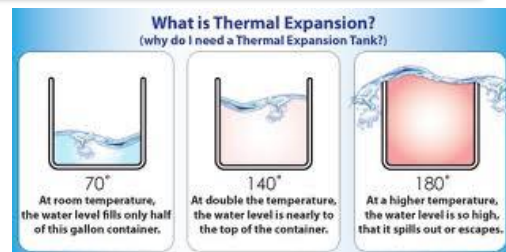


Thermal Expansion Tank Training Flyer

One product that we sell is called a thermal expansion tank. Thermal expansion tanks are beneficial to most home owners and becoming code in more and more cities. Because of this, it is important we all have a basic understanding of what they are. This flyer is intended to serve as a brief overview of expansion tanks and what they are.

What is Thermal Expansion?

Thermal expansion is the term used to describe the expansion of water volume due to heating. All water heaters, regardless of fuel type, can experience thermal expansion. In every tank-type water heater, cold water is heated as it enters the water heater tank. This increases the overall water volume and pressure inside the tank, which must be relieved to avoid the potentially negative effects of thermal expansion.



For example, water heated from 90°F to a thermostat setting of 140°F in a 40 gallon water heater will expand by almost one-half gallon. Since water is not compressible, the extra volume created by expansion must go somewhere.

Why is this just becoming a bigger issue now?

In the past, domestic hot water systems were “**open**” systems. So when the volume of heated water exceeded tank capacity, it flowed back out to the city main or water well.

But today’s plumbing regulations require the integration of backflow preventers or check valves, primarily to keep the water in a home from the possibility of contaminating the water supply. As a result, present-day hot water systems are considered “**closed**” systems. Any pressure build up is essentially trapped in the house. (To learn more about backflow you can read the [Backflow Training Flyer](#)).



T&P Valve:

A water heater has a **temperature and pressure (T&P) relief valve** that is designed as a safety device to be used primarily in emergency cases, not on a regular, daily basis to relieve pressure caused by typical thermal expansion. Relying solely on the T&P valve to accommodate for thermal expansion wastes water and energy, and may cause the valve to prematurely fail.



Even before the T&P relief valve is triggered (usually at 150 psi), excessive pressure levels caused by thermal expansion can exert forces that have negative effects on a hot water system. Below are some of the effects this can have:

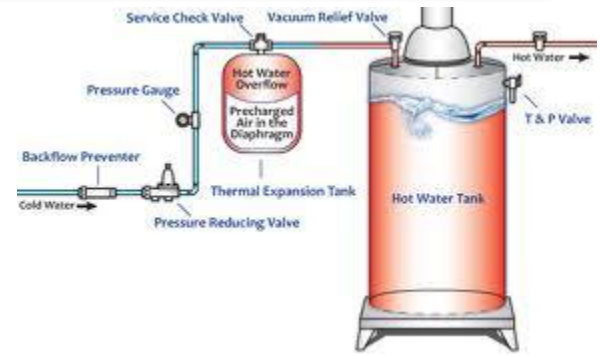
- Premature product failure – Damaged or collapsed center flue (Increased Carbon Monoxide in home) - Decreased product performance and product life - Damage to water heater connections and the home’s piping system - Decreased life of a home’s water fixtures and appliances - Noisy water hammer in the home’s pipes

So what is the solution?

A **thermal expansion tank** is a small, pressurized tank with a compressible air cushion (diaphragm) that is installed on the supply side (cold water inlet) of a water heater.

When the thermal expansion of water creates excess pressure within the water heater, excess water is forced into the expansion tank, keeping pressure levels within the normal operating range of the water heater.

As the pressure within the water heater normalizes (typically after there's a call for hot water within the home), the water within the expansion tank is forced back into the water heater by the diaphragm, and the potentially harmful effects of thermal expansion are eliminated. Having an expansion tank also helps prevent dripping faucets and running toilets by keeping the extra built up pressure from reaching the fixtures and prematurely damaging them.



Do you need an Expansion Tank if you have Well Water?

If a customer is not on city water and have a well, chances are they do not need a thermal expansion tank. It would not do any harm to have one but it most likely isn't necessary. A well has a well tank that acts as an expansion tank. However, if for some reason a customer has a check valve between the well tank and the water heater they should consider installing a thermal expansion tank between the check valve and water heater.

Sizing:

This concludes the main portion of the training flyer. For those interested in learning more, there is an additional section on the next page detailing how to size a thermal expansion tank. To be entered into a drawing for Lee clothing email the answer one of the bonus questions below to Brandon.

Next Steps and a Couple Questions:

The first next step is to learn more and the second next step is to start bringing these up with our customers. The link below is to a MythBusters video detailing what a water heater under very high pressure may do.

<https://www.youtube.com/watch?v=9bU-l2ZiML0>

Bonus Question 1: There are two types of backflow. Which of the two types of [back flow](#) could be created by thermal expansion in an open system?

Bonus Question 2: Can you think of another application in a home that creates thermal expansion and would require an expansion tank?

Sizing a Thermal Expansion Tank:

There are a few factors to consider when sizing a thermal expansion tank: Water Heater Size, Water heater set temperature, Incoming Water Pressure, and Air Pressure Set Point in the thermal expansion tank.

Water Heater Size & Temperature Set Point:

Below is what BackStop, our line of thermal expansion tank recommends for their tanks with the water heater at a 140 degree set point. (Factory set point is typically 120 degrees). If a home owner raises the temperature higher than 140 they may want to opt for a larger size tank. **You cannot oversize an expansion tank however you can undersize them.**

Water Heater Size and Temperature Set Point:

To get the supply pressure inside a home, a home owner can either call a Contractor or follow the steps listed below:

1. Turn off every plumbing fixture in and around the home, including faucets, the ice maker, the automatic pool filler, sprinklers, the dishwasher, the washing machine and the evaporative cooler.
2. Locate the outdoor water spigot closest to the front of the house. That's where the water enters the house from the city's water supply.
3. Remove the hose from the "hose bib", the part of the spigot that lets you screw the hose on and off.
4. Screw on a water pressure gauge in its place. They can purchase the pressure gauge from us.
5. Turn the spigot on.
6. Watch the needle on the gauge move. It will land at the number that indicates the water pressure.
7. Repeat the test three times in one day: early in the morning, when you get home from work and at bedtime. You'll probably see some variation each time. The optimum range is 55 to 65 pounds per inch (PSI).

Air Pressure Set Point in Thermal Expansion Tank:

Once the supply water pressure has been determined the air pressure in the thermal expansion tank should be set. A good rule of thumb is to set the thermal expansion pressure 5psi higher than the water pressure in the home.

QUICK SIZING CHART FOR NON-ASME MODELS									
SUPPLY PRESSURE (PSIG)	WATER HEATER VOLUME (GAL.)								
	40	50	60	80	100	120	150	175	200
40	A 101	A 101	A 101	A 102	A 102	A 102	A 103	A 103	A 103
50	A 101	A 101	A 101	A 102	A 102	A 102	A 103	A 103	A 103
60	A 101	A 101	A 102	A 102	A 102	A 102	A 103	A 103	A 103
70	A 101	A 101	A 102	A 102	A 102	A 102	A 103	A 103	A 103
80	A 101	A 101	A 102	A 102	A 102	A 103	A 103	A 103	A 103
90	A 101	A 102	A 102	A 102	A 103	A 103	A 103	A 103	A 103
100	A 102	A 102	A 102	A 103	A 103	A 103	A 103	A 103	A 103
110	A 102	A 102	A 103	A 103	A 103	A 103	A 103	A 104	A 104
120	A 103	A 103	A 103	A 103	A 103	A 103	A 104	A 104	A 104

*Based upon temperature increase from ambient temperature of 40°F to 140°F.

*For larger sizes or higher temperatures please consult factory 714 674-0590