

PRODUCT NAME: CARBON MONOXIDE**1. 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 MONOXIDE
CHEMICAL NAME: Carbon Monoxide
COMMON NAMES/SYNONYMS: Carbonic Oxide, Exhaust Gas, Flue Gas
TDG (Canada) CLASSIFICATION: 2.3 (2.1)
WHMIS CLASSIFICATION: A, D1A, D2A, B1**

**PREPARED BY: Loss Control (908)464-8100/(905)501-1700
PREPARATION DATE: 6/1/95
REVIEW DATES: 06/18/04**

2. Composition, Information on Ingredients**EXPOSURE LIMITS¹:**

INGREDIENT	% VOLUME	PEL-OSHA²	TLV-ACGIH³	LD₅₀ or LC₅₀ Route/Species
Carbon Monoxide FORMULA: CO CAS: 630-08-0 RTECS #: FG3500000	100.0	50 ppm TWA	25 ppm TWA	LC ₅₀ : 3760 ppm Inhalation/rat (1 H, time adjusted)

¹ Refer to individual state or 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 2004 Threshold Limit Values for Chemical Substances and Physical Agents.

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

3. Hazards Identification**EMERGENCY OVERVIEW**

Odorless, colorless, highly flammable, poison gas. Inhalation of carbon monoxide can reduce the ability of the blood to carry oxygen to the body. Effects depend on the level of exposure and may include headaches, dizziness, convulsions, loss of consciousness and death. May adversely affect fetal development. Dangerous fire and explosion hazard. Avoid heat, sparks, and flames. Contents under pressure. Use and store below 125 °F.

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ROUTE OF ENTRY:

Skin Contact No	Skin Absorption No	Eye Contact No	Inhalation Yes	Ingestion No
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HEALTH EFFECTS:

Exposure Limits Yes	Irritant No	Sensitization No
Teratogen Yes	Reproductive Hazard Yes	Mutagen Yes
Synergistic Effects None Reported		

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

EYE EFFECTS: Contact with rapidly expanding gas near the point of release may cause frostbite.

SKIN EFFECTS: Contact with rapidly expanding gas near the point of release may cause frostbite with redness, skin color change to gray or white, and blistering.

INGESTION EFFECTS: None reported.

INHALATION EFFECTS: Carbon monoxide is odorless and colorless. There may be no warning of overexposure until symptoms occur. Inhaled carbon monoxide binds with blood hemoglobin to form carboxyhemoglobin, a substance that can not take part in normal oxygen transport. This greatly reduces the blood's ability to transport oxygen. Depending on levels and duration of exposure, symptoms may include headache, dizziness, heart palpitations, weakness, confusion, nausea, convulsions, eventual unconsciousness and death. Lack of oxygen caused by overexposure to carbon monoxide may produce immediate as well as delayed neurological problems. Inhalation of carbon monoxide may also adversely affect fetal development.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known. Individuals with anemia, lung disease, cerebrovascular disease, heart disease, smokers, and children are expected to be more susceptible to the effects of carbon monoxide.

POTENTIAL ENVIRONMENTAL EFFECTS: Ecotoxicity values were unavailable. Toxic effects are expected to be similar to those seen in humans and test animals.

4. First Aid Measures

EYES: None required for gas. If frostbite is suspected, flush eyes with cool water for 15 minutes and obtain immediate medical attention.

SKIN EFFECTS: None required for gas. For frostbite, immerse skin in lukewarm water. DO NOT USE HOT WATER. Obtain medical attention. .

INGESTION: None required.

INHALATION: Conscious persons should be assisted to an uncontaminated area and be treated with supplemental oxygen. Quick removal from the contaminated area is most important. If breathing is difficult, administer oxygen. Unconscious persons should be moved to an uncontaminated area and be given artificial respiration and oxygen at the same time. The administering of the oxygen at an elevated pressure (up to 2 to 2.5 atmospheres) has shown to be beneficial as has treatment in a hyperbaric chamber. The physician should be informed that the patient has inhaled toxic quantities of carbon monoxide. PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO CARBON MONOXIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD.

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5. Fire Fighting Measures

Conditions of Flammability: Flammable gas		
Flash point: Not Available	Method: Not Applicable	Autoignition: Temperature: 116 °F (639 °C)
LEL(%): 12.5	UEL(%): 74.0	
Hazardous combustion products: None		
Sensitivity to mechanical shock: None		
Sensitivity to static discharge: Not Available		

FIRE AND EXPLOSION HAZARDS:

Having almost the same density as air, carbon monoxide will not diffuse by rising. Flammable in air over a very wide range. It reacts violently with oxygen difluoride and barium peroxide. Cylinder may vent rapidly or rupture violently under fire conditions.

EXTINGUISHING MEDIA:

Stop the flow of gas before extinguishing fire. Water, dry chemical, carbon dioxide.

FIRE FIGHTING INSTRUCTIONS:

If possible, stop the flow of gas. Inerting the atmosphere to reduce oxygen levels may extinguish flame, allowing capping of leaking container. Do not attempt this unless specifically trained. Reduce the rate of flow and inject an inert gas, if possible, before completely stopping the flow to prevent flashback. Do not extinguish the fire until the supply is shut off as otherwise an explosive re-ignition may occur. If the fire is extinguished and the flow of gas continues, use increased ventilation to prevent build-up of explosive atmosphere. Use non-sparking tools to close container valves.

Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers. Direct 500 GPM water stream onto containers above liquid level with remote monitors. Limit the number of personnel in proximity of fire and evacuate surrounding areas in all directions.

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

6. Accidental Release Measures

Immediately extinguish all ignition sources and evacuate all personnel from affected area. No smoking, flares, sparks, or flames in hazard area. Use appropriate protective equipment (See Section 8). Stop the flow of gas or remove cylinder to outdoor location if this can be done without risk. Provide maximum explosion-proof ventilation and ventilate enclosed areas. Consult a HAZMAT specialist and the appropriate emergency telephone number in Section 1 or your closest BOC location. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs.

7. Handling and Storage

Electrical Classification: Class 1, Group C

Earth-ground and bond all lines and equipment associated with the carbon monoxide system. All equipment should be non-sparking or explosion proof.

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Carbon Monoxide can be handled in all commonly used metals up to approximately 500 psig (3450 kPa). Above that pressure it forms toxic and corrosive carbonyl compounds with some metals. Carbon steels, aluminum alloys, copper and copper alloys, low carbon stainless steels and nickel-based alloys such as Hastelloy A, B & C are recommended for higher pressure applications.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated areas away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 125°F (52°C). Cylinders 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 cylinders being stored for excessive periods of time. Post "NO SMOKING OR OPEN FLAMES" signs in the storage area or use area. There should be no sources of ignition in the storage area or use area.

Use only in well-ventilated 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 cylinders. Use a suitable hand truck for cylinder movement. Use a pressure-reducing regulator when connecting cylinder to lower pressure piping or systems. Do not heat cylinder 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. Do not insert any object (i.e.: screwdriver) into valve cap openings as this can damage the valve causing leakage.

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.

For additional recommendations, consult Compressed Gas Association Pamphlet P-1.

8. Exposure Controls, Personal Protection

ENGINEERING CONTROLS:

Use local exhaust and general ventilation systems to control air contaminants at or below acceptable exposure guidelines and prevent build up of flammable concentrations. Small quantities can be handled in forced ventilation hoods. If product is handled routinely where the potential for leaks exists, all electrical equipment must be rated for use in potentially flammable atmospheres. Consult the National Electrical Code for details.

EYE/FACE PROTECTION:

Safety goggles or glasses.

SKIN PROTECTION:

Protective gloves suitable for the job.

RESPIRATORY PROTECTION:

For emergency release and conditions with exposures above the applicable exposure limits use a positive pressure NIOSH approved air-supplying respirator systems (SCBA or airline/escape bottle) using a full-face mask and at a minimum Grade D air.

OTHER/GENERAL PROTECTION:

Safety shoes, eyewash station.

9. Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure	: >220.4	Psia
Vapor density (Air = 1)	: Not Available	
Evaporation point	: Not Available	
Boiling point	: -312.7	°F
	: -191.5	°C
Freezing point	: -337.1	°F
	: -205.1	°C
pH	: Not Available	
Specific gravity	: 0.96	
Oil/water partition coefficient	: Not Available	
Solubility (H ₂ O)	: Very slight	
Odor threshold	: Not Applicable	
Odor and appearance	: Odorless; colorless gas	

10. Stability and Reactivity

STABILITY: Stable

INCOMPATIBLE MATERIALS/CONDITIONS: Oxidizers. Avoid heat, sparks, and flame.

HAZARDOUS DECOMPOSITION PRODUCTS: Carbon dioxide

HAZARDOUS POLYMERIZATION: Will not occur.

11. Toxicological Information

INHALATION: The 4 hour LC₅₀ for carbon monoxide is 1807 ppm (rat).

SKIN AND EYE: Does not cause skin or eye irritation.

OTHER: Mice exposed to concentrations of carbon monoxide at 65 ppm and higher demonstrated dose-dependent effects on the fetus (i.e.: increased mortality and decreased weight) with no signs of maternal toxicity. Offspring of rats exposed at 150 ppm carbon monoxide had minor reductions in birth weight and persistent memory deficits which became more pronounced in adulthood. Fetal carboxyhemoglobin levels are generally 10-15% higher than maternal levels. Overexposure to carbon monoxide may also decrease the likelihood of successful pregnancy. In rats treated with carbon monoxide, the rate of successful pregnancy in the control group was 100% whereas the rate of successful pregnancy in animals treated with 30 and 90 ppm CO was 69% and 38% respectively.

Genetic changes observed in mammalian cell assay systems at exposures of 1500 to 2500 ppm for 10 minutes.

12. Ecological Information

Product does not contain Class I or Class II ozone depleting substances.

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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 Monoxide, compressed	Carbon Monoxide, compressed
HAZARD CLASS:	2.3 (2.1)	2.3 (2.1)
IDENTIFICATION NUMBER:	UN 1016	UN 1016
SHIPPING LABEL:	POISON GAS, FLAMMABLE GAS	TOXIC GAS, FLAMMABLE GAS

Additional Marking Requirement: "Inhalation Hazard"

Additional Shipping Paper Description Requirement: "Poison-Inhalation Hazard, Zone D"

15. Regulatory Information

SARA TITLE III NOTIFICATIONS AND INFORMATION

SARA TITLE III - HAZARD CLASSES:

Acute Health Hazard

Chronic Health Hazard

Fire Hazard

Sudden Release of Pressure Hazard

SARA TITLE III - SECTION 313 SUPPLIER NOTIFICATION:

This product does not contain toxic chemicals subject to reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372.

U.S. TSCA/Canadian DSL: All ingredients are listed on the U.S. Toxic Substances Control Act (TSCA) inventory or exempt from listing and on the Canadian Domestic Substance List (DSL).

California Proposition 65: This product contains an ingredient (carbon monoxide) known to the State of California to cause birth defects or other reproductive harm.

Canadian Controlled Products Regulations (CPR): This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

16. Other Information

NFPA HAZARD CODES	HMIS HAZARD CODES	RATINGS SYSTEM
Health: 2	Health: 1	0 = No Hazard
Flammability: 4	Flammability: 4	1 = Slight Hazard
Instability: 0	Physical Hazard: 3	2 = Moderate Hazard
		3 = Serious Hazard
		4 = Severe Hazard

Note: Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2004, *CGA Recommended Hazard Ratings for Compressed Gases, 2nd Edition*.

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.

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