

## Small Vented and Unvented Combustion Space Heaters

Space heaters are typically used when the main heating system is inadequate or too costly to install or operate. In some cases, small space heaters can be less expensive to use if you only want to heat a small part of a building. Space heater capacities generally range between 10,000 Btu to 40,000 Btu per hour. Common fuels used for this purpose are: electricity, propane, natural gas, kerosene, fuel oil, wood and wood pellets.

Some space heaters work by only radiant heat transfer, but most rely on both radiation and convection. A radiant heater does not have a fan. Instead they deliver heat to people and solid objects that are in line-of-sight with it in the same way the sun heats the Earth. Radiant heaters are generally more comfortable and quieter to operate. Most space heaters use both radiation and a fan (convection) to heat the room.

Space heaters are also classified as vented and unvented. Vented units are designed to be permanently located next to an outside wall, so that the flue gas vent can be installed through a ceiling or directly through the wall to the outside. The better-made vented units sometimes have a duct to bring outside air to the burner and a sealed glass cover to keep room air away from the fire. This is called sealed combustion or 100% outdoor air. Sealed combustion heaters are much safer to operate than other types of space heaters. They are also less likely to backdraft and adversely affect indoor air quality. Less expensive (and less efficient) units use the room air for combustion or a supplemental air intake. They do not have a sealed glass front to keep room air away from the fire and should not be confused with a seal combustion heater. Since both types of vented heaters exhaust the combustion gases to the outdoors there is less danger of this type affecting indoor air quality than an unvented space heater.

Unvented combustion heaters use indoor air for combustion and vent the combustion by-products directly into the room. They usually burn kerosene or natural gas. Kerosene burning heaters are typically portable and can be moved around where and when needed. When operated and maintained properly, these systems can be up to 98% efficient, and introduce little indoor air pollution to the room. However, most building scientists and indoor air quality professionals do not recommend ventless heaters in homes where moisture problems exist, or where small children and elderly persons live or where the heater is likely to be operated for more than 2 hours per day. Under NO circumstances should you ever install ventless heaters in airtight houses, mobile homes, or trailers.

Occupant safety is a major concern when operating an unvented combustion heater. Poorly made, maintained, or operated units have caused fires and other combustion-related accidents. Improperly installed or malfunctioning ventless heaters often introduce carbon monoxide (CO), nitrous oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), and large amounts of water vapor, and possibly consume most of the oxygen in a room. Depending upon the level of exposure, these pollutants and the lack of oxygen can cause eye irritation, headaches, dizziness, fatigue, respiratory problems, and possibly death.

Newer unvented heaters have sensors intended to automatically shut off the burner when the oxygen level in the room falls below a safe level. Older unvented heaters (including kerosene heaters) lack many safety features required on newer models. Because of these problems, a number of states have banned the use of unvented heaters. States where these appliances are legal suggest opening a window slightly to provide fresh air. Check with your local fire and health officials to determine if unvented heaters are permitted in your area before you install one. If you operate some types of portable heaters where their use is prohibited, you may jeopardize your fire insurance coverage. Check with your insurance agent to see if such restrictions apply.

In addition to the manufacturer's installation and operating instructions. You should follow these general safety guidelines for operating any combustion space heater:

- Select a heater of the proper size for the room you wish to heat.
- Do not purchase oversized heaters. Most heaters come with a general sizing table.
- Locate the heater on a level surface away from foot traffic. Be especially careful to keep children and pets away from the heater. Keep portable heaters more than three feet (one meter) away from any furniture, drapes, decorations, and walls.
- DO NOT leave a portable heater running unattended or while you sleep. Do not use a portable heater in a bedroom.

- Use only the approved fuel for your heater. Never use gasoline! Follow the manufacturer's fueling instructions. Fill portable heaters outdoors, wipe up spills, and do not use old or contaminated fuel. Never fill a heater that is still hot. Do not overfill the heater; you must allow for the expansion of the liquid. Only use approved containers clearly marked for that particular fuel, and store them outdoors.
  - Whenever using an unvented heater, always open a window about a half inch (1.3 cm) to let in fresh air.
  - If dizziness, drowsiness, chest pain, fainting, or respiratory irritation occurs while using an unvented heater, shut off the heater immediately and move the affected person to where he/she can breathe fresh air.
  - Only purchase newer model heaters that have all of the current safety features. Make sure the heater has the Underwriter's Laboratory (UL) label attached to it.
  - Only use portable heaters that have a tip-over safety shut-off device which will automatically extinguish the flame if the heater is knocked over.
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