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Water Heater Venting — Part I

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Know your water heater, know your venting options.

Growing up in the plumbing profession, venting a gas-fired water heater was always an easy process: You looked at the top of the water heater, determined the size of the outlet, connected that size vent connector (smoke pipe), and tied it to the chimney or vent. Ah, the good old days — they don't exist anymore for venting a water heater.

In the early 1990s, the gas industry decided to redefine venting requirements of gas-fired appliances. One of the first steps was to develop new categories for classifying the venting of gas-fired appliances. The categories were simply Category I, II, III and IV.

A Category I is your standard, atmospheric-venting, gas-burning appliance. Most water heaters fall into the classification of a Category I appliance. Category II appliances are atmospheric-venting; however, the products of combustion may condense in the vent system.

Category III appliances have a pressure vent, but the products of combustion do not condense in the vent system. Finally, Category IV appliances have a pressure vent and the products of combustion condense in the vent system. A pulse combustion appliance is an example of a Category IV appliance.

Category II, III and IV appliances are easy to vent. These appliances must have their own vent system that is specifically listed for the appliance. The vent system cannot vent another appliance. This is a case of "one appliance, one vent." You will find a variety of vent materials used for Category II, III and IV. Included would be stainless-steel and plastic. The concern, of course, is the condensate that can corrode the vent system.

There are a number of instantaneous water heaters that fall into the Category II and III range. There is even a pulse water heater that is a Category IV appliance. The venting must be in accordance with the manufacturer's installation instructions. Today, the manufacturers of gas-fired appliances list a number of manufacturers that will supply the vent that is acceptable for the appliance.

The important factors to consider for Category II, III and IV appliances are: 1) the length of the vent; 2) the number of elbows or 45-degree bends; 3) the size of the vent; and 4) the termination. All of these factors are regulated by the listing of the appliance. The Mechanical Code has additional requirements for the termination of the vent.

Standard Tank-Type Water Heater

You would think that by keeping the standard tank-type water heater a Category I appliance life would remain easy for venting the water heater. Well, after identifying the various categories of appliances, they had to add one more into the mix. A newer style of Category I appliance came about after the creation of these categories: The fan-assist combustion unit.

A fan-assist combustion unit is still a Category I venting appliance. While there is a fan on the unit, normally located just below the vent outlet on the appliance, the fan assists the combustion process. It is not used for venting purposes. As a result, the pressure at the outlet of the vent connector is about the same for every other type of Category I appliance.

The problem associated with the fan-assist combustion unit is that it has a higher efficiency, which in turn lowers the flue gas temperature. A large number of residential furnaces are fan-assist combustion units. There are also fan-assist boilers.

Since these are Category I appliances, the vent from multiple appliances can connect to the same chimney or vent. Thus, a fan-assist furnace can vent through the same Type B vent as a water heater.

While the water heater hasn't changed much, the furnace venting has. As a result, the codes have developed an entirely new set of requirements for venting fan-assist combustion units with standard water heaters. It is no longer business as usual.

Combining Appliances

There are a number of details that have to be considered when combining these two styles of gas-fired appliances into the same vent. The water heater now will vent much better than a fan-assist combustion unit. If you tie them directly together, the water heater will always out-perform the fan-assist combustion unit. As a result, the fan-assist combustion unit may not vent adequately.

To solve this potential problem, we actually foul up the venting of the water heater. Since we cannot improve the venting of the fan-assist unit, the only alternative is to make the water heater match the venting of the fan-assist. Hence, we foul it up a little bit.

The fan-assist appliance also has a lower temperature, meaning that it requires more energy to heat the inside wall of the vent. If you do not adequately heat the inner wall of the chimney or vent, the products of combustion will condense on the vent. Gas condensate is corrosive and can cause the premature failure of the chimney or vent.

As a result, the sizing of the vent becomes critical. In the good old days, there was an expression that you could not oversize a chimney or vent. Well, today you can easily oversize the chimney or vent. The result of the "oversizing" is the formation of condensate on the inside wall of the chimney or vent.

Vent offset is another detail that changes the design of the system. When the vent offsets in the attic, it diminishes the venting ability of the vent system. Typically, there is a 20 percent drop-off in the efficiency of the vent system.

Finally, the height of the chimney or vent will impact the venting system design. The taller the chimney or vent, the more the products of combustion are in contact with the inner wall. Again, this may increase the potential for condensate building on the inner wall, causing a premature failure.

Next month, I'll review the details in the vent-sizing tables. You may be surprised by some of the changes you will have to make when connecting a gas-fired water heater to the vent system. The changes apply to both new and replacement water "heaters."

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