

MATERIAL SAFETY DATA SHEET

CARBON DIOXIDE – CO₂
(LIQUIFIED & SOLID)

Section 1: Product And Company Identification

Product Name: 1. Carbon Dioxide (Liquid)
2. Carbon Dioxide (Solid) – Dry Ice

Manufacturer & Supplier: Carbacid (Co2) Limited.
P. O. Box 30564,
00100 Nairobi, Kenya
Emergency Phone:
+254 20 535082 / + 254 50 50536

Email: carbacid@carbacid.co.ke
info@carbacid.co.ke

website:

Section 2 : Composition/ Ingredient Information

Ingredient Name: Carbon Dioxide

Concentration : > 99.9%

C.A.S : 124-38-9

1. PEL 5000 ppm TLV 5000 ppm STEL30,000 ppm

Section 3: Hazard Identification

Emergency Overview: Carbon dioxide is a colourless gas or a colourless, cryogenic liquid. At low concentrations, the gas is odourless. At higher concentrations it has a sharp, acidic odour. It will act as an asphyxiant and an irritant. Carbon dioxide is a powerful cerebral dilator. At concentrations between 2 and 10%, carbon dioxide can cause nausea, dizziness, headache, mental confusion, increased blood pressure and respiratory rate. Above 8% nausea and vomiting appear. Above 10%, suffocation and death can occur within minutes. Contact with the cold gas can cause freezing of exposed tissue. Moisture in the air can lead to formation of carbonic acid that can irritate the eyes. Avoid contact with eyes, skin and clothing as contact with rapidly expanding gas, liquid, or solid can cause frostbite. May cause target organ damage, based on animal data. Carbon dioxide is heavier than air and should not be allowed to accumulate in low lying areas. All forms of carbon dioxide are non-combustible. May cause respiratory tract, eye, and skin irritation. Can cause target organ damage. Can cause rapid suffocation. Do not puncture or incinerate container as contains extremely cold liquid and gas under pressure. Keep container closed. Avoid breathing gas. Use with adequate ventilation.

Target Organs : May cause damage to the following organs:
Lungs, cardiovascular system, skin, eyes, central nervous system (cns).

Route Of Entry: Inhalation, skin and eye contact.

Effects of acute exposure - Eye Contact: Vapour may cause a stinging sensation. Moderately irritating to eyes. Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns.

Effects of acute exposure - Skin Contact: No adverse effects from gas. Moderately irritating to the skin. Contact with rapidly expanding gas may cause burns or frostbite. Contact with cryogenic liquid can cause frostbite and cryogenic burns.

Effects of acute exposure - Inhalation: Moderately irritating to the respiratory system. May cause dizziness. Asphyxiant. Can cause vomiting. May result in unconsciousness. May cause excitation, excess salivation, rapid breathing. May cause headaches and drowsiness. May cause stinging of the nose and throat.

Effects of acute exposure - Ingestion: Not a likely route of exposure. Ingestion is not a normal route of exposure for gases. Contact with cryogenic liquid can cause frostbite and cryogenic burns.

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Effects Of Chronic Exposure:	Damage to retinal ganglion cells and central nervous system may occur due to the presence of carbon dioxide. Carcinogenic effects: not available. Mutagenic effects: not available. Teratogenic effects: not available.
Reproductive Effects:	Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.
Medical Conditions Aggravated By Overexposure	Pre-existing disorders involving any target organs mentioned in this msds as being at risk may be aggravated by over-exposure to this product.

Section 4 : First Aid Measures

Skin Contact:	Remove contaminated clothing. Treat for frostbite if necessary by gently warming affected areas. Consult a physician. In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately. 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.
Eye Contact:	Immediately flush eyes with plenty of water for at least 15 minutes. Consult an ophthalmologist.
Inhalation:	Rescuers should not attempt to retrieve victims of exposure to this product without adequate personal protective equipment. At a minimum, self-contained breathing apparatus should be worn. On exposure remove victim(s) to fresh air, as quickly as possible. If breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. If not breathing qualified personnel should administer artificial respiration. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
Ingestion:	No first aid should be needed. Not considered a potential route of exposure
Frostbite :	Try to warm up the frozen tissues and seek medical attention.

Section 5: Fire Fighting Measures

Flammability:	Not flammable.
Conditions Of Flammability:	Will not burn.
Extinguishing Media:	Use appropriate extinguishing media for surrounding fire.
Special Procedures:	Self-contained breathing apparatus required. Fire fighters should wear the usual protective gear. Cool fire exposed containers with water spray from a safe distance. If involved in fire, shut off flow immediately if it can be done without risk. Personnel should be evacuated, if necessary, to upwind area. Remove containers from fire area if without risk, as contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.
Auto-Ignition Temperature:	Not applicable.
Flash Point (°C), Method:	Not applicable.
Lower Flammability Limit (% Vol):	Not applicable.
Upper Flammability Limit (% Vol):	Not applicable.
Sensitivity To Mechanical Impact:	Explosion data Avoid impact against container.
Explosive Power:	Closed containers may rupture or explode due to pressure build-up when exposed to extreme heat.

Section 6 : Accident Release Measures

Personal Precautions :	Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
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Environmental Precautions:	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
Methods For Cleaning Up :	Immediately contact emergency personnel. Stop leak if without risk. Note: see section 1 for emergency contact information and section 13 for waste disposal.
	Use a self-contained breathing apparatus. Ventilate area. Monitor the surrounding area for carbon dioxide and oxygen levels. Carbon dioxide must be below the 5000-ppm TLV/PEL level shown in section 2 and Oxygen must be at least 19.5% before personnel may be allowed into the area without self-contained breathing apparatus. A portion of the released liquid may form dry ice. Clear the area and allow the solid to sublime/evaporate and dissipate. If emergency personnel must enter the area, self-contained breathing apparatus, □levlar gloves, and appropriate foot and leg protection must be worn. Solid pieces of dry ice may be picked up with tongs and gloves, placed Into a thermally insulated and vented container and moved to a safe disposal location.

Section 7 : Handling and Storage

Handling Procedures And Equipment:	High pressure gas. Do not puncture or incinerate Container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Use with adequate ventilation. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement. Prevent entrapment of liquid in closed systems or piping without pressure relief devices. Some materials may become brittle at low temperatures and will easily fracture. Never allow any unprotected part of the body to touch un-insulated pipes or vessels that contain cold fluids. The extremely cold metal of the container will cause moist flesh to stick fast and tear when one attempts to withdraw from it. Protect system components against physical damage. Check all hoses and transfer equipment before filling them with the liquid. Replace any worn or cut hoses prior to use. Liquid carbon dioxide is extremely cold and is under pressure. A leak will result in the formation of "dry ice" particles that will be forcibly ejected from the system, possibly injuring the operator. A complete hose failure can result in a large release of carbon dioxide and violent movement of the hose and associated equipment, which may cause severe injury or death. Special care must be taken when depressurizing and disconnecting hoses. Releasing the contents of a liquid-filled line to atmospheric pressure may result in the formation of a solid dry ice plug in the line. This plug will prevent further removal of the liquid behind the plug, resulting in either an unexpected, rapid release of carbon dioxide as the line warms, or the catastrophic failure of the line as the liquid warms behind the plug. Sufficient vapour pressure must be applied and maintained behind the liquid before opening a discharge valve. This action will prevent the depressurization of the liquid to the point of solid formation before it exits the line. Use adequate ventilation. Avoid inhalation. Never work on a pressurized system. If there is a leak, close the upstream valve, blow down the system by venting to a Safe place, then repair the leak.
Storage requirements:	Use storage containers, piping, valves and fittings designed for storage and distribution of liquefied carbon dioxide and vaporized (gaseous) carbon dioxide. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °c (125 °f).

Section 8 : Exposure controls/Personal Protection

	Precautionary measures
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.
Gloves/Type:	Insulated gloves suitable for low temperatures
Respiratory/Type:	Air purifying respirator for concentrations up to 10 times tlv; air supplied for higher concentrations.
Face/Eye/Type:	Face shield. When working with cryogenic liquids, wear a full face shield.
Footwear/Type:	Leather shoes.
Ventilation Requirements:	Mechanical ventilation is satisfactory. Ensure oxygen concentration remains above 19.5% and carbon dioxide concentration does not exceed 5000 ppm, local exhaust at points of emission preferred.
Personal Protection In Case Of A Large Spill	Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. Full chemical-resistant suit and self-contained breathing apparatus should be worn only by trained and authorized persons.

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Section 9 : Physical and Chemical Properties

Physical State:	Liquid	Solubility In Water (%):	Slight.
Appearance & Odor:	Colourless, odourless.	Critical Temperature	30.9°C (87.6°F)
Odor Threshold (PPM):	Odourless.	Molecular Weight	44.01 g/mole
Vapor Pressure At 70°F:	830 psig	Molecular Formula	C-O2
Vapor Sp. Gravity (Air=1):	1.52 @ 70°f (21°c)	Specific Volume (Ft 3/Lb) :	8.7719
Volatiles (% By Volume)	100%	Gas Density (Lb/Ft 3) :	0.114
Boiling Point :	Sublimes. -78.5°C (760 mmhg) -109.3°F	Density@BP:	Solid density = 97.5 lb/ft3 (1562 kg/m3)
Freezing Point :	-56.6°C -69.8°F		

Section 10 : Stability and Reactivity

Chemical Stability:	Product is stable.
Conditions Of Reactivity:	Heat
Hazardous Polymerization:	Under normal conditions of storage and use, hazardous polymerization will not occur.
Incompatible Substances:	Alkali metals. Chromium. Metal acetyl ides. Alkaline earth metals. Titanium above 550°c. Uranium above 750°c.
Hazardous Decomposition Products:	Under normal conditions of storage and use, hazardous decomposition products should not be produced. An electrical discharge can cause carbon dioxide to decompose into carbon monoxide and oxygen. Carbon dioxide will combine with water vapour or liquid to form carbonic acid.

Section 2 : Toxicological Information

Toxicity Data	Ld50 of product, species & route:
	<u>Result</u> <u>rat</u> <u>exposure</u>
	Lc50 inhalation gas. 470000 ppm 30 minutes
Chronic Effects On Humans	May cause damage to the following organs: lungs, cardiovascular system, skin, eyes, Central nervous system (cns).
Other Toxic Effects On Humans	No specific information is available in our database regarding the other toxic effects of This material to humans.

Section 12 : Ecological Information

Aquatic Ecotoxicity	Not available.
Toxicity Of The Products Of Biodegradation:	Not available
Environmental Fate :	Not available.
Environmental Hazards :	No known significant effects or critical hazards.
Toxicity To The Environment :	Not available.

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Section 13 : Disposal Considerations

Waste Disposal: Gas will dissipate in air.
Product removed from the cylinder must be disposed of in accordance with appropriate statutory and standards regulation. Return cylinders with residual product to supplier.
Do not dispose of locally.

Section 14 : Transport Information

DOT/ TDG Classification: For bulk liquid shipments
Carbon dioxide refrigerated liquid
UN 2187
Class 2.2 (non-flammable gas)

Section 15 : Regulatory Information

WHMIS Classification: A

DSL Status: Appears on DSL.

1. Local statutory regulation
Detail Of Legislation Kenya Gazette Supplement No.46 (Legislative Supplement No.28) : Dated 4th May 2007
Publication: Legal Notice No.59 : The Factories And Other Places Of Work Act (Cap.514)
Title Of Legislation: The Factories And Others Places Of Work (Fire Risk Reduction) Rules 2007

2. Local statutory regulation
Detail Of Legislation Special issue : Kenya Gazette Supplement No.111 (Acts No.15) : Dated 26th October 2007
Publication Kenya Gazette Supplement Acts, 2007
Title Of Legislation: The Occupational Safety And Health Act, 2007

Section 16: Other Information

Definitions and other useful data:

CAS #: The chemical abstract service number, which uniquely identifies each constituent.

TLV : Threshold limit value - an airborne concentration of a substance which represents conditions under which it is generally
Believed that nearly all workers may be repeatedly exposed without adverse effect.

PEL: Permissible exposure limit - the same value as a tlV.

IDLH: Immediately dangerous to life and health - a concentration from which one can escape within 30-minutes without
Suffering permanent injury.

Fire protection Health Hazard Rating Scale (Blue): **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials);
1 (materials that on exposure under fire conditions could cause irritation or minor residual injury);
2 (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury);
3 (materials that can on short exposure could cause serious temporary or residual injury);
4 (materials that under very short exposure could cause death or major residual injury).

Fire protection Flammability Hazard Rating Scale (Red): **0** (minimal hazard);
1 (materials that require substantial pre-heating before burning);
2 (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]);
3 (class IB and IC flammable liquids with flash points below 38°C [100°F]);
4 (class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]).

Fire protection Reactivity Hazard Rating Scale (Yellow): **0** (normally stable);
1 (material that can become unstable at elevated temperatures or which can react slightly with water);
2 (materials that are unstable but do not detonate or which can react violently with water);
3 (materials that can detonate when initiated or which can react explosively with water);
4 (materials that can detonate at normal temperatures or pressures).

Toxicological Information: Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are Presented.

Definitions of some terms: **LD50** -lethal dose (solids & liquids) which kills 50% of the exposed animals;
LC50 - lethal concentration (gases) which kills 50% of the exposed animals;
ppm concentration expressed in parts of material per million parts of air or water;
mg/m³ concentration expressed in weight of substance per volume of air;
mg/kg quantity of material, by weight.