1. Chemical Product and Company Identification

Product name	:	Carbon Dioxide (liquefied Carbon Dioxide)
Supplier	:	Leland Limited, Inc. 2614 South Clinton Ave. South Plainfield, NJ 07080 1-908-668-1008 (9-5 EST)
Emergency calls (CHEMTREC)	:	1-800-424-9300 (Domestic) 1-703-527-3887 (International)

2. Hazards Identification

EMERGENCY OVERVIEW
CAUTION! High-pressure gas.
Can cause rapid suffocation.
Can increase respiration and heart rate.
May cause nervous system damage.
May cause frostbite.
May cause dizziness and drowsiness.
Self-contained breathing apparatus may be required by rescue workers.
Odor: None

Threshold Limit Value	:	TLV-TWA, 5,000 ppm (ACGIH, 1998). TLV-TWA, 15 min STEL, 30,000 ppm.
Effects of a Single (acute) Overexposure	:	Inhalation - Carbon Dioxide gas is an asphyxiant with effects due to lack of oxygen. It is also physiologically active, affecting circulation and breathing. Moderate concentrations may cause headache, drowsiness, dizziness, stinging of the nose and throat, excitation, rapid breathing and heart rate, excess salivation, vomiting, and unconsciousness. Lack of oxygen can kill. Skin Contact - No harm expected from vapor. Cold gas, or liquid or solid Carbon Dioxide may cause severe frostbite. Swallowing - An unlikely route of exposure. This product is a gas at normal temperature and pressure. Eye Contact - No harm expected from vapor. Cold gas, or liquid or solid Carbon Dioxide may cause severe frostbite.
Effects of Repeated (chronic) Overexposure	:	No harm expected.
Other Effects of Overexposure	:	Damage to retinal or ganglion cells and central nervous system may occur.
Medical Conditions Aggravated by Overexposure	:	The toxicology and the physical and chemical properties of Carbon Dioxide suggest that overexposure is unlikely to aggravate existing medical conditions.
Significant Laboratory Data with Possible Relevance to Human Health Hazard Evaluation	:	A single study has shown an increase in heart defects in rats exposed to 6% Carbon Dioxide in air for 24 hours at different times during gestation. There is no evidence that Carbon Dioxide is teratogenic in humans.
Carcinogenicity	:	Carbon Dioxide is not listed by NTP, OSHA, or IARC.

3. Composition, Information on Ingredients

Carbon Dioxide is supplied in cylinders as a liquid under its own vapor pressure, which varies depending on the temperature. It is non-toxic, non-flammable and heavier than air.

Single or Mixed	:	Single
Chemical Name	:	Carbon Dioxide
Content (vol%)	:	99.5 or more
Chemical Formula	:	CO_2
CAS Number	:	124-38-9
OSHA PEL	:	5,000 ppm
ACGIH TLV-TWA	:	5,000 ppm

4. First Aid Measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Inhalation	:	Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
Skin Contact	:	For exposure to cold vapor or solid, immediately warm frostbite area with warm water not to exceed 105 °F (41 °C). In case of massive exposure, remove contaminated clothing while showering with warm water. Get medical attention immediately.
Frostbite	:	Try to warm up the frozen tissues and seek medical attention.
Eye Contact	:	Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
Swallowing	:	An unlikely route of exposure. This product is a gas at normal temperature and pressure.
Protective Measures before starting First Aid	:	In an Carbon Dioxide leak, Oxygen concentration may be low. Before attempting first aid, ventilate the area thoroughly or wear a respirator.
Notes to Physician	:	There is no specific antidote. This product is inert. Treatment of overexposure should be directed at the control of symptoms and the clinical condition.

5. Fire Fighting Measures

Flammability of the Product	:	Non-flammable
Extinguishing Media	:	Carbon Dioxide cannot catch fire. Use extinguishing media for surrounding fire.
Special Fire Fighting Procedures	:	**CAUTION! High-pressure gas.** Evacuate all personnel from danger area. Immediately deluge cylinders with water from maximum distance until cool, then move them away from fire area if without risk. Self-contained breathing apparatus may be required by rescue workers. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

Unusual Fire and Explosion Hazards	:	Carbon Dioxide cannot catch fire. Heat of fire can build pressure in cylinder and cause it to rupture. Recommended storage temperature: 0 ˚C to +40 ˚C.
Hazardous Combustion Products	:	None known.

6. Accidental Release Measures

Steps to be taken if Material is Released or Spilled	:	CAUTION! High-pressure liquid and gas. Carbon Dioxide is an asphyxiant. Lack of oxygen can kill. Evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Shut off leak / flow if you can do so without risk. Ventilate area or move cylinder to a well-ventilated area. Test for sufficient oxygen, especially in confined spaces, before allowing reentry.
Protectors	:	If necessary, wear a respirator. If oxygen concentration is low, do not enter the area unprotected.
Environmental Affects	:	Carbon Dioxide does not adversely affect the environment.
Waste Disposal Method	:	Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local disposal authority for assistance.

7. Handling and Storage

Handling : Protection of Carbon Dioxide users

<u>Suffocation</u>

Where large amounts of Carbon Dioxide are used, ensure sufficient ventilation.

<u>Handling of cylinders</u>

Handle cylinders carefully.
Before using gas, confirm the name of the gas by checking the mark or the other items on the cylinder.
Feed gas via a pressure regulator, not directly.
Use only specialized pressure regulators for Carbon Dioxide.
Before connecting a pressure regulator, check the thread type.
Before using a gas cylinder, check the pressure regulator, hoses, pipes, joints, etc., for leakage.
Do not refill cylinders.
Do not modify or erase marks or other items on cylinders. Do not peel off labels on cylinders.
Do not use gas cylinders in electric circuits.
Do not use burners or the like to directly heat the cylinder.
Do not touch dry ice with the bare hands because it has an extremely low temperature.

<u>Others</u>

Do not use Carbon Dioxide in place of compressed air.

<u>Fire or Explosion Prevention</u>

Carbon Dioxide is Non Flammable. No special measures are needed.

Dust Prevention
No special measures are needed.

Storage : Chemical substances that should not be mixed with Carbon Dioxide: None
Storage Conditions
Keep Carbon Dioxide away from fire and spark sources.
Do not store cylinders near electric lines or grounding.
Store cylinders in a dry and well ventilated area.
Keep cylinders away from corrosive fluid.
Keep cylinders away from direct sunlight at an ambient temperature of 0 to 40 °C (32 to 104 °F).
Do not expose cylinders to rough handling or falling.
Control oxygen concentration in storage areas at 18 vol% or more.

8. Exposure Controls and Personal Protection

Engineering Controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Personal Protection

Eyes : To protect eyes, wear goggles/safety glasses.

Respiratory Protection : Use air-purifying or air-supplied respirators, as appropriate, where local or general exhaust ventilation is inadequate during a release of gas. Adequate ventilation must keep worker exposure below applicable TLVs and ensure greater than 19.5% oxygen is present. An air-supplied respirator must be used in confined spaces. Respiratory protection must conform to OSHA rules as specified in 29 CFR 1910.134.

Hands : When handling Carbon Dioxide cylinders, wear leather gloves.

Skin and Body : Not needed.

Other : Protective equipment for cylinder handling, select in accordance with OSHA 29 CFR 1910.132 and 1910.133.

9. Physical and Chemical Properties

Physical state	:	Liquid @<31.1 °C (88 °F), otherwise dense vapor
Color	:	Colorless
Odor	:	Odorless
Explosiveness	:	Non-flammable
Molecular Weight	:	44.01 g/mole
Specific gravity	:	1.53 (Air=1)
Boiling/Sublimation point	:	-78.5 °C (-109.3 °F)
Triple point	:	-56.6 °C (-69.9 °F) @0.518 MPa
Critical point	:	31.1 °C (88 °F) @7.38 MPa
Gas Density	:	1.98 g/L (@ 0 °C, 0.1013MPa (1 atm))
Liquid Density	:	770 g/L (@ 20 °C, 5.67MPa (56 atm))
Vapor Pressure	:	5.7 MPa (830 psig) @21.1 °C (70 °F)
Solubility in water	:	0.90 CO_2/H_2O @ 20 °C (68 °F)

10. Stability and Reactivity

Stability and Reactivity : This product is stable.
Hazardous Decomposition Products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous Polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to Avoid : None currently known.

11. Toxicological Information

Acute toxicity : No known toxicological effects from this product.
Inhalation : Inhalation:
The gas is low in inhalation toxicity but causes of oxygen deficiency if concentration is high.

Concentration(vol%)	Effect
0.04	Normal air
0.5	Limit of long-term safety (TLV)
1.5	Tolerable for an extended time without affecting operability and basic physiology, but calcium and phosphorus metabolism may be affected in some cases.
2	Respiration becomes deeper.
3	Operability drops. Physiological changes appear in variations in blood pressure, heartbeat, and other factors.
4	Respiration becomes much deeper. Higher breathing, slight gasping. Considerable degree of discomfort.
5	Extreme difficulty in breathing; serious gasping intolerable for most people; some feeling of nausea. Toxicosis occurs after 30 minutes exposure.
7 - 9	Limit of tolerance, resulting in violent gasping. In about 15 minutes, the subject looses consciousness.
10 - 11	Disabled regulation; unconsciousness in about 10 minutes.
15 - 20	Much more serious symptoms are seen, but not lethal within an hour.
25 - 30	Respiration weakens, blood pressure drops, resulting in coma, lost reflexes, and paralysis. Death occurs in some hours.

Local Physical Effects on Skin, Eyes, etc. : None
Sensitization : None

Chronic or Long-term Toxicity : None

12. Ecological Information

Global warming potential (GWP) : 1
Global Warming Potential (GWP)
Index detailing effects on global warming
Carbon Dioxide does not contain any Class I or II ozone-depleting chemicals.

13. Disposal Considerations

Disposal of Carbon Dioxide : Gradually release in open air, because if released indoors, it may cause simple suffocation, even though the toxicity is low.

Disposal of Cylinders : If gas remains in cylinders, release gas with proper equipment and dispose of cylinders as incombustible waste.
For empty cylinders, check for a puncture hole and dispose of as incombustible waste.
Do not dispose of cylinders without first checking that all gas has been released. Empty cylinder shells are 100% recyclable steel.

14. Transport Information

DOT / IMO Shipping Name : Carbon Dioxide
Identification Number : UN 1013
Shipping Label(s) : Nonflammable gas
Hazard Class : 2.2
Placard (When required) : Nonflammable gas
Special Shipping Information : See CFR 49, 172.101, 173.306 for exceptions of labeling.

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

U.S. Federal Regulations : EPA (Environmental Protection Agency)
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (40 CFR Parts 117 and 302):
Reportable Quantity (RQ): None

SARA: Superfund Amendment and Reauthorization Act:
Sections 302/304: Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of extremely hazardous substances (40 CFR Part 355):
Threshold Planning Quantity (TPQ): None
Extremely Hazardous Substances (40 CFR 355): None
Sections 311/312: Require submission of Material Safety Data Sheet (MSDSs) and chemical inventory reporting with identification of EPA hazard categories. The hazard categories for this products are as follows:

IMMEDIATE: No
DELAYED: No

PRESSURE: Yes
REACTIVITY: No
FIRE: No

Sections 313: Requires submission of annual reports of release of toxic chemicals that appear is 40 CFR Part 372.
Carbon Dioxide does not require reporting under Section 313.

40 CFR 68: Risk Management Program for Chemical Accidental Release Prevention: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.
Carbon Dioxide is not listed as a regulated substance.

TSCA: Toxic Substances Control Act: Carbon Dioxide is listed on the TSCA inventory applicable in some states.

OSHA (Occupational Safety and Health Administration):
29 CFR 1910.119: Process Safety Management of Highly Hazardous Chemicals: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.
Carbon Dioxide is not listed in Appendix A as a highly Hazardous chemical.

State Regulations : **California**: This product is **not** listed by California under the Safe Drinking Water Toxic Enforcement Act of 1986 (Proposition 65).
Pennsylvania: This product is subject to the Pennsylvania Worker and Community Right-To-Know Act (35 P.S. Sections 7301-7320).

16. Other Information

Hazard Rating Systems :

NFPA Ratings	**HMIS Ratings**
Health = 1	Health = 0
Flammability = 0	Flammability = 0
Reactivity = 0	Reactivity = 0
Special = SA*	

*(CGA recommends this rating to designate Simple Asphyxiant.)

Notice to reader : This Material Safety Data Sheet (MSDS) is prepared based on the latest materials and data. It may be subject to change when new data is obtained. The MSDS state precautions assuming that the product is used under normal conditions. Uses under special conditions should take these conditions into account to ensure safety. While the MSDS has been prepared as comprehensively as possible, we cannot guarantee its applicability or effectiveness under all possible conditions or applications.