

BY GLENN MATHEWSON

1. Even if a full-height water heater fits within the vertical limitations of a crawlspace, the installation may not meet code.

2. The discharge pipe from a T&P valve can't have tees, and it can't tie into other lines, such as the condensate line from the furnace.

3. The discharge pipe must slope down, but the crimp reduces the diameter of the pipe, which is a code violation.



Water Heater in a Crawlspace

Contractors often ask me if the code will allow them to install a water heater in a crawlspace. With recent upgrades to the code, this once common (and mostly unregulated) practice has become rare. When the federal government increased its efficiency requirements for water heaters, manufacturers responded with new designs that effectively phased out gas “lowboy” water heaters; these units, with their low, wide tanks and conventional heat-transfer technology, were not efficient enough.

Aside from the shortage of vertical space in most crawlspaces (**1**), the most significant challenge for this type of installation is configuring the discharge from the temperature and pressure (T&P) relief valve. These valves are simple devices that act like the cap on your car’s radiator, releasing water that is either hot or under high pressure. Before these valves were required on water heaters, a malfunction could occur that allowed temperatures in the tank to increase to the point where the water heater

would explode—often with enough force to propel the heater like a rocket from the basement through the roof of a three-story house. But even if the T&P valve does its job properly, the discharge pipe coming from the valve must be properly installed for the system to function.

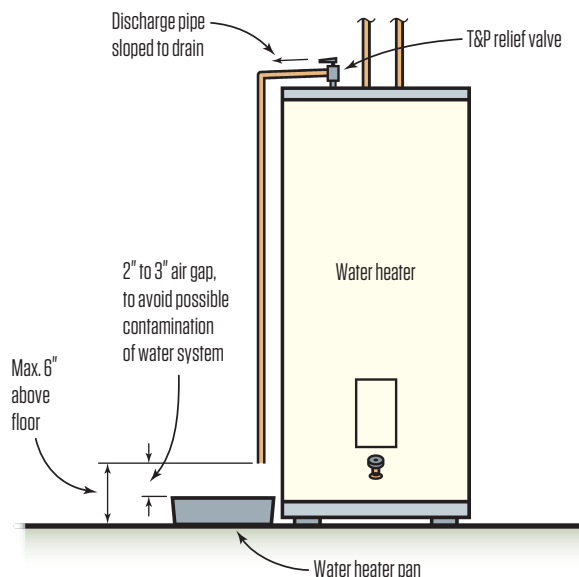
The latest version of the International Residential Code (IRC) provides a long list of requirements for this discharge in section P2803.6.1. And while the code should be commended for its effort to ensure water-heater safety, the list of installation requirements is very difficult to satisfy—especially in a crawlspace. Here are the requirements from that list that are most likely to affect a water-heater installation in the crawlspace.

TERMINATION POINT READILY OBSERVABLE TO THE OCCUPANTS

The toughest requirement to comply with for a crawlspace water heater is proving that the T&P valve “discharges to a termination point that is readily



T&P Discharge Pipe



4. A good way to create an air gap in the discharge pipe is to plumb in a reducer that acts as a cup. The plumbing shown in the photo, however, has created a scald hazard, because the air gap is not within 6 inches of the floor.

observable by the building occupants.” When a T&P valve is discharging, it means that the water heater is malfunctioning and the occupants need to be aware of the situation. But other than the annual trips to the crawlspace to get out the Christmas decorations, a crawlspace is not a part of the home that most occupants regularly visit. Out of sight, out of mind is not what we want with a T&P valve.

If water continues to discharge from the valve, it not only wastes energy and water, but also builds up minerals, which can cause the valve to leak or malfunction. We can’t risk the valve not opening completely when it needs to do its job. With the heater tucked away in a crawlspace, the folks in the house are not apt to notice a discharging T&P valve.

DISCHARGE MUST FLOW BY GRAVITY AND NOT BE TRAPPED

These requirements mean that the discharge pipe must be sloped to drain from the T&P to its termination point. The slope must be straight and continuous without tees or valves **(2)**. If water can become trapped in any part of the pipe, natural evaporation could leave mineral deposits that over time would reduce the diameter of the pipe and obstruct full flow—and reducing the diameter would violate yet another code requirement **(3)**. If the crawlspace is ventilated, trapped water could also be subject to freezing in colder climates.

One option might be to terminate the pipe to a receptor outdoors in a location that is “readily observable” (under a low deck would

not be an option). But terminating the discharge pipe outdoors while maintaining a straight downward slope for drainage could be especially difficult if the house is built on a flat site close to grade. And even if you satisfy all those requirements, there are others to contend with as well.

DISCHARGE THROUGH AN AIR GAP LOCATED IN THE SAME ROOM

Because of its direct connection to the water heater, the T&P valve is an extension of the potable water system in a home. Therefore it must be protected from cross-connection or contamination. To deal with this issue, the IRC requires that the pipe “discharge to an air gap in the same room as the water heater” **(4)**. The air gap

is a foolproof and effective method of protection that doesn't require a device of any kind. The required air gap must be in the same room as the water heater, and is typically at a floor drain or water-heater pan.

This arrangement is probably not available in most crawlspaces. Discharging to a water-heater pan may alleviate some T&P requirements, but those requirements might conflict with the pan drain requirements. With the approval of the local building official, one solution might be to terminate the T&P discharge at the water-heater pan with the air gap above, and then drain the pan to a sump pit out-fitted with a sump pump.

When the main sewer line is low enough in a crawlspace, adding a branch with a floor drain might seem like a reasonable choice for a waste receptor if it's plumbed correctly. But a floor drain must have a P-trap, and a P-trap in a crawlspace creates a new set of problems.

First, if the trap is in a ventilated crawlspace, it will require protection from freezing and from evaporation. With no continuous source of water, the trap could quickly start venting noxious sewer gases. And while these approaches offer some solutions to the drainage issue, they still are not "readily observable."

Another approach is to provide the air gap in the crawlspace, while still using an outdoor termination as the observable location. This arrangement also ensures that the valve will discharge even if the outdoor termination somehow becomes blocked. Though spilling water into the crawlspace is not a good design, it's still a good failsafe against a steam explosion. For this strategy, a reducer fitting becomes the waste receptor below the T&P discharge, which then continues to the outdoor termination.

DISCHARGE 6 INCHES ABOVE THE FLOOR

Just when it looks like we've found a good solution, we must address yet another requirement: The T&P discharge can be no more than 6 inches above the floor.

Here's why: We've already determined that the termination of the T&P must be in

the same room as the water heater and that an air gap is required. Because this termination and air gap must be "readily" observable to the occupants, it's safe to assume that the home's occupants are going to be near the water heater on a regular basis. Water discharged from the T&P is extremely hot, and would scald anyone caught in the splash. For this reason, code requires that the discharge be located within 6 inches of the floor—bare feet and ankles beware!

Now let's look at the crawlspace situation. The final termination and observable location we're shooting for is outside, so that point should be near grade level. But with a crawlspace, the water heater itself is most likely below grade. To provide the required air gap and still maintain a slope to the outside, the air gap would need to be near the top of the water heater. Even though it's unlikely that someone would be near a crawlspace water heater, the T&P valve is supposed to be tested annually. Testing the T&P requires close access to operate the valve, which would put someone in the path of any discharge above the crawlspace floor.

The rest of the T&P discharge requirements are important, but aren't complicated by a crawlspace installation. If read in black and white, the IRC requirements essentially preclude a water heater from ever being located in a crawlspace.

However, most code administrators recognize that new code provisions can create tricky situations for the repair and maintenance of existing buildings, and most are willing to work in that grey area to allow "alternative means and methods" (such as water monitoring alarms) when a crawlspace water heater needs to be replaced.

For new construction, however, it's usually much more difficult to get concessions, and you may simply be left with finding a main-floor location for the water heater and leaving the crawlspace for storing seasonal decorations.

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