The Word: Draft

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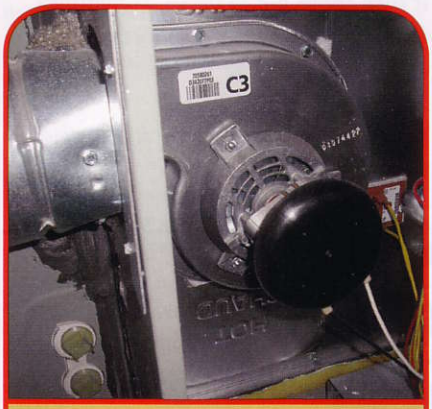
Once again, The Word invites you to travel into the dark realm of terms that are often misused or misunderstood in home inspection reports. The Word hopes you will find this trip informative and maybe a little entertaining.

The Word's term today is draft. The Word refers to what occurs in a combustion appliance flue, not to what you feel on a cold winter night. The Word finds this term interesting because once you understand how draft works in a flue; the complex rules governing vents and flues make more sense.

Let's recall how atmospheric (natural) draft works. Hot combustion gasses rise in a flue because of temperature and density differences between the combustion gasses in the flue and conditions in and surrounding the flue. This is called the stack effect. Combustion gasses rise until they exit the flue or until they cool below the temperature of the surrounding area. When combustion gasses cool below the temperature of the surrounding area, they fall back down the flue, creating the phenomenon sometimes called backdrafting. Combustion gasses prefer a straight vertical run. Any offset from vertical makes it more difficult for them to rise and this can also cause backdrafting.

Natural-draft appliances include most fuel-burning appliances that we see during our inspections. Examples include all Category I gas appliances (such as draft hood-equipped water heaters and medium-efficiency furnaces), most gas and oil-burning boilers, and most masonry and factory-built fireplaces.

All natural-draft appliances use the stack effect to expel combustion gasses. This includes appliances that have small fans between the combustion chamber and the flue collar. These fans are called draft inducers. In medium-efficiency gas furnaces, these fans pull the combustion gasses through a serpentine combustion chamber designed to increase the time that the gasses remain in contact with the air being heated. This increased contact time increases the furnace's efficiency. These draft inducers do not, as some believe, place the flue gasses under positive pressure in the flue.



A draft-inducer fan

"These draft inducers do not, as some believe, place the flue gasses under positive pressure in the flue."

The stack effect relies, in part, on the height of the flue above the appliance. Flues that are too short or too tall may not function properly. For Category I gas appliances, flues (vents) less than 6 feet and more than 50 feet above the appliance fall outside the range of values in International Residential Code 2009 (IRC) Table G2428.2. These vents require engineering design or installation according to the appliance manufacturer's instructions.

Combustion gasses don't like elbows and non-vertical vent sections. For Category I gas appliances, the IRC allows total elbows of not more than 180° between the appliance and the vent termination. More elbows reduce the BTU/hour input allowed to use a vent system and you may wish to question vent systems with elbows that total more than 180°. You may also wish to question non-vertical vents and vent connectors that exceed 75 percent of the vent height. Refer to the vent tables in the IRC to determine if long vent connectors are approved. Non-vertical means more than a 45° offset from vertical.

Combustion gasses don't like flues that are too large or too small. Flues that are too small may not accommodate the volume of combustion gasses produced by the appliance. Flues that are too large may allow the combustion gasses to cool before exiting the flue and fall back down the flue (backdraft) into the home.

A common situation where flue size may be an issue is when a Category I gas appliance is connected to a masonry chimney. Chimneys are usually intended to accommodate a much higher volume of much hotter combustion gasses than are produced by most gas appliances. A chimney that is the wrong size may not expel the combustion gasses and may be severely damaged by water vapor contained in combustion gasses.

A general rule for determining if a masonry chimney is an appropriate vent for a Category I gas appliance is: (1) the area (not the diameter) of the appliance vent connector should be at least as large as the area of the chimney, and (2) the area of the chimney should be

not more than seven times the area of the vent connector. You may also use the vent tables in IRC Section 2428.3 to determine proper chimney size.

When inspecting a masonry chimney used as an appliance vent, verify that: (1) the vent connector is inserted into the chimney flue so that it does not touch the opposite side of the flue liner, (2) the vent connector penetration into the chimney is sealed air-tight, and (3) the chimney below the vent connector is sealed air-tight. Improper sealing may allow cooler air to dilute the combustion gasses and cause backdrafting.

A listed chimney flue liner may be installed in a masonry chimney and used as an appliance vent. The flue liner must be installed according to the manufacturer's instructions. Whenever a chimney is used as an appliance vent, the chimney's fireplace should be disabled or a warning placed in the fireplace stating that the fireplace may not be used.

Many of the rules in this article also apply to liquid- and solid-fuel appliances. Refer to IRC Chapter 18 for more information.

Combustion appliances are some of the most potentially dangerous components that we inspect. Knowing more about how they work and some of the rules for their proper installation will help you keep your clients safe.

Memo to the fire Gods and other authorities: The Word does not reside on Mt. Olympus and welcomes other viewpoints. Send your lightning bolts or e-mails to inspectorbruce@cox.net. ■

Attend Bruce Barker's presentation, "Not Your Daddy's Building Code," in the Specialty Track at InspectionWorld Las Vegas in January 2010.

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 Standards Committee.