The Word: Vent

By Bruce Barker, ACI

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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.

*Our subject this month is **wizard words**. The Word finds this subject interesting because words are powerful. One of the first lessons young wizards are taught at Hogwarts is to learn the true name of a thing. Knowing the true name gives the wizard power over it. The same concept applies to inspection wizards. It's difficult to inspect something, and to communicate your findings to your client, unless you know the true name of what you are inspecting.*

VENT: ONE WORD, MANY NAMES

The word "vent" is used in many ways when applied to building components. Vent describes a component of the plumbing system. Vent describes a component of many combustion appliance systems. Vent describes openings into attics and crawlspaces. Vent describes systems that remove moist air from the house, such as from bathrooms, kitchens and clothes dryers. Vent is also used as a verb to describe the operation of these systems. Finally, vent is used as an abbreviation for ventilation.

One of the dictionary definitions of vent is

"AN OPENING PERMITTING THE ESCAPE OF FUMES, A LIQUID, A GAS, OR STEAM."

Given this definition, none of the ways we use the word vent are completely wrong, but neither are they completely right. The Word wonders if the true names of these components are something else—something that better describes their purpose and function.

PLUMBING VENTS

Use of the word vent in the plumbing system is well established and reasonably descriptive of its purpose and function. The primary purpose of a plumbing vent is to protect the water seal in a trap. A vent does this by letting air into the drainage pipes to avoid siphoning water out of a trap, or blowing water out of a trap, when water flows. Air provided by a plumbing vent also helps water flow freely in the drainage pipes.

The atmospheric vent pipe sticking out of the roof is the traditional way to provide air in drainage pipes. Atmospheric vents work well when properly installed, which is easy to do when venting one or two fixtures. Atmospheric vent installation gets more complicated when trying to use one vent pipe to serve multiple fixtures, such as when using wet vents and circuit vents (see Figure 1).

Installation also gets more complicated when trying to vent fixtures in islands and peninsulas where there is no convenient wall in which to run a vertical vent pipe. Atmospheric vents are expensive to install. Each piece of pipe requires materials and labor. Then, of course, there's the problem of the leaking vent pipe boot on the roof. Eventually, most vent pipe boots leak.

The air admittance valve (AAV) cures most of the problems created by atmospheric vents. AAVs were invented in Sweden in the 1970s and introduced in the United States in the late 1980s. AAVs are often called Studor vents, which is the brand name of the original AAV manufacturer. Acceptance of AAVs was slow at first, but they are now accepted by the model codes and in most jurisdictions.

An AAV opens to let air into the drainage pipes when the valve senses negative pressure, thus serving part of an atmospheric plumbing vent's purpose. It can be used just about any place an atmospheric vent can be used. When the correct size AAV is installed, it can serve one or many fixtures. An AAV can be installed in attics and crawlspaces, and in any other interior space with adequate ventilation and accessibility. An AAV may not be installed outside, nor may it be the vent for a sewage ejector (Photo 1).

One might think that the AAV could eliminate the need for the atmospheric plumbing vent. Air admittance valves certainly reduce the need for the atmospheric vent, but AAVs do not eliminate the need for one atmospheric vent per house. The one atmospheric vent per house provides air to avoid trap seal blowouts (unlikely, but possible in residential construction) and helps water flow freely.

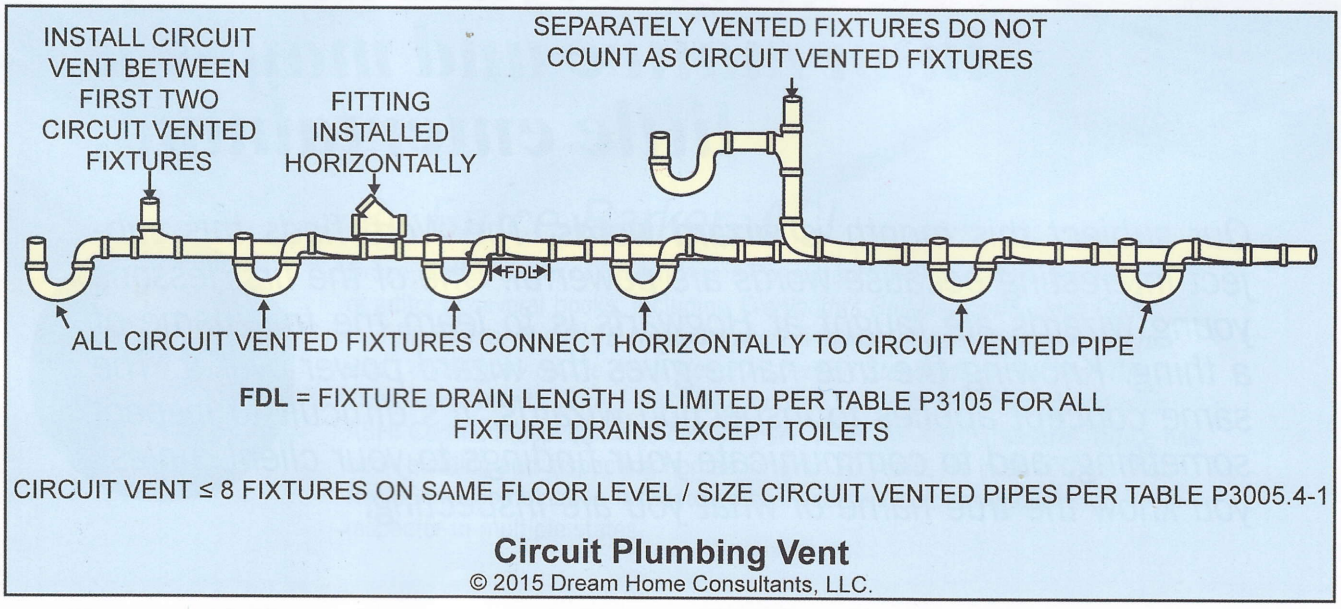

Figure 1. Each fixture drain must enter a circuit-vented pipe individually and horizontally.

Beware that a false AAV is out there waiting to fool the unsuspecting wizard. This is the check vent, also known as a cheater vent. These vents are spring-operated devices that will usually fail more quickly than the more expensive AAV. Check vents are approved only for installation in manufactured homes. Know a check vent by its small size, usually black color, visible spring and lack of a UPC symbol.

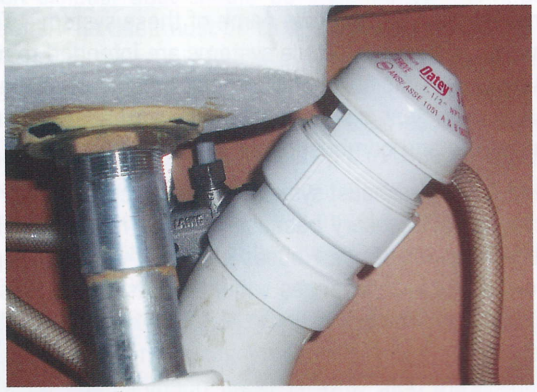

Photo 1. AAV incorrectly installed at an angle.

COMBUSTION VENTS

Use of the word vent to describe systems that help combustion products get from combustion appliances to outside is also well established, and descriptive of its purpose and function. The problem is that some wizards do not know about the true names of the vent system components.

The following refers to vents serving natural draft combustion appliances such as low- and medium-efficiency furnaces and water heaters. Manufacturer's instructions rule for high-efficiency appliance vents and vents that use a fan to either push or pull combustion gasses through the vent.

A combustion vent is actually a system that usually consists of several components. Beginning at the combustion appliance, a **vent connector** runs from the appliance to the **vent**, which terminates with a **cap**. If the vent system is entirely vertical with no laterals, then there is no vent connector, just the vent and a cap (Figure 2).

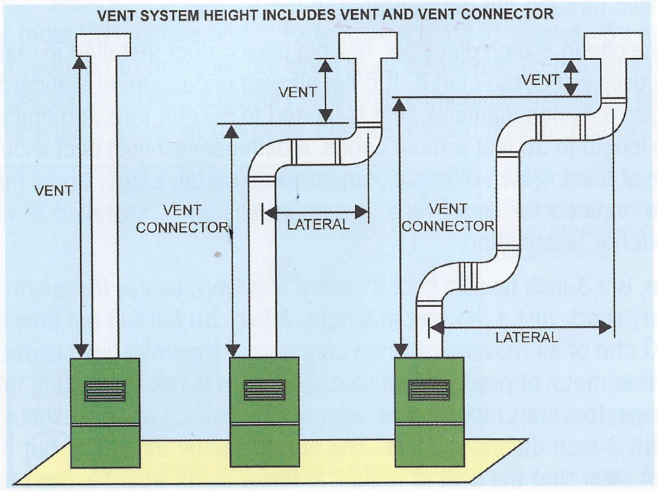

Figure 2. The vent is the vertical section. Everything before that is the vent connector.

Knowing the true name of the vent system components is important because whether or not the vent system is properly installed is determined, to a large degree, by how the individual components are installed. The rules for installing a vent connector are different from those for installing a vent. Vent systems that are improperly installed can backdraft and can allow condensation of acidic water in the vent.

Knowing a few simple rules can help alert you to a vent system that may be improperly installed. Vent systems that run afoul of these rules are not necessarily deficient, but it may be wise to pay special attention to them and, in some cases, recommend evaluation.

- Two 90° elbows (or any combination of fittings that is ≤ 180°) are assumed in a vent connector. Each additional elbow impedes combustion gas flow.
- Single-wall vent connectors that exceed 75% of the vent system height and Type B vent connectors that exceed 100% of the vent system height may impede combustion gas flow.
- Single-wall vent connectors may not be installed in attics and crawlspaces, and may not be installed in garages in cold-climate zones.
- A vent connector that does not rise about 12 inches vertically before the first elbow may impede combustion gas flow.
- Flexible vent connectors usually may be installed in the same way as a solid Type B vent connector, except that they may not:
  - penetrate a combustible partition such as a wall, floor or ceiling;
  - be cut or altered;
  - be compressed more than 20% of their full extended length;
  - be bent at more than 90°;
  - be installed in a concealed space.

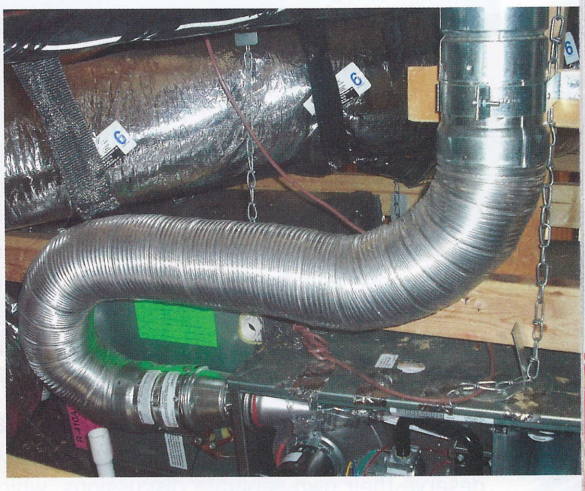

Photo 2. Flexible vent improperly penetrates a ceiling and has been improperly modified. Photo 3. Way too many bends!

Note that instructions for various models of flexible vent connectors are different and other restrictions may apply, especially for the DuraVent brand DuraConnect single-wall flexible connector (Photos 2 and 3).

- Vent system components should not be installed exposed in places where accidental contact is likely, such as in closets and garages.
- Vent connectors should be supported about every 4 to 5 feet and near fittings. Vents should be supported at the roof penetration. All vent system components should be supported per manufacturer's instructions.
- Vents should not extend above the roof farther than necessary to achieve the minimum roof clearance. For example, a Type B vent should not extend above a roof with a 6/12 pitch much more than 12 inches (and not less than 12 inches) (Photo 4).

Photo 4. Vent is too close to the roof, too close to the sidewall and too close to the window.

ATTIC AND CRAWLSPACE VENTILATION

Use of the word vent to describe openings that provide air to attics and crawlspaces is well established; however, The Word submits for your consideration that vent is not the true name that describes the purpose and function of providing ventilation to attics and crawlspaces. The Word submits the term "ventilation openings" as the true name of these openings. This true name makes it clear that these openings provide ventilation to the attic and crawlspace.

Attic ventilation and crawlspace ventilation, and the alternatives involving unventilated spaces, are complicated topics. These topics deserve their own separate discussions, which The Word will do in other articles.

EXHAUST SYSTEMS

Use of the word vent to describe systems that remove moisture and odors from inside the house is well established; however, The Word again submits for your consideration that vent is not the true name that describes the purpose and function of these systems. The Word, and the International Residential Code, submit the term "exhaust" as the true name of these systems. This true name makes it clear that these systems are intended to move air containing excess moisture and noxious fumes out of the house, and it makes a clear distinction between exhaust systems and plumbing vents and combustion vents.

Until very recently, exhaust systems did not receive much respect. Respect wasn't necessary because it didn't matter much if the systems worked well or not. Houses were built with many openings that allowed many air changes with the outside. In these leaky houses, moisture inside the house was removed with reasonable effectiveness by multiple air exchanges per hour with the outside. Now, houses are built with far fewer openings and far fewer air changes per hour. Moisture remains in the house or, worse, migrates into the attic and wall cavities if the exhaust systems do not work effectively.

There are three types of exhaust systems frequently found in houses. They all have three components: a fan to move the air, a duct to conduct the material outside of the house and a termination at the outside.

Low-volume exhaust systems are mostly found in bathrooms and usually move air at a rate between 50 cubic feet per minute (cfm) (minimum) and 100 cfm. Kitchen exhaust systems usually move air at a rate between 100 cfm (minimum) and 400 cfm. Clothes dryer exhaust systems usually move air at a rate around 200 cfm.

Bathroom exhaust systems get the least respect of all. Many HVAC contractors believed that these fans were intended to remove odors when, in fact, their primary purpose is to remove moisture from a place where a lot of moisture is created. In tight houses, it is essential that these exhaust systems function properly. Functioning properly means getting the amount of air that the fan is rated to move through the duct and out of the house.

The cheap 3-inch diameter, flexible plastic duct installed in many houses just doesn't cut it. It is not allowed under current standards. Even a 4-inch diameter duct is limited to 50 cfm fans and limited in length to 56 feet without bends. A bathroom exhaust duct should be at least 4-inch diameter, smooth-wall metal. Larger ducts may be required for larger fans. A damper should be installed at the exterior termination.

So, is a 3-inch flexible duct a defect? Probably, unless the length is very short, just a few feet in length. A 50-cfm fan will not provide 50 cfm of air movement when connected to a small flexible duct, either metal or plastic. That said, The Word is not advocating that inspectors start reporting as defective thousands of bath exhausts with 3-inch diameter ducts. The ducts may be defective, but it's not clear that the cost of replacing these ducts would exceed the benefits.

A kitchen exhaust system with a duct run to the outside is only required when there is no operable window in the kitchen area. There almost always is an operable kitchen window, so a kitchen exhaust system is not usually required. It is, however, highly recommended, but lack of one is not a defect. In fact, even a recirculating hood is not required if clearance to wood cabinets is maintained (at least 30 inches vertical).

A kitchen exhaust duct should be installed per manufacturer's instructions. The duct must be smooth-wall metal and be airtight from the fan to the outside. There should be a damper either at the exterior termination or at the fan. If there is no damper at the exterior termination, there should be a screen to keep critters out. Manufacturers of fans rated around 100 cfm usually recommend a minimum 6-inch diameter duct or a 3-inch-by-10-inch rectangular duct. Ducts that are not smooth-wall metal and ducts that are not airtight are a reportable defect because they are a fire hazard and a sanitation hazard (Photo 5).

Photo 5. The flex duct from the fan is bad enough, but to air couple it to a bath duct?

The clothes dryer exhaust duct system consists of two ducts. The transition duct runs between the dryer and the smooth-wall metal exhaust duct. The transition duct may be a flexible metal duct that is not more than 8-feet long. The old plastic transition duct should be replaced. Transition ducts may not penetrate walls, floors and ceilings, and may not be installed in attics and crawlspaces.

The dryer duct should be 4-inch diameter, smooth-wall metal—not larger and not smaller. The duct should be not more than 35 feet long, developed length. Developed length means adding 5 feet for most 90° elbows and 2 ½-feet for most 45° elbows. We are not required to measure the dryer duct developed length, but an inspector faced with a laundry room in the middle of the house can take a good guess at the dryer duct developed length (Figure 3).

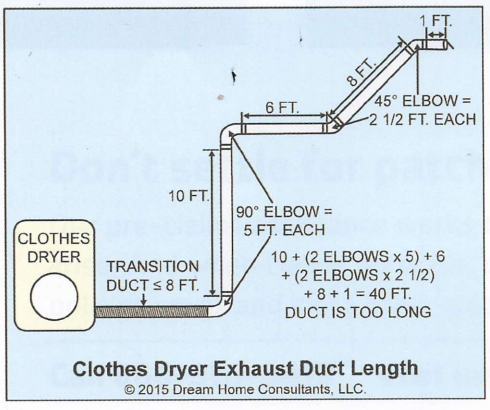

Figure 3. Summary of clothes dryer exhaust duct requirements.

Inspectors should look closely at the clothes dryer exhaust exterior termination. A damper should be installed at the exterior termination. There should be no screen installed (Photo 6). If there is a lot of visible lint at the termination, there is a good chance there is lint in the duct (Photo 7). Lint is a fire hazard, so reporting lint at the termination is prudent.

Photo 6. In case you need convincing why there should be no screens at dryer exhaust terminations.

Photo 7. Wonder what the inside of the duct looks like?

THE BOTTOM LINE

Knowing and using the true name of a component is important. The true name helps give you the power to inspect and report about a component. The true name is also important for avoiding misunderstandings, as illustrated in the following example:

A question was asked of The Word about a temperature reading taken at a furnace vent. Confused, The Word asked why the inspector would measure the temperature of a furnace (combustion) vent and what the inspector hoped to learn from this out-of-scope procedure. It turns out that the inspector was measuring the temperature at an HVAC supply register (the true name of this component). It's okay to confuse The Word. It's not okay to confuse a client.

MEMO TO THE MINISTRY OF MAGIC

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.