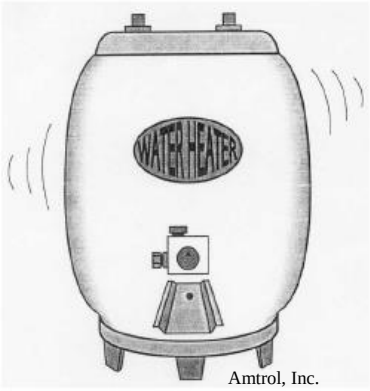
THERMAL EXPANSION

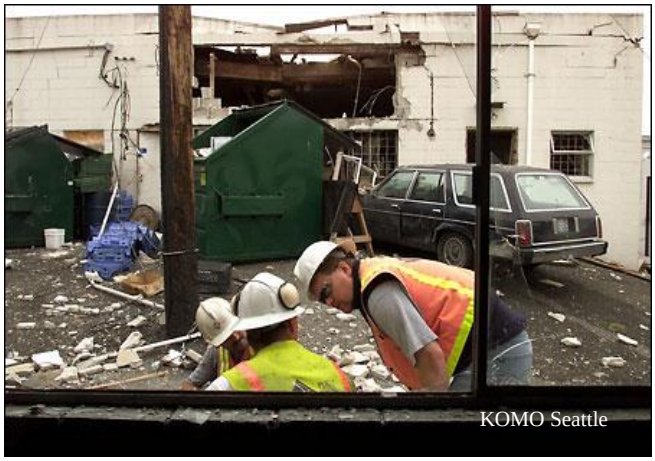
The Water Works Board of the City of Birmingham (BWWB) requires backflow prevention devices on all new services, any existing service being renewed, and all residential services with irrigation, or services which the BWWB deems a backflow threat. These devices prevent potential backflow from your private water system into the public water distribution system. **Backflow** is the unwanted, reversal of normal flow from the customer's private water system into the public water distribution system as a result of a cross-connection. The installation of the backflow prevention device is required in order to comply with the U. S. Environmental Protection Agency Safe Drinking Water Act and the Alabama Department of Environmental Management (ADEM) Water Supply Program regulations, Section 335-7-9. These rules require public water utilities implement programs for preventing, eliminating and controlling cross-connections. A **cross-connection** is any connection or potential connection between the customer's private water system and the public potable water distribution system through which any gas, liquid, particle, or other undesirable element could enter the public potable water distribution system. Eliminating cross-connections is essential to preventing backflow. However, installation of a backflow prevention device may adversely affect your water heater if proper precautions are not taken.

With the installation of a residential dual-check valve or a backflow prevention assembly, the public water distribution system no longer absorbs pressure build-up within the private plumbing system/water heater. Without backflow prevention, the expanded and heated water from the water heater of a home or business flows back into the public water distribution system. The installation of a backflow prevention device, swing-check valve, or pressure reducing valve causes the private plumbing system to become a "closed" system and prevents the heated and expanded water from backflowing into the public water distribution system. The expansion of heated water, or **thermal expansion,** can build incredible pressures in the water heater and private plumbing system. Water heaters are equipped with a temperature and pressure (T & P) relief valve, which is designed to relieve excessive temperature and pressure within the water heater. This T & P valve is an <u>emergency relief valve</u>, and is not intended to compensate pressure increases created by thermal expansion, therefore pressure may build up in your water heater tank and household plumbing. Thermal expansion may cause the T & P relief valve to leak, household plumbing fixtures to drip, solenoid valves on the icemaker and dishwasher to malfunction, toilet ball-cocks to leak, or washing machine hoses to burst. Extreme Thermal Expansion may cause serious harm to the water heater, <u>particularly if</u>



Amtrol, Inc.

the water heater is gas-fired. Most, if not all manufacturers of water heaters automatically invalidate their warranty if the water heater is installed on a "closed" plumbing system without proper thermal expansion protection. When dangerous pressures are built up in a water heater, internal parts may fail such as the internal flues, fittings, or water connections. If a flue way collapses it can lead to the potential release of toxic gases, such as carbon monoxide. If the T & P relief valve is disabled or damaged, the water heater may actually explode with incredible force. One such explosion occurred in Washington State in 2001. The blast, due to a plugged T & P relief valve, created almost one million dollars worth of damage to a shopping center.



Damage from a water heater explosion in Washington State.

Current plumbing codes require the installation of thermal expansion relief devices in "closed" systems. Thermal Expansion can easily be contained by the use of a Thermal Expansion Ball Cock, a Thermal Expansion Tank or a Thermal Expansion Relief Valve. Contact plumbing supply distributors for availability of these products. Be advised that the **T&P relief valve** is an emergency device for discharging excessive water from the water heater's tank and is not a device to control thermal expansion. To eliminate potential water damage inside the premises, install drain pipe from the relief valve through an air gap to a termination point a maximum 6 inches above a floor drain or outside ground level where any discharge from this plain end pipe will be clearly visible. The drain pipe should be as short as possible and must not be capped, blocked, plugged or contain any valve between the T & P relief valve and the end of the drain pipe. Drain pipe outlet should be observed on a regular basis and any water found to be flowing or dripping from the piping should be addressed immediately by contacting your water heater service technician or a certified plumber. A **Ball Cock and Thermal Expansion Relief Valve** device allows the excess water from the plumbing system to be released into the toilet tank. Utilizing this type of device could contribute to a customer's billed consumption of potable water. The excess water is not efficiently utilized by the customer as it is released into the toilet tank, then spills into the tank's internal overflow drain tube. This type of device may be installed where the customer's plumbing system pressure is less than 65 psi. A **Thermal Expansion Tank** is the ideal device as it does not contribute to water loss from the plumbing system. The tanks are designed to absorb the increased volume of water caused by thermal expansion and then release it back to the plumbing system when the water cools or the system is opened again. The thermal expansion tank should be installed on the supply side piping of the water heater. It is imperative that an expansion tank be properly sized based on the customer's individual plumbing system conditions. In situations where the water pressure in a customer's plumbing system is less than 80 psi, a P**ressure Relief Valve** may be placed on the cold

water piping to the water tank inlet. The valve is designed to release excess pressure from within the customer's plumbing system. If this valve is installed, drain piping from this valve should be routed to a proper floor drain or to the exterior of the building as noted above for the T & P relief valve drain piping. Discharge piping of a relief device shall not connect to piping serving any other relief device or equipment. Installing a pressure relief valve could result in increased water usage by a customer. Water may be released from the valve due to potential pressure fluctuations which are characteristic of a customer's private water system and the public water distribution system.

You are encouraged to have a certified plumber inspect your plumbing system to determine if it is a "closed" system. If so, you will need to install or have installed a device of your choice to eliminate thermal expansion. A certified plumber can recommend which device is best to prevent thermal expansion. Failure to address this problem may cause serious damage to your water heater or plumbing fixtures. The BWWB is not responsible for any damage to private property caused by thermal expansion.

Please feel free to call the BWWB Department of Cross Connection Control and Backflow Prevention at 244-4251 if you have additional questions.

Thermal Expansion Relief Devices - Examples

BWWB does not provide recommendations on product manufacturers or distributors.

Thermal Expansion Tanks

Ball Cock and Thermal Expansion Relief Valve