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## MATERIAL SAFETY DATA SHEET

Product Name:

CARBON DIOXIDE,  
Solid (CO<sub>2</sub>)

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Revision: 8

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### IDENTIFICATION

**Chemical Name:** Carbon Dioxide, Solid  
**Synonyms:** Dry Ice  
**UN Number:** 1845

**Use:** Food freezing, refrigerated transport, dry ice blasting.

### HAZARDS IDENTIFICATION

**Dangerous Goods Class and Subsidiary Risk:** 2.2

**HSNO Classification:** Not Hazardous

**Hazard Statement:** Solidified gas. Contact with product may cause cold burns or frostbite. In high concentrations may cause asphyxiation.

**Precautionary Statements:** Read label before use.  
Read Material Safety Data Sheets.  
Wear cold insulating gloves, face shield and eye protection.  
Thaw frosted parts with lukewarm water. Do not rub affected area.  
Get immediate medical advice/attention.  
Store in a well ventilated place.  
Product is a simple asphyxiant.

### COMPOSITION

Ingredients	CAS Number	Proportion
Chemical Entity Carbon Dioxide	124-38-9	100%

Contains no other components or impurities that will influence the classification of the product.

## FIRST AID MEASURES

### Health Effects

#### Acute

Swallowed: Can cause cold burn if swallowed.  
Eye: Can cause severe cold burn if brought in contact with eye.  
Skin: Can cause severe cold burn if brought in contact with skin.

**Inhaled:** Carbon Dioxide is non-toxic. When solid carbon dioxide sublimates it can dilute the oxygen concentration in air below the level necessary to support life; it can act as an asphyxiant. Effects of oxygen deficiency are:

- 16%: breathing and pulse rate increased, impaired thinking and attention, reduced coordination;
- 14%: Abnormal fatigue upon exertion, emotional upset, faulty coordination, poor judgement;
- 12.5%: Very poor judgement and coordination, impaired respiration that can cause permanent hearing damage, nausea and vomiting;
- below 10%: Inability to perform various movements, loss of consciousness, convulsions, and death.

The effects of carbon dioxide enrichment are:

- 1%: Slight and unnoticeable increase in breathing rate;
- 2%: Breathing becomes deeper and rate will increase above the normal level. Prolonged exposure for several hours may cause a headache and a feeling of exhaustion;
- 3%: Breathing will start to feel laboured and breathing rate will increase to twice the normal rate. Hearing ability will be reduced; blood pressure and pulse rate will increase. Headaches will also be evident.
- 4 – 5%: Breathing rate will increase to four times the normal rate. Signs of intoxication will be evident after ½ hour exposure and you will have a slight choking feeling in addition to the symptoms above.
- 5 – 10%: Carbon dioxide will have a sharp smell. There will be visual disturbance, laboured breathing, headache, and ringing in the ears. Confusion will be followed by loss of consciousness.
- 10 – 100%: Levels above 10% will lead to rapid loss of consciousness. Further exposure at higher concentrations leads to asphyxiation.

#### Chronic

Long term exposure to carbon dioxide has no known health effects. Prolonged exposure to an oxygen deficient atmosphere (below 19% oxygen in air) may affect the heart and nervous system. Exposure to solid carbon dioxide can result in cold burns, which need immediate medical attention. Frozen tissue can die (frostbite).

#### First Aid

##### Inhalation:

In high concentrations may cause headache, nausea and vomiting, which may lead to unconsciousness as well as asphyxiation. Symptoms of asphyxiation may include loss of mobility/consciousness. Remove victim to uncontaminated area whilst wearing self contained breathing apparatus. Victim may not be aware of asphyxiation. Keep victim warm and rested. Call a doctor. Prompt medical attention is mandatory in all cases of overexposure to Carbon Dioxide. Apply artificial respiration if breathing stopped. Continued treatment should be symptomatic and supportive.

##### Swallowed:

Seek medical attention immediately. Drink large quantities of water (not hot) to help thaw affected areas.

##### Eye Contact

Immediately flush eyes thoroughly with unheated tap water for at least 15 minutes. Obtain medical assistance.

#### Skin Contact

Solid carbon dioxide can cause severe cold burn upon contact with skin.

- In case of cold burn move the victim to a warm place (about 22°C) but do not apply direct heat. Never use dry heat.
- Do not rub frozen parts, as tissue damage may result.
- Gently, flush the affected areas of the skin with large quantities of unheated tap water. Do not use hot water or any other form of direct heat.
- The skin should gradually change colour, via blue, back to pink.
- Loosen any clothing that might restrict the circulation to the affected area but take care not to remove any clothing frozen to flesh.
- Apply DRY, sterile, non-adhering dressing with a large bulky protective covering to protect the wounds
- Do not apply dry sterile dressing too tightly in case it restricts blood circulation. Keep the affected body part at rest. It will become swollen, painful and prone to infection when thawed.
- Treat the person for shock.
- Do not give person alcohol to drink or tobacco to smoke. Both will restrict blood flow to the wound and retard recovery.
- Obtain medical assistance immediately.

#### **Advice to Doctor**

The thawing process, depending on the degree of exposure, can be painful and it can be necessary to administer drugs to control pain.

Thawing takes from 15 – 60 minutes.

Administer a tetanus booster after hospitalisation.

Advise doctor that victim has been exposed to an oxygen deficient atmosphere. Specialist advice for treatment of cryogenic burns is available at a Burns Unit.

#### **General:**

Low air temperature due to close proximity of solid atmosphere gases can cause hypothermia and all persons at risk should be warmly clad.

When solid carbon dioxide sublimates, it can dilute the oxygen concentration in the air. Rescuers should not enter an oxygen deficient atmosphere without using self-contained full face positive pressure breathing equipment.

### **FIRE FIGHTING MEASURES**

#### **Flammability:**

Non Flammable.

#### **Fire/Explosion Hazard:**

Carbon Dioxide is non-flammable, but container may release large quantities of Carbon Dioxide if ruptured.

Carbon Dioxide may serve to extinguish fire.

#### **Extinguishing Media:**

Use appropriate media to extinguish source of surrounding fire.

#### **Hazchem Code:**

2T

#### **Recommended Protective Clothing:**

Breathing apparatus should be worn in confined spaces.

Thermal protection from cold temperatures required.

### ACCIDENTAL RELEASE MEASURES

**Personal Protection:**

Personnel handling solid carbon dioxide shall be provided with full overalls, safety footwear, safety glasses and leather or PVC gloves. In areas where equipment failure may cause an immediate high concentration of carbon dioxide, ensure adequate ventilation and have approved self-contained, full face respiratory equipment readily available for emergencies.

**Spills and Disposal:**

Ventilate area. Stop leak if it can be done without risk. Allow gas to dissipate to atmosphere. Cold vapours are heavier than air. In case of large spillage evacuate nearby trenches, excavations, pits and the like.

**Reference Guide:**

Standard SNZ HB 76:2008 Dangerous Goods – Initial Emergency Response Guide.

AS/NZS 1337 – Eye Protection for Industrial Applications

AS/NZS 2161.1 – Occupational Protective Gloves – Selection, use and maintenance

AS/NZS 1715 – Selection, Use and Maintenance of Respiratory Protective Devices

AS/NZS 1716 – Respiratory Protective Devices

**General:**

Low air temperature due to close proximity of liquefied atmosphere gases can cause hypothermia and all persons at risk should be warmly clad.

### HANDLING AND STORAGE

**Handling****Flammability:**

Non Flammable.

**General:**

Low air temperature due to close proximity of liquefied atmosphere gases can cause hypothermia and all persons at risk should be warmly clad.

**Approved Handlers:**

Approved handlers are not required, non hazardous gas (HSNO).

**Storage:**

Keep dry ice in a non-sealed container in a well ventilated place.

Supplied in portable polystyrene chilly bins or by large insulated dry ice containers holding up to 400kg.

**Separation:**

Dry ice can be stored with most common substances.

**Spills and Disposal:**

Ventilate area. Stop leak if it can be done without risk. Allow gas to dissipate to atmosphere. Cold vapours are heavier than air. In case of large spillage evacuate nearby trenches, excavations, pits and the like.

### EXPOSURE CONTROLS / PERSONAL PROTECTION

#### Exposure Standards:

TLV 5,000 ppm v/v STEL 30,000 ppm v/v

#### Engineering Controls:

Provide adequate local exhaust and dilution (general) ventilation and supply sufficient replacement air to maintain oxygen concentration above 19%.

#### Personal Protection:

Personnel handling solid carbon dioxide shall be provided with full overalls, safety footwear, safety glasses and leather or PVC gloves. In areas where equipment failure may cause an immediate high concentration of carbon dioxide, ensure adequate ventilation and have approved self-contained, full face respiratory equipment readily available for emergencies.

#### Reference Guide:

AS/NZS 1337 – Eye Protection for Industrial Applications

AS/NZS 2161.1 – Occupational Protective Gloves – Selection, use and maintenance

AS/NZS 1715 – Selection, Use and Maintenance of Respiratory Protective Devices

AS/NZS 1716 – Respiratory Protective Devices

### PHYSICAL AND CHEMICAL PROPERTIES

#### Physical Properties

Appearance:	Frosty white, solid, sharp odour	Flashpoint:	Non Flammable
Sublimation Temp:	-78.5°C	Flammability Limits:	Non Flammable
Solubility in Water (at 0°C):	1.716 m <sup>3</sup> /kg		

#### Other Properties

Relative Density (at 15°C) (Air = 1):	1.53	Density of Gas (101.3 kPa, 15°C):	1.873 kg/m <sup>3</sup>
Molecular Weight:	44.01	Critical Temperature:	31.06°C

### STABILITY AND REACTIVITY

#### Flammability:

Non Flammable. Contains refrigerated gas; may cause cryogenic burns or injury.

#### Materials Compatibility:

Stable under normal conditions.

### TOXICOLOGY INFORMATION

In high concentrations causes rapid circulatory insufficiency. Symptoms are headache, nausea and vomiting, which may lead to unconsciousness.

### ECOLOGICAL INFORMATION

Can cause frost damage to vegetation.

When discharged in large quantities may contribute to the greenhouse effect.

Global warming factor (CO<sub>2</sub>=1): 1

### DISPOSAL CONSIDERATIONS

Do not discharge into any place where its accumulation could be dangerous

### TRANSPORT INFORMATION

<b>UN Number:</b>	1845
<b>Proper Shipping Name:</b>	CARBON DIOXIDE, SOLID (DRY ICE)
<b>Dangerous Goods Class and Subsidiary Risk:</b>	2.2
<b>Packing Group:</b>	Not applicable
<b>Hazchem Code:</b>	2T
<b>Other Information:</b>	Avoid transport on vehicles where the load is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers: <ul style="list-style-type: none"><li>• Ensure that containers are firmly secured.</li><li>• Ensure cylinder valve is closed and not leaking.</li><li>• Ensure there is adequate ventilation.</li><li>• Compliance with applicable regulations.</li></ul>

### REGULATORY INFORMATION

**ERMA Register Approval No:** HSR001018

**HSNO Controls:** Hazardous Substances (Compressed Gases) Regulations 2004.  
Hazardous Substances (Tank Wagon and Transportable Containers) Regulations 2004.

**Approved Handlers:** Approved handlers are not required, non hazardous gas (HSNO).

### OTHER INFORMATION

Portable solid vessels - Colour Metallic silver  
Outlet Solid - CGA 320  
Gas - AS2743 Type 30

- References:
- L'Air Liquide Gas Encyclopaedia - Elsevier Scientific Publishing Co. Amsterdam
  - NZS 5433:2007 Transport of Dangerous Goods on Land
  - ERMA Website – Approvals Register – [www.erma.govt.nz](http://www.erma.govt.nz)
  - SNZ HB76:2008 Dangerous Goods – Initial Emergency Response Guide
  - Air Liquide Group MSDS – Carbon Dioxide (Solid) AL018C Rev. 1
  - Air Liquide Australia "Carbon Dioxide, Solid" MSDS June 2008
  - AS1678 2C1 Emergency Procedure Guide – Transport – Non-Flammable, Compressed Gas
  - CGA Safety bulletin SB2-2007 Oxygen Deficiency
  - Operators Handbook for the Transport of Dangerous Goods by Road – NZ Road Transport & Logistics Industry Training Organisation
  - ALNZ - Transport of Gas cylinders in Non-Dedicated Vehicles Customer Information Guide
  - AS1894 The Storage and Handling of Non-Flammable Cryogenic and Refrigerated Liquids – Appendix G
  - Work Place Exposure Standards Effective From 2002, Department of Labour, New Zealand
  - NZCIC Code of Practice – Preparation of Safety Data Sheets

**END MSDS**

This MSDS summarises to our best knowledge, at the date of issue, the health and safety hazard information regarding this product and general guidance on how to safely handle the product in the workplace. All due care has been taken to include accurate and up-to-date information in this MSDS.

Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace in conjunction with other products. If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact Air Liquide New Zealand.

As far as lawfully possible, no liability for any loss, injury or damage (including consequential loss) which may be suffered or incurred by any person as a consequence of their reliance on the information contained in this MSDS can be accepted.

Our responsibility for products sold is subject to our standard terms and conditions, a copy of which is available on request.

This MSDS has been prepared in accordance with NZCIC Code of Practice – Preparation of Safety Data Sheets.

This MSDS is subject to change without notice. For the latest version of this MSDS visit <http://www.airliquide.com.au/en/technical/new-zealand-msds.html>

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