

Flue Venting

All combustion processes require a source of oxygen. In an open flame, natural convection causes heated air to rise up and away from the flame. This displacement in turn causes fresh air to carry oxygen towards the flame. In more advanced systems, natural convection is often insufficient to supply the combustion process with enough oxygen. In these cases mechanical draught is introduced. Mechanical draught is normally introduced through a positive static pressure upstream of combustion or a negative static pressure at the flue.

Gas appliances are further delineated by whether or not condensation occurs in the vent. Appliance vents are considered to be condensing when vent temperatures are less than 140°F above dew point, while vent temperatures 140°F or more above dew point are considered to be non-condensing. These two sets of classifications are used to place gas appliances into one of four venting categories established by the NFPA:

Category	Duct SP	Duct Temperature
I	Negative/Neutral	More than 140° above dew point
II	Negative/Neutral	Less than 140° above dew point
III	Positive	More than 140° above dew point
IV	Positive	Less than 140° above dew point

Further considerations for each type of furnace are discussed below. Note that appliance specifications will refer specifically to one of the four categories; no other chimney or vent should be used other than that category noted in the equipment specification sheet.

Category I: Outlet static pressure is neutral or negative, drawing air through the combustion chamber. Flue gas temperature at the outlet does not exceed 550 °F. Flow area of the largest vent or stack is not greater than seven times the flow area of the smallest vent diameter. Category I equipment may not be connected to any positive pressure appliance (category III or IV). Total horizontal distance of common vent connectors may not exceed 18 inches for each inch of common vent diameter. The total horizontal distance of a vent plus the vent connector serving draft hood-equipped furnaces may not be greater than 75% of the vertical height of the vent system. Category I furnaces conform to the requirements of the National Fuel Gas Code, NFPA 54, and UL 441.

Category II: Outlet static pressure is neutral or negative, drawing air through the combustion chamber. Furnace operates with a vent gas temperature less than 140 °F above the dew point temperature. Furnace may cause condensation in the vent. The appliance conforms to the requirements of NFPA 211 and UL 1738.

Category III: Operates with a positive vent static pressure (measured at the furnace outlet), pushing air through the combustion chamber. Operates with a vent gas temperature 140 °F or higher above dew point temperature; does not condense. Furnace conforms to the requirements of NFPA 211, UL 1738, and UL 103.

Category IV: Operates with a positive vent static pressure (measured at the outlet of the appliance), pushing air through the combustion chamber. Operates with a vent gas temperature less than 140 °F above the dew point temperature and may condense in the vent. The appliance conforms to the requirements of NFPA 211 and UL 1738.