TECHNICAL BULLETIN

BULLETIN 41

BULGING HEATER

SYMPTOM	The heater has cockeyed nipples, top of the flue is pulled out of sight or bottom of the head bulged or reversed. These conditions may also appear when the heater is leaking.

CAUSE	A great number of water heaters are returned as “in warranty failures”. Many times, the failure is actually due to excessive pressure. This is evident when the bottom head is bulged or reversed. A.O. Smith water heaters are manufactured and tested to withstand an internal pressure in excess of 300 psi without distortion. Because of the bulged bottom, it indicates that the tank has been subjected to a pressure in excess of 300 psi. Water in an ordinary storage tank is under a certain static pressure, dependent on the supply pressure in the system. As this water is heated, its volume increases, and if there is no check valve, pressure reducing valve, or other obstruction in the cold water line, i.e. the system is open, a portion of the water will back up into the cold water supply line. In an open system the water pressure in the tank will always be approximately equal to the supply pressure. The presence of a check valve or a water pressure reducing valve, or the closing of a shut-off valve in the cold water line makes the system a closed system. In such a situation, water cannot back up into the cold water line and the pressure resulting from the normal thermal expansion is not equalized. Should the heating continue even for a short period of time, pressure exerted by this combined volume of water may become great enough to rupture the storage tank. There would be no explosion, however, since the water in the tank is below the boiling point at atmospheric pressure. It should be noted that any blocking of the supply piping such as the jamming of a water meter disc may change an open system into a closed system. Also, the installation of a water conditioning unit may convert an open system into a closed one. Our installation instructions, and instruction plates, all include the statement that when a water heater is installed on a closed system, a correctly sized thermal expansion tank must be installed, or our warranty is void. The temperature and pressure relief valve is not intended to protect against thermal expansion.

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PRESSURE TABLE

PRESSURE BUILD UP ON 30 GALLON HEATER CONNECTED IN A CLOSED SYSTEM

Water Temperature (°F)		Tank Pressure (psi)
74		80
75		85
76		105
78		125
80		145
82		175
85		225
88		275
90	*Tank bottom will start to reverse*	310
95	*and eventually break a weld and leak*.	400
100		520
105		625

If the tank were strong enough at 140°F, the pressure in the tank would be in excess of 1,000 psi.

THE FIX

Since many of the symptoms noted above are often noticed when the heater is leaking, repair to the unit is not possible. However, prior to installation of a new water heater, it is important to install a thermal expansion tank that will help maintain a consistent working pressure.

While temperature and pressure relief valves required to be installed on the water heater are mechanical devices that relieve overheated water or excessive pressure, they cannot maintain a consistent pressure. The installation of a thermal expansion tank is the only device recommended to maintain a constant safe operating pressure.

CAUTION

Water heaters installed in a closed system without a properly sized and installed thermal expansion tank will void warranty. Therefore, if the heater displays any of the symptoms noted above, it will not be eligible for warranty consideration.