



Indoor Air Quality

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Sources of Indoor Air Pollution - Carbon Monoxide (CO)

Definition

Colorless gas or liquid; practically odorless. Burns with a violet flame. Slightly soluble in water; soluble in alcohol and benzene. Specific gravity 0.96716; boiling point -190°C; solidification point -207°C; specific volume 13.8 cu. ft./lb. (70°F). Auto ignition temperature (liquid) 1128°F. Classified as an inorganic compound. Source: "The Condensed Chemical Dictionary," 9th ed., revised by Gessner G. Hawley, Van Nostrand Reinhold Co., NY, 1977.

Sources of Carbon Monoxide

Unvented kerosene and gas space heaters; leaking chimneys and furnaces; back-drafting from furnaces, gas water heaters, wood stoves, and fireplaces; gas stoves; generators and other gasoline powered equipment; automobile exhaust from attached garages; and tobacco smoke.

Health Effects Associated with Carbon Monoxide

At low concentrations, fatigue in healthy people and chest pain in people with heart disease. At higher concentrations, impaired vision and coordination; headaches; dizziness; confusion; nausea. Can cause flu-like symptoms that clear up after leaving home. Fatal at very high concentrations.

Levels in Homes

Average levels in homes without gas stoves vary from 0.5 to 5 parts per million (ppm). Levels near properly adjusted gas stoves are often 5 to 15 ppm and those near poorly adjusted stoves may be 30 ppm or higher.

Steps to Reduce Exposure to Carbon Monoxide

- Keep gas appliances properly adjusted.
- Consider purchasing a vented space heater when replacing an unvented one.
- Use proper fuel in kerosene space heaters.
- Install and use an exhaust fan vented to outdoors over gas stoves.
- Open flues when fireplaces are in use.
- Choose properly sized wood stoves that are certified to meet EPA emission standards. Make certain that doors on all wood stoves fit tightly.
- Have a trained professional inspect, clean, and tune-up central heating system (furnaces, flues, and chimneys) annually. Repair any leaks promptly.
- Do not idle the car inside garage.

Carbon Monoxide - from the IAQ Tools for Schools Kit - IAQ Coordinator's Guide
www.epa.gov/iaq/schools/tfs/guide.html

Sources of Indoor Air Pollution

- [Asbestos](#)
- [Biological Pollutants](#)
- [Carbon Monoxide](#)
- [Formaldehyde/Pressed Wood Products](#)
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- [Pesticides](#)
- [Radon](#)
- [Respirable Particles](#)
- [Secondhand Smoke/Environmental Tobacco Smoke](#)
- [Stoves, Heaters, Fireplaces, and Chimneys](#)

Read "The Inside Story: A Guide to Indoor Air Quality" [EPA 402-K-93-007, April 1995]

Description	Sources	Standards or Guidelines
Carbon monoxide (CO) is a colorless and odorless gas. It results from incomplete oxidation of carbon in combustion processes.	Common sources of CO in schools are from improperly vented furnaces, malfunctioning gas ranges, or exhaust fumes that have been drawn back into the building. Worn or poorly adjusted	The OSHA standard for workers is 50 ppm for 1-hour. NIOSH recommends no more than 35 ppm for 1-hour. The US. National Ambient Air Quality Standards for CO are 9 ppm for 8-

	and maintained combustion devices (e.g. boilers, furnaces) can be significant sources, or a flue that is improperly sized, blocked, disconnected, or leaking. Auto, truck, or bus exhaust from attached garages, nearby roads, or idling vehicles in parking areas can also be a source.	hours and 35 ppm for 1-hour. The Consumer Product Safety Commission recommends levels not to exceed 15 ppm for 1-hour or 25 ppm for 8-hours.
Health Effects	Control Measures	
CO is an asphyxiate. An accumulation of this gas may result in a varied constellation of symptoms deriving from the compound's affinity for and combination with hemoglobin, forming carboxy-hemoglobin (COHb) and disrupting oxygen transport. Tissues with the highest oxygen needs myocardium, brain, and exercising muscle are the first affected. Symptoms may mimic influenza and include fatigue, headache, dizziness, nausea and vomiting, cognitive impairment, and tachycardia. At high concentrations CO exposure can be FATAL.	Combustion equipment must be maintained to assure that there are no blockages and air and fuel mixtures must be properly adjusted to ensure more complete combustion. Vehicular use should be carefully managed adjacent to buildings and in vocational programs. Additional ventilation can be used as a temporary measure when high levels of CO are expected for short periods of time.	

Additional Resources

Links

Office of Air and Radiation page - "[CO - How Carbon Monoxide Affects the Way We Live and Breathe](#)"

National Center for Environmental Health

Air and Respiratory Health Branch

Centers for Disease Control and Prevention

[Checklist for Prevention of Carbon Monoxide Poisoning](#) [EXIT disclaimer >](#)

U.S. Consumer Product Safety Commission,

Office of Information and Public Affairs,

Washington, D.C. 20207

[Carbon Monoxide Questions and Answers \(CPSC document #466\)](#) [EXIT disclaimer >](#)

The U.S. Consumer Product Safety Commission protects the public from the unreasonable risk of injury or death from 15,000 types of consumer products under the agency's jurisdiction. To report a dangerous product or a product-related injury, you can go to CPSC's forms page - www.cpsc.gov/talk.html [EXIT disclaimer >](#) and use the first on-line form on that page. Or, you can call CPSC's hotline at (800) 638-2772 or CPSC's teletypewriter at (800) 638-8270, or send the information to info@cpsc.gov.

American Lung Association Fact Sheet on Carbon Monoxide

www.lungusa.org/air/carbon_factsheet99.html [EXIT disclaimer >](#)

Occupational Safety and Health Administration's Fact Sheet on Carbon Monoxide (a pdf file) -

www.osha.gov/OshDoc/data_General_Facts/carbonmonoxide-factsheet.pdf [EXIT disclaimer >](#)

About Your House - Carbon Monoxide, Canadian Mortgage and Housing Corporation (CMHC) www.cmhc-schl.gc.ca/en/burema/gesein/abhose/abhose_ce25.cfm [EXIT disclaimer >](#)

U.S. Coast Guard Boating Safety warning: <http://www.uscgboating.org/news/boatingview.aspx?id=22> [EXIT disclaimer >](#)

CPSC Recommends Carbon Monoxide Alarm for Every Home (January 18, 2001 CPSC Release # 01-069)

After a recent rash of carbon monoxide poisonings - including incidents in Maryland, Pennsylvania and New Jersey -- the U.S. Consumer Product Safety Commission (CPSC) is repeating its recommendation that every home should have a carbon monoxide (CO) alarm. CPSC also urges consumers to have a professional inspection of all fuel-burning appliances -- including furnaces, stoves, fireplaces, clothes dryers, water heaters, and space heaters -- to detect deadly carbon monoxide leaks. CPSC recommends that every home should have at least one CO alarm that meets the requirements of the most recent Underwriters Laboratories (UL) 2034 standard or International Approval Services 6-96 standard.
www.cpsc.gov/cpscpub/prerele/prhtml01/01069.html

Publications/Resources

Protect Your Family and Yourself from Carbon Monoxide Poisoning, October 1996 (402-F-96-005)

Discusses health hazards associated with exposure to carbon monoxide (CO), a colorless, odorless gas which can cause headaches, dizziness, nausea, faintness, and, at high levels, death. Provides guidance on what to do if you think you are suffering from CO poisoning and what to do to prevent exposure to CO. Also included is a brief discussion about carbon monoxide detectors.

Proteja su vida y la de su familia evitando el envenenamiento con monóxido de carbono (ref. # 402-F-97-004)

This fact sheet has also been translated into **Vietnamese (ref. # 402-F-96-005C)**, **Chinese (ref. # 402-F-96-005A)**, and **Korean (ref. # 402-F-96-005B)**. To get copies of any of these, contact IAQINFO at 1-800-438-4318.

ALERT!! Preventing Carbon Monoxide Poisoning from Small Gasoline-Powered Engines and Tools. (1996)

This joint alert from NIOSH, CDPHE, CPSC, OSHA and EPA warns that people using gasoline-powered tools such as high-pressure washers, concrete cutting saws (walk-behind/hand-held), power trowels, floor buffers, welders, pumps, compressors, and generators in buildings or semi-enclosed spaces have been poisoned by Carbon Monoxide. Recommendations for preventing CO poisoning are provided for employers, equipment users, tool rental agencies, and tool manufacturers.

Single copies of the Alert [DHHS (NIOSH) Publication No. 96-118] are available for free from: **Publication Dissemination, IED, National Institute for Occupational Safety and Health**; 4676 Columbia Parkway, Cincinnati, OH 45226
fax number: (513) 533-8573, phone number: 1-800-35-NIOSH (1-800-356-4674)
e-mail: pubstaf@niosdt1.em.cdc.gov [EXIT disclaimer >](#)

The "Senseless" Killer, 1993

Prepared by the U.S. Consumer Product Safety Commission, this leaflet describes symptoms of carbon monoxide poisoning, sources of carbon monoxide in the home, and actions that can reduce the risk of carbon monoxide poisoning.

What You Should Know About Combustion Appliances and Indoor Air Pollution, 1993 (400-F-91-100)

This brochure was prepared by the U.S. Consumer Product Safety Commission, the American Lung Association, and the EPA and answers commonly-asked questions about the effect of combustion appliances (e.g., fuel-burning furnaces, space heaters, kitchen ranges, and fireplaces) on indoor air quality and human health. It describes other sources of combustion pollutants in and around the home and it suggests ways to reduce exposure to such pollutants and encourages proper installation, use, and maintenance of combustion appliances.

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Protect Your Family and Yourself from Carbon Monoxide Poisoning

Carbon Monoxide Can Be Deadly

You can't see or smell carbon monoxide, but at high levels it can kill a person in minutes. Carbon monoxide (CO) is produced whenever any fuel such as gas, oil, kerosene, wood, or charcoal is burned. If appliances that burn fuel are maintained and used properly, the amount of CO produced is usually not hazardous. However, if appliances are not working properly or are used incorrectly, dangerous levels of CO can result. Hundreds of people die accidentally every year from CO poisoning caused by malfunctioning or improperly used fuel-burning appliances. Even more die from CO produced by idling cars. Fetuses, infants, elderly people, and people with anemia or with a history of heart or respiratory disease can be especially susceptible. Be safe. Practice the DO's and DON'Ts of carbon monoxide.

CO Poisoning Symptoms

Know the symptoms of CO poisoning. At moderate levels, you or your family can get severe headaches, become dizzy, mentally confused, nauseated, or faint. You can even die if these levels persist for a long time. Low levels can cause shortness of breath, mild nausea, and mild headaches, and may have longer-term effects on your health. Since many of these symptoms are similar to those of the flu, food poisoning, or other illnesses, you may not think that CO poisoning could be the cause.

Play it Safe

If you experience symptoms that you think could be from CO poisoning:

- ✓ **DO GET FRESH AIR IMMEDIATELY.** Open doors and windows, turn off combustion appliances and *leave the house*.
- ✓ **DO GO TO AN EMERGENCY ROOM** and tell the physician you suspect CO poisoning. If CO poisoning has occurred, it can often be diagnosed by a blood test done soon after exposure.
- ✓ **DO** Be prepared to answer the following questions for the doctor:
 - Do your symptoms occur only in the house? Do they disappear or decrease when you leave home and reappear when you return?
 - Is anyone else in your household complaining of similar symptoms? Did everyone's symptoms appear about the same time?
 - Are you using any fuel-burning appliances in the home?
 - Has anyone inspected your appliances lately? Are you certain they are working properly?

Prevention is the Key to Avoiding Carbon Monoxide Poisoning

- ✓ **DO** have your fuel-burning appliances -- including oil and gas furnaces, gas water heaters, gas ranges and ovens, gas dryers, gas or kerosene space heaters, fireplaces, and wood stoves -- inspected by a trained professional at the beginning of every heating

season. Make certain that the flues and chimneys are connected, in good condition, and not blocked.

- ✓ **DO** choose appliances that vent their fumes to the outside whenever possible, have them properly installed, and maintain them according to manufacturers' instructions.
- ✓ **DO** read and follow all of the instructions that accompany any fuel-burning device. If you cannot avoid using an unvented gas or kerosene space heater, *carefully follow the cautions* that come with the device. Use the proper fuel and keep doors to the rest of the house open. Crack a window to ensure enough air for ventilation and proper fuel-burning.
- ✓ **DO** call EPA's IAQ INFO Clearinghouse (1-800-438-4318) or the Consumer Product Safety Commission (1-800-638-2772) for more information on how to reduce your risks from CO and other combustion gases and particles.
- ✗ **DON'T** idle the car in a garage -- even if the garage door to the outside is open. Fumes can build up very quickly in the garage and living area of your home.
- ✗ **DON'T** use a gas oven to heat your home, even for a short time.
- ✗ **DON'T** *ever* use a charcoal grill indoors -- even in a fireplace.
- ✗ **DON'T** sleep in any room with an unvented gas or kerosene space heater.
- ✗ **DON'T** use any gasoline-powered engines (mowers, weed trimmers, snow blowers, chain saws, small engines or generators) in enclosed spaces.
- ✗ **DON'T** ignore symptoms, particularly if more than one person is feeling them. You could lose consciousness and die if you do nothing.

A Few Words About CO Detectors

Carbon Monoxide Detectors are widely available in stores and you may want to consider buying one as a back up -- ***BUT NOT AS A REPLACEMENT*** for proper use and maintenance of your fuel-burning appliances. However, it is important for you to know that the technology of CO detectors is still developing, that there are several types on the market, and that they are not generally considered to be as reliable as the smoke detectors found in homes today. Some CO detectors have been laboratory-tested, and their performance varied. Some performed well, others failed to alarm even at very high CO levels, and still others alarmed even at very low levels that don't pose any immediate health risk. And unlike a smoke detector, where you can easily confirm the cause of the alarm, CO is invisible and odorless, so it's harder to tell if an alarm is false or a real emergency.

So What's a Consumer to Do?

First, don't let buying a CO detector lull you into a false sense of security. Preventing CO from becoming a problem in your home is better than relying on an alarm. Follow the checklist of DOs and DON'Ts above.

Second, if you shop for a CO detector, do some research on features and don't select solely on the basis of cost. Non-governmental organizations such as Consumers Union (publisher of *Consumer Reports*), the American Gas Association, and Underwriters Laboratories (UL) can help you make an informed decision. Look for UL certification on any detector you purchase.

Carefully follow manufacturers' instructions for its placement, use, and maintenance.

If the CO detector alarm goes off:

- Make sure it is your CO detector and not your smoke detector.
- Check to see if any member of the household is experiencing symptoms of poisoning.
- If they are, get them out of the house immediately and seek medical attention. Tell the doctor that you suspect CO poisoning.
- If no one is feeling symptoms, ventilate the home with fresh air, turn off all potential sources of CO -- your oil or gas furnace, gas water heater, gas range and oven, gas dryer, gas or kerosene space heater and any vehicle or small engine.
- Have a qualified technician inspect your fuel-burning appliances and chimneys to make sure they are operating correctly and that there is nothing blocking the fumes from being vented out of the house.

Carbon Monoxide Survivor

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A guide to carbon monoxide...

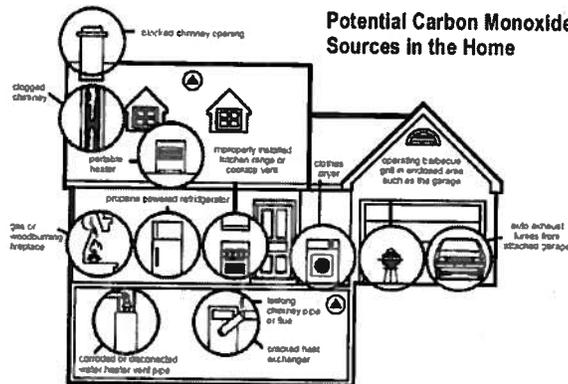
[Home](#) > [Sources](#) > [Examples of carbon monoxide sources all around us](#)

Carbon monoxide sources around us

Carbon monoxide sources are all around us including:

Home carbon monoxide sources:

- Furnace (natural gas, propane, oil, wood)
- Fireplace (gas, wood, coal)
- Stove (gas, wood)
- Dryer (gas only)
- Barbeque (gas, charcoal)
- Gasoline/petrol powered garden tools
- Generator (gasoline, diesel, propane)
- carbon monoxide in cigarettes and tobacco smoke



Vehicles carbon monoxide sources:

- Cars, trucks, vans, recreational vehicles, campers, camper
- shells, transport, buses
- Gasoline/petrol
- Diesel
- Propane
- Natural gas

Boats carbon monoxide sources:

- carbon monoxide poisoning is surprisingly common in recreational motor-boating situations, especially for people swimming around swim platforms and boarding ladders located close to the motor exhaust area.
- Even a mild case of CO poisoning can be made lethal because there is a risk of drowning when the effects of the poisoning take hold.
- Gasoline/petrol
- Diesel

Camping carbon monoxide sources:



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[CO linked to common disorders](#)

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- carbon monoxide poisoning can easily happen when campers bring a heater into a tent.
- Heater (propane, kerosene)
- Generator (gasoline, diesel, propane)
- Camp fire

Travel carbon monoxide sources:

- Many hotel, motel and dormitory rooms are heated with individual heating units. There could be hundreds of rooms and heating units in a building which increases the risk of sporadic (or unqualified) maintenance.
- The proximity of heating units to each other also increases the risk that the exhaust venting from one unit could get drawn into the air intake in another unit. In an ideal world this would never happen but weather, onsite conditions, and maintenance issues increase the risk of CO exposure.

Work carbon monoxide sources:

- Carbon monoxide is a common industrial hazard resulting from the incomplete burning of natural gas and any other material containing carbon such as gasoline/petrol, kerosene, oil, propane, coal, or wood
- Gasoline powered tools such as pressure washers, chain saws, concrete-cutting saws, power trowels, floor buffers, and welders
- Propane powered forklifts and other equipment
- Forges, blast furnaces, and coke ovens
- Carbon monoxide is produced in large amounts by some industrial processes
- Paint removers/strippers containing methylene chloride also "create" carbon monoxide. Though methylene chloride does not give off carbon monoxide, the vapors are converted (metabolized) within the body into carbon monoxide. As a result, a person can suffer carbon monoxide poisoning from inhaling methylene chloride vapors.

Other carbon monoxide sources:

- Indoor ice arenas (from engines on ice resurfacing equipment)
- Indoor car and motor shows
- Any environment in which combustion engines are used or burning is done, under conditions of insufficient ventilation
- Forest and bush fires
- Around kilns in pottery studios and industrial applications
- Any kind of fire in a building, vehicle, boat, plane, or semi enclosed space

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☆☆☆☆ carbon monoxide poisoning Rose

I have a pellet stove, can this cause carbon monoxide poisoning

Intentional poisoning via exhaust?

Brian Seymour from Northwestern California

My wife and I are now at loggerheads with our apartment manager about an issue with two neighbors who operate their dryers 10-12 hours per day (using multiple dryer sheets, to which we have become sensitized) and vent them across an eight-foot fenced