



MATERIAL SAFETY DATA SHEET

PRODUCT NAME: CARBON DIOXIDE, REFRIGERATED LIQUID

1. Chemical Product and Company Identification

**BOC Gases,
Division of,
The BOC Group, Inc.
575 Mountain Avenue
Murray Hill, NJ 07974**

**BOC Gases
Division of
BOC Canada Limited
5975 Falbourne Street, Unit 2
Mississauga, Ontario L5R 3W6**

**TELEPHONE NUMBER: (908) 464-8100
24-HOUR EMERGENCY TELEPHONE
NUMBER: CHEMTREC (800) 424-9300**

**TELEPHONE NUMBER: (905) 501-1700
24-HOUR EMERGENCY TELEPHONE
NUMBER: (905) 501-0802
EMERGENCY RESPONSE PLAN NO: 2-0101**

**PRODUCT NAME: CARBON DIOXIDE, REFRIGERATED LIQUID
CHEMICAL NAME: Carbon Dioxide
COMMON NAMES/SYNONYMS: Carbonic Anhydride, Refrigerated Liquid
TDG (Canada) CLASSIFICATION: 2.2
WHMIS CLASSIFICATION: A**

**PREPARED BY: Loss Control (908)464-8100/(905)501-1700
PREPARATION DATE: 6/1/95
REVIEW DATES: 6/1/99**

2. Composition, Information on Ingredients

EXPOSURE LIMITS¹:

| INGREDIENT | % VOLUME | PEL-OSHA² | TLV-ACGIH³ | LD₅₀ or LC₅₀ Route/Species |
|---|-----------------|-----------------------------|--------------------------------|---|
| Carbon Dioxide FORMULA: CO ₂ CAS: 124-38-9 RTECS #: FF6400000 | 99.8 TO 99.999 | 5000 ppm TWA | 5000 ppm TWA 30000 ppm STEL | Not Available |

¹ Refer to individual state of provincial regulations, as applicable, for limits which may be more stringent than those listed here.
² As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)
³ As stated in the ACGIH 1998-1999 Threshold Limit Values for Chemical Substances and Physical Agents.

IDLH (Carbon Dioxide): 40,000 ppm

OSHA Regulatory Status: This material is classified as hazardous under OSHA regulations.

3. Hazards Identification

EMERGENCY OVERVIEW
Odorless, colorless, non-flammable liquefied gas. Maintain oxygen levels above 19.5%. Carbon dioxide exposure can cause nausea and respiratory problems. High concentrations may cause vasodilation leading to circulatory collapse. Contact with liquid product may cause frostbite in exposed tissues. Contents under pressure. Use and store below 125 °F.

PRODUCT NAME: CARBON DIOXIDE, REFRIGERATED LIQUID

ROUTE OF ENTRY:

| | | | | |
|---------------------|-----------------------|--------------------|-------------------|------------------------|
| Skin Contact Yes | Skin Absorption No | Eye Contact Yes | Inhalation Yes | Ingestion No |
|---------------------|-----------------------|--------------------|-------------------|------------------------|

HEALTH EFFECTS:

| | | |
|--------------------------------------|---------------------------|---------------------|
| Exposure Limits Yes | Irritant No | Sensitization No |
| Teratogen No | Reproductive Hazard No | Mutagen No |
| Synergistic Effects None reported | | |

Carcinogenicity: -- NTP: No IARC: No OSHA: No

EYE EFFECTS:

Contact with evaporating liquid may cause frostbite.

SKIN EFFECTS:

Contact with liquefied product may cause frostbite upon evaporation. Frostbite effects are a change in color of the skin to gray or white, possibly followed by blistering. Skin may become inflamed and painful.

INGESTION EFFECTS:

Ingestion is unlikely. Contact with liquid may cause frostbite.

INHALATION EFFECTS:

Carbon dioxide is a cerebral vasodilator. Inhaling large concentrations can cause rapid circulatory insufficiency leading to coma and death. Chronic, harmful effects are not known from repeated inhalation of low concentrations. Low concentrations of carbon dioxide cause increased respiration and headache.

Product may also act as asphyxiant. Effects of oxygen deficiency may include: rapid breathing, diminished mental alertness, impaired muscular coordination, faulty judgement, depression of all sensations, emotional instability, and fatigue. As asphyxiation progresses, nausea, vomiting, prostration, and loss of consciousness may result, eventually leading to convulsions, coma, and death.

Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known.

NFPA HAZARD CODES

Health: 3
Flammability: 0
Instability: 0

HMIS HAZARD CODES

Health: 3
Flammability: 0
Reactivity: 0

RATINGS SYSTEM

0 = No Hazard
1 = Slight Hazard
2 = Moderate Hazard
3 = Serious Hazard
4 = Severe Hazard

4. First Aid Measures

EYES:

Never introduce oil or ointment into the eyes without medical advice! In case of freezing or cryogenic "burns" by rapidly evaporating liquid. DO NOT WASH THE EYES WITH HOT OR EVEN TEPID WATER! Remove victim from the source of contamination. Open eyelids wide to allow liquid to evaporate. If pain is present, refer the victim to an ophthalmologist for further treatment and follow up. If the victim cannot tolerate light, protect eyes with a light bandage or handkerchief.

SKIN:

Remove contaminated clothing and flush affected area with cold water and soap. DO NOT USE HOT WATER. A physician should see the patient promptly if frostbite has occurred.

INGESTION:

A physician should see the patient promptly if frostbite has occurred.

INHALATION:

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO CARBON DIOXIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

5. Fire Fighting Measures

| | | |
|--|---------------------------|-----------------------------------|
| Conditions of Flammability: Nonflammable | | |
| Flash point: None | Method: Not Applicable | Autoignition Temperature: None |
| LEL(%): None | | UEL(%): None |
| Hazardous combustion products: None | | |
| Sensitivity to mechanical shock: None | | |
| Sensitivity to static discharge: None | | |

FIRE AND EXPLOSION HAZARDS:

Nonflammable. Cylinder may rupture violently from pressure when involved in a fire situation.

EXTINGUISHING MEDIA:

None required. Use as appropriate for surrounding materials.

FIRE FIGHTING INSTRUCTIONS:

Firefighters should wear respiratory protection (SCBA) and full turnout or Bunker gear. Continue to cool fire-exposed containers until well-after flames are extinguished.

6. Accidental Release Measures

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in container or container valve, contact the appropriate emergency telephone number listed in Section 1 or call your closest BOC location.

7. Handling and Storage

Electrical Classification:

Non-Hazardous.

This liquefied gas is noncorrosive and may be used with all common structural materials.

Dry carbon dioxide can be handled in most common structural materials. Moist carbon dioxide is generally corrosive by its formation of carbonic acid. For applications with moist Carbon Dioxide, 316, 309 and 310 stainless steels may be used as well as Hastelloy® A, B, & C, and Monel®. Ferrous Nickel alloys are slightly susceptible to corrosion. At normal temperatures carbon dioxide is compatible with most plastics and elastomers.

Use only in well-ventilated areas. Carbon dioxide vapor is heavier than air and will accumulate in low areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll containers. Use a suitable hand truck for container movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping or systems. Do not heat containers by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the system.

Protect containers from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where containers are stored to exceed 125°F (52 C). Containers should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full containers being stored for excessive periods of time.

For additional information, consult the Compressed Gas Association (CGA) pamphlets P-1, G-6 Carbon Dioxide, G-6.1 Standard for Low Pressure Carbon Dioxide Systems at Consumer Sites, G-6.3 Carbon Dioxide Filling and Handling Procedures for Beverage Plants, and SB-2. Never carry a compressed gas cylinder or a container of a gas in cryogenic liquid form in an enclosed space such as a car trunk, van or station wagon. A leak can result in a fire, explosion, asphyxiation or a toxic exposure.

8. Exposure Controls, Personal Protection

ENGINEERING CONTROLS:

Local exhaust to control air contaminants to at or below acceptable exposure guidelines and maintain atmospheric oxygen at 19.5%.

EYE/FACE PROTECTION:

Safety goggles with faceshield where contact with liquid is possible.

SKIN PROTECTION:

Protective gloves of any material appropriate for the job. Insulated gloves are recommended for cryogenic liquids.

RESPIRATORY PROTECTION:

Positive pressure air line with full-face mask and escape bottle or self-contained breathing apparatus should be available for emergency use.

OTHER/GENERAL PROTECTION:

Safety shoes, emergency showers

9. Physical and Chemical Properties

| PARAMETER | VALUE | UNITS |
|--|--|-------|
| Physical state (gas, liquid, solid) | : Cryogenic liquid | |
| Vapor pressure at 70°F | : 856 | psia |
| Vapor density at 70°F, 1 atm (Air = 1) | : 1.53 | |
| Evaporation point | : Not Available | |
| Boiling point (CO ₂ Sublimes) | : -109.3 | °F |
| | : -78.5 | °C |
| Freezing point | : -69.8 | °F |
| | : -56.6 | °C |
| PH | : Not Available | |
| Specific gravity | : Not Available | |
| Oil/water partition coefficient | : Not Available | |
| Solubility (H ₂ O) | : Very soluble | |
| Odor threshold | : Not Applicable | |
| Odor and appearance | : A colorless, clear liquid which evaporates to a colorless, odorless gas. | |

10. Stability and Reactivity

STABILITY:

Stable

INCOMPATIBLE MATERIALS:

Certain reactive metals, hydrides, moist cesium monoxide, or lithium acetylene carbide diamino may ignite. Passing carbon dioxide over a mixture of sodium peroxide and aluminum or magnesium may explode.

HAZARDOUS POLYMERIZATION:

Will not occur.

11. Toxicological Information

REPRODUCTIVE:

Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.

Exposure of female rats to 60,000 ppm carbon dioxide for 24 hours has produced toxic effects to the embryo and fetus in pregnant rats. Toxic effects to the reproductive system have been observed in other mammalian species at similar concentrations.

OTHER:

Inhaling high concentrations of carbon dioxide may cause circulatory insufficiency leading to coma and death. Chronic, harmful effects are not known from repeated inhalation of low (3 to 5 molar %) concentrations.

12. Ecological Information

No data given.

PRODUCT NAME: CARBON DIOXIDE, REFRIGERATED LIQUID

13. Disposal Considerations

Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to BOC Gases or authorized distributor for proper disposal.

14. Transport Information

| PARAMETER | United States DOT | Canada TDG |
|------------------------|-------------------------------------|-------------------------------------|
| PROPER SHIPPING NAME: | Carbon Dioxide, refrigerated liquid | Carbon Dioxide, refrigerated liquid |
| HAZARD CLASS: | 2.2 | 2.2 |
| IDENTIFICATION NUMBER: | UN 2187 | UN 2187 |
| SHIPPING LABEL: | NONFLAMMABLE GAS | NONFLAMMABLE GAS |

15. Regulatory Information

SARA TITLE III NOTIFICATIONS AND INFORMATION

SARA TITLE III HAZARD CLASSES:

Acute Health Hazard

Sudden Release of Pressure Hazard

16. Other Information

| | |
|-------|---|
| ACGIH | American Conference of Governmental Industrial Hygienists |
| DOT | Department of Transportation |
| IARC | International Agency for Research on Cancer |
| NTP | National Toxicology Program |
| OSHA | Occupational Safety and Health Administration |
| PEL | Permissible Exposure Limit |
| SARA | Superfund Amendments and Reauthorization Act |
| STEL | Short Term Exposure Limit |
| TDG | Transportation of Dangerous Goods |
| TLV | Threshold Limit Value |
| WHMIS | Workplace Hazardous Materials Information System |

Compressed gas cylinders shall not be refilled without the express written permission of the owner. Shipment of a compressed gas cylinder which has not been filled by the owner or with his/her (written) consent is a violation of transportation regulations.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:

Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).