



INSTRUCTION
NO **HE-106**

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

**INSTALLATION, OPERATION,
and MAINTENANCE INSTRUCTIONS**

**DOUBLE-WALL
HEAT EXCHANGER
MODEL DW**

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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 in this manual.

WARNING!

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

Shut off all incoming and outgoing steam or 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
BOILER WATER MAY FLASH INTO STEAM WHEN RELEASED

NEVER search for leakage in a steam or 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 the AERCO Double-Wall Model DW Steam to Water and Water to Water Heat Exchangers. The two digits -- 24, 45, or 68 -- following the "DW" in the Model Number signify the square feet of heating surface in the Heater. That is, DW-24 signifies 24 square feet of heating surface, etc.

Steam, boiler water, condensate, waste water, or other hot fluid is the PRIMARY or TUBE SIDE fluid. The water (service or domestic water) or other fluid being heated is the SECONDARY or SHELL SIDE fluid.

The tubes carrying the primary heating fluid are each surrounded by second tubes, with an air space between the inside and outside tubes. The two tubes, then, provide double protection from the primary heating fluid leaking into the secondary fluid being heated, or vice versa.

ACCESSORIES

Accessories included in the AERCO DW-PLUS Heater Package Assembly are (see Figures HE-106-1, HE-106-2, HE-106-13, and HE-106-15)

For All Applications

**Temperature Controller, installed in the Control Box when an Air-Operated Flow Control Valve is furnished

**Pressure & Temperature Relief Valve

**Shell Hot Water Outlet Temperature Gage, mounted below the Control Box

Over-Temperature Limit System, including Temperature Switch in Control Box Solenoid Valves --

Water, in Heater Top Head

Air, in Control Box when Air-Operated Flow Control Valve is furnished

Steam, on Self-Contained Flow Control Valve when such is furnished

Indicator Lights, "Power On" and "Tripped", on Control Box

For Steam as the Heating Fluid

**Steam Flow Control Valve, either Air-Operated or Self-Contained as ordered and furnished, sized as required for the application

**Compound Steam Pressure Gage mounted below the Control Box

For Boiler Water, etc , as the Heating Fluid

**Water Flow Control Valve, Air-Operated or Self-Contained, 2-way or 3-way as required for the application, and sized as required for the application

**Heating Fluid Inlet and Outlet Temperature Gages, mounted below the Control Box

**The accessories noted ** are mandatory whether or not furnished by AERCO in a packaged assembly. If ordered, these may be furnished separately by AERCO but not installed on the Heater.

All other items -- steam traps, stop valves, check valves, strainers, unions or flanges, and other piping and fittings as shown in Figures HE-106-3 through HE-106-8 are to be furnished by others.

NOTE

THIS INSTRUCTION COVERS ONLY THE HEAT EXCHANGER PORTION OF THE MODEL DW HEATER IF THE HEATER IS PACKAGED (INCLUDES MOUNTED ACCESSORIES), SEPARATE INSTRUCTIONS COVERING THE CONTROL VALVE AND OTHER ACCESSORIES ARE INCLUDED WITH THE SHIPMENT.

NOTE

The AERCO Double-Wall 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 alterations of the equipment as originally furnished without the written approval of AERCO.

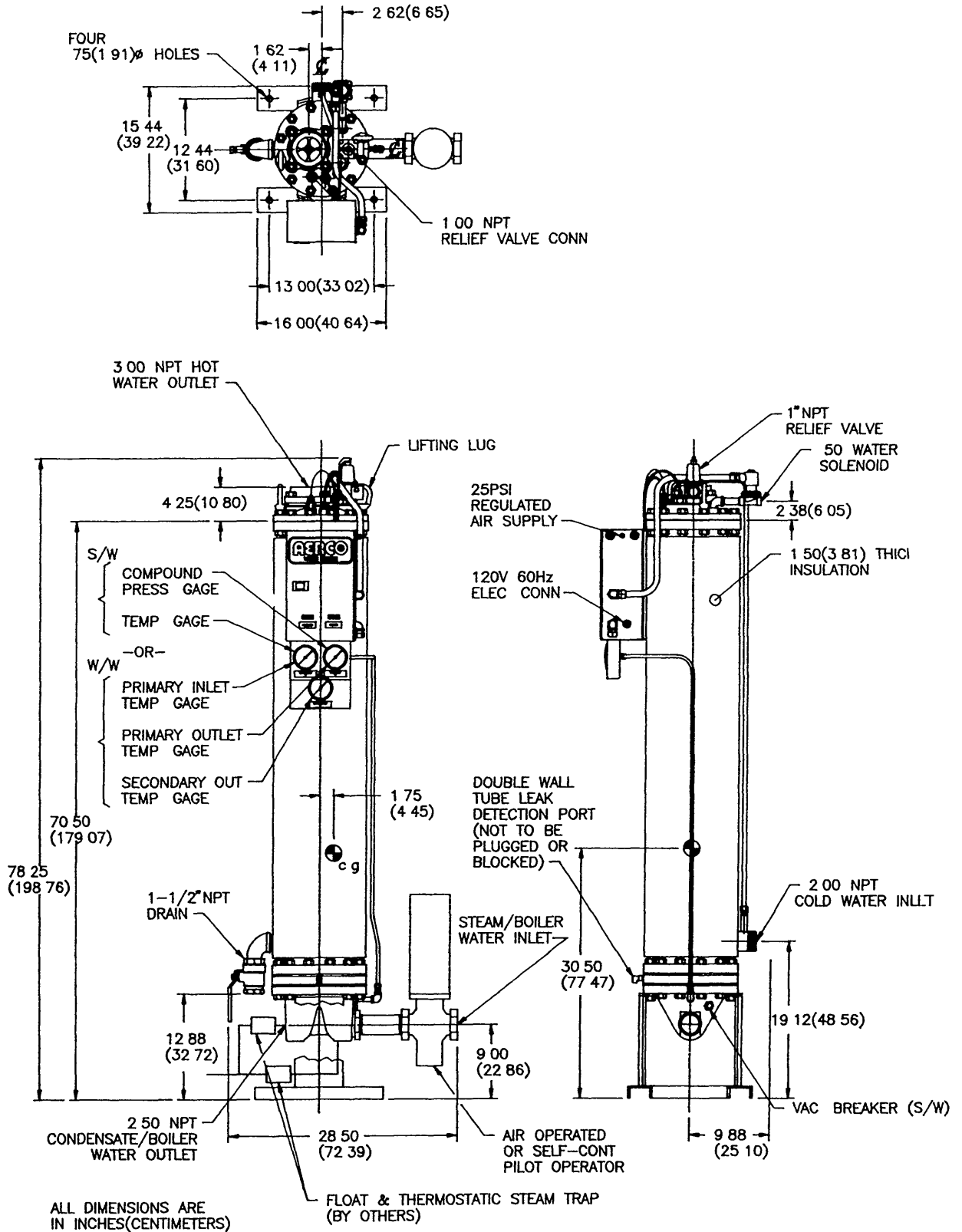


Figure HE-106-1 - Dimensions for AERCO Double-Wall Heater, Model DW-24

	DW-45	DW-68
A	90 00(228 60)	90 50(229 87)
B	36 67(93 14)	37 00(93 98)
C	4 50(11 43)	5 44(13 82)
D	2 50(6 35)	3 50(8 89)
E	2 62(6 65)	3 25(8 26)

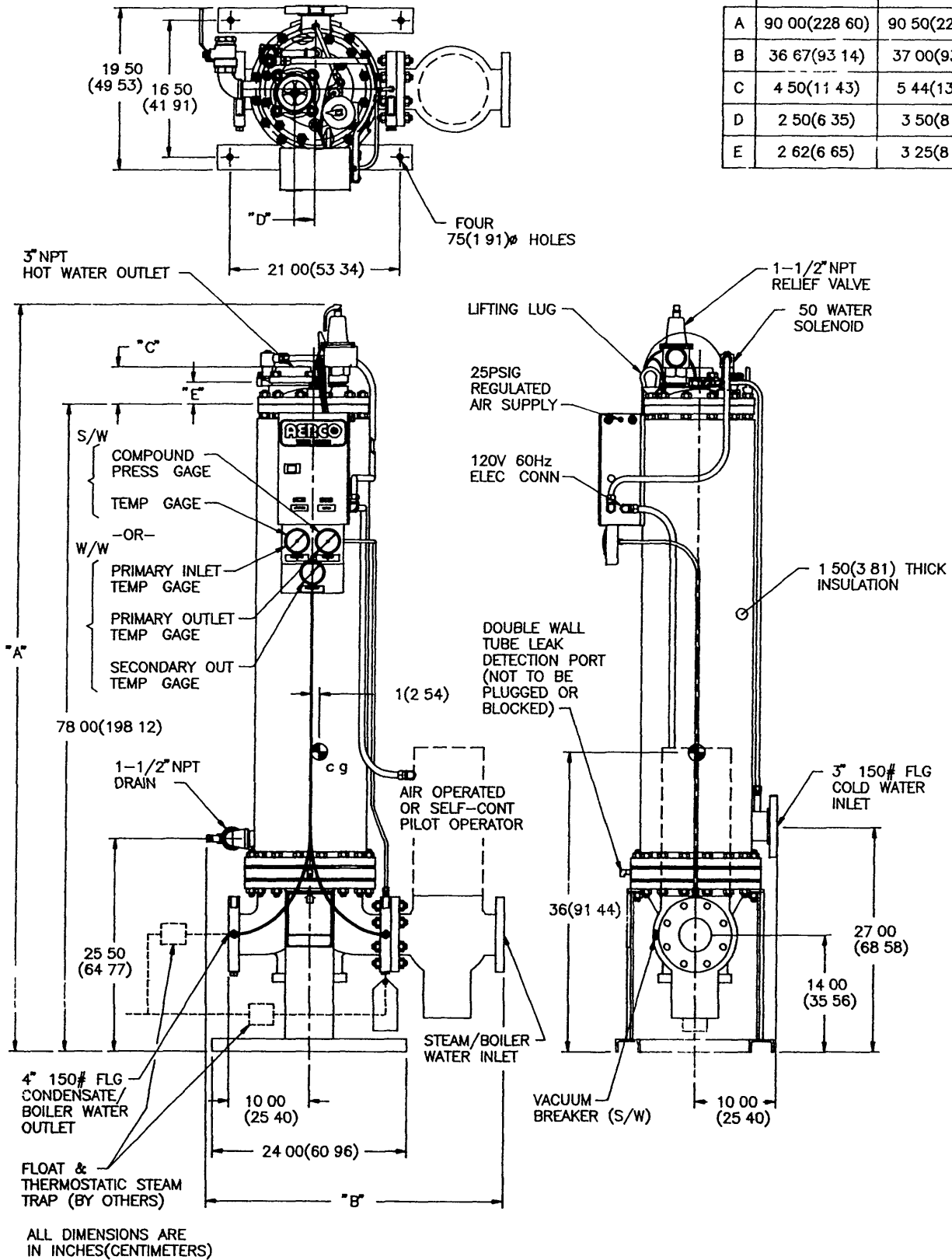


Figure HE-106-2 -- Dimensions for AERCO Double-Wall Heater, Models DW-45 & DW-68

















INSTALLATION

- 1 Dimensions for an AERCO Double-Wall Heat Exchanger Model DW-24 are shown in Figure HE-106-1, and for Models DW-45 and DW-68 are shown in Figure HE-106-2
- 2 Uncrate the Heater carefully Set the Heater upright by using a block and tackle or hoist attached to the lifting lugs (eye-bolts) on the Top Head of the Heater 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 2 feet clearance all around the Heater and where the head room clearance is at least 6 feet higher than the height of the Heater from the floor to the flange at the top of the Heater Shell
- 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 showing
 - Steam as the Heating Fluid --
 - Single Heater -- Figure HE-106-3
 - Parallel Heaters -- Figure HE-106-4
 - Single Heater with an Accumulator -- Figure HE-106-5
 - Single Heater with a Stratified Storage Tank -- Figure HE-106-6
 - Boiler Water as the Heating Fluid --
 - Single Heater with a 2-Way Control Valve -- Figure HE-106-7
 - Single Heater with a 3-Way Control Valve - Figure HE-106-8

For Heater system combinations not included in the illustrations noted above, use either a piping diagram furnished separately by AERCO or determine the necessary connections and accessories by combining the appropriate connections shown in the Figures listed above For instance, for parallel Heaters, make inlet and outlet connection systems in similar manner as those shown in Figure HE-106-4 Likewise if an accumulator or storage tank is included in the system, connect the Heated Water outlet piping as shown in Figure HE-106-5 or HE-106 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-106-1 or HE-106-2
 - 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 Include all of the stop valves, check valves, steam traps, strainers, and other elements as shown in the appropriate illustration (Figures HE-106-3 through HE-106-8) or as separately specified by AERCO
 - e If the Heater is furnished with the Control Valve not connected as shown in Figure HE-106-1 or HE-106-2, the piping between the Control Valve and the Heater connection should be as short as possible, with sufficient unions or flanges included to allow easy removal of the Valve
 - f Reductions from a pipe to a smaller size connection at the Heater or Control Valve should be made directly at the Heater or Valve connection Expansions from a pipe to a larger size connection at the Heater or Control Valve should be made as far as practical from the Heater or Valve connection
 - g For a Heater using Steam as the Heating Fluid, the Condensate return piping should be arranged to permit Condensate to drain freely by gravity from the Heater connection FAILURE TO DO SO MAY RESULT IN IMPROPER OPERATION OF THE HEATER and/or IN DAMAGE TO THE HEATER/CONDENSATE SYSTEM
 - h For a Heater using Boiler Water or other fluid as the Heating Fluid
 - Where the Heating Fluid temperature is high enough to cause a significant flashing, AERCO recommends the use of "double cock and bleed" valving, as shown dotted in Figures HE-106-7 and HE-106-8, in both the Heating Fluid supply and return lines to permit safe access to the equipment for maintenance
 - The 3/8-inch bleed line shown in Figure HE-106 7 from the Heating Fluid supply line to the Heating Fluid return line is required to provide a constant circulation of Heating Fluid, and, thus, constant hot Fluid in the supply line to the Heater
 - The line shown in Figure HE-106-8 from the Heating Fluid supply line to the B port of the 3 Way Control Valve is required to assure constant and adequate circulation of the Heating Fluid where such is necessary
 - i All drain discharges -- Relief Valve, water Solenoid Valve, and Heater drain -- should be piped directly to a convenient Floor drain

- 7 If the Heater is not furnished as a factory-packaged unit as shown in Figure HE-106-1 or HE-106-2
- a Install the Relief Valve in its correct connection in the Heater Top Head
 - b Install the secondary (Heated Water) temperature thermometer in its correct connection in the Heater Top Head
 - c The Temperature Controller, for use with an air-operated Control Valve, OR the self-contained Control Valve must be mounted sufficiently close to the Heater to permit insertion of the Controller or Valve thermal element into its correct connection in the Heater Top Head After the Controller or Valve has been installed, assemble the thermal element into its proper connection
 - d If an Over-Temperature Limit System is furnished, install the Solenoid Valve(s), the Temperature Switch, the Pilot Light and wiring in accordance with the AERCO instruction furnished with the System See Figure HE-106-1 or HE-106-2 for the location of the water-diverting Solenoid Valve
- Insert the Temperature Switch Thermal Element in the 3/4-inch Thermostat connection in the Heater Top Head
- e It is recommended that, after all piping, etc , connections have been made, the Heater be insulated
- 8 BEFORE MAKING FINAL PIPING CONNECTIONS TO AND FROM THE HEATER AND CONTROL VALVE, BLOW OUT ALL PIPING THOROUGHLY
- 9 If an air-operated Control Valve is furnished, make the necessary supply air connection to the Temperature Controller -- through the side of the Control Box (Figure HE-106-10) if the Heater is factory-packaged THE SUPPLY AIR PRESSURE MUST BE MAINTAINED AT 25 PSIG MINIMUM, 30 PSIG MAXIMUM
- 10 If the Heater is factory-packaged, connect 110 volt 60 Hz power supply wiring through the side of the Control Box to the electrical junction box (Figure HE-106 10)

LEGEND

	STOP VALVE		STRAINER
	CHECK VALVE		RELIEF VALVE
	CONTROL VALVE		THERMO-METER
	ORIFICE UNION		STEAM TRAP
	CONTROL THERMAL ELEMENT		CIRCULATOR
	PRESSURE GAGE		BALANCING COCK
	PIPE UNION OR FLANGES		PETCOCK
	COMPOUND PRESSURE GAGE		FLOW INDICATOR

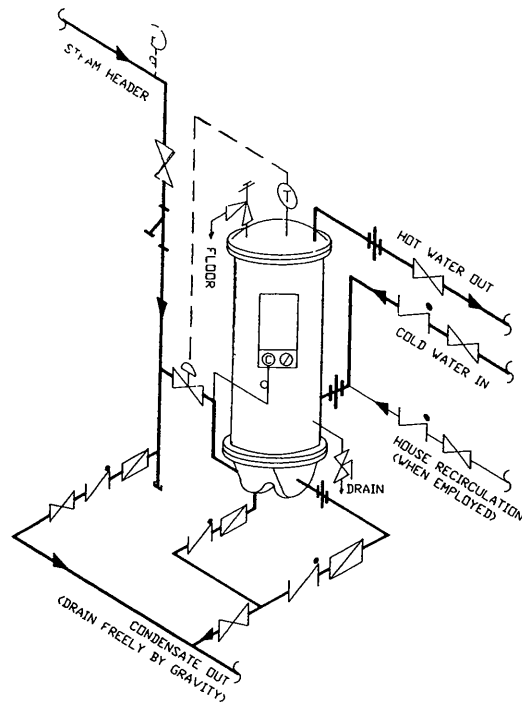


Figure HE-106-3 -- Piping Connections for a Single Steam to Water Heater

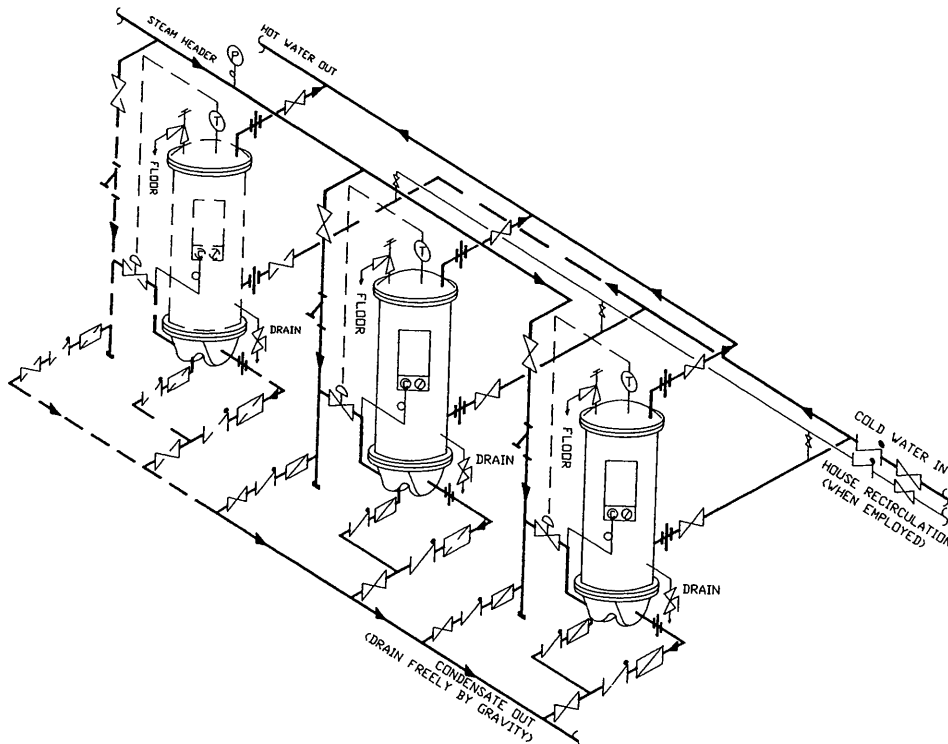


Figure HE-106-4 -- Piping Connections for Parallel Steam to Water Heaters

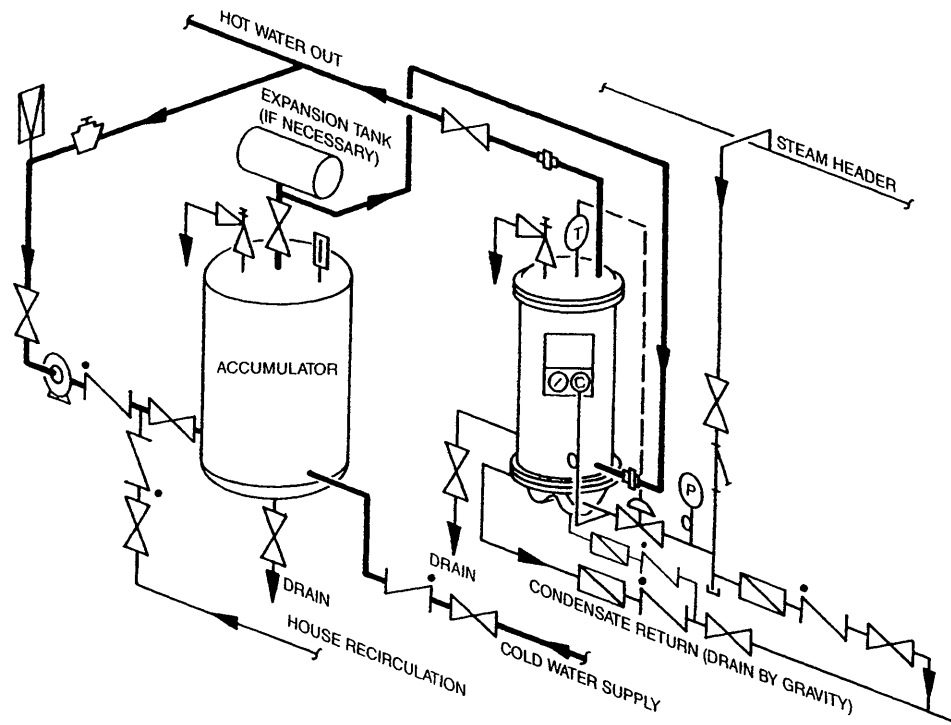


Figure HE-106-5 -- Piping Connections for a Single Steam to Water Heater with an Accumulator

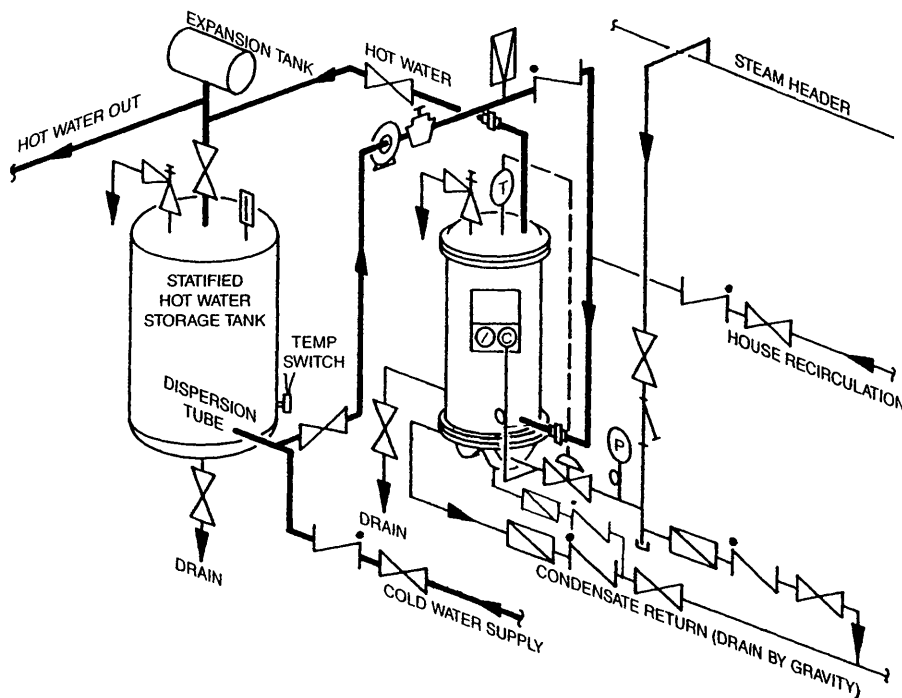


Figure HE-106-6 -- Piping Connections for a Single Steam to Water Heater with a Stratified Storage Tank

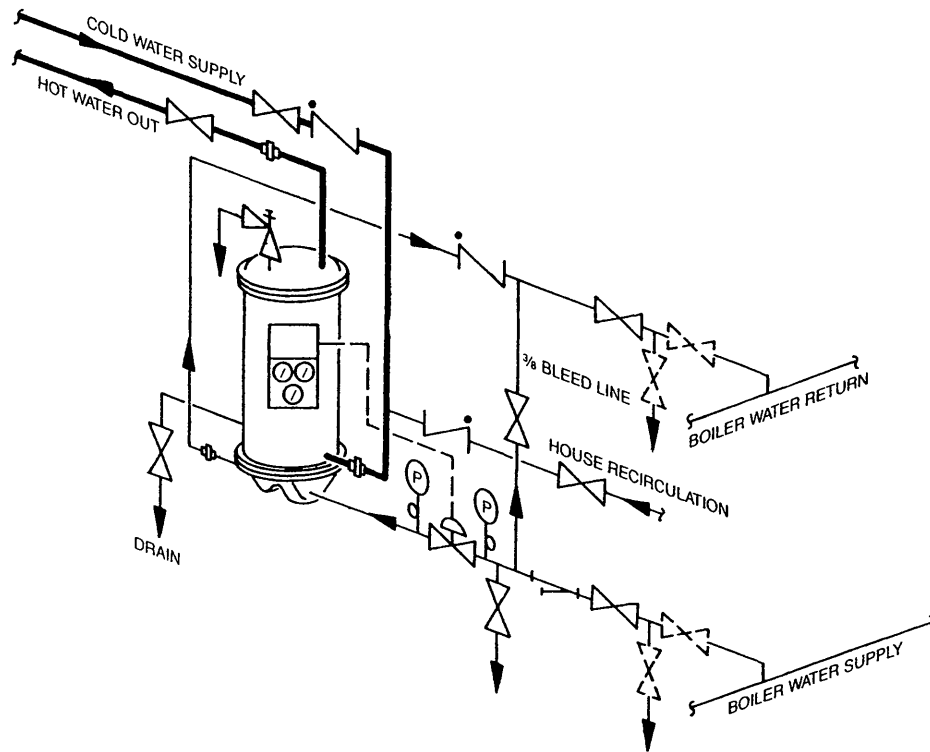


Figure HE-106-7 -- Piping Connections for a Single Water to Water Heater with a 2-Way Control Valve

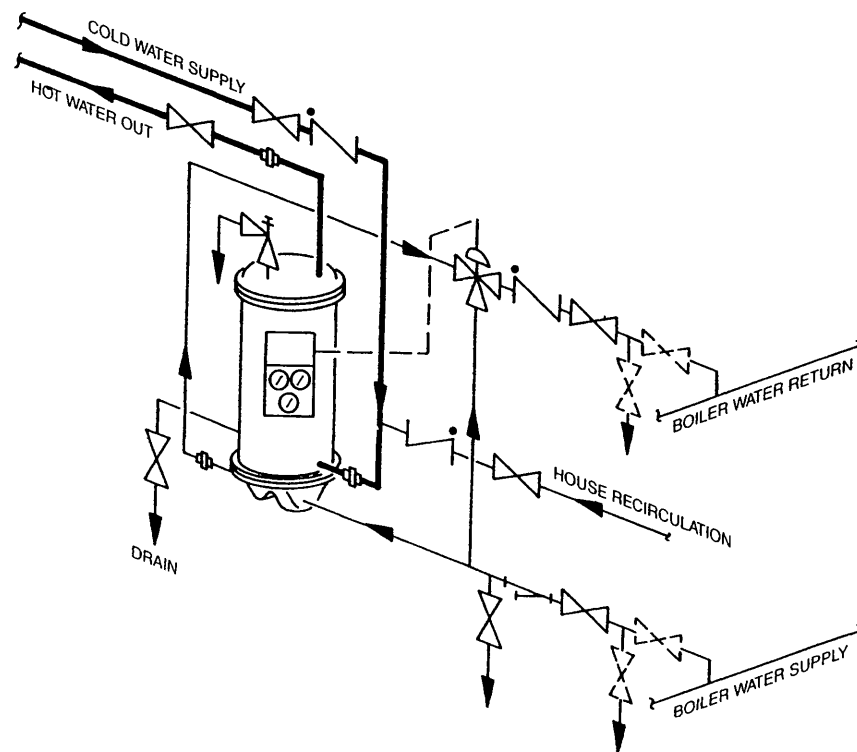


Figure HE-106-8 -- Piping Connections for a Single Water to Water Heater with a 3-Way Control Valve

PRINCIPLE OF OPERATION

The AERCO Double-Wall Heat Exchanger (Heater) consists of three principal parts (see Figure HE-106-9)

Shell with Upper and Lower Heads 2 Double-Wall U-Bend Heat Exchanger Tubes 3 Integral Demand Anticipator Temperature Control Unit

Cold Water (or other fluid to be heated) enters the Heater through the inlet connection and orifice near the bottom of the Shell. The orifice serves to divert some of the Cold Water into the Shunt Tube, and a diverter within the Shell and among the Tubes disperses the incoming Cold Water evenly into the Shell. The Cold Water in the Shell, then, flows upward through the Tubes (heating surfaces) and, heated, is discharged through the Spring Check Valve and Hot Water outlet connection in the Top Head of the Heater.

Heating Fluid (steam, boiler water, condensate, waste water, or other hot fluid) enters through the Control Valve and the inlet connection to the manifold at the bottom of the Heater. The Heating Fluid then flows through the inside tubes of the double-wall Heat Exchanger Tubes simultaneously in parallel, into the outlet manifold, and leaves the Heater through the Condensate or Heating Fluid outlet connection.

The outside tubes of the double wall Heat Exchanger Tubes serve as protection against leakage of Heating Fluid into the Cold Water being heated in the Shell or vice versa. If such a leak should occur, the Heating Fluid or Cold Water, whichever is leaking, will flow through the space between the inner and outer tubes and down into the space between the flanges which make up the Bottom Head of the Heater. Then it will flow out through the Leak Detection Tube, affording a very quick signal to an operator that a leak has occurred.

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 in the top of the Shell at the Heater outlet and surrounding the Temperature Sensing Element.

As Heated Water flows up through the Shell, its flow is diverted, by means of the Baffle, toward the Temperature Sensing Element in order that the Element always senses the temperature of the Water coming directly from the Heat Exchanger Tubes and not any stray temperatures. Also, the Heated Water so directed enters the open bottom end of the Sensing Tube.

Cold Water enters the Sensing Tube from the Shunt Tube at a rate proportional to the load (call for Hot Water) on the Heater. That is, at no load, there is no Cold Water to the Sensing Tube, whereas, as soon as there is a call for Heated Water, Cold Water begins to flow into the Sensing Tube and mixes with the Heated Water in the Tube.

The mixture of Heated and Cold Water in the Sensing Tube creates an average temperature which will be cooler than the temperature of the Heated 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 Heating Fluid Control Valve to modulate between full open and full closed as necessary to maintain the required Heated 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 Shell and at the Heater outlet. If that Water is at the required temperature or above, the Sensing Element signals the Heating Fluid Control Valve to close.

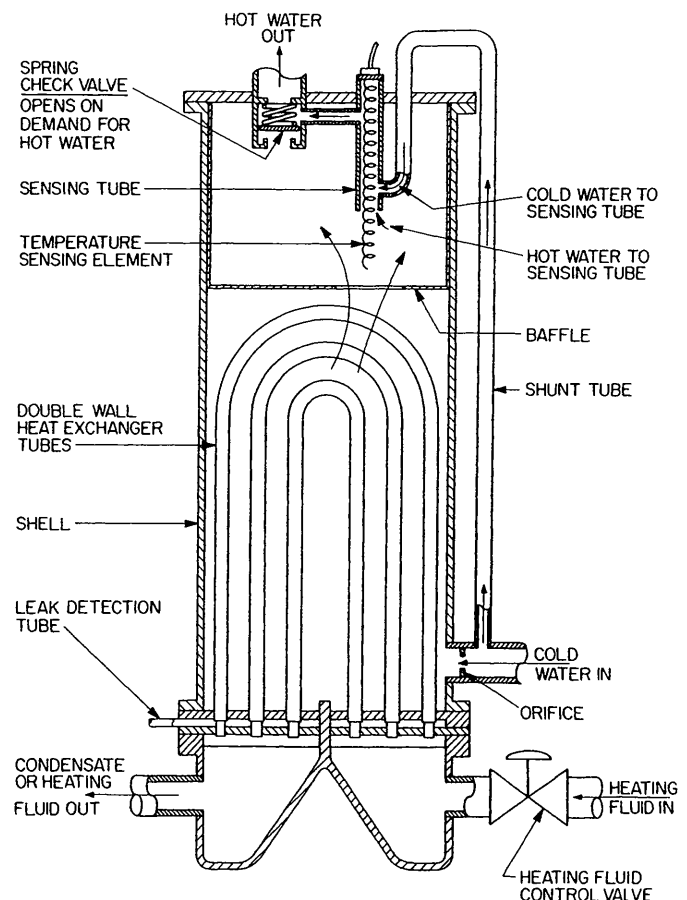


Figure HE-106-9 -- Schematic of an AERCO Model DW Heater showing its Anticipator Temperature Control

However, the moment that there is demand for Heated Water, Cold Water flows from the Shunt Tube to mix with the Heated Water in the Sensing Tube, cooling the Sensing Element so that it signals the Heating Fluid Control Valve to open. The need for Heating Fluid to the Heat Exchanger Tubes is satisfied at once, incoming Cold Water passing by the Tubes 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 of the temperature of the incoming Cold Water, and thus provides FEED-FORWARD temperature control at all times.

OPERATING PROCEDURES

- OP1 With the installation entirely completed, including all piping connections have been made, all connecting piping has been cleaned (blown) out, and all connections and installations per steps 7, 9, and 10 under INSTALLATION above 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 build up and the Heater will not fill. When Water flows out of the Relief Valve, the Heater is full.
- OP2 If the Heater includes an Over-Temperature Limit System, temporarily set the System's temperature switch (see Figures HE-106-10 and HE-106-13) to its high temperature limit. If there is no Temperature Limit System, proceed to Step OP3.
- OP3 If the Heating Fluid Control Valve furnished is air-operated, set the Temperature Controller (see Figure HE-106-10) at the desired temperature to be held at the Heater Hot Water outlet.
- OP4 Open the stop valve in the Heater Hot Water outlet line. Open hot water faucets or valves in the building or process to insure a flow of water through the Heater. For best results in adjusting the temperature control, a flow of 10% to 25% of Heater rating is desirable.
- OP5 Slowly open all stop valves in the Heating Fluid inlet and outlet lines. If double block and bleed valving is used, make sure that the drain (bleed) valve is closed tight.
- OP6 Follow the instructions furnished with the air-operated Temperature Controller and Control Valve OR with the self-contained Temperature Regulating Control Valve, and
- Introduce Heating Fluid (steam, boiler water, condensate, waste water, or other hot fluid) to the Heater.
 - 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.
 - Close the Hot Water faucets or or valves which were 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
- As quickly as possible, put a load on the Heater by opening Hot Water faucets or valves in the building or process.
 - Adjust the Temperature Controller OR Temperature Regulator Valve to provide best response on load changes. See the instruction furnished with the Controller or Regulator.
- OP8 If the Heater includes an Over-Temperature Limit System, adjust its Temperature Switch to its proper setting in accordance with the instructions furnished which cover the System -- usually 15 degrees F to 20 degrees F higher than the desired Heater Hot Water outlet temperature.
- OP9 The Heater installation is now set for operation. No further operation procedure is necessary unless or until further temperature control adjustments may be required. If so, repeat Steps OP4, OP5, OP6, and, if necessary, OP7.
- OP10 To SHUT DOWN the system
- Close all stop valves in the Heating Fluid inlet and outlet lines.
 - IN THIS ORDER, close the stop valves in (1) the Heater Hot Water outlet line, (2) the recirculation line, if any, and (3) the Cold Water inlet line.
- OP11 For DRAINING THE HEATER, see the instructions under ROUTINE MAINTENANCE below.
- OP12 To START UP again, with the Heater Shell filled per Step OP1 above, open stop valves IN THE FOLLOWING ORDER (1) stop valve in the Cold Water inlet line, (2) all stop valves in the recirculation line, if any (3) stop valve in the Heater Hot Water outlet line, and (4) stop valves in the Heating Fluid inlet and outlet lines.
- After each startup, check the temperature control. If necessary, make adjustments per Steps OP4 through OP8 above.

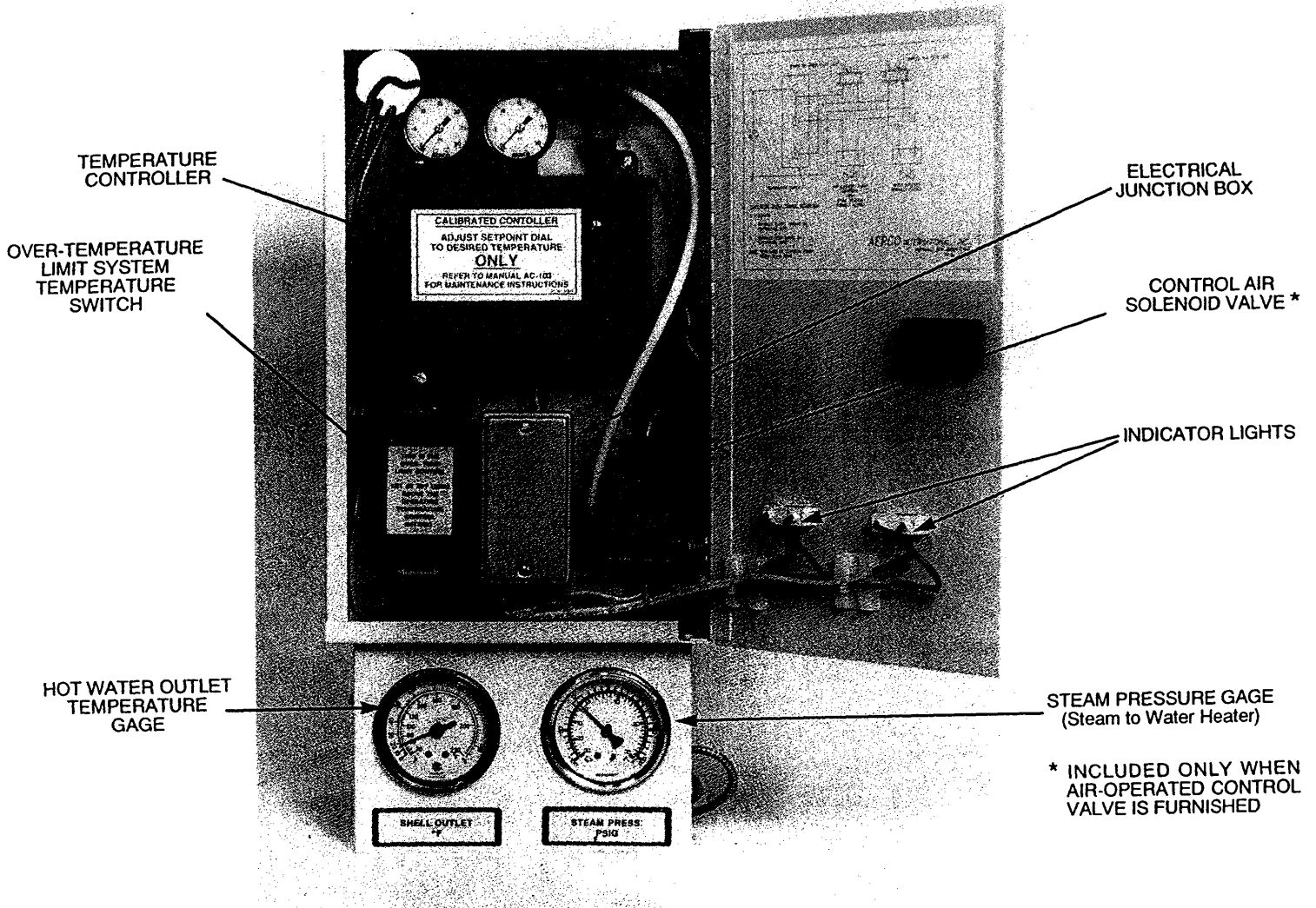
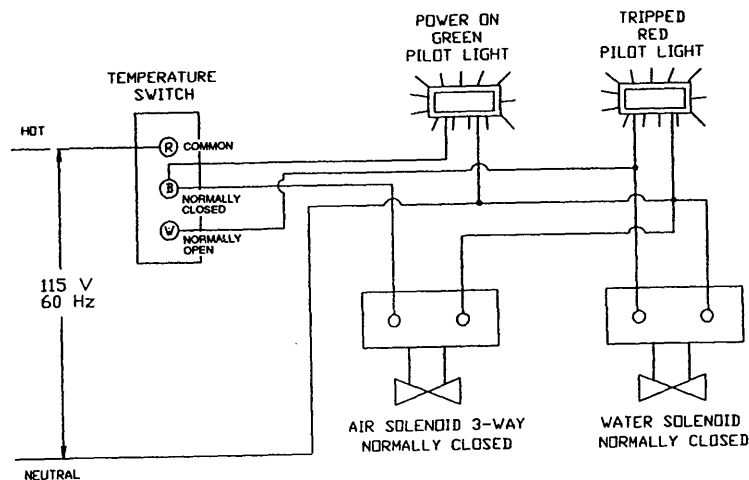


Figure HE-106-10 -- Control Box



NOTES:
1. ELECTRIC DRAW WHEN 'TRIPPED' IS 0.5 Amp @ 115 V.

Figure HE-106-11 -- Over-Temperature Limit System Wiring Diagram

ROUTINE MAINTENANCE

- | | |
|--|---|
| <p>RM1 After the first 3 months of initial operation, drain the Heater as outlined in Steps RM4 through RM7 below. Examine the water being drained</p> <p>a If the amount of solids in the water being drained appears to be heavy, set a schedule to drain the Heater every 3 months</p> <p>b If the amount of solids appears to be light, set a schedule to drain the Heater every 6 months</p> <p>c Even if the amount of solids appears to be very light or not at all, drain the Heater at least once each year</p> <p>d Also, see TROUBLESHOOTING and CORRECTIVE MAINTENANCE below. If descaling by thermal shock is required, schedule that procedure in your Routine Maintenance</p> <p>RM2 Check the Leak Detection Tube once each week for leaks in the Heat Exchanger Tubes. MAKE CERTAIN THAT THE DETECTION TUBE NEVER GETS PLUGGED. If any fluid is coming out of the Detection Tube, shut down the Heater as outlined under Step OP10 under OPERATING PROCEDURES above and see CHECK FOR A TUBING LEAK, Step D7 under DISASSEMBLY below</p> <p>RM3 Check the temperature control at least every 6 months. Make any necessary adjustments per Steps</p> | <p>OP4 through OP8 under OPERATING PROCEDURES above</p> <p>TO DRAIN THE HEATER</p> <p>RM4 Close all stop valves in the Heating Fluid (steam, boiler water, etc) inlet and outlet lines</p> <p>RM5 IN THIS ORDER, close the stop valves in (1) the Heater Hot Water outlet line (2) the recirculation line, if any, and (3) the Cold Water inlet line</p> <p>RM6 CAREFULLY open the Relief Valve in the Heater Top Head to relieve pressure in the Heater Shell. If fluid continues to flow from the Relief Valve, one of the Cold Water stop valves either leaks or is not shut off tight. This must be remedied until there is no more flow from the Relief Valve</p> <p>RM7 WITH THE RELIEF VALVE BEING HELD OPEN (to prevent creating a vacuum in the Shell), open the Drain Valve at the bottom of the Heater Shell, Figure HE-106-1 or HE-106-2, and drain the Heater completely</p> <p>RM8 To refill the Heater and place it back into operation, close the Drain Valve tight and proceed through Steps OP1 and OP12 under OPERATING PROCEDURES above</p> |
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TROUBLESHOOTING

	SYMPTOM	PROBABLE CAUSE & REMEDY CORRECTIVE MAINTENANCE (CM) ITEM NO
A	Heater does not maintain required temperature at rated capacity	CM1, CM9, CM11, CM14, CM15, CM16, CM17, CM20, CM21, CM22, CM24, CM25
B	Heater overheats	CM1, CM4, CM5, CM8, CM10, CM11
C	Hot Water outlet temperature fluctuates widely	CM8, CM9, CM10, CM11, CM14, CM16, CM17, CM18, CM20, CM21, CM22, CM23, CM24
D	Insufficient Fluid-to-be-Heated through or from the Heater	CM2, CM12, CM14
E	Excess or insufficient Heating Fluid (condensate, boiler water, etc) being returned from Heater	CM14, CM20, CM21
F	Heating Fluid (steam, boiler water, etc) being discharged from Heater at too high a temperature	CM15
G	Pressure/Temperature Relief Valve pops	CM3, CM4, CM5, CM6, CM7, CM8, CM10, CM11, CM13, CM21
H	Heater shuts down below, at, or too near above required Heated Fluid temperature	CM13
I	Loud banging in Heater or in Heating Fluid (steam, boiler water, etc) piping -- not to be confused With a normal clicking noise	CM6, CM7, CM18, CM19, CM21

CORRECTIVE MAINTENANCE

Refer to TROUBLESHOOTING

The following are probable causes and remedies for improper action of the Heater

- CM1 Thermometer or temperature gages read wrong
Check by replacing the Thermometer and/or each temperature gage with one which is known to be correct
- CM2 Cold Water (fluid to be heated) pressure is low
Check and correct, if necessary, the pressure to the Heater
- CM3 Static pressure of the Cold Water (fluid to be heated) is too high Make corrections necessary to bring the pressure below that for which the Relief Valve is set
- CM4 Fluid to be heated is preheated too hot Reduce the preheating to a temperature at least 10 degrees F below the desired Heated Fluid outlet temperature
- CM5 Leaking valve in by-pass line, if any, around the Heating Fluid Control Valve Maintain the Valve to shut tight
- CM6 Lack of expansion capability in the Heated Fluid system Insert an expansion tank in the Heated Fluid outlet line near the Heater
- CM7 Insufficient shock absorbers Insert shock absorbers (water hammer arresters) in both the Cold and Heated Fluid Systems as needed to eliminate shock waves
- CM8 The Heating Fluid Control Valve does not close
Check the instructions for the Valve
- CM9 The Heating Fluid 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 Temperature Regulator 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 (18) in Figure HE-106-14) has not become clogged, and that the Check Valve at the Heater Hot Water outlet is working properly (see CM12 below) 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 D6 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 either the inside or outside wall of one or more of the Heat Exchanger Tubes as indicated by a flow from the Leak Detection Tube Refer to Step D7 under DISASSEMBLY below for the corrective action to be taken
- CM15 The Heat Exchanger Tubes are scaled up
Descale the Heater by thermal shock in the manner outlined under DESCALING BY THERMAL SHOCK METHOD below If this does not descale the Tubes sufficiently, contact AERCO or your nearest AERCO Representative for advice concerning the required remedy
- CM16 The Heater is being utilized at a rate higher than its design capacity Contact AERCO or your nearest AERCO Representative for advice in remedying this problem

WHERE STEAM IS THE HEATING FLUID

- CM17 Steam Pressure is too low Check the supply Pressure Gage ahead of the Steam Flow 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 Steam Pressure Compound Gage reading should reach design pressure for Steam in the Heat Exchanger Tubes as the Heater Hot Water outlet temperature starts to drop If it does not, check the operation of the Steam Control Valve
- CM18 No Check Valve in the Condensate drain line Lack of this Check Valve can allow Condensate -- and live Steam if present -- to be drawn back into the Heater from the Condensate line This can result in a high back pressure, water hammer, and, if live Steam is present, over-heating Install a Check Valve in the Condensate drain line as indicated in Figures HE-106-3 through HE-106-6
- CM19 Supply Steam line is not properly trapped Install a trap as indicated in Figures HE-106-3 through HE-106-6
- CM20 Condensate is backing up into the Heater because of a restriction in the Condensate drain line such as an undersized or faulty trap Check AERCO or the nearest AERCO Representative for the trap size required and make the necessary correction
- CM21 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 6g 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

WHERE THE HEATING FLUID IS BOILER WATER

- CM22 The Boiler Water (or other Heating Fluid) temperature is too low. Check the reading of the thermometer or Temperature Gage in the Boiler Water line ahead of the Heater inlet. If it reads lower than the temperature for which the Heater is designed, make the necessary adjustment to bring it up to that which is required.
- CM23 No Boiler Water bleed line between the Heater Boiler Water inlet and outlet. Boiler Water in the inlet line cools when the Control Valve is closed for any length

- of time. Add the bleed line as shown in Figure HE-106-7.
- CM24 The Temperature Controller is not set correctly. Adjust per Steps OP6 and OP7 under OPERATING PROCEDURES above.
- CM25 Insufficient capacity of Boiler Water supply. Check to make sure that all supply and return stop valves are full open. It is possible that the pump does not have sufficient capacity. Check with AERCO or with your nearest AERCO Representative.

DESCALING BY THERMAL SHOCK

Where, under certain conditions of continuous steady usage, the Fluid (water) being heated is so hard or alkaline that normal expansion and contraction of the Heat Exchanger Tubes and routine blowdown (draining the Heater Shell -- see ROUTINE MAINTENANCE above) will not remove scale buildup on the Tubes, the heating surfaces (Tubes) may be thoroughly shocked, without damage to any part of the Heater, to dislodge scale solids.

Proceed as follows

- TS1 Drain the Heater per Steps RM4 through RM7 under ROUTINE MAINTENANCE above. However, instead of holding the Relief Valve open in Step RM7, REMOVE the Relief Valve from the Heater Top 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 in the Heater Top Head.
- TS3 Open the stop valves in the Heating Fluid (steam, boiler water, etc) inlet and outlet lines to allow the Heating Fluid to the Heater Tubes. After about 30 seconds or until the Tubes have become thoroughly heated, close all stop valves in the Heating Fluid outlet line. Leave the Heating Fluid inlet stop valves open for 2 or 3 minutes longer, then close those stop valves.

CAUTION In Steps TS4 and TS5, steam may be generated which will escape through the Relief Valve opening in the Heater Top Head.

- TS4 Inject a flow of cold water through the Relief Valve connection for about 2 minutes. Then shut off the cold water and open the Heating Fluid outlet line stop valves.
- TS5 Repeat Steps TS3 and TS4 several times until the water coming from the Heater Shell drain appears to be relatively free of solids.
- TS6 Remove the cold water source from the Relief Valve connection. Open the stop valves in the Fluid-to-be Heated 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 tight, replace the Relief Valve in the Heater Top Head, and place the Heater back into operation per Steps OP1 and OP12 under OPERATING PROCEDURES above.
- TS8 If water conditions are so severe that the thermal shocking does not remove the scale deposits, consult AERCO or your nearest AERCO Representative for advice.

DISASSEMBLY

REFERENCE ILLUSTRATIONS

- HE-106-11 -- Over-Temperature Limit System Wiring Diagram
- HE-106-12 -- Anticipator Check Valve Assembly
- HE-106-13 -- Heater Control Box Assembly
- HE-106-14 -- Bare Heat Exchanger Assembly
- HE-106-15 -- Model DW Packaged Heater Assembly

SPECIAL TOOLS REQUIRED

Torque wrench for 5/8" nuts Block and Tackle or ratchet or winch hoist for lifting off the Heater Top Head and Shell, or for lifting and moving the Heater

TO REMOVE THE CHECK VALVE ASSEMBLY

- D1 Shut down the Heater in accordance with Step OP10 under OPERATING PROCEDURES above. Manually (and CAREFULLY) open the Relief Valve in the Heater Top to relieve any pressure in the Heater Shell
- D2 Disconnect the union or flange in the Hot Water outlet piping -- the one located beyond the outside diameter of the Heater Top Head
- D3 See Figure HE-106-12. Remove Nuts (111), the Hot Water Outlet Flange (110) along with the piping connected to the Flange
- D4 Separately, lift out the Spring Plate Assembly (103), Flange Gasket (101), Spring (105), and Valve Plug Assembly (104)
- D5 Clean all parts and gasket surfaces thoroughly, and repair or replace any part necessary to make the Check Valve operate properly -- that is, to open on Water flow through the Heater
- D6 See REASSEMBLY below for reassembly of the Check Valve into the Heater Top Head

TO CHECK FOR A TUBING LEAK

- D7 Shut down and drain the Heater in accordance with Steps RM4 through RM7 under ROUTINE MAINTENANCE above
- D8 Open the stop valves in the steam or boiler water inlet line to introduce steam or boiler water to the Heat Exchanger Tubes
- D9 If there is no flow from the Leak Detection Tube (whereas there had been a flow when the Heater was in operation), the leak or leaks are in the outer wall or walls of the tubing. This type of leak may be repaired per Step D22 below, or the entire Heater or U-Bend Tube Assembly (see Step D23 below) must be returned to AERCO for repair (see Step D26 below)
- D10 If, however, there is a flow from the Leak Detection Tube, the leak or leaks are in the inside wall or walls

of the tubing. In this case, the Heater, or at least the U-Bend Tube Assembly (see Step D23 below), must be returned to AERCO for repair (see Step D26 below)

TO REMOVE THE HEATER SHELL

Normally, there is no reason for the Heater Shell to be removed. However, if a leak has been detected in the Heat Exchanger Tubing and it has been determined to be in the outer tubing walls per Step D9 above, OR if there is another unusual reason for doing so, the Heater Shell may be removed as follows

NOTE that it is not necessary to disassemble or remove the Check Valve Assembly (see Step D1 above) in order to remove the Heater Shell

- D11 If not already shut down and drained per Step D7 above, shut down and drain the Heater in accordance with Steps RM4 through RM7 under ROUTINE MAINTENANCE above

See Figure HE-106-15

- D12 If a self-contained Heating Fluid Control Valve has been furnished or is being used with the Heater
 - a Remove the Temperature Control Thermal Element from the Heater Top Head. SECURE THE ELEMENT CAPILLARY SO THAT IT WILL NOT BE DAMAGED
 - b Disconnect, at the Valve, any electrical wiring (50) from the Heater Control Box to a Solenoid Valve on the Control Valve
- D13 Disconnect ALL EXTERNAL PIPING from the Heater Top Head, including that to the Relief Valve (52) and the Water Solenoid Valve (51), if furnished. Disconnect the Hot Water outlet piping at the union or flange located beyond the outside diameter of the Heater Top Head
- D14 Disconnect the Cold Water Inlet Piping from the Heater Inlet Flange
- D15 Disconnect any power supply wiring to the Heater Control Box
- D16 If an air-operated Heating Fluid Control Valve has been furnished or is being used with the Heater, disconnect all air supply and control air piping (61) to and from the Temperature Controller or Control Box
- D17 Disconnect Tube (60) and Thermometer(s) (58), if furnished, from the Heating Fluid inlet and/or outlet Heater flanges
- D18 Mark the edge of the Heater Bottom Head flanges in order to indicate their correct relative positions upon reassembly

- See Figure HE-106-14
- D19 Remove Nuts (2) and Studs from the Heater Bottom Head flanges
- D20 Using a hoist or block and tackle attached to the Lifting Lugs (5) on the Heater Top Head, CAREFULLY lift the Top Head (16) and Shell (15) STRAIGHT UP off the Heat Exchanger U-Bend Tubing assembly DO NOT SCRAPE THE SHELL LINING AGAINST THE TUBING
- D21 Clean and inspect the inside of the Shell and the U-Bend Tubing assembly for obvious damage
- D22 If a leak in the Tubing has been detected (Steps D7 through D10 above) and it has been determined that the leak is in the outside wall of one or more of the double-wall Tubes, the leak may be found either by a thorough inspection or as follows
- Connect a source of Cold Water to the Leak Detection Port (6)
 - Turn the Water on and search to find where the leak or leaks are located
 - The leak or leaks may be repaired by brazing However, if this does not stop the leak or leaks, the entire U-Bend Tubing assembly (11) must be replaced Either reassemble the Heater and return the entire Heater to AERCO for repair (see Step D26 below) or remove the U-Bend Tubing assembly and return only that assembly to AERCO for repair (see Step D26 below)
- D23 To disassemble the U-Bend Tubing assembly from the Heater, remove Nuts (2) and Studs and lift the assembly off the Manifold and Skid Assembly (10)
- D24 If the Shell copper liner has been damaged, reassemble the Heater and return it to AERCO for replacement of the liner See Step D26 below
- D25 If necessary, for any reason, to remove the Heater Top Head (16) from the Shell (15)
- Remove all Thermal, Temperature Gage, and Temperature Switch Elements from their locations in the Heater Top Head
 - Remove all connecting wiring, if any, from the Heater Top Head
 - Disconnect the Compression Fitting (19) at the top of the Shunt Tube (18)
 - Remove all piping and wiring to the Relief Valve (52) and Water Solenoid Valve (51), if any
 - Remove the Nuts (2), Studs, and Lifting Lugs (5) Then lift the Head off the Shell
 - Inspect the Anticipator assembly (Figure HE-106-12) for any damage If it is damaged, either order a new Head Assembly (16), which includes the Anticipator, from AERCO, or return the Head Assembly to AERCO for repair (see Step D26 below)
- D26 If the Heater or any of its assemblies are to be returned to the AERCO factory for repair, consult AERCO or your nearest AERCO Sales Representative for instructions for making the return

REASSEMBLY

REFERENCE ILLUSTRATIONS

Same as for DISASSEMBLY above

SPECIAL TOOLS REQUIRED

Same as for DISASSEMBLY above

TO REASSEMBLE THE CHECK VALVE

See Figure HE-106-12

- R1 Insert the Valve Plug (104), and Spring (105) into the Spring Cup Housing (106) Place a NEW Flange Gasket (101) on the Housing flange
- R2 Insert the Spring Plate Assembly (103) into the Spring, taking care to center it as closely as possible
- R3 Line up the Hot Water Outlet Flange (110) on the Studs (112) in the Heater Top Head (109), MAKING SURE that the Spring Plate Assembly (103) is centered in the groove in the bottom of the Outlet Flange (110) as shown in Figure HE-106-12

- R4 Replace Nuts (111) and tighten the Outlet Flange leak tight to the Heater Top Head
- R5 If this is the only reassembly operation, reconnect the Hot Water outlet piping and place the Heater back into operation in accordance with Steps OP1 and OP12 under OPERATING PROCEDURES above

HEATER REASSEMBLY

- R6 BEFORE REASSEMBLING, CLEAN ALL GASKET SURFACES THOROUGHLY, using a wire brush or emery cloth if necessary ALWAYS USE NEW GASKETS in a reassembly
- R7 If the Heat Exchanger U-Bend Tubing assembly (11) must be reassembled onto the Manifold and Skid Assembly (10)
- Place a Manifold Release Gasket (9), then a Manifold Gasket (8), and then another Manifold Release Gasket (9) (ALL NEW) onto the Manifold flange

- b Lower the U-Bend Tubing assembly over the 4 studs in the Manifold flange and onto the Manifold Gaskets, making sure the the bottom flange of the U-Bend assembly seats onto the locating pin in the top surface of the Manifold flange and that the U-Bend assembly is lined up for insertion of the Studs through the flanges
- R8 To replace the Heater Shell (15)
- a Place Tubesheet Release Gasket (13), then a Lower Shell Gasket (12), then another Release Gasket (13) (ALL NEW) onto the U-Bend assembly flange
 - b Using a hoist or block and tackle attached to the Lifting Lugs (5) on the Heater Top Head (or, if the Top Head has been removed, to bolt holes in the Shell top flange), CAREFULLY lower the Top Head and Shell STRAIGHT DOWN over the U-Bend Tubing assembly (11) DO NOT SCRAPE THE SHELL LINING AGAINST THE TUBING
 - c Make sure that the Shell is positioned properly by lining up the marking put on the edges of the flanges in Step D18 under DISASSEMBLY above
 - d Assemble the Studs and Nuts (2) into the Manifold, U-Bend, and Shell flanges Cross-tighten the Nuts to approximately 75 foot-pound torque to obtain uniform seating Then progressively tighten the Nuts to approximately 150 foot-pound torque for a tight seat
- R9 If the Heater Top Head (16) has been removed from the Shell (15)
- a Place a NEW Gasket (14) onto the gasket surface of the Shell top flange
 - b Replace the Heater Top Head assembly onto the Shell top flange making sure that the stud holes line up
- c Reassemble the Studs, Lifting Lugs (5), and Nuts (2) into the Head and Shell flanges Tighten the Nuts in the same manner as outlines in Step R8d above
 - d Replace the Water Solenoid Valve (51), if any, the Relief Valve (52), and all piping Reconnect the Compression Fitting (19) at the top of the Shunt Tube (18) Reconnect all connecting wiring, if any, required for accessories on the Top Head Replace the Thermal, Temperature Gage, and Temperature Switch Elements into their proper locations in the Top Head
- R10 Reconnect the Compression Fitting (56) to the Heating Fluid Inlet Flange
- R11 Reconnect the Thermometers (58), if furnished, to the Heating Fluid Inlet and Outlet flanges
- R12 If an air-operated Control Valve has been furnished or is being used with the Heater, reconnect all air supply and control air piping to and from the Temperature Controller or Control Box
- R13 Reconnect any power supply wiring to the Heater Control Box and any wiring between the Control Box and any Solenoid Valves included in the system
- R14 Reconnect all external piping to the Heater Top Head, including that to the Relief Valve (52) and the Water Solenoid Valve (51), if furnished
- R15 Replace the Temperature Control Thermal Element into the Thermal Well Bushing (53) in the Heater Top Head R16 Refill and place the Heater back into operation in accordance with Steps OP1 and OP12 under OPERATING PROCEDURES above

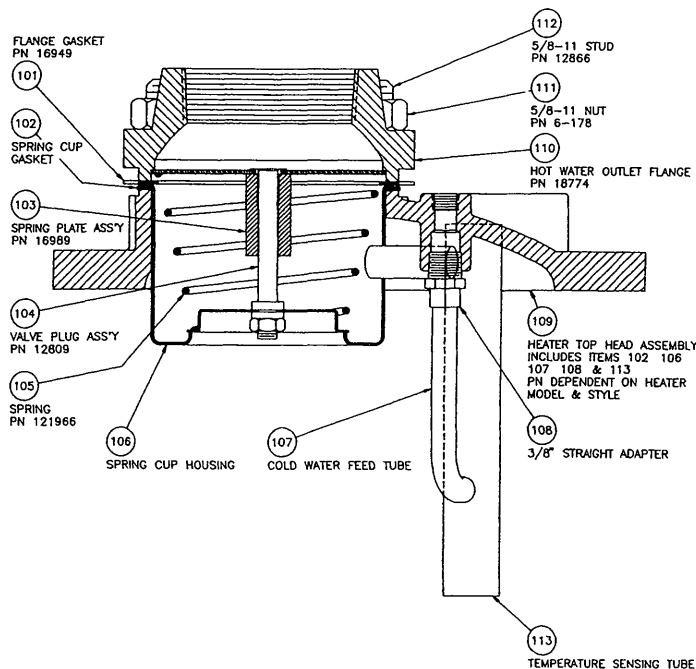


Figure HE 106-12 -- Anticipator Check Valve Assembly

RECOMMENDED SPARE PARTS

Following are lists of Recommended Spare Parts for one AERCO Double-Wall Heater depending on its application and the type of Control Valve with which it has been furnished or is being used. These are as follows:

COMMON PARTS for ANY Model DW Heater	List A
Steam to Fluid PACKAGED Model DW Heater	List B
Boiler Water to Fluid PACKAGED Model DW Heater	List C
ANY PACKAGED Model DW Heater with Air-Operated Control Valve	List D
ANY PACKAGED Model DW Heater with Self-Contained Control Valve	List E

Quantity Per Heater	Item No	Item	Shown in Figure No
LIST A -- COMMON PARTS for ANY Model DW Heater			
2	101	Check Valve Gasket	HE-106-12
2	14	Upper Shell Gasket	HE-106-14
2	12	Lower Shell Gasket	HE-106-14
4	13	Upper Tubesheet Release Gasket	HE-106-14
2	8	Manifold Gasket	HE-106-14
4	9	Manifold Release Gasket	HE-106-14

NOTE that all of the above in List A may be obtained from AERCO in one Gasket Kit --- Model DW24, Part No 123196-24
Model DW45, Part No 123196-45
Model DW68, Part No 123196-68

LIST B -- For ANY Steam to Fluid PACKAGED Model DW Heater
All of List A above PLUS

1	126	Temperature Switch	HE-106-13
1	132	Fluid Outlet Temperature Gage	HE-106-13
1	133	Compound Pressure Gage	HE-106-13
1	129	Green Indicator Light	HE-106-13
1	130	Red Indicator Light	HE-106-13
1	51	Water Solenoid Valve	HE-106-15
1	52	P&T Relief Valve	HE-106-15

LIST C -- For ANY Boiler Water to Fluid PACKAGED Model DW Heater
All of List A above PLUS

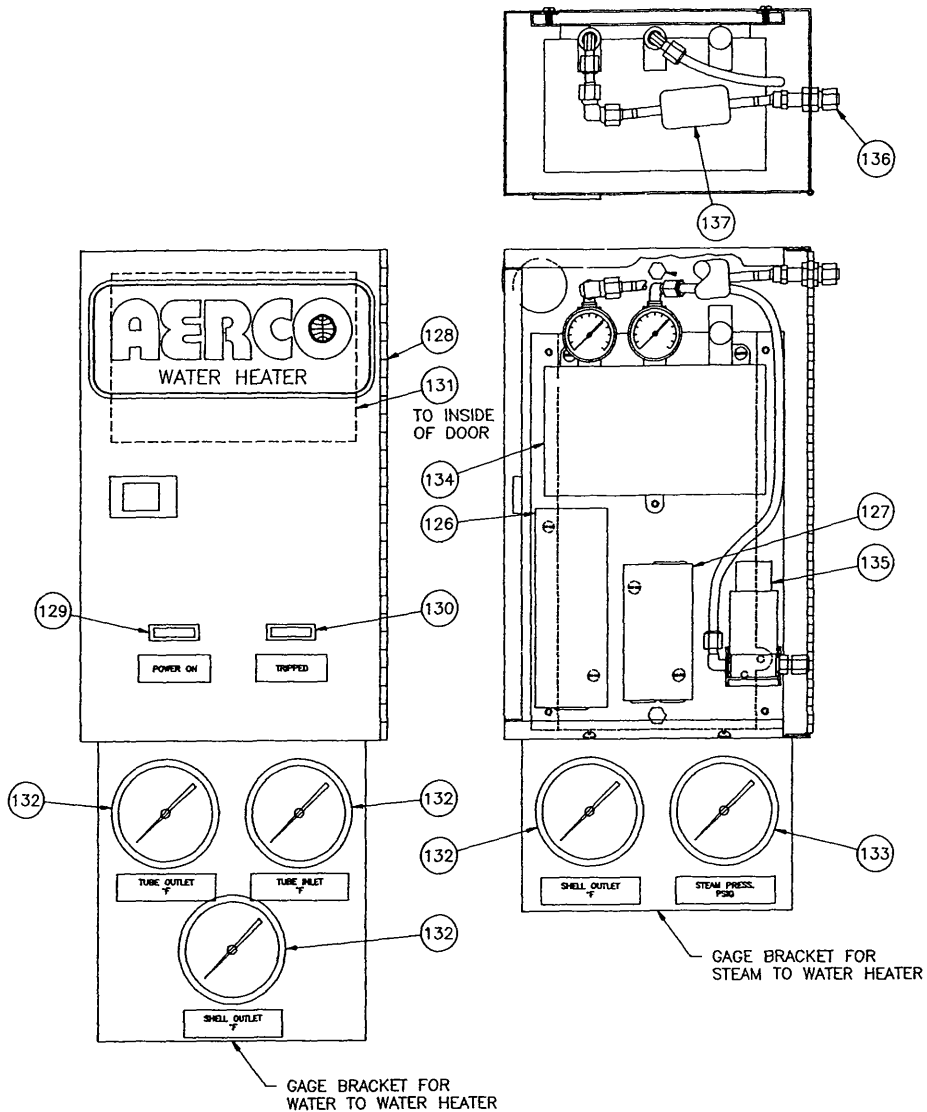
1	126	Temperature Switch	HE-106-13
1	132	Fluid Outlet Temperature Gage,	
1		Boiler Water Inlet or Outlet	
		Temperature Gage	HE-106-13
1	129	Green Indicator Light	HE-106-13
1	130	Red Indicator Light	HE-106-13
1	51	Water Solenoid Valve	HE-106-15
1	52	P&T Relief Valve	HE-106-15

LIST D -- Model DW PACKAGED Heater with Air-Operated Control Valve
List A above PLUS List B or C above PLUS

1	134	Temperature Controller	HE-106-13
1	135	Air Solenoid Valve	HE-106-13

LIST E -- Model DW PACKAGED Heater with Self-Contained Control Valve
Lists A and B above PLUS

1	--	Steam Solenoid Valve (mounted on Control Valve)	
1	--	Control Valve Thermal Element, AERCO Part No 5144-1	

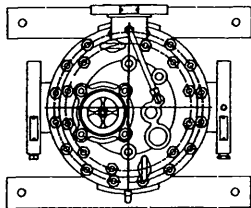


137	122679	1	IN-LINE AIR FILTER (AIR-OP VA)
136	8-37	1	1/4 BULKHEAD UNION CONN (AIR-OP VA.)
135	9537	1	AIR SOLENOID VALVE (AIR-OP VA)
134	18557	1	TEMPERATURE CONTROLLER (AIR-OP VA.)
133	121602-□	A/R	2-1/2" DIAL PRESSURE GAUGE (S/W ONLY)
132	12953-□	A/R	2-1/2" DIAL THERMOMETER
131	121992	1	WIRING DIAGRAM LABEL
130	121948	1	RED INDICATOR LIGHT
129	121949	1	GREEN INDICATOR LIGHT
128	20789	1	CONTROL BOX
127	121299	1	ELECTRICAL JUNCTION BOX
126	5131-1	1	TEMPERATURE SWITCH
ITEM	PART NO	REQ	DESCRIPTION
PARTS LIST#1 (COMMON PARTS)			

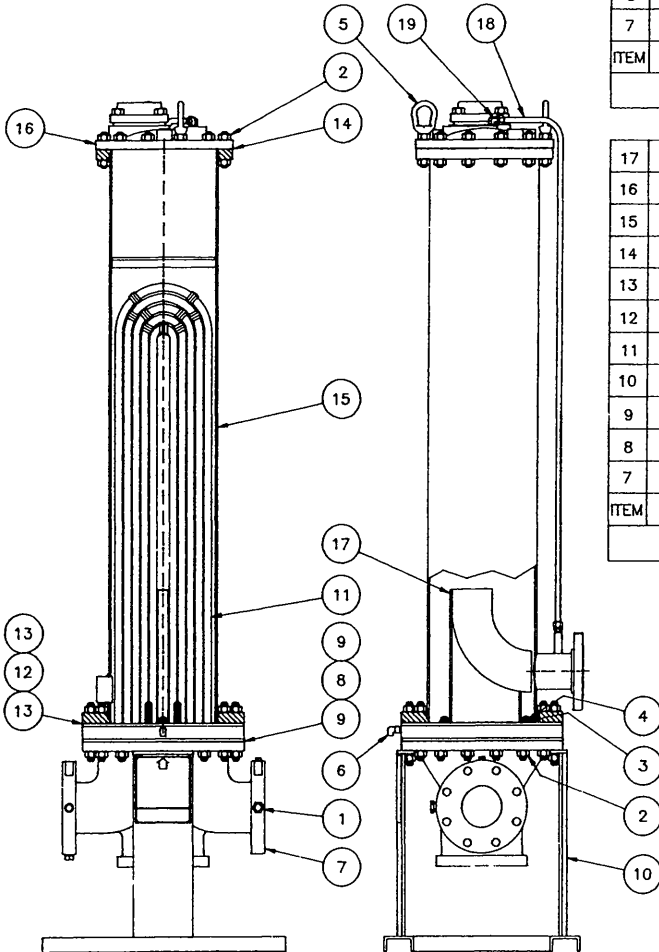
Figure HE-106-13 -- Control Box Assembly and Parts List

19	12867	1	3/8" TUBE x 1/4 NPT 90° COMP FTG
18	RM-6031	A/R	3/8" NOM (500 O D) COPPER TUBE
6	122132	1	LEAK DETECTION ELBOW
5	12865	2	EYENUT
4	6-264	2	3/8-16 NUT
3	6-266	2	3/8" LOCK WASHER
2	6-178	A/R	5/8-11 NUT
1	122770	1	VACUUM BREAKER (S/W ONLY)
ITEM	PART NO	REQ	DESCRIPTION
PARTS LIST (COMMON PARTS)			

17	18820	1	FLOW DIVERTER ASSEMBLY
16	20825	1	UPPER HEAD ASSEMBLY
15	18818	1	SHELL ASSEMBLY
14	122157	1	UPPER SHELL GASKET
13	122158	2	UPPER TUBESHEET RELEASE GASKET
12	122157	1	LOWER SHELL GASKET
11	18816	1	U-BEND TUBE AND TUBESHEET ASS Y
10	20813	1	MANIFOLD & SKID ASSEMBLY
9	122160	2	STEAM/COND MANIFOLD RELEASE GASKET
8	122159	1	STEAM/CONDENSATE MANIFOLD GASKET
7	20811	1	STEAM/CONDENSATE MANIFOLD
ITEM	PART NO	REQ	DESCRIPTION
PARTS LIST (DW-68)			



17	18820	1	FLOW DIVERTER ASSEMBLY
16	18862	1	UPPER HEAD ASSEMBLY
15	181046	1	SHELL ASSEMBLY
14	AG	1	UPPER SHELL GASKET
13	123167	2	UPPER TUBESHEET RELEASE GASKET
12	123166	1	LOWER SHELL GASKET
11	181044	1	U-BEND TUBE AND TUBESHEET ASS Y
10	181045	1	MANIFOLD & SKID ASSEMBLY
9	122160	2	STEAM/COND MANIFOLD RELEASE GASKET
8	122159	1	STEAM/CONDENSATE MANIFOLD GASKET
7	20811	1	STEAM/CONDENSATE MANIFOLD
ITEM	PART NO	REQ	DESCRIPTION
PARTS LIST (DW-45)			



17	161029	1	FLOW DIVERTER ASSEMBLY
16	20824	1	UPPER HEAD ASSEMBLY
15	18794	1	SHELL ASSEMBLY
14	122078	1	UPPER SHELL GASKET
13	122139	2	UPPER TUBESHEET RELEASE GASKET
12	122078	1	LOWER SHELL GASKET
11	18799	1	U-BEND TUBE AND TUBESHEET ASS Y
10	20794	1	MANIFOLD & SKID ASSEMBLY
9	122138	2	STEAM/COND MANIFOLD RELEASE GASKET
8	122077	1	STEAM/CONDENSATE MANIFOLD GASKET
7	20784	1	STEAM/CONDENSATE MANIFOLD
ITEM	PART NO	REQ	DESCRIPTION
PARTS LIST (DW-24)			

Figure HE-106-14 -- AERCO Model DW Bare Heat Exchanger Assembly and Parts List

62	8-40	1	1/4" 90° COMP FTG (AIR-OP VA ONLY)
61	RM-3041	A/R	1/4 IMPOLENE TUBING (AIR-OP VA ONLY)
60	RM-6041	A/R	1/4 NOM (375 O D) COPPER TUBE
59	18840-□	1	CONTROL BOX ASSEMBLY
58	12953-□	A/R	THERMOMETER (W/W ONLY)
57	6-178	A/R	5/8-11 NUT
56	8-6	A/R	1/4 TUBE x 1/4 NPT MALE COMP FTG
55	A/R	A/R	CONTROL VALVE
54	12820-11	1	1-1/2 BALL VALVE
53	5143	1	THERMAL WELL BUSHING
52	6461-150	1	P&T RELIEF VALVE
51	5134	1	1/2 WATER SOLENOID VALVE
50	RM-2000	A/R	3/8" TYPE LT CONDUIT (SELF-CONT VA ONLY)
ITEM	PART NO	REQ	DESCRIPTION
PARTS LIST (COMMON PARTS)			

63	20828	1	BARE HEATER ASSEMBLY
ITEM	PART NO	REQ	DESCRIPTION
PARTS LIST (DW-68)			

63	201002	1	BARE HEATER ASSEMBLY
ITEM	PART NO	REQ	DESCRIPTION
PARTS LIST (DW-45)			

63	20822	1	BARE HEATER ASSEMBLY
ITEM	PART NO	REQ	DESCRIPTION
PARTS LIST (DW-24)			

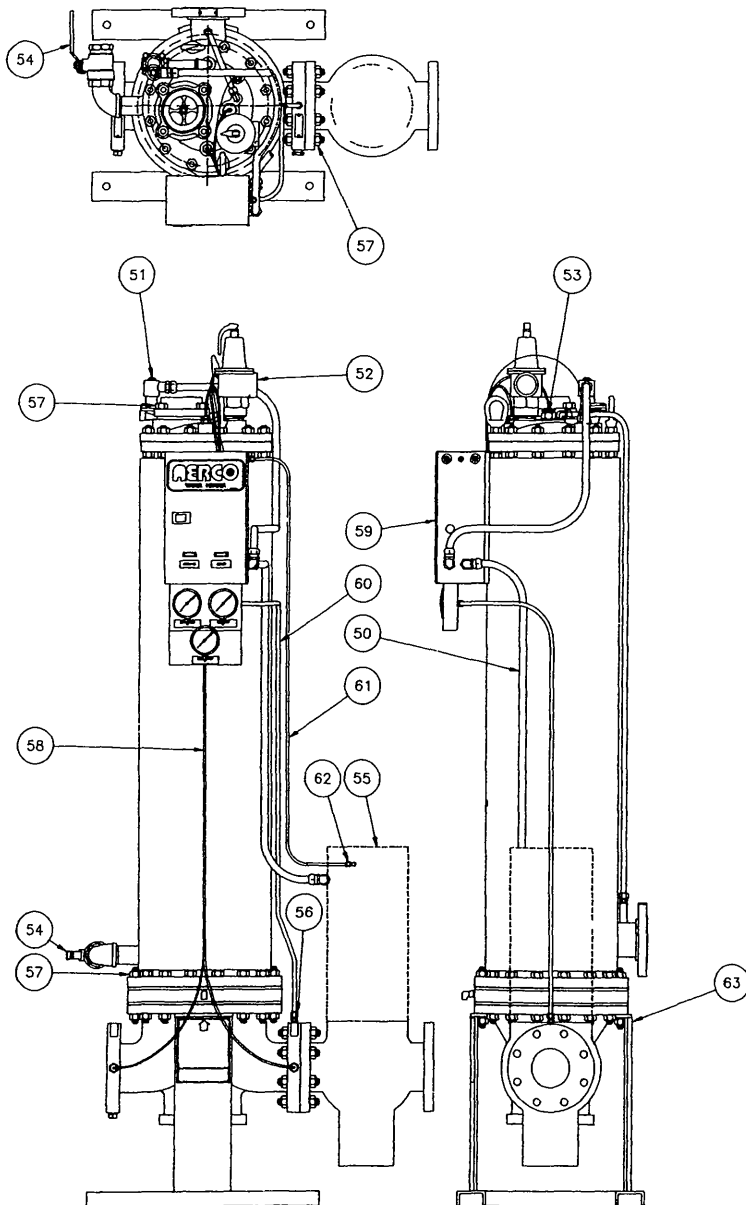


Figure HE-106-15 -- AERCO Model DW Packaged Heater Assembly and Parts List

