

<http://waterheatertimer.org/How-to-replace-TP-valve.html>

The Temperature/Pressure Relief Valve

One of the most common code violations our inspectors observe in the field involves the Temperature/Pressure Relief (TPR) Valve on the water heater unit. The purpose of this article is to assist property owners and inspection professionals in identifying these common code violations so they may be prevented and corrected.

What is a Temperature/Pressure Relief Valve?

Section 3303.1 of the International One- and Two-Family Dwelling Code[i] requires the installation of a combination **Temperature/Pressure Relief Valve** (commonly referred to as a TPR valve) or a separate temperature relief valve and a pressure relief valve on every water heater. The purpose of the TPR valve is to provide an important safety mechanism that allows for the immediate discharge of excess temperature and pressure that builds up inside the tank as the water is heated.

If not allowed to properly discharge, this excess temperature and pressure will eventually cause the tank to explode. One such tragedy occurred in Spencer, Oklahoma at the Starr Elementary School on January 9, 1982 where six children and a teacher were killed when the school's water heater exploded with the force and effect of two pounds of dynamite. This occurred due to a malfunctioning TPR valve. **Figure 1 (right)** shows a typical Temperature/Pressure Relief (TPR) Valve installation on a gas water heater.



Figure 1 - Typical installation of a Temperature/Pressure Relief (TPR) Valve on a gas water heater

Consequently, Code Section 3303.3[i] dictates that a TPR valve must discharge once the pressure inside the tank reaches 150 psi (pounds per square inch). Code Section 3303.4[iii] specifies that the TPR valve must be installed within the top 6 inches of the water heater tank in order to enable the valve to discharge at a temperature of no greater than 210°F. As a result, any discharge piping must be rated to withstand at least 210°F to prevent melting and blockage of the TPR valve when discharged.

Common Violations in the Field

As we have seen, the presence of a functioning Temperature/Pressure Relief (TPR) Valve on a water heater is extremely important. However, there are other factors to consider in ensuring the protection of property and people who may be standing near the water heater when the valve actually discharges. Namely, where does the scalding water or steam go once the valve is allowed to discharge?

The following are the more common discharge piping violations we observe in the field:

1) *Improperly-Sized Discharge Pipe*

Code Section 3303.6.1.[\(i\)](#) requires that the TPR valve is fitted with a discharge pipe that provides the **same size opening as the valve outlet itself**.

Figure 2 (right) shows a TPR Valve that has been fitted with a discharge pipe that is **smaller** than the size of the valve outlet. This is a common defect that is strictly prohibited because smaller discharge pipes restrict the flow of the pressurized water released by the valve. This creates a dangerous bottleneck, building-up even more pressure at the point of discharge that can cause the tank to explode. Personal injury (or death) and property damage may result.



Figure 2 - Improperly sized TPR discharge pipe

2) *Missing Discharge Pipe*

In many instances, the discharge pipe required in Section 3303.6.1.[\(i\)](#) was never installed at all. This normally occurs during replacement or initial installation of the water heater.

Figure 3 (right), shows a missing TPR discharge pipe. This creates a dangerous condition whereby the TPR valve will spray scalding steam or scalding hot water onto anyone (or anything) that happens to be near the water heater when discharge occurs.

When you consider that the TPR valve discharges water at 210° F., serious injury or property damage will result.

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3) Improper Termination of the Discharge Pipe

Ideally, the TPR valve discharge pipe will be vented to the outside of the building where the scalding water or steam can be discharged without posing a threat to people or property. However, in many installations direct piping to the outside is not possible or is deemed to be too costly to provide.

Accordingly, Code Section 3303.6.1 [1] does allow for the discharge pipe to **terminate inside a receptacle** (or spill pan) as long as an **air gap** is provided between the end of the discharge pipe and the top rim of the spill pan itself **without creating a hazard or potential cause of damage**.

This is clearly not the case in **Figure 4 (right)**. Here we see the copper discharge pipe runs down the right hand side of the water heater tank to terminate into a metal spill pan below. However, the problem lies in the fact that the end of this discharge pipe terminates below the upper rim of a shallow spill pan.

This installation of the discharge pipe poses several potential dangers.

First, the discharge pipe may be able to siphon any liquid that may accumulate inside the pan. This is due to the fact that the end of the discharge pipe terminates below the top rim of the receptacle itself. Once siphoning occurs, the liquid (be it dirty water, household chemicals, oil, etc.) will be drawn back into the water heater tank, thereby contaminating the household drinking water supply.

While this occurrence is admittedly unlikely due to the fact that the TPR valve would have to fail (stay open) while a simultaneous drop in line pressure would create a siphon, the mechanical potential does exist for this contamination to occur. Thus the air gap provision in the building code.



Figure 3 - Missing TPR Valve discharge pipe



Figure 4 - Improper Termination of Discharge Pipe.

Secondly, and even more likely, is the risk of personal injury when this TPR valve discharges. This is because the discharge pipe terminates into a spill pan that cannot safely catch the flow of water or steam during discharge. When you consider that the TPR valve discharges at 150 psi, which is five times greater than the force of your garden hose, the scalding water can strike the bottom of the shallow pan and spray out in all directions.

Therefore, a deeper spill pan receptacle with adequate circumference would be advisable over the shallower, tightly-fitting spill pans commonly observed in the field.

Figure 5 (right), shows a spill pan that tightly fits the base of a water heater. Unfortunately, such an installation accomplishes little in the way of catching water or steam from the TPR safety discharge valve, rendering the spill pan useless.

Spill pan installations depicted in this photograph are common in condominiums and some residential homes where space is a premium.



Figure 5 - Inadequate Water Heater Spill Pan Sizing

Summary

As we have seen, the Temperature/Pressure Relief (TPR) Valve serves an extremely important function – ensuring the safe and proper operation of the water heater. As professional home and commercial property inspectors, we frequently observe the code violations discussed in this article and encourage property owners and inspection professionals to take the time and effort to identify and correct them.

Consequently, the conditions presented in this article should be corrected immediately by a qualified and licensed contractor.

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