INSTALLATION & OPERATING MANUAL

Indirect Water Heaters

DTI 30
DTI 40
DTI 55
DTI 65
DTI 80
DTI 119
DTI 80-Max
DTI 119-Max

CAUTION

Uniform Plumbing Code Requirements

An indirect fired water heater that incorporates a single wall heat exchanger shall be in accordance with the following requirements:

- **The heat transfer medium shall be either potable water or contain fluids recognized as safe by the Food and Drug Administration (FDA) as food grade.**
- **The maximum operating pressure of the heat exchanger shall not exceed the maximum operating pressure of the potable water supply.**

Intertek Intertek

Intentionally left empty

Contents

1.0 Safety information

Manual safety markings

Danger

Points out an immediate hazardous situation that must be avoided to prevent serious injury or death.

Warning

Points out a potential hazardous situation that must be avoided to prevent serious injury or death.

Caution

Points out a potential hazardous situation that must be avoided to prevent possible moderate injury and/or property damage.

Note

Points out installation, maintenance, and operational notes to enhance efficiency, longevity, and proper operation of your water heater.

Important safety instructions

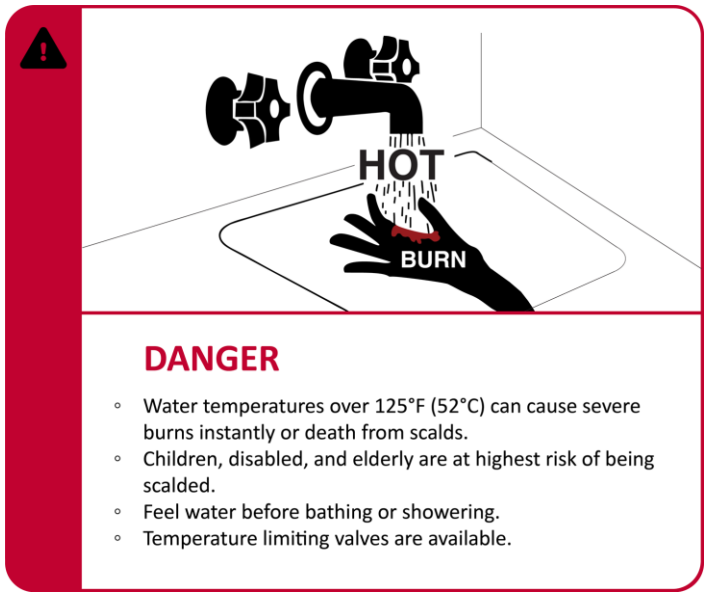
Failure to read and comply with all instructions and applicable national and local codes may result in hazardous conditions that could result in property damage and injury to occupants, and in extreme cases to death. Keep instructions near the indirect water heater for future reference.

When using electrical appliances, follow safety precautions to reduce the risk of fire, electric shock, or injury to persons, including:

- Install or locate the indirect water heater only in accordance with the provided installation instructions.
- Use the indirect water heater only for its intended use as described in this manual.
- As with any appliance, close supervision is necessary when used by children.
- Do not operate the indirect water heater if it is not working properly, or if it has been damaged or dropped.
- Installation, start-up, and servicing of this indirect water heater must be done with care and attention, and should only be performed by competent, qualified, licensed, and trained plumbing and heating technicians. Contact your nearest authorized service facility for examination, repair, or adjustment.

Danger

Do not store or use gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance. If you smell gas vapors, do not try to operate any appliance - do not touch any electrical switch or use any phone in the building. Immediately, call the gas supplier from a phone located remotely. Follow the gas supplier's instructions, or if the supplier is unavailable, contact the fire department.



TIME/TEMPERATURE RELATIONSHIP IN SCALDS	
WATER TEMPERATURE	TIME TO PRODUCE A SERIOUS BURN
120°F (49°C)	More than 5 minutes
125°F (52°C)	1 ½ to 2 minutes
130°F (54°C)	About 30 seconds
135°F (57°C)	About 10 seconds
140°F (60°C)	Less than 5 seconds
145°F (63°C)	Less than 3 seconds
150°F (66°C)	About 1 ½ seconds
155°F (68°C)	About 1 second

Table courtesy of Shriners Burn Institute

Warning

Improper installation, adjustment, alteration, service, or maintenance can cause property damage, personal injury, or loss of life. Read and understand the entire manual before attempting installation, start-up, operation, or service. Installation and service must be performed only by an experienced, skilled installer or service agency.

The indirect water heater contains very hot water under high pressure. Do not unscrew any pipe fittings or attempt to disconnect any components of this indirect water heater without positively ensuring that the water is cool and has no pressure. Always wear protective clothing and equipment when installing, starting up or servicing this indirect water heater to prevent scalding injuries. Do not rely on the temperature and pressure gauges to determine the temperature and pressure of the indirect water heater. This indirect water heater contains components that become very hot when the boiler is operating. Do not touch any components unless they are cool.

Failure to follow all instructions in the proper order can cause personal injury or death. Read all instructions, including all those contained in component manufacturers' manuals before installing, starting up, operating, maintaining, or servicing the indirect water heater.

Caution

To reduce the risk of excessive temperatures and pressures in this indirect water heater, install temperature and pressure protective equipment required by local codes, but no less than a combination temperature/pressure relief valve certified by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials, as meeting the requirements for Relief Valves for Hot Water Supply Systems, ANSI Z21.22/CSA 4.4 latest edition.

This relief valve must be marked with a maximum set pressure not to exceed the marked working pressure of the indirect water heater. Install the relief valve into the tapping provided and marked for this purpose in the indirect water heater and orient it or provide tubing so that any discharge from the valve will exit only within 6 inches above a suitable drain. The discharge opening must not be blocked or reduced in size under any circumstances. The heat transfer medium must be water or other non-toxic fluid having a toxicity rating or class of 1, as listed in clinical Toxicology of Commercial Products, latest edition.

Installation, start-up and servicing of boilers and indirect water heaters must be done with due care and attention, and should only be performed by competent, qualified, licensed, and trained heating technicians.

Warning

The boiler supplying hot water to the indirect hot water heater coil must be equipped with an automatic shutoff system actuated before the outlet water temperature exceeds 250°F (121°C). The automatic shutoff system must be of the manual reset type and comply with one of the following: Standard for Automatic Gas Shutoff Devices for Hot Water Supply Systems, ANSI Z21.87/CSA 4.6, or the Standard for Limit Controls, UL353 or CSA C22.2 No.24.

2.0 Specifications

Specification	30	40	55	65
Diameter Inches (cm)	20.1 (51.1)	21.8 (55.5)	21.8 (55.5)	23.8 (60.4)
Height Inches (cm)	39.6 (100.6)	46.9 (119.2)	62.8 (159.4)	59.5 (151.0)
Gross DHW Volume Gallons	26.8	40.1	56.8	66.6
Net DHW Volume Gallons	25.7	38.9	55.1	64.9
Max. Operating Pressure PSI	150	150	150	150
Max. DHW Temperature °F (°C)	180 (82)	180 (82)	180 (82)	180 (82)
Weight Pounds (kg)	44 (20)	58 (27)	83 (38)	96 (44)
Shipping Weight Pounds (kg)	51 (23)	66 (30)	92 (42)	105 (48)
Domestic Connection Size Inches	¾	¾	¾	¾
Boiler Connection Size Inches	1	1	1	1
First Hour Delivery* Gallons / Hour	159	185	240	285
Continuous Draw* Gallons / Hour	137	154	193	230
Boiler Output Required* BTU / Hour	88,000	98,000	123,000	146,500
Heating Coil Flow Rate* GPM	8	8	8	13
Heating Coil Pressure Drop* Feet of Head	3.0	2.5	3.3	8.2
Heating Coil Surface Area Ft^2 (m^2)	6.9 (0.64)	8 (0.74)	10.7 (0.99)	11.1 (1.03)
Certified – Water Heater	✓	✓	✓	✓
Certified – Low Lead	✓	✓	✓	✓

Table 1 *30, 40, 55, 65 Models*

*Based on 180°F boiler supply, 135° DHW and 58°F entering cold water

Specification	80	119	80-Max	119-Max
Diameter Inches (cm)	23.8 (60.4)	28.9 (73.4)	23.8 (60.4)	28.9 (73.4)
Height Inches (cm)	69.9 (177.6)	65.8 (167.2)	69.9 (177.6)	65.8 (167.2)
Gross DHW Volume Gallons	80.2	115	80.2	115
Net DHW Volume Gallons	78.0	111.8	75.3	110
Max. Operating Pressure PSI	150	150	150	150
Max. DHW Temperature °F (°C)	180 (82)	180 (82)	180 (82)	180 (82)
Weight Pounds (kg)	107 (48)	143 (65)	130 (59)	166 (76)
Shipping Weight Pounds (kg)	118 (53)	155 (71)	141 (64)	178 (81)
Domestic Connection Size Inches	1	1 ½	1 ½	1 ½
Boiler Connection Size Inches	1	1 ½	1 ½	1 ½
First Hour Delivery* Gallons / Hour	345	445	484	625
Continuous Draw* Gallons / Hour	279	350	428	537
Boiler Output Required* BTU / Hour	178,000	224,000	273,000	343,000
Heating Coil Flow Rate* GPM	13	15	13	25
Heating Coil Pressure Drop* Feet of Head	10.5	8.8	7.2	28.0
Heating Coil Surface Area Ft^2 (m^2)	14.2 (1.32)	18.5 (1.72)	26.4 (2.45)	27.6 (2.56)
Certified – Water Heater	✓	✓	✓	✓
Certified – Low Lead	✓	✓	✓	✓

Table 2 *80, 119, 80-Max, 119-Max Models*

* Based on 180°F boiler supply, 135° DHW and 58°F entering cold water

2.1 Dimensions

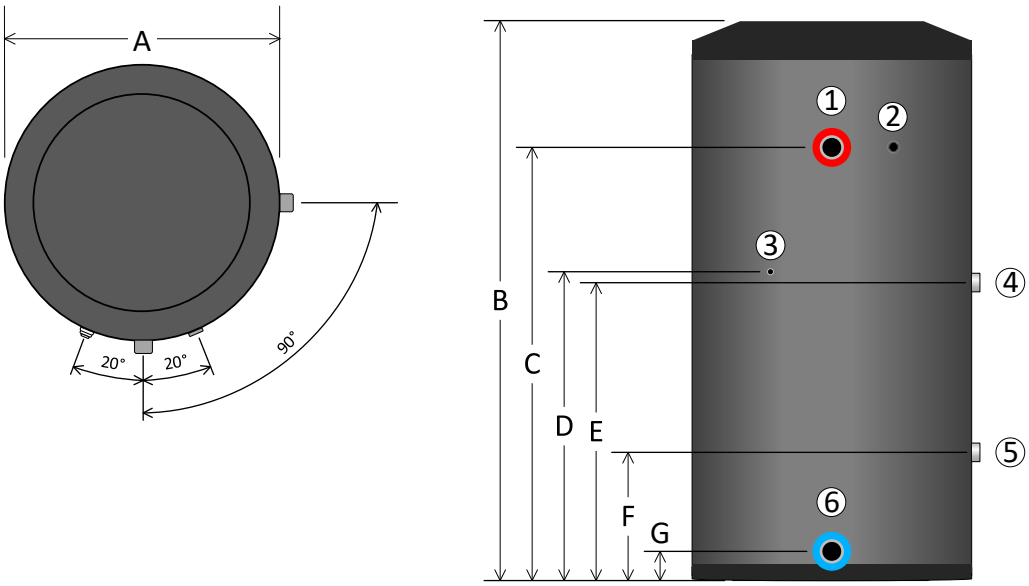


Figure 1 *Indirect water heater dimensions - 30*

Dimension	30
A = Diameter Inches (cm)	20.1 (51.1)
B = Height Inches (cm)	39.6 (100.6)
C = DHW Outlet & Relief Valve Inches (cm)	30.9 (78.5)
D = Sensor / Aquastat Well Inches (cm)	22.4 (57.0)
E = Boiler Supply Inches (cm)	22 (56.0)
F = Boiler Return Inches (cm)	9.5 (24.0)
G = DHW Inlet Inches (cm)	2.2 (5.5)

Legend	30
1	DHW Outlet (¾″ M)
2	T & P Relief Valve (¾″ F)
3	Sensor / Aquastat Well
4	Boiler Supply (1” M)
5	Boiler Return (1” M)
6	DHW Inlet (¾″ M)

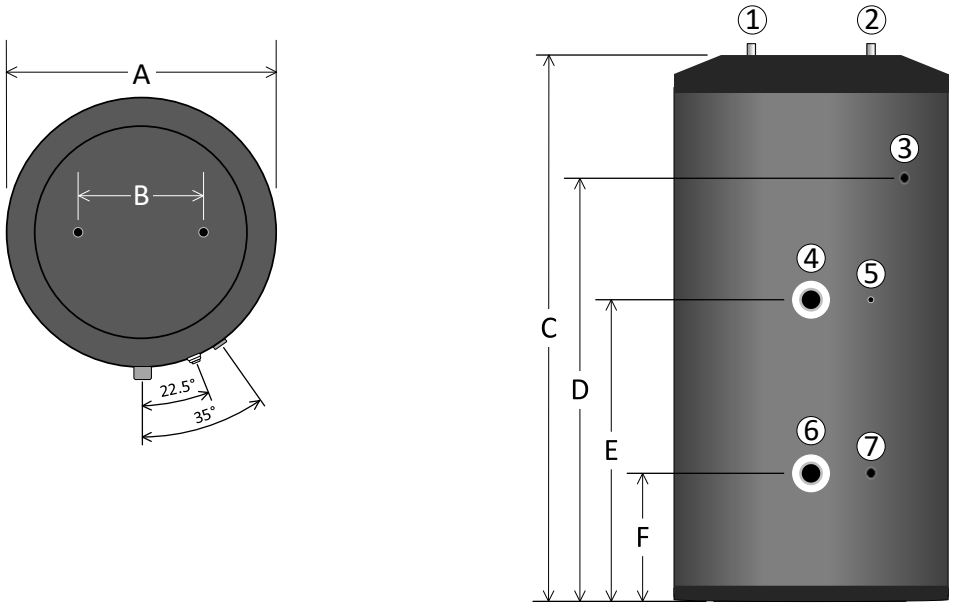


Figure 2 *Indirect water heater dimensions - 40, 55, 65*

Dimension	40	55	65
A = Diameter Inches (cm)	21.8 (55.5)	21.8 (55.5)	23.8 (60.4)
B = DHW Inlet & Outlet Center to Center Inches (cm)	10.1 (25.6)	10.1 (25.6)	10.1 (25.6)
C = Height Inches (cm)	46.9 (119.2)	62.8 (159.4)	59.5 (151.0)
D = Relief Valve Inches (cm)	37 (93.9)	52.8 (134.1)	50.1 (127.2)
E = Boiler Supply & Sensor / Aquastat Well Inches (cm)	23.6 (59.9)	27.7 (70.4)	26.1 (66.2)
F = Boiler Return & Drain Inches (cm)	10.2 (25.9)	10.2 (25.9)	9.9 (25.2)

Legend	40, 55, 65
1	DHW Outlet (¾″ M)
2	DHW Inlet (¾″ M)
3	T & P Relief Valve (¾″ F)
4	Boiler Supply (1” M)
5	Sensor / Aquastat Well
6	Boiler Return (1” M)
7	DHW Drain (½” F)

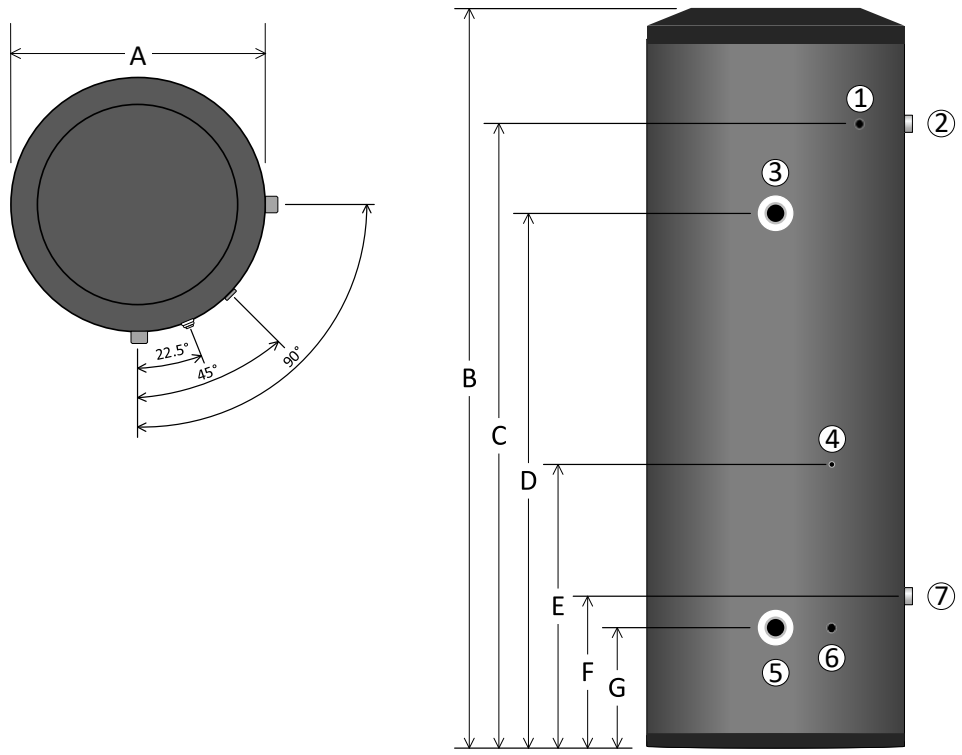


Figure 3 *Indirect water heater dimensions - 80, 119, 80-Max, 119-Max*

Dimension	80	119	80-Max	119-Max
A = Diameter Inches (cm)	23.8 (60.4)	28.9 (73.4)	23.8 (60.4)	28.9 (73.4)
B = Height Inches (cm)	69.9 (177.6)	65.8 (167.2)	69.9 (177.6)	65.8 (167.2)
C = DHW Outlet & Relief Valve Inches (cm)	60.5 (153.7)	52.8 (134.2)	60.1 (152.7)	52.8 (134.2)
D = Boiler Supply Inches (cm)	30.0 (76.2)	31.7 (80.5)	52.8 (134.2)	42.5 (107.9)
E = Sensor / Aquastat Well Inches (cm)	30.0 (76.2)	31.7 (80.5)	26.3 (66.7)	34.0 (86.2)
F = DHW Inlet Inches (cm)	12.1 (30.7)	13.3 (33.7)	12.3 (31.2)	13.9 (35.2)
G = Boiler Return & Drain Inches (cm)	9.9 (25.2)	11.5 (29.2)	9.9 (25.2)	11.5 (29.2)

Legend	80	119, 80-Max, 119-Max
1	T & P Relief Valve (¾″ F)	T & P Relief Valve (1” F)
2	DHW Outlet (1” M)	DHW Outlet (1½” M)
3	Boiler Supply (1” M)	Boiler Supply (1½” M)
4	Sensor / Aquastat Well	Sensor / Aquastat Well
5	Boiler Return (1” M)	Boiler Return (1½” M)
6	DHW Drain (½” F)	DHW Drain (½” F)
7	DHW Inlet (1” M)	DHW Inlet (1½” M)

2.2 Coil pressure drop

Pressure Drop vs Boiler Flow (ft of head)				
Model	**8 GPM**	**13 GPM**	**15 GPM**	**25 GPM**
30	3.0	-	-	-
40	2.5	-	-	-
55	3.3	-	-	-
65	-	8.2	-	-
80	-	10.5	-	-
119	-	-	8.8	-
80-Max	-	7.2	-	-
119-Max	-	-	-	28.0

Table 3 *Pressure drop vs boiler flow rate*

2.3 Temperature & pressure relief valve requirements

Note

The maximum heat transfer through the coil of the indirect water heaters at 240 °F boiler supply temperature and 210 °F domestic hot water temperature are as follows:

- Models 30 through 80 are less than 100,000 BTU/HR.
- Models 119, 80-MAX, and 119-MAX are less than 200,000 BTU/HR.

Domestic hot water temperature is limited to below 210 °F and nominal water capacity is below 120 gallons for all indirect water heater models.

Accordingly, per HLW 101.2, Section IV of the ASME Boiler and Pressure Vessel Code, all these indirect water heater models are exempt from compliance with the code. Check with local codes for applicability.

Minimum Relief Valve Capacity (CSA Rating)		
Model	**CSA Rating (Btu/hr)**	**Minimum Relief Valve Required**
30	105,000	Watts ¾" LF100XL or XL8, or equivalent
40	105,000	Watts ¾" LF100XL or XL8, or equivalent
55	105,000	Watts ¾" LF100XL or XL8, or equivalent
65	105,000	Watts ¾" LF100XL or XL8, or equivalent
80	105,000	Watts ¾" LF100XL or XL8, or equivalent
119	205,000	Watts 1" LF40XL-4, or equivalent
80-Max	205,000	Watts 1" LF40XL-4, or equivalent
119-Max	205,000	Watts 1" LF40XL-4, or equivalent

Table 4 *Recommended relief valves*

3.0 Introduction

3.1 Included components

Included Equipment

- 10KΩ temperature sensor
- Aquastat (USA only)

Not Included:

- Temperature and pressure relief valve

The included 10KΩ temperature sensor is compatible with many boilers that are equipped with an electronic controller. An aquastat can be used with boilers which are not compatible with the 10KΩ temperature sensor.

3.2 Conformity

Inspect shipment carefully for signs of damage. All equipment is carefully inspected and packed. Our responsibility ceases upon delivery of the indirect water heater to the carrier. Any claims for damage or shortage, must be filed immediately against the carrier. No claims for variances or shortages will be allowed by the manufacturer.

3.3 Standards

Installation must conform to the requirements of the authority having jurisdiction. In the absence of such requirements, the installation must conform to the Uniform Plumbing Code and the National Electrical Code NFPA 70, latest editions in the US and the National Plumbing Code of Canada and the Canadian Electrical Code, latest editions in Canada.

This indirect water heater complies with the lead content requirement for “lead-free” plumbing. as defined by NSF/ANSI/CAN 372. and the US Safe Drinking Water Act.

4.0 Before installation

> **Note**
>
> Local authorities may not accept the indirect water heater due to jurisdictional demands such as double-wall heat exchanger requirements, local, or state registration requirements. Before installing the indirect water heater, you must confirm that local authorities will accept this equipment.

4.1 Installation checklist

The following checklist will help with indirect water heater, boiler, and circulator sizing.

		Check
Indirect water heater sizing	Choose the indirect water heater model based on the expected water usage for the given site. The average residence with one shower or more will require a Model 40 or larger. Factors that increase water demand dramatically include high flow shower heads, hot tubs, and the use of more than one shower at a time. Increase the size if these factors are present. Carefully review the indirect water heater *Specifications on pages 8 and 9*, and consult ASHRAE sizing guides and other reliable references.	☐
Boiler sizing	The indirect water heater will provide the rated performance only if it is used with a boiler with a heating capacity of at least as much as the capacity ratings in *Table 1* and *Table 2* . If the boiler has less capacity, the water heating output will be reduced.	☐
Circulator sizing	Refer to *Table 1* and *Table 2* for the optimal water flow through the coil and the pressure drop. Calculate the pressure drop across all piping and fittings connected to the indirect water heater zone. Be sure to include all zone valves, check valves, and shut-off valves. We recommend piping the indirect water heater zone with minimum 1" pipe.	☐

4.2 System zone control

Caution

To avoid water damage from leaks, install a drain pan under the indirect water heater unless it is located where leaks will not cause property damage. See *Figure 8*.

If unable to direct discharge from the T&P relief valve into a drain or into an area where water damage will not occur, install a drain pan capable of draining away the full continuous discharge flow of the T & P relief valve.

You must install the indirect water heater as a separate zone from the space heating system. The indirect water heater zone's piping and circulator should be sized for the required flow rate to achieve the full DHW output when piped to an adequately sized boiler. The best method for zone control is the use of circulators.

The three most common systems are:

1. **Zone Circulators** - Space heating zones use a circulator for each zone, and the indirect water heater is controlled with an additional circulator.
2. **Hybrid System** - Space heating zones use zone valves for each zone with a single circulator, and the indirect water heater is controlled with an additional circulator.
3. **Zone Valves** - Space heating zones and the indirect water heater use zone valves for each zone with a single circulator. Select a valve with a low pressure drop and adequate pipe size to ensure maximum flow.

4.3 DHW priority options

4.3.1 DHW Priority

The demand for space heating is interrupted until the hot water demand is satisfied. This option provides the maximum delivery of hot water. You can easily configure many boilers to operate the hot water demand as a priority load. Priority is recommended when:

1. The boiler output is less than 100,000 Btu per hour, or
2. The boiler output required to satisfy the hot water demand is more than 50% of the boiler output needed to satisfy the space heating demand, or when
3. An interruption in space heating can be tolerated during long domestic hot water draws.

When using the Priority option, the preferred strategy is to use a dedicated load circulator for domestic hot water generation. In most cases, the delay in space heating will not be noticed because of the rapid recovery of the indirect water heater.

Note

When using the sequential load feature of the V-10 control, you must check the operation of system components to ensure they are compatible. Many air handlers, for instance, use a thermostat connection that energizes an internal relay to operate the air handler circulator and its fan on a call for heat. Thus, these components may operate when other loads are running at a higher priority, resulting in cold air blowing, or taking heat from another load. You may need to modify the wiring to separate these functions from the thermostat control in favor of more effective control.

4.3.2 No DHW priority

The boiler output is divided between space heating and water heating. Heating of domestic hot water can be reduced during simultaneous space and water heating demands.
The amount of reduction depends on the:

- Boiler output
- Number of space heating zones calling
- Space heating target water temperature
- Amount of boiler water flow split between the space heating zones and the indirect water heater zone.

4.4 Locating the indirect water heater

Locate the indirect water heater in an area where water leakage will not result in damage to areas adjacent to the indirect water heater or to lower floors of the structure. If unable to find an appropriate location, you must install a suitable drain pan under the indirect water heater and connect the drain pan to a drain.

To enable easy access for servicing, install the indirect water heater as close to the boiler as practicable.

The indirect water heater is designed for installation on combustible flooring and in alcoves, closets, etc. If the indirect water heater will be installed directly on carpeting, it must be installed on a metal or wood panel extending at least 3” (76.2 mm) beyond the indirect water heater in all directions. If the indirect water heater is installed in a carpeted alcove or closet, the entire floor must be covered by the panel. The panel must be strong enough to carry the weight of the indirect water heater when full of water.

Surface	Minimum Distance from Combustibles	Recommended Distance for Service
Front Inches (cm)	1 (2.5)	24 (61)
Right, Left, and Rear Inches (cm)	1 (2.5)	1 (2.5)
Top Inches (cm)	1 (2.5)	1 (2.5)
Bottom Inches (cm)	0 (0)	0 (0)

Table 5 *Clearances from indirect water heater jacket*

4.5 Temperature and pressure relief valve

1. An ANSI Z21.22/CSA 4.4 compliant temperature and pressure relief valve meeting or exceeding the rating shown in *Table 4 on page 13* must be installed in the tapping on the side of the indirect water heater labeled "Relief Valve".

2. Pipe the outlet of the relief valve to an appropriate location (floor drain or drain pan) terminating within 6" of an appropriate drain location. Pipe the relief valve piping down toward the outlet of the piping, so that the piping and the valve can fully drain. Never terminate the relief valve piping outdoors where it may freeze.

Danger

Do not install a shut off valve between the indirect water heater and the temperature and pressure relief valve. Do not cap, plug, or obstruct the outlet of the temperature and pressure relief valve discharge. Any restriction preventing the normal operation of the temperature and pressure relief valve can cause property damage, personal injury, or loss of life.

Warning

During operation, the temperature and pressure relief valve may discharge large amounts of steam and/or hot water. To reduce the potential for bodily injury and property damage, a discharge line **must** be installed that:

- Is connected from the relief valve outlet with no intervening valve and directed downward to a safe point of discharge.
- Allows complete drainage of both the relief valve and the discharge line.
- Is independently supported and securely anchored to avoid applied stress on the relief valve.
- Is as short and straight as possible.
- Terminates freely to atmosphere where any discharge is clearly visible and at no risk of freezing.
- Terminates with a plain end, which is not threaded.
- Is constructed of a material suitable for exposure to temperatures of 375°F or greater.
- Is, over its entire length, of a pipe size equal to or greater than that of the relief valve outlet.

Warning

There are a number of conditions, including improper control settings, which could result in elevated DHW temperatures from **any** type of water heater. An overheating hazard can result, potentially causing serious personal injury and/or property damage.

We recommend as a minimum precaution, installing a point of source ASSE 1017 approved thermostatic mixing valve on the outlet of the indirect water heater. Local jurisdictions may require more comprehensive protective measures depending on the place of installation (schools, nursing homes, etc.). Consult local authorities for direction.

4.6 Additional recommended components

1. **Shut-off valves** - Allows the isolation of the indirect water heater from the system during service.
2. **Drain valve** - Install at the bottom of the indirect water heater to allow for draining and servicing.
3. **Unions** - Allows for easy servicing or removal.
4. **Vacuum breaker** - Protects the indirect water heater from collapse if a hot indirect water heater is valved off to service other components in the system.
5. **Thermal expansion tank** - If the indirect water heater is installed in a closed water supply system, such as a system having a back flow preventer in the cold water supply line, the installation of a thermal expansion tank is required.
6. Refer to *Figure 8* for suggested external components.

4.7 Removing an existing water heater

If replacing an electric or direct-fired gas or oil water heater with the indirect water heater, disconnect the water piping and either strip back to the nearest main line and cap off, or re-use for the new indirect water heater.

- **External Tankless Heater.** Disconnect all lines to the boiler and plug the boiler fittings. Disconnect the external heater from the boiler piping and from the domestic piping system.
- **Internal Tankless Heaters**. Disconnect the domestic piping. Do not plug the cold water or the hot water fittings of the internal tankless coil. Leave the coil in the boiler with the cold and hot water fittings open to prevent pressure build-up in the coil.
- **Electric Water Heater**. Disconnect the electrical supply wiring and remove back to the breaker panel or terminate in an approved junction box. Work must conform to all applicable electrical codes.
- **Direct Fired Gas Water Heater.** Disconnect the gas supply line to the heater, strip back to the nearest mains piping and cap off. Remove vent connector back to the common venting system and seal off or abandon as applicable. Work must conform to all applicable codes.
- **Direct Fired Oil Water Heater**. Disconnect the oil supply line to the heater, strip back to the nearest mains piping and cap off. If oil heating system is to be abandoned completely, ensure proper removal and disposal of old oil water heater and remaining fuel oil. Remove vent connector back to the common venting system and seal off or abandon as applicable. Work must conform to all applicable codes.

Caution

When an existing unit is removed from a common venting system, the common venting system is likely to be too large for proper venting of the appliances remaining connected to it.

Seal the common vent system opening then examine the common vent system to ensure it is not over-sized as a result of having removed the common vented water heater.

Any improper operation of the common venting system must be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 (latest edition) in the US or the Natural Gas and Propane Installation Code, CSA B149.1 (latest edition) in Canada.

4.8 Water quality

Improper water quality will reduce the expected life of the indirect water heater. Hard water, sediment, high or low pH, and high levels of chlorides in the domestic water should be avoided. Sediment and hard water will eventually coat the heating coil inside the indirect water heater and reduce the rate of hot water production and may eventually cause a failure. High or low pH and/or high chloride concentrations will cause corrosion and eventually failure. A filter is strongly recommended where sediment is present in the water. We recommend a water softening system for areas with hard water. In areas where the water quality is unknown, a water quality test should be performed.

Caution

Do not operate the indirect water heater in areas where the water pH is above 8.0 or below 6.0, and/or with chloride concentrations greater than 80 parts per million (ppm). The standard warranty does not cover problems caused by improper water pH or excessive levels of chlorides.

5.0 Piping

> **Note**
>
> Installers should contact local water purveyors about the suitability of their supply for use in hydronic heating systems. If uncertain about the water quality, consult a local water treatment expert about testing the water, and if necessary, treating the water.
>
> Alternatively, water or hydronic fluid of known quality can be brought to the site.

The following section describes how to pipe the indirect water heater with the domestic water system. For reference, see *Figure 8*.

5.1 Domestic piping

1. Drain the domestic water system:
   a. Shut off the cold water supply at the main shutoff valve.
   b. Open one or more faucets to relieve the pressure.
   c. Open the system drain, leaving the faucets open.
2. After positioning the indirect water heater in the final location, connect the cold water supply to the DHW inlet connection.

   Install the cold water supply using the following suggested components where applicable: a union, a heat trap, a shut-off valve, a drain valve, an expansion tank, a back flow preventer, and a vacuum breaker.
3. Connect the domestic hot water piping to the DHW outlet connection using a union, a heat trap, and a shut-off valve.
4. Pipe the relief valve discharge so that the discharge from the valve will exit within 6 inches above a suitable drain. The discharge opening must not be blocked or reduced in size under any circumstances.
5. Fill the indirect water heater with domestic water.
   a. Open all faucets to allow air to purge from the indirect water heater and piping.
   b. Open the domestic hot water shut-off valve.
   c. Slowly open the cold water inlet shut-off valve.
   d. Purge all air from the domestic water system.
   e. Allow the water to run, so that you clear the indirect water heater of any debris. Run the water long enough that it runs clear for at least one exchange of the indirect water heater volume.
   f. Close all faucets.
   g. Check the system for leaks. Repair as required.

5.2 Boiler piping

Warning

Do not use automotive-type ethylene or any other type of automotive antifreeze, or undiluted antifreeze of any kind in the boiler system. This may result in severe boiler or indirect water heater damage. Installers are responsible for ensuring that glycol solutions are formulated to inhibit corrosion in hydronic heating systems of mixed materials. Improper mixtures and chemical additives may cause damage to ferrous and non-ferrous components as well as damage to non-metallic, wetted components, normally found in hydronic systems.

Ethylene glycol is toxic and may be prohibited for use by codes applicable to your installation location. For environmental and toxicity reasons, we recommend only using non-toxic propylene glycol and non-toxic boiler water additives of any kind.

1. Determine where the boiler, the space heating, and the indirect water heater connections should be made based on the type of heating system, or is to be installed for a new hydronic system installation. See section *Piping Diagrams on page 32* for guidance.
2. The minimum recommended pipe size of the indirect water heater zone is 1” to ensure adequate flow, 1½" for larger indirect water heaters.

Note

The piping drawings in Section 10.0 are simple guides to a successful installation. Many necessary components are not shown, and details such as thermal traps are left out, so the drawings have greater clarity. We require that our boilers and indirect water heaters be installed by licensed and experienced trades people who are familiar with the applicable local and national codes. System design is to be completed by an experienced hydronic designer or engineer. The application drawings in this manual are only part of the finished design. You must carefully read and follow these installation instructions, and just as importantly, the installation instructions for the boiler model you are using with the indirect water heater.

5.3 Zone circulator system

The indirect water heater connection labeled “In from Boiler” should be piped to the boiler supply piping after the air separator and before the space heating takeoffs.

Mount the indirect water heater circulator as close as is practicable to the indirect water heater, and make sure the flow arrow points toward the indirect water heater. The use of shut-off valves is recommended for future service convenience. The indirect water heater connection labeled “Out to Boiler” should be piped to the boiler return, piping as close to the boiler as possible and after any flow control or check valves in the space heating return piping. We recommend the use of a union and a shut-off valve. The use of a check valve is required to prevent back flow through the indirect water heater during operation of the space heating system.

5.4 Zone valve system

We recommend using a minimum pipe size of 1" and 1" full-port zone valve with a high CV on the indirect water heater zone to ensure adequate flow.

The indirect water heater connection labeled “In from Boiler” must be piped to the boiler supply piping after the air separator and grouped with the other zones. The use of a shut-off valve is recommended for future service convenience.

The indirect water heater connection labeled “Out to Boiler” should be piped to the boiler return piping and grouped with the other zone returns. We recommend using a union and a shut-off valve. The use of a check valve is required to prevent back flow through the water heater during operation of the space heating system.

6.0 Electrical

Danger

Do not connect temperature sensor to “Therm” terminals on a V-10 control board equipped boiler. It could result in overheating, potentially causing serious personal injury and/or property damage.

1. Install all electrical wiring and grounding according to the National Electrical Code NFPA 70, latest edition in the US and the Canadian Electrical Code, latest edition in Canada.
2. All indirect water heaters are supplied with a 10KΩ temperature sensor which is compatible with many boilers that are equipped with an electronic controller. An aquastat can be used with boilers which are not compatible with the 10KΩ temperature sensor.
3. For indirect water heaters that are supplied with an aquastat. Follow the wiring instructions supplied with the aquastat and the boiler installation instructions.

6.1 Temperature sensor

The temperature sensor supplied with the indirect water heater is an NTC Thermistor with a resistance of 10,000 ohms at 25°C and β = 3892. Prior to installation, confirm that the temperature sensor is compatible with the boiler by confirming the resistance *Table 6* matches the temperature sensor requirements of the boiler.

The temperature sensor allows the boiler to constantly monitor the DHW temperature inside the indirect water heater and respond when the water temperature falls below the DHW setpoint.

Warning

The temperature sensor supplied with the indirect water heater may not be compatible with all makes of boiler or controls, and its use may create a hazardous condition. **Do not use the sensor with incompatible boilers.** Indirect water heaters are supplied with a 10kΩ thermistor sensor for inserting into the temperature well, and securing with a retainer clip or cap. You must solidly affix the thermistor to prevent it from falling out or from being pulled out. If the sensor is pulled out of the well, a continuous call for hot water will be generated, resulting in elevated DHW temperatures and risk of scalding.

To install the temperature sensor:

1. Insert the temperature sensor bulb fully into the well on the side of the indirect water heater and secure to prevent it from falling out.
2. Connect the temperature sensor wires to the appropriate terminals of a compatible boiler using an electrical junction box approved for the application. Reference the boiler installation manual for wiring details.
3. Set the DHW setpoint on the boiler to the lowest setting which meets the owner’s needs. Reference the boiler installation manual for programming details.

Warning

Scalding from hot water may occur if the DHW setpoint is set too high. The addition of a scald protection device may be required either at the outlet of the indirect water heater or at the point of use. Check with your local plumbing authority for local requirements.

Temperature		Resistance	Temperature		Resistance
°F	°C	Ω	°F	°C	Ω
30	-1	34,558	115	46	4,184
35	2	29,996	120	49	3,760
40	4	26,099	125	52	3,383
45	7	22,763	130	54	3,050
50	10	19,900	135	57	2,754
55	13	17,436	140	60	2,490
60	16	15,311	145	63	2,255
65	18	13,474	150	66	2,045
70	21	11,883	155	68	1,857
75	24	10,501	160	71	1,689
80	27	9,299	165	74	1,538
85	29	8,250	170	77	1,403
90	32	7,334	175	79	1,281
95	35	6,532	180	82	1,172
100	38	5,828	185	85	1,073
105	41	5,210	190	88	983
110	43	4,665	195	91	903

Table 6 *Temperature sensor resistance values*

6.2 Aquastat

An aquastat regulates the DHW temperature by closing a contact when the DHW temperature inside the indirect water heater falls below the aquastat setpoint. The aquastat contact opens once the water temperature reaches the DHW setpoint. Indirect water heaters sold in the USA include a Honeywell L4080B aquastat.

To install an aquastat:

1. Carefully bend the capillary tube/sensing bulb so that it is at a right angle to the back of the aquastat.
2. Loosen the mounting screw and carefully insert the sensing bulb into the well on the side of the indirect water heater until the aquastat mounts to the well head.
3. Tighten the screw to lock in place.
4. Wire the aquastat to the boiler or zone panel. Reference the boiler installation/zone panel manual for wiring details.
5. Set the DHW setpoint on the aquastat to the lowest setting which meets the owner's needs.

Warning

Scalding from hot water may occur if the DHW setpoint is set too high. The addition of a scald protection device may be required either at the outlet of the indirect water heater or at the point of use. Check with your local plumbing authority for local requirements.

7.0 Operation

7.1 Important terms

DHW Setpoint	Indirect water heater storage temperature. Recommend no higher than 140°F to prevent scalding.
DHW Setpoint Differential	The variance the control allows in the DHW Setpoint. A differential of 10°F is recommended.
Boiler DHW Setpoint	The Boiler setpoint during DHW operation. Should be at least 30°F higher than the DHW setpoint.
Boiler Setpoint Differential	The variance allowed in the Boiler DHW setpoint. Recommend setting of 20°F. Set higher to reduce short cycling around the DHW setpoint.

7.2 Start-up

After the indirect water heater has been plumbed and wired, and the boiler water piping is purged of air, the indirect water heater is ready to be started. Follow the boiler installation and operating instructions to place the boiler in operation.

7.3 DHW temperature adjustment

The temperature sensor/aquastat controls the maximum water temperature in the indirect water heater. If the DHW setpoint is set too high, the resulting hot water can cause painful scalding with possible serious and permanent injury. The temperature at which this occurs varies with a person's age, and the length of time in contact with the hot water. The slower response time of infants, elderly, or handicapped people increases the hazard for them.

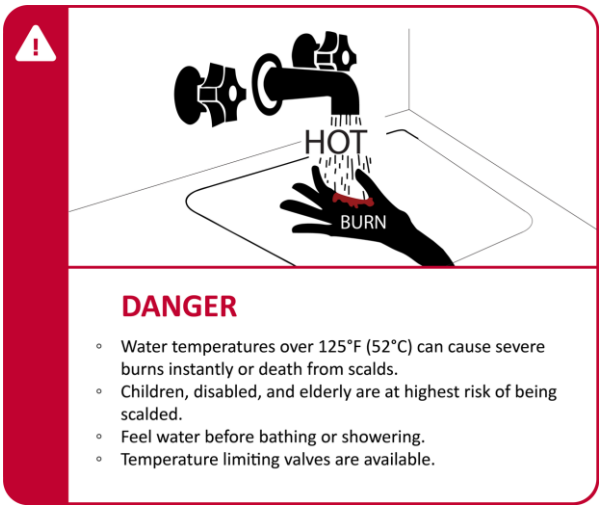
Check the water temperature at a hot water faucet soon after the DHW setpoint has been reached and the circulator and the boiler have turned off. Adjust as needed.

Lowering the DHW setpoint will not have an immediate effect on the DHW temperature until stored water is used and the indirect water heater goes through a reheat cycle. Additional temperature checks should follow the completion of a heating cycle. Further adjustments may be required after you have used the indirect water heater.

Caution

As a precaution:

- After the indirect water heater has reached its setpoint temperature, the installer should locate a faucet that is unprotected by an over temperature device.
- Turn the faucet on full hot and allow it to run long enough to ensure the water and piping have heated up to the indirect water heater discharge temperature.
- Using an accurate thermometer, test the water temperature to ensure it is within plus or minus 10°F of the DHW setpoint. If there is more deviation, the cause should be determined, and corrective measures taken.


HOT
BURN
DANGER
Water temperatures over 125°F (52°C) can cause severe burns instantly or death from scalds.
Children, disabled, and elderly are at highest risk of being scalded.
Feel water before bathing or showering.
Temperature limiting valves are available.

8.0 Maintenance

The indirect water heater will provide many years of reliable operation. Be aware that components such as temperature sensors, aquastats, and relief valves may require replacing and servicing. Depending on the quality of the water supply, sediment and/or scale may coat the coil in the indirect water heater and reduce the hot water recovery rate. Failure to use the correct procedures or parts could result in unsafe operation. Owners should arrange follow-up inspections and simple maintenance procedures according to the maintenance schedule below.

For service or repairs to the indirect water heater, call your heating contractor. To ensure proper service, the following information is provided to enable the installation, operation, and maintenance of this indirect water heater. When the installation is completed, keep this manual with the indirect water heater.

Maintenance Required	Frequency	Check
Boiler and Domestic Water Piping - Check all piping for signs of leakage at the joints, unions**,** and shut-off valves. Repair as required.	Annually	☐
Temperature and pressure relief valve - Before testing the relief valve, make certain the discharge pipe is properly connected to the valve outlet, and arranged to contain and safely dispose of hot water discharge.	Annually	☐
Sediment - Depending on water conditions, a varying amount of sediment may collect in the indirect water heater. Levels requiring service are indicated by a small temperature difference between the boiler supply and return, and a reduced recovery rate. Repeated flushing typically clears such material. As a preventive measure, draw water from the drain valve until it runs clear and consider installing a water filter.	Annually (More frequently in hard water areas)	☐
Scale - Hard water may cause scale buildup on the outside of the coil inside the indirect water heater. A water softener can help prevent this problem. Symptoms are identical to sediment buildup. If repeated flushing does not resolve the problem, chemical cleaning may be required.	Annually	☐

8.1 Chemical cleaning of the heating coil

8.1.1 Flushing the indirect water heater

1. To avoid water damage, shut off the cold water supply to the indirect water heater.
2. When using the temperature sensor, make note of the DHW setpoint in the boiler control, and turn off the power to the boiler and indirect water heater.
3. Reduce the water pressure in the indirect water heater by opening a hot water faucet.
4. Drain ⅓ of the water so that the indirect water heater is two-thirds full. The water level must cover the coil and the thermostat well.
5. Remove the relief valve from the indirect water heater.
6. Using a funnel, pour one gallon of commercial ice maker cleaning solution into the indirect water heater through the relief valve opening. Follow the instructions, cautions, and warnings supplied with the cleaning solution.
7. Turn on the power to the boiler and indirect water heater.
8. When using the temperature sensor, program the boiler control to its highest DHW setpoint, and allow the boiler to heat the water until the control is satisfied.
9. When using an aquastat, raise the setpoint to the maximum setpoint and allow the boiler to heat the water until the aquastat is satisfied.
10. If the DHW setpoint is not reached after 45 minutes of operation, program the DHW setpoint in the boiler control setting to its lowest temperature or adjust the aquastat to its lowest setting.
11. Allow the heated solution to sit in the indirect water heater for 30 minutes.
12. Drain the indirect water heater completely to remove the cleaning solution.

8.1.2 Refilling the indirect water heater

1. Fill the indirect water heater with fresh, cold water and drain it completely.
2. To flush all the cleaning solution from the indirect water heater, refill and drain at least three (3) times.
3. Reinstall the relief valve and the drain piping.
4. Open the cold water supply and fill the indirect water heater with water.
5. Purge the air from the indirect water heater and the piping by opening the cold and hot water faucets in the house.
6. Return the DHW setpoint to the normal setting.

9.0 Troubleshooting

Symptom	Diagnosis	Solution
No hot water at faucets	Boiler not operating	» Ensure boiler power is on » Ensure the boiler is programed for DHW and the setpoint is correct » If using a temperature sensor, verify the DHW temperature on the boiler control
	Indirect water heater circulator not operating	» Follow steps for boiler not operating » Ensure the circulator relay is closed and suppling power to the circulator » Ensure the zone valve is open and the end switch is closed calling for heat » Check wiring connections at the circulator » Measure voltage at the circulator during a call for heat, should be 120VAC » If power is at the circulator and connections are correct, replace circulator
	Indirect water heater zone valve not open	» Follow steps for boiler not operating » Check for 24VAC at the zone valve while there is a call for DHW, if voltage is correct and wire connections are good, replace the zone valve
	Incorrect temperature sensor reading	» Ensure the temperature sensor bulb is at the bottom of the well » Ensure the temperature sensor is wired to the correct boiler terminals » Disconnect the temperature sensor from the boiler terminals and measure the resistance. Compare the measured resistance with the value shown in Table 6. » Repair any wiring issues causing an open or short circuit. » Replace temperature sensor if resistance reading is incorrect
Water at faucets too cold	DHW setpoint set to low	» Increase the DHW setpoint in the boiler control if using a temperature sensor » Increase the DHW setpoint of the aquastat when using an aquastat
	Boiler setpoint set to low	» Ensure the boiler setpoint for a DHW demand is at least 10°F (6°C) higher than the DHW setpoint

Water at faucets too hot	DHW setpoint set to high	» Decrease the DHW setpoint in the boiler control if using a temperature sensor » Decrease the DHW setpoint of the aquastat when using an aquastat
	Incorrect temperature sensor reading	» Ensure the temperature sensor bulb is at the bottom of the well » Ensure the temperature sensor is wired to the correct boiler terminals » Confirm the temperature sensor is compatible with the boiler
Temperature & pressure relief valve discharges periodically	Thermal expansion	» Check the potable expansion tank and service/replace as necessary » If temperature and pressure during operation are below the maximums, replace the relief valve » Do not plug the relief valve.

10.0 Piping Diagrams

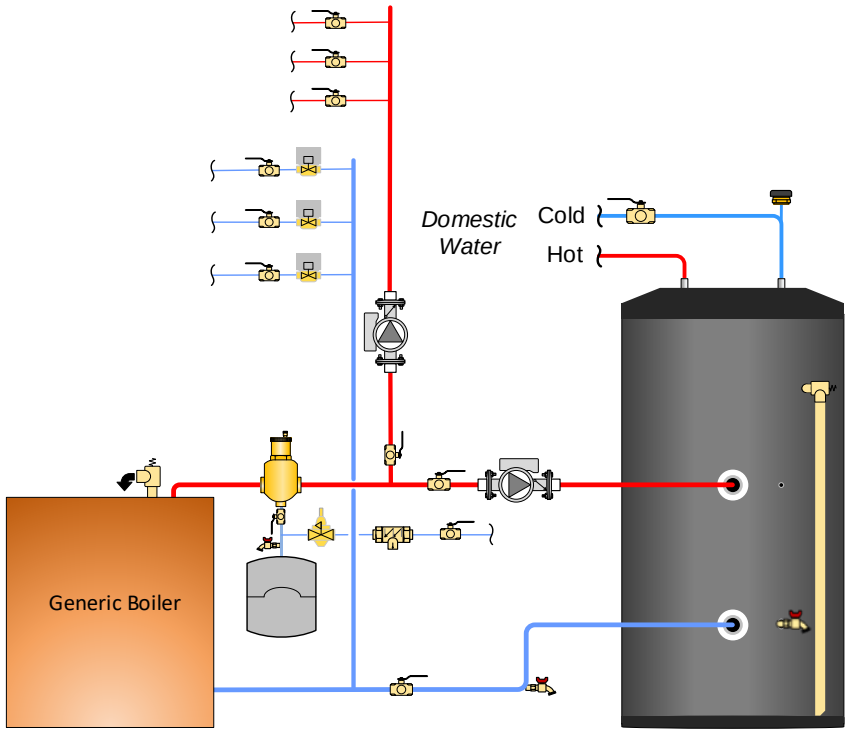


Figure 4 *Top DHW connection model - generic boiler piping*

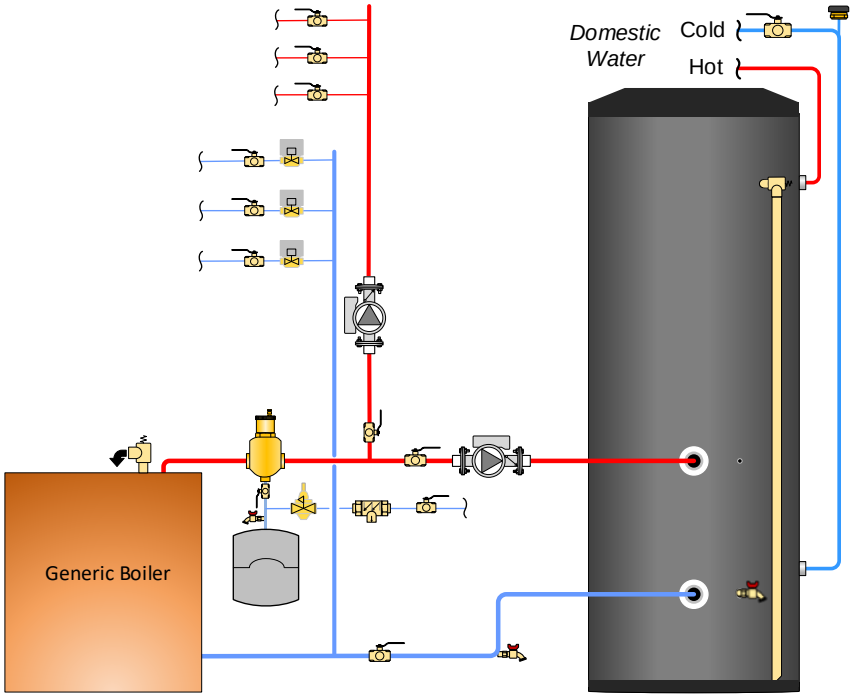


Figure 5 *Side DHW connection model – generic boiler piping*

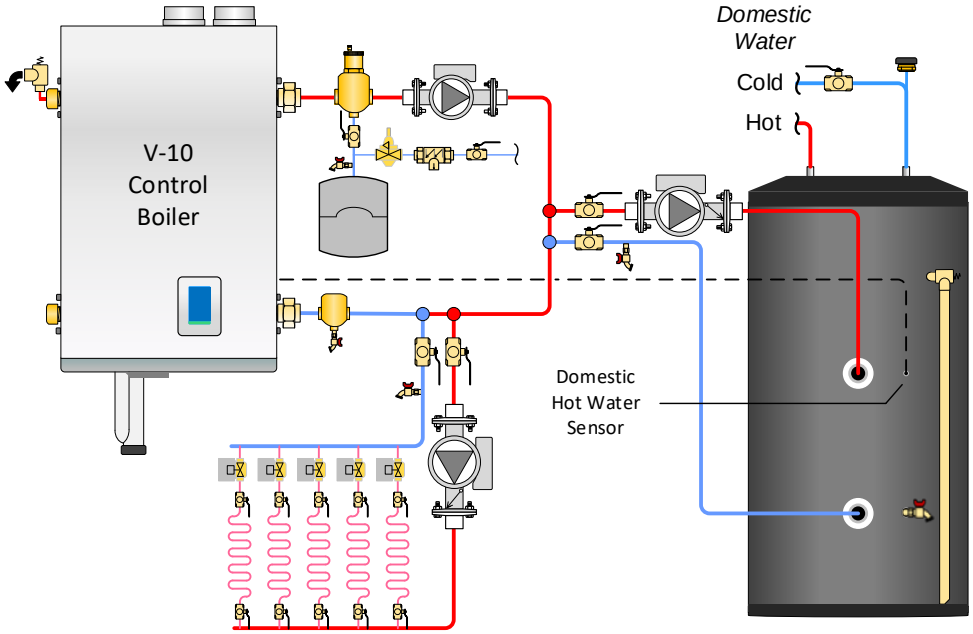


Figure 6 *Top DHW connection model - V-10 control boiler*

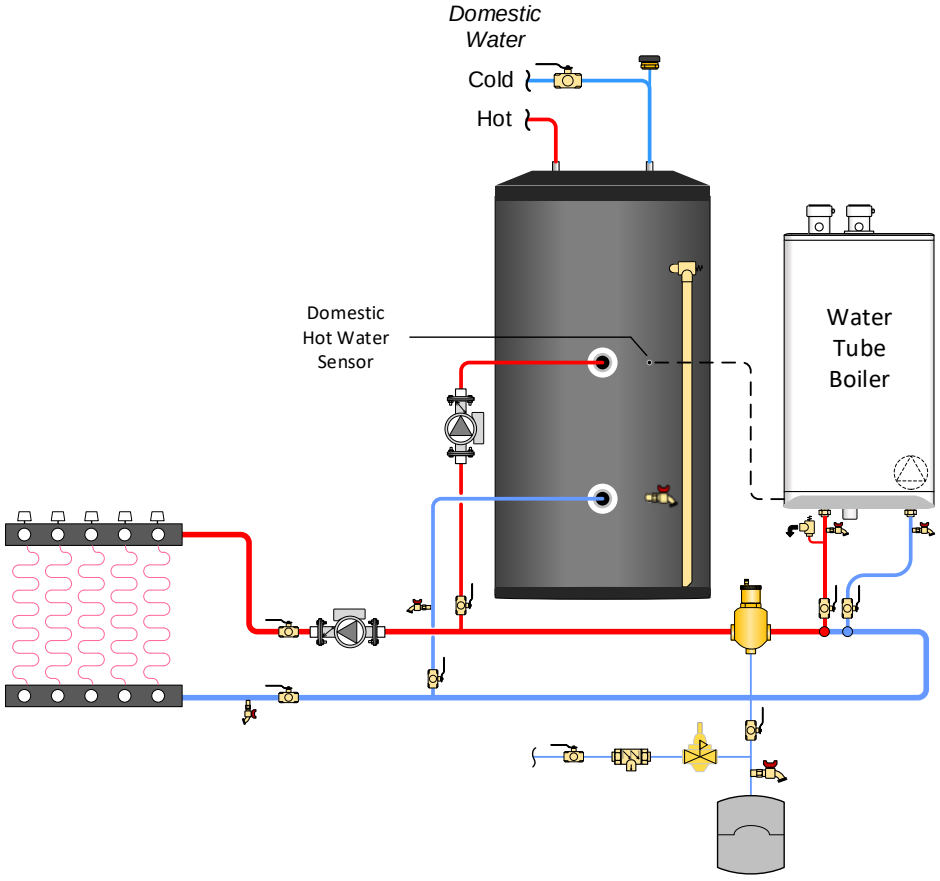


Figure 7 *Top DHW connection model - water tube boiler*

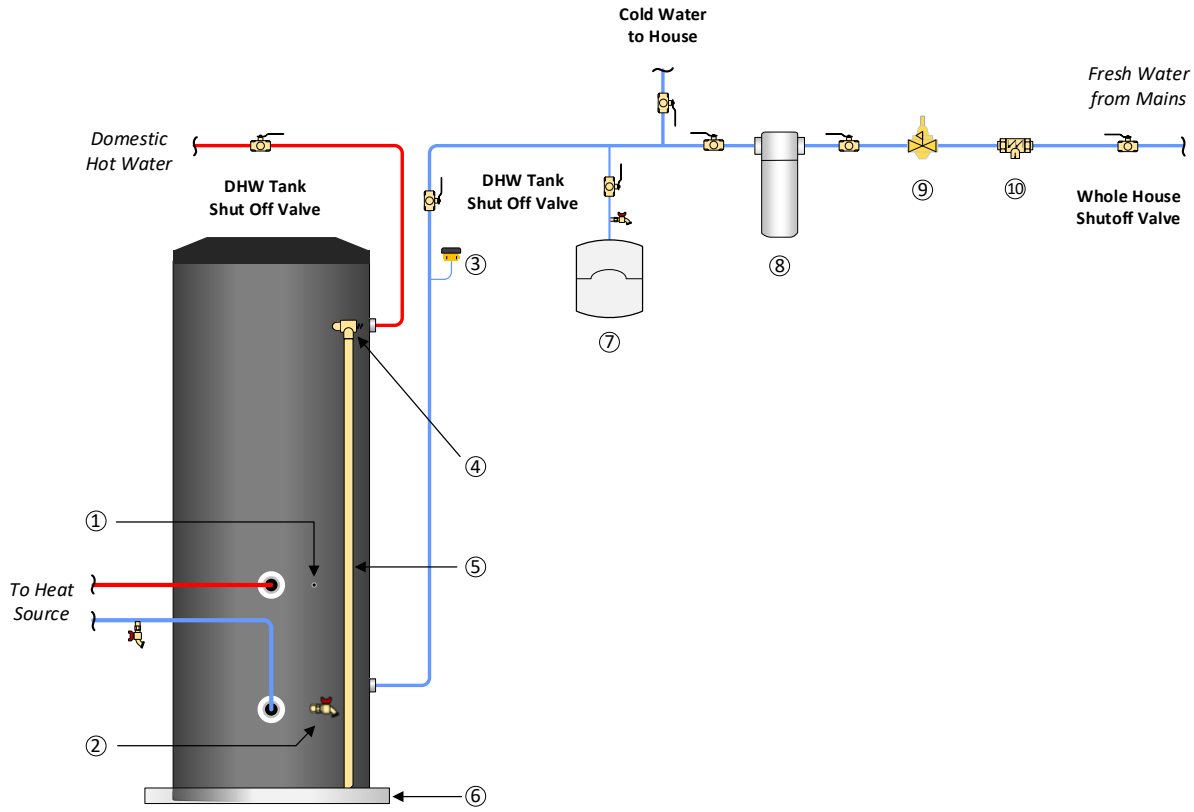


Figure 8 *Suggested domestic water piping*

1	Temperature sensor well
2	Drain valve
3	Vacuum breaker
4	Temperature & pressure relief valve
5	Relief valve discharge pipe
6	Drain pan
7	Potable expansion tank - required where backflow check valves are installed.
8	Whole house water filter - required where contaminants are present in the water supply
9	Pressure reducing valve - required where mains pressure exceeds maximum indirect water heater pressure rating
10	Backflow preventer - wherever required by local code

Even if components shown in *Figure 8* are not required by code in your jurisdiction, we strongly recommend the external components. At the very least, we require installation of a vacuum breaker in the position shown, with no shut-off valves between the device and the indirect water heater.

Important Note: All external components shown are field supplied.

11.0 Replacement Parts

Part Number	Description
P-9073	10KΩ temperature sensor
P-9017	Aquastat

IBC Technologies Inc.
8015 North Fraser Way
Burnaby, BC Canada V5J 5M8
T 604-877-0277
F 604-877-0295
Toll Free: 1-844-HEAT-IBC/ 1-844-432-8422

IBC Technologies USA Inc.
121 Walter A Gaines Way
Lawnside, NJ 08045 USA
T 856-877-0544
F 856-735-5584

Rheem Sales Co.
Montgomery, AL.
T 833-212-9276

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