

# Combustion Safety

## A Matter of Chance?

Chances are that your gas or propane water heater, furnace, fireplace or stove won't make you sick. However, it is a matter of chance, as a significant number of recently built homes have combustion safety risks. Why take chances? Smart appliance choices and/or testing can reduce the health risks while delivering other benefits.



### Have You Experienced...

- A carbon monoxide detector occasionally going off for no apparent reason?
- The smell of fumes when your fireplace is burning?
- Unexplained headaches, dizziness or weakness?
- A temptation to plug the open ducts that bring cold outdoor air into your basement?

These may be signs of combustion risks in your home.

### Risky Business

Breathing the exhaust from your gas- or propane-burning appliances is hazardous to your health. Carbon monoxide can be fatal in high doses or cause chronic health problems at lower concentrations. Nitrogen oxides are irritants with lesser health impacts. Safe combustion means that there is little or no carbon monoxide production and 100% of combustion products are vented outdoors 100% of the time. Conventional building practices have not guaranteed this. Common risks include:

- **Vulnerable appliances.** Most water heaters and furnaces, and many fireplaces, are “atmospherically vented” appliances (see box). Gas and propane ranges are unvented appliances that exhaust 100% of their combustion products into the home.
- **Pressure imbalances.** Small pressure changes in the house can cause atmospherically vented appliances to backdraft (see box).
- **Ineffective range hoods.** Many homes with gas or propane stoves have recirculating range hoods that don't vent to outdoors.
- **Limited testing.** Few combustion appliances are tested or adjusted for safe combustion after installation.

### Capture the Opportunities

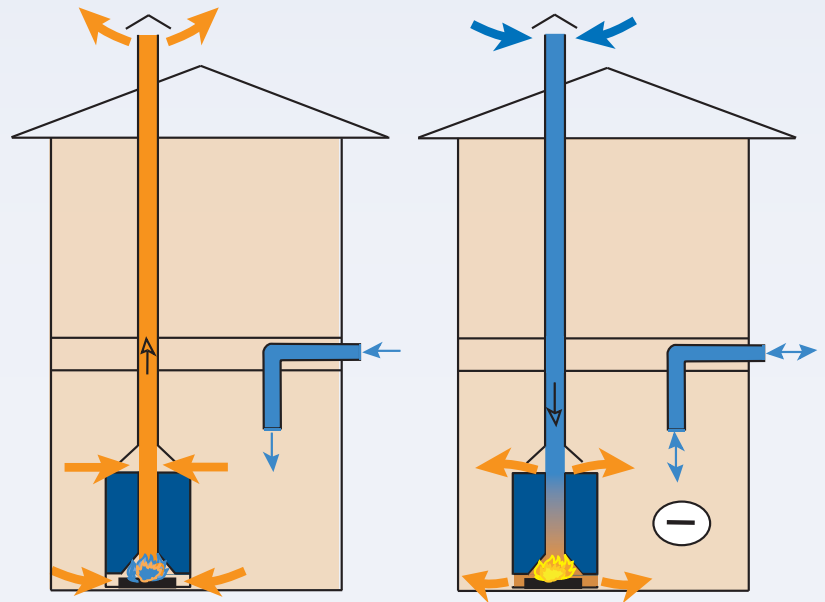
A careful approach to combustion safety can provide many benefits:

**Comfort.** Open flues and combustion air ducts—and the cold drafts that come through them—can be eliminated when closed-combustion appliances are used.

**Health.** The chance of breathing dangerous combustion byproducts can be virtually eliminated.

**Value.** A home with closed-combustion appliances will be tighter than a home with conventional appliances. Some closed-combustion appliances are more efficient, too. These differences mean smaller energy bills.

### Backdrafting Blues



Gas mixes with house air to burn in an atmospherically vented water heater. When the system works as designed, very small pressure differences push exhaust products safely up the vent (left). However, air leaks to the attic, exhaust fans, clothes dryers, leaky ductwork and wind can create negative pressures in the vicinity of the water heater. Flow through the vent can reverse, meaning exhaust fumes enter the home (right). This dangerous condition is known as “backdrafting.”

## Safe Appliances

The most reliable path to combustion safety is to choose safer appliances. There are two alternatives:

- **Closed-combustion** appliances draw outdoor air for combustion through a sealed pipe and exhaust combustion products directly outdoors through another hard-piped vent. No indoor air is used and these appliances are virtually immune to backdrafting. As a bonus, no open “combustion air” ducts are required, eliminating cold winter drafts. Some closed-combustion appliances also are more efficient than conventional models, meaning lower utility bills. Types of closed-combustion appliances include “sealed-combustion” and “direct-vent” units.
- **Power-vented** appliances rely on indoor air for combustion but use a fan to forcibly push exhaust products out the flue. They are much less susceptible to backdrafting than conventional units.



(right) are examples of combustion appliances that are much less likely to backdraft than their conventional, atmospherically vented counterparts.

Closed-combustion and/or power-vented furnaces, water heaters and fireplaces are readily available from all major appliance manufacturers.



All combustion appliances should be checked and adjusted to produce very low levels of carbon monoxide.

## Testing for Safety

All combustion appliances, including gas ranges, closed-combustion and power-vented appliances, should be tested and tuned for minimal carbon monoxide output. All atmospherically vented combustion appliances should be checked for safe operation, under all conditions, by conducting a “worst-case depressurization test.”

## What’s Important?

- Choose closed-combustion or power-vented furnaces, water heaters and fireplaces.
- Gas or propane ovens are discouraged. However, if you choose one, also choose a quality vented range hood and operate it whenever the oven is turned on. See [Healthy Indoor Air](#).
- Ask for test results for carbon monoxide production from all combustion appliances.
- Ask whether worst-case depressurization tests were conducted for all atmospherically vented combustion appliances.
- Consider installing carbon monoxide monitors as a backup, not as a first line of defense. Install monitors in areas of the home where combustion appliances are located and plan to maintain these safety devices.

## House as a System

A house is more than just a collection of parts. It is a **system** that incorporates heating, cooling, air circulation, lighting and more. If the pieces don’t work well together, there will be problems. In a high-performing home, a “whole-house” design approach and quality craftsmanship combine to deliver better comfort, healthier indoor air and energy cost savings in a package that’s built to last and hold its value.

## More Information

This fact sheet is one in a series. Visit the following Web site for more information about combustion safety or to review fact sheets on other new home choices: [www.ColoradoNewHomeChoices.org](http://www.ColoradoNewHomeChoices.org).

