

Firefighters guidance note #6-XX: Carbon dioxide hazards

Special considerations for safely responding to incidents involving carbon dioxide gas or liquid.

Issued: December 2017

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Background

Firefighters may be exposed to the hazard of carbon dioxide in the course of their work.

Concerns/hazards

At high concentrations, carbon dioxide can displace oxygen in the air, depriving the body of oxygen. This can cause unconsciousness. Carbon dioxide also acts as a strong central nervous system depressant.

Actions for employers

Employers should:

- incorporate the principles set out in this guidance note into their standard operating procedures/operating guidelines
- consider consulting with their joint health and safety committee or health and safety representative when developing procedures/guidelines

Carbon dioxide

Here are some basic facts about carbon dioxide, or CO₂:

- CO₂ is a colourless and odourless gas that cannot be detected by human senses
- the main route of CO₂ exposure is through inhalation
- at high concentrations, CO₂ is considered an asphyxiant because it can displace oxygen in the air
- it is a strong central nervous system depressant
- liquid CO₂ is stored at extremely low, or cryogenic, temperatures - direct contact with the liquid or cold vapors can chill or freeze the skin

A lack of oxygen can lead to various symptoms, such as:

- rapid breathing
- rapid heart rate
- clumsiness
- emotional upset
- fatigue
- nausea and vomiting
- collapse
- convulsions
- coma
- death

Symptoms occur more quickly with physical effort due to the increased rate of inhalation.

Exposure locations

Historically, CO₂ was typically delivered in pressurized cylinders to businesses serving carbonated beverages or draft beer.

Large volumes of cryogenic liquefied gas may be contained in a Dewar - a double-walled flask of metal or silvered glass with a vacuum between the walls, used to hold liquids at well below ambient temperature. These Dewars can be located either inside or outside the building and are refilled from a delivery vehicle.

CO₂ systems can be found in commercial and industrial establishments, including brew-your-own-beer and wine establishments.

Response considerations

Occupants may report CO₂ alarms as carbon monoxide alarms. Self-contained breathing apparatus (SCBA), should be used to investigate.

When responding to a location where CO₂ is stored, be alert to the possibility that CO₂ may be leaking from the delivery systems. Wear appropriate personal protective equipment including gloves and SCBA.

Possible exposure signs to be alert for include:

- more than one victim with the symptoms listed above
- unconscious victims located in unventilated spaces
- CO₂ alarms sounding
- reports of leaking CO₂ from occupants

If a CO₂ leak is suspected, consider the following measures:

- put on SCBA and begin ventilating the building
- positive-pressure ventilation to remove CO₂, especially from below-ground areas, because of the high vapour density
- remove victims from the hazard area immediately, provide supplemental oxygen and contact emergency medical services

- if safe to do so, shut off, isolate or move the leaking cylinder or Dewar while wearing structural firefighting gear, including gloves and SCBA
- if it is not safe to shut off, isolate or move the leaking cylinder or Dewar, withdraw and treat the scene as a hazardous materials incident
- contact the supplier and the Technical Standards and Safety Authority in all cases of CO₂ leaks
- make sure the area is safe, by testing for the presence of CO₂, before permitting occupants to re-enter

Applicable regulations, acts and standards

Read:

- [Occupational Health and Safety Act](#)
 - clause 25(2)(a) for providing information and instruction to a worker
 - clause 25(2)(d) for making workers aware of hazards
 - clause 25(2)(h) for taking every precaution reasonable to protect workers
 - *Ontario Regulation 833 - [Control of Exposure to Biological or Chemical Agents](#)*
 - section 4 for the short term exposure limit for CO₂ of 30,000 parts per million and the time weighted average for CO₂ of 5,000 parts per million, as set out in the 2013 ACGIH Table
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Related

Read all firefighters guidance notes

This resource does not replace the *Occupational Health and Safety Act* (OHSA) and its regulations, and should not be used as or considered legal advice. Health and safety inspectors apply the law based on the facts in the workplace.
