

Carbon Monoxide Poisoning: Protect Yourself and Your Employees

Every year hundreds of people die from accidental, non-fire related carbon monoxide (CO) poisoning. Additionally, thousands are treated in hospital emergency departments for overexposures. These fatalities and illnesses are preventable.

As the recent line of Hurricanes left millions without electricity, the use of gasoline powered generators as well as fuel-burning tools and cooking appliances drastically increase as residents and businesses try to put their lives back together.

Carbon monoxide poisoning cases often climb after severe weather events, especially during winter months. “3 dead, 4 hospitalized with carbon-monoxide poisoning from generator after Hurricane Irma” – Orlando Sentinel 9/14/17. The risk of CO poisoning is ever present when exhaust from burned fuels is generated inside buildings or enclosed spaces.

What is carbon monoxide?

Carbon monoxide is an invisible, odorless and tasteless gas. Often named, and rightfully so, “The Quiet Killer”, CO is a common hazard resulting from the burning of fuels containing carbon such as gasoline,

kerosene, propane, natural gas, diesel, wood and charcoal.

How does carbon monoxide harm you?

When you breathe, the oxygen in the air is taken into your lungs where it enters your blood and is carried throughout your body by the protein hemoglobin. When you breathe in carbon monoxide, the CO also binds to hemoglobin. It binds so strongly that it prevents oxygen from binding as well. Over time, if you breathe enough carbon monoxide, it binds to all of the hemoglobin in your body, and you no longer have enough oxygen in your blood.

Exposure to low and moderate levels of CO can cause early onset of flu-like symptoms including headache, fatigue, dizziness, drowsiness and nausea. Sudden chest pain in people with angina may occur. During prolonged or high exposures, symptoms may worsen and include vomiting, confusion and collapse in addition to loss of consciousness. Symptoms can vary widely from person to person. Additionally, CO poisoning may occur sooner in those most susceptible such as young children, the elderly, and people with underlying lung and heart disease.

CARBON MONOXIDE (CO) POISONING



Signs and Symptoms of Carbon Monoxide Exposure

It doesn't take much CO to cause problems. Below is a table outlining the general effects of carbon monoxide on healthy adults. Individual susceptibility will vary.

PPM CO In Air	Percent CO In Air	Symptoms Experienced By Healthy Adults	Comments
9 ppm	0.0009%	No adverse effects in healthy adults	ASHRAE maximum recommended level for 8-hour average
25ppm	0.0025%	No adverse effects in healthy adults	ACGIH – 8-hour Threshold Limit Value
35 ppm	0.0035%	No adverse effects in healthy adults	CONN-OSHA 8-hour permissible exposure limit
50 ppm	0.0050%	Possible shortness of breath on vigorous exertion with 8 hours of exposure	Federal OSHA 8-hour permissible exposure limit
100 ppm	0.01 %	Slight headache, increased fatigue, and shortness of breath	
200 ppm	0.02%	Mild headache, fatigue, and slight nausea after 2-3 hours of exposure	CONN-OSHA Ceiling Limit (Cannot Exceed)
400 ppm	0.04%	Headache and nausea after 1-2 hours of exposure	
800 ppm	0.08%	Headache, nausea and dizziness after 45 minutes; collapse and unconsciousness after 1 hour of exposure	
1,000 ppm	0.10%	Loss of consciousness after 1 hour of exposure.	Levels greater than 1200 ppm are considered “immediately dangerous to life or health” (IDLH) per NIOSH
1,600 ppm	0.16%	Headache, nausea and dizziness after 20 minutes of exposure	
3,200 ppm	0.32%	Headache, nausea and dizziness after 5-10 minutes; collapse and unconsciousness after 30 minutes of exposure	
6,400 ppm	0.64%	Headache and dizziness after 1-2 minutes, unconsciousness and danger of death after 10-15 minutes of exposure	
12,800 ppm	1.28%	Immediate physiological effects, unconsciousness and danger of death after 1-3 minutes of exposure	

ppm = parts per million

At lower levels, people sometimes mistake the symptoms of CO exposure for the flu, or do not associate their severe headache and nausea with carbon monoxide exposure.

People with heart or lung conditions or other health problems can be more sensitive to the effects of carbon monoxide. In addition the fetus of a pregnant woman can be adversely affected by the carbon monoxide she inhales.

The CONN-OSHA permissible exposure limits for carbon monoxide are 35 ppm averaged over 8 hours with a 200 ppm ceiling limit.

Federal OSHA permissible exposure limits are 50 ppm averaged over 8 hours.

ACGIH - American Conference of Governmental Industrial Hygienists

ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers

NIOSH - National Institute for Occupational Safety and Health

Table adapted from Washington State Department of Labor and Industries

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What are some common sources of carbon monoxide at work?

The use of propane-powered forklifts or the idling of vehicles in buildings and the use of gasoline powered tools including pressure washers, cutting tools, cement mixers, compressors and heaters within enclosed spaces can increase CO levels. Concentrations of CO can rapidly increase when such equipment is not properly maintained, resulting in incomplete burning of fuel. The location of generators (e.g. inside buildings or near open windows and doors) can greatly increase carbon monoxide levels in enclosed spaces.

What can you do if you suspect CO poisoning?

- Leave the area immediately, especially if more than one person has similar symptoms including headache, dizziness, confusion, fatigue and nausea
- Go outside to get fresh air and report the situation to your supervisor
- Call 911 or go to the nearest hospital if you feel sick
- Move unconscious victims to fresh air, if safe to do so. You may be exposed to fatal concentrations of CO in a rescue attempt. Don't become a victim yourself

How can employers prevent CO poisoning?

- Install an effective ventilation system that will remove CO from work areas
- Maintain equipment and appliances (e.g. water heaters,

space heaters, boilers) that can produce CO in good working order to promote their safe operation and reduce CO formation

- Prohibit the use of gasoline-powered engines or tools in poorly ventilated areas
- Provide personal CO monitors with audible alarms in potential exposure to CO exists
- Install fixed CO monitors with audible alarms
- Educate workers about the sources and conditions that may result in CO poisoning as well as the symptoms and control of CO exposure

What can employees do to prevent CO poisoning?

- Report any situation to your employer that might cause CO to accumulate
- Be alert to ventilation problems – especially in enclosed areas where gases of burning fuels may be released
- Report complaints of dizziness, drowsiness, headaches or nausea promptly to your supervisor
- Avoid the use of gas-powered engines, such as those in power washers as well as heaters and forklifts, while in enclosed spaces

December 15, 2017 is OSHA's new electronic workplace injury reporting compliance date

The Occupational Safety and Health Administration of the U.S. Department of Labor has extended to Dec. 15 the deadline by which employers must electronically report 2016 injury and illness data from Form 300A through its [Injury Tracking Application website](#).

OSHA said Wednesday that the two-week delay was needed to allow affected employers more time to become familiar with the new system, which was [launched Aug. 1](#). Originally, Form 300A electronic submissions for 2016 were to begin July 1, but OSHA pushed the deadline to Dec. 1 before extending it.

Under the final rule titled "Improve Tracking of Workplace Injuries and Illnesses," [announced in May 2016](#) under the Obama administration, "high-hazard" industries that have 250 or more employees are required to submit to OSHA injury and illness information on OSHA Forms 300, 300A and 301.

Some businesses with 20 to 249 employees are required to submit information from Form 300A only. Among those affected industries identified in [Appendix A to Subpart E of Part 1904](#) of

the rule are community care facilities for the elderly (NAICS 6233), other residential care facilities (NAICS 6239) and nursing care facilities (NAICS 6231).

Please note that *all* Connecticut public sector employers must submit the 2016 OSHA form 300A data by the December 15th deadline. There are no size or industry exemptions.

The Dec. 15 filing deadline applies only to Form 300A, [according to OSHA](#). Current deadlines call for affected employers with 250 or more employees to submit information from all completed 2017 forms (300A, 300 and 301) by July 1 and affected employers with 20 to 249 employees also to submit information from the completed 2017 Form 300A by July 1. Beginning in 2019, all affected employers are scheduled to submit all forms by March 2.

OSHA also announced Wednesday, however, that it intends to reconsider, revise or remove portions of the final rule next year.

Fatality & Casualty Reporting

State & Town: CONN-OSHA (860) 263-6946 (local) or 1-866-241-4060 (toll-free)
Private Employers: Report to Federal OSHA at 1-800-321-OSHA(6742)

Hazard Corner...

Six workers poisoned by carbon monoxide from flooring removal machine.

Workers removing ceramic floor tile in an office building were poisoned by carbon monoxide from a propane powered flooring removal machine. The propane powered machine was operated in a 22,000 square foot office space. Although fans had been set up to move the air around the worksite, they did not vent to the outside and the buildings ventilation system had been shut off.

The six workers, including the flooring removal machine operator, had been working in this space for about four hours and began feeling ill and having headaches. Soon thereafter, their foreman had them evacuate the office space and go outside. Because they continued to feel sick, the employer then directed all of them to go to the local hospital where they were treated for carbon monoxide poisoning.

Carbon monoxide measurements were taken at the tailpipe of the flooring removal machine shortly after the poisoning incident. The instrument showed extremely high levels of carbon monoxide being emitted. It was also discovered that the choke cable on this rental machine was out of adjustment, causing the machine to run with the choke completely engaged. This resulted in incomplete combustion of the propane fuel and excessive amounts of carbon monoxide being generated.

Carbon monoxide levels are often measured in parts per million. The malfunctioning flooring removal machine was emitting over 100,000 parts per million into the work area over the course of about four hours. The estimated levels of carbon monoxide in the air of the office space were 165 to 265 parts per million, calculated

from the amount of carbon monoxide measured in the blood COHe (carboxyhemoglobin) of the exposed workers at the hospital. Five workers recovered completely from their exposures, but one experienced long-term complications.

To view images, a video and obtain additional information on this investigation by Chris Jacomme, Washington State Department of Labor and Industries, Division of Occupational Safety and Health, following the link below.

<http://wisha-training.lni.wa.gov/Training/InvestigationStories/COpoisoning/player.html>



Running just one propane-powered machine in a poorly ventilated space can lead to carbon monoxide poisoning, even in larger spaces like this one.

CONN-OSHA~ Training Update...

Lockout/Tagout *January 9, 2018 from 10:00 a.m. to noon* This 2-hour session will discuss comprehensive energy control protocols designed to protect workers performing servicing and other tasks while achieving maintenance, quality control and production goals.

Powered Industrial Trucks *February 6, 2018 from 10:00 a.m. to noon* This 2-hour workshop will cover safe work practices, methods of providing formal and practical training, and tools for operator evaluation. Written handout materials will be provided to use in the development of your site-specific training program.

OSHA Recordkeeping *March 6, 2018 from 9:00 a.m. to noon* This interactive session will discuss the rules and ensure confidence that you have properly recorded and reported occupational injuries and illnesses, including how to fill out the OSHA 300 Log of Work-Related Injuries and Illnesses accurately and correctly. The new electronic reporting requirements will also be discussed.

Breakfast Roundtable This discussion group meets the third Tuesday of every month from 8:15 am to 9:45 am. Pre-registration is required. Visit our web page for more information: <http://www.ctdol.state.ct.us/osha/Breakfast/index.htm> To be placed on the e-mail distribution list, contact John Able at John.able@ct.gov

Classes are free and are held at 200 Folly Brook Boulevard, Wethersfield, CT in Conference Room A/B (unless otherwise noted). To register, contact Catherine Zinsser at catherine.zinsser@ct.gov Pre-registration is required. A Photo I.D. is also required to allow entry into a public building. For more training information, visit the CONN-OSHA web site www.ConnOsha.com