Venting Gas Appliances Using a Chimney

By **BRUCE BARKER, ACI**

ONCE AGAIN, The Word invites you to travel into the dark realm of issues that are sometimes misunderstood by home inspectors. The Word hopes you will find this trip informative and maybe a little entertaining.

The Word's subject this month is **venting gas appliances using a chimney**. The Word finds this subject interesting because this is a common situation in some areas and because inspectors may find this subject confusing.

Remember when reading all The Word columns that we're discussing general principles. Something you see in the field isn't always wrong just because it doesn't comply with a general principle. Local building codes, manufacturer's instructions and engineered designs trump general principles.

This column applies only to what are known as Category I gas appliances. The most common Category I gas appliances are draft-hood-equipped furnaces and water heaters and induced-draft, medium-efficiency furnaces.

This column does not apply to high-efficiency gas appliances (the ones vented using PVC pipe) and it does not apply to other gas appliance types such as those using a positive-pressure vent. Vents for these appliances should be designed and installed according to the appliance manufacturer's instructions.

The problem

A chimney often is built to serve something (like a wood-burning fireplace or an oil-fired boiler) that produces a greater volume of combustion gasses at a higher temperature compared with gas appliances. Thus, the typical chimney flue has a much greater area than the typical gas vent.

Chimneys and vents work because the hot combustion gasses are less dense and more buoyant than the surrounding air. This creates a difference in pressure (a draft) that allows the hot combustion gasses to rise to the top of the chimney or vent where they are expelled from the home. A chimney or vent that is too small will not have enough capacity (area) to expel the combustion gasses as quickly as required to maintain an adequate draft. A chimney or vent area that is too large will not heat up enough to create the draft.

Improperly sized chimneys and vents create two primary problems. One problem is backdrafting, where the combustion gasses are not expelled out from the top of the chimney or vent and flow into the home instead. Backdrafting can occur when the chimney or vent is too small or if there are too many obstructions (like elbows). The other problem is condensation, where water vapor in the combustion gasses condenses on the interior of the chimney flue or vent. This water vapor can be acidic and can severely deteriorate the chimney or vent in a short period of time. Condensation can occur when the chimney or vent is too large.

The exposed chimney

An exposed chimney is one that has any side of the chimney exposed to the outside below the roof line. The chimney is exposed if even one side runs along an outside wall. A chimney that serves as a vent for a gas appliance may not be exposed. Look at the chimney when evaluating a chimney that serves as a gas vent. The chimney must be entirely enclosed within the four walls of the home until it enters the attic; otherwise, the system may not work properly and should be evaluated by a qualified engineer. Exposed chimneys may not get hot enough to maintain a draft, resulting in backdrafting, condensation or both.

Be careful to distinguish the situation above from the situation where a vent (such as a Type B vent or a chimney liner) runs inside the chimney. In this case, the chimney serves as a chase for the vent, not as the vent.

Appliances that may use a chimney as a vent

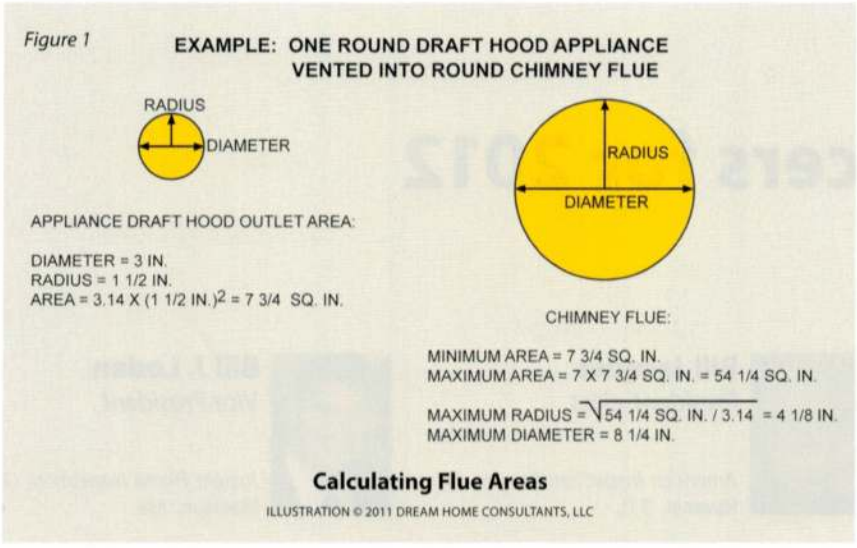
The simple rule for determining when a chimney may serve as a gas appliance vent is when the chimney serves as a:

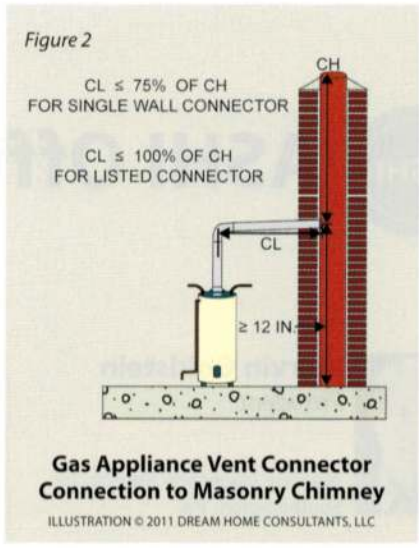
1) common vent for two or more draft-hood-equipped or induced-draft appliances; or as a
2) vent for one draft-hood-equipped appliance.

A chimney may serve as a vent for other types or configurations of gas appliances, but these other types or configurations must comply with manufacturer's instructions or they may need to be engineered. When you see a chimney serving as a vent that does not comply with 1 or 2 above, it's not necessarily wrong; however, it might be. You may wish to call for further evaluation, particularly if you see evidence of venting problems.

Flue area

Evidence of venting problems may prompt you to question whether the chimney flue area is correct. Such evidence includes rust, stains or soot around draft hoods or the combustion chamber, or deterioration of the chimney flue. We are not required to determine if the chimney flue area is correct, but knowing how to do so will help you estimate if the flue area seems reasonable.





One method for determining the correct chimney flue size is to use the IRC tables in Section 2428. This method must be used when common venting two or more gas appliances. There is an easier method if you are venting one draft-hood-equipped gas appliance.

The chimney flue area for one draft-hood-equipped gas appliance may not be less than the area of the draft-hood outlet and not more than seven times the area of the draft-hood outlet. In case you don't remember how to calculate the area of a circle and work backward to a diameter, Figure 1 shows an example.

Remember, too, that rectangular flues are not really rectangles; they are rounded rectangles. Their area is smaller than a full rectangle. There are tables in the IRC that show the area of common-sized round and rectangular fireclay flues.

Vent connectors between appliances and chimneys

A single wall-vent connector serving Category I gas appliances should be galvanized steel that is at least 0.018 inch thick (approximately 28 gage). Other approved materials such as aluminum and stainless steel are also acceptable, as are listed vent materials such as Type B and Type L vents.

Vent connectors should be securely attached to the appliance draft hood or flue collar, and joints in the vent connector should also be securely attached to each other. Attachment means sheet metal screws (usually 3) or other approved materials such as the manufacturer-supplied locking mechanisms of Type B vents. The vent connector should slope up toward the chimney at least ¼ inch per foot and should be adequately supported.

Vent connectors should be inserted directly into the chimney flue at least 12 inches above the bottom of the flue. They should be sealed around the insertion point and secured so that the connector will not move too close to the other side of the chimney flue. The chimney flue should be sealed below the vent connector so that the draft is not disrupted by air flowing in through the fireplace opening.

As is true for all common venting systems, where two or more vent connectors enter a chimney, the smaller connector should connect to the chimney above the larger connector.

Vent connector length

Hot gasses are lazy. They like a straight vertical path up. Hot gasses may backdraft if they travel too far horizontally in the connector or if they do not have enough vertical distance in the chimney to develop a good draft. This is why there is a limit on how long a vent connector may be relative to the height of the chimney above the vent connector. The length of a single-wall vent connector may not be more than 75% of the height of the chimney above where the connector enters the chimney. A Type B or Type L vent connector may not be more than 100% of the height of the chimney above where the connector enters the chimney. Figure 2 illustrates this relationship.

The preceding vent-connector length rule applies only when using the vent-connector and flue-size rule for draft-hood-equipped appliances described in the Flue Area section of this article. The preceding vent-connector length rule does not apply when using the tables in IRC G2428. The unadjusted vent-connector length limit in the IRC G2428 tables is 1.5 feet times the vent-connector diameter. For example, the maximum length of a 3-inch diameter vent connector when using the G2428 tables is 1.5 feet x 3 = 4.5 feet. A longer vent connector may be used if the table values are reduced.

Also note the number of elbows in a vent connector. Any combination of elbows that totals more than 180° may be a problem because of the resistance to gas flow caused by the elbows. Evaluation by a qualified contractor may be wise in such cases.

The bottom line

A chimney can be a low-cost and convenient venting system for gas appliances and the system can work if properly designed, installed and maintained. The problem is that these systems often are not properly designed, installed and maintained. The Word hopes that you now have a little better idea about how to inspect such systems.

Memo to Vulcan and the other fire gods: The Word does not reside on Mt. Olympus (just at its base) and welcomes other viewpoints. Send your lightning bolts or emails to inspectorbruce@cox.net. The thoughts contained herein are those of The Word. They are not ASHI standards or policies. ■

Bruce Barker, Dream Home Consultants, Peoria, Ariz., 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 or if you need a presenter at your next chapter event, go to ***www.dreamhomeconsultants.com****.*