INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR INDIRECT FIRED WATER HEATER

Hubbell™
ELECTRIC HEATER COMPANY

BASE MODEL "BWP"

Edition 2017

HUBBELL
ELECTRIC HEATER COMPANY
P.O. BOX 288
STRATFORD, CT 06615

PHONE: (203) 378-2659
FAX: (203) 378-3593
INTERNET: http://www.hubbellheaters.com/

-- IMPORTANT --
Always reference the full model number and serial number when calling the factory.

WARNING / CAUTION

1. **FLUIDS UNDER PRESSURE MAY CAUSE INJURY WHEN RELEASED.** Always shut off all incoming and outgoing valves and carefully decrease all trapped pressures to zero before opening any covers, piping or gauge connections, etc.

2. **HOT WATER OR HOT SURFACES CAN CAUSE SEVERE BURNS.** Wear safety goggles and protective gloves when carrying out maintenance procedures involving the heater and/or when removing and accessories from the heater. Shield your eyes and body to protect from spray when opening a relief valve.

3. Tank is to be completely filled with water and all air is to be vented before energizing.

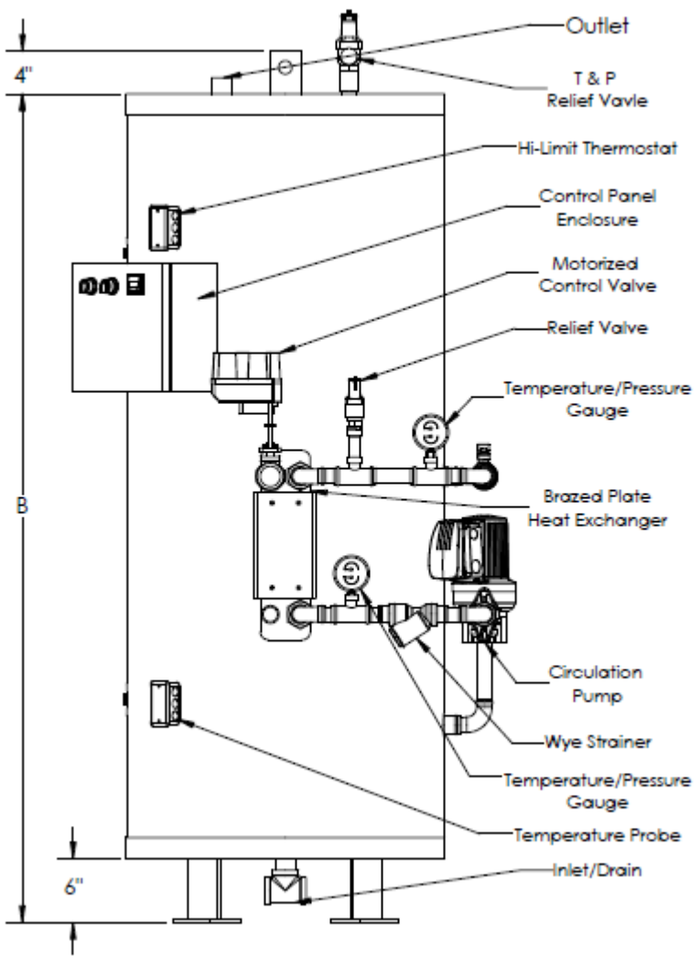
4. Due to the rigors of transportation, all connections should be checked for tightness before heater is placed in operation.

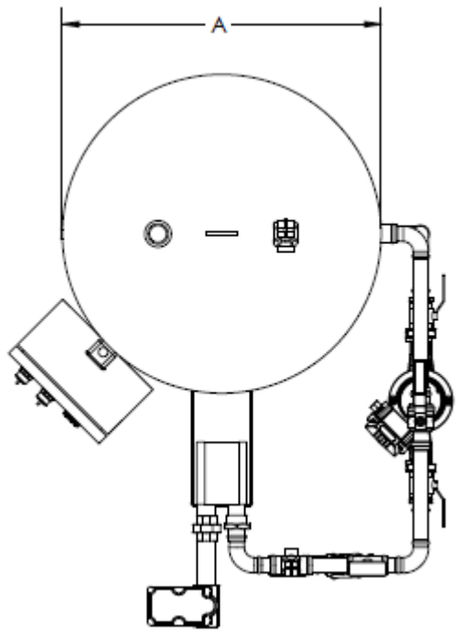
5. Safety relief valve must be installed in tapping provided.

6. **KEEP AWAY FROM LIVE ELECTRICAL CIRCUITS.** Do not perform any maintenance, make any adjustments, or replace any components inside the control panel with the high voltage power supply turned on. Under certain circumstances, dangerous potentials may exist even when the power supply is off. To avoid casualties, always turn the power supply safety switch to off, or ground the circuit before performing any maintenance or adjustment procedure.

7. Generalized instructions and procedures cannot anticipate all situations. For this reason, only qualified installers should perform the installations. A qualified installer is a person who has licensed training and a working knowledge of the applicable codes and regulations, tools, equipment, and methods necessary for safe installation of an indirect fired water heater. If questions regarding installation arise, check with your local plumbing and electrical inspectors for proper procedures and codes. If you cannot obtain the required information, contact the company.

MODEL BWP -
OUTLINE DIMENSIONS





Actual Storage Capacity (Gallons)	Overall Dimensions (Inches) Vertical		Storage Tank	Nominal Storage Capacity (Gallons)	Inlet Outlet Sizing (NPT)	Approx. Shipping Weight (Lbs.)
	Diameter "A"	Height "B"	Diameter Length			
80*	26	65	22 x 54	90	1.5	700
120*	28	75	24 x 64	140	1.5	900
150*	30	79	26 x 68	170	1.5	1100
200	34	82	30 x 72	220	1.5	1700
250	40	74	36 x 64	285	1.5	1850
300	40	88	36 x 78	345	1.5	2180
350	40	94	36 x 84	370	1.5	2500
400	46	85	42 x 75	450	1.5	2700
450	46	93	42 x 83	500	1.5	3000
500	52	82	48 x 72	565	2	3225
550	52	89	48 x 79	620	2	3400
600	52	95	48 x 85	665	2	3650
800	52	119	48 x 109	850	2	4300
1000	52	145	48 x 135	1060	2	5200
1500	58	174	54 x 164	1625	2	6000
2000	64	185	60 x 175	2145	3	8100
3000	76	197	72 x 187	3300	3	8300

SECTION I
GENERAL DESCRIPTION AND CONSTRUCTION

GENERAL DESCRIPTION
This manual provides a complete description, as well as installation, operation, troubleshooting, maintenance, and servicing procedures for a fully packaged indirect fired water heater. This heater provides potable hot water for various functions. It is a permanently installed, stationary, self-contained unit with automatic operating controls.

The complete assembly on a standard unit consists of the storage tank, a brazed plate heat exchanger (piped to the storage tank), a circulator pump, and an ASME rated combination temperature and pressure safety relief valve. Optional equipment may be supplied with your unit. Please consult the product drawing for details specific to your assembly. The unit is factory assembled, insulated, jacketed, piped, tested, and ready for service connections.

GENERAL OPERATION
The BWP model operates using boiler water as its energy source for heating potable hot water. The BWP series can provide potable hot water up to 180°F. Therefore, the supplied boiler water must be within the range of 150°F to a maximum of 220°F and must be at least 5° above the potable water temperature desired from the water heater storage tank outlet.

Boiler water and potable water enter the plate heat exchanger, in a counter flow pattern, where heat transfer takes place from the boiler water to the potable water. The heated potable water exits the heat exchanger and enters the storage tank. An integrally mounted control panel provides a central location for electrical power connections.

How it Works

1. When there is a demand for hot water consumption, hot water exits from the top of the storage tank and is replaced by cold water entering the bottom of the tank. When enough cold water enters the storage tank to lower the stored hot water temperature below the desired value, the control circuit closes creating a call-for-heat, which energizes the circulating pump and boiler water control valve.
2. When the circulating pump and control valve are energized, the pump circulates domestic water from the storage tank through the potable side of the heat exchanger plates. Boiler water flowing through the opposing side of the heat exchanger plates heats the potable water before it returns to the storage tank.
3. When the stored water temperature increases above the desired value, the control circuit opens and the circulating pump and boiler water control valve are de-energized. With the pump no longer running, no more potable water flows from the heat exchanger into the storage tank.

CONSTRUCTION
The water heater components and operating controls are factory selected, sized, piped, and tested to ensure reliable operation. See applicable drawing supplied with water heater for specific details.

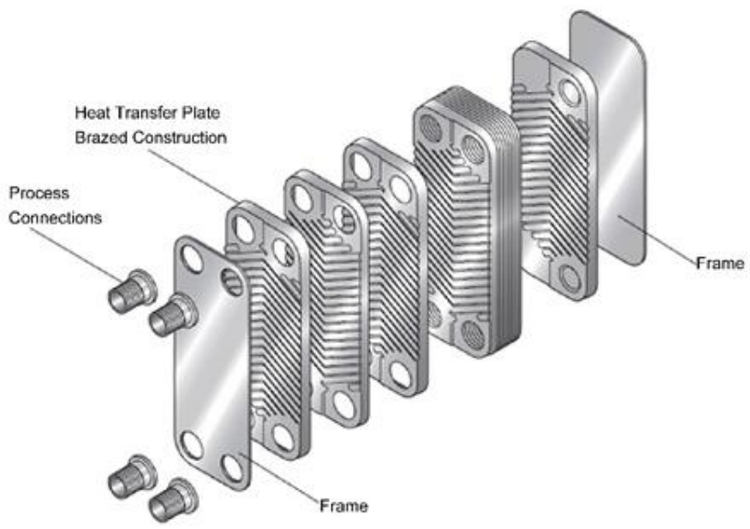
TANK CONNECTIONS

The storage tank is constructed of all welded carbon steel, and internally lined with specially formulated Hydrastone cement to a ½-inch minimum thickness for superior protection and tank longevity. The tank is designed for a maximum allowable working pressure of 150 psi (225 psi TP).

Temperature and Pressure Relief Valve
A combination safety temperature and pressure relief valve is installed at the top of every storage tank. An overflow line (either 1-inch or ¾-inch connection) should be utilized from the relief valve outlet to a suitable floor drain. Refer to Section II, Piping Installation, Figure I, Temperature and Pressure Relief Valves section of this manual for additional information.

Outer Shell, Insulation, and Supports
The tank is encapsulated in 2-inch thick polyurethane foam insulation. The insulation is protected by a high impact non-corroding colorized composite protective jacket. The entire vessel is supported on heavy-duty integrally welded steel supports for sturdy floor mounting.

BRAZED PLATE HEAT EXCHANGER

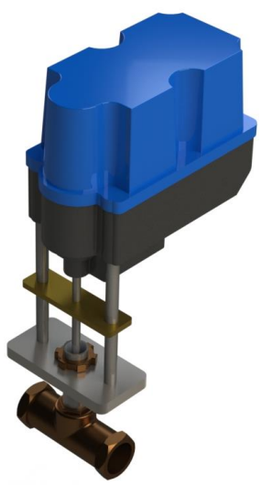


The water heater is supplied with an efficient high quality Brazed Plate Heat Exchanger. The heat exchanger consists of individual embossed plates contained between end plates. The serially arranged plates are brazed together forming a sealed pack with flow gaps between each plate. The boiler water and potable water flow through every other flow gap in opposite directions for efficient heat transfer. The number and arrangement of the heat exchanger plates depends on the specific requirements of each water heater application. Refer to the separate component O&M manual for a complete functional description as well as detailed information on the construction and maintenance of the brazed plate heat exchanger.

BOILER WATER COMPONENTS

Boiler Water Control Valves
The standard BWP model includes a 2-way Modulating Control Valve. Refer to the technical drawings provided with the heater to determine which valve type is utilized.

Control Valve, 2-Way



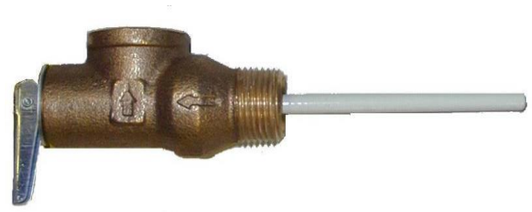
A high quality electrically operated control valve is installed in the boiler water line upstream of the heat exchanger. This sophisticated electronic device controls the flow of boiler water to the heat exchanger providing the precise amount of boiler water to produce the desired potable water output temperature. This valve receives an electrical position signal from the panel mounted temperature controller to maintain the pre-set water temperature.

The control valve is installed in such a way that in the event of reaching the potable water high limit temperature, power is removed from the control valve allowing it to automatically close. The closed valve blocks the flow of boiler water to the heat exchanger, thereby preventing excessively high temperatures of the potable water. Refer to the separate component O&M manual for a complete functional description as well as detailed information of the 2-way valve.

POTABLE WATER COMPONENTS

Thermocouple
A thermocouple is mounted in the storage tank. That element is wired to the panel mounted temperature controller for monitoring and control of the desired water temperature. See Control Panel components for additional detail.

Temperature and Pressure Safety Relief Valve
A temperature and pressure Safety Relief valve is provided for installation in the potable water line downstream of the heat exchanger.



Circulator Pump
A recirculation loop is used to maintain the necessary flow of potable water from the storage tank through the heat exchanger. This loop recirculates the potable water via a circulator installed between the heat exchanger inlet and the storage tank. The circulator runs any time the system initiates a "call-for-heat." For more information regarding the circulator pump see included supplemental material from the pump manufacturer.

Strainer
A cast bronze 'Y' strainer with 20 mesh stainless steel screen protects the potable water controls and the passages within the plate heat exchanger from dirt and debris in the water supply.

CONTROL PANEL COMPONENTS

Control Panel Enclosure
A painted steel NEMA 1 enclosure houses the main electrical control elements.

On/Off Switch
A lighted toggle switch is mounted through the enclosure door and is utilized to turn on power to the unit.

Temperature Controller
A temperature and process controller is configured to control the boiler water control valve with input from a thermocouple mounted in the storage tank. The controller is mounted through the enclosure door to allow full access to the user interface. Refer to the separate component O&M manual for a complete functional description as well as detailed information.

High Limit Thermostat
The water heater is supplied with an immersion thermostatic switch that is installed and wired at the factory. The immersion thermostat can be adjusted through a range of 100°-190°F and is typically set 10°F above the panel mounted high limit set point. The thermostat is adjustable with a flat tip screwdriver.

Fused Low Voltage Transformer
A fused low voltage transformer is supplied prewired within the control panel. This is used to step down higher voltages to 24-volts for the control circuit.

MISCELLANEOUS COMPONENTS

Dial Temperature and Pressure Gauge

A combination temperature (70°-250°F) and pressure (0-200 psi) gauge with a 2½-inch dial may be installed within the potable and boiler water inlet and outlet piping for local indication.

OPTIONS

The following optional features may be included in your water heater. Reference included drawing specific to your heater for further details.

Single Solenoid Safety System

A single solenoid safety system closes the water supply to the control valve should the temperature in the tank reach the high limit set point.

Control Valve, 3-Way

The control valve is a motorized 3-way characterized control valve that regulates the flow of boiler water to the heat exchanger, providing the precise amount of boiler water to produce the desired potable water output temperature. This valve receives an electrical position signal from the panel mounted temperature controller, directing excess boiler water flow around the heat exchanger and directly to the boiler water outlet piping.

Isolation Valves for Clean-in-Place Heat Exchanger Maintenance

Depending on the water quality and operating temperature, scale can form during operation and will continue to accumulate inside the heat exchanger. If non-damaging water conditions are particularly poor, it may be necessary to outfit the heat exchanger piping with isolation valves to utilize Clean-in-Place practices for heat exchanger maintenance.

Double Wall Brazed Plate Heat Exchanger

Depending on the application a Double Wall Brazed Plate Heat Exchanger may be required. Ultimately a double wall configuration differs from a single wall configuration by utilizing a gap of air between the plates to prevent cross contamination of fluid streams in the event of an internal leak within unit.

SECTION II
INSTALLATION

WARNING/CAUTION

CODES AND REGULATIONS

This equipment must be installed in accordance with all appliance markings, the instructions included in this manual, and any supplemental instructions provided. This equipment must also be in compliance with any installation regulations enforced in the local area where the installation is to be made. These must be carefully followed in all cases. Authorities having jurisdiction must be consulted before installation. In the absence of such regulations, the installation must be in accordance with the latest edition of the applicable state and local mechanical and plumbing codes. The storage tank conforms to the current edition of the ASME Boiler and Pressure Vessel Code Section IV, and the plate heat exchangers conforms to the current edition of the ASME Boiler and Pressure Vessel Code Section VIII.

For protection against excessive pressures and temperatures, local codes may require the installation of a temperature-and-pressure (T&P) relief valve certified by a nationally recognized laboratory that maintains periodic inspection of production of listed equipment of materials, as meeting the requirements for Relief Valves and Automatic Gas Shutoff for Hot Water Supply Systems. ANSI Z21.22-1971. THE CUSTOMER IS RESPONSIBLE TO PROTECT PROPERTY AND PERSONNEL FROM HARM WHEN THE VALVE FUNCTIONS.

All water heaters have a risk of leakage at some unpredictable time. IT IS THE CUSTOMER'S RESPONSIBILITY TO PROVIDE A CATCH PAN OR OTHER ADEQUATE MEANS, SO THAT THE RESULTANT FLOW OF WATER WILL NOT DAMAGE PROPERTY.

Never operate unit in excess of design conditions.

The tank should be fully drained in the event the incoming boiler water is shut off and if there is danger of freezing.

WATER HEATER PLACEMENT

Checking Equipment Before Installation

Inspect the unit completely upon receipt from the freight carrier before signing the bill of lading. Inspect the heater and all accompanying parts for signs of impact or mishandling. Verify the total number of pieces shown on packaging slips with those actually received. Contact the freight carrier immediately if any damage or shortage is detected.

Handling and Locating the Water Heater

WARNING: Use industry standard safe rigging methods when attempting to lift or move this product. Failure to follow industry standard safe rigging methods (such as the use of straps and spreaders bars when lifting the water heater skid assembly) can cause uncontrolled tipping or even dropping of the water heater, resulting in property damage, personal injury, or even death.

1. Place the heater on a solid foundation in a clean and dry location. This location should be as close as possible to the point of most frequent hot water. Additionally, the location chosen should be near to boiler water and/or electrical power as practical.
2. If the heater is to be raised off the floor, the entire bottom of the heater should be supported by a solid surface.
3. Verify that the system utilities are adequate to meet the water heater requirements as

specified in this manual and/or other applicable appliance markings.

4. Unit should be level to permit proper drainage should any water connections leak. A suitable drain would be capable of accepting hot water discharge (at least 210°F) from the water heater temperature and pressure relief valve.
5. This water heater is suitable for indoor installation only and must not be subject to freezing.
6. When the water heater has been placed in its final location, remove all shipping supports and bracing.

Service Clearances

A minimum service clearance of 18" is recommended on all sides and above the water heater to facilitate easy access for inspection and service of installed components. Optional equipment may increase the clearance requirements.

Also allow sufficient space for installing and servicing connections such as building water, electrical, pump, boiler water, heat exchanger, and any other auxiliary/optional equipment.

PIPING INSTALLATION

IMPORTANT: The most effective means for preventing deterioration from accelerated corrosion due to galvanic and stray current is the installation of dielectric fittings/unions. The installation of these fittings is the responsibility of the installing contractor.

IMPORTANT: If two or more water heaters are piped in parallel, it is critical that the piping systems are balanced to assure that the combined capacity is realized. It is recommended that reverse return piping is utilized in multiple-unit installations.

CAUTION: DO NOT use galvanized pipe or fittings or steel pipe or fittings when making waterside connections. Use only non-ferrous waterside materials.

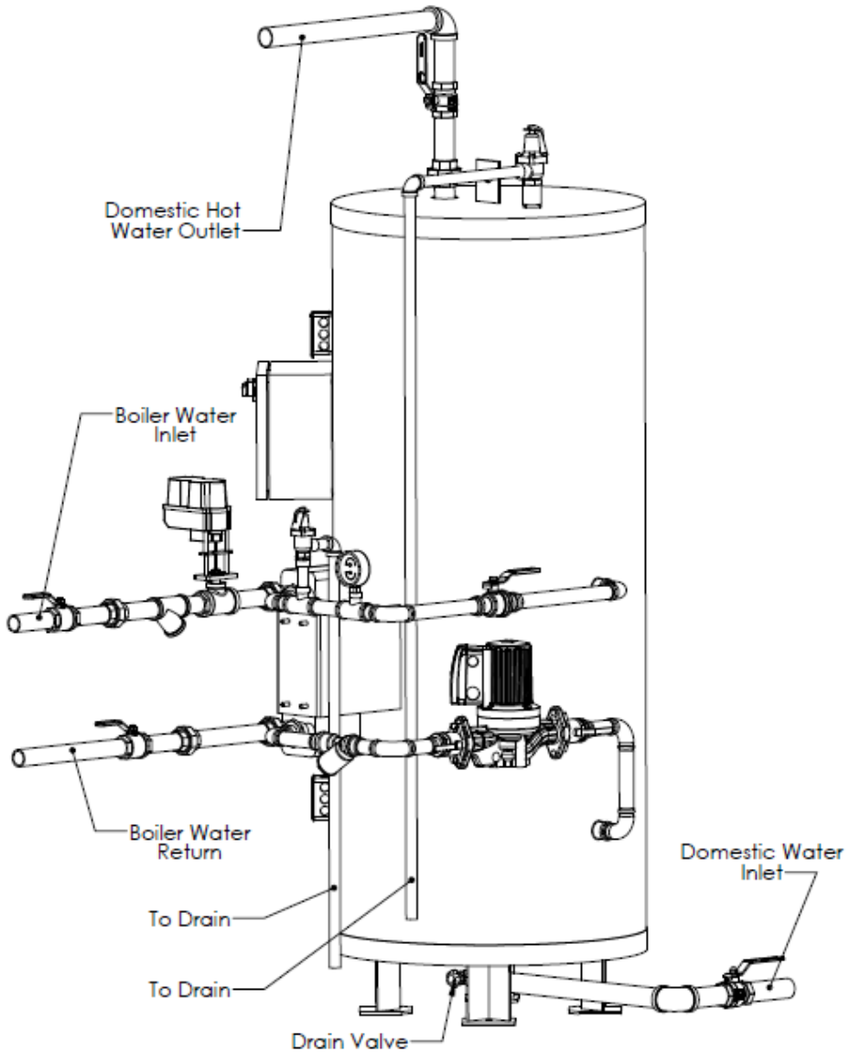


Figure 1: Installation Diagram of an Integrally Mounted Single Pass Heat Exchanger.

(Not all components shown are supplied by Hubbell)

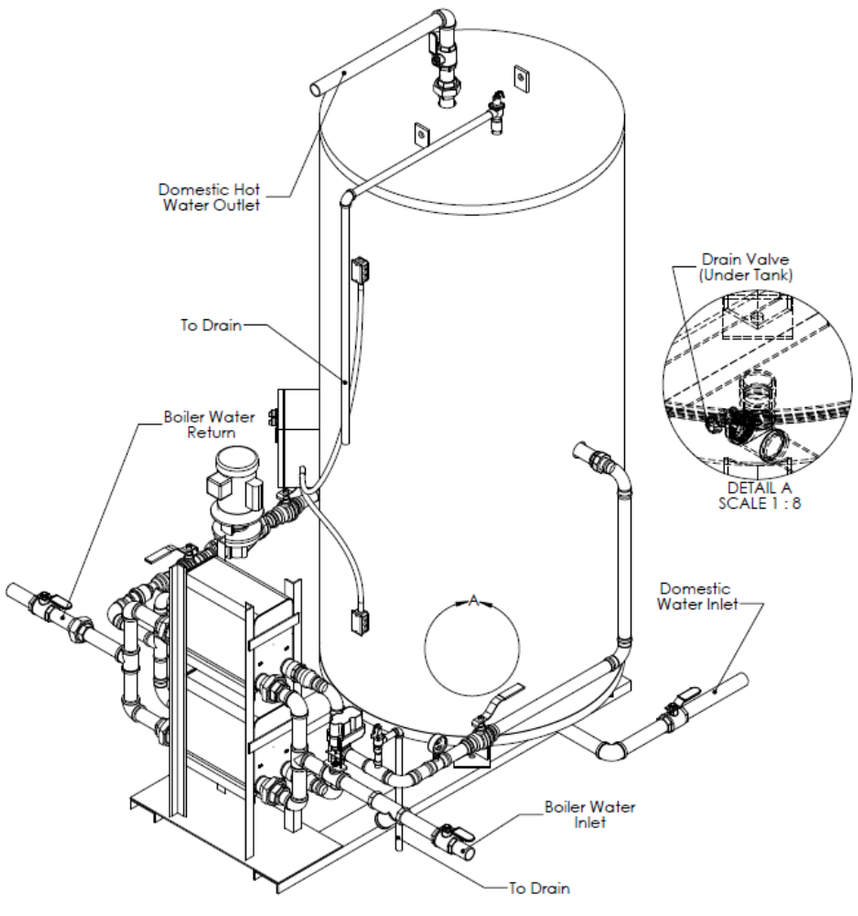


Figure 2: Installation Diagram displaying a multiple 2-Pass Heat Exchanger Assembly.

(Not all components shown are supplied by Hubbell)

Potable Inlet and Outlet Piping

1. All domestic and boiler water pipes should be flushed before assembly and installation. Failure to flush lines could cause components to clog or malfunction.
2. All integral components have been properly sized to meet design conditions. Piping to the unit should not be smaller than the size of pipe connections furnished by Hubbell. Additionally, piping and components connected to the water heater must be rated for potable water, the water temperatures they will experience, and for their application.
3. It may be necessary to ship some piping assemblies disconnected and separately secured to the shipping container to avoid damage to the water heater components. In this case, these assemblies need to be reconnected. Reconnect the heat exchanger potable water lines to the storage tank as indicated in the installation diagrams. Contact factory if the storage tank and/or heat exchanger need to be relocated using field-supplied piping. Relocating the heat exchanger may require a larger field-supplied pump to overcome the distance between the exchanger and storage tank.
4. When tightening unions, valves, flanges, and/or fittings on the storage tank and heat exchanger it is recommended to use a backup wrench. Using a different tool may cause damage due to over-tightening which can void the warranty on supplied components.
5. It is considered common practice to install shut-off valves and unions in the potable water and boiler water inlet and outlet piping to aid in servicing. Use caution when threading pipe nipples into storage tank and heat exchanger connections to prevent over-tightening or cross-threading.
6. If the water heater is installed in a closed water supply system (requiring a back-flow preventer or a check valve in the cold-water line) it may be necessary to provide thermal expansion control via a thermal expansion tank.
7. Pipe the Y-Strainer valve and the storage tank drain valve to a suitable drain capable of accepting hot water discharge when opening the water heater drain valves.
8. After plumbing, verify that all fittings, connections, and components are leak free.
9. After confirming the system is leak free, all boiler water and hot potable water piping (including the heat exchanger) should be insulated to the minimum pipe insulation thickness: specified in ASHRAE 90.1 “Energy Standard for Buildings Except Low-Rise Residential Buildings.” If cold water supply lines are subject to freezing during operation or shutdown periods, insulate or otherwise protect them.

WARNING: Failure to insulate or guard all surfaces containing hot water can result in property damage, personal injury, or even death. Uninsulated or unguarded surfaces containing hot water can be hot enough to cause severe burns instantaneously.

Boiler Water Piping

WARNING: All system piping to the heat exchanger plumbing must be adequately supported. Failure to provide adequate support will result in excessive loads on the heat exchanger connections that can cause hot water discharge resulting in property damage, personal injury, and even death.

1. All boiler water pipes should be flushed before assembly and installation. Failure to flush lines could cause components to clog or malfunction.
2. The unit will perform in accordance with the boiler and domestic water temperatures and flows to which it is connected. It must be installed to operate with the temperature and flow conditions specified when selecting the heater. Therefore, the boiler water piping must be sized to deliver sufficient hot water to the heat exchanger without excessive pressure drop.
3. When tightening unions, valves, flanges, and/or fittings on the storage tank and heat exchanger it is recommended to use a backup wrench. Using a different tool may

cause damage due to over-tightening which can void the warranty on supplied components.

4. It is considered common practice to install shut-off valves and unions in the potable water and boiler water inlet and outlet piping to aid in servicing. Use caution when threading pipe nipples into storage tank and heat exchanger connections to prevent over-tightening or cross-threading.
5. Pipe the Y-strainer in the boiler supply piping near the heat exchanger inlet to a suitable drain capable of accepting hot water discharge.
6. Confirm that an air separator is installed in the boiler water supply piping to the heat exchanger.
7. Concerning the boiler water control valve, use standard design practices to avoid "deadheading."

Temperature and Pressure Relief Valve Piping

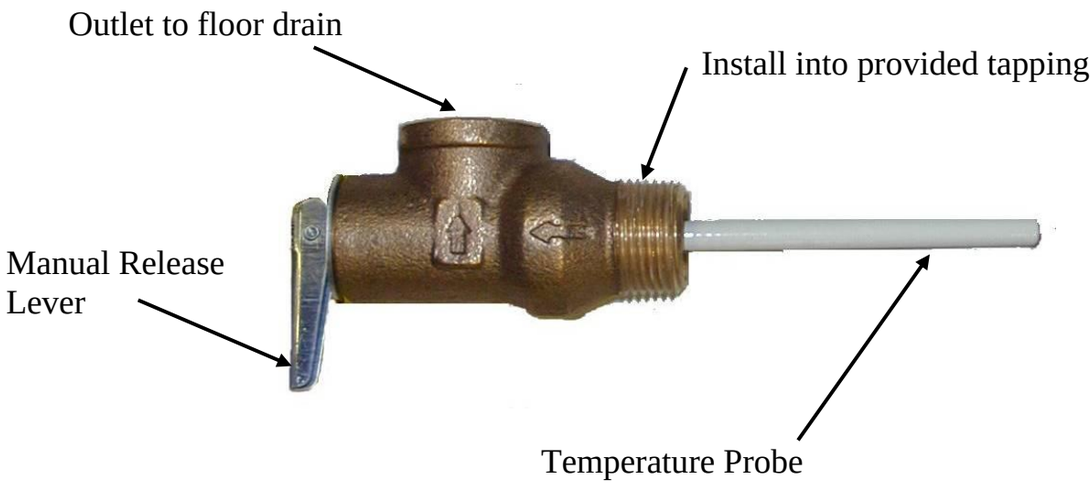
The BWP water heater storage tank is supplied with a temperature and pressure relief valve(s) sized in accordance with the ANSI/ASME Boiler and Pressure Vessel Code, Section IV. The brazed plate heat exchanger included with the BWP water heater is supplied with a pressure relief valve sized in accordance with the ANSI/ASME Boiler and Pressure Vessel Code, Section VIII.

The relief valve(s) must be threaded directly into the dedicated fitting(s) located near the top of the storage tank/heat exchanger and each relief valve discharge must be separately plumbed to a suitable floor drain.

The discharge line must not be smaller than the relief valve opening, must allow complete drainage of the valve and line and it must be positioned in the floor drain (in the event that any water or steam forcefully exiting the drain line does not openly splash).

The water heater must not be operated without a correctly installed, properly sized and properly operating relief valve. It is industry standard that the relief valve(s) be manually operated at least once a year. If water does not freely flow from the manually operated relief valve(s) or if it does not fully reseat when released, then a new relief valve(s) is required. The new valve(s) must be of the same type, temperature and pressure rating, and relieving capacity as the original relief valve supplied with the water heater.

Do not plug or restrict the relief valve or the relief valve drain line.



WARNING: Do not install a reducing coupling, valve or other restriction between the relief valve discharge and a suitable floor drain. Such a restriction could prevent the valve from fully relieving if the pressure settings are exceeded, which could result in property damage, personal injury, or even death.

IMPORTANT: A relief valve that periodically discharges may result from thermal expansion. As stated in the "Potable Inlet and Outlet Piping" section of this manual: if the water heater is installed in a closed water supply system (requiring a back-flow preventer or a check valve in the cold-water line) the system will require a means to control expansion. Contact Hubbell, a water heater, and/or a plumbing professional to resolve this situation.

ELECTRICAL INSTALLATION

IMPORTANT: This heater is wired for 120VAC, 1ph, 60Hz service (unless specified otherwise). The heater must be electrically grounded in accordance with the latest edition of the National Electrical Code ANSI/NFPA No. 70. When the unit is installed in Canada, it must conform to the CSA C22.1, Canadian Electrical Code and/or Local Electrical Codes.

CAUTION: Do not use the water heater or any attached piping as an electrical ground of any kind.

1. Refer to Hubbell drawing for any electrical requirements.
2. Enter electric enclosure with properly sized feeder leads. Install these power leads into the box lugs on the terminal block or magnetic contactor.
3. All other electrical connections are made at the factory; therefore, no other electrical connections are necessary.
4. Due to the rigors of transportation, check factory wiring connections for tightness.F

FILLING THE HEATER

1. Fill the entire system with water. To be sure that the unit is not inoperative because of air in a space normally filled with water (air-bound), open the relief valve. Leave the valve open until a steady flow of water is observed. Then close the valve and complete filling the system.
2. Check the unit again to make sure there are no system leaks. Avoid using petroleum based products to stop any leaks that may be discovered. All system leaks must be repaired.

SECTION III
OPERATION

STARTUP

CAUTION: To avoid pump damage, do not energize the heater or circulating pump until the tank is full of water.

CAUTION: To avoid damage to the heat exchanger, gradually introduce boiler water to the heat exchanger.

1. When placing the unit into operation, open the relief valve to purge air from the top of the tank and begin to fill the tank with cold water (checking for leaks). Be sure the tank is completely filled before closing the relief valve.
2. Locate the ON/OFF switch in the control box. Activate the pump and thermostats by pushing the control switch to the "ON" position.
3. Verify the desired set-point temperature. The operating thermostat is set at the factory at approximately 140°F, and the hi-limit device is factory set at approximately 200°F. **If changes to the desired temperatures are required please reference the provided supplemental instructions from the controller manufacturer.**
4. Push the operating switch to "OFF" before opening the main boiler water supply valve. To prevent thermal shock, do not allow boiler water to the heat exchanger suddenly when the heat exchanger is empty or cold.
5. Gradually open valve to allow water to enter the heat exchanger until all passages of the heat exchanger are filled and slowly bring the heat exchanger up to temperature.
6. Push the operating switch to "ON" to energize the pump and control valve. This will begin to heat the water in the storage tank. Allow the water temperature in the storage tank to rise above the set-point entered into the temperature controller and to de-energize the circulating pump and control valve.
7. Confirm the pump cycles on when the stored water temperature drops enough to cause the temperature controller to re-energize the circulating pump by opening a nearby hot water tap to consume hot water from the storage tank. Check operation of all safety and operating controls (Repeat as necessary).
8. Confirm there is no pulsation or water hammer, since this can cause vibration and strain which can result in damage or leaks. Contact a water heater or plumbing professional to resolve this situation.
9. Gaskets may require tightening after the heat exchanger has reached the set-point temperature. Follow the supplemental instructions provided by the heat exchanger manufacturer to retighten the gasket joints.
10. Never operate unit in excess of design conditions.
11. Never break any joint, (gasketed or screwed), until the pressure in the unit has been reduced to zero and the unit drained.

SHUTDOWN

1. Remove all power from the system.
2. Close all boiler water supply valves to the unit.
3. Close all cold-water supply valves to the unit.
4. If the water is to be removed from service for an extended period of time: the storage tank, heat exchanger, and piping can now be drained completely. (1) Lift lever on relief valve to vent tank. (2) Open drain valve.

SECTION IV
SCHEDULED MAINTENANCE AND SERVICING

WARNING / CAUTION

WARNING: Turn off all electrical service to the heater before accessing electrical components or terminals located inside the control cabinet or at any other point of wiring access. Close and fasten the control cabinet cover or any other point of wiring access before restoring electrical service to the heater. If the electrical service is not turned off and these components are touched, a shock can occur, which can result in property damage, personal injury, or even death.

IMPORTANT: Hubbell cannot control the use of the product provided, the water conditions in which it is used, or the adherence to a regular maintenance schedule, therefore, the warranty on the BWP unit does not cover poor performance, structural failure, or leaking due to an excessive accumulation of scale.

RECOMMENDED MAINTENANCE SCHEDULE

Monthly Maintenance

1. Test low-water cutoff device.
2. Check gauges, monitors, and indicators.
3. Check instrument and equipment settings.

Annual Maintenance

1. Check all joints, pipe connections and the heat exchanger for tightness, corrosion, or deterioration.
2. Check all pumps, valves, controls, and devices including thermostats for proper operation.
3. Check relief valves for proper operation.
4. Test hi-limit and operating temperature controls.

As Required Maintenance

1. Tank flush and cleanout.
2. Clean heat exchanger.
3. Clean potable water Y-Strainer.
4. Clean (or blow down) boiler water Y-Strainer.

GENERAL MAINTENANCE

Tank

Depending on the water quality and operating temperature, scale can form during operation and will continue to accumulate on the bottom of the tank. Therefore, it is recommended to inspect the tank every six months (more frequent inspections may be required if higher scaling conditions are present). To help prevent the accumulation of scale, flush the tank at regular intervals.

To flush:

1. Remove power to the unit by turning off the electrical disconnect switch.
2. Open the drain valve and allow water to flow through the tank until it runs clear.
3. Close the drain valve and restore power to the unit by turning on the electrical disconnect switch. Refer to Section III – Operation section of this manual for further instructions.

NOTE: When the heater is returned to service, conduct a thorough inspection of all connections, fittings, and wiring.

Temperature and Pressure Relief Valve
Test the temperature and pressure relief valve(s) on the storage tank and the heat exchanger at least once a year. Do this by manually lifting the relief valve lever briefly. If a relief valve does not open and close properly then it must be replaced with a new relief valve of the same type. Refer to Section II – Piping Installation section of this manual for further instructions.

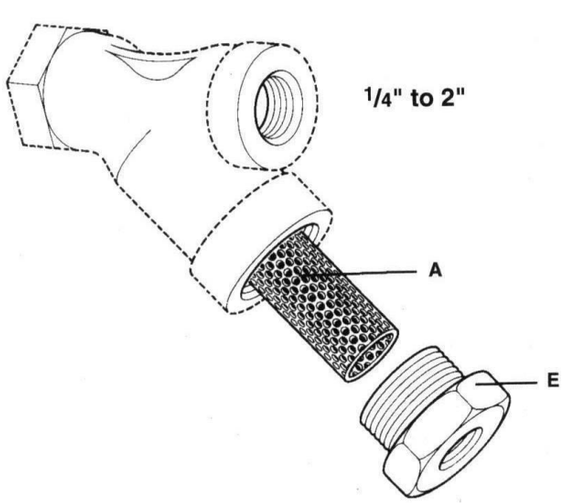
Thermostats and Temperature Limiting Devices
The temperature sensors that regulate the process control of the unit extend into the water inside the storage tank. Depending on the water conditions in your area, scale may coat these sensors, affecting the accuracy of the sensors. This can allow water temperature to exceed the desired limits. Therefore, it is recommended to remove and inspect these sensors at regular intervals and remove scale if present.

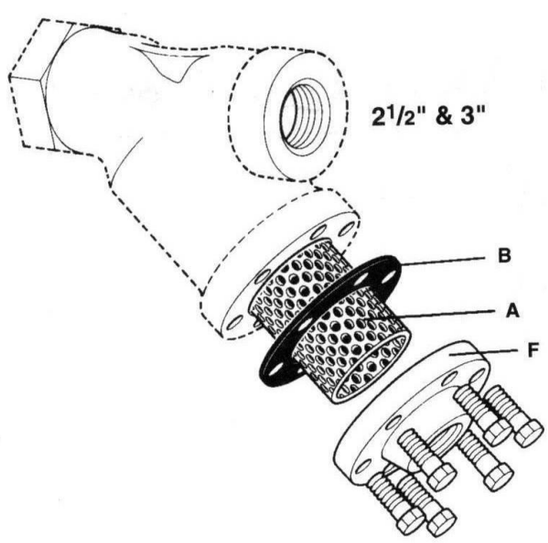
Boiler Water Control Valve
The boiler water control valve is sealed and factory installed and therefore should require no maintenance. However, durability of the valve stems and packing is dependent upon maintaining non-damaging water conditions. Inadequate water filtration/treatment can result in corrosion, scale, and abrasive particle formation. It is important then, to make sure the Y-Strainers are regularly cleaned.

Additional preventative maintenance includes protecting the actuator from dropping water, condensation, and other moisture and making sure the actuator is not covered with thermal insulating material. Water or moisture could result in an electrical short, and high ambient temperatures may damage the actuator.

Cleaning the Y-Strainer
Perform annually or more often, if required.

1. Remove blowoff bushing (E) or cap (F), as required.
2. Remove gasket (B), if required.
3. Remove, clean, and re-install screen (A).
4. Replace gasket (B).
5. Re-install blowoff bushing (E) or cap (F), as required.





Heat Exchanger
Depending on the water quality and operating temperature, scale can form during operation and will continue to accumulate inside the heat exchanger. For instructions on regular maintenance procedure consult the supplemental information from the heat exchanger manufacturer.

SECTION V
TROUBLESHOOTING

Symptom	Probable Cause	Corrective Action / Remedy
Gradual loss of heating capacity.	HX is fouled.	Clean HX per separate O&M.
	Excess silt in bottom of tank.	Drain and flush tank per Section IV, annual scheduled maintenance.
	Strainers clogged.	Clean strainers per Section IV, annual scheduled maintenance.
	Pump impellor deteriorated.	Repair or replace per separate O&M.
	Operating conditions are outside of design parameters.	Check if the set-point is higher than specified. Confirm the measured flow rate by volume and rate, make sure there are not additional loads on the heater.
Overheating.	Malfunctioning or misadjusted thermostat.	Reconfigure per separate O&M. If the thermostat is properly adjusted and is not de-energizing the circulator pump, verify the wiring is correct and replace the thermostatic control if necessary.
	Circulator not operating.	Repair or replace per separate O&M.
	Circulator not de-energizing.	Repair or replace per separate O&M.
Outlet water temperature is not constant.	Insufficient recovery.	Check to make sure the heater design rating is not being exceeded.
	Malfunctioning or misadjusted thermostat.	Repair or replace per separate O&M.
Excessive vibration.	High rate of flow beyond design conditions.	Consult factory.
	Under sized piping to the unit.	Re-pipe lines to unit using proper sized lines.
No hot water, even at low flow.	Boiler water control valve not opening.	Check that the electrical coils are energized. If not, it is a wiring problem. If so, repair or replace per separate O&M.
	Malfunction or misadjusted thermostat.	Reconfigure per separate O&M. If the thermostat is properly adjusted and is not energizing the circulator pump, verify the wiring is correct and replace the thermostatic control if necessary.
	Circulator not operating.	Repair or replace per separate O&M.

***** Red symptom indicates that equipment should be shut down immediately and cause of malfunction corrected before unit is re-started or serious damage may result.

SECTION VI
MISCELLANEOUS CHARTS AND FORMULAS

METRIC CONVERSIONS

Liters x 0.2641 = Gallons	Bar x 14.5 = psi
Gallons x 3.79 = Liters	psi x 6.86 = kPa
Gallons x 0.003785 = m^3	kPa x 0.1456 = psi
m^3 x 264.2 = Gallons	Lbs x 0.4536 = Kg
$1^{\circ}C\ \Delta T = 1.8^{\circ}F\ \Delta T$	Kg x 2.2 = Lbs
$^{\circ}F = (^{\circ}C \times 1.8) + 32$	ft^2 x 0.0929 = m^2
$^{\circ}C = (^{\circ}F - 32) \times 0.556$	m^2 x 10.765 = ft^2
psi x 0.06896 = Bar	

THE ELECTRIC HEATER COMPANY

P.O. BOX 288
STRATFORD, CT 06615-0288
PHONE: (203) 378-2659
FAX: (203) 378-3593
INTERNET: http://www.hubbellheaters.com/