STERLING HVAC PRODUCTS

Category I vs Category III Venting

Picking the right vent type for your building!

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One of the most common questions we get from customers is about how to install our units. In fact, after parts identification, installation is the second most common type of question our technical support groups receives. One particular facet of installation customers are sometimes confused about is which type of vent pipe they can use. In order to address that, we need to look at the four different venting categories. Category II and IV are for condensing gas heating appliances with a flue loss of less than 17%. In these appliances, the flue gas condenses from a gas to a corrosive liquid. These appliances have their own special venting requirements that we will deal with in a separate paper. In this paper, we will focus on Category I and III venting systems.

Definitions

Category I is defined as a gas heating appliance with a flue loss equal to or greater than 17% (non-condensing) with a negative vent static pressure. In other words, in a Category I venting system, if there is a leak in the venting system, air from the space will flow into the flue pipe and no flue gas will flow into the space.

Category III is defined as a gas heating appliance with a flue loss equal to or greater than 17% (non-condensing) with a positive vent static pressure. In a Category III venting system, if there is a leak in the venting system, flue gas will flow from the flue pipe into the space. Given the potential safety hazard of carbon monoxide building up in the space, Category III vent pipe must meet the additional safety requirements of UL 1738.

Category I - Vent pipe requirements

For Category I appliances, NFPA 54, Chapter 12 allows for the use of single wall, double wall, B-vent flue pipe or even a chimney.

- B-vent must meet the thickness requirements of UL 441, section 6. It is the most common vent pipe.
- Single wall vent pipe must meet NFPA 54, section 12.8 which requires the vent pipe be constructed of galvanized sheet steel not less than 0.0304” thick or equivalent material.
- Double wall is considered Special Gas Vent pipe per section 12.5 of NFPA 54. It must be part of a “listed vent system” that has been tested and approved by the 3rd party certification agency for use with the unit. It also must be part of the unit’s agency listing report and included in the installation instructions in the unit installation manual. Note: most double wall vent pipe is also certified to Category II, III and IV per UL 1738.
- Chimneys must be built and installed per NFPA 211. However, chimneys are rarely used, if ever, due to their large first cost per unit, large size and difficulty in moving if the floor layout of a building changes.

Category III - Vent pipe requirements

While there are many requirements for the venting system in UL 1738 (3rd Edition October 4th, 2010), the main requirements that the vent pipe must meet are:

1. The vent pipe material must meet a minimum metal thickness (section 6) and corrosion resistance (section 39).
2. Joints and seams must be gas-tight (section 33).

In order to meet the first requirement, the vent pipe can be made from a variety of materials including aluminum alloy, porcelain coated steel, stainless steel and several others. However, the most common material sold in heating supply houses is stainless steel vent pipe.

In order to meet the second requirement, the vent pipe must be single or double wall vent pipe. Single wall and double wall vent pipe are designed to lock together and usually include an internal seal to help seal the joint. B-vent is not allowed since the joints do not form a gas-tight seal. Single wall typically will have a lower cost than double wall vent pipe. Double wall vent pipe, while more expensive, has a lower surface temperature which will reduce the clearance to combustible requirements. Consult the vent pipe installation manual for exact clearance requirements.

Identifying your vent category

Whether a vent system is Category I or III is determined by the flue gas pressure in the flue pipe relative to the pressure in the space. However, it is not always clear what that pressure is since it is affected by the CFM of the power venter, length and diameter of the flue pipe, and pressure of the space the pipe is installed in. While two units may be installed in the same space, using the exact same vent pipe diameter and length, they may still be different venting

categories. The unit installation manual may help clarify if the unit is only Category III or if it can also be installed in Category I applications. The first step to determine if your venting system is Category I or III is to identify if your venting system is vertical or horizontal. Per chapter 12 of NFPA 54, the system is defined as vertical if the horizontal distance is less than 75% of the vertical distance.

For vertical applications: Since hot flue gas naturally rises, it is possible for the flue pipe to be under negative pressure even if the gas-fired appliance has a power venter forcing the flue gas into the vent pipe. If a manufacturer's installation manual identifies that the standard combustion, vertically vented system can be Category I or III it will most likely be Category I unless the space is under negative pressure. Conversely, separated combustion applications are almost always Category III regardless if they are installed vertically or horizontally. While they may still be installed vertically, due to the additional length of the combustion air pipe, the hot flue gas rising is not able to overcome the friction of the additional vent pipe. Check the appliance installation manual to see if vertical installations can be Category I.

For horizontal applications: The flue gas is only moved by the power venter forcing the flue gas through the flue pipe. Since the flue gas is forced into the pipe, for almost all applications the flue pipe will be under positive pressure and require Category III vent pipe. The only exception would be in a commercial application if the space is under an high positive pressure or the venting system has a booster fan at the end of the flue pipe drawing the exhaust through it. In those cases, it would be possible for the flue pipe to be under negative pressure relative to the space pressure and would be Category I. Contact the appliance manufacturer to see if booster fans are allowed for use with their products.

It should be noted that for residential appliances, all horizontally vented appliances are considered Category III regardless of the space pressure or booster fan. Per CSA bulletin "Gas Products No. 241" dated January 27, 2011, there is no residential horizontal venting Category I and all horizontal residential venting is to be considered Category III. Category I horizontal venting is only possible in commercial applications.

When in doubt, check the unit manufacturer's Installation Manual to see which venting category applies to the unit.