

NAVY MANAGES RISK OF CARBON MONOXIDE POISONING IN BASE HOUSING

Carbon monoxide is a deadly gas that is generated when fuel is incompletely burned. According to the Journal of the American Medical Association, carbon monoxide is the leading cause of accidental poisoning deaths in the United States. Over 2,500 people die each year, and more than 10,000 more are hospitalized from carbon monoxide inhalation.



The danger stems from the fact that carbon monoxide, or CO, has no warning properties. It is a colorless, tasteless, odorless gas that results from incomplete combustion of fuels such as gasoline, natural gas, liquid petroleum gas, kerosene, oil, wood, or coal that do not have sufficient oxygen to burn completely. Complete combustion produces harmless carbon *dioxide*, but incomplete combustion results in deadly CO gas.

Red blood cells carry oxygen throughout the body to sustain life. CO is deadly because it displaces the oxygen in red blood cells, reducing the amount of



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oxygen available to the body, which results in damage to the central nervous system, loss of consciousness, and eventually death. Most people who lose consciousness from CO poisoning are left with permanent brain damage, mental and speech disorders, vision and hearing impairment, and seizures. CO is quick and deadly. Symptoms of CO inhalation include dizziness, fatigue, headaches, nausea, and irregular breathing, all of which may be mistaken for a cold or the flu. Children and the elderly are among the first to be overcome; so are family pets.

Sources of CO in the home include faulty fuel-burning heaters, furnaces, stoves, water heaters, or clothes dryers. CO is also produced from fireplaces, chimneys, and flues; from the indoor use of charcoal heaters and grills; and inside garages from idling internal combustion engines, such as automobiles, motorcycles, campers, trucks, and lawnmowers.

In 1998, several families in a Navy base housing area were overcome by CO generated from defective heating units. The Chief of Naval Operations and the Naval Facilities Engineering Command took aggressive action to ensure that

heaters in base housing units and other high-risk areas were inspected and that defective units were repaired or replaced. The Navy - the first of the military services to install CO detectors in all Navy housing and high-risk areas such as childcare centers - then purchased and installed 60,000 CO detectors. The detectors were installed to provide early warning of the presence of CO gas. Since that time, no carbon monoxide-related deaths have been reported in Navy housing or childcare facilities.

Some time after the CO detectors were installed Navy-wide, three members of a Navy family escaped serious injury or death at Naval Air Station, Kingsville,



Texas when their CO detector warned of rising CO levels in their Navy housing unit. The family was treated at the local hospital for CO inhalation and released. A follow-up investigation revealed a defect in venting the gas-fired heater in the family's residence. The Navy replaced the vents and inspected all family housing at NAS Kingsville to identify and repair defective heating systems.

Carbon monoxide detectors have been installed in all Navy housing.

At another base, the wife of a Sailor living in family housing suspected that her stove was

malfunctioning because she felt ill after spending time in the kitchen. Residential CO detectors are typically placed near bedrooms because people are most susceptible to being overcome by CO while they sleep. To confirm her suspicions, the wife moved the CO detector from the upstairs hallway to the kitchen. The detector went off right away, emitting an audible alarm. She and her family immediately vacated the house and called 911.

The CO detector may have saved this family's lives. The source of the CO turned out to be the gas stove. Although CO levels had not yet reached high enough concentrations to trigger the alarm in the upstairs hallway, rising levels of CO would eventually have reached there and triggered the detector's alarm.

A third case of CO detection occurred when a Navy family living in base housing near San Diego, California heard their CO detector's alarm one night, four years after it had been installed. The husband and wife opened the doors and windows to air the house out and called the gas company. The gas company sent a technician immediately.

During his inspection of the house's furnace, the technician discovered that the flame on the furnace's pilot light was more yellow in color than it should have been, an indication of incomplete combustion, which leads to the formation of deadly CO. The furnace flue also showed hairline cracks that would have increased leakage of CO throughout the house.

Based on their findings, the gas company estimated that CO concentrations in the residence at the time the alarm sounded were probably about 200 parts per million (ppm). The gas company also indicated that, based on the condition of the furnace, it was likely that without the CO detector alarm going off and immediate intervention, CO levels would have continued to increase until, one night, family members could have died in their sleep.

WHAT CARBON MONOXIDE CAN DO TO YOU

200 ppm	Mild headache within 2 to 3 hours
400 ppm	Headache and nausea within 1 to 2 hours
800 ppm	Headache, nausea, and dizziness within 45 minutes. Loss of consciousness within 2 hours.
1,000 ppm	Loss of consciousness after 1 hour
1,600 ppm	Headache, dizziness, and nausea within 20 minutes. Loss of consciousness after 30 minutes. Death in less than 2 hours.
3,200 ppm	Headache, dizziness and nausea in 5 to 10 minutes. Death within 30 minutes.
6,400 ppm	Headache and dizziness in 1 to 2 minutes. Death in less than 20 minutes.
12,800 ppm	Immediate loss of consciousness. Danger of death in less than 3 minutes.

The Navy strives to make its personnel aware of the steps that can be taken to reduce the risk of overexposure to CO for themselves and their families:

- √ Purchase and install a CO detector that senses low levels of CO and sounds an alarm. The detector should meet the Underwriters Laboratories (UL) 2034 or International Approval Services (IAS) 696 Standard (look for label on CO detector unit).
- √ CO detectors with digital readouts showing detected CO levels are preferable. The alarm sounds when CO levels reach 50 parts per million.

√ Follow the manufacturer's instructions and recommendations for testing the detector and, if battery powered, replace the battery at recommended intervals.

√ Before turning the heat on after moving into a new home, have a qualified technician inspect the heating system to verify the condition of the furnace or heater, fresh air inlets, filters, air registers, ducts, and chimney(s). The technician should repair or replace defective parts; replace dirty or clogged filters; clean return air registers; and remove blockage or debris from the chimney flue(s).



Carbon monoxide detectors with digital readouts are preferable.

√ Never use hibachis or barbecue grills inside buildings, tents, campers, boats, or vehicles. If you use space heaters, ensure they are UL listed and follow the manufacturer's recommendations regarding ventilation; if you live in base housing, ensure the use of space heaters is authorized.

√ Gasoline-powered engines and tools present a serious risk since they can generate high concentrations of CO within a short period of time. Never use such engines or tools (e.g., high-pressure washers, concrete-cutting saws, power trowels, welders, pumps, compressors, and generators) inside buildings or in sheltered or partially enclosed areas.

√ Be alert to the signs and symptoms of CO overexposure - headache, nausea, weakness, dizziness, visual disturbances, changes in personality, or loss of consciousness. Any of these signs or symptoms can occur within minutes of overexposure and can be life threatening. If you suspect the presence of CO, get everyone out of the building immediately. Open doors and windows, and turn off all heaters and other possible sources of CO. If anyone has been overcome or shows signs of CO poisoning, call 911 or take the victim(s) to an emergency room.

√ Never operate a motor vehicle inside a closed or attached garage. After starting the engine, immediately drive the vehicle outside. Remember that fuel-burning appliances, generators, or any motorized vehicle - car, truck, motorcycle, motor home, boat, or camper - can generate CO.

The Centers for Disease Control's CO checklist can be found at [Carbon Monoxide Prevention Checklist](#) [PDF format]. Various CO-related tips and articles are available on the Naval Safety Center website at <http://safetycenter.navy.mil/safetips/carbonmonoxide.htm> .

Carbon monoxide is an odorless, colorless gas that can permanently injure or kill without warning. A CO detector can provide early warning of the presence of this deadly gas. The Navy's policy of installing carbon monoxide detectors in all Navy housing units and other high risk areas, routinely inspecting the detectors, and performing periodic maintenance on heating systems to prevent CO from leaking into living quarters has saved lives and continues to be a successful method of preventing carbon monoxide poisoning.



No carbon monoxide-related deaths have been reported in Navy housing or childcare facilities since CO detectors were installed Navy-wide.

For further information regarding carbon monoxide detectors in the Navy:

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