

## INSTALLATION & OPERATING



INTERSTOR®

IWT Indirect Water Heaters

IWT 40  
IWT 50  
IWT 65  
IWT 80  
IWT 119





IWT 80-MAX  
IWT 119-Max

### CAUTION:

The heat transfer medium must be water or other nontoxic fluid having a toxicity rating or Class of 1, as listed in Clinical Toxicology of Commercial Products, 5th edition.

The pressure of the heat transfer medium must be limited to a maximum of 30 PSIG by an approved safety or relief valve.

## Manual safety markings

 <b>Danger</b> Points out an immediate hazardous situation that must be avoided to prevent serious injury or death.	 <b>Warning</b> Points out a potential hazardous situation that must be avoided to prevent serious injury or death.
 <b>Caution</b> Points out a potential hazardous situation that must be avoided to prevent possible moderate injury and/or property damage.	 <b>Note</b> 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 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 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 IBC's indirect water heaters 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.

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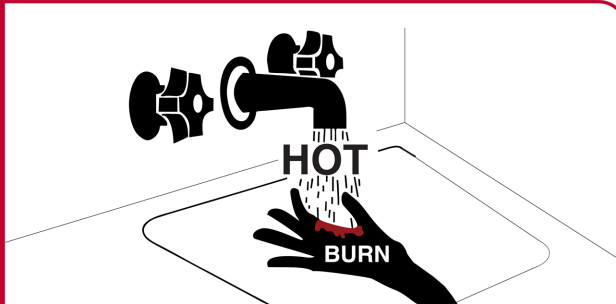
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# Safety information



## 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.



## 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.



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



**Caution**

To reduce the risk of excessive pressures and temperatures in this water heater, install temperature and pressure protective equipment required by local codes, but no less than a combination temperature 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 and Automatic Shutoff Devices for Hot Water Supply Systems, ANSI Z21.22-latest edition.

This valve must be marked with a maximum set pressure not to exceed the marked working pressure of the water heater. Install the valve into an opening provided and marked for this purpose in the 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 IBC boilers and water heaters must be done with due care and attention, and should only be performed by competent, qualified, licensed and trained heating technicians.

**Note**

The instructions in the manual focus almost entirely on installations where the IBC indirect water heater is used with a compatible IBC boiler. Installers and designers must read the IBC boiler manuals and application notes to ensure that finished installations operate in harmony, and deliver optimal energy savings and efficiency.

Although IBC indirect water heaters are compatible with most other boiler makes, installers and designers must tailor their designs to the specific control, operational and installation requirements of alternative boilers. This equipment must be installed according to the installation regulations of the local area. These regulations must be carefully followed in all cases. Authorities having jurisdiction must be consulted before the installations are made.

All wiring on water heaters must adhere to the National Electrical Code and/or local regulations.

## Specifications

The table below displays information on dimensions and weights to help with installing and connecting the tank. Diagrams provided in this section contain connection sizes.

Specification	IWT 40 (150L)	IWT 50 (200L)	IWT 65 (250L)	IWT 80 (302L)	IWT 119 (425L)
Max. Operating Pressure	150 psi	150 psi	150 psi	150 psi	150 psi
Height (inches/mm)	45.2 / 1148	57 / 1448	54.5 / 1384	64.5 / 1638	65.7 / 1669
Diameter (inches/mm)	22 / 559	22 / 559	24.5 / 622	24.5 / 622	28 / 711
Operation at outlet water temperature ° F / ° C	180 / 82	180 / 82	180 / 82	180 / 82	180 / 82
Gross tank volume - USG / Liters	40 / 151	53 / 201	66 / 250	79.3 / 300	119 / 450
Net tank volume - USG / Liters	38.3 / 145	50.7 / 192	63.9 / 242	77.4 / 293	113 / 426
Weight - empty Lbs / kg	100 / 45.3	127 / 57.6	145 / 65.8	166 / 75	230 / 104
Shipping weight - Lbs / kg	120 / 54.4	145 / 65.7	170 / 77	193 / 87.5	275 / 125
Domestic conn. size	¾" M	¾" M	¾" M	1" M	1½" M
First hour delivery - Gal/Hr *	204	259	309	356	474
Continuous Draw @ - Gal/Hr*	170	217	259	287	373
Boiler Output Required - Btu/Hr*	120,000	140,000	180,000	200,000	240,000
Minimum flow rate - GPM	14	14	14	14	14
Heating coil pressure drop - Ft. Hd.*	6.2	7	7.5	10.1	11.8
Coil heat transfer area - Ft <sup>2</sup>	8.1	10.2	11.4	13.4	18.1
Certified - water heater	✓	✓	✓	✓	✓
Certified - low lead	✓	✓	✓	✓	✓

**Table 1** Dimensions and weights: IWT 40, IWT 50, IWT 65, IWT 80, IWT 119

\*Based on 180°F boiler supply and 58°F entering cold water

Specification	IWT 80-Max (302L)	IWT 119-Max (425L)
Max. Operating Pressure	150 psi	150 psi
Dimensions Height (inches/mm)	64.5 / 1638	65.7 / 1669
Diameter (inches/mm)	24.5 / 622	28 / 711
Operation at outlet water temperature ° F / ° C	180 / 82	180 / 82
Gross tank capacity - USG / Liters	79.3 / 300	119 / 450
Net tank capacity - USG / Liters	75.0 / 284	111 / 419
Weight - empty Lbs / kg	188 / 85	246 / 111
Shipping weight - Lbs / kg	201 / 91	290 / 131
Domestic conn. size	1½" M	1½" M
First hour delivery - Gal/Hr *	719	753
Continuous Draw @ - Gal/Hr *	653	653
Boiler Output Required - Btu/Hr *	420,000	420,000
Minimum flow rate - GPM	25	25
Heating coil pressure drop - Ft. Hd.*	16.7	16.7
Coil Heat Transfer Area - Ft.2*	27.4	27.4
Certified - water heater	✓	✓
Certified - low lead	✓	✓

**Table 2** Dimensions and weights: IWT 80-Max, IWT 119-Max

\*Based on 180°F boiler supply and 58°F entering cold water



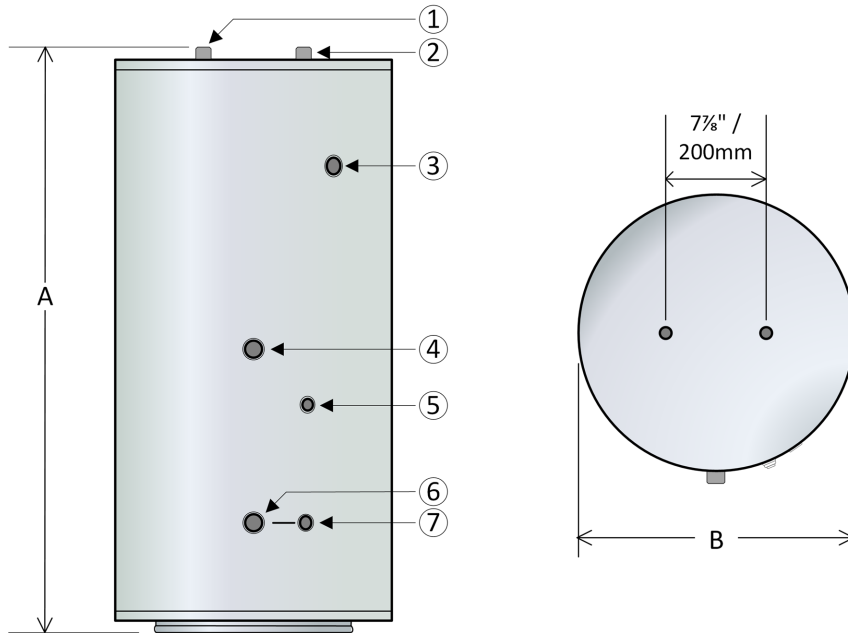


Figure 1 Tank dimensions - IWT 40, IWT 50, IWT 65

	IWT 40	IWT 50	IWT 65
A=Height (inches/mm)	45.2 / 1148	57 / 1448	54.5 / 1384
B=Diameter (inches/mm)	22 / 559	22 / 559	24.5 / 622

- ① ¾" M NPT Hot water outlet
- ② ¾" M NPT Cold water outlet
- ③ ¾" F NPT T&P relief valve
- ④ 1" M NPT In from boiler (boiler supply)
- ⑤ Sensor well
- ⑥ 1" M NPT Out to boiler (boiler return)
- ⑦ ½" F NPT (tank drain)

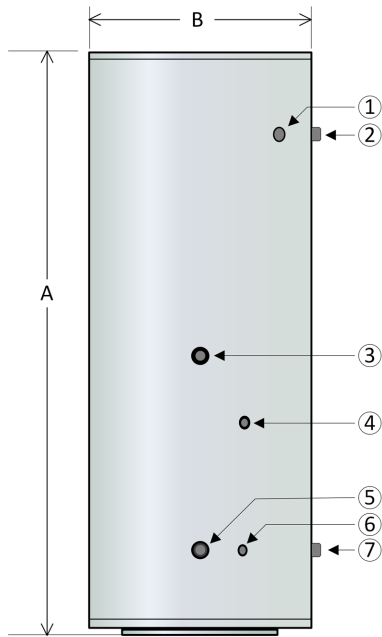


Figure 2 Tank dimension: IWT 80, IWT 80-Max

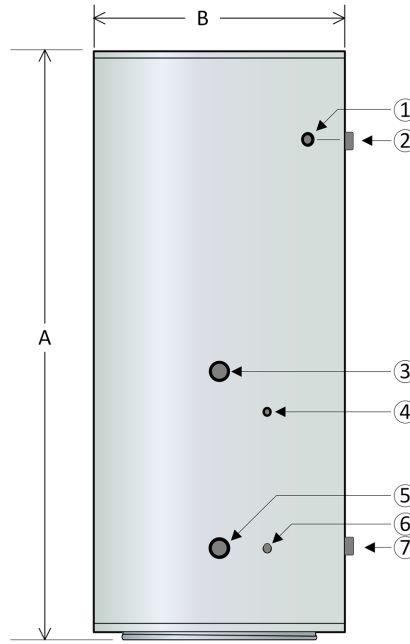


Figure 3 Tank dimension: IWT 119, IWT 119-Max

	IWT 80	IWT 80-Max	IWT 119	IWT 119-Max
A=Height (inches)	64.5 / 1638	64.5 / 1638	65.7 / 1669	65.7 / 1669
B=Diameter (inches)	24.5 / 622	24.5 / 622	28 / 711	28 / 711

	IWT 80	IWT 80-Max	IWT 119	IWT 119-Max
①	¾" F NPT T&P Relief valve	1" F NPT T&P Relief valve	1" F NPT T&P Relief valve	1" F NPT T&P Relief valve
②	1" M NPT Hot water outlet	1½" M NPT Hot water outlet	1½" M NPT Hot water outlet	1½" M NPT Hot water outlet
③	1" M NPT In from boiler (boiler supply)	1½" M NPT In from boiler (boiler supply)	1½" M NPT In from boiler (boiler supply)	1½" M NPT In from boiler (boiler supply)
④	Sensor well	Sensor well	Sensor well	Sensor well
⑤	1" M NPT Out to boiler (boiler return)	1½" M NPT Out to boiler (boiler return)	1½" M NPT Out to boiler (boiler return)	1½" M NPT Out to boiler (boiler return)
⑥	½" F NPT (tank drain)	½" F NPT (tank drain)	½" F NPT (tank drain)	½" F NPT (tank drain)
⑦	1" M NPT Cold water inlet	1½" M NPT Cold water inlet	1½" M NPT Cold water inlet	1½" M NPT Cold water inlet

## Recovery rate

<b>IWT 40 (135 °F)</b>				
<b>Boiler Output (BTU/Hr)</b>	<b>Boiler Flow = 14 gpm / 160 °F</b>		<b>Boiler Flow - 14 gpm / 180°F</b>	
	<b>1st Hour Rating (Gal/Hr)</b>	<b>Continuous rating (Gal/Hr) 58°F entering cold water</b>	<b>1st Hour Rating (Gal/Hr)</b>	<b>Continuous rating (Gal/Hr) 58°F entering cold water</b>
50,000	97	60	114	78
60,000	108	72	129	93
80,000	132	96	159	124
100,000	155	120	190	156
120,000	166	131	204	170
140,000	166	131	204	170
160,000	166	131	204	170

**Table 3** Recovery rates - IWT 40

<b>IWT 50 (135 °F)</b>				
<b>Boiler Output (BTU/Hr)</b>	<b>Boiler Flow = 14 gpm / 160 °F</b>		<b>Boiler Flow - 14 gpm / 180°F</b>	
	<b>1st Hour Rating (Gal/Hr)</b>	<b>Continuous rating (Gal/Hr) 58°F entering cold water</b>	<b>1st Hour Rating (Gal/Hr)</b>	<b>Continuous rating (Gal/Hr) 58°F entering cold water</b>
50,000	107	60	124	78
60,000	118	72	139	93
80,000	141	96	169	124
100,000	165	120	199	156
120,000	188	144	230	187
140,000	211	167	259	217
160,000	211	167	259	217

**Table 4** Recovery rates - IWT 50

<b>IWT 65 (135 °F)</b>				
<b>Boiler Output (BTU/Hr)</b>	<b>Boiler Flow = 14 gpm / 160 °F</b>		<b>Boiler Flow - 14 gpm / 180°F</b>	
	<b>1st Hour Rating (Gal/Hr)</b>	<b>Continuous rating (Gal/Hr) 58°F entering cold water</b>	<b>1st Hour Rating (Gal/Hr)</b>	<b>Continuous rating (Gal/Hr) 58°F entering cold water</b>
50,000	116	60	134	78
60,000	128	72	149	93
80,000	151	96	179	124
100,000	174	120	209	156
120,000	198	144	239	187
140,000	221	168	269	218
160,000	244	192	300	249
180,000	252	199	309	259

**Table 5** Recovery rates - IWT 65

<b>IWT 80 (135 °F)</b>				
<b>Boiler Output (BTU/Hr)</b>	<b>Boiler Flow = 14 gpm / 160 °F</b>		<b>Boiler Flow - 14 gpm / 180°F</b>	
	<b>1st Hour Rating (Gal/Hr)</b>	<b>Continuous rating (Gal/Hr) 58°F entering cold water</b>	<b>1st Hour Rating (Gal/Hr)</b>	<b>Continuous rating (Gal/Hr) 58°F entering cold water</b>
50,000	136	60	153	78
60,000	147	72	168	93
80,000	171	96	198	124
100,000	194	120	228	156
120,000	217	144	259	187
140,000	240	168	289	218
160,000	263	192	319	249
180,000	287	216	349	280
200,000	292	221	356	287

**Table 6** Recovery rates - IWT 80

<b>IWT 119 (135 °F)</b>				
<b>Boiler Output (BTU/Hr)</b>	<b>Boiler Flow = 20 gpm / 160 °F</b>		<b>Boiler Flow - 20 gpm / 180°F</b>	
	<b>1st Hour Rating (Gal/Hr)</b>	<b>Continuous rating (Gal/Hr) 58°F entering cold water</b>	<b>1st Hour Rating (Gal/Hr)</b>	<b>Continuous rating (Gal/Hr) 58°F entering cold water</b>
50,000	170	60	187	78
60,000	181	72	202	93
80,000	204	96	232	124
100,000	228	120	262	156
120,000	251	144	293	187
140,000	274	168	323	218
160,000	297	192	353	249
180,000	321	216	383	280
200,000	344	240	413	311
220,000	367	263	443	342
240,000	390	287	474	373

**Table 7** Recovery rates - IWT 119

<b>IWT 80 Max (135 °F)</b>				
<b>Boiler Output (BTU/Hr)</b>	<b>Boiler Flow = 25 gpm / 160 °F</b>		<b>Boiler Flow - 25 gpm / 180°F</b>	
	<b>1st Hour Rating (Gal/Hr)</b>	<b>Continuous rating (Gal/Hr) 58°F entering cold water</b>	<b>1st Hour Rating (Gal/Hr)</b>	<b>Continuous rating (Gal/Hr) 58°F entering cold water</b>
200,000	322	249	383	311
220,000	347	274	414	342
240,000	371	299	444	373
250,000	383	311	459	389
300,000	444	373	536	467
350,000	505	435	612	544
380,000	542	473	658	591
400,000	566	498	688	622
420,000	591	523	719	653

**Table 8** Recovery rates - IWT 80-Max

<b>IWT 119 Max (135 °F)</b>				
<b>Boiler Output (BTU/Hr)</b>	<b>Boiler Flow = 25 gpm / 160 °F</b>		<b>Boiler Flow - 25 gpm / 180°F</b>	
	<b>1st Hour Rating (Gal/Hr)</b>	<b>Continuous rating (Gal/Hr) 58°F entering cold water</b>	<b>1st Hour Rating (Gal/Hr)</b>	<b>Continuous rating (Gal/Hr) 58°F entering cold water</b>
200,000	357	249	418	311
220,000	381	274	448	342
240,000	405	299	479	373
250,000	418	311	494	389
300,000	479	373	570	467
350,000	539	435	646	544
380,000	576	473	692	591
400,000	600	498	722	622
420,000	625	523	753	653

**Table 9** Recovery rates - IWT 119-Max

## Pressure drop vs tank flow

<b>Pressure Drop (ft of water) vs Tank Flow</b>			
<b>Model</b>	<b>10 gpm</b>	<b>14 gpm</b>	<b>25 gpm</b>
IWT 40	3.3	6.2	-
IWT 50	4.0	7.0	-
IWT 65	4.4	7.5	-
IWT 80	5.4	10.1	-
IWT 119	6.5	11.8	-
IWT 80 Max	8.0	14.4	16.7
IWT 119 Max	8.0	14.4	16.7

**Table 10** Pressure drop vs boiler flow - all models

## Minimum relief valve (CSA rating) and recommended valves

### Note

The maximum heat transfer through the coil (heat input) of the InterStor IWT water heaters at 240 °F boiler supply temperature and 210 °F potable water temperature are as follows:

- » Models IWT 40 through IWT 80 single coil units are less than 89,000 BTU/HR.
- » Models IWT 119, IWT 80-MAX and IWT 119-MAX are less than 181,000 BTU/HR.

Potable water temperature is limited to below 210 °F and nominal water containing capacity is below 120 gallons for all InterStor IWT models. Accordingly, per Part HLW---101.2, Section IV of the ASME Boiler and Pressure Vessel Code, all IBC InterStor IWT series indirect water heater products are exempt from compliance with the code.

Check with local codes for applicability.

Minimum Relief Valve (CSA Rating)		
IWT Model	CSA Rating Btu/hr	Recommended Relief Valve
IWT 40	105,000	Watts ¾" LF100XL or XL8, or equivalent
IWT 50	105,000	Watts ¾" LF100XL or XL8, or equivalent
IWT 65	105,000	Watts ¾" LF100XL or XL8, or equivalent
IWT 80	105,000	Watts ¾" LF100XL or XL8, or equivalent
IWT 119	205,000	Watts ¾" LF40XL-5, or equivalent
IWT 80-MAX	205,000	Watts ¾" LF40XL-5, or equivalent
IWT 119-MAX	205,000	Watts ¾" LF40XL-5, or equivalent

**Table 11** Recommended relief valve details

# 1.0 Introduction

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The IBC Indirect water heater (IWT) is shipped with a 10KΩ sensor. An aquastat can be used to create a call for heat with most boilers. The 10KΩ sensor will work with all IBC boilers. Ensure compatibility if using the sensor with other boiler manufacturers' equipment.

## 1.1 Standard components

Items supplied with the indirect water heater include:

- » 10KΩ sensor
- » Tank drain valve (installed)

Not Included:

- » Temperature and pressure relief valve
- » Aquastat

## 1.2 Pressure relief valve

Supply a temperature and pressure relief valve rated to ANSI Z21.22 and that has a rating greater than the gross input of the boiler connected to the water heater. For more information, see [Temperature and pressure relief valve on page 18](#).

## 1.3 Conformity

Inspect shipment carefully for signs of damage. All equipment is carefully inspected and packed. IBC's responsibility ceases upon delivery of the 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.

## 1.4 Standards

Installation must conform to the requirements of the authority having jurisdiction. In the absence of such requirements, the installation must conform to the National Plumbing Code and the National Electrical Code ANSI/NFPA No. 70, current edition.

For drinking water system components follow the Lead Content NSF/ANSI 372:2016 code.

Appliances for use with an external heat source must follow the 1992/06/01 IAS U.S code.



## 2.0 Pre-installation overview

### Note

Local inspection 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 check that local authorities will accept this equipment.

## 2.1 Installation checklist

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

	Checklist	Check
Water heater sizing	<p>Choose the 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 tank size if these factors are present.</p> <p>Carefully review the IBC water heater <a href="#">Specifications on page 5</a>, and consult ASHRAE sizing guides and other reliable references. Dimensions, weights, ratings, and capacities are outlined in the Specifications tables (see <a href="#">Table 1</a> and <a href="#">Table 2</a>).</p>	<input type="checkbox"/>
Boiler sizing	<p>The 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 <a href="#">Table 1</a> and <a href="#">Table 2</a>. If the boiler has less capacity, the water heating output will be reduced.</p>	<input type="checkbox"/>
Circulator sizing	<p>Refer to <a href="#">Table 1</a> and <a href="#">Table 2</a> for the flow through the water heater coil and the pressure drop at minimum flow. Calculate the pressure drop across all piping and fittings connected to the water heater zone. Be sure to include all zone valves, check valves, and shut-off valves. We recommend piping the water heater zone with minimum 1" pipe around the entire loop on typical small residential sites.</p>	<input type="checkbox"/>

## 2.2 System zone control



### Caution

To avoid water damage from leaks, install a drain pan under the water heater unless it is located where leaks will not cause property damage. See [Figure 8](#).

If unable to direct discharge from a 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 relief valve.

You must install the water heater as a separate zone from the space heating system. The water heating zone's piping and circulator must be sized for the minimum flow rate with all the zones in use and a maximum flow with only the water heater in use. 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 water heater is controlled with an additional circulator.
2. **Hybrid System.** Space heating zones use zone valves for each zone, and the water heater is controlled with an additional circulator. See [Figure 4](#).
3. **Zone Valves.** Space heating zones use zone valves for each zone, and the water heater is controlled with an additional zone valve. Select a valve with a low pressure drop and adequate pipe size to ensure maximum flow.



### 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 valve outlet with no intervening valve, and directed downward to a safe point of discharge.
- » Allows complete drainage of both the valve and the discharge line.
- » Is independently supported and securely anchored to avoid applied stress on the 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 valve outlet.

**! Do not cap, plug, or obstruct the discharge pipe outlet.**

## 2.3 Priority or non-priority for hot water

### 2.3.1 Option 1 – 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 IBC 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 water heater.

### 2.3.2 Option 2 – Non-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 maximum amount of reduction depends on the:

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

## 2.4 Locating the water heater


Locate the water heater in an area where water leakage from the tank or connections will not result in damage to areas adjacent to the 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 water heater and connect the drain pan to a drain.

To enable easy access for servicing, install the water heater as close to the boiler as far as is practicable. The appliance is designed for installation on combustible flooring and in alcoves, closets, etc.

Surface	Distance from Combustibles	For Service
Front	1"	24"
Rear, Right and Left Sides	1"	1"
Top	1"	1"
Bottom	0"	0"

**Table 12** Clearances from heater jacket

## 2.5 Temperature and pressure relief valve

1. Supply a temperature and pressure relief valve rated to ANSI Z21.22 and that has a rating greater than the gross input of the boiler connected to the water heater.
2. Install the temperature and pressure relief valve in the tapping on the side of the tank labeled "Relief Valve".
3. 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.
4.  Do not install a shut off valve between the water tank and the relief valve. Do not plug the outlet of the relief valve.



### Warning

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

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

## 2.6 Additional recommended components

1. **Shut-off valves** - Allow the isolation of the water heater from the boiler system during service.
2. **Tank drain valve** - Install at the bottom of the water heater to allow for servicing and draining of the water heater.
3. **Unions** - Allow for easy locating or removal.
4. **Vacuum breaker** - Protects the water heater from collapse if a hot tank is valved off to service other components in the system.
5. **Thermal expansion tank** - If the 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.

## 2.7 Removing the existing domestic water heating system

If the IBC water heater is being installed in an older hydronic system that does not use an IBC boiler:

- » **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 systems.
- » **Internal Tankless Heaters.** Disconnect the domestic piping. Do not plug the cold water or the hot water fittings in 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.



### Caution

When removing any fuel burning appliance from a common venting system, the opening must be properly sealed off including remaining appliances still using the common venting system, the vent must be examined to ensure that it is not over-sized as a result of having removed the old water heater.

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

- » **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 tank or nearest mains piping and cap off. If oil heating system is to be abandoned completely, ensure proper removal and disposal of old oil tank 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**

Do not operate the IBC water heaters 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). IBC's standard warranty does not cover problems caused by improper water pH or excessive levels of chlorides.

## 2.8 Water quality

Improper water quality will reduce the expected life of the 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 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.

## 3.0 Piping

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### 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 procedure describes how to pipe the indirect water heater with the domestic water system. For reference, see [Figure 8](#).

### 3.1 Domestic water 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 water heater in the final location, install piping onto the cold inlet connection.

Connect to cold water supply connection 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.

Install piping on to hot water supply 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 only within 6 inches above a suitable drain. The discharge opening must not be blocked or reduced in size under any circumstances.
5. Fill the water heater tank.
  - a. Open all faucets to allow air to purge from the tank and piping. Remove screens on faucets.
  - b. Open the domestic hot water shut-off valve.
  - c. Slowly open the cold water inlet shut-off valve.
  - d. Purge all of the air from the domestic water system.
  - e. Allow the water to run, so that you clear the tank of any debris.

Run the water long enough so that it runs clear and to change at least one tank volume change past full.

- f. Close all faucets.

- g. Reinstall all of the screens in the faucets.
- h. Check the system for leaks. Repair as required.

## 3.2 Boiler water piping



### Warning

Do not use automotive-type ethylene or other types of automotive glycol antifreeze, or undiluted antifreeze of any kind on the boiler water side of the system. This may result in severe boiler or tank 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, IBC recommends 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 water heater connections should be made based on the type of piping system that is either in place, or is to be installed for a new hydronic system installation. See section [Diagrams on page 33](#) for guidance.
2. It is recommended that minimum size 1" pipe be used on the water heater zone to ensure adequate flow, larger sizes min 1½".

### Note

The piping drawings in Section 8.0 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 tanks 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 drawing(s) 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 water heater.

## 3.3 Zone circulator system

The water heater connection labeled "In from Boiler" should be piped to the boiler supply piping after the air purger and before the space heating takeoffs - for primary/secondary systems, see primary loop space heating piping in [Figure 7](#) .

For parallel piping, see [Figure 4](#) . Mount the water heater circulator as close as is practicable to the water heater, and make sure the flow arrow points toward the water heater. The use of shut-off valves is recommended for future service convenience.



The 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 water heater during operation of the space heating system.

### **3.4 Zone valve system (residential only)**

IBC recommends using minimum size 1" pipe and 1" full-port zone valves with a high CV on the water heater zone to ensure adequate flow.

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

The 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.

## 4.0 Electrical

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### Danger

Do not connect thermistor sensors to “Therm” terminals on the IBC control board. It could result in overheating, potentially causing serious personal injury and/or property damage.

1. Install electric wiring and grounding according to the National Electrical code and local regulations.
2. Water heaters are not supplied with an aquastat. For field-supplied aquastats, follow the wiring instructions supplied with the aquastat and the installation instructions of the boiler being connected to the water heater.
3. All water heaters are supplied with a 10K $\Omega$  temperature sensor that connects to the IBC control board “DWH Sensor” terminals with standard 2-wire, 18 gauge thermostat wire. For other boiler models, an aquastat thermostat is required.
4. In addition, refer to the Installation manual of the boiler.

## 4.1 Temperature sensor

The temperature sensor supplied with the IBC indirect water heater is an NTC Thermistor type with a resistance of 10,000 ohms at 25°C and  $\beta = 3892$ . IBC does not recommend using 3rd party sensors. IBC distributors can supply compatible water temperature sensors.

The resistance of the temperature sensor varies inversely with temperature. To test, measure the temperature of the sensed environment and compare with the value derived from the measurement of the resistance (obtained by connecting a good quality test meter capable of measuring up to 5,000 k $\Omega$  (5,000,000 $\Omega$ ) at the controller end of the sensor lead).

To obtain a resistance reading, remove power to the boiler. When taking the reading, you must disconnect the sensor leads from the terminal strip. Do not grip the sensor leads in your hands or place them on or against a conductive surface or the reading will be compromised. Place multi-meter probes onto the bare wire ends of the leads and obtain the reading. Compare the reading with the actual sensor temperature and the resistance value listed for that temperature in the table below. Do not apply voltage to the sensor (damage may result).



### Warning

The Thermistor temperature sensor supplied with the IBC water heater is may not be compatible with other makes of boiler or controls, and its use may create a hazardous condition. **Do not use the IBC sensor with other appliance makes.** IBC indirect water heaters are supplied with a 10k $\Omega$  thermistor sensor for inserting into the temperature well of the tank, 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 tank temperatures and risk of scalding.

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 13** Temperature Sensor resistance values

## 4.2 Aquastat

To regulate/limit the temperature, installers can install a field-supplied aquastat such as the Honeywell L4006.

The aquastat mounts in the well provided on the water heater. Electrically, the aquastat will open on temperature rise (stops calling for heat when the water reaches the desired temperature) and will close when the water temperature drops below the desired temperature. The aquastat should have an 8°F (4.4°C) differential.

### **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 control.
2. Loosen the mounting screw and carefully insert the sensing bulb into the well until the control mounts to the well head.
3. Tighten the screw to lock in place.
4. Connect wires (sized for the voltage being used) to the aquastat terminals.
5. Set the aquastat to the correct temperature by adjusting the dial, so that the desired temperature is at the pointer.
6. Set the aquastat to the lowest practical setting to meet the consumer's needs.

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

## 5.0 Operation

### 5.1 Important terms explained

<b>DHW Tank SetPoint</b>	Temperature the end user gets from the faucet. Recommend no higher than 140°F to prevent scalding.
<b>Tank Diff'l Temp</b>	The variance the control allows in the DHW Tank Set Point. A tank differential of 10°F is recommended.
<b>Maximum Supply Temp</b>	Highest DHW supply set point temperature the boiler will allow. Should be at least 30°F higher than the DHW supply set point temperature.
<b>Supply Diff'l Temp</b>	The variance the control allows in the DHW Supply Set Point. Trial setting of 20°F. Set higher to reduce short-cycling around the DHW Supply Set Point.

### 5.2 Start-up

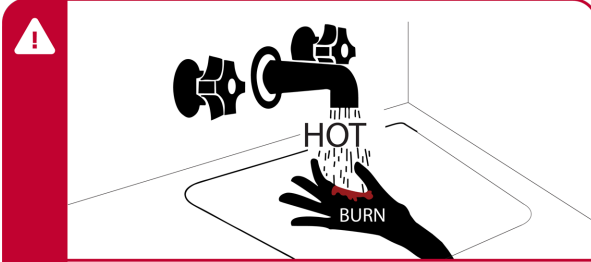
After the water heater has been plumbed and wired, and the boiler water piping is purged of air, the water heater is ready to be started. Follow the boiler installation and operating instructions to place the boiler in operation.

### 5.3 Temperature adjustment

The tank sensor controls the maximum water temperature in the water heater. If it 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, older, or handicapped people increases the hazard for them.

Check the water temperature at a hot water faucet soon after the tank thermostat has satisfied, and the circulator and the boiler have turned off. Adjust as needed.

Lowering the thermostat setting will not have an immediate effect on the water temperature because stored water is used and because the thermostat goes through the cycle of heating cold water and satisfying at the new, lower temperature. Additional temperature checks should follow the completion of a heating cycle. Further adjustments may be required after you have used the water heater.



**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.



**Caution**

As a precaution:

- » After the 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, and allow it to run long enough to ensure the water and piping have been heated up to the discharge temperature of the tank.
- » Using an accurate thermometer, test the water temperature to ensure it is within plus or minus 10°F of the setpoint. If there is more deviation, the cause should be determined and corrective measures taken.

## 6.0 Maintenance

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The appliance will provide many years of reliable operation. Be aware that components such as sensors and relief valves may require replacing and servicing. Depending on the quality of the water supply, sediment and/or scale may coat the heating coil in the tank 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 IBC's suggested maintenance schedule below.

For service or repairs to the water heater, call your heating contractor. Your water heater has been manufactured to provide years of service. To insure proper service, the following information is provided to enable the installation, operation, and maintenance of this water heater. When the installation is completed, keep this manual with the 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	<input type="checkbox"/>
Temperature and pressure relief valve	Annually	<input type="checkbox"/>
Sediment: Depending on water conditions, a varying amount of sediment may collect in the tank. Levels requiring service are indicated by a small temperature difference between the boiler supply and return lines, 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	<input type="checkbox"/>
Scale: Hard water may cause scale buildup on the outside of the heating coil inside the tank. 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	<input type="checkbox"/>

### 6.1 Chemical cleaning of the heating coil

#### 6.1.1 Flushing the tank

1. To avoid water damage, shut off the cold water supply to the water heater.
2. Make a note of the DHW temperature control setting on the IBC control, and turn off the power to the boiler and water heater.
3. To reduce the risk of scalding, reduce the water pressure in the tank by opening a hot water faucet.
4. Remove the relief valve from the water heater.
5. Drain  $\frac{1}{3}$  of the water heater so that the tank is two-thirds full. The water level must cover the coil and the thermostat well.
6. Using a funnel, pour one gallon of commercial ice maker cleaning solution into the tank 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 water heater.
8. Program the IBC control to its highest DHW temperature setting, and allow the boiler to heat the water until the control is satisfied.
9. If the boiler control is not satisfied after 45 minutes of operation, program the IBC DHW control setting to its lowest temperature.
10. Allow the heated solution to set in the tank for 30 minutes.
11. Drain the tank completely using fittings and hoses, as required, to reach a drain.

### **6.1.2 Refilling the tank**

1. Fill the water heater tank with fresh, cold water and drain it completely.
2. To flush all of the cleaning solution from the tank, 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 tank with water.
5. Purge the air from the tank and the piping by opening the cold and hot water faucets in the house.
6. Return the IBC DHW control setting to the temperature noted in Step 2.



## 7.0 Troubleshooting

This section includes conditions that may occur in the water heater as well as various solutions.

Symptom	Diagnosis	Solution
No hot water at faucets	Boiler does not operate	<ul style="list-style-type: none"> <li>» Ensure boiler power is on.</li> <li>» Ensure the boiler is programmed for DHW and the water temperatures are set properly</li> <li>» Check the tank temperature on the IBC screen, Open or Short + sensor or wiring issue</li> </ul>
	Water Heater Circulator does not operate	<ul style="list-style-type: none"> <li>» Follow steps for Boiler does not operate</li> <li>» Ensure the pump relay is closed and supplying power to the pump</li> <li>» Ensure the zone valve is open and the end switch is closed calling for heat</li> <li>» Check wiring connections at the circulator</li> <li>» Measure voltage at the circulator during a call for heat, should see 120VAC</li> <li>» If power is at the circulator and connections are correct, replace circulator</li> </ul>
	Water heater zone valve does not open	<ul style="list-style-type: none"> <li>» Follow steps for Boiler does not operate</li> <li>» Check for 24VAC at the zone valve while there is a call for heat, if correct voltage is available and connections are good, replace the zone valve.</li> </ul>
Water at faucets too cool	Tank sensor open, short, or mis-wired	<ul style="list-style-type: none"> <li>» Ensure the tank sensor is connected to the correct terminals and the wires are properly attached to the terminal strip and the sensor is properly attached to the wiring at the tank</li> <li>» Disconnect the sensor wires from the terminal strip and measure the resistance in Ohms across the 2 sensor wires. Compare this value to the chart and the actual tank temperature. Repeat this test for the sensor only and compare the results.</li> <li>» Check/replace the wire from the boiler to the sensor or replace the sensor</li> </ul>
	DHW temperature setting too low	Increase the DHW Tank Set Point temperature
	Boiler Maximum Supply Temp. setting too low	Make sure the Maximum Supply Temp. setting is at least 10°F higher than the DHW Supply Setpoint PLUS 1/2 of the Supply Diff'l Temp setting.

Symptom	Diagnosis	Solution
Water at faucets too hot	DHW temperature setting too high	Reduce the DHW Tank Set Point temperature
	DHW temperature sensor giving false reading	<ul style="list-style-type: none"><li>» Sensor is not fully inserted into the well</li><li>» Sensor giving incorrect resistance reading</li><li>» Sensor connected to IBC Therm terminals instead of DHW Sensor terminals</li><li>» Improper 3rd party sensor installed in well</li></ul>

## 8.0 Diagrams

### Note

When using the sequential load feature of the IBC boiler, 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 from the IBC boiler.

You can find more detailed and full-sized drawings at [www.ibcboiler.com/TIPortal](http://www.ibcboiler.com/TIPortal).

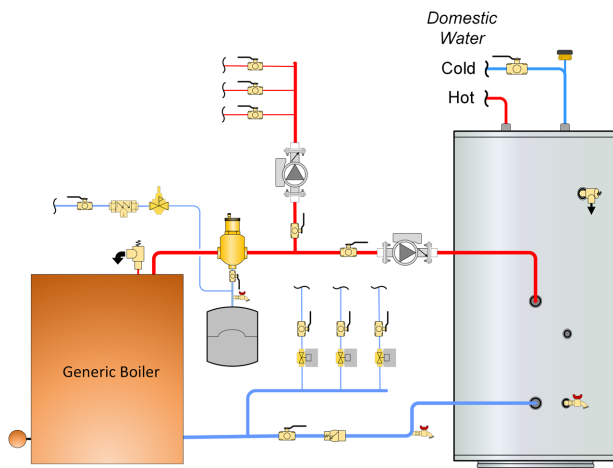


Figure 4 Small model - generic boiler piping - Indirect tank connected to a boiler - parallel piping

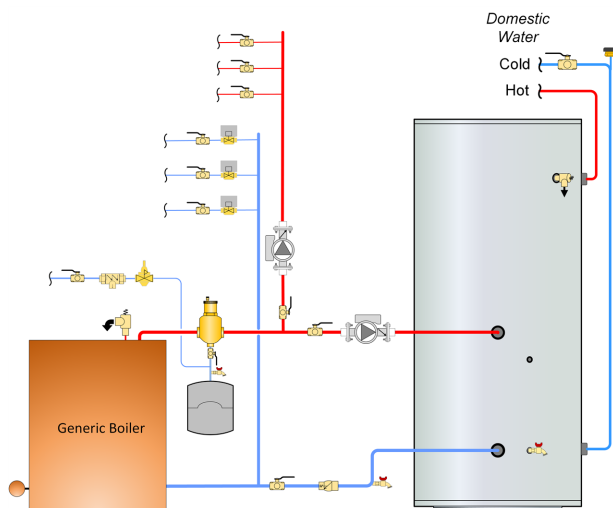


Figure 5 Large model - Indirect tank connected to a boiler - parallel piping

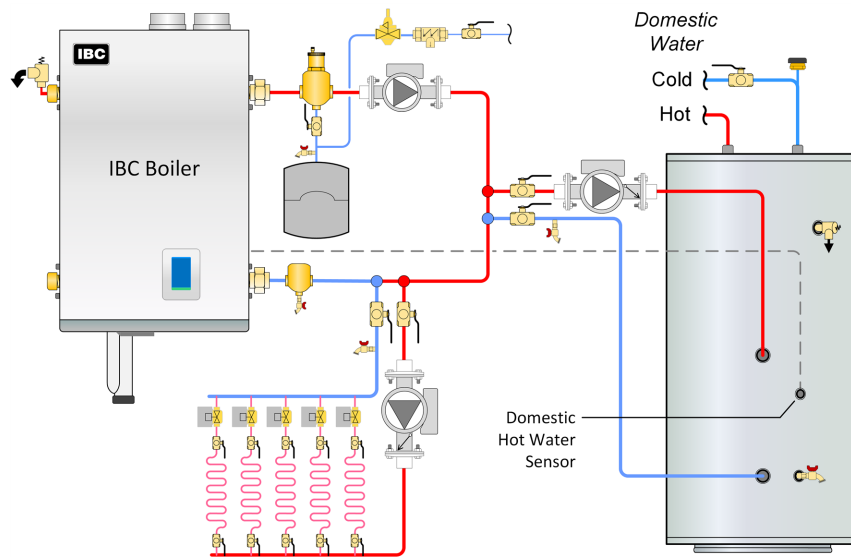


Figure 6 Primary/secondary piping

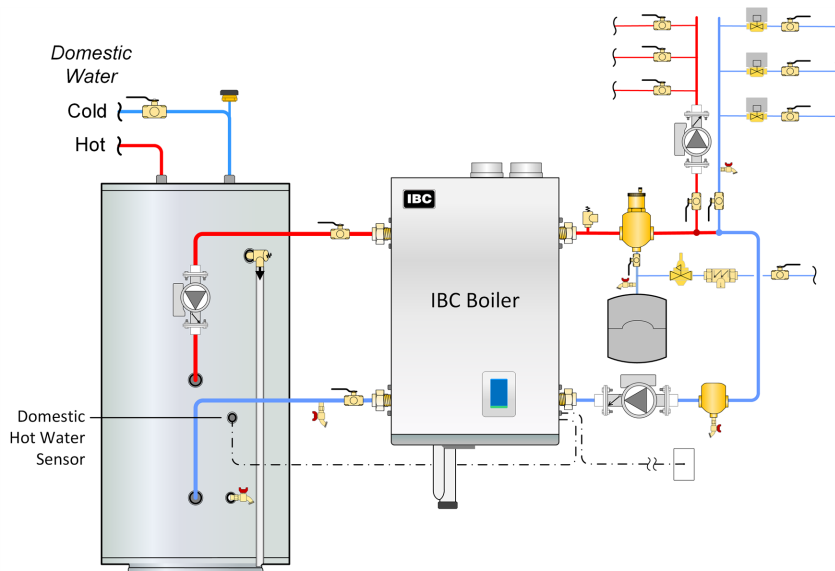


Figure 7 Two-sided parallel piping on indirect side primary/secondary on heating side



## Domestic water piping

Even if components shown in [Figure 8](#) are not required by code in your jurisdiction, IBC Technologies strongly recommends the external components. At the very least, IBC requires installation of a vacuum breaker in the position shown, with no shut-off valves between the device and the tank. **Important Note:** All external components shown are field-supplied.

IBC supplies the tank including the factory-installed temperature well. An IBC temperature sensor is shipped separately with the tank to be inserted fully into the temperature well and wired to the IBC boiler control board on the terminals labeled *DHW Sensor*.



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