Inspection Technical Tip

COMMON VENTING FAN ASSIST FURNACES

By Michael Casey, COA—The Right Direction℠
Over the years we have received many questions regarding venting induced-draft, AKA fan assisted furnaces in common with water heaters. There are several items to consider, and understand, to properly inspect gas appliances. These items are the definitions of fan assist furnace and gravity venting directly from the National Fuel Gas Code (also known as NFPA 54 or NFGC) and the four vent categories of gas appliances.

**Furnace, Gravity, with integral fan.** These are known by many names, such as induced draft furnace, Plus 80 (AFUE rating) and fan-assisted furnace. Fan Assist or Fan Assist Combustion System furnaces have an integral fan, commonly called the inducer fan, which is installed solely to overcome the internal furnace resistance, in the heat exchanger, to airflow. The exhaust after the heat exchanger relies on heat and natural stack effect to vent properly (that is the temperature differential between gas inside the flue and atmospheric). Remember, the more efficient the furnace; the longer the heat exchanger is to allow for more heat transfer into the circulation air. Longer heat exchangers require inducer fans which place a slight negative pressure on the exchanger to be sure the products of combustion are evacuated so as to allow for gravity venting up a flue pipe.

Induced draft furnaces are categorized as FAN (for Fan Assist) in the NFGC or Gas Appliance Manufacturers Association (GAMA) venting tables found in the installation instructions for all furnaces. The inspector should not confuse these furnaces with those that are power vented, that is, pressurize the flue to propel the exhaust gases, such as Category III and IV appliances.

Once you get into “Plus 90” or so appliances (sometimes even furnaces at 85% or so) the flue gases are too cool and B-Vent cannot be used nor can they be commonly vented with other appliances. These Plus 90 appliances might be induced, however, they will be equipped with condensate drains due to the potential for condensation of the combustion gases inside the flue because they exit so cool.
“Gravity” means these furnaces rely upon on the basic principal of the "stack effect" of a heated chimney, in which the flue gas is less dense (hotter) than the ambient air surrounding the appliance creating a pressure difference (negative) inside the flue. This is subject to flue size, height, temperature and the availability of “dilution” air through the draft diverter or combustion chamber to create flow up the chimney. Gravity appliances are Category I vent appliances. To achieve correct draft the flue gas must be hot; usually 300-400 F or so for fan assist Plus 80 appliances, to escape through the flue termination. Thus a limited amount of heat is extracted from the combustion process to allow for adequate flue stack temperature and evacuation of the heat exchanger. All Category I gas appliances can use B-Vent (sometimes a portion of single-wall connector) as the typical flue. B-Vent is a galvanized steel coaxial pipe with a circulation air annular space between the inner and outer liner. It is also called “insulated” connector or chimney in the Codes. Other venting Category appliances are either positive pressure or have a potential for condensation and appropriate materials must be used. Type B-Vent is approved only for Category I venting rated appliances.

Let’s look more at the different Categories of Appliance Venting per every major Code authoring agency. The categories are based on vent temperature rise above dewpoint and pressure. These can be found in the NFGC and ANSI Z223.1, Z21.47, Z21.10.3 and Z21.13.
Category one appliances are very common; these would be our typical induced draft “Plus 80” furnaces, water heaters and other natural draft appliances. Very few category two appliances are seen in residential applications. Common category three appliances are many tank-less water heaters, which use a stainless steel single wall flue pipe. These usually require 3-inches clearance to combustibles and the joints must be gas-tight. Most installers use the red colored high-heat silicone at the joints to accomplish this requirement. Category four appliances are the common forced draft or plus 90 appliances that are vented with plastic (not high temp plastic, regular schedule 40 plastic) and have cool exhaust temperatures which will condense.

Nearly all manufacturers will identify the proper venting category on the equipment rating plate and/or instructions. The text boxes are typical verbatim excerpts from instructions.

The left indicates a “Plus 90” high efficiency unit venting with Category IV methods only, due to the cool flue gas. There is no mention of common venting with any other appliance.

The left text box from a “Plus 80” induced draft furnace instructions clearly indicates use Category I venting only and common venting may be allowed. In fact, many new furnaces now arrive with stickers on the front indicating they may be common vented due to the confusion regarding induced draft furnaces (see figure 2). See sections 2427.1 of the 09 IRC and 802.1.1 of the 09 UMC for more information as well.
Since induced draft furnaces that are **Category I** rated can be common vented with other Cat I appliances, we know we can use the proper GAMA tables to size the vents. These will be listed “two or more appliances” and maximum combined BTU input amounts will appear in the FAN (Fan Assist) plus NAT (natural draft vent, like a water heater) common vent columns. The smaller appliance should enter the common flue above the larger BTU rated appliance and as high as possible whenever practical. However, if the smaller appliance must be below, the increase in vent size for the common vent must occur below the larger appliance inlet.

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**Figure 2, Typical Fan Assist Gas Furnace Label.** Photo Courtesy InspectionNews.net and Jon Mackay
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See figures 3 and 4 for typical common venting specifications for FAN and NAT appliances courtesy of Simpson Dura-Vent.

Note that Dura-Connect flexible single wall connectors are not approved for use in crawlspaces or attics.
Note the vent must increase in size below the larger appliance connection if above the smaller.

Figure 4, Typical Fan Assist Gas Furnace Common Vent Courtesy Simpson Dura-Vent
Retro-Fit Venting

Most problems with common venting occur when a new Plus 80 furnace is retrofitted in place of an older natural draft furnace vented in common with a water heater through a masonry chimney; particularly if the chimney is exposed to the exterior. The new furnace exhaust is cooler and the masonry chimney does not heat up enough to fully exhaust without condensation. In most cases, a masonry chimney can be used as a chase for a B-Vent or other metal liner to help keep it hotter. Some Plus 80 fan assist furnaces indicate in the instructions “do not connect to non-metallic chimney”; effectively eliminating the use of anything but B-Vent.

If the new furnace is separately vented and the water heater is left on the masonry chimney, called “orphaned water heaters”, the exhaust will condense in the masonry chimney causing hazardous conditions. It is recommended that the water heater be separately vented in a metal flue or vented in common with the new furnace.

In conclusion, when in doubt regarding an appliance type and/or installation, read the labels, and, if possible, the installation manual. There are a myriad of appliances on the market now with many possible venting alternatives. A common misunderstanding of the Uniform Mechanical Code, Section 802.3.4.4, has led many inspectors to conclude that common venting is a prohibited connection with Fan Assist furnaces. The code states as follows: “Vent connectors serving appliances vented by natural draft shall not be connected into any portion of mechanical draft systems operating under positive pressure.” At first glance, this appears to include all forced air furnaces with fan-assisted combustion systems. That conclusion has led many inspectors to make faulty disclosures in their reports.

Michael Casey is a partner with Casey, O’Malley Associates; a national A.M. Best recommended consulting and inspector training firm based in San Diego and joint venture partner with The ASHI School. Mike is a past president of the California Real Estate Inspection Association (1994/1995) and of the American Society of Home Inspectors (ASHI) (2002). He is multi-code certified by the ICC and IAPMO. He is also a licensed general, plumbing and mechanical contractor in several states and a Virginia Certified Home Inspector. Besides co-authoring several books in the Code Check series, Casey has authored many other books, has taught home and building inspection and has an expert witness practice throughout North America since 1987. Michael can be contacted at: mike@caseyomalleyassociates.com

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