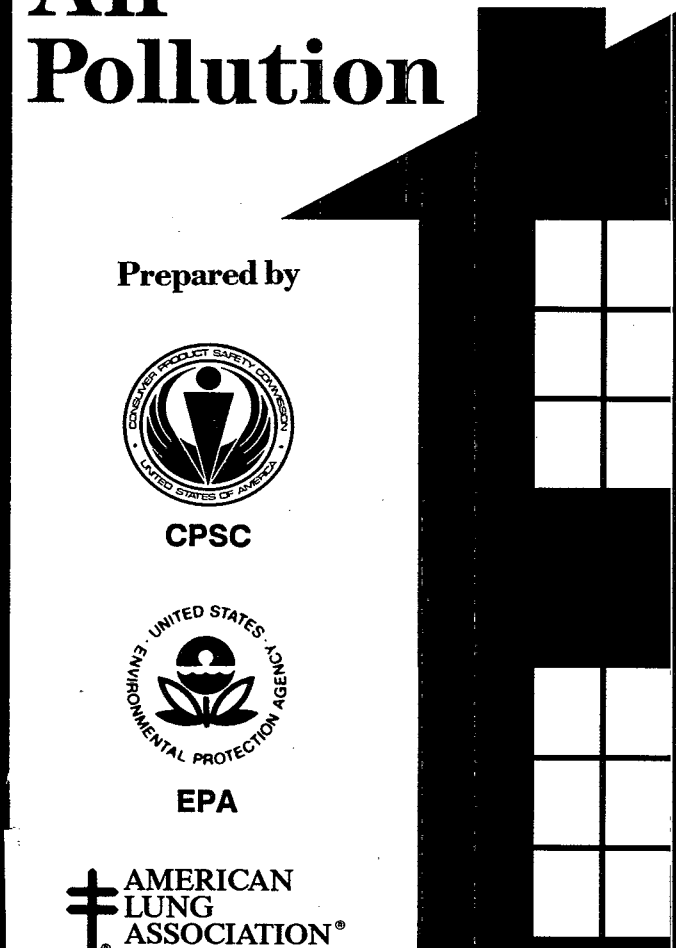
What You Should Know About

Combustion Appliances and Indoor Air Pollution



Prepared by

CPSC

EPA

AMERICAN LUNG ASSOCIATION®
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What You Should Know About Combustion Appliances and Indoor Air Pollution

Hazards may be associated with almost all types of appliances. The purpose of this booklet is to answer some common questions you may have about the potential for one specific type of hazard – indoor air pollution – associated with one class of appliances – combustion appliances.

Combustion appliances are those which burn fuels for warmth, cooking, or decorative purposes. Typical fuels are gas, both natural and liquefied petroleum (LP); kerosene; oil; coal; and wood. Examples of the appliances are space heaters, ranges, ovens, stoves, furnaces, fireplaces, water heaters, and clothes dryers. These appliances are usually safe. However, under certain conditions, these appliances can produce combustion pollutants that can damage your health, or even kill you.

POSSIBLE HEALTH EFFECTS range from headaches, dizziness, sleepiness, and watery eyes to breathing difficulties or even death. Similar effects may also occur because of common medical problems or other indoor air pollutants.

This booklet was written: (1) to encourage the proper use, maintenance, and installation of combustion appliances; (2) to discuss the pollutants produced by these appliances; (3) to describe how these pollutants can affect your health; and (4) to tell you how you can reduce your exposure to them.

This booklet has been prepared by the U.S. Consumer Product Safety Commission, the U.S. Environmental Protection Agency, and the American Lung Association®

Should I be concerned about indoor air pollution?

Yes. Studies have shown that the air in our homes can be even more polluted than the outdoor air in big cities. Because people spend a lot of time indoors, the quality of the air indoors can affect their health. Infants, young children and the elderly are a group shown to be more susceptible to pollutants. People with chronic respiratory or cardiovascular illness or immune system diseases are also more susceptible than others to pollutants.

Many factors determine whether pollutants in your home will affect your health. They include the presence, use, and condition of pollutant sources, the level of pollutants both indoors and out, the amount of ventilation in your home, and your overall health.

Most homes have more than one source of indoor air pollution. For example, pollutants come from tobacco smoke, building materials, decorating products, home furnishings, and activities such as cooking, heating, cooling, and cleaning. Living in areas with high outdoor levels of pollutants usually results in high indoor levels. Combustion pollutants are one category of indoor air pollutants.

What are combustion pollutants?

Combustion pollutants are gases or particles that come from burning materials. The combustion pollutants discussed in this booklet come from burning fuels in appliances. The common fuels burned in these appliances are natural or LP gas, fuel oil, kerosene, wood, or coal. The types and amounts of pollutants produced depend upon the type of applicance, how well the appliance is installed, maintained, and vented, and the kind of fuel it uses. Some of the common pollutants produced from burning these fuels are carbon monoxide, nitrogen dioxide, particles, and sulfur dioxide. Particles can have hazardous chemicals attached to them. Other pollutants that can be produced by some appliances are unburned hydrocarbons and aldehydes.

Combustion always produces water vapor. Water vapor is not usually considered a pollutant, but it can act as one. It can result in high humidity and wet surfaces. These conditions encourage the growth of biological pollutants such as house dust mites, molds, and bacteria.

Where do combustion pollutants come from?

Combustion pollutants found indoors include: outdoor air, tobacco smoke, exhaust from car and lawn mower internal combustion engines, and some hobby activities such as welding, wood-burning, and soldering. Combustion pollutants can also come from vented or unvented combustion appliances. These appliances include space heaters, gas ranges and ovens, furnaces, gas water heaters, gas clothes dryers, wood or coal-burning stoves, and fireplaces. As a group these are called "combustion appliances."

What is a vented appliance? What is an unvented appliance?

Vented appliances are appliances designed to be used with a duct, chimney, pipe, or other device that carry the combustion pollutants outside the home. These appliances can release large amounts of pollutants directly into your home, if a vent is not properly installed, or is blocked or leaking.

Unvented appliances do not vent to the outside, so they release combustion pollutants directly into the home.

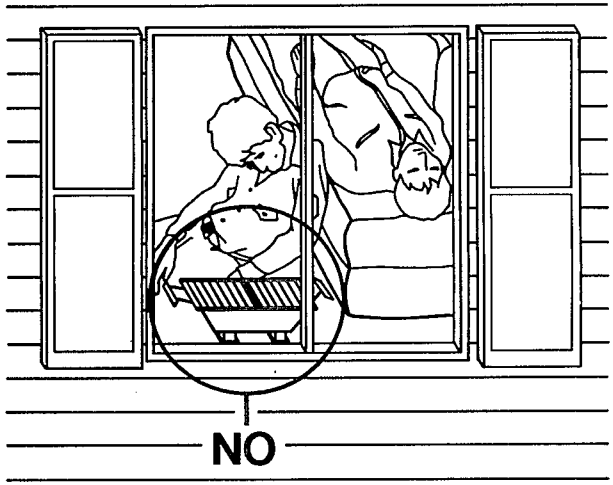
Look at the box below for typical appliance problems that cause the release of pollutants in your home. Many of these problems are hard for a homeowner to identify. A professional is needed.

COMBUSTION APPLIANCES AND POTENTIAL PROBLEMS

Appliances	Fuel	Typical Potential Problems
Central Furnaces Room Heaters Gas Fireplaces	Natural or Liquified Petroleum Gas	Cracked heat exchanger Not enough air to burn fuel properly Defective/blocked flue Maladjusted burner
Central Furnaces	Oil	Cracked heat exchanger Not enough air to burn fuel properly Defective/blocked flue Maladjusted burner
Central Heaters Room Heaters	Wood	Cracked heat exchanger Not enough air to burn fuel properly Defective/blocked flue Green or treated wood
Central Furnaces Stoves	Coal	Cracked heat exchanger Not enough air to burn fuel properly Defective/blocked flue Defective grate
Room Heaters Central Heaters	Kerosene	Improper adjustment Wrong fuel (not K-1) Wrong wick or wick height Not enough air to burn fuel properly
Water Heaters	Natural or Liquefied Petroleum Gas	Not enough air to burn fuel properly Defective/blocked flue Maladjusted burner
Ranges Ovens	Natural or Liquefied Petroleum Gas	Not enough air to burn fuel properly Maladjusted burner Misuse as a room heater
Stoves Fireplaces	Wood Coal	Not enough air to burn fuel properly Defective/blocked flue Green or treated wood Cracked heat exchanger or firebox

Can I use charcoal grills or charcoal hibachis indoors?

No. Never use these appliances inside homes, trailers, truck-caps, or tents. Carbon monoxide from burning and smoldering charcoal can kill you if you use it indoors for cooking or heating. There are about 25 deaths each year from the use of charcoal grills and hibachis indoors.



NEVER burn charcoal inside homes, trailers, tents, or other enclosures. The carbon monoxide can kill you.

What are the health effects of combustion pollutants?

The health effects of combustion pollutants range from headaches and breathing difficulties to death. The health effects may show up immediately after exposure or occur after being exposed to the pollutants for a long time. The effects depend upon the type and amount of pollutants and the length

of time of exposure to them. They also depend upon several factors related to the exposed person. These include the age and any existing health problems. There are still some questions about the level of pollutants or the period of exposure needed to produce specific health effects. Further studies to better define the release of pollutants from combustion appliances and their health effects are needed.

The sections below discuss health problems associated with some common combustion pollutants. These pollutants include carbon monoxide, nitrogen dioxide, particles, and sulfur dioxide. Even if you are healthy, high levels of carbon monoxide can kill you within a short time. The health effects of the other pollutants are generally more subtle and are more likely to affect susceptible people. It is always a good idea to reduce exposure to combustion pollutants by using and maintaining combustion appliances properly.

Carbon Monoxide:

Each year, according to CPSC, there are more than 200 carbon monoxide deaths related to the use of all types of combustion appliances in the home. Exposure to carbon monoxide reduces the blood's ability to carry oxygen. Often a person or an entire family may not recognize that carbon monoxide is poisoning them. The chemical is odorless and some of the symptoms are similar to common illnesses. This is particularly dangerous because carbon monoxide's deadly effects will not be recognized until it is too late to take action against them.

Carbon monoxide exposures especially affect unborn babies, infants, and people with anemia or a history of heart disease. Breathing low levels of the chemical can cause fatigue and increase chest pain in people with chronic heart disease. Breathing higher levels of carbon monoxide causes symptoms such as headaches, dizziness, and weakness in healthy people. Carbon monoxide also causes sleepiness, nausea, vomiting, confusion, and disorientation. At very high levels it causes loss of consciousness and death.

Nitrogen Dioxide:

Breathing high levels of nitrogen dioxide causes irritation of the respiratory tract and causes shortness of breath. Compared to healthy people, children, and individuals with respiratory illnesses such as asthma, may be more susceptible to the effects of nitrogen dioxide.

Some studies have shown that children may have more colds and flu when exposed to low levels of nitrogen dioxide. When people with asthma inhale low levels of nitrogen dioxide while exercising, their lung airways can narrow and react more to inhaled materials.

Particles:

Particles suspended in the air can cause eye, nose, throat, and lung irritation. They can increase respiratory symptoms, especially in people with chronic lung disease or heart problems. Certain chemicals attached to particles may cause lung cancer, if they are inhaled. The risk of lung cancer increases with the amount and length of exposure. The health effects from inhaling particles depend upon many factors, including the size of the particle and its chemical make-up.

Sulfur Dioxide:

Sulfur dioxide at low levels of exposure can cause eye, nose, and respiratory tract irritation. At high exposure levels, it causes the lung airways to narrow. This causes wheezing, chest tightness, or breathing problems. People with asthma are particularly susceptible to the effects of sulfur dioxide. They may have symptoms at levels that are much lower than the rest of the population.

Other Pollutants:

Combustion may release other pollutants. They include unburned hydrocarbons and aldehydes. Little is known about the levels of these pollutants in indoor air and the resulting health effects.

What do I do if I suspect that combustion pollutants are affecting my health?

If you suspect you are being subjected to carbon monoxide poisoning get fresh air immediately. Open windows and doors for more ventilation, turn off any combustion appliances, and leave the house. You could lose consciousness and die from carbon monoxide poisoning if you do nothing. It is also important to contact a doctor **IMMEDIATELY** for a proper diagnosis. Remember to tell your doctor that you suspect carbon monoxide poisoning is causing your problems. Prompt medical attention is important.

Remember that some symptoms from combustion pollutants – headaches, dizziness, sleepiness, coughing, and watery eyes – may also occur because of common medical problems. These medical problems include colds, the flu, or allergies. Similar symptoms may also occur because of other indoor air pollutants. Contact your doctor for a proper diagnosis.

To help your doctor make the correct diagnosis, try to have answers to the following questions:

- Do your symptoms occur only in the home? Do they disappear or decrease when you leave home, and reappear when you return?
- Is anyone else in your household complaining of similar symptoms, such as headaches, dizziness, or sleepiness? Are they complaining of nausea, watery eyes, coughing, or nose and throat irritation?
- Do you always have symptoms?
- Are your symptoms getting worse?
- Do you often catch colds or get the flu?
- Are you using any combustion appliances in your home?
- Has anyone inspected your appliances lately? Are you certain they are working properly?

Your doctor may take a blood sample to measure the level of carbon monoxide in your blood if he or she suspects carbon monoxide poisoning. This sample will help determine whether carbon monoxide is affecting your health.

Contact qualified appliance service people to have your appliances inspected and adjusted if needed. You should be able to find a qualified person by asking your appliance distributor or your fuel supplier. In some areas, the local fuel company may be able to inspect and adjust the appliance.

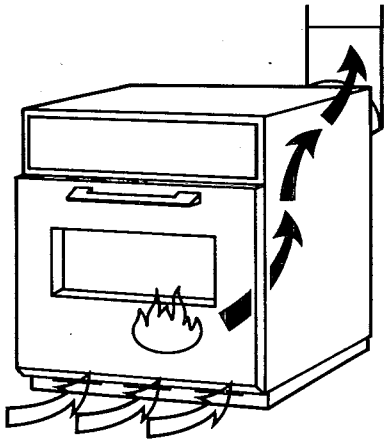
How can I reduce my exposure to combustion pollutants?

Proper selection, installation, inspection and maintenance of your appliances are **extremely important** in reducing your exposure to these pollutants. Providing good ventilation in your home and correctly using your appliance can also reduce your exposure to these pollutants.

Additionally, there are several different residential carbon monoxide detectors for sale. The CPSC is encouraging the development of detectors that will provide maximum protection. These detectors would warn consumers of harmful carbon monoxide levels in the home. They may soon be widely available to reduce deaths from carbon monoxide poisoning.

APPLIANCE SELECTION

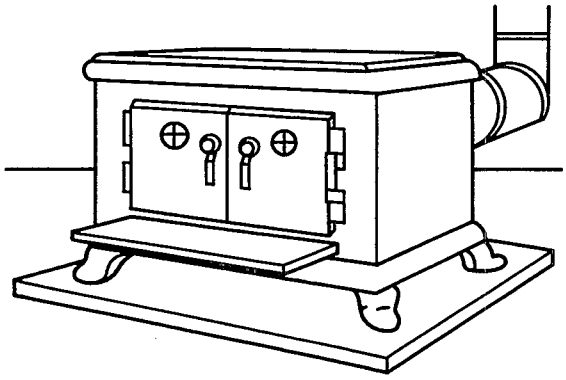
- **Choose vented appliances whenever possible.**
- **Only buy combustion appliances that have been tested and certified to meet current safety standards.** Examples of certifying organizations are Underwriters Laboratories (UL) and the American Gas Association (AGA) Laboratories. Look for a label that clearly shows the certification.
- **All currently manufactured vented gas heaters are required by industry safety standards to have a safety shut-off device.** This device helps protect you from carbon monoxide poisoning by shutting off an improperly vented heater.



- **Check your local and state building codes and fire ordinances to see if you can use an unvented space heater, if you consider purchasing one.** They are not allowed to be used in some communities, dwellings, or certain rooms in the house.
- **If you must replace an unvented gas space heater with another, make it a new one.** Heaters made after 1982 have a pilot light safety system called an oxygen depletion sensor (ODS). This system shuts off the heater when there is not enough fresh air, before the heater begins producing large amounts of carbon monoxide. Look for the label that tells you that the appliance has this safety system. Older heaters will not have this protection system.
- **Consider buying gas appliances that have electronic ignitions rather than pilot lights.** These appliances are usually more energy efficient and eliminate the continuous low-level pollutants from pilot lights.
- **Buy appliances that are the correct size for the area you want to heat.** Using the wrong size heater may produce more pollutants in your home and is not an efficient use of energy.
- **Talk to your dealer to determine the type and size of appliance you will need.** You may wish to write to the appliance manufacturer or association for more information on the appliance. Some addresses are in the back of this booklet.

- **All new woodstoves are EPA-certified to limit the amounts of pollutants released into the outdoor air.** For more information on selecting, installing, operating, and maintaining wood-burning stoves, write to the EPA Wood Heater Program. Their address is in the back of this booklet. Before buying a woodstove check your local laws about the installation and use of woodstoves.

Proper Installation



- **You should have your appliances professionally installed.** Professionals should follow the installation directions and applicable building codes. Improperly installed appliances can release dangerous pollutants in your home and may create a fire hazard. Be sure that the installer checks for backdrafting on all vented appliances. A qualified installer knows how to do this.

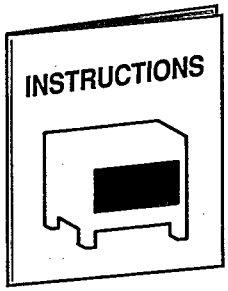
Ventilation

- **To reduce indoor air pollution, a good supply of fresh outdoor air is needed.** The movement of air into and out of your home is very important. Normally, air comes through cracks around doors and windows. This air helps reduce the level of pollutants indoors. This supply of fresh air is also important to help carry pollutants up the chimney, stovepipe, or flue to the outside.

- **Keep doors open to the rest of the house from the room where you are using an unvented gas space heater or kerosene heater, and crack open a window.** This allows enough air for proper combustion and reduces the level of pollutants, especially carbon monoxide.
- **Use a hood fan, if you are using a range.** They reduce the level of pollutants you breath, if they exhaust to the outside. Make sure that enough air is coming into the house when you use an exhaust fan. If needed, slightly open a door or window, especially if other appliances are in use. For proper operation of most combustion appliances and their venting system, the air pressure in the house should be greater than that outside. If not, the vented appliances could release combustion pollutants into the house rather than outdoors. If you suspect that you have this problem you may need the help of a qualified person to solve it.
- **Make sure that your vented appliance has the vent connected and that nothing is blocking it.** Make sure there are no holes or cracks in the vent. **Do not vent gas clothes dryers or water heaters into the house for heating. This is unsafe.**
- **Open the stove's damper when adding wood.** This allows more air into the stove. More air helps the wood burn properly and prevents pollutants from being drawn back into the house instead of going up the chimney. Visible smoke or a constant smoky odor inside the home when using a woodburning stove is a sign that the stove is not working properly. Soot on furniture in the rooms where you are using the stove also tells this. Smoke and soot are signs that the stove is releasing pollutants into the indoor air.

Correct Use

- **Read and follow the instructions for all appliances so you understand how they work.** Keep the owner's manual in a convenient place to refer to when needed. Also, read and follow the warning labels because they tell you important safety information that you need to know. Reading and following the instructions and warning labels could save your life.



CAUTION: Risk of indoor air pollution. Use this heater only in a well ventilated area. See operating instructions for

CAUTION: Improper fuel may cause pollution and sooting of the burner. Use only water clear No. 1-K kerosene.

DANGER: Risk of explosion. Never use gasoline in this heater.

- **Always use the correct fuel for the appliance.**
  - **Only use water-clear ASTM 1-K kerosene for kerosene heaters.** The use of kerosene other than 1-K could lead to a release of more pollutants in your home. Never use gasoline in a kerosene heater because it can cause a fire or an explosion. Using even small amounts of gasoline could cause a fire.
  - **Use seasoned hardwoods (elm, maple, oak) instead of softwoods (cedar, fir, pine) in woodburning stoves and fireplaces.** Hardwoods are better because they burn hotter and form less creosote, an oily, black tar that sticks to chimneys and stove pipes. Do not use green or wet woods as the primary wood because they make more creosote and smoke. Never burn painted scrap wood or wood treated with preservatives, because they could release highly toxic pollutants, such as arsenic or lead. Plastics, charcoal, and colored paper such as comics, also produce pollutants. Never burn anything that the stove or fireplace manufacturer does not recommend.
- **Never use a range, oven, or dryer to heat your home.** When you misuse gas appliances in this way, they can produce fatal amounts of carbon monoxide. They can produce high levels of nitrogen dioxide, too.
- **Never use an unvented combustion heater overnight or in a room where you are sleeping.** Carbon monoxide from combustion heaters can reach dangerous levels.

- **Never ignore a safety device when it shuts off an appliance. It means that something is wrong.** Read your appliance instructions to find out what you should do or have a professional check out the problem.
- **Never ignore the smell of fuel.** This usually indicates that the appliance is not operating properly or is leaking fuel. Leaking fuel will not always be detectible by smell. If you suspect that you have a fuel leak have it fixed as soon as possible. In most cases you should shut off the appliance, extinguish any other flames or pilot lights, shut off other appliances in the area, open windows and doors, call for help, and leave the area.

Inspection and Maintenance

- **Have your combustion appliance regularly inspected and maintained to reduce your exposure to pollutants.** Appliances that are not working properly can release harmful and even fatal amounts of pollutants, especially carbon monoxide.
- **Have chimneys and vents inspected when installing or changing vented heating appliances.** Some modifications may be required. For example, if a change was made in your heating system from oil to natural gas, the flue gas produced by the gas system could be hot enough to melt accumulated oil combustion debris in the chimney or vent. This debris could block the vent forcing pollutants into the house. It is important to clean your chimney and vents especially when changing heating systems.

What are the inspection and maintenance procedures?

The best advice is to follow the recommendations of the manufacturer. The same combustion appliance may have different inspection and maintenance requirements, depending upon where you live.

In general, check the flame in the furnace combustion chamber at the beginning of the heating season. Natural gas furnaces should have a blue flame with perhaps only a slight yellow tip. Call your appliance service representative to adjust the burner if there is a lot of yellow in the flame, or call your local utility company for this service. LP units should have a flame with a bright blue center that may have a light yellow tip. Pilot lights on gas water heaters and gas cooking appliances should also have a blue flame. Have a trained service representative adjust the pilot light if it is yellow or orange.

Before each heating season, have flues and chimneys inspected and cleaned before each heating season for leakage and for blockage by creosote or debris. Creosote buildup or leakage could cause black stains on the outside of the chimney or flue. These stains can mean that pollutants are leaking into the house.

The chart on the next page shows how and when to take care of your appliance.

This booklet discussed the types of pollutants that may be produced by combustion appliances, described how they might affect your health, and suggested ways you could reduce your exposure to them. It also explained that proper appliance selection, installation, operation, inspection, and maintenance are very important in reducing exposure to combustion pollutants.

INSPECTION AND MAINTENANCE SCHEDULES

Applicance	Inspection/ Frequency	Maintenance/ Frequency
Gas Hot Air Heating System	Air Filters – Monthly	Clean/change filter – As needed
	Look at flues for rust and soot – Yearly	Qualified person check/ clean chimney, clean combustion chamber, adjust burners, check heat exchanger and operation Yearly (at start of heating season)
Gas/Oil Water/Steam Heating Systems and Water Heaters	Look at flues for rust and soot – Yearly	Qualified person check/ clean chimney, clean combustion chamber, adjust burners, check operation Yearly (at start of heating season)
Kerosene Space Heaters	Look to see that mantle is properly seated – Daily when in use	Check and replace wick Yearly (at start of heating season)
	Look to see that fuel tank is free of water or other contaminants – Daily or before refueling	Clean combustion chamber Yearly (at start of heating season)
		Drain fuel tank Yearly (at end of heating season)
Wood/Coal Stoves	Look at flues for rust and soot – Yearly	Qualified person check/clean chimney, check seams and gaskets, check operation Yearly (at start of heating season)

For more information:

For a copy of CPSC's booklets *What You Should Know About Space Heaters* and *What You Should Know About Kerosene Heaters,* and for information on asbestos, biological pollutants, lead, methylene chloride, humidifiers, and formaldehyde in your home, write to:

U.S. Consumer Product Safety Commission
Washington, D.C. 20207

For a copy of *The Inside Story: A Guide to Indoor Air Quality,* and additional information on indoor air quality write:

Public Information Center (PM-211B)
U.S. Environmental Protection Agency
401 M Street, SW
Washington, D.C. 20460

Information on indoor air quality is also available from local American Lung Association (ALA) offices. They are listed in the white pages of the phone book.

For information on woodstoves write:

Wood Heater Program (EN-341W)
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460

For information on kerosene heaters, write or call:

National Kerosene Heater Association
3100 West End Avenue, Suite 250
Nashville, TN 37203
(Telephone: 615-269-9015)

For information on gas heating appliances, write:

Gas Appliance Manufacturers Association, Inc.
1901 North Moore Street, Suite 1100
Arlington, VA 22209

American Gas Association
1515 Wilson Blvd.
Arlington, VA 22209

For a copy of *Straight Answers to Burning Questions* or other woodburning information, write:

Wood Heating Alliance
1101 Connecticut Ave N.W., Suite 700
Washington, DC 20036

Note: The CPSC and the EPA have not reviewed or approved all the information and documents on indoor air quality that may be provided by other groups or organizations.

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