

VENTING: *What you don't know can kill you*

Many household appliances such as heaters, dryers, ranges, fireplaces and furnaces operate by burning a combustible fuel such as natural gas, propane, wood or other fossil fuel. Appliances of this type (combustion appliances) need proper venting to operate safely.

Venting, as used here, includes the routing of combustion gases to the outdoors and the equipment used to do the job. Anything that burns produces combustion gases. Combustion gases contain large amounts of carbon dioxide and water vapor and, when combustion is incomplete, carbon monoxide. Although carbon dioxide and water vapor are not toxic, they can produce harmful effects if their concentrations are allowed to build up.

Carbon monoxide is extremely dangerous. It is the leading killer poison in the United States. Low levels of carbon monoxide exposure can cause headaches, nausea, weakness, dizziness, disorientation, sleepiness and/or breathing difficulties. Many of these symptoms are the same as those for common illnesses such as the flu. Be particularly concerned if other members of the household also have symptoms and you feel better when you leave the house. Carbon monoxide can be produced any time there is combustion, but it is more likely when you see a yellow or yellow-orange flame. It is very dangerous, particularly since it cannot be seen or smelled.

To promote health and safety, most appliances, such as water heaters and home heaters that produce large quantities of combustion products and are used for long periods, are vented to the outside. Products such as gas ranges, which do not produce as many combustion products and are not used as steadily, may rely on the natural house ventilation (exchange of indoor and outdoor air through doors, windows and cracks) to prevent buildup of combustion products. Many old-style

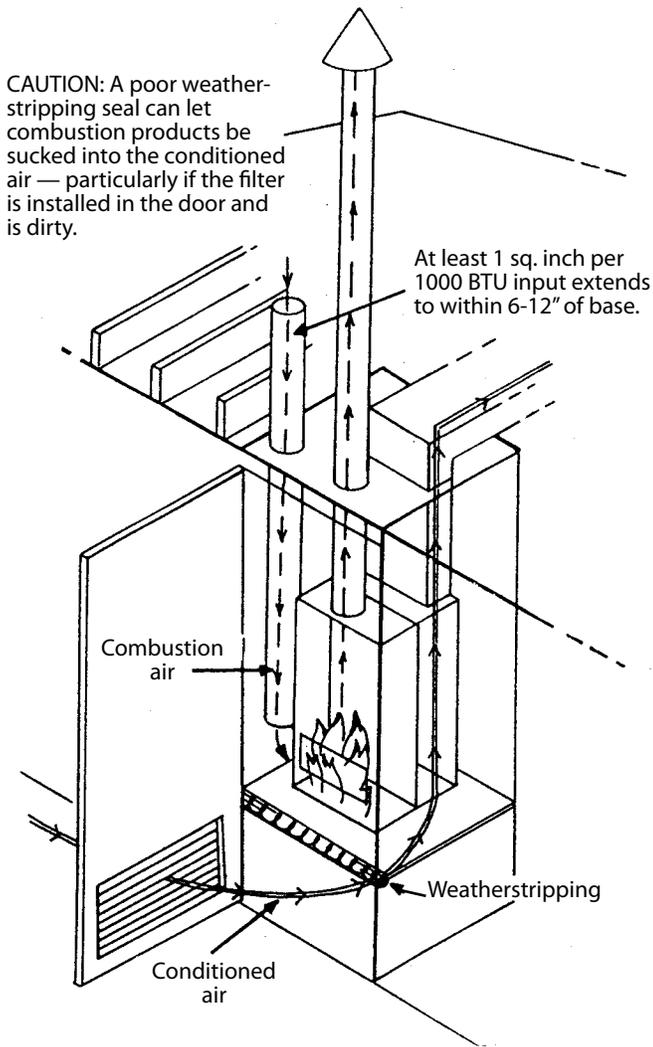
unvented heaters also relied on this natural ventilation in the past, and it usually worked well since most old houses were quite drafty.

Today, although they are not allowed in some areas, you can still buy unvented space heaters. The instructions included with them say to use them in a well-ventilated area, perhaps with an open window. They also stress a heater should be well maintained and the flame should be blue. Most will include an oxygen depletion sensor to turn the heater off if oxygen levels are low. Under the proper conditions these unvented appliances can work, but today's tighter houses reduce the natural ventilation and may cause a device that would be safe in an old drafty house to be a hazard. Under these conditions, it is imperative that proper venting be correctly installed and used.

The preferred way to handle combustion products is by venting to the outside. With venting, combustion products are routed outdoors and a new supply of air (combustion air) is brought to the appliance. The combustion air may be gotten from the interior of the building, which typically is the case for a water heater, or it may be supplied directly from outside, as it is for most whole house heaters. The accompanying sketch shows a whole house furnace for which the combustion air is drawn in from outside and used to burn the fuel and the combustion products are vented through a flue pipe to the outside. The fire is separated from the indoor air by a heat exchanger that heats the indoor air before it is distributed to the house by ducts.

Venting works by sucking the combustion products out through a pipe. This not only vents the combustion products safely outdoors but also provides for a flow of air to the fire. This flow of air helps to produce complete combustion, a blue flame, efficiency and minimal carbon monoxide

Schematic of a whole house heater. Actual construction may vary.



production. The venting could either be forced, in which a fan is used to suck or push the gases out, or natural convection. To work, natural convection relies on the tendency of hot air to rise. When air is heated, it becomes less dense and will rise or float. If this heated air and the combustion products are confined in a pipe, they will rise and draw air through the appliance and vent the combustion products outdoors. The amount of suction it can exert depends on the temperature difference in the pipe (or stack) and the surrounding air and the height of the pipe. Because this suction is limited, the venting system must be matched to the application, carefully constructed and well maintained.

Many municipalities, parishes, counties and states have building codes with strict requirements for venting. If the codes are correctly followed, they should ensure correct construction of the venting

system. Bypassing or ignoring the code – even if you live outside a code area – could be disastrous. Following the code during construction is one, but only one, part of the solution. The system must be maintained, the code followed and recommended materials used. Remember, repairs, alterations or new appliances could affect the venting system, and they should comply with the code.

Maintenance should include an annual check of all venting systems by a qualified person. Things to check include the heat exchanger in the furnace for cracks or holes, the flue pipes for blockage by such things as bird nests or insects and for openings from misalignment or corrosion. Combustion products are acidic and could cause rapid corrosion if correct materials and construction for the application are not used. Particularly susceptible are horizontal runs (All horizontal runs must rise at least $\frac{1}{4}$ inch per foot.), which should always be inspected during annual inspections and should be constructed only of materials recommended by the manufacturer of the vented appliance. In fact, the manufacturer's recommendation should be followed for all appliances, and, if you change an appliance, be sure the vent system is suitable. For example, some condensing furnace manufacturers allow the use of PVC plastic for the flue pipes, but on anything other than a condensing furnace, plastic, if allowed or recommended, must be special high temperature plastic, which is considerably more expensive than PVC.

An example of a repair project that might affect the venting system is roof repair. During repair, the distance between flue pipes and combustible materials could be changed, and that could result in fire danger. Most flue pipes require a minimum clearance from combustible material. This clearance generally is 2 inches for single-wall metal pipe and 1 inch for double-wall metal pipe. This prevents the hot pipe from starting a fire in the combustible material. The fire may start after months or years of use, because the heat could degrade the combustible material to the point that it will ignite at lower temperatures.

New units, particularly high efficiency units, probably will require different venting systems than the units they replace. These more efficient units use more of the fuel's energy, saving you money, but they also reduce the amount of suction the vent system produces.

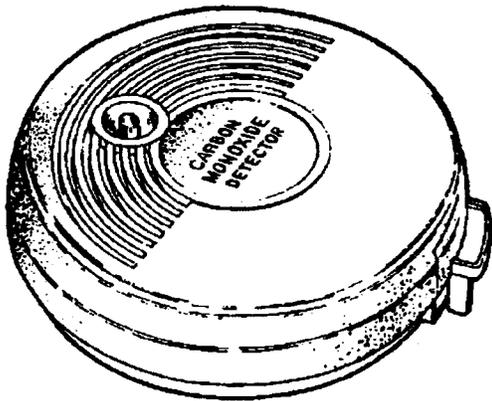
Another factor to check is the effect of other ventilation on your venting system. A house under negative pressure (greater air pressure outside) can defeat an otherwise good venting system. This will fight the sucking action of the venting system and may even cause combustion products to be sucked into the house. Negative pressure can be caused by such things as exhaust fans, leaking air conditioning ducts, and attic power vents combined with insufficient or blocked attic vent openings.

An additional safeguard is using carbon monoxide monitors. They can alert you to the presence of high levels of carbon monoxide. Those with audible warning are recommended.

Choose units that meet or exceed UL standards and follow the manufacturer's instructions.

Remember, carbon monoxide monitors can offer an extra measure of protection but should not be your only safeguard or even your first line of defense. Your first priority should be to prevent combustion products from accumulating.

Probably the best safeguard is using qualified professionals who know what they are doing and not bypassing the code or inspection process. A professional who has equipment to measure the carbon monoxide level should be an advantage.



At the same time, you may want to use this checklist as a starting point for safe venting. After all, it is you who will have to live – or die – with the consequences of your venting.

- Are all installations involving combustion appliances done according to code by qualified professionals in accordance with manufacturers' recommendations?
- Have systems serviced and checked annually by qualified professionals.
- Be alert to warning signs – the smell of fuel, smoke or combustion products and symptoms of exposure.
- Use only the fuel specified by the appliance's manufacturer and use appliance as intended.
- Check all flue pipes and chimneys for blockages, restrictions and leaks.
- Check the clothes dryer vent for lint buildup.
- Avoid situations that create negative indoor air pressure.
- Make sure attic vents are open and not restricted.
- Check operation of combustion appliances. A blue flame and absence of soot buildup indicate complete combustion.
- When installing a new combustion appliance, make sure the existing vent system is adequate or replace it with an adequate one.
- Have proper ventilation for the appliance you are using. Unvented heaters usually require, at a minimum, opening a window at least a little.
- Do not use barbecue grills indoors.
- Open garage doors before starting your car in an attached garage. Do not run your car for any length of time inside an attached carport or garage.
- Do not use appliances such as gas ovens, ranges or dryers for heating your house.
- Check the condition of monitors and alarms (smoke, fire and carbon monoxide) at recommended intervals.

Licenses, permits and inspections

Some municipalities and parishes require licenses (certification), permits and inspections. This system is designed to protect consumers.

A license (certification) means its holder has a degree of competence and proficiency in the trade covered by the license (certification). A permit system may prevent costly mistakes that are not

allowed under codes. Inspections are intended to ensure work is done safely according to appropriate building codes.

If you sidestep the system, you may end up with an unsafe installation for which you are liable. Check with your parish and municipal authorities to determine their requirements before installing or repairing any heating or cooling equipment, including water heaters.

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