

Carbon Monoxide Emergency Familiarization

Overview

- **Introduction**
- **Carbon Monoxide (CO) Properties**
- **Possible sources of CO**
- **CO Health Hazards**
- **Suggested Fire Department Operational Guidelines**
- **CO levels – what they mean**
- **Review EFFPD CO Procedure**

Introduction

- **Background:**
 - **CO associated with 500 non-fire related deaths each year**
 - **60% of deaths from motor vehicle exhaust**
 - **40% of deaths from consumer products**

Properties of Carbon Monoxide

- **Odorless, colorless, tasteless, non-irritating gas**
- **Virtually undetectable without specialized equipment**
- **A natural by-product of incomplete combustion from equipment burning carbon based fossil fuels such as:**
 - **Gasoline**
 - **Wood**
 - **Coal**
 - **Propane**
 - **Oil**
 - **Methane**



Properties of Carbon Monoxide

- **Flammable gas**
 - Auto ignition temperature = 1128° F
 - Lower Explosive Limit 12.5%
 - Upper Explosive Limit 74%
- **Vapor Density of .968**
 - Slightly less than that air
 - CO will rise with warm air
 - CO disperses evenly once it cools

Possible Sources of CO

- **Attached garages with running automobiles**
- **Cooking and heating appliances**
 - **Improperly vented**
 - **Not serviced**
 - **Inefficient/improper operation**



Health Hazards

- A “silent killer”: CO will kill before its presence is known
- No early warning signs
- Displaces O₂ in the bloodstream
- Victims die from asphyxiation

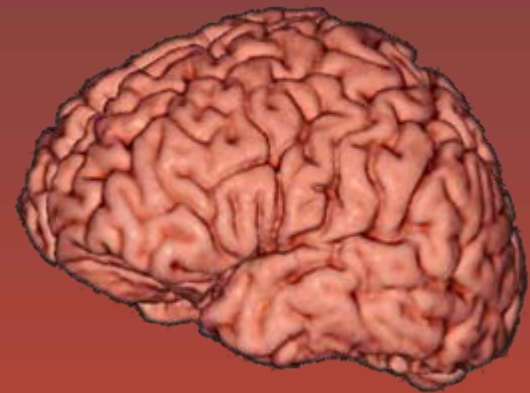
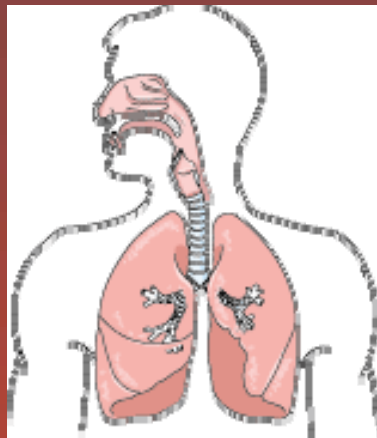


Health Hazards

- **Absorbed into the body through lungs**
- **Transferred to the blood**
- **Combines with hemoglobin to become carboxyhemoglobin (COHb)**
- **CO poisoning is measured by the % of COHb in the blood**

Health Hazards

- **Reduced O₂ reduces functions of the brain, cardiac muscle, and respiratory system**
- **CO has a greater affinity for hemoglobin than O₂ at 210 times to 1**



Health Hazards

- **Individual CO poisoning levels depend on several factors**
- **Initial COHb concentration**
- **Concentration of CO inhaled**
- **Length of exposure**
- **Activity while inhaling CO**
- **Body size and physiological factors**

Operational Guidelines

Dispatchers:

- **First point of contact with the public and must:**
 - **Know the properties of CO**
 - **Know signs and symptoms of CO exposure**
 - **Obtain pertinent information**
 - **Query reporting party to determine appropriate level of response**
 - **Dispatch appropriate emergency personnel and apparatus**
 - **Instruct occupants to evacuate and seek fresh air**

Operational Guidelines

Dispatchers (continued)

- Obtain signs and symptoms

- Head ache
- Nausea
- Dizziness/drowsiness
- Fatigue
- Confusion
- Fainting
- Irritability
- Loss of consciousness
- Unconsciousness
- Coma
- Death
- Seizure
- Permanent brain damage

Operational Guidelines

Dispatchers (continued)

- **Determine the following from the reporting party:**
 - **Are occupants experiencing signs and symptoms**
 - **Is a CO alarm sounding**



Operational Guidelines

Dispatchers (continued)

- Advise reporting party to:
 - Evacuate the structure
 - Do not re-enter under any circumstances



Operational Guidelines

Incident Commander

- **Determine level of assistance required**
- **Ensure EMS performs patient assessment**
 - **Treat and/or Transport**
- **Assess all possible CO sources (inside and outside the structure)**

Operational Guidelines

Incident Commander

- **NOTE: If CO is present in dangerous levels, an Immediately Dangerous to Life and Health (IDLH) atmosphere exists. You must consider the 2-in 2-out OSHA ruling. A Rapid Intervention Team in place may be appropriate.**

Operational Guidelines

Incident Commander (continued)

- **Conduct informal interview with occupants**
- **Determine if anyone is experiencing symptoms of CO Poisoning**
- **Locate fossil fuel powered appliances**
- **Ascertain where and what occupant activities were prior to their call**
- **Determine onset and length of time symptoms present**

Operational Guidelines

Operations

- **If interview determines likelihood of CO:**
 - **Evacuate the structure**
 - **Inspect exterior for blocked vents**
 - **Establish baseline CO meter readings outside structure**
 - **Record your measurements**
 - **Take measurement near entrance inside doorway**
 - **High and low at least 5 seconds at all points**

Operational Guidelines

Operations (continued)

- **Measure and record interior meter readings through out structure**
- **When checking CO producing appliances, do not take readings near vents or flue pipes**
 - **Allow at least 5 seconds at each measurement point**
- **Record all measurements taken**

Operational Guidelines

Operations (continued)

- **Upon locating source:**
 - **Open all windows and doors**
 - **Ventilate structure**
 - **Properly shut off and secure the appliance**
 - **Advise occupants not to use appliance until serviced by a licensed technician**
- **Occupants can return when levels fall below 9 ppm**
- **Reset the CO alarm device when possible**

Operational Guidelines

Operations (continued)

- **Advise the owner to call 911 if:**
 - **The CO alarm sounds again**
 - **They experience any signs or symptoms of CO poisoning**

CO Levels What They Mean

- **Less than 9 ppm**
- **Advise occupant you did not find high levels of CO**
- **If call was for CO alarm activation, review manufacturer's instructions**
- **If alarm was manufactured before Oct 1, 1998, replace the alarm**

CO Levels What They Mean

- **Levels above 9 ppm**
- **If located, turn off source of exposure**
- **If source is permanently installed, have occupant notify qualified service technician**
- **Advise occupant to have CO producing appliance serviced by a license professional at least annually**
- **Occupants may return when levels fall below 9 ppm**
- **If alarm manufactured prior to Oct 1, 1998, replace the alarm**

**EAST FORK FIRE AND PARAMEDIC DISTRICT
CARBON MONOXIDE DETECTOR ALARM RESPONSE POLICY**

Policy

It is the policy of the East Fork Fire and Paramedic Districts that response to Carbon Monoxide Detector Alarms will be carried out upon request from public and private sector interests and constituents within the fire district boundaries. Response will be conducted following the specific set of Operational and Response Procedures and Guidelines as prepared and adopted by the district.

Definition

Carbon Monoxide (CO) is an invisible, odorless, tasteless, gas produced by incomplete combustion. It is produced when fossil fuels burn incompletely or are exposed to heat. Carbon Monoxide has a vapor density of .98%. The Lower Explosive Limit (LEL) is 12.5% or 125,000 PPM and the Upper Explosive Limit is 75% or 750,000 PPM.

Potential sources of carbon monoxide in your home include your furnace, fireplace, water heater, space heaters, automobile, grill/barbecue, gas dryer, and stoves.

Procedure

The purpose of this procedure is to provide guidelines for responding to carbon monoxide alarms and emergencies within the East Fork Fire & Paramedic Districts. *Please remember, as with all procedural guides, the actual incident conditions may require alternative action.*

- 1.1 The minimum *hazardous materials* response will include one station, a paramedic rescue, and the duty chief.
- 1.2 Upon arrival, have all the occupants of the structure leave if they have not already done so.
- 1.3 If any of the occupants are symptomatic of carbon monoxide poisoning, give high flow oxygen, monitor vital signs, and notify the incoming paramedic rescue unit. Symptomatic or not, anyone suspected of a carbon monoxide exposure for any period of time, they need to be evaluated by an ALS unit.
- 1.4. Unless and immediate rescue situation exists, **DO NOT ENTER OR VENTILATE THE STRUCTURE** until the paramedic rescue has arrived with the gas detector. If an rescue entry must be made, personnel must don full protective equipment, including SCBA.
- 1.5. If there is ANY doubt whether the incident cause is the result of a natural gas or LPG leak, secure the fuel at the meter or tank.
- 1.6. Obtain briefing from the occupant(s) if possible, regarding the type and location of fuel burning appliances, building layout, and any other information which would be appropriate prior to entry .
- 1.7. Upon arrival of the paramedic rescue, an initial CO reading will be taken at the point of entry by a team consisting of two(2) persons. If the detector alarms, two(2) teams of two (2) shall

don full protective gear, including SCBA. One team will serve as the entry team while the second team shall serve as the back up team. The entry team shall proceed into the structure and begin to take readings with the gas detector. If no alarm is sounded at the point of entry, the team will proceed into the structure and conduct air sampling as necessary. If at any time, the carbon monoxide monitor indicates that the product is in excess of 12000 PPM, the procedure and policy will not apply, and appropriate steps should be taken relative to a possible explosion hazard

1.8. All readings and locations will be documented as they are gathered by the entry team.

1.9. If a source of exposure is isolated, the fuel supply to the source should be secured and the appropriate public utility or LPG supplier contacted.

1.10. Ventilate the structure using natural ventilation as a primary source of ventilation.

1.11. Occupants should not be allowed to re-occupy the structure until the public utility, LPG supplier, or other service personnel have arrived on scene and mitigated the cause, and/or alarm malfunction was verified.

1.12. Complete the necessary documentation and incident response forms. (SEE ATTACHEMENT A)

Medical Considerations

Persons with cardiac and respiratory problems, children and infants, and expectant mothers are more susceptible to carbon monoxide poisoning.

The "cherry red" skin color is rarely seen. More often, the victim(s) are pale and cyanotic. Pulse oximetry is NOT an accurate assessment tool.

Carbon Monoxide exposure is broken down into three degrees, each with varying symptoms.

Mild Exposure - Slight headache, nausea, vomiting, and fatigue

Medium Exposure - Throbbing headache, drowsiness, confusion, fast heart rate

Extreme Exposure - Convulsions, unconsciousness, heart and lung failure, death

Detector Operating Characteristics

Carbon Monoxide detectors are designed to alarm before there is an immediate life threat. Since you can't see or smell CO, never assume it is not present.

Carbon Monoxide detectors are designed to alarm under certain conditions and dependent upon the type of detector. Some detectors will "chirp" about once per minute, indicating a "**LOW BATTERY WARNING.**" A detector, which alarms for 3 to 5 seconds every 5 minutes, indicates An "**EARLY WARNING.**" A detector which alarms continuously, indicate a "**FULL ALARM.**" Some detectors provide a digital readout of the detected carbon monoxide level(s) in addition to the sounding of an alarm.

Precautionary Situations

Please be reminded, that this information will be applicable in the vast majority of cases, however, there are a few *“Watch Out”* situations you may need to consider....

If at any time, the carbon monoxide monitor indicates that the product is in excess of 12000 PPM, the procedure and policy will not apply, and appropriate steps should be taken relative to a possible explosion hazard.

You should also be aware of any “unusual circumstances” such as a vehicle which was found running in a garage for a long period of time as part of a possible suicide attempt, or history of several responses to the same location for detector activation.

Remember, no incident should be considered a routine call...

Documentation

The use of the gas detector and the actual monitoring should be conducted by specially trained personnel using appropriate equipment that has been maintained according to the manufacturer’s instructions, guidelines, and the districts procedures. During the evaluation and air sampling process of the procedure, all readings will be documented on the prescribed form (SEE ATTACHMENT A).

Four (4) specific circumstances will be identified with only one being selected to define the results of the air sampling.

Detector Malfunction - *“Our instruments did not detect any levels of Carbon Monoxide. The problem may be with you detector. We are advising you to contact the detector manufacturer for technical assistance and or consult your detector’s operation and installation manual”*

Less Than 10 PPM - *“Our instrument did not detect elevated levels at this time. Check your detector per the manufacturer’s recommendations You may need to install a new sensor module. If it activates again, please contact the fire department.”*

10 -99 PPM- *“We have detected potentially dangerous levels of CO. We recommend you leave your home immediately. It is not safe until repairs are made and replacement detector sensor module(s) is installed.”*

100 PPM or More - *“We have detected a potential lethal level of CO in your home. Leave your home immediately. It is not safe until repairs are made or the source is found and corrected. The Fire District or Douglas County Public Works Department will post the building as not suitable for occupancy.”*

Summary

- **Introduction**
- **Carbon Monoxide (CO) Properties**
- **Possible sources of CO**
- **CO Health Hazards**
- **CO levels – what they mean**
- **Review of EFFPD CO Procedure**