

Chemical Profiles

Carbon Dioxide

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What are other names or identifying information for carbon dioxide?

CAS Registry No.: 124-38-9

Other Names: CO₂, Liquefied carbon dioxide, Refrigerated carbon dioxide

Main Uses: Manufacture of other chemicals, food processing, numerous other uses

Appearance: Colourless gas.

Odour: Odourless

Canadian TDG: UN1013, UN2187

What is the WHMIS classification?

According to the Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST) [carbon dioxide](#) (gas) can be classified as:

Gases under pressure - Compressed gas



The signal word is warning.

Hazard statement includes:

- Contains gas under pressure; may explode if heated

Note: Carbon dioxide has been classified by the American Conference of Governmental Industrial Hygienists (ACGIH) as an asphyxiant.

Please note that this classification was retrieved from the [CNESST](#) site on December 5, 2023 and was established by CNESST personnel to the best of their knowledge based on data obtained from scientific literature, and it incorporates the criteria contained in the *Hazardous Products Regulations* (SOR/2015-17). It does not replace the supplier's classification which can be found on its Safety Data Sheet.

What are the most important things to know about carbon dioxide in an emergency?

Emergency Overview: Colourless gas. Odourless. Will not burn. COMPRESSED GAS. Contains refrigerated gas. May explode if heated. CONFINED SPACE HAZARD. Can accumulate in hazardous amounts in low-lying areas especially inside confined spaces. ASPHYXIANT. High concentrations can displace oxygen in air and cause suffocation. May cause frostbite.

What are the potential health effects of carbon dioxide?

Main Routes of Exposure: Inhalation

- **Inhalation:** Low concentrations are not harmful. Higher concentrations can affect respiratory function and cause excitation followed by depression of the central nervous system. A high concentration can displace oxygen in the air. If less oxygen is available to breathe, symptoms such as headache, rapid breathing, rapid heart rate, clumsiness, emotional upsets and fatigue can result. As less oxygen becomes available, nausea and vomiting, collapse, convulsions, coma and death can occur. Symptoms occur more quickly with physical effort. Lack of oxygen can cause permanent damage to organs including the brain and heart.
- **Skin Contact:** Not irritating. Direct contact with the liquefied gas can chill or freeze the skin (frostbite). Symptoms of mild frostbite include numbness, prickling and itching. Symptoms of more severe frostbite include a burning sensation and stiffness. The skin may become waxy white or yellow. Blistering, tissue death and infection may develop in severe cases.
- **Eye Contact:** May cause mild irritation. Direct contact with the liquefied gas can freeze the eye. Permanent eye damage or blindness can result.
- **Ingestion:** Not a relevant route of exposure (gas).
- **Effects of Long-Term (Chronic) Exposure:** Not harmful.
- **Carcinogenicity:** Not known to cause cancer.
 - International Agency for Research on Cancer (IARC): Not specifically evaluated.
 - American Conference for Governmental Industrial Hygienists (ACGIH): Not specifically designated.
- **Teratogenicity / Embryotoxicity:** Not known to harm the unborn child.
- **Reproductive Toxicity:** Not known to be a reproductive hazard.
- **Mutagenicity:** Not known to be a mutagen.

What are first aid measures for carbon dioxide?

Inhalation: In case of oxygen deficiency: take precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment). If breathing is difficult, trained personnel should administer emergency oxygen. If the heart has stopped, trained personnel should start cardiopulmonary resuscitation (CPR) or automated external defibrillation (AED). Get medical attention immediately. Treatment is urgently required. Transport to a hospital.

Skin Contact: Not applicable (gas). Liquefied gas: quickly remove victim from source of contamination. DO NOT attempt to rewarm the affected area on site. DO NOT rub area, flush with water, or apply direct heat. Carefully cut around clothing that sticks to the skin and remove the rest of the garment. Do not remove frozen clothing from frostbitten areas. Loosely cover the affected area with a sterile dressing. DO NOT allow victim to drink alcohol or smoke. Get medical attention immediately.

Eye Contact: Not applicable (gas). Liquefied gas: immediately and flush with large amounts of gently flowing water for at least 15 minutes, occasionally lifting the upper and lower eyelids. DO NOT attempt to rewarm. Cover both eyes with a sterile dressing. DO NOT allow victim to drink alcohol or smoke. Get medical attention immediately. Treatment is urgently required. Transport to a hospital.

Ingestion: Not applicable (gas).

First Aid Comments: Some of the first aid procedures recommended here require advanced first aid training. All first aid procedures should be periodically reviewed by a medical professional familiar with the chemical and its conditions of use in the workplace.

What are fire hazards and extinguishing media for carbon dioxide?

Flammable Properties: Does not burn.

Suitable Extinguishing Media: Not combustible. Use extinguishing agent suitable for surrounding fire.

Specific Hazards Arising from the Chemical: Can displace oxygen in the air, causing suffocation. Gas may accumulate in hazardous amounts in low-lying areas especially inside confined spaces, resulting in a health hazard. Closed containers may rupture violently when heated releasing contents. In a fire, the following hazardous materials may be generated: very toxic carbon monoxide, carbon dioxide.

What are the stability and reactivity hazards of carbon dioxide?

- **Chemical Stability:** Normally stable.
 - **Conditions to Avoid:** High temperatures. Temperatures above 52.0 °C (125.6 °F)
 - **Incompatible Materials:** Increased risk of fire and explosion on contact with: metal powder or dusts. Not corrosive to metals.
 - **Hazardous Decomposition Products:** None known.
 - **Possibility of Hazardous Reactions:** None known.
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What are unintentional release measures for carbon dioxide?

Personal Precautions: Increase ventilation to area or move leaking container to a well-ventilated and secure area. Vapour or gas may accumulate in hazardous amounts in low-lying areas especially inside confined spaces, if ventilation is not sufficient.

Methods for Containment and Clean-up: Stop or reduce leak if safe to do so. Ventilate the area to prevent the gas from accumulating, especially in confined spaces.

What handling and storage practices should be used when working with carbon dioxide?

Handling: Prevent unintentional contact with incompatible chemicals. Use the pressure regulator appropriate for cylinder pressure and contents. Secure cylinder in an up-right position. Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. If used in a confined space, check for oxygen deficiency before worker entry and during work.

Storage: Store in an area that is: cool, dry, well-ventilated, out of direct sunlight and away from heat and ignition sources, temperature-controlled, secure and separate from work areas, on the ground floor or preferably, if storing in large volumes, in an isolated, detached building. Always secure (e.g. chain) cylinders in an upright position to a wall, rack or other solid structure.

What is the American Conference of Governmental Industrial Hygienists (ACGIH®) recommended exposure limit for carbon dioxide?

ACGIH® TLV® - TWA: 5000 ppm

ACGIH® TLV® - STEL [C]: 30000 ppm

Exposure Guideline Comments: TLV® = Threshold Limit Value. TWA = Time-Weighted Average. STEL = Short-term Exposure Limit. C = Ceiling limit.

Adapted from: 2022 TLVs® and BEIs® - Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati: American Conference of Governmental Industrial Hygienists (ACGIH)

NOTE: In many (but not all) Canadian jurisdictions, the exposure limits are similar to the ACGIH® TLVs®. Since legislation varies by jurisdiction, contact your local jurisdiction for exact details. A list is available in the OSH Answers on [Canadian Governmental Occupational Health & Safety Departments](#).

A list of which acts and regulations that cover [exposure limits to chemical and biological agents](#) is available on our website. Please note that while you can see the list of legislation for free, you will need a subscription to view the actual documentation.

What are the engineering controls for carbon dioxide?

Engineering Controls: Use local exhaust ventilation, if general ventilation is not adequate to control amount in the air.

What Personal Protective Equipment (PPE) is needed when working with carbon dioxide?

Eye/Face Protection: Wear chemical safety goggles. (frost bite).

Skin Protection: Always wear insulated protective clothing, if contact with refrigerated gas is possible.

Respiratory Protection:

Up to 40000 ppm:

(APF = 10) Any supplied-air respirator.

(APF = 50) Any self-contained breathing apparatus with a full facepiece.

APF = Assigned Protection Factor

Recommendations apply only to National Institute for Occupational Safety and Health (NIOSH) approved respirators. Refer to the [NIOSH Pocket Guide to Chemical Hazards](#) for more information.

Fact sheet last revised: 2024-01-16

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