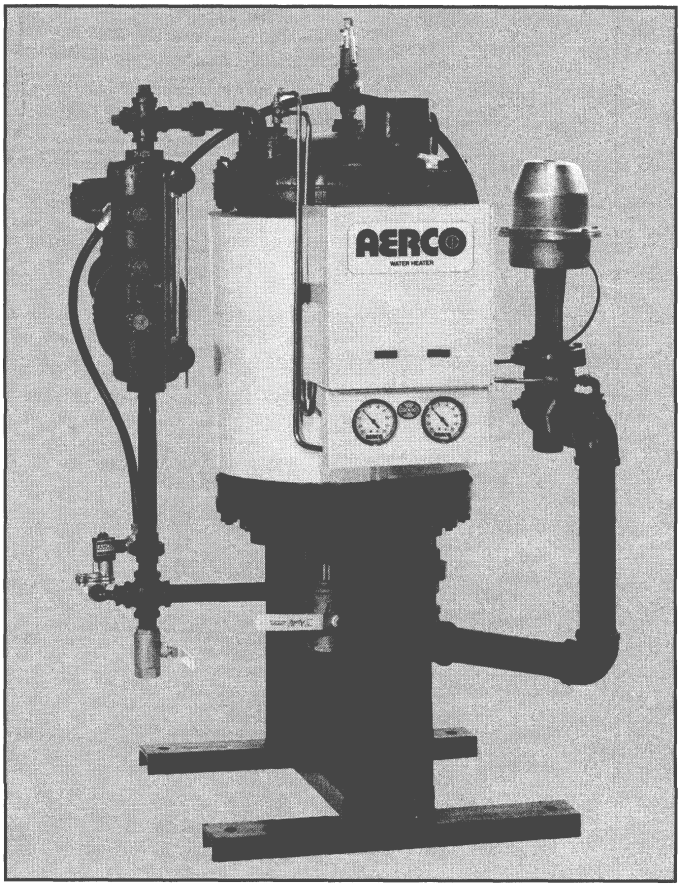
Instruction No. **SG-101**

**AERCO INTERNATIONAL, Inc., Northvale, New Jersey, 07647 USA**

# Installation, Operation & Maintenance Instructions

# PACKAGED STEAM GENERATOR

# MODEL SS1B PLUS

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**INSTRUCTIONS – AERCO HELITHERM STEAM GENERATOR MODEL SS1B-PLUS**

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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 AND WATER STOP VALVES AND CAREFULLY DECREASE ALL TRAPPED PRESSURES TO ZERO (see Step OP8, Shutdown, in OPERATING PROCEDURES Section) BEFORE PERFORMING ANY MAINTENANCE.

**WARNING!**

LIVE STEAM CAN CAUSE SEVERE BURNS

NEVER ATTEMPT TO SEARCH FOR LEAKAGE IN A LIVE STEAM SYSTEM BY "FEEL". USE A MIRROR OR OTHER SUITABLE POLISHED OBJECT.

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# GENERAL INFORMATION

## INTRODUCTION

This instruction covers a HELITHERM Series A or Series B Steam to Water Heat Exchanger. Steam is the primary or tube side fluid. Water Converted to steam is the secondary or shell side fluid.

The number of coils included in a particular Heater is denoted by the last two digits in the Heat Exchanger Model No. That is: 01 = 1 coi1, 03 = 3 coils, 10 = 10 coils, 15 = 15 coils, etc.

The Style designation for a Heat Exchanger denotes materials of construction for the various components. If this information is required for a specific heat exchanger, or contact the nearest AERCO Sales Representative.

## ACCESSORIES

Accessories included in the AERCO B-Plus Steam Generator Package Assembly are (see Figures SG-101-1, SG-101-8, and SG-101-10):

- Over-Pressure Limit System, including the fo1lowing:
- Steam Pressure Controller - Installed in the Control Box
- Liquid Level Controller - mounted on the side of the Generator
- Water Solenoid Valve -- installed at the cold water inlet
- Inlet and Outlet Steam Pressure Gages -- -- mounted" below the Control Box
- Over-Pressure Limit System, including the following:
  - Pressure Switch - installed in the Control Box
  - Air Solenoid Valve -- installed in the Control Box
  - Indicator Lights -- "Power On" and "Over Pressure" -- installed in the Control Box
- Pressure & Temperature Relief Valve – size furnished as required in accordance with the design Btu output of the Generator -- located in the Generator top head
- Inverted Bucket Steam Trap -- located in the Condensate Outlet (see Figure SG-101-1)

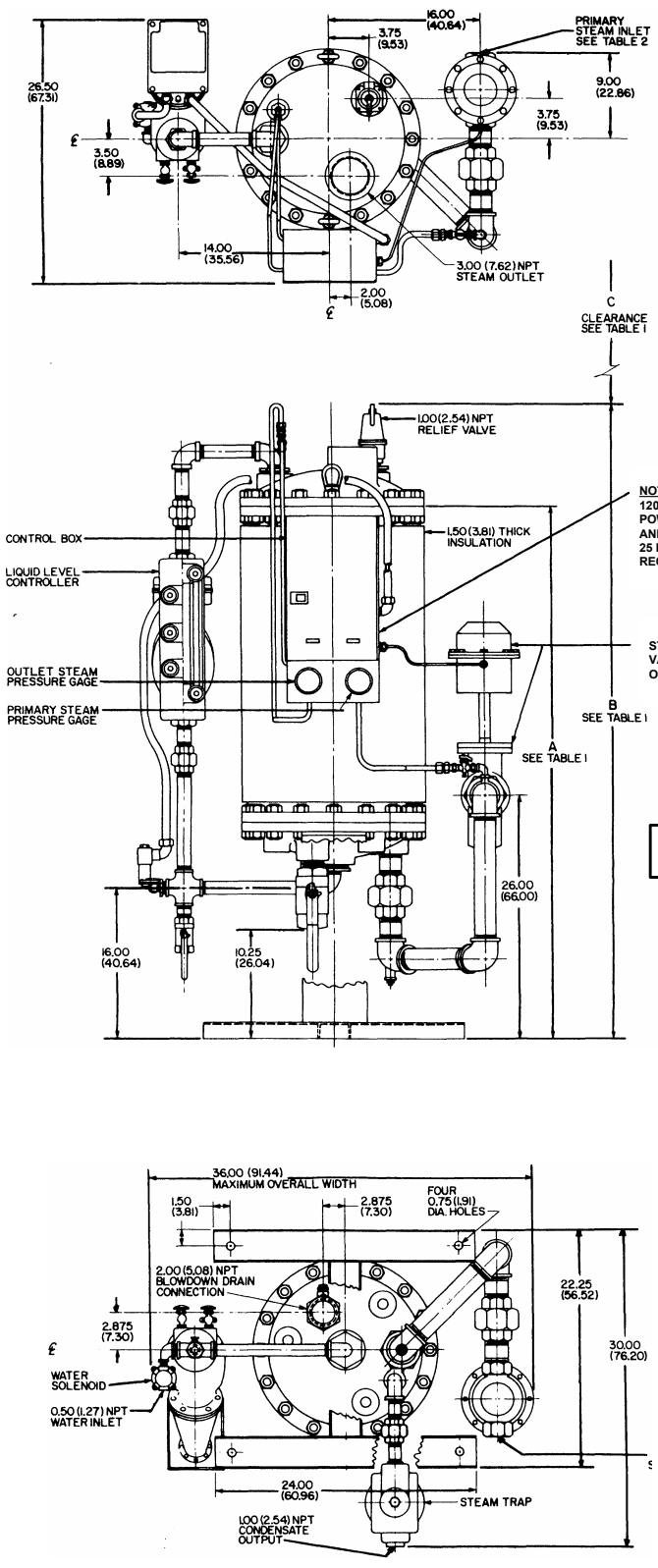
All other items, such as: stop valves, check valves, strainers, unions or flanges and other piping and fittings as shown in Figure SG-101-2 are to be furnished by the installer or user.

**NOTE**

The AERCO Steam Generator 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 from that as originally furnished without the written approval of AERCO.

**NOTE**

THIS INSTRUCTION COVERS ONLY THE STEAM GENERATOR PORTION OF THE MODEL B-PLUS PACKAGED ASSEMBLY. SEPARATE INSTRUCTIONS ARE INCLUDED IN THIS PACKAGE COVERING THE PRIMARY STEAM CONTROL VALVE, STEAM PRESSURE CONTROLLER LIQUID LEVEL CONTROLLER OVER-PRESSURE LIMIT SYSTEM AND ITS COMPONENTS AND OTHER ACCESSORIES INCLUDED IN THE GENERATOR PACKAGE.




NOTE:
120V/60 Hz ELECTRICAL POWER SUPPLY AND 25 PSIG AIR SUPPLY REQUIRED

DIMENSIONS ARE SHOWN IN INCHES (CENTIMETERS)

**TABLE 1**

| GENERATOR MODEL | NO. OF COILS | HEATING SURFACE FT² (M²) | DIMENSIONS INCHES (CM) A | B | C | APPROX. WT. LBS. (KG) DRY | WET |
|---|---|---|---|---|---|---|---|
| SS1B+02 | 2 | 15 (1.39) | 40.75 (103.5) | 55.00 (139.70) | 21.00 (53.34) | 520 (237) | 660 (300) |
| SS1B+03 | 3 | | | | | | |
| SS1B+04 | 4 | 20 (1.86) | 45.75 (116.20) | 60.00 (152.40) | 26.00 (66.04) | 570 (259) | 720 (327) |
| SS1B+05 | 5 | 25 (2.32) | 49.75 (126.37) | 64.00 (162.56) | 30.00 (76.20) | 610 (277) | 770 (350) |
| SS1B+06 | 6 | 30 (2.79) | 54.75 (139.07) | 69.00 (175.26) | 35.00 (88.90) | 640 (291) | 830 (377) |
| SS1B+07 | 7 | 35 (3.25) | 58.75 (149.23) | 73.00 (185.42) | 40.00 (101.60) | 670 (304) | 880 (400) |
| SS1B+08 | 8 | 40 (3.72) | 63.75 (161.93) | 78.00 (198.12) | 45.00 (114.30) | 710 (322) | 930 (422) |
| SS1B+09 | 9 | 45 (4.18) | 67.75 (172.09) | 82.00 (208.28) | 50.00 (127.00) | 740 (336) | 980 (445) |
| SS1B+10 | 10 | 50 (4.65) | 72.75 (184.79) | 87.00 (220.98) | 55.00 (139.70) | 770 (350) | 1030 (468) |
| SS1B+11 | 11 | 55 (5.11) | 76.75 (194.95) | 91.00 (281.14) | 60.00 (152.40) | 800 (363) | 1080 (490) |
| SS1B+12 | 12 | 60 (5.57) | 81.75 (207.65) | 96.00 (243.84) | 65.00 (165.10) | 840 (381) | 1130 (513) |
| SS1B+13 | 13 | 65 (6.04) | 85.75 (217.81) | 100.00 (254.00) | 70.00 (177.80) | 870 (395) | 1180 (536) |
| SS1B+14 | 14 | 70 (6.50) | 90.75 (230.51) | 105.00 (266.70) | 75.00 (190.50) | 900 (409) | 1230 (558) |
| SS1B+15 | 15 | 75 (6.97) | 94.75 (240.67) | 109.00 (276.86) | 80.00 (203.20) | 930 (422) | 1280 (581) |

**TABLE 2**

| VALVE SIZE INCHES | PRIMARY STEAM INLET SIZE, NPT INCHES | CM |
|---|---|---|
| 1.00 | 1.00 | 2.54 |
| 1.25 | 1.25 | 3.18 |
| 1.50 | 1.50 | 3.81 |
| 2.00 | 2.00 | 5.08 |

**TABLE 3**

| HEAT EXCHANGER DESIGN PARAMETERS | MAX. WORKING PRESSURE PSIG (kPa) | MAX. TEMP. DEG. F (DEG. C) | TEST PRESSURE PSIG (kPa) |
|---|---|---|---|
| SHELL SIDE | 50 (345) | 400 (204) | 75 (517) |
| TUBE SIDE | 250 (1723) | 400 (204) | 375 (2584) |
| ASME CODE CERTIFICATION STAMP | | | U-7 |

*Figure SG-101-1. Dimensions for AERCO Packaged Steam Generator, Model SS1B-PLUS*

# INSTALLATION

1. Dimensions for an AERCO Steam Generator Model SS1B-PLUS are shown in Figure SG-101-1.

2. Uncrate the Generator carefully. Set it upright by using a block and tackle or hoist attached to the lifting lugs on the top head of the Generator (the eye bolts shown in Figure SG-101-9). Always use the lifting lugs to lift and/or move the Generator.

3. If possible, for easy in-place maintenance, locate the Generator where there is at least 2 feet clearance all around the unit and where the head room clearance is equal to or more than dimension C in Figure SG-101-1 for the size Generator furnished.

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

5. Make all piping connections as instructed in Step 6 below and in accordance with Figure SG-101-2 or with any specific piping diagram which may have been furnished by AERCO for this installation.

6. For best Generator 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 Generator connection types, sizes, and locations, see Figure SG-101-1.

   c. All piping to the Generator top head should be provided with unions or flanges which are located beyond the outside diameter of the Generator head to permit removal of the head and she!1for in-place maintenance.

   d. Include all of the stop valves, check valves, steam traps and other elements in the piping as shown in Figure SG-101-2 or as separately specified by AERCO. Note that the steam trap and Generator drain valve are included in the Generator assembly.

   e. Be sure to include a vacuum breaker in the steam outlet line ahead of the stop valve. This assures no vacuum buildup during operation.

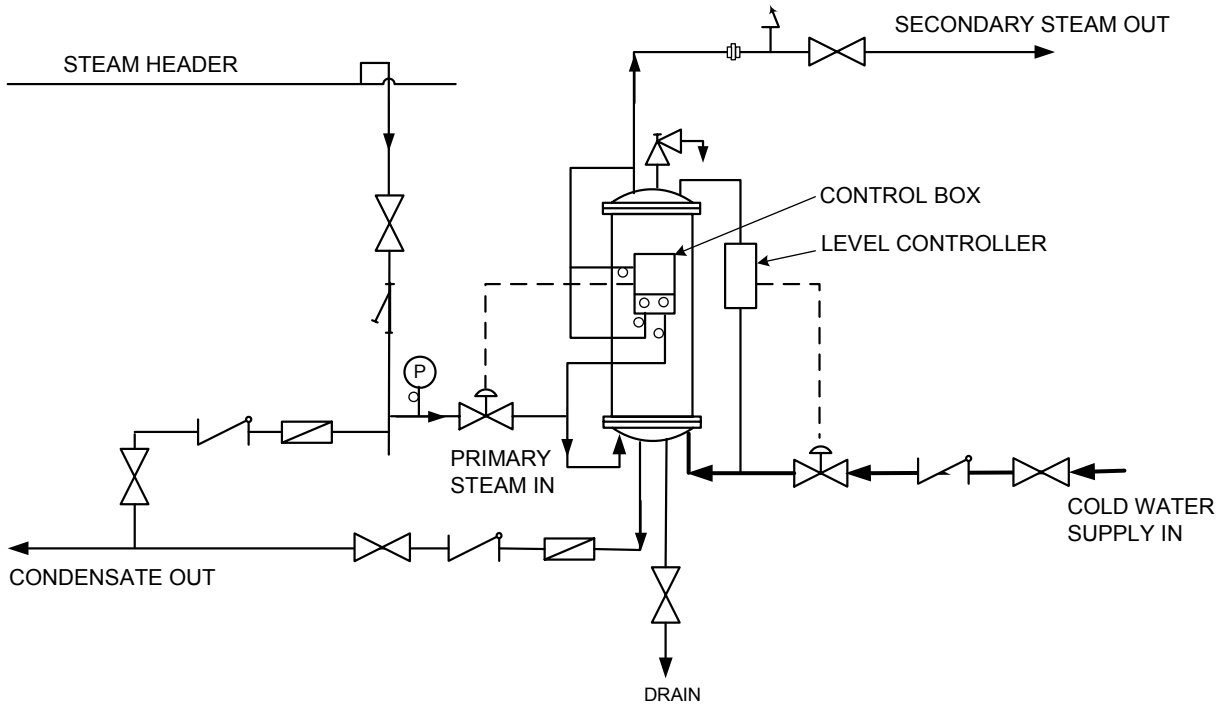
   f. The condensate return piping should be arranged to permit condensate to drain freely by gravity from the Generator bottom head. Failure to do so may result in Generator improper operation and/or in damage to the primary steam/condensate system.

   g. All drain discharges -- relief valve in the top head of the Generator and drain valve in the bottom head -- should be piped directly to a convenient floor drain.

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

8. Make the necessary air-operated Control Valve supply air connection to the connector through the side of the control box. THE SUPPLY AIR PRESSURE MUST BE MAINTAINED AT 25 PSIG.

9. Connect 110V 60 Hz power supply wiring through the side of the control box to the electrical junction box.




LEGEND

| | | |
|---|---|---|
| STOP VALVE | STRAINER | PRESSURE GAGE |
| RELIEF VALVE | RELIEF VALVE | PIPE UNION OR FLANGES |
| CONTROL VALVE | STEAM TRAP | VACUUM BREAKER |

***Figure SG-101-2. Piping Connections for AERCO Steam Generator***

# PRINCIPLE OF OPERATION

The AERCO Helitherm Heat Exchanger (Generator) SS1B-P1us consists of four principal parts (see Figure SG-101-3):

1. Shell with Top and Bottom Heads
2. Coils assembled to Primary Steam Riser and Condensate Return
3. Pressure Control Unit
4. Water Level Control Unit

Cold Water enters the Generator through the inlet connection and dispenser (dispersion tube) in the bottom head. The Cold Water in the shell, then, flows upward among the coils (heating surfaces) and, heated, is converted to Secondary Steam which is discharged through the Secondary Steam outlet connection in the top head.

Primary Steam enters through the Primary Steam Control Valve and its inlet connection in the bottom head and is fed through the Primary Steam riser to the inlet of each coil unit. The Primary Steam then flows through each coil unit simultaneously in parallel, leaves through each coil outlet as Condensate, enters the condensate return, and leaves the Generator through the condensate outlet connection in the bottom head of the Generator.

The Pressure Controller senses the pressure of the Secondary Steam at any given moment and signals the Primary Steam Control Valve to modulate between full open or closed as necessary to maintain the required Secondary Steam outlet pressure.

The Water Level Controller senses the level of water in the Generator at any given moment and signals the Water Solenoid Valve to open or dose as necessary to maintain the desired water level in the Generator.

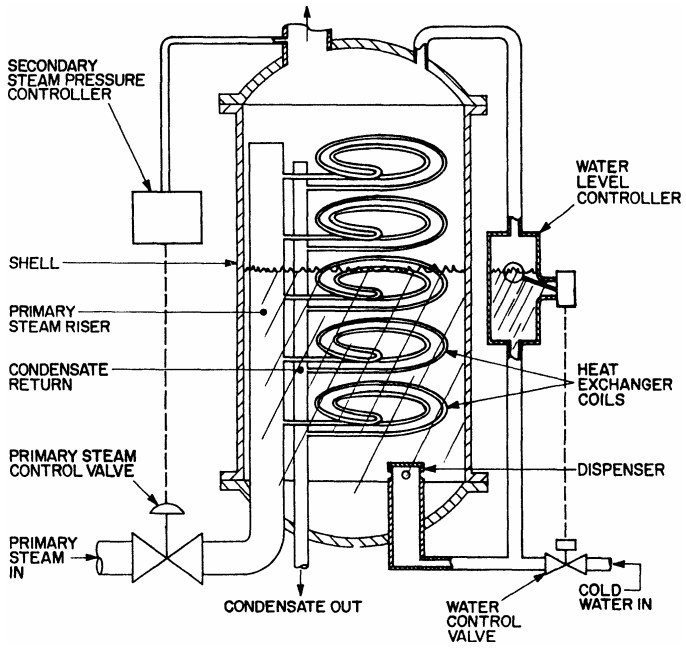



***Figure SG-101-3. AERCO Steam Generator Schematic***

# OPERATING PROCEDURES

OP1. With the installation entirely completed, including:

- All piping connections have been made,
- All connecting piping has been cleaned and blown out,
- All connections per steps 8 and 9 under INSTALLATION have been made,

turn ON the electrical power supply and open any stop valve(s) in the Cold Water inlet line Hold the relief valve in the Generator top head open to allow air to escape (otherwise an air pocket will be built up and the Generator will not fill properly). The Level Controller will hold the Water Solenoid Valve open to allow water to flow into the Generator shell until the desired water level is reached, at which time the Level Controller will close the Water Solenoid Valve. Then close the relief valve.

OP2. Temporarily set the Pressure Switch (58) in the Control Box to its high pressure limit. See Figure SG-101-8, (Item 58) and the wiring diagram in Figure SG-101-4.

OP3. Set the Pressure Controller (53) in the Control Box at the pressure desired to be held at the Secondary Steam outlet.

OP4. Open any stop valve(s) in the Secondary Steam outlet line. Open a steam outlet valve in the process to insure a flow of steam from the Generator. For best results in adjusting the pressure control, a steam flow of 10% to 23% of Generator rating is desirable.

OP5. Slowly open all stop valves in the Primary Steam inlet and Condensate outlet lines.

OP6. Follow the instructions furnished with the air-operated Pressure Controller and Control Valve and:

a. Introduce Primary Steam to the Generator.

b. Adjust the Pressure Controller until the Secondary Steam outlet pressure is being held steady at the desired pressure. If the Secondary Steam outlet pressure is erratic, see step OP7 below.

c. Close the process steam outlet valve which was opened in step OP4}.

OP7. If the Secondary Steam outlet pressure is erratic, especially during load changes:

a. Put a load on the Generator by opening a steam outlet or outlets in the process as quickly as possible.

b. Adjust the Pressure Controller to provide best response on load changes. See the instruction furnished with the Controller.

OP8. Adjust the Over-Pressure Limit System Pressure Switch (58) in the Control Box to its desired setting -- usually 5 to 7 psig higher than the desired Secondary Steam pressure.

OP9. The Generator is now set for operation. No further operation procedure is necessary unless, or until, further pressure control adjustments may be required. If so, repeat steps OP4, OP5, OP6, OP8, and, if necessary, step OP7.

OP10. To SHUT DOWN the system:

a. Close all stop valves in the Primary Steam inlet and Condensate outlet lines.

b. In this order, close any stop valves in:

(1) the Secondary Steam outlet line,

(2) the Cold Water inlet line.

OP11. For DRAINING THE GENERATOR, see the instructions included under ROUTINE MAINTENANCE.

OP12. To START UP again, with the shell filled per step OP1 above, open the stop valves in the following order:

a. stop valve in the Cold Water inlet line,

b. stop valve in the Secondary Steam outlet 1ine, and

c. stop valves in the Primary Steam inlet and Condensate outlet lines.

OP13. After each startup, check the pressure control, If necessary, make adjustments per steps OP4 through OP8 above.

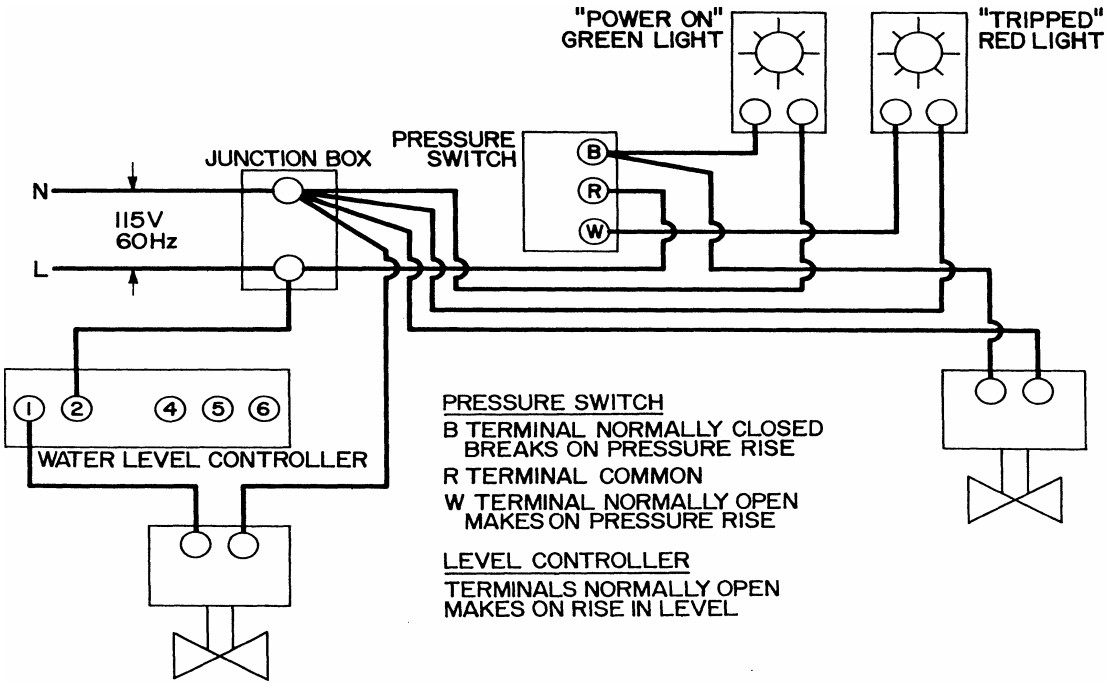



***Figure SG-101-4. Over-Pressure Limit System Wiring Diagram***

# 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 blow-down (draining) is required lo remove accumulated solids.

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

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

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

c. Even if the amount of solids appears to be very light, drain the Generator at least once each year.

d. Also, see the TROUBLESHOOTING and CORRECTIVE MAINTENANCE which follow. If descaling by thermal shock is required, schedule that procedure in ROUTINE MAINTENANCE

Check the pressure control at least once every 3 months. Make any necessary adjustments per steps OP4 through OP8 of the OPERATING PROCEDURES Section.

DRAIN THE HEATER as follows:

RM1. Close all stop valves in the Primary Steam inlet and Condensate outlet lines.

RM2. RM2. In this order, close the stop valves in:

a. the Cold Water inlet line

b. the Secondary Steam outlet line,

RM3. Carefully open the relief valve in the Generator top head to relieve pressure in the Generator shell.

RM4. With the relief valve being held open (to prevent creating a vacuum), open the drain valve and drain the Generator completely.

RM5. To refill the Generator and place it back into service, close the drain valve and follow steps OP1, OP12 and OP13 in the OPERATING PROCEDURES Section.

# TROUBLESHOOTING

| SYMPTOM | PROBABLE CAUSE & REMEDY "CORRECTIVE MAINTENANCE" ITEM NO. |
|---|---|
| A. Generator does not maintain required pressure at rated capacity. | CM1, CM2, CM5, CM8, CM9, CM11, CM12, CM13 |
| B. Secondary Steam pressure is too high. | CM1, CM5, CM7, CM9 |
| C. Secondary Steam outlet pressure fluctuates widely. | CM2, CM5, CM7, CM8, CM9, CM11, CM13 |
| D. Insufficient Water to the Generator. | CM3, CM4 |
| E. Excess or insufficient Condensate being returned from the Generator. | CM5, CM11 |
| F. Steam being discharged into Condensate drain, | CM12, CM13 |
| G. Relief Valve pops. | CM7, CM9, CM10 |
| H. Generator shuts down below, at, or too near above required Secondary Steam outlet pressure. | CM10 |
| I. Loud banging in Generator or in Primary Steam or Condensate piping (not to be confused with a normal clicking noise). | CM5, CM6 |

# CORRECTIVE MAINTENANCE

Refer to the previous TROUBLESHOOTING Table. The following are probable causes and remedies for improper action of the Generator.

CM1. The Primary or Secondary Pressure Gage may read wrong. Check each with a gage that is known to be correct.

CM2. Primary Steam pressure is too low. Check the Primary Steam pressure gage below the Control Box. If the reading is low, adjust the steam pressure to that which is required. If there is a restriction in the Primary Steam supply line, the gage reading will drop excessively when the Generator calls for full steam even though the pressure appears to be normal when the load is light. If the Primary Steam supply pressure is correct, its pressure gage reading should reach design pressure for steam in the coils as the Generator Secondary Steam outlet pressure drops. If it does not, check the operation of the Primary Steam Control Valve.

CM3. Water level is low or water supply fails. Check the operation of the Level Controller and Water Solenoid at the Cold Water inlet.

CM4. Cold Water pressure is low. Check and correct, if necessary, the Water pressure to the Generator.

CM5. 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 6f in the INSTALLATION Section. 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.

CM6. Primary Steam supply line is not properly trapped. Install a trap as indicated in Figure SG-101-2.

CM7. The Primary Steam Control Valve does not close. Check the instructions covering the Valve.

CM8. The Primary Steam Control Valve does not open. Check the instructions covering the Valve.

CM9. The Secondary Steam pressure control system is not operating properly. Check the instructions covering the Pressure Controller in the Control Box.

CM10. The Over-Pressure 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 the pressure switch and solenoid valve.

CM11. There is a leak in the Generator coil(s), steam riser, or Condensate return, causing water from the shell to leak into the heating coil system, or steam or condensate from the coil system into the shell. To verify such a leak, shut off the Primary Steam supply and break a connection in the Condensate line – BE CAREFULL TO AVOID SEVERE BURNS --.Condensate will drain from the coil system 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 Generator. Disassemble, inspect, repair (if possible), replace, and reassemble the Generator as outlined in the DISASSEMBLY and REASSEMBLY Sections.

CM12. The Generator coils are scaled up. Descale the Generator by thermal shock in the manner outlined under DESCALING BY THERMAL SHOCK.

CM13. The Generator is being utilized at a rate higher than its design capacity. Contact the nearest AERCO Representative for advice in remedying this problem.

# DESCALING BY THERMAL SHOCK METHOD

Where, under certain conditions of continuous steady usage, the cold water is so hard or alkaline that normal flexure of the coils (see ROUTINE MAINTENANCE) and routine blow-down (draining the Generator shell) will not remove scale build-up on the coils, the heating surfaces (coils) may be thermally shocked, without damage to any part of the Generator, to dislodge scale solids.

Proceed as follows:

TS1. Drain the Heater per steps RM1 through RM4 in the ROUTINE MAINTENANCE Section. However, instead of holding the relief valve open in step RM4, remove the relief valve from the Generator top head.

TS2. Open the Generator drain valve. Leave the drain valve open until step TS8 in the following procedure.

TS3. Connect a source of cold water (for example, a hose) to the open relief valve connection.

TS4. Open all stop valve(s) in the Primary Steam inlet line and the Condensate outlet line to allow steam to the Generator. After about 30 seconds, or until steam is blowing out of the condensate drain line, close the stop valve in the Condensate outlet line. Leave the Primary Steam inlet line open for about 2 minutes longer, then close all Primary Steam inlet stop valves.

TS5. Inject a flow of cold water through the relief valve connection for about 2 minutes. Then shut off the water flow and open the Condensate drain line stop valve to drain off all Condensate.

TS6. Repeat steps TS4 and TS5 several times until the water coming from the Generator drain appears to be relatively free of solids.

TS7. 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 Generator shell.

TS8. After the Generator shell has been completely drained, close the Generator drain valve, replace the relief valve, and place the Generator back into operation per steps OP1, OP12, and OP 13 in the OPERATING PROCEDURES section.

TS9. 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:

| | |
|---|---|
| SG-101-4 | Over-Pressure Limit System Wiring Diagram |
| SG-101-8 | Generator Control Box Assembly |
| SG-101-9 | Generator Assembly |
| SG-101-10 | Generator Package Assembly |

Special Tools Required;

(1) Torque wrench for 5/8" nuts.

(2) A block and tackle or ratchet or winch hoist is recommended for lifting off the Generator top head and shell, or for lifting and moving the Generator.

NOTE that all part item numbers given in parentheses ( ) in the instructions below refer to those shown in Figure SG-101-8, SG-101-9, or SG-101-10.

D1. Shut down and drain the Generator in accordance with steps RM1 through RM4 under ROUTINE MAINTENANCE above.

D2. Disconnect ALL external piping from the Generator top head, including that to the Relief Valve (24). Disconnect the Secondary Steam outlet piping at the union or flanges located beyond the outside diameter of the Generator top head.

D3. Disconnect Union (29) located above the Level Controller (34).

D4. Disconnect the power supply wiring to the Control Box and the wiring between the Control Box and the Level Controller,

D5. Disconnect the air supply and control air piping from the Control Box.

D6. Close the Shutoff Cock (38) in the Primary Steam Pressure Gage line and disconnect the Compression Fitting (25).

D7. Mark the edge of the Generator bottom head flanges in order to indicate their correct relative positions upon reassembly.

D8. Remove Nuts (l4) and Studs (12) from the Generator bottom head flanges.

D9. Using a hoist or block and tackle attached to the Lifting Lugs (2) on the Generator top head, CAREFULLY lift the top head and shell STRAIGHT UP off the Generator riser and coil, assembly., DO NOT SCRAPE the shell lining against the coil tubing.

D10. Clean and inspect the inside of the shell and the Steam Riser/Condensate Return/Coils assembly for obvious damage.

D11. With the Condensate Return stop valves closed, open the stop valve(s) in the Primary Steam inlet line to allow Primary Steam to the Generator coils. Any leak in the coils. Steam riser, or Condensate return will become visible quickly. Note where the leaks are and shut off the Primary Steam.

D12. If a coil must be replaced, use a 1-5/16" open end wrench to disconnect the unions holding the coils to the Steam riser and Condensate return. Be careful not to damage the spud threads (see Figure SG-101-6).

D13. If either the Steam riser or Condensate return must be replaced, it is recommended that the Generator be reassembled and returned to the AERCO factory for replacement. (AERCO has the proper factory setup, pressure testing equipment, ready access to any needed additional parts, and the expertise necessary to provide a guaranteed replacement.) Contact the nearest AERCO Representative for instruction for making the return.

If, however, returning the Generator to the AERCO factory is impractical, field replacement may be made but cannot be guaranteed by AERCO. If this decision is made, proceed as follows:

a. Remove all coils per step D12 above. Examine each coil carefully to make sure that replacement at this time is not an advisable action.

b. Remove the damaged Steam riser or Condensate return.

D14. If the shell copper liner has been damaged, reassemble the Generator and return it to the AERCO factory for replacement of the 1iner. Contact the nearest AERCO Representative for instruction for making the return.

D15. If it is necessary for any reason to remove the Generator top Head (1) from the Shell (11):

a. Disconnect the Compression Fittings (25) from their connections at the top Head and pull the Tubing (23) aside.

b. Remove the Nuts (14), Studs (3) and (12), and Lifting Lugs (Eye Bolts) (2), and lift the Head off the Shell.

# REASSEMBLY

Reference illustrations:

Same as DISASSEMBLY, plus:

SG-101-5 Alignment of Steam Riser and Condensate Return

SG-101-6 Assembly of Coil to Steam Riser or Condensate Return

SG-101-7 Coil Spacing Tool

Special Tools Required; Same as for DISASSEMBLY, plus a coil spacing tool as shown in Figure SG-101-7.

**NOTE**

All part item numbers shown in parentheses ( ) in the following instructions refer to those shown in Figures SG-101-8, SG-101-9, or SG-101-10.

R1. If either the steam riser (7) or Condensate Return (8) must be replaced:

a. Use pipe joint compound or Teflon tape on the threads and screw the replacement Steam Riser and/or Condensate Return into the Generator lower head.

b. Tighten the Riser or Return taking care to line up the spud centers with the raised indicators on the bosses in the head casting as shown in Figure SG-101-5.

R2. If a coil must be replaced:

a. See Figure SG-101-6. A conical Coil Gasket (10) is required for each Coil union in the Generator. It is recommended that Coil Gaskets (10) be replaced whenever a coil is reassembled to a Riser or Return, even though the Coil itself is not being replaced. Snap the gasket into the Riser or Return spud.

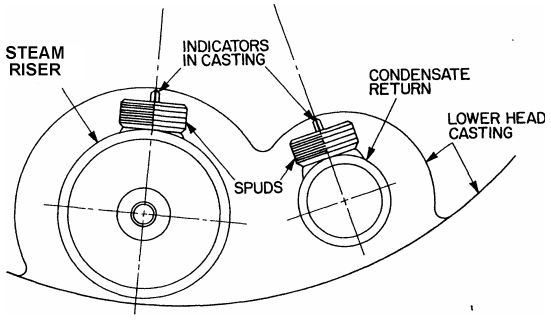



***Figure SG-101-5. Alignment of Steam Riser and Condensate Return***

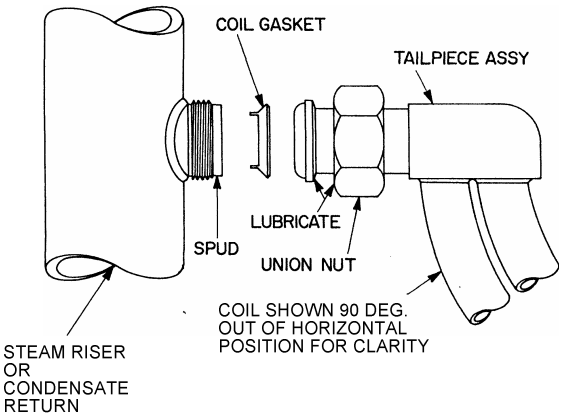



***Figure SG-101-6. Assembly of Coil to Steam Riser or Condensate Return***

b. Before attempting to assemble the Coils to the Riser or Return spuds, wrap each spud with Teflon tape and apply a lubricant (grease) to the back of the union nuts and shoulders on the Coil tail pieces (see Figure SG-101-6). Rotate the nuts to spread the lubricant.

c. Assemble the Coil union to the Condensate Return (8) first. Do not tighten. Assemble the other Coil union to the Steam Riser (7).

d. Using a torque wrench, tighten both unions to approximately 75 ft-lb while holding the coil so that the turns of the coil remain perfectly horizontal, where they are brazed to the tail pieces, after tightening. NOTE: Never use a hammer on a wrench to tighten a union nut. Deformation and subsequent leaking may result.

e. Space the Coil tubes evenly throughout the Generator, with each tube space at least 1/2" wide. It is especially important that no tubes rest on any Coil unions. A spacing tool may be made up similar to that shown in Figure SG-101-7 (available from AERCO, Part No. 12523). Insert the tool flat between the Coil tubes and twist the tool until the desired spacing is obtained.

f. Test for leaks per step D11 of the DISASSEMBLY Section. Make any corrections necessary.

R3. Clean all gaskets and gasket surfaces thoroughly. AERCO recommends that new gaskets (13) be used whenever reassembling either the top or bottom head to the shell.

R4. If the Generator Top Head (1) has been removed from the Shell (11):

a. Clean the Gasket surfaces thoroughly and place a Gasket (13) (a new Gasket is recommended) on the Shell top flange.

b. Replace the Generator top Head onto the top of the Shell, lining up the stud holes.

c. Reassemble the Studs (3) and (12), the Lifting Lugs (Eye Bolts) (2), and Nuts (14) into the Head and Shell flanges. Cross-tighten the Nuts to approximately 75 ft-lb torque to obtain uniform seating. Then, progressively tighten the Nuts to approximately 150 ft-lb torque for a tight seal.

d. Realign the Tubing (23) and reconnect the Compression Fittings (25) to their connections at the top Head.

R5. Place the Gasket (13) on the Generator bottom Head flange.

R6. Using a hoist or block and tackle attached to the Lifting Lugs (2) on the Generator top Head (1), 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.

R7. 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 D7 of the DISASSEMBLY Section. For further assurance, check to see that the raised indicators on the outside diameters of each of the top and bottom Head flanges line up with each other. This is very important.

R8. Assemble the Studs (12) and Nuts (l4) into the bottom Head and Shell flanges. Tighten the Nuts in the same manner as in step R4c above.

R9. Reconnect the Compression Fitting (25) in the Primary Steam Pressure Gage line and open the Shutoff Cock (38).

R10. Reconnect Union (29) located above the Level Controller (34).

R11. Reconnect the air supply and control air piping to the Control Box.

R12. Reconnect the power supply wiring to the Control Box and all wiring between the Control Box and the Level Controller (34).

R13. Reconnect all external piping to the Generator Top Head, including that to the Relief Valve (24).

R14. Refill and place the Generator back into operation in accordance with steps OP1, OP12 and OP13 in the OPERATING PROCEDURES Section.

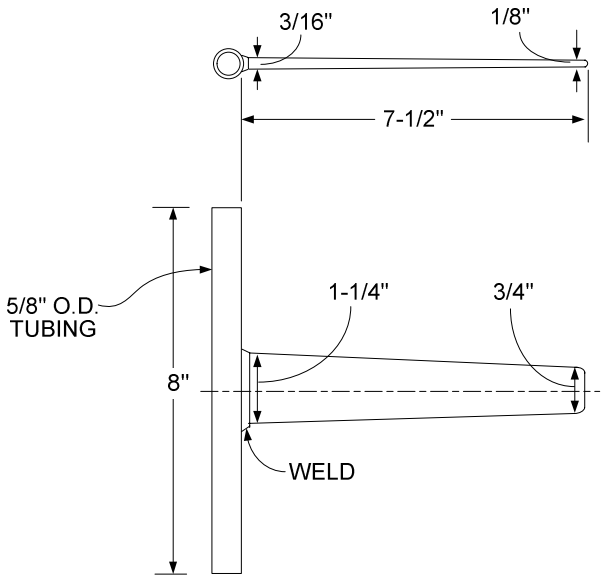
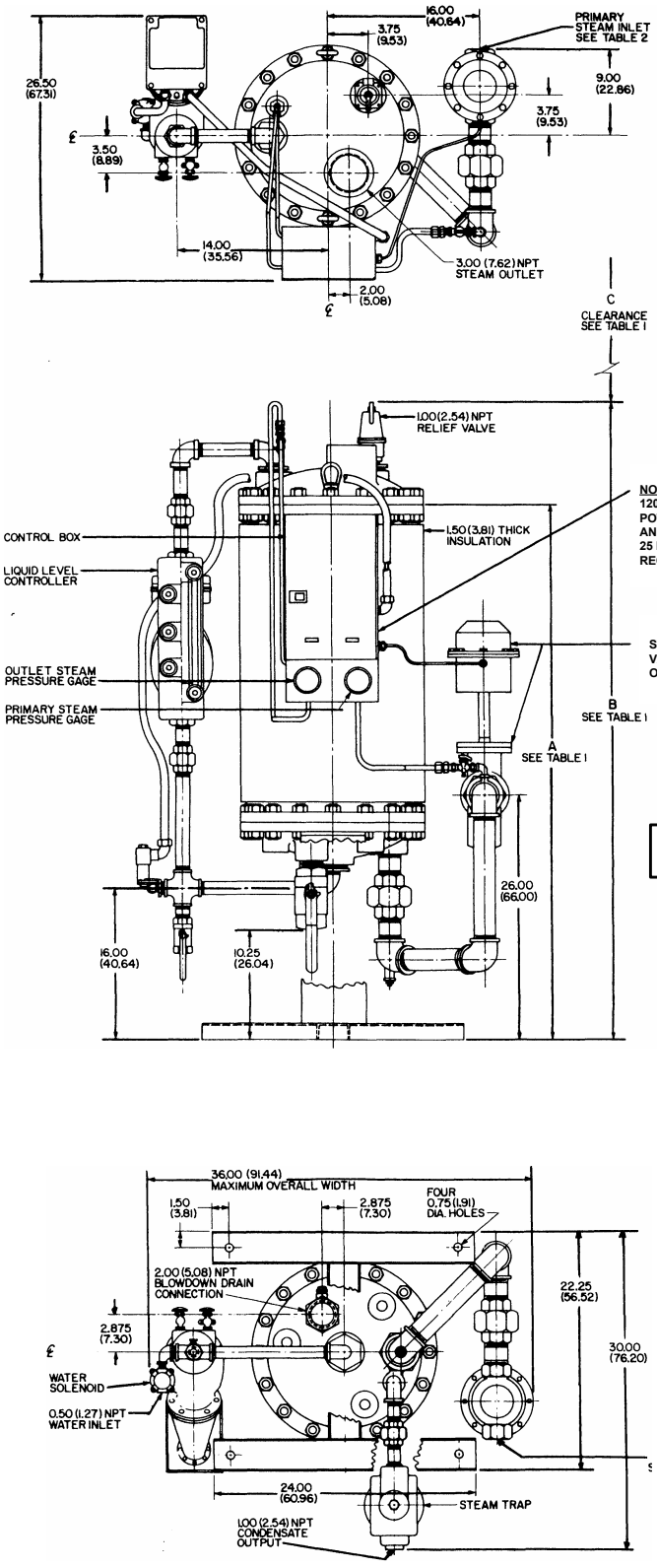



***Figure SG-101-7. Coil Spacing Tool***

# RECOMMENDED SPARE PARTS

| Quantity Per Generator | Item No. | Part Name | Shown in Figure No. |
|---|---|---|---|
| * | 9 | Coil Assembly | SG-101-9 |
| ** | 10 | Conical Coil Gasket | SG-101-9 |
| 4 | 13 | Head Gasket | SG-101-9 |
| 1 | 24 | Relief Valve | SG-101-10 |
| 1 | 42 | Water Solenoid Valve | SG-101-10 |
| 1 | 53 | Pressure Controller | SG-101-8 |
| 1 | 58 | Pressure Switch | SG-101-8 |
| 1 | 62 | Air Solenoid Valve | SG-101-8 |
| 1 | 65 | Compound Pressure Gage | SG-101-8 |
| 1 | 75 | Green Indicator Light | SG-101-8 |
| 1 | 78 | Red Indicator Light | SG-101-8 |

* Minimum of 2 to a maximum of the number in your largest Generator
** 2 per Spare Coil Assembly, Item 9 plus 2




NOTE:
120V/60 Hz ELECTRICAL POWER SUPPLY AND 25 PSIG AIR SUPPLY REQUIRED

DIMENSIONS ARE SHOWN IN INCHES (CENTIMETERS)

**TABLE 1**

| GENERATOR MODEL | NO. OF COILS | HEATING SURFACE FT² (M²) | DIMENSIONS INCHES (CM) A | B | C | APPROX. WT. LBS. (KG) DRY | WET |
|---|---|---|---|---|---|---|---|
| SS1B+02 | 2 | 15 (1.39) | 40.75 (103.5) | 55.00 (139.70) | 21.00 (53.34) | 520 (237) | 660 (300) |
| SS1B+03 | 3 | | | | | | |
| SS1B+04 | 4 | 20 (1.86) | 45.75 (116.20) | 60.00 (152.40) | 26.00 (66.04) | 570 (259) | 720 (327) |
| SS1B+05 | 5 | 25 (2.32) | 49.75 (126.37) | 64.00 (162.56) | 30.00 (76.20) | 610 (277) | 770 (350) |
| SS1B+06 | 6 | 30 (2.79) | 54.75 (139.07) | 69.00 (175.26) | 35.00 (88.90) | 640 (291) | 830 (377) |
| SS1B+07 | 7 | 35 (3.25) | 58.75 (149.23) | 73.00 (185.42) | 40.00 (101.60) | 670 (304) | 880 (400) |
| SS1B+08 | 8 | 40 (3.72) | 63.75 (161.93) | 78.00 (198.12) | 45.00 (114.30) | 710 (322) | 930 (422) |
| SS1B+09 | 9 | 45 (4.18) | 67.75 (172.09) | 82.00 (208.28) | 50.00 (127.00) | 740 (336) | 980 (445) |
| SS1B+10 | 10 | 50 (4.65) | 72.75 (184.79) | 87.00 (220.98) | 55.00 (139.70) | 770 (350) | 1030 (468) |
| SS1B+11 | 11 | 55 (5.11) | 76.75 (194.95) | 91.00 (281.14) | 60.00 (152.40) | 800 (363) | 1080 (490) |
| SS1B+12 | 12 | 60 (5.57) | 81.75 (207.65) | 96.00 (243.84) | 65.00 (165.10) | 840 (381) | 1130 (513) |
| SS1B+13 | 13 | 65 (6.04) | 85.75 (217.81) | 100.00 (254.00) | 70.00 (177.80) | 870 (395) | 1180 (536) |
| SS1B+14 | 14 | 70 (6.50) | 90.75 (230.51) | 105.00 (266.70) | 75.00 (190.50) | 900 (409) | 1230 (558) |
| SS1B+15 | 15 | 75 (6.97) | 94.75 (240.67) | 109.00 (276.86) | 80.00 (203.20) | 930 (422) | 1280 (581) |

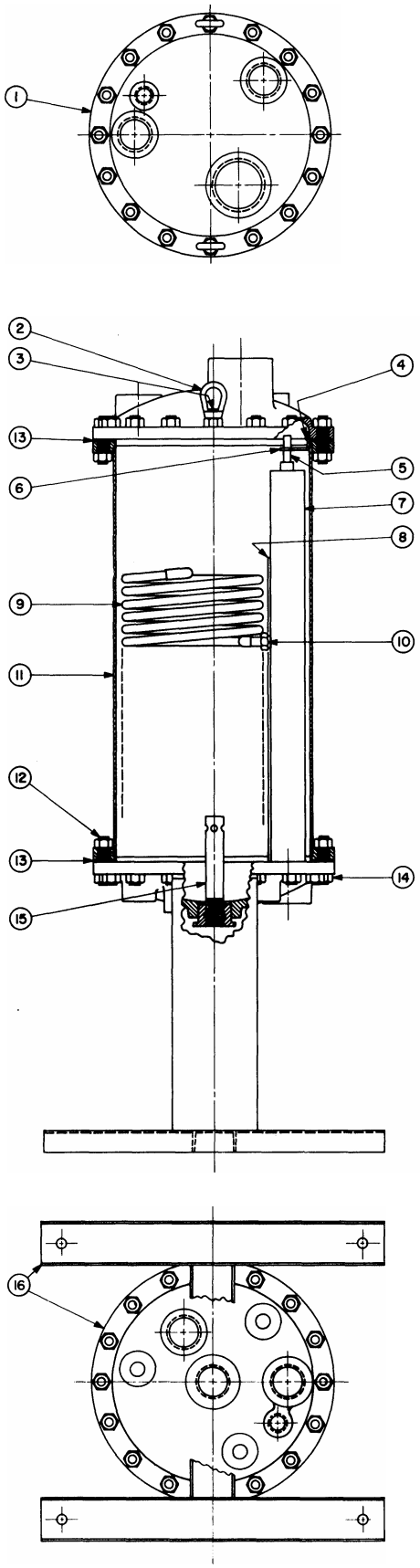
**TABLE 2**

| VALVE SIZE INCHES | PRIMARY STEAM INLET SIZE, NPT INCHES | CM |
|---|---|---|
| 1.00 | 1.00 | 2.54 |
| 1.25 | 1.25 | 3.18 |
| 1.50 | 1.50 | 3.81 |
| 2.00 | 2.00 | 5.08 |

**TABLE 3**

| HEAT EXCHANGER DESIGN PARAMETERS | | | |
|---|---|---|---|
| | MAX. WORKING PRESSURE PSIG (kPa) | MAX. TEMP. DEG. F (DEG. C) | TEST PRESSURE PSIG (kPa) |
| SHELL SIDE | 50 (345) | 400 (204) | 75 (517) |
| TUBE SIDE | 250 (1723) | 400 (204) | 375 (2584) |
| ASME CODE CERTIFICATION STAMP | | | U-7 |

*Figure 1. Dimensions for SS1B-PLUS*



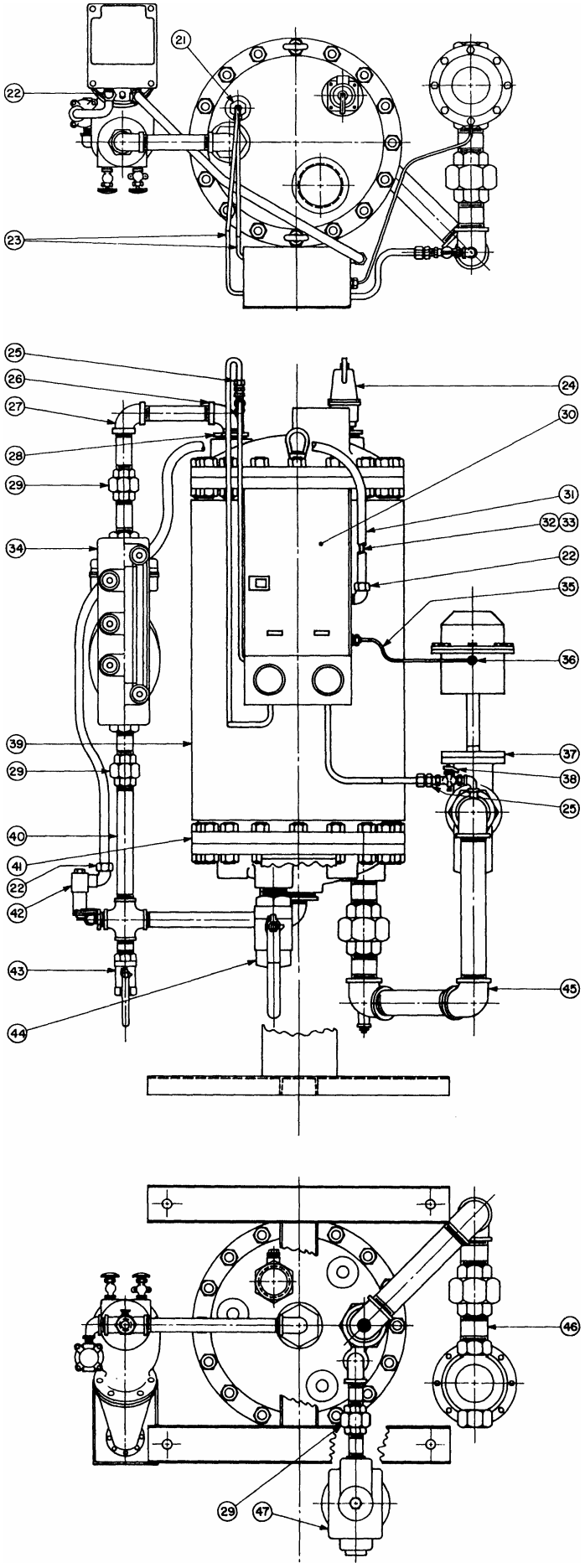

| ITEM NO. | QTY REQ. | DESCRIPTION | PART NO |
|---|---|---|---|
| 1 | 1 | TOP HEAD | 20886 |
| 2 | 2 | 5/8" EYE BOLT | 12865 |
| 3 | 2 | 5/8"-llx4"L6STUD | 6-248 |
| 4 | 2 | 1/4"-20 SOC. HEAD CAP SCREW | 6816 |
| 5 | 1 | RISER SUPPORT PIN | 6690 |
| 6 | \| | RISER SUPPORT BRACKET | 6641 |
| 7 | 1 | STEAM INLET RISER ASSY | 18888 |
| 8 | 1 | CONDENSATE RETURN ASSY | 8676 |
| 9 | TABLE A | COIL ASSEMBLY | 844-A |
| 10 | TABLE A | CONICAL GASKET | 8079 |
| 11 | 1 | SHELL ASSEMBLY | TABLE A |
| 12 | 28 | 5/8"-11x3-l/2" LG STUD | 6-173 |
| 13 | 2 | HEAD GASKET | BG |
| 14 | 62 | 5/8"-11 NUTS | 6-178 |
| 15 | 1 | WATER INLET DISPERSION TUBE | 122480 |
| 16 | 1 | BOTTOM HEAD & SKID ASSY | 18890 |

USED ONLY WITH MODELS SS1B+07 THRU SS1B+15

TABLE A

| MODEL | QUANTITY REQ. | | ITEM 11 |
|---|---|---|---|
| | ITEM 9 | ITEM 10 | PART NO |
| SS1B+02 | 2 | 4 | B20 |
| SS1B+03 | 3 | 6 | B24 |
| SS1B+04 | 4 | 8 | B29 |
| SS1B+05 | 5 | 10 | B33 |
| SS1B+06 | 6 | 12 | B38 |
| SS1B+07 | 7 | 14 | B42 |
| SS1B+08 | 8 | 16 | B47 |
| SS1B+09 | 9 | 18 | B51 |
| SS1B+10 | 10 | 20 | B56 |
| SS1B+11 | 11 | 22 | B60 |
| SS1B+12 | 12 | 24 | B65 |
| SS1B+13 | 13 | 26 | B69 |
| SS1B+14 | 14 | 28 | B74 |
| SS1B+15 | 15 | 30 | B78 |

***Figure SG-101-9. AERCO Steam Generator Model SS1B-PLUS Assembly and Parts List***




| ITEM NO. | QTY REQ | DESCRIPTION | PART NO. |
|---|---|---|---|
| 21 | 1 | 1"xl/4"NPT REDUCING BUSHING | 9-493 |
| 22 | 4 | 3/8"x1/2"HUB 90° CONDUIT | 122104 |
| 23 | A/R | 3/8"OD TYPE L COPPER TUBING | RM6041 |
| 24 | 1 | PRESS. RELIEF VALVE (NOTE A) | 122500 |
| 25 | 3 | 3/8"OD TUBE x 1/4" NPT COMR | 8-6 |
| 26 | 3 | 1" NPT STREET ELL | 9-328 |
| 27 | 1 | 1" NPT 90° ELL | 9-222 |
| 28 | 1 | 2"x1" REDUCING BUSHING | 9-365 |
| 29 | 3 | 1"NPT UNION | 9-291 |
| 30 | 1 | CONTROL BOX ASSEMBLY (SEE ASSY DRAWING) | |
| 31 | A/R | 3/8" TYPE LT CONDUIT | RM2000 |
| 32 | A/R | 14 GA. BLACK STRANDED WIRE | RM4524 |
| 33 | A/R | 14 GA. WHITE STRANDED WIRE | RM4525 |
| 34 | 1 | LIQUID LEVEL CONTROLLER | 122501 |
| 35 | A/R | 1/4"IMPOLENE TUBING | RM3041 |
| 36 | 1 | 1/4"xl/8" NPT 90° IMPOLENE COMP. | 8-4 |
| 37 | 1 | AIR OP CONTROL VALVE (NOTE C) | 20774 |
| 38 | 1 | 1/4" FEMALE/MALE SHUTOFF COCK | 121975 |
| 39 | 1 | INSULATION (NOTE B) | 18777 |
| 40 | A/R | 1" BLACK IRON PIPE | RM358 |
| 41 | 1 | HEATER ASSEMBLY (NOTE B) | 20887 |
| 42 | 1 | 1/2" WATER SOLENOID | 5134 |
| 43 | 1 | 1" NPT BALL VALVE | 12820-7 |
| 44 | 1 | 2" NPT BALL VALVE | 12820- |
| 45 | 1 | STEAM INLET ASSEMBLY | 18762 |
| 46 | 1 | VALVE SPOOL PIECE (NOTE C) | |
| 47 | 1 | INVERTED BUCKET STEAM TRAP | 122502 |

A/R - LENGTH OR QUANTITY AS REQUIRED
NOTE A - WHEN ORDERING STATE SIZE
NOTE B - WHEN ORDERING STATE NUMBER OF COILS IN HEATER
NOTE C - WHEN ORDERING STATE CONTROL VALVE SIZE

***Figure SG-101-10. AERCO Packaged Steam Generator Model SS1B-PLUS Assembly and Parts List***