces (56) at the top of the Heater and (81) at the bottom.

(c) For Heaters with Air-Operated Control Valves, disconnect the Tubing (64) at the Control Box (66). Also the air supply tubing to the Control Box.

(d) For Water to Water Heaters with 3-Way Control Valves -- HE-108-15, disconnect the Union (85) in the Valve piping running from the Valve to the bottom of the Heater.

(e) For Heaters with Self-Contained Control Valves, disconnect the Temperature Control Thermal Element from the Thermal Well Bushing (59) in the Heater upper head. Be careful not to damage the element or its capillary,

and

disconnect the conduit and wiring, at the Control Box, running to the Solenoid Valve (74).

D8. Disconnect the Union or Flanges in the Spool Piece (56) at the top of the Heater.

D9. Disconnect the Hot Water Outlet piping at a union located beyond the outside diameter of the Heater top head. Do not break the connection at the Outlet Flange (26) unless it is necessary to disassemble the Anticipator Check Valve (see steps D1 through D5 above).

D10. Disconnect any piping to the Relief Valve (58) and the Water Solenoid Valve (51) on the Heater top head.

D11. Disconnect the power supply wiring from the Control Box.

D12. Disassemble the Flanged Nut Assembly (37) on the Heater top head:

(a) Unless necessary, do not turn the Spool Piece (56) out of the Assembly

(b) Remove the Nuts (35) and Studs (36), carefully without using any wrenches on either the top or bottom piece of the Assemby, and without rotating either piece.

(c) Carefully turn the lower piece of the Assembly off the Heater Riser and its adaptor so as not to break the adaptor. Take care not to rotate the Riser and Coil Assembly (43).

D13. Mark the edge of the Heater bottom head flanges in order to indicate their correct relative positions upon reassembly.

D14. Remove the Nuts (35) and Studs (36) from the Heater bottom head flanges

D15. Using a hoist or block and tackle attached to the Lifting Lugs (39) on the Heater top head, CAREFULLY lift the top head and shell STRAIGHT UP off the Heater Riser and coil assembly. DO NOT SCRAPE the shell lining against the coil tubing.

D16. Clean and inspect the inside of the shell and the coil and riser assembly. Make any simple repairs possible. If there are

(a) any leaks in the coil and riser assembly,
(b) any breaks in or other damage to the shell liner, or
(c) any other extensive damage,

reassemble the Heater and arrange for its return to the AERCO factory for repair -- contact the nearest AERCO Representative for instructions

(Note that AERCO can furnish a new Riser and Coil Assembly(43) for you to assemble into the Heater. However, such an assembly must be done very carefully and at your own risk.)

REASSEMBLY

Reference Illustrations --

Same as for DISASSEMBLY above, plus
HE-108-10 Coil Spacing Tool

Special Tools Required

Same as for DISASSEMBLY above, plus a coil spacing tool as shown in Figure HE-108-10

To Reassemble Check Valve Assembly

See Figure HE-108-9.

R1. Insert the Valve Plug (31), the Washer (30), the Spring (29), and the Gasket (27) into the Spring Cup Housing (33). AERCO recommends that a new Gasket (27) be used whenever the Check Valve is reassembled.

R2. Insert the Spring Plate Assembly (28), taking care to center it as closely as possible.

R3. Line up the Outlet Flange (26) on the Studs (34) in the Heater top head, making sure that the Spring Plate Assembly (28) is centered in its groove in the bottom of the Outlet Flange (26).

R4. Replace the Nuts (35) and tighten the Outlet Flange (26) leak-tight to the Heater top head.

R5. If this is the only reassembly operation, reconnect the Heater Hot Water outlet piping union and place the Heater back into operation in accordance with steps OP1, OP10, and OP13 under OPERATING PROCEDURES above.

To Reassemble Heater Head and Shell

NOTE that all part item numbers given in parentheses (00) in the instructions below refer to those parts shown as follows in the Figures noted:

Items (1) through (25) are shown in HE-108-11
Items (26) through (50) are shown in HE-108-12
Items (51) and up are shown in HE-108-13, -14, and -15

R6. Using a tool such as the one shown in Figure HE-108-10, make sure that the coils are evenly spaced throughout the Heater. Insert the tool flat between the coil tubes and twist the tool until the desired spacing is obtained.

R7. Clean all gasket surfaces thoroughly. Place the Gasket (41) on the Heater bottom head flange. AERCO recommends that new Gaskets (41) be used whenever reassembling either the top or bottom head to the shell.

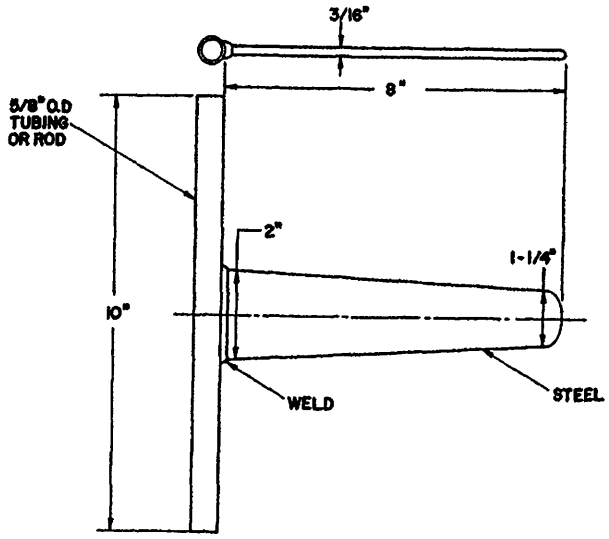


Figure HE-108-10 -- Coil Spacing Tool

R8. Inspect, clean, and replace the Riser O-Ring (45) (same as the one shown at the bottom of the Heater) on the flange at the top of the Riser and Coil Assembly (43). If damaged, the O-Ring must be replaced (AERCO recommends replacement at each reassembly).

R9. Using a hoist or block and tackle attached to the Lifting Lugs (39) on the Heater top head (40), CAREFULLY lower the top head and shell STRAIGHT DOWN over the Coil and Riser Assembly. DO NOT SCRAPE the shell lining against the coil tubing.

R10. Before resting the shell flange onto the bottom head flange, make sure that the shell is positioned properly by lining up the marking put on the edges of the flanges in step D13 under DISASSEMBLY above. This is very important.

R11. Assemble the lower head/shell Studs (36) and Nuts (35) into the flanges. Cross-tighten to approximately 75 ft-lb torque in order to obtain uniform seating. Then progressively tighten the Nuts to approximately 150 ft-lb torque for a tight seal.

R12. Inspect the Riser Adapter at the top of the Heater Riser. Make sure that its upper mating surface is clean. If the Adapter has come loose from the Riser, reinstall it as follows:

(a) Clean the Adapter and the upper end (inside) of the Riser thoroughly with alcohol.

(b) Apply Loctite 620 to the Adapter surface which mates with the Riser, and insert the Adapter into the Riser. Let this set for about an hour before proceeding with step R13. (Steps R15 through R17 may be carried out while waiting for the Loctite to set.)

R13. Reassemble the lower piece of the Flanged Nut Assembly (37) to the Riser, carefully so as not to rotate the Riser, and tighten it down securely.

R14. Reassemble the upper piece of the Flanged Nut Assembly (37) to the lower piece and the Riser Adapter, being very careful not to damage the mating surfaces. Never rotate the Adapter or the Riser. Never use wrenches to hold or turn either the upper or lower pieces of the Nut Assembly (37). Tighten the Nuts (35) securely and evenly all around, but do not exceed a tightening torque of 25 ft-lb.

R15. Reconnect the power supply wiring and the air supply tubing to the Control Box.

R16. Reconnect any piping to the Relief Valve (58) and the Water Solenoid Valve (51) on the top head of the Heater.

R17. Reconnect the Hot Water Outlet piping at its union located beyond the outside diameter of the Heater head.

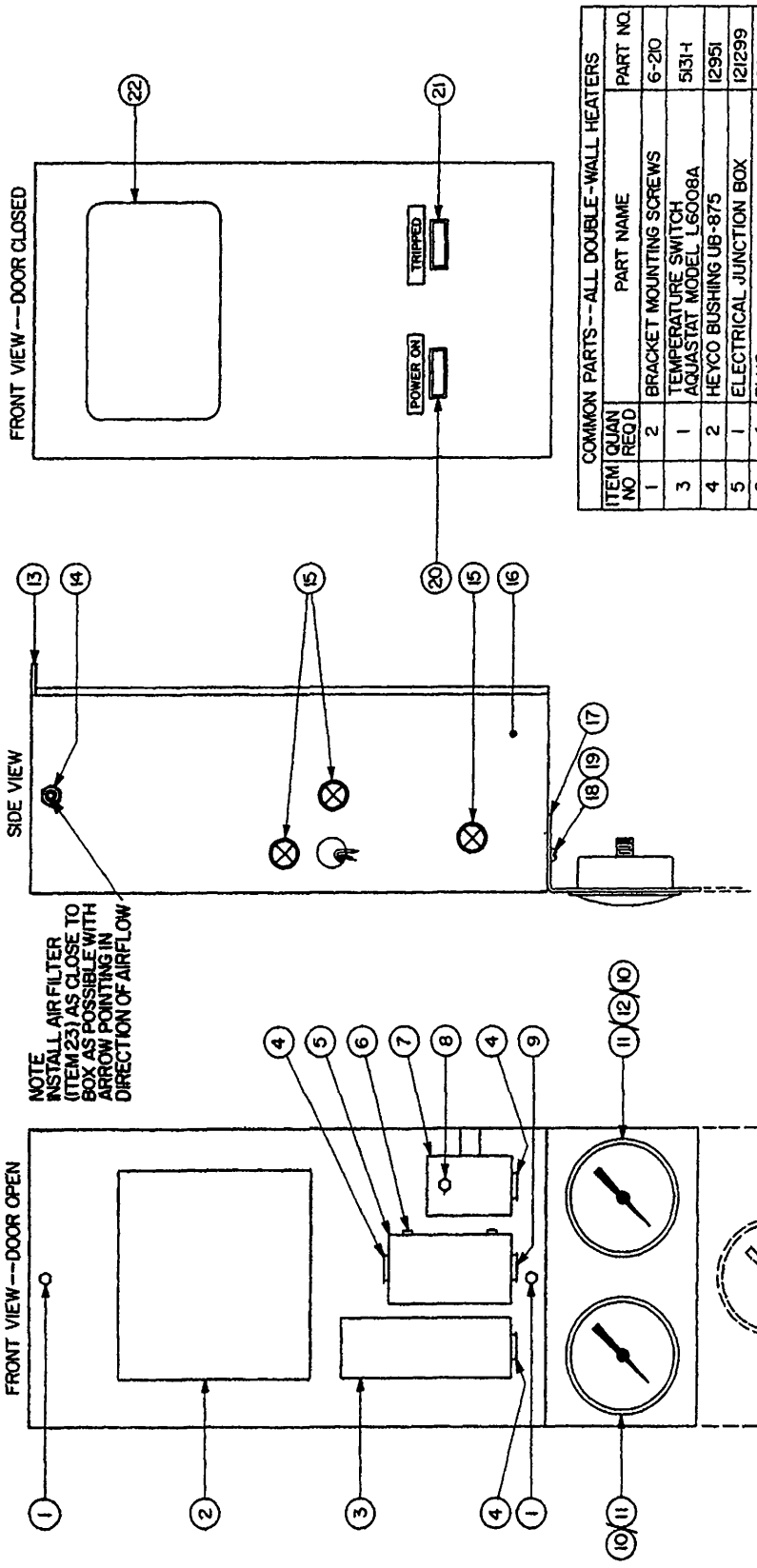
R18. Reconnect the union or flanges in the Spool Piece (56) at the top of the Heater to its mating Steam or HTH Water piping or Valve.

R19. Make all of the reconnections which were disconnected in step D7 under DISASSEMBLY above. Make sure that all tubing, thermal elements, conduits, and wiring are reconnected properly

R20. Refill and place the Heater back into operation in accordance with steps OP1, OP10, and OP13 under OPERATING PROCEDURES above.

RECOMMENDED SPARE PARTS

Quantity Per Heater	Item No	Part Name	Shown in Figure No.
For Any Series E-PLUS Heater			
1	3	Temperature Switch	HE-108-11
1	10	Dial Thermometer	HE-108-11
1	20	Green Indicator Light	HE-108-11
1	21	Red Indicator Light	HE-108-11
1	23	In-Line Air Filter	HE-108-11
2	27	Outlet Flange Gasket	HE-108-12
4	41	Head Gasket	HE-108-12
1	51	Water Solenoid Valve	HE-108-13, -14, -15
1	58	P&T Relief Valve	HE-108-13, -14, -15
For Steam to Water Heater			
1	12	Compound Pressure Gage	HE-108-11
2	45	Riser O-Ring	HE-108-12
For Water to Water Heater			
1	11	Dial Thermometer	HE-108-11
2	45	Riser O-Ring	HE-108-12
For Heater With Air-Operated Control Valve			
1	2	Temperature Controller	HE-108-11
1	7	Air Solenoid Valve	HE-108-11
For Heater With Self-Contained Control Valve			
1	74	Steam Solenoid Valve	HE-108-13, -14
1	--	Control Valve Thermal Element, AERCO Part No. 5144-1	HE-108-13, -14



COMMON PARTS--ALL DOUBLE-WALL HEATERS			
ITEM NO	QUAN REQ'D	PART NAME	PART NO.
1	2	BRACKET MOUNTING SCREWS	6-210
3	1	TEMPERATURE SWITCH AQUASTAT MODEL L6008A	5131-1
4	2	HEYCO BUSHING UB-875	12951
5	1	ELECTRICAL JUNCTION BOX	121299
6	4	PLUG	122183
9	1	HEYCO BUSHING UB 625	122184
13	1	BOX MOUNTING BRACKET	161021
15	2	HEYCO BUSHING UB 750	12952
16	1	CONTROL BOX	20789
18	2	10-32x3/8" LG MACH SCREWS	6-288
19	2	10-32 NUTS	6-223
20	1	GREEN INDICATOR LIGHT	121949
21	1	RED INDICATOR LIGHT	121948
22	1	AERCO LOGO LABEL	12869

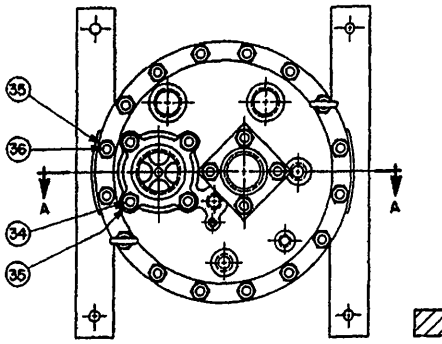
ADDITIONAL PARTS FOR HEATER WITH STEAM AS HEATING FLUID			
ITEM NO	QUAN REQ'D	PART NAME	PART NO.
10	1	2-1/2" DIAL THERMOMETER	12953-1
12	1	2-1/2" DIAL COMPOUND PRESSURE GAGE	121602-1
17	1	GAGE MOUNTING BRACKET	161016

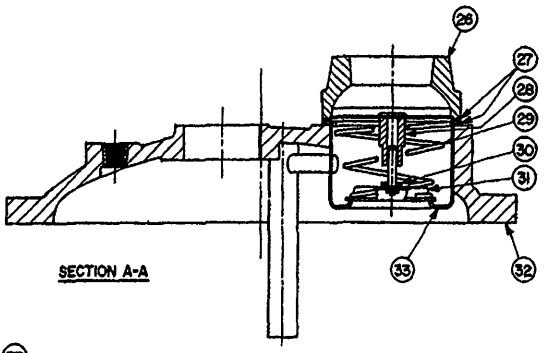
ADDITIONAL PARTS FOR HEATER WITH HOT FLUID AS HEATING FLUID			
ITEM NO	QUAN REQ'D	PART NAME	PART NO
10	1	2-1/2" DIAL THERMOMETER	12953-1
11	2	2-1/2" DIAL THERMOMETER	12953-2
17	1	3-GAGE MOUNTING BRACKET	18918

ADDITIONAL PARTS FOR ANY HEATER WITH AIR-OPERATED CONTROL VALVE			
ITEM NO	QUAN REQ'D	PART NAME	PART NO.
2	1	TEMPERATURE CONTROLLER BARBER COLMAN PK-8124-103	18557
4	1	HEYCO BUSHING UB-875	12951
7	1	AIR SOLENOID VALVE ASCO CAT NO 8320-83	9537
8	2	1/4" TUBE x 1/8" NPT 90° COMP FITTING	8-40
14	1	1/4" BULKHEAD UNION CONN	8-37
15	1	HEYCO BUSHING UB-750	12952
23	1	IN-LINE AIR FILTER	122679

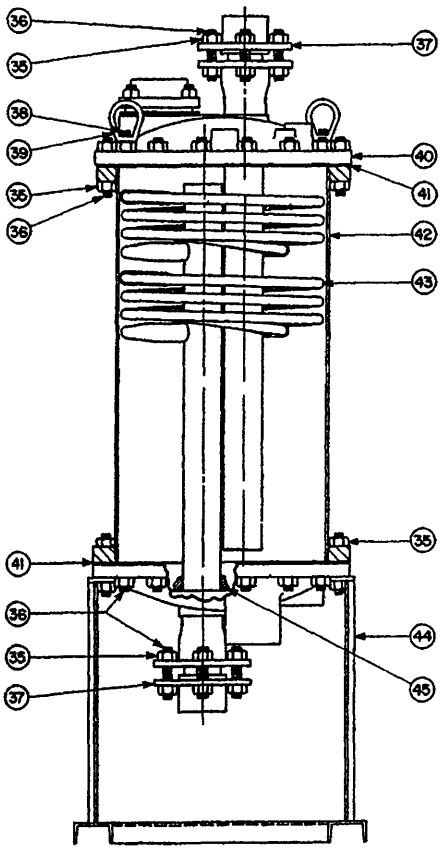
*SUPPLIED LOOSE IN BOX

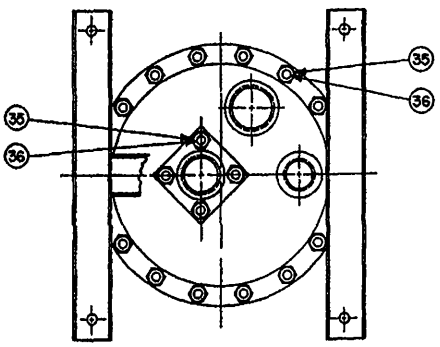
Figure HE-108-11 -- AERCO Series E-PLUS Control Box -- Assembly and Parts List





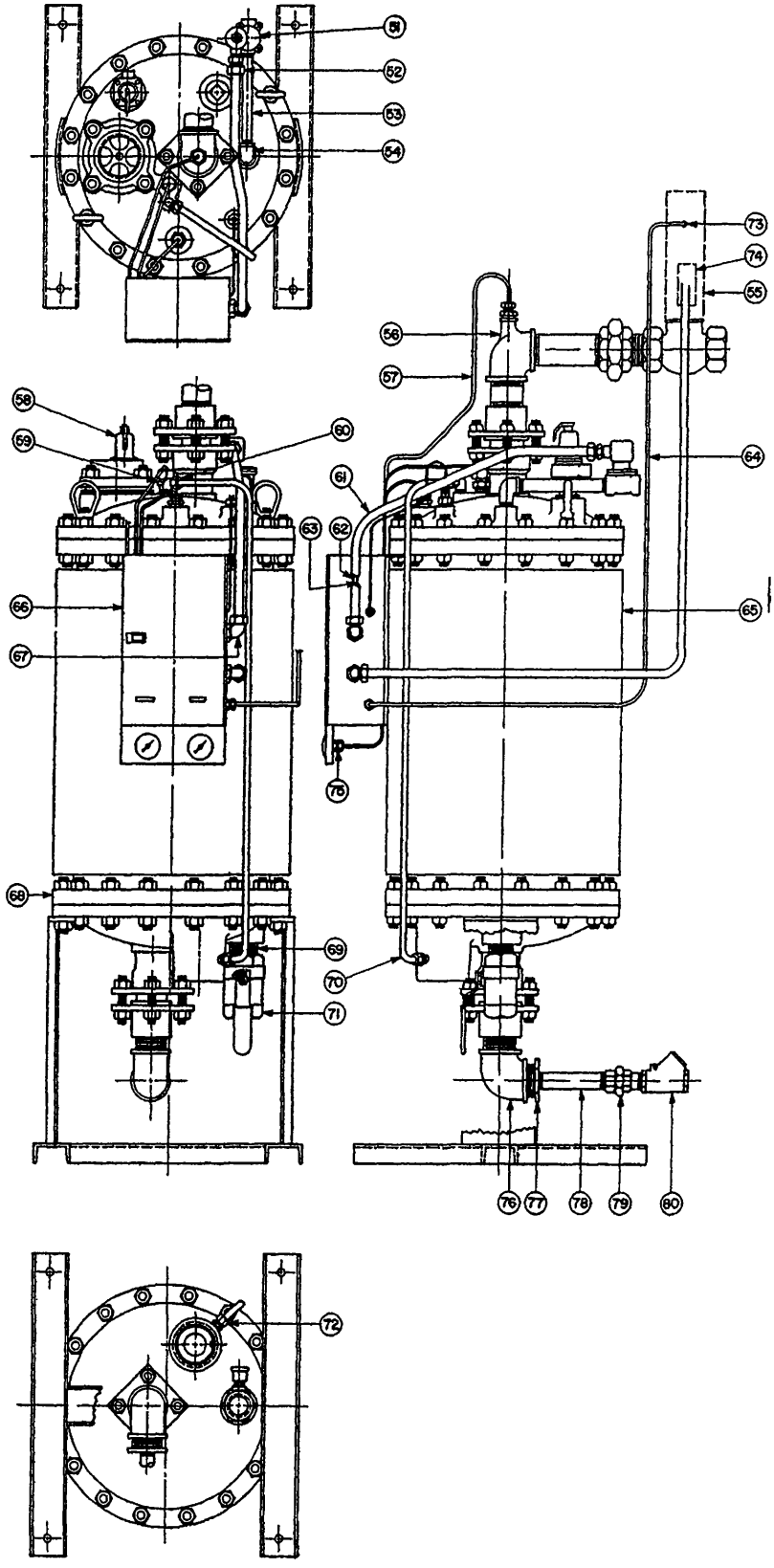
SECTION A-A





ITEM NO.	QUAN REQ'D	PART NAME	PART NO.
26	1	HOT WATER OUTLET FLANGE	18774
27	2	HOT WATER OUTLET FLANGE GASKET	16949
28	1	SPRING PLATE ASSEMBLY	16989
29	1	SPRING	121966
30	1	VALVE PLUG WASHER	12921
31	1	VALVE PLUG ASSEMBLY	12809
32	1	UPPER HEAD & SENSING ASSEMBLY	18885
33	1	SPRING CUP HOUSING	161040
34	4	5/8-11x2 3/4 LONG STUD	12866
35	84	5/8-11 HEX NUT	6-178
36	38	5/8-11 STUD	6-248
37	2	FLANGED NUT ASSEMBLY	16835
38	2	LIFTING LUG STUD	12864
39	2	LIFTING LUG	12865
40	1	TOP HEAD TOTAL ASSEMBLY	18886
41	2	HEAD GASKET	18532
42	1	SHELL ASSEMBLY	18913
43	1	COIL & RISER ASSEMBLY	20896
44	1	BOTTOM HEAD & SKID ASSEMBLY	20901
45	2	RISER O-RING	12810

Figure HE-108-12 -- AERCO Series E-PLUS Bare Heater -- Assembly and Parts List



ITEM NO.	QUAN. REQ'D	PART NAME	PART NO.
51	1	1/2" WATER SOLENOID VALVE	5134
52	1	3/8"x1/2" STRAIGHT LT CONDUIT CONN	9-38
53	1	1/2"x8" LG RED BRASS NIPPLE	222597
54	1	1/2" NPT STREET ELBOW	9-336
55	1	CONTROL VALVE	TABLE A
56	1	VALVE SPOOL PIECE ASSEMBLY	TABLE A
57	A/R	3/8" OD TYPE L COPPER TUBING	RM604L
58	1	1-1/2" NPT P&T RELIEF VALVE	6462
59	1	THERMAL WELL BUSHING	6143
60	1	90° COMPRESSION FITTING	12867
61	A/R	3/8" TYPE LT CONDUIT	RM2000
62	A/R	14 GAGE BLACK STRANDED WIRE	RM4524
63	A/R	14 GAGE WHITE STRANDED WIRE	RM4525
64	A/R	1/4" IMPOLENE TUBING	RM3041
65	1	INSULATION	16880
66	1	CONTROL BOX ASSEMBLY	16640
67	A/R	90° LT CONDUIT CONNECTOR	12204
68	1	BARE HEATER SEE FIG.HE 108-12	20897
69	1	1/2" NPT CLOSE NIPPLE	9-296
70	A/R	1/2" OD TYPE K COPPER TUBING	RM602H
71	1	1-1/2" DRAIN VALVE	12820-11
72	1	STRAIGHT COMPRESSION FITTING	9-85
73	1	90° COMPRESSION FITTING	8-40
74	1	1/4" STEAM SOLENOID VALVE	11352
75	1	COMPRESSION FITTING	8-63
76	1	2-1/2" 90° ELBOW	2-1
77	1	2-1/2"x1-1/2" REDUCER	9-380
78	1	1-1/2" NPT PIPE x 6" LG	RMB-254
79	1	1-1/2" ORIFICE UNION	5002
80	1	1-1/2" NPT CHECK VALVE	12767-1.5

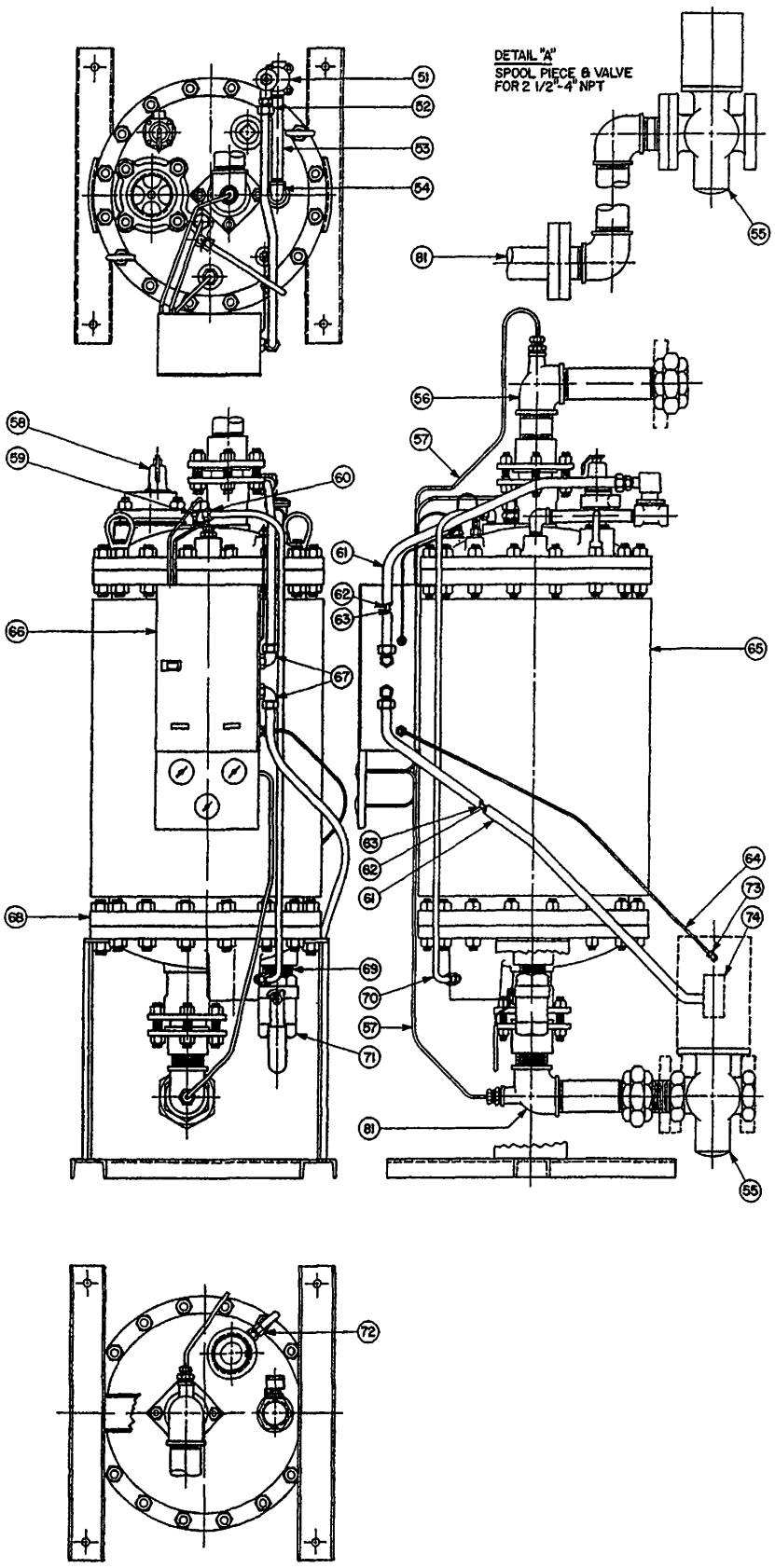
A/R NUMBER OR LENGTH AS REQUIRED

TABLE A

CONTROL VALVE* ITEM 55 SIZE	AIR OPERATED	SELF CONTAINED	SPOOL PIECE ITEM 56
1-INCH	CKT-P	CKT 9	K61181 2
1-1/4-INCH	CKT-P	CKT 9	K61181 2
1-1/2-INCH	CKT P	CKT-9	K61181 2
2 INCH	CKT P	CKT 9	K61181-3
2 1/2 INCH	CKT P	CKT 9	K61181-4
3-INCH	CKT-P	CKT-9	K61181-4
4 INCH	CKT-P	CKT-9	K61181-4

*AERCO VALVE TYPE

Figure HE-108-13 -- AERCO Steam to Water Packaged Heater, Model SW3E-PLUS
Assembly and Parts List



ITEM NO.	QUAN. REQ'D	PART NAME	PART NO.
51	1	1/2" WATER SOLENOID VALVE	5134
52	1	3/8"x1/2" STRAIGHT LT CONDUIT CONN.	8-38
53	1	1/2"x8" LG RED BRASS NIPPLE	122597
54	1	1/2" NPT STREET ELBOW	9-336
55	1	CONTROL VALVE	TABLE A
56	1	SPOOL PIECE ASSEMBLY	TABLE A
57	A/R	3/8" OD TYPE L COPPER TUBING	RM6041
58	1	1-1/2" NPT P&T RELIEF VALVE	6462
59	1	THERMAL WELL BUSHING	5143
60	1	90° COMPRESSION FITTING	12867
61	A/R	3/8" TYPE LT CONDUIT	RM2000
62	A/R	14 GAGE BLACK STRANDED WIRE	RM4524
63	A/R	14 GAGE WHITE STRANDED WIRE	RM4523
64	A/R	1/4" IMPOLENE TUBING	RM3041
65	1	INSULATION	16880
66	1	CONTROL BOX ASSEMBLY	16840
67	A/R	90° LT CONDUIT CONNECTOR	122104
68	1	BARE HEATER, SEE FIG. HE-108-12	20697
69	1	1/2" NPT CLOSE NIPPLE	9-256
70	A/R	1/2" OD TYPE K COPPER TUBING	RM6031
71	1	1-1/2" DRAIN VALVE	12820-11
72	1	STRAIGHT COMPRESSION FITTING	8-65
73	1	90° COMPRESSION FITTING	8-40
74	1	1/4" SOLENOID VALVE	11352
81	1	VALVE SPOOL PIECE ASSEMBLY	TABLE A

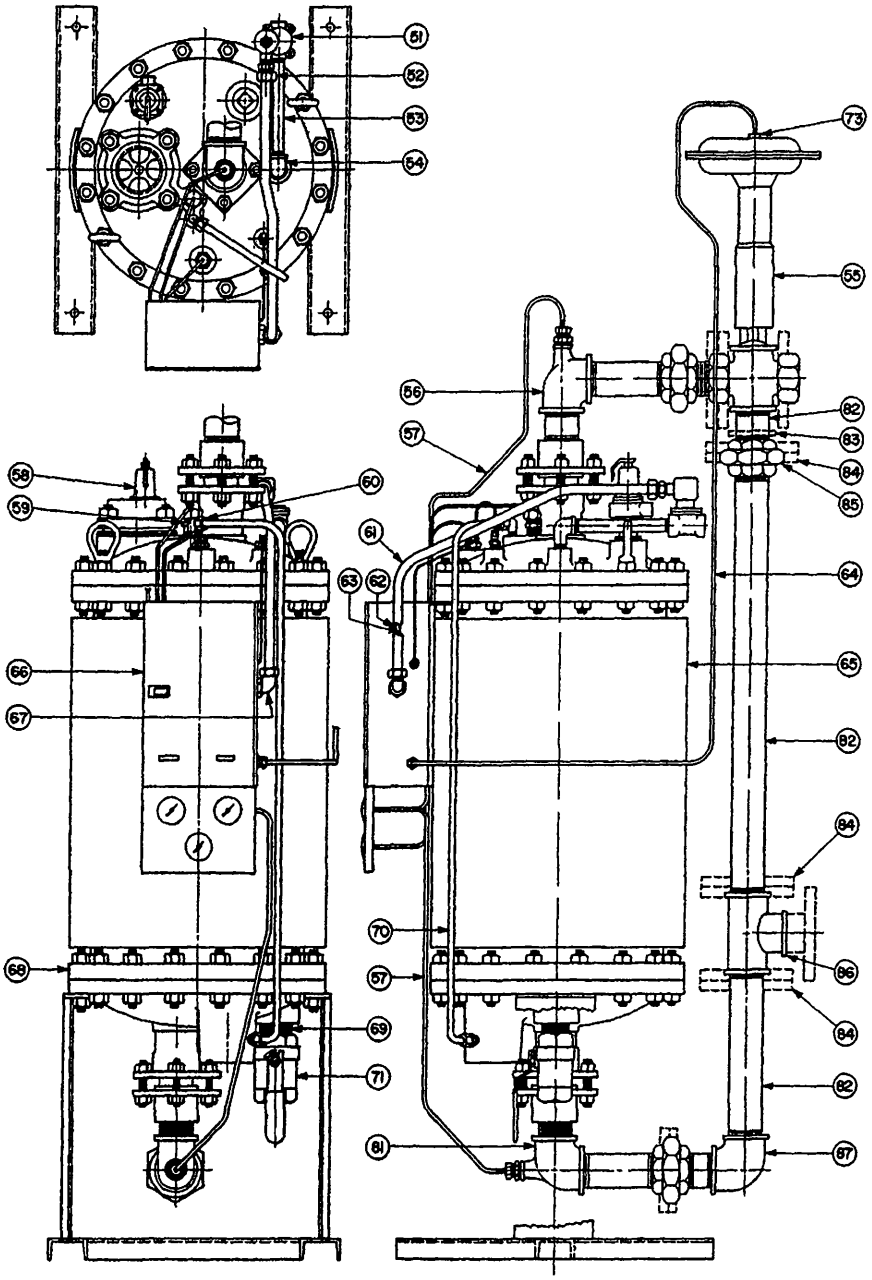
A/R NUMBER OR LENGTH AS REQUIRED

TABLE A

CONTROL VALVE* ITEM 55			SPOOL PIECE	
SIZE	AIR OPERATED	SELF CONTAINED	ITEM 56	ITEM 81
1 INCH	CXT-P	CXT S	16188-1	16165-1
1-1/4-INCH	CXT-P	CXT S	16188-1	16165-2
1-1/2-INCH	CXT-P	CXT S	16188-1	16165-3
2-INCH	CXT-P	CXT-S	16188-1	16165-4
2-1/2-INCH	CXT-P	CXT-S	16188-4	16165 5
3-INCH	CXT-P	CXT S	16188-4	16165-6
4-INCH	CXT-P	CXT S	16188-4	16165-7

* AERCO VALVE TYPE

Figure HE-108-14 -- AERCO Water to Water Packaged Heater, Model WW3E-PLUS, with 2-Way Control Valve -- Assembly and Parts List



ITEM NO.	QUAN. REQ'D	PART NAME	PART NO.
51	1	1/2" WATER SOLENOID VALVE	5134
52	1	3/8"x1/2" STRAIGHT LT CONDUIT CONN	9-38
53	1	1/2"x8" LG RED BRASS NIPPLE	22597
54	1	1/2" NPT STREET ELBOW	9-336
55	1	CONTROL VALVE	TABLE A
56	1	SPOOL PIECE ASSEMBLY	TABLE A
57	A/R	3/8" OD TYPE L COPPER TUBING	RM6041
58	1	1-1/2" NPT P&T RELIEF VALVE	6462
59	1	THERMAL WELL BUSHING	5145
60	1	90° COMPRESSION FITTING	12867
61	A/R	3/8" TYPE LT CONDUIT	RM2000
62	A/R	14 GAGE BLACK STRANDED WIRE	RM4524
63	A/R	14 GAGE WHITE STRANDED WIRE	RM4525
64	A/R	1/4" IMPOLENE TUBING	RM3041
65	1	INSULATION	19880
66	1	CONTROL BOX ASSEMBLY	19840
67	A/R	90° LT CONDUIT CONNECTOR	12204
68	1	BARE HEATER-SEE FIG HE 108-12	20897
69	1	1/2" NPT CLOSE NIPPLE	9-296
70	A/R	1/2" OD TYPE K COPPER TUBING	RM6031
71	1	1-1/2" DRAIN VALVE	12820-11
72	1	STRAIGHT COMPRESSION FITTING	8-68
73	1	90° COMPRESSION FITTING	8-40/8-41
81	1	SPOOL PIECE ASSEMBLY	TABLE A
82	A/R	BLACK IRON PIPE	TABLE B
83	A/R	REDUCER	TABLE B
84	A/R	FLANGE	TABLE B
85	A/R	UNION	TABLE B
86	1	CAST IRON TEE	TABLE B
87	1	CAST IRON ELBOW	TABLE B

A/R=NUMBER OR LENGTH AS REQUIRED

TABLE A

CONTROL VALVE* 3-WAY AIR OPERATED		SPOOL PIECE	
SIZE	ITEM 55	ITEM 56	ITEM 81
1-INCH	CRD	16188-2	16165-4
1 1/4-INCH	CRD	16188-2	16165-4
1-1/2-INCH	CRD	16188-2	16165-4
2 INCH	CRD	16188-3	16165-4
2-1/2-INCH	CRD	16188-4	16165-8
3-INCH	CRD	16188-4	16165-9
4-INCH	CRD	16188-4	16165-10

*AERCO VALVE TYPE

TABLE B

VALVE SIZE	PIPE ITEM 82	REDUCER ITEM 83	FLANGE ITEM 84	UNION ITEM 85	TEE ITEM 86	ELBOW ITEM 87
1 INCH	RM354	RM8 31	--	RM294	RM429	RM2 4
1-1/4-INCH	RM354	RM8 33	--	RM294	RM429	RM2 4
1-1/2 INCH	RM354	RM8 34	--	RM294	RM429	RM2 4
2-INCH	RM354	--	--	RM294	RM429	RM2-4
2 1/2-INCH	RM359	--	RM9-169	--	RM9-15	RM2-1
3-INCH	RM355	--	RM9-191	--	RM9-16	RM2 11
4-INCH	RM356	--	RM9-125	--	RM9-17	RM2 13

Figure HE-108-15 -- AERCO Water to Water Packaged Heater, Model WW3E-PLUS, with 3-Way Control Valve -- Assembly and Parts List