

Indoor Air Quality Guideline

No. 2

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California Environmental Protection Agency

 Air Resources Board

COMBUSTION POLLUTANTS IN YOUR HOME

About this guideline

Combustion pollutants are the gases and particles made by burning any fuel such as wood, natural gas, kerosene, charcoal, or tobacco. This indoor air quality guideline will tell you about the health effects and sources of indoor combustion pollutants. You'll also learn how you and your family can reduce your exposure to combustion pollutants.

If you need additional information on any topic discussed in this guideline, you can contact us as indicated at the end of this brochure and request the free Supplement to this guideline.

Combustion pollutants and your health

The major indoor combustion pollutants are **carbon monoxide (CO)**, **nitrogen dioxide (NO₂)**, **particles (PM₁₀)**, and **polycyclic aromatic hydrocarbons (PAHs)**. At elevated levels, carbon monoxide causes headaches, fatigue, queasiness, and at very high levels, brain and heart damage and death. Other combustion pollutants can cause eye, nose, and throat irritation, and serious lung disease, including cancer. **Smoke** from cigarettes or wood burning contains a particularly toxic combination of many pollutants that can cause cancer or irritation. **Young children**, people with asthma, people with heart or lung disease, and people with anemia are especially vulnerable to the toxic effects of combustion pollutants.

The health effects of individual combustion pollutants are shown in Table 1. Because combustion sources give off more than one pollutant, you should be alert for any of the health effects listed in Table 1.

*Combustion produces many
toxic pollutants*

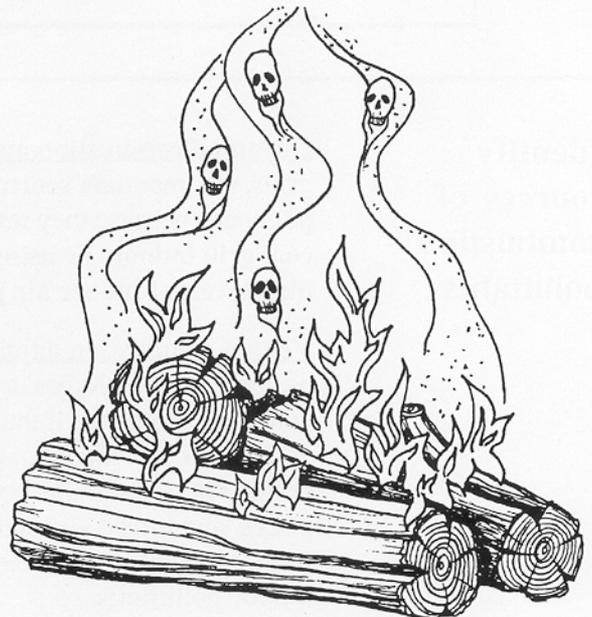


TABLE 1
HEALTH EFFECTS AND SOURCES
OF INDOOR COMBUSTION POLLUTANTS

POLLUTANT	DESCRIPTION	HEALTH EFFECTS	SOURCES
CARBON MONOXIDE (CO)	Colorless, odorless, tasteless gas	Death at very high levels, headache, fatigue, queasiness, poor vision and concentration, heart pains	Malfunctioning gas appliances, improper use of gas stoves, woodburning, kerosene heaters, charcoal grills, idling cars in enclosed garages, polluted outdoor air
NITROGEN DIOXIDE (NO₂)	Colorless, tasteless gas. Sharp odor	Lung damage, lung disease after long exposure, respiratory infections	Gas stoves, malfunctioning gas appliances, woodburning, kerosene heaters, charcoal grills, motor vehicles
PARTICLES (PM₁₀)	Small, inhalable particles	Nose, throat and eye irritation, emphysema, bronchitis, allergies, asthma, respiratory and ear infections, lung cancer	Tobacco smoke, woodburning, kerosene heaters, charcoal grills, incense burning, house dust, hobbies, polluted outdoor air
POLYCYCLIC AROMATIC HYDRO-CARBONS (PAHs)	Organic particles and gases	Lung, stomach, bladder, and skin cancer. Nose, throat, and eye irritation	Tobacco smoke, woodburning, kerosene heaters, charcoal grills, self-cleaning ovens, incense burning, house dust, hobbies, polluted outdoor air

Identify sources of combustion pollutants

Unvented combustion appliances, which include most gas stoves, kerosene heaters, and charcoal grills, are important sources of indoor pollution. They can produce high indoor levels of air pollutants because they release combustion pollutants directly into the home. **Using your charcoal grill indoors or using your gas stove or oven for home heating can produce especially high levels of indoor air pollutants.**

Vented combustion appliances, which include most furnaces, wood stoves, fireplaces, gas water heaters, and gas clothes dryers, usually vent (exhaust) the combustion pollutants directly to the outdoors. However, if the vent system is not properly designed, installed, and maintained, indoor pollutants can build up quickly inside the home. Flues, chimneys, or vents sometimes leak or become blocked so that pollutants spill into the home. Also, operating large exhaust fans, fireplaces, and forced air heating systems with unbalanced air flows can cause combustion pollutants from vented appliances to spill into the house. **“Spillage” can produce very high levels of indoor pollutants.**

Environmental tobacco smoke (ETS, second hand smoke) is a complex mixture of particles and gases which come mostly from the tobacco smoldering between puffs. ETS is usually the **major source** of indoor particles and PAHs. It is also a significant source of other toxic pollutants and irritants.

Other activities can also produce very high levels of indoor combustion products, like idling your car or using kerosene heaters in your garage. When these activities are done in an attached garage, the pollutants enter the main house as well. Burning incense, grilling foods, using your oven's cleaning cycle, and hobbies that produce smoke or flame also increase indoor pollution.

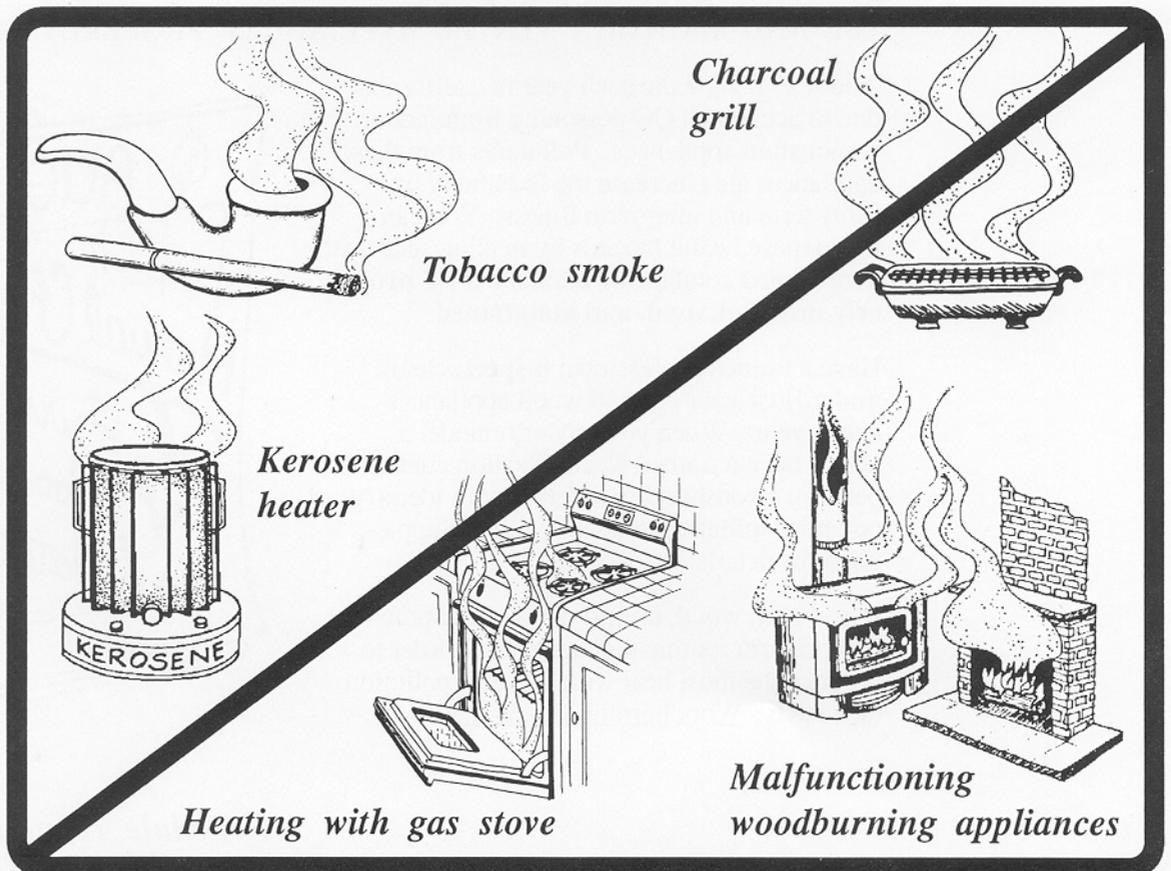
Housedust and soil. Particles and PAHs stick to housedust and to soil that is tracked into the house. These pollutants can be inhaled when housedust is stirred up; some can also be absorbed through the skin or swallowed through hand-to-mouth contact. This is most likely to happen with young children, who are often on the floor.

Outdoor air that contains high levels of combustion pollutants can contaminate indoor air. Nearby woodstoves and fireplaces, motor vehicle traffic, outdoor barbecues, and gasoline-powered lawn and garden equipment pollute the outdoor air that flows into your house.

What you can do about sources

Unvented or poorly vented combustion sources can quickly fill your home with hazardous levels of carbon monoxide and other pollutants. **Take preventive measures** to protect yourself and your family from these health hazards!

Remove or reduce sources of combustion pollutants from your home



DON'T USE UNVENTED OR POORLY VENTED SOURCES

The only **sure** way to eliminate indoor combustion pollutants is to **keep sources of these pollutants out of your house and garage.**

- ✓ **Keep tobacco smoke out of your home** and away from open doors or windows. ETS can increase the chance of lung cancer in nonsmokers. Children, pregnant women, or persons with lung or heart disease are especially sensitive to smoke.
- ✓ **Kerosene heaters and charcoal grills should never be used indoors.**
- ✓ **Never use your gas stove or oven for home heating.** This can produce hazardous levels of indoor pollutants and cost more than other heating methods.
- ✓ **Do not use leaking or malfunctioning woodburning appliances.** Have your woodstoves and fireplaces inspected each year. Check them for backdrafting and spillage (see below). These steps will greatly reduce, but will not completely eliminate, the escape of pollutants to the indoors.
- ✓ **Do not idle cars in enclosed or attached garages.**
- ✓ **Choose "sealed combustion" or "direct vent" gas appliances,** with their exhaust vents and air supplies completely sealed from the indoors, to keep combustion products from entering the home. You may want to consider using other alternatives such as new, high-efficiency electric appliances or solar heating systems.

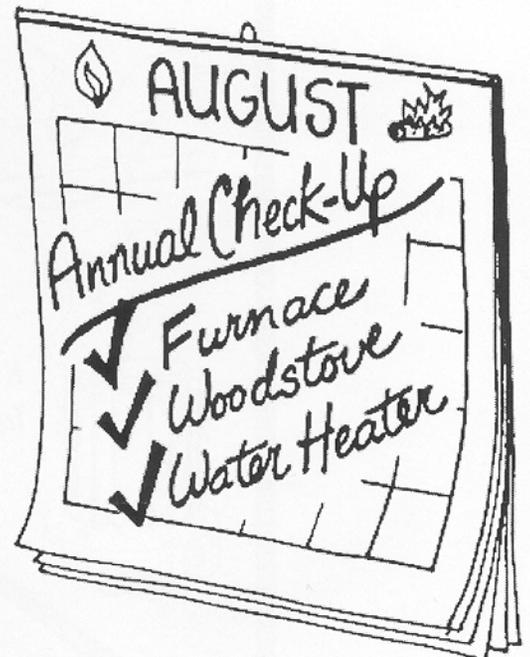
You can also **reduce your use of combustion appliances for heating** by: 1) improving your home's insulation, weatherstripping, caulking, and ductwork; 2) replacing your old furnace with a more efficient furnace; or 3) replacing your woodburning appliance with a properly vented gas fireplace or vented gas heater.

USE AND MAINTAIN VENTED APPLIANCES PROPERLY

About 25 people die each year in California due to accidental CO poisoning from indoor combustion appliances. Pollutants from these appliances also increase the likelihood of short-term and long-term illness. You can avoid these health hazards by making sure that your vented combustion appliances are **properly installed, used, and maintained.**

Have a trained professional **inspect, clean, and adjust** your gas and wood appliances **every year.** When you buy or remodel a home, have a trained weatherization contractor perform a **combustion safety test** to identify potential spillage problems (see the Supplement for details).

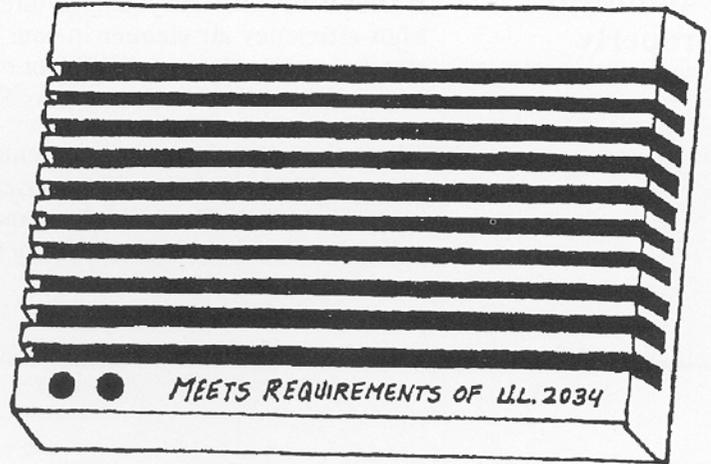
If you burn wood, use proper burning practices and perform routine maintenance in order to produce the most heat with the least pollution (see ARB's Woodburning Handbook).



Schedule regular maintenance of your combustion appliances

The combustion appliances most likely to have maintenance problems are older appliances, wall or floor gas furnaces, propane appliances, fireplaces, and woodstoves. If you use one of these appliances or one that may be poorly vented, you may want to take the extra safety step of installing one or more **carbon monoxide alarms** that are certified by Underwriters Laboratory. The alarm will detect potentially harmful levels of CO. It could save your life.

*Consider
using a
carbon
monoxide
alarm*

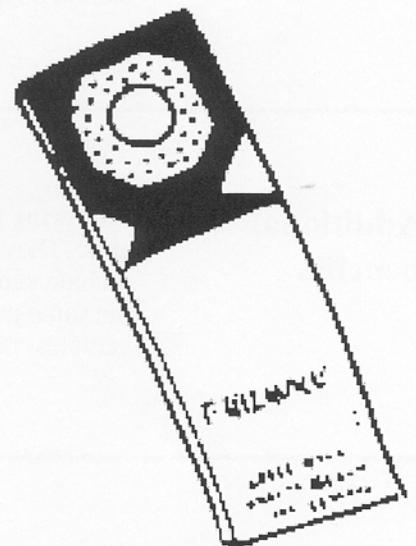


Ensure adequate and balanced ventilation

Combustion appliances need enough air to burn the fuel and to safely exhaust the pollutants to the outdoors. Using exhaust fans, clothes dryers, and forced air systems can cause spillage of combustion pollutants into the home if the exhausted air is not balanced by an equal supply of outdoor air. Smoky odors and noticeable moisture in your home often indicate combustion spillage. So remember to **balance the air flow** whenever you use a high-flow exhaust fan, a fireplace, or a woodstove. One way might be to open a nearby window. If any odor or moisture still remains, you may also need to add a fan that is specifically designed to supply enough outdoor air near the appliance.

Check your combustion appliances for spillage by putting new **spillage indicators** on your gas furnace and water heater **in the home or garage** every year, and checking them weekly. If an indicator changes color, don't use your woodburning appliance or exhaust fan (such as a downdraft cooktop fan) at the same time as your forced air system. See the Supplement to this guideline for further information on testing and corrective actions.

Range hoods can be very effective in removing the pollutants produced by cooking activities. **Use and maintain your range hood** for your stove and oven. Remove and clean the metal mesh filters on your range hoods with detergent when they begin to look grimy (most can be put in the dishwasher). **"Ductless" range hoods are not effective** because they exhaust into the house rather than outside; add a duct or replace the hood with one vented to the outside (ducted).



*Consider using
spillage indicators*

Use and maintain air-cleaning equipment properly

Most air cleaners can help remove particles (but usually not gases) from indoor air. The typical furnace filter with the coarse mesh does a poor job of removing particles. For a few dollars more, you can **upgrade to pleated or extended surface filters**, which have a medium- or high-efficiency rating. **Change this filter at least every month** or two during periods of use.

If your household has young children or someone with allergies or lung disease, consider using a **high-efficiency air cleaner** in your forced-air heating system or add a stand-alone unit. Some stand-alone air cleaners (HEPA or electrostatic types) can remove particles in a single room; some also can help remove gases. Small desktop air cleaners generally are not effective.

Clean the house frequently to remove house dust particles, especially if there are children or pets running in and out of the house. Vacuum rugs and furniture with a vacuum cleaner that has a very efficient air filter, and damp mop the floors. Also, leaving your **shoes by the door** and using **door mats** outside can really help keep indoor particle levels down.

When to take action

If you have smokers, combustion appliances, or other combustion sources in your home, **take the actions described** in this guideline to reduce indoor pollutant levels. You usually will not need to measure pollutant levels if you take these preventive actions. But you may want to have a detailed combustion safety test conducted or have indoor pollutant levels measured if: 1) you suspect that you may have a problem; 2) you want to be sure your actions have been effective; or 3) one or more household members still show symptoms that may be due to combustion pollutants. Contact us at the number listed on the next page for the Supplement to this guideline and for information on indoor pollutant levels.

An additional note: if one or more of your household members or pets show any of the health effects listed in Table 1 for carbon monoxide **and you have reason to suspect CO poisoning**, get your family out of the building right away. Contact your doctor immediately and ask to be tested for CO poisoning. Call the fire department for immediate help in identifying any CO problem. If no obvious problems are identified, you should consider calling a qualified weatherization contractor to conduct a detailed combustion safety test.

Additional benefits

Following these guidelines can greatly reduce your health risks from indoor combustion pollutants. They can also help you **save on your energy bills**. Other benefits of taking these actions include **reduced fire hazards** and reduced impacts on **outdoor air quality**. Remember to use the same principles discussed here to reduce air pollution in **other enclosed spaces** such as motor vehicles, motor homes, tents, schools, offices, and public buildings.

**For more
information**

For the **free Supplement** to this guideline or for more information on alarms, spillage indicators, and pollutant monitors, please contact:

California Air Resources Board
Research Division
Indoor Exposure Assessment Section
P.O. Box 2815
Sacramento, CA 95812
(916) 322-8282 (message line)

Your notes

This indoor air quality guideline was written by California Air Resources Board staff and reviewed by the California Office of Environmental Health Hazard Assessment and the California Department of Health Services.

Illustrations by D. Czarnecki and E. DeCetis

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**DEVELOP AN ACTION PLAN
TO REDUCE COMBUSTION POLLUTANTS IN YOUR HOME**

A. List all sources of combustion pollutants in your home. Circle the most important ones.

SOURCE AND LOCATION

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

B. Starting with your most important sources, write down the steps you will take to reduce exposures to combustion pollutants in your home. Set a realistic schedule for taking these actions.

ACTION

WHEN TO DO IT

- | | |
|---|--------|
| 1. Request Supplement to this guideline | 1. NOW |
| 2. | 2. |
| 3. | 3. |
| 4. | 4. |
| 5. | 5. |
| 6. | 6. |