



United States Consumer Product Safety Commission

Carbon Monoxide Questions and Answers

CPSC Document #466

1. What is carbon monoxide (CO) and how is it produced?

Carbon monoxide (CO) is a deadly, colorless, odorless, poisonous gas. It is produced by the incomplete burning of various fuels, including coal, wood, charcoal, oil, kerosene, propane, and natural gas. Products and equipment powered by internal combustion engine-powered equipment such as portable generators, cars, lawn mowers, and power washers also produce CO.

2. How many people are unintentionally poisoned by CO?

On average, about 170 people in the United States die every year from CO produced by non-automotive consumer products. These products include malfunctioning fuel-burning appliances such as furnaces, ranges, water heaters and room heaters; engine-powered equipment such as portable generators; fireplaces; and charcoal that is burned in homes and other enclosed areas. In 2005 alone, CPSC staff is aware of at least 94 generator-related CO poisoning deaths. Forty-seven of these deaths were known to have occurred during power outages due to severe weather, including Hurricane Katrina. Still others die from CO produced by non-consumer products, such as cars left running in attached garages. The Centers for Disease Control and Prevention estimates that several thousand people go to hospital emergency rooms every year to be treated for CO poisoning.

3. What are the symptoms of CO poisoning?

Because CO is odorless, colorless, and otherwise undetectable to the human senses, people may not know that they are being exposed. The initial symptoms of low to moderate CO poisoning are similar to the flu (but without the fever). They include:

- Headache
- Fatigue
- Shortness of breath
- Nausea
- Dizziness

High level CO poisoning results in progressively more severe symptoms, including:

- Mental confusion
- Vomiting
- Loss of muscular coordination
- Loss of consciousness

- Ultimately death

Symptom severity is related to both the CO level and the duration of exposure. For slowly developing residential CO problems, occupants and/or physicians can mistake mild to moderate CO poisoning symptoms for the flu, which sometimes results in tragic deaths. For rapidly developing, high level CO exposures (e.g., associated with use of generators in residential spaces), victims can rapidly become mentally confused, and can lose muscle control without having first experienced milder symptoms; they will likely die if not rescued.

4. How can I prevent CO poisoning?

- Make sure appliances are installed and operated according to the manufacturer's instructions and local building codes. Most appliances should be installed by qualified professionals. Have the heating system professionally inspected and serviced annually to ensure proper operation. The inspector should also check chimneys and flues for blockages, corrosion, partial and complete disconnections, and loose connections.
- Never service fuel-burning appliances without proper knowledge, skill and tools. Always refer to the owners manual when performing minor adjustments or servicing fuel-burning equipment.
- Never operate a portable generator or any other gasoline engine-powered tool either in or near an enclosed space such as a garage, house, or other building. Even with open doors and windows, these spaces can trap CO and allow it to quickly build to lethal levels.
- Install a CO alarm that meets the requirements of the current UL 2034 safety standard. A CO alarm can provide some added protection, but it is no substitute for proper use and upkeep of appliances that can produce CO. Install a CO alarm in the hallway near every separate sleeping area of the home. Make sure the alarm cannot be covered up by furniture or draperies.
- Never use portable fuel-burning camping equipment inside a home, garage, vehicle or tent unless it is specifically designed for use in an enclosed space and provides instructions for safe use in an enclosed area.
- Never burn charcoal inside a home, garage, vehicle, or tent.
- Never leave a car running in an attached garage, even with the garage door open.
- Never use gas appliances such as ranges, ovens, or clothes dryers to heat your home.
- Never operate unvented fuel-burning appliances in any room where people are sleeping.
- Do not cover the bottom of natural gas or propane ovens with aluminum foil. Doing so blocks the combustion air flow through the appliance and can produce CO.

- During home renovations, ensure that appliance vents and chimneys are not blocked by tarps or debris. Make sure appliances are in proper working order when renovations are complete.

5. What CO level is dangerous to my health?

The health effects of CO depend on the CO concentration and length of exposure, as well as each individual's health condition. CO concentration is measured in parts per million (ppm). Most people will not experience any symptoms from prolonged exposure to CO levels of approximately 1 to 70 ppm but some heart patients might experience an increase in chest pain. As CO levels increase and remain above 70 ppm, symptoms become more noticeable and can include headache, fatigue and nausea. At sustained CO concentrations above 150 to 200 ppm, disorientation, unconsciousness, and death are possible.

6. What should I do if I am experiencing symptoms of CO poisoning and do not have a CO alarm, or my CO alarm is not going off?

If you think you are experiencing any of the symptoms of CO poisoning, get outside to fresh air immediately. Leave the home and call your fire department to report your symptoms from a neighbor's home. You could lose consciousness and die if you stay in the home. It is also important to contact a doctor immediately for a proper diagnosis. Tell your doctor that you suspect CO poisoning is causing your problems. Prompt medical attention is important if you are experiencing any symptoms of CO poisoning. If the doctor confirms CO poisoning, make sure a qualified service person checks the appliances for proper operation before reusing them.

7. Are CO alarms reliable?

CO alarms always have been and still are designed to alarm before potentially life-threatening levels of CO are reached. The safety standards for CO alarms have been continually improved and currently marketed CO alarms are not as susceptible to nuisance alarms as earlier models.

8. How should a consumer test a CO alarm to make sure it is working?

Consumers should follow the manufacturer's instructions. Using a test button tests whether the circuitry is operating correctly, not the accuracy of the sensor. Alarms have a recommended replacement age, which can be obtained from the product literature or from the manufacturer.

9. How should I install a CO Alarm?

CO alarms should be installed according to the manufacturer's instructions. CPSC recommends that one CO alarm be installed in the hallway outside the bedrooms in each separate sleeping area of the home. CO alarms may be installed into a plug-in receptacle or high on the wall. Hard wired or plug-in CO alarms should have battery backup. Avoid locations that are near heating vents or that can be covered by furniture or draperies. CPSC does not recommend installing CO alarms in kitchens or above fuel-burning appliances.

10. What should you do when the CO alarm sounds?

Never ignore an alarming CO alarm! It is warning you of a potentially deadly hazard.

If the alarm signal sounds **do not try to find the source of the CO:**

- a. Immediately move outside to fresh air.
- b. Call your emergency services, fire department, or 911.
- c. After calling 911, do a head count to check that all persons are accounted for. DO NOT reenter the premises until the emergency services responders have given you permission. You could lose consciousness and die if you go in the home.
- d. If the source of the CO is determined to be a malfunctioning appliance, DO NOT operate that appliance until it has been properly serviced by trained personnel.

If authorities allow you to return to your home, and your alarm reactivates within a 24 hour period, repeat steps 1, 2 and 3 and call a qualified appliance technician to investigate for sources of CO from all fuel burning equipment and appliances, and inspect for proper operation of this equipment. If problems are identified during this inspection, have the equipment serviced immediately. Note any combustion equipment not inspected by the technician and consult the manufacturers' instructions, or contact the manufacturers directly, for more information about CO safety and this equipment. Make sure that motor vehicles are not, and have not been, operating in an attached garage or adjacent to the residence.

11. What is the role of the U.S. Consumer Product Safety Commission (CPSC) in preventing CO poisoning?

CPSC staff worked closely with Underwriters Laboratories (UL) to help develop the safety standard (UL 2034) for CO alarms. CPSC helps promote carbon monoxide safety by raising awareness of CO hazards and the need for correct use and regular maintenance of fuel-burning appliances. CPSC staff also works with stakeholders to develop voluntary and mandatory standards for fuel-burning appliances and conducts independent research into CO alarm performance under likely home-use conditions.

12. Do some cities require that CO alarms be installed?

Many states and local jurisdictions now require CO alarms be installed in residences. Check with your local building code official to find out about the requirements in your location.

13. Should CO alarms be used in motor homes and other recreational vehicles?

CO alarms are available for boats and recreational vehicles and should be used. The Recreation Vehicle Industry Association requires CO alarms in motor homes and in towable recreational vehicles that have a generator or are prepped for a generator.