Welcome to the Hard Hat Training Series!

Welcome to the Hard Hat Training Series. Today, we will be talking about the hazards associated with Carbon Monoxide and how to protect yourself from its deadly effects.

HARD HAT TRAINING SERIES

SAFETY PROVISIONS, inc.

CARBON MONOXIDE SAFETY TRAINING


Photo courtesy of smalltownstock.photoshelter.com

At the beginning of 2006 a disaster shook the town of Sago, West Virginia when a methane explosion caused a cave-in at a local coal mine. 13 of the miners were trapped inside the mine, blocked by the massive cave-in that had just occurred. For two days, families comforted and prayed together as rescuers attempted to locate and rescue the 13 deep within the mine.

Photo courtesy of cinabrio

Sadly, after two days of anxiety and worry, the families greatest fears were realized. The rescue teams found the 13 missing miners. Only one survived. Unfortunately, despite having survived the cave in, the survivors were surrounded by an invisible poisonous gas known as the silent killer. The real name for this noxious gas is Carbon Monoxide, commonly referred to as CO for short.

What Is CO?

Carbon Monoxide is a invisible, odorless gas that forms during incomplete combustion. These incomplete combustion reactions occur in stoves, furnaces, engines, chimneys, and within fire. Carbon monoxide can also form naturally in coal mines as the coal oxidizes at lower temperatures.

Did you know?

Complete combustion reactions result in the formation of Carbon Dioxide (CO_2) and water (H_2O), two chemicals that are harmless. However, when there is an abundance of fuel, such as gasoline, and under abundance of O_2, the reaction is what is known as a incomplete combustion reaction and results in the of CO as well as CO_2 and H_2O. The ratio of CO that will be formed will be low, but enough to cause carbon monoxide poisoning to anyone breathing it in.

Carbon monoxide has the same density of air and will mix in with the normal atmosphere. Because of this, carbon monoxide will quickly dissolve to harmless levels outside. However, in enclosed spaces with low ventilation CO levels can rise to dangerous levels.

Carbon monoxide is toxic because red blood cells are more attracted to CO than oxygen. This attraction means that the body will start picking up CO in place of the oxygen in the atmosphere. As more oxygen is displaced, the victim becomes dizzy then goes unconscious, and if not treated quickly they will suffocate.

Carbon monoxide can be explosive in very high concentrations. Though this is rare, it is important consider this risk. This is especially important when CO is stored in containers and gas cylinders.

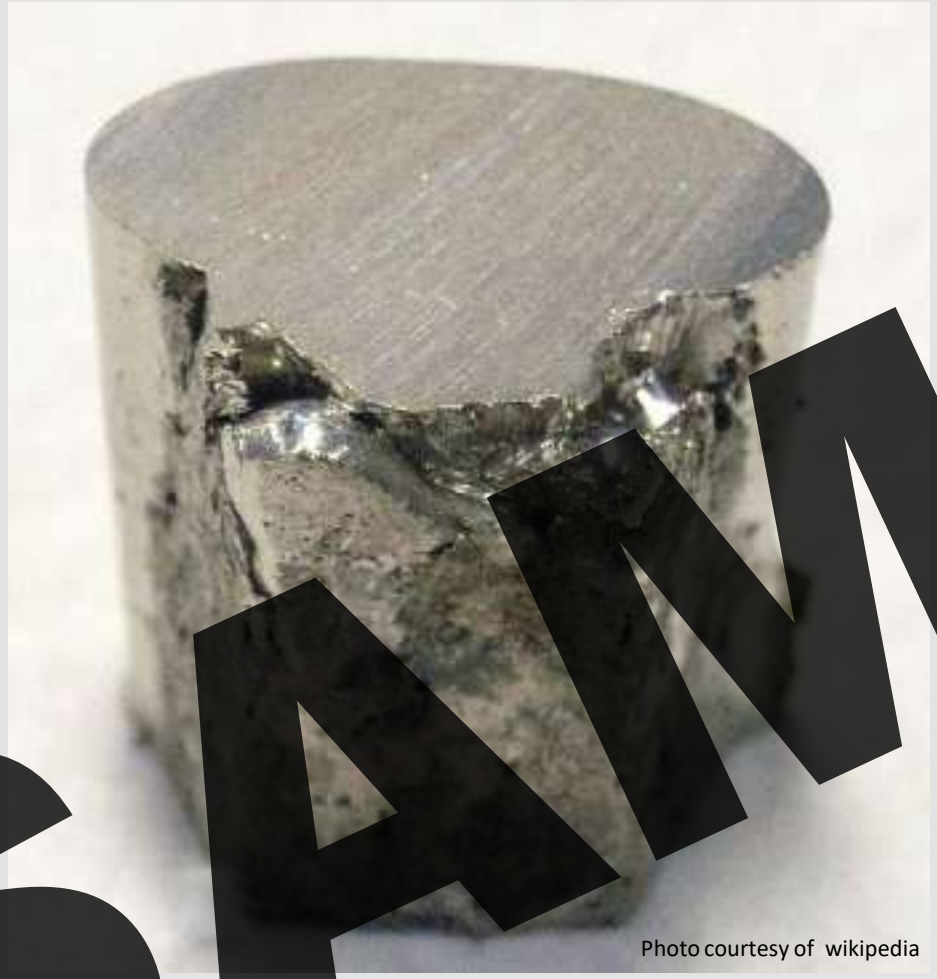
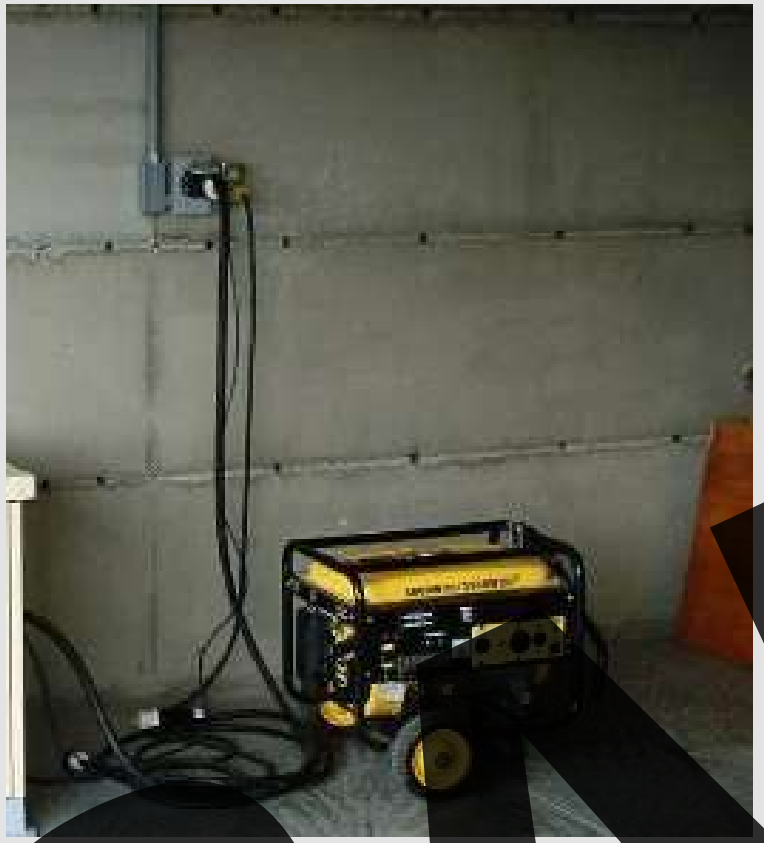


Photo courtesy of wikipedia

CO is typically just a bi-product of incomplete combustion, however, it does have some uses. In metallurgy (processing of metals) it is used to produce carbonyls, important catalysts in the industry, and is used to isolate pure nickel from other metals in the mixture. It is also a foundational part of many chemicals, including methanol and some alkenes and aldehydes.

Photo courtesy of indiaMART



CO is a danger in many occupations. Any job that is around ovens, boiler rooms, refineries, or numerous other processes that produce CO can put workers at risk. The most common source for occupational exposure to CO is from internal combustion engines such as vehicles, gas-powered tools, or portable generators.

Helpful Terms

Before proceeding, let's take the time to define a few terms that will be helpful as you navigate the course. **Parts per million (ppm):** A means to measure the concentration of CO. Parts per million indicates how many volume-based units out of a million the substance in question makes up.

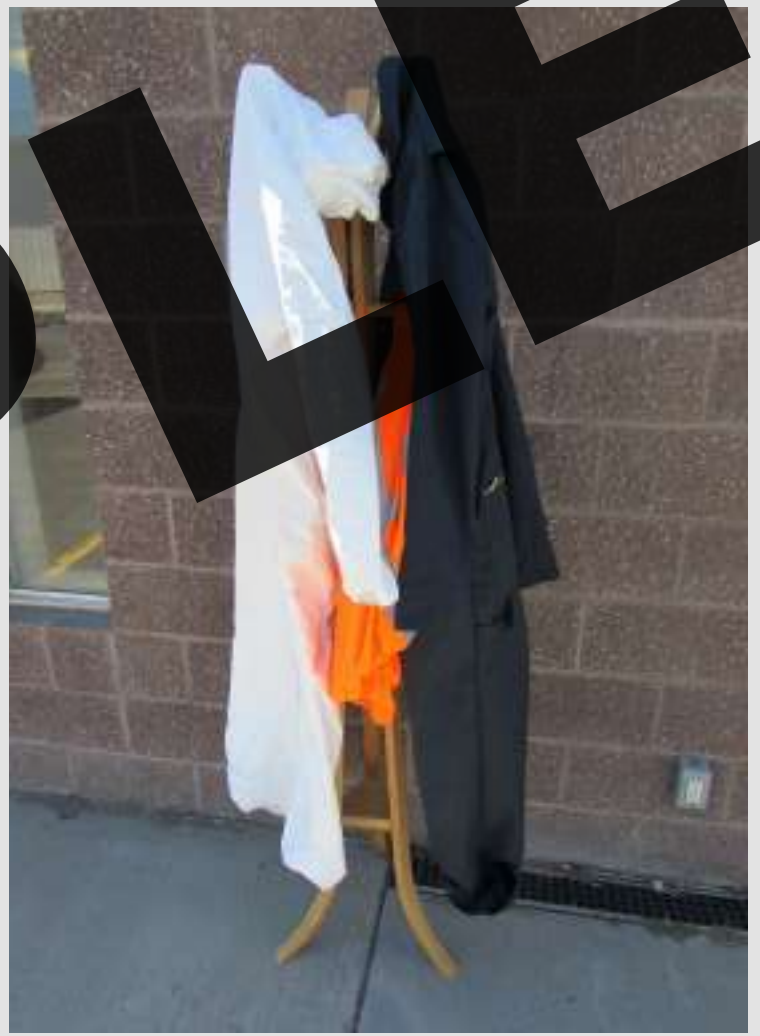
Permissible Exposure limit, or **PEL:** the maximum amount of exposure workers can have over a designated amount of time, usually eight hours.
Acceptable Ceiling Concentration: The maximum amount of a substance that a worker can be exposed to during a regular work day
Acceptable maximum peak: The maximum concentration a worker can be exposed to during a specified amount of time. This concentration will be higher than the acceptable ceiling concentration, as it is only for a brief time.

Regulated Areas: Areas that are marked off and designated by the employer where CO is or might be present. These areas should have appropriate warning signs. Only workers who have been properly trained should ever enter a regulated area.

Competent Person: One who is capable of recognizing CO hazards and has the authority to take immediate corrective measures to mitigate or eliminate them. A competent person should know how to test for CO, what to do in case of exposure, and how to respond to emergency situations.

Qualified Person: A qualified person has a degree, certificate, professional standing, extensive knowledge, training, or experience with whatever subject is being referenced. They will have the ability to identify, resolve, and solve issues in the particular field or work being performed.

The last term to become familiar with is **PPE (Personal Protective Equipment)**. This term refers to any equipment or gear used to help keep you safe.



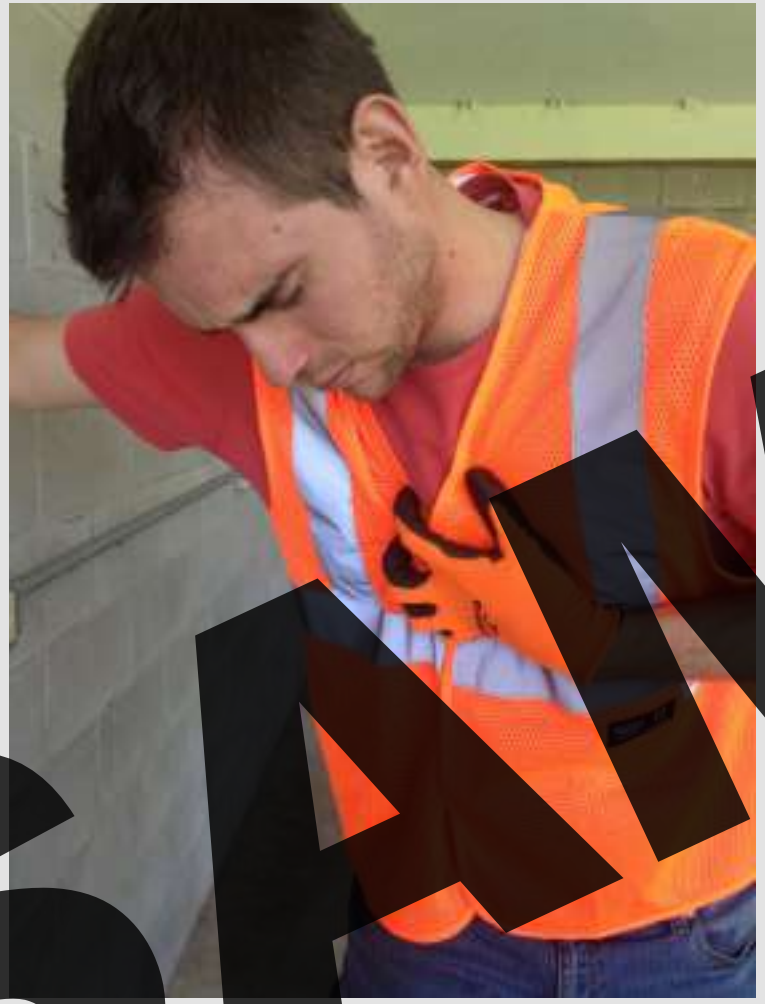
STANDARDS

- 1910 Subpart Z - Toxic and Hazardous Substances
  - 1910.1000 TABLE Z-2 - TABLE Z-2
- 1910.134 - Respiratory Protection
- 1910.146 – Permit-required confined spaces
  - 1910.146 App B – Procedures for Atmospheric Testing

These are some of the main standards concerning CO. Of course, states may have additional standards, as will some industries. We have provided these as a guide, but it's your responsibility to know all federal, state, local, and company rules that apply to CO on your jobsite.

OSHA has set the PEL for carbon monoxide to 50 ppm. However, the National Institute for Occupational Safety and Health (NIOSH) recommends that the exposure limit not exceed 35 ppm. Though it is not law, NIOSH also recommends a ceiling limit for CO to be 200 ppm.

The Mining Safety and Health Administration (MSHA) has set the allowed exposure limit to the threshold limit value recommended by the American conference of Governmental Industrial Hygienists. They recommend that employees are not exposed to more than 25 ppm of CO over an eight hour work day.



Carbon Monoxide is a killer and can cause serious damage to those who are exposed to it. Once it reaches higher levels (800 ppm) it can render one unconscious. Depending on the concentration, the gas can kill within an hour. To make it worse, it is entirely undetectable to our natural senses, going unnoticed while damaging your body.

Training

The purpose of this presentation is to help you understand the hazards that carbon monoxide presents and how to safely work when there is potential for exposure. At the completion of this training, workers should understand the risks, locations, and emergency procedures associated with CO. Training is vital for helping workers stay safe when jobs include risk of exposure to CO. No matter what controls, procedures, and precautions are implemented on a job, they will be worthless unless workers are trained on how to properly utilize them.

We will talk about how carbon monoxide can harm you, symptoms of exposure, and dangerous concentration levels of the gas.

We will talk about monitoring and identifying the location and possible hazards of carbon monoxide. We will also offer instruction on proper procedures for monitoring confined spaces and other areas that may contain CO.

We will go in depth on basic practices that will keep workers safe when a CO hazard is present. This will include monitoring, evacuation plans, confined space procedures, and emergency situations. These applications will vary according to jobsite. Employers should discuss the rules, procedures, and applications that are specific to your jobsite.

We will spend time going over the PPE that you must wear when the risk of CO is present. This will include instructions for the proper care of your PPE and donning and doffing PPE on worksites that might be exposed to CO.

Carbon monoxide exposure can be extremely dangerous and should be taken seriously. In 2015 nearly 400 deaths from unintentional CO poisoning occurred. The gas is invisible and completely odorless, making it impossible for you to know that you are being poisoned without special equipment. Luckily, with care and understanding, injuries and deaths from CO are preventable if the proper measures are taken.

Exposure