

Non-Traditional Gas Appliance Venting

BY BRUCE BARKER

ONCE AGAIN THE WORD INVITES YOU TO TRAVEL into the dark realm of subjects that are sometimes misunderstood by home inspectors. The Word hopes you will find this trip informative and maybe a little entertaining.

The Word's topic this month is **special type gas venting**. The Word finds this topic interesting because gas appliances using vent systems other than traditional Type B vents and chimneys are becoming more common. The Word wouldn't be surprised if special type gas vents become the norm during the careers of younger inspectors. We should learn more about inspecting these special type vents.

Tradition

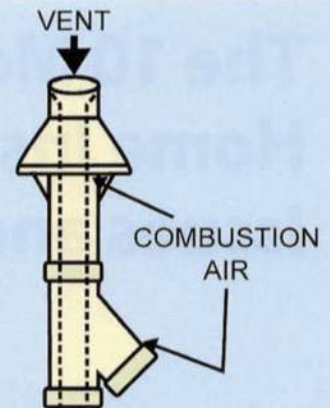
Inspecting traditional Type B and chimney gas appliance vent systems is relatively easy. Common traditional vent systems include: double-wall galvanized steel Type B vents and their close cousin stainless steel Type L vents, masonry chimneys (including those lined with metal liners), and single wall galvanized steel vents. Each of these traditional vent systems have prescriptive (code) rules. Once you learn the rules, you can inspect most traditional vent systems. We've discussed traditional vent systems before, so we're not going to do so now. Previous The Word columns are available on the *Reporter's* website.

Manufacturer's Instructions Rule

Rules for most special type gas vents are (for the most part) based on manufacturer's instructions. These instructions vary between manufacturers and products and the differences can be significant. Don't try to apply traditional gas vent rules when inspecting special type gas vents.

The Words

Some special type gas venting systems are relatively new and others



Concentric Direct Vent

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Figure 1

have been around for a while and are actually quite common. Let's identify some of them.

A **direct-vented** appliance vent is less about the vent and more about where the combustion air comes from. A direct-vented appliance draws combustion air from outside the structure. Combustion air may come through a separate pipe or through the outside of a double-wall, concentric pipe. See *Figure 1*. Direct-vented appliances may terminate either through a sidewall or through the roof.

A **non-direct** vented appliance (sometimes called a direct-exhausted appliance) draws combustion air from inside the structure and expels the combustion products outside. Inside often means a ventilated attic or crawlspace. Sometimes, the same appliance can be installed either as a direct-vented or a non-direct vented appliance.

Some gas appliances have **integrated vents** in which the vent is part of the appliance. Common examples include ground-and roof-mounted gas package units and demand (tankless) water heaters designed for outdoor installation. Manufacturer's instructions rule for these appliances, including clearances to combustibles. Clearances to windows, doors, soffits and other components usually follow guidelines for non-direct-vented appliances.

Some gas appliances come from the factory with **mechanical draft systems**. Some appliance vents have these systems installed in the field. Category III and IV appliances (see above) are factory-equipped with mechanical draft systems that push the combustion products through the vent under positive pressure. Category I appliance vents may have power exhausters installed at their termination to pull the combustion products through the vent if the products can't get out on their own for some reason. This distinction between push and pull is important. Push means that the vent system must be sealed to keep combustion products from leaking.

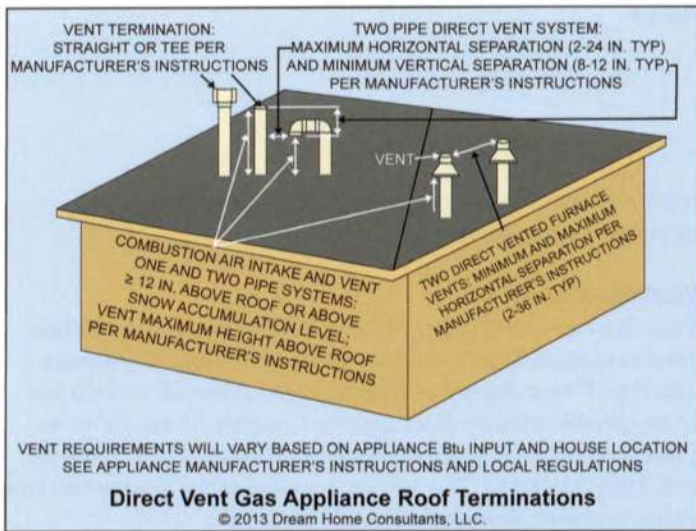


Figure 2

Pull means traditional (less well sealed) vent systems can be used.

The other important distinction is between mechanical draft and induced draft. Mechanical draft deals with moving combustion products through the vent system by pushing or pulling. Induced draft deals with pulling combustion products through the appliance's heat exchanger and allowing buoyancy to draw them the rest of the way through the vent. The little fans in Category I furnaces do not put the vent system under pressure.

The Categories

Category I gas appliances usually use one of the traditional vent systems. Common examples include low-and medium efficiency furnaces and boilers, and draft hood-equipped water heaters. The Categories I-IV refer to the vent gas characteristics. Category I vent gas is hot (around 300° F.) and rises through the vent by being less dense and more buoyant than the surrounding air.

Some direct-vented gas appliances are Category I appliances. Common examples include some decorative gas fireplaces. These appliances may not be connected to traditional vent systems and must use manufacturer-recommended vent components.

Clearance between these vents and combustible materials may be different as well. Clearance between the top side of these vents and combustible materials can be two or three inches.

Some direct-vented gas appliances are Category III appliances. Some demand (tankless) water heaters are in this category. Category III appliance vents operate under positive pressure with a vent gas temperature equal to or greater than a Category I appliance. Category III appliances may not be connected to traditional vents and must use manufacturer-recommended vent components. Category III appliances are not considered condensing appliances; however, condensation can be a problem. Condensate collection and disposal systems are often required

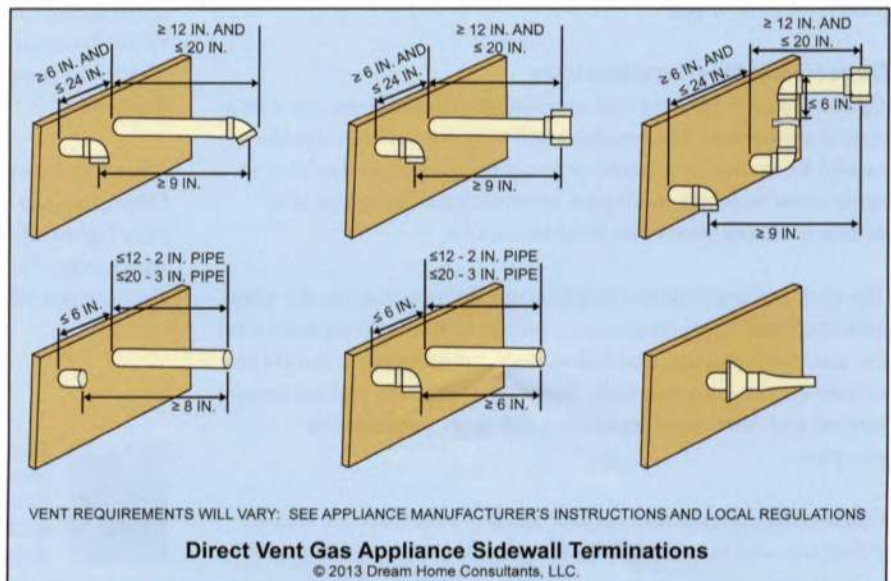
in cold climates and may be required in some vent configurations (e.g., multiple elbows and vertical vent installations).

Category IV gas appliances all use some type of special type vent system. Common examples include high-efficiency, condensing furnaces and high-efficiency water heaters (both storage and demand types). Category IV appliance heat exchangers are very efficient (usually 90+ %) at drawing heat from the combustion products so the vent gas is cool. The gas is so cool that it must be exhausted under positive pressure and can use plastic pipe as the vent.

Condensation in the vent system is an issue for all Category IV appliances. Manufacturers require condensate collection and disposal systems in all climates and the vent should be sloped back toward the appliance so that condensate will flow into the collection system. Other manufacturers recommend sloping horizontal vents toward the discharge point to let the condensate drain through the wall cap. Manufacturers often recommend insulating Category IV vents that run through uninsulated spaces in cold climates (design temperature below 32° F). This is to help prevent the condensate from freezing and blocking the vent.

If you're paying close attention, you may notice that we haven't discussed Category II gas appliances. The vent systems for Category II appliances (like Category I appliances) operate under negative vent pressure (the hot gasses rise). The problem for designers of Category II gas appliances is that the vent gasses aren't all that hot (less than 140° F.), so condensation in the vent can occur. The Word is not aware of any Category II appliances currently available for sale.

Figure 3



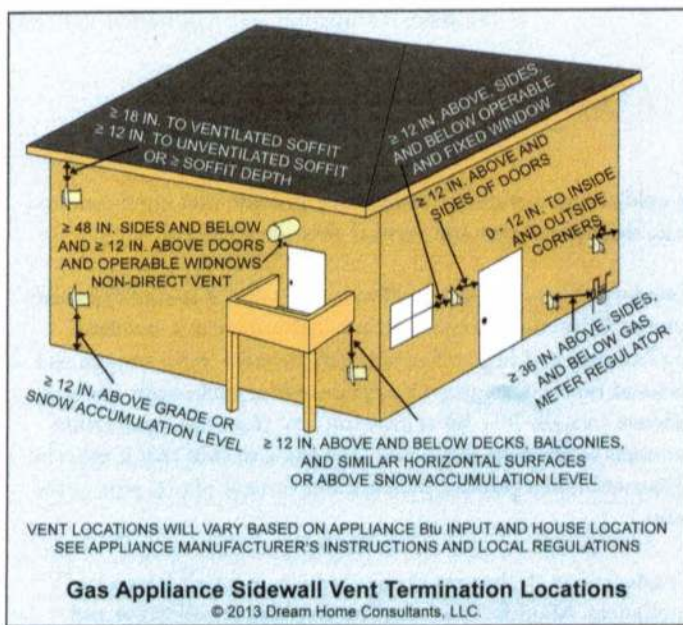


Figure 4

requirements when two or more direct-vented appliances are terminated in the same area.

Vent Clearances

Vent clearances for Category III and IV appliances to things like windows seem odd compared to clearances for traditional vents. The Type B vent clearances of eight feet to a sidewall and ten feet to an operable window don't apply to Category III and IV vents. Clearances for these vents are based on ANSI Z223.1 / NFPA 54 or CAN/CSA-B149.1. You will see a version of the illustrations and charts in almost all manufacturer's instructions.

The first important thing to know about these clearances is that there are different illustrations and charts for direct-vented and non-direct vented appliances and there are different requirements for the United States and Canada. The second thing is that different manufacturers have different clearance requirements. Finally, clearances depend on the Btu appliance's input.

Figure 4 shows some typical clearance distances between vents and common components. The twelve-inches clearance above grade or above the local snow accumulation height (whichever is higher) is consistent among manufacturers as is the clearance around gas meter regulators. Clearance to operable windows and doors depends on the Btu rating of the appliance and whether it's direct- or non-direct vented. Clearance to non-operable windows is recommended by some manufacturers to avoid condensation on the window. Clearance to inside and outside corners and to soffits varies between manufacturers.

The Bottom Line

Our new ASHI Standard of Practice for Home Inspection specifically excludes inspecting for compliance with manufacturer's instructions. This is as it must be. Even if the instructions are available, which they usually aren't, time doesn't permit a detailed examination of the instructions and of the installation. Still, most of us like to go beyond the Standard to better serve our clients. The Word hopes you now have a better understanding of the issues involved with these increasingly common gas appliances.

Memo to Vulcan (god of fire): The Word does not reside on Mt. Olympus (just at its base) and welcomes other viewpoints. Send your lightning bolts or emails to Bruce@DreamHomeConsultants.com. The thoughts contained herein are those of The Word; they are not ASHI standards or policies. ■

The Pipe

Category III direct vented-appliances use manufacturer-recommended metal pipe. The pipe consists of two concentric pipes, one inside the other, with the vent in the center and combustion air drawn through the outer pipe. See Figure 1. These pipes must be sealed because the vent is under positive pressure.

Most Category IV appliances use plastic pipe for venting and combustion air intake. Manufacturers usually recommend Schedule 40 PVC, ABS or CPVC. The pipe should be solvent-cemented using compatible cement and primer, if required. Manufacturers recommend pipe support in the three-to-five foot range.

A new material for venting Category IV appliances is polypropylene. Polypropylene vents come in rigid and flexible types. Like all manufactured vent products, manufacturer's installation instructions rule, so if you see this material, you may wish to jot down the manufacturer's information and do some research. Here is the website for one manufacturer. http://www.duravent.com/docs/product/L273_W.pdf

Direct-Vent Pipe Terminations

Figures 2 and 3 show typical termination requirements for direct-vented appliances. The numbers will vary (sometimes significantly) by manufacturer and pipe configuration, so don't try to apply these numbers to all pipe terminations. The point is to demonstrate the issues you need to look for.

The vent and combustion air pipes should terminate in the same pressure zone. Pipes terminating on the roof should terminate on the same roof section, and sidewall-terminating pipes should terminate on the same sidewall. There are minimum and maximum vertical and horizontal separation distances between the two pipes.

Other termination issues include the fact that there are usually minimum and maximum pipe lengths. There are also separation



Bruce Barker operates Dream Home Consultants. He has been building and inspecting homes since 1987. He is the author of "Everybody's Building Code" and currently serves as chair of the ASHI Standards Committee. To read more of Barker's articles, go to www.dreamhomeconsultants.com.