

CAUTION

Heat Exchanger Protection

Domestic water in a heat exchanger can be contaminated by boiler water or steam if a leak develops. If hazardous chemicals are in the boiler water or steam, they may be injected into the domestic water. Proper installation and maintenance can prevent this. Consider one or more of the following suggestions to protect your system.

1. Maintain steam or boiler water at a lower pressure than the domestic water. If a leak develops, domestic water would then safely leak into the boiler water.
2. Install a differential pressure control across the heat exchanger. This would alert you to higher pressure in the boiler water. Include alarms and manual reset devices to make the control more useful.
3. A pressure relief valve can be installed on the boiler water or steam supply line. The relief valve should be set to open at a pressure lower than the domestic water supply pressure.
4. Use an isolation exchanger. An isolation exchanger with a transfer fluid and pump provides protection although it is expensive and bulky.
5. Watch for water or steam hammer. It can cause heat exchanger failure. Hammer is usually the result of failure to properly drain condensate. Be sure steam is dry before going to the exchanger. It should be properly trapped upstream of control valves. The condensate will leave the exchanger quickly providing the exchanger is installed level, it is clean and it has a properly working trap. Also be sure the condensate line is working. Plugged lines cause trouble. High lifts cause trouble especially with modulating valves.
6. In a steam boiler, high water levels, excessive make up or overflowing condensate tanks could be related to heat exchanger leakage. Check on such clues.
7. Regularly check exchanger for leakage. Install isolation valves on exchanger connections. If exchanger will hold pressure after isolation valves are closed and pressure source removed, there are probably no leaks.
8. Also consider the type of boiler chemicals used. Many are FDA approved and can be safely used in a system.

HEAT-N-STORE INSTRUCTIONS

STEP ONE – RECEIVING THE EQUIPMENT

1. As soon as the equipment arrives on the truck, be sure to inspect it thoroughly. If there is any damage or missing parts, have the truck driver note on the Bill of Lading the fact that the damage has occurred or that parts are missing. A claim should be filed with the truck line to cover any discrepancies. **DO THIS IMMEDIATELY.**
2. As soon as the equipment is unloaded, move it to a safe place. It should not be left exposed to the ravages of weather and to the dangers of pilferage.

STEP TWO – LOCATE THE UNIT IN THE DESIRED POSITION

1. Locate the heater to comply with building codes and insurance regulations. Provide at least 24 inches clearance all around the unit – especially allow room for removal of the heat exchanger tube bundle. See the specification sheet to determine the amount of room needed. Local codes may require greater clearance room.
2. Be sure to provide room to clean strainers, to lubricate pump and to provide access to valves, manholes and controls.
3. The water heater may be placed on 10-inch high concrete piers. The piers distribute the weight of the heater. Keep the heater off wet floors and provide additional cleanout room for your convenience. Check distributed weight to be sure floor is not overloaded. Remember – water weighs 8.3 pounds per gallon.
4. Make sure the heat exchanger is level on steam units so that condensate will not collect in either the first or second pass of horizontal exchangers. Place a level on the exposed cylindrical shell of the heat exchanger to insure that it is level. Making the skid level may not necessarily make the exchanger level.

STEP THREE – MAKE PLUMBING CONNECTIONS

1. Make inlet and outlet service water connections according to drawings following. **Do not** install a check valve in the cold water inlet. Some plumbing codes prohibit the installation of such a check valve. If local codes require a check valve, drill a ¼ inch hole in the flapper of the valve to prevent leakage through the relief valve.
2. When the service and hot water piping to the water heater are made of copper pipe, we recommend dielectric unions or bushings be installed.
3. Provide a blowdown drain. This should be installed on the threaded connection located near the bottom of the unit. A full size ball valve should be installed and a drain line run full size to a suitable sewer or other means of disposal.
4. The relief valve should be piped to the sewer. Be sure the piping is not obstructed in any way or the pipe size reduced from the outlet size of the relief valve. Valves must not be installed on this line. The outlet end of the drain line pipe should not be

threaded. If the outlets of two relief valves are connected, the cross sectional area of the connection should not be less than the total area of the outlet of the valves.

5. Install the house recirculated hot water connection line. This connection is normally located opposite the rear end of the heat exchanger. Pumps and isolation valves and a check valve should be included in this line. The pump should be installed with an ON-OFF switch and allowed to run continuously. An aquastat is not normally required unless specified.
6. After all water lines are connected, fill the heater with water. Check for and correct all leaks.

STEP FOUR – MAKE SYSTEM PIPE CONNECTIONS

1. Connect main steam line to inlet steam strainer on the unit. This line should provide a dry, saturated steam to the steam flow control valve at the steam pressure shown on the nameplate. The first number after the “R” is the required inlet steam pressure. The steam lines can be sized with the information provided in this manual. If a main steam strainer is not provided with your Heat-N-Store, it should be installed to protect the steam flow control valve.
2. A strainer is not required in front of the main steam trap. A strainer is sometimes located between the heat exchanger condensate outlet and the heat exchanger condensate trap. It is intentionally deleted from this unit. If this strainer should become plugged with sediment, it would cause a back up of condensate into the heat exchanger, which would destroy the heat exchanger. The main steam strainer has removed most sediment and rust. Residual material passing through will cause little trouble at the trap. Do not install a strainer prior to this trap.
3. Condensate Lines – All traps are prepiped to the condensate accumulator line. This line may be run either left or right from the unit. Install a pipe cap over the unused end of the condensate line.
4. Insulate all steam and condensate lines.

NOTE: If desired, the condensate outlet pipe may be piped back up to within 2 inches of the bottom of the heat exchanger outlet connections and then run to the return system from there. The trap does not have to be raised. If it is desired to raise the condensate about the exchanger outlet, a special trap or return system must be used. Consult the factory for more information.

STEP FIVE – (ALTERNATE FOR WATER TO WATER HEAT EXCHANGERS USING BOILER WATER INSTEAD OF STEAM)

STANDARD

1. Connect hot boiler water supply line to the hot water supply connection tee. This tee is located in the line between the “U” connection on the three-way valve and the heat exchanger. Connect the hot water return

line going back to the boiler to the "C" or common connection of the three-way valve. (Note that this standard three-way valve hookup is shown in installation drawing following No. SK-506. The three-way valve is actually in the outlet of the heat exchanger and not in the supply connection line to the heat exchanger.

2. The hot water supply connection should be equipped with strainers, if not factory installed. Isolating valves should be installed on both the hot water supply and hot water return lines.
3. Insulate all boiler water supply and return lines.

NOTE: ALTERNATE SYSTEMS

Alternate boiler water flow control valve installation arrangements may be used. It is important that the boiler water flow through the valve in the correct manner. Consult the additional installation drawings following the labels on the unit or the factory for additional details.

STEP SIX – PROVIDE AIR SUPPLY

If a pneumatically operated valve has been furnished on the unit, instrument air is required. Provide an instrument source of air and an air pressure regulator. The air should be filtered, deoiled and dewatered. Regulated outlet air pressure to the temperature controller should be 20 to 25 psig.

STEP SEVEN – MAKE ELECTRICAL CONNECTIONS TO THE UNIT

Provide 115 volt, single phase, 60-hertz power to the circulating pump motor. (If special motor power characteristics are ordered, the motor will be so marked to indicate the power supply required.) An ON-OFF switch should be located near the unit. Smaller pumps have built in thermal overload protection. Larger pumps do not and should be wired through motor starters for overload protection. wiring should be a minimum of 12 gauge with a continuous ground bond. Connections to the electric motor should be through a flexible lead not over 18 inches long. The power supply should come through a suitably fused switch. Be sure all wiring complies with local and national electrical codes.

STEP EIGHT – CHECK INSTALLATION

1. Be sure all piping connections are properly made. Be sure steam or boiler water lines lead to the head of the heat exchanger and not directly to the tank itself. Be sure steam supply pressure does not exceed tank design pressure.

2. Be sure a pressure relief valve is installed and properly piped to a drain. A temperature and pressure relief valve will be installed on the unit in lieu of standard when specified. Be sure the valve is there.
3. Be sure the building water recirculation line is properly connected to the shell of the unit and not to the drain line at the bottom of the unit. This house recirculation line is intended only to recirculate hot water to the fixtures in the building. It has nothing to do with the circulating pump installed on the unit.
4. Be sure proper air supply is piped to an air pressure regulator on the unit. (This is not required for pilot operated or self-operated valves.)
5. Check to be sure that isolating valves are located around all pumps, that there are stop valves to isolate the main steam line and there are gate or ball valves in all water connections to the unit. Gate valves should be used when there is no pressure drop across the valve as it is operated, such as the isolating valves, around a circulating pump. Globe or ball valves should be used if there is a pressure drop across the valve. Globe valves are preferred for steam stop valves.
6. Be sure a full size drain valve is installed.
7. Be sure a shut off valve and union are in the steam or boiler water supply lines.
8. Be sure all pipes are properly supported. Do not depend on heater for support as it may be drained at times and could trip.
9. Be sure steam heat exchangers are level.

INITIAL STARTUP

1. Refer to the installation instructions check list to be sure that your heater has been properly installed. Use piping diagrams and pictures to be sure you correctly installed the water heater.
2. Lubricate the Heater
 - a. Lubricate the steam or boiler water flow control valve when required on "Powers Regulator Company" valves. Lubrication is not recommended on valves with "S" packing. This would be the Powers "DS" and "SS" models used when steam pressure is over 50 psi. When lubrication is required, the valve stem must be lubricated by unscrewing the valve packing nut, screwing it back finger tight and then back off one turn. Turn the lubricator screw until the grease packing nut cannot be moved with the fingers.
 - b. Lubricate the circulating pump motor if required. Most Grundfos pumps do not require lubrication. Bell & Gossett, Taco and other pumps may require lubrication. This motor has not been factory lubricated due to unknown conditions of storage or time of startup. A tube of lubricating oil is factory wired to the pump. Install oil according to directions on the tube. Wire the empty tube to the pump so others will know motor is oiled. If oil is not furnished, consult motor nameplate to see if there are special lubrication instructions.
3. Fill Tank - Open cold water supply valve. Fill tank. Bleed air out of tank through relief valve. Be sure cold water supply pressure does not exceed 75 percent of tank design pressure or valve pressure setting. If it does, the valve may not shut or may leak in operation.
4. Fill System - Open hot water supply valve to allow water into system.
5. Start Pump - Start heat exchanger circulating pump. Be sure it is turned in right direction on 3 phase pumps. (Do not operate pump without water in it.)
6. Open Steam or Boiler Water Valve - Open steam or boiler water supply valve. Valve should be opened slowly to allow exchanger to come up to temperature slowly. Steam valves should be left wide open to protect the seat.
7. The circulating pump on the unit is designed to match or exceed the heat exchanger capacity. On some heaters, it may be necessary to slow down the passage of water over the heat exchanger. This adjustment is best

performed with a tank full of cold water or a maximum demand for hot water through the unit.

- a. Set the temperature controller (Accritem, etc.) or valve (self operating type) at desired temperature, say 140 degrees F. Make sure the steam or boiler water valve is wide or close to it. (Do not make pump adjustments if control valve is shut or nearly so.)
- b. Make sure the temperature sensor valve on the anticipator lines is wide open. This is the manual valve in the ½" copper line that runs from the pump discharge to the temperature controller.
- c. A manual valve is installed at the discharge of the heat exchanger circulation pump. The valve may be part of the pump discharge fitting or it may be a separate valve depending on the pump used. This valve should be left wide open initially.

(As operating experience is gained with the unit and with the system, the valve can be adjusted. Closing the valve slightly will increase the heat exchanger discharge temperature and slightly reduce the volume of water heater. This may be desirable to match some load conditions. It will also make hotter water available at the top of the tank after a heavy draw has used up all the stored hot water.)

8. Steam or Boiler Water Flow Control Valves

- a. Powers Model 591-XXXX pneumatically operated valves require calibration of the accritem. See accritem instructions at rear of this manual.
- b. Powers Model II self-operated valves require a temperature setting adjustment. See valve instructions at rear of this manual.
- c. Spence E Valve Requirements – Complete dismantling at regular intervals for inspection and repair is not recommended. Under normal conditions, if kept relatively free of dirt, a regulator will function year after year with a minimum of maintenance attention. These service points are suggested:

- After the first few days and thereafter twice a year, inspect for dirt collected at –

Bleedpoint orifice – screwed into downstream side of main valve

Restriction orifice – screwed into underside of main valve Types E and E3. Type E2 main valve has an open elbow with orifice.

Inlet screen in pilot – remove square bottom cap to drop out.

- After the first few days of operation and thereafter twice a year, inspect all flanges and screwed joints for leakage. Tighten all bolts. Never allow a leak to persist.
- Do not under any circumstances loosen bolts on temperature diaphragm chamber or attempt to dismantle the thermostat element. The system is filled with volatile fluid, which, if lost, will render the pilot inoperative. A damaged element, however, can easily be changed in the field by following the directions.

All of the above adjustments should be rechecked after the heater is up to temperature.

9. Adjust the Flow Sensor

A small pipe or tube connects outlet of the circulating pump with the shroud around the temperature sensing bulb. This line allows a small amount of water from the bottom of the tank to flow over the temperature sensing bulb. This assists in providing the close temperature control for which your unit is noted. Properly adjusted, it will also smooth out the demand load on your boiler. A small needle valve is included in this line.

Start with the needle valve wide open. This provides maximum sensitivity to incoming cold water and the quickest response to it. Wide open, it may also overload the boiler for short periods because of the high capacity of the heat exchanger. Overloading the boiler will cause its steam pressure to drop and may cause it to prime or pump out water. If any of these happen, close the needle valve until they cease. Basically, in the closed position, the temperature sensing bulb senses the warmest water in the top of the tank and the flow control valve is slowest in operation. With the needle valve wide open, the cold water in the bottom of the tank is quickly sensed and the valve operates quickly. Do not close the valve tight, as it will sense only the hot water in the top of the tank.

MAINTENANCE

Future operation of the unit may require readjustment of the above controls at times.

Heat Exchanger

As heating surfaces become fouled, the temperature of the water at the outlet of the exchanger will be reduced. Close the pump discharge valve to correct this. Keep in mind that the thermometer on the unit reads two different temperatures. When the tank is cold, it reads the exchanger's discharge temperature. When the tank is up to temperature (the steam or boiler water valve closed), it reads the tank temperature.

When the heat exchanger becomes excessively fouled so it will not put out enough hot water, it must be cleaned per the instruction sheet, which follows.

If steam hammering noise is noticed, check to be sure exchanger is level.

Pumps

Relubricate according to the instructions on the pump motors. Generally, this requires oiling each six months for pumps that require lubrication.

Valve Maintenance

See instruction sheet for the particular model valve installed.

Traps

If traps leak, they prevent system from reaching full recovery capacity and they waste steam. Worn parts or a piece of dirt or scale lodged in the orifice usually causes leaky traps. Traps should be cleaned and parts replaced if necessary. Traps can be tested by measuring the upstream and downstream temperature on both sides of the trap. The temperatures should be different and be about equal to the saturated steam temperatures on each side of the trap.

Tank

Mud should be washed out of tank annually. The Magnesium Anode should be replaced when it decreases to approximately 50 percent of its original size of 1-3/8".

Copper U-Tube Heat Exchangers

1. At regular intervals, observe interior and exterior condition of all tubes and keep them clean. Neglect in keeping all tubes clean may result in complete stoppage of flow through some tubes, with consequent overheating of these tubes as compared to surrounding tubes resulting in leaking tube joints.
2. Do not attempt to clean tubes by blowing steam through individual tubes.
3. Do not open heads until all pressure is off equipment and the unit drained.
4. Do not handle tube bundles with hooks or other tools, which might damage tubes. Bundles should be moved about on cradles or skids.
5. Exchangers subject to fouling should be cleaned periodically. A marked increase in pressure drop and/or reduction in performance usually indicate cleaning is necessary. Since the difficulty of cleaning increases rapidly as the scale thickens or deposit increases, the intervals between cleaning should not be too great. There are specific compounds on the market for this purpose. Most major manufacturers of water treatment chemicals such as Dearborn, Calgon, Perolin, Mogul, Oakite, Wyandotte and many others make these cleaning compounds. Many other good companies make good cleaning compounds. All are available either directly from the company or through plumbing supply houses.
6. When removing tube bundles from exchangers for inspection or cleaning, care should be exercised that improper handling does not damage them. Tube bundles are often of great weight, yet the tubes are small and of relatively thin metal.

In cleaning a tube bundle, tubes should not be hammered on with any metallic tool. In case it is necessary to use scrapers, care should be exercised that the scraper is not sharp enough to cut the metal of the tubes.

COMPONENT PARTS

Parts should be exact replacements of original parts furnished for good performance. Exact replacement parts can be obtained through Sellers Engineering Company, PO Box 48, 918 West Walnut Street, Danville, Kentucky 40422, or your local representative.

When ordering parts, give:

1. Sellers invoice number from nameplate plus the ASME number,
2. Owner's name and address plus shipping address, and
3. Part description.