

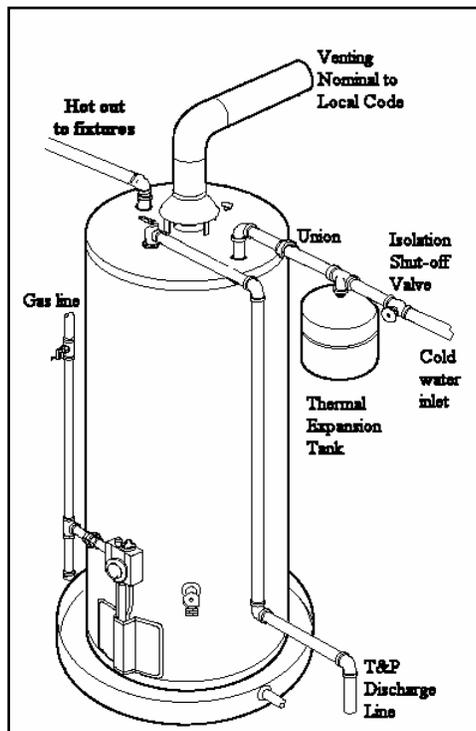


### Thermal Expansion

When water is heated it expands. Reacting to physical law, water expands in volume as its temperature rises. In a 40 gallon water heater, water being heated to its thermostat setting will end up expanding to about 40.53 gallons when the desired temperature is reached. The extra volume created by this expansion has got to go somewhere.

Before the advent of cross connection control, expanded water which exceed the capacity of the tank flowed back to the city main where it was easily dissipated. It was 'open' at the city side of the supply system. Today, with back flow preventers, water meter check valves and pressure reducing valves without a bypass being installed, expanded water from a water heater cannot return to the city supply. It is now a 'closed system' and the expanding water has no place to go. Dangerous conditions exist during thermal expansion long before the relief valve operates. Internal pressures repeatedly occurring during recovery periods can 'stress' the tank causing the tank welds and fitting connections to the tank to weaken. Remember -

**water + heat + pressure + closed system = potential explosion !**



As a result, the expanding water creates a rapid and dangerous pressure increase in the water heater and system piping inside the residence. Eventually, the combination of temperature, pressure and the closed system will activate the T&P valve. The setting on the safety relief is quickly reached and the relief valve opens, losing hot water down the drain.....or all over the floor. Even though the relief valve operates during each recovery period, internal high pressures occurring over and over again can accelerate tank leakage and shorten water heater life. A good indication of thermal expansion is when the T&P valve releases about one cup of water for each ten gallons of heater capacity with each heating cycle.

The best solution to thermal expansion is to control the pressure the heated water generates within normal, safe operating range, well below the emergency setting of a relief valve. This will allow thermal expansion to occur, but without causing a dangerous increase in pressure. This is accomplished by adding an expansion tank. A Rheem THERM-X-GUARD thermal expansion tank with a sealed in compressible air cushion, provides a space to store and hold the additional expanded water volume. When the water is heated the expanded volume is consumed by the expansion tank. When hot water is used in the system, the expansion tank returns the hot water back into the system for use.

### Temperature and Pressure (T&P) Valves

T&P valves are safety limit devices that will prevent or relieve overheated water and pressure. Without a relief valve during an unsafe condition, the tank pressure would rise to the point the tank may rupture or explode. This would cause potential damage to both people and property. Rheem water heaters are pressure tested to 300 pounds per square inch (PSI) and has a working pressure of 150 PSI. The T&P valve is designed to open when the pressure inside the tank exceeds 150 PSI. The T&P valve will also open if the water temperature reaches 210<sup>0</sup> F. The valve will continue to function, or remain open, until the unsafe condition is over.

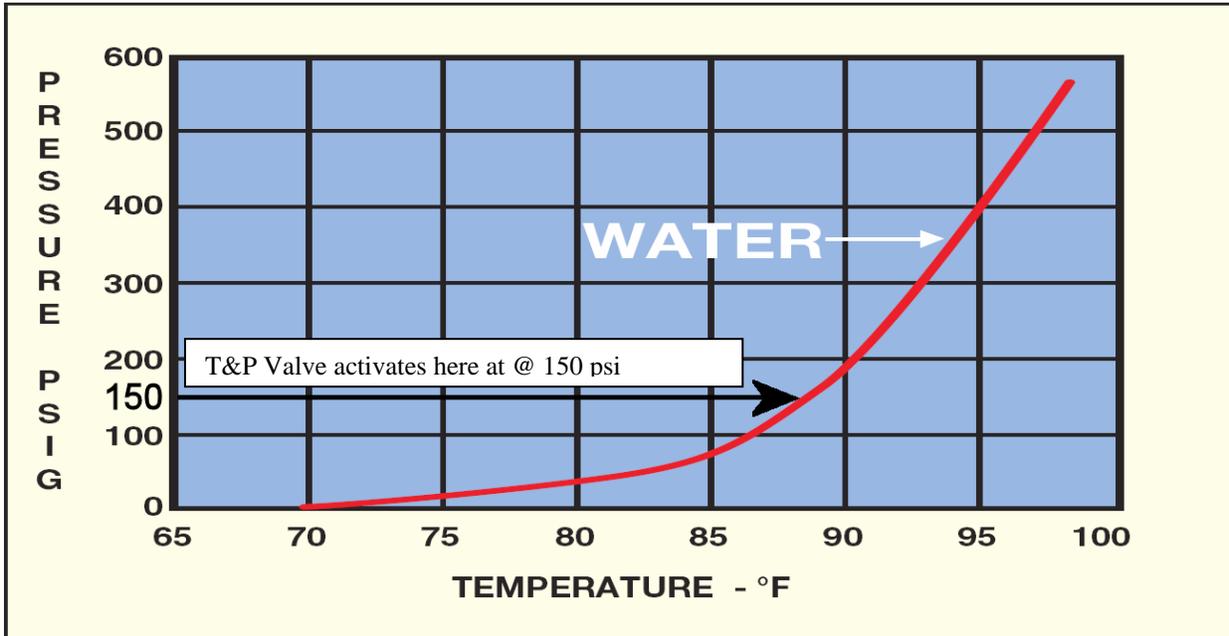
T&P valves should be inspected and tested every six months. When 'springing forward' or 'falling back' with daylight savings time, think about the T&P valve on your water heater.



**Thermal Expansion**

The following points out the danger of what happens to water pressure when heated a closed system.

*Pressure vs. Temperature increase in closed piping system.*



(Chart courtesy of Amtrol MC#4090 (9/05))

For example, fill a water heater with 70 degree inlet cold water and zero the pressure by lifting and closing the T&P Valve. Then begin to heat the water. By the time the temperature rises less than 20 degrees, it has already built up enough pressure (150 psi) in a closed system to activate the T&P valve.



Rheem water heater tanks are manufactured and tested to withstand a test pressure of 300 PSI and a working pressure of 150 PSI. A bulged bottom or top immediately indicates that the tank has been subjected to a pressure in excess of 300 PSI and is not covered by warranty.

*Service Tip: Thermal expansion tank pressure must be 10-15 psi above service pressure.*

*There are sizing issues when selecting the proper expansion tank.*

*Consult the expansion tank manufactures specifications.*