

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Chlorine	Trade Name: Chlorine
Product Use: Many	
Chemical Name: Chlorine	Synonym: Dichlorine, Molecular chlorine, Betholite
Chemical Formula: Cl ₂	Chemical Family: Halogen
Telephone:	Emergencies: * 1-800-363-0042
Supplier /Manufacture:	Praxair Canada Inc. 1 City Centre Drive Suite 1200 Mississauga, ON L5B 1M2
Phone:	905-803-1600
Fax:	905-803-1682

**Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier or Praxair sales representative.*

2. Composition and Information on Ingredients

INGREDIENTS	% (VOL)	CAS NUMBER	LD ₅₀ (Species & Routes)	LC ₅₀ (Rat, 4 hrs.)	TLV-TWA (ACGIH)
Chlorine	100	7782-50-5	Not available.	147 ppm	0.5 ppm

3. Hazards Identification

Emergency Overview



DANGER! Toxic, corrosive, oxidizing liquid and gas under pressure. Harmful or fatal if inhaled. Causes eye, skin, and respiratory tract burns. Can support combustion. Self-contained breathing apparatus must be worn by rescue workers. Odour: Pungent, irritating, choking.

ROUTES OF EXPOSURE:

Absorbed through skin. Eye contact. Inhalation. Ingestion.

THRESHOLD LIMIT VALUE: TLV-TWA Data from 2004 Guide to Occupational Exposure Values (ACGIH). TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION: Overexposure to vapour concentrations moderately above the Threshold Limit Value (TLV) of 1 ppm is irritating to the eyes and upper respiratory tract. Very brief exposure to a concentration of 1000 ppm may be fatal. Inhalation of high concentration (e.g., greater than 15 ppm) causes choking, coughing, burning of the throat, and severe irritation of the upper respiratory tract; additionally, there is the possibility of pulmonary edema, general lung injury, and pneumonitis. Lack of oxygen can cause death. STEL: 1 ppm (ACGIH, OSHA)

SKIN CONTACT: May cause severe irritation and chemical burns with ulceration and scarring of the skin. Repeated exposure of the skin may result in cumulative dermatitis.

SKIN ABSORPTION:	Prolonged or widespread skin contact with the liquid may result in the absorption of harmful amounts of material.
SWALLOWING:	An unlikely route of exposure. This product is a gas at normal temperature and pressure, but burns of the mouth, esophagus, and stomach may result.
EYE CONTACT:	Exposure as low as 3 - 6 ppm may cause redness, pain, blurred vision, or lacrimation. High concentrations or liquid contact may cause severe chemical burns with permanent damage or blindness.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:

Repeated exposure may cause progressive lung dysfunction. Exposure may also corrode the teeth and may cause a chloracne-like condition.

OTHER EFFECTS OF OVEREXPOSURE:

None known.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:

Inhalation may aggravate asthma and inflammatory or fibrotic pulmonary disease, as well as heart disease. Skin contact may aggravate an existing dermatitis.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:

May cause severe inflammation of the conjunctiva, corneal opacity, iris atrophy, and lens injury.

CARCINOGENICITY:

A4 (Not classifiable for human or animal.) by ACGIH. Not listed as carcinogen by OSHA, NTP or IARC.

4. First Aid Measures

INHALATION:

Remove to fresh air. Give artificial respiration if not breathing. Oxygen may be given when necessary. Keep patient warm. Call a physician.

SKIN CONTACT:

If exposed to liquid, avoid breathing vapour. Immediately warm frostbite area with warm water (not to exceed 40 C). In case of massive exposure, remove clothing and shoes while showering with warm water. Get medical attention immediately.

SWALLOWING:

An unlikely route of exposure; this product is a gas at normal temperature and pressure.

EYE CONTACT:

Immediately flush eyes with water for a least 15 minutes. The eyelids must be held open and away from the eyeball to ensure that all surfaces are flushed thoroughly. See a physician, preferably an ophthalmologist, immediately.

NOTES TO PHYSICIAN:

Victims of overexposure should be kept under medical observation for 24 to 48 hours or 72 hours if exposure was severe. The hazards of this material are due mainly to its severe irritant and corrosive properties on the skin and mucosal surfaces. There is no specific antidote; and treatment should be directed at the control of symptoms and clinical condition.

5. Fire Fighting Measures

FLAMMABLE : No. **IF YES, UNDER WHAT CONDITIONS?** Vigorously accelerates combustion.

FLASH POINT (test method) Not applicable.	AUTOIGNITION TEMPERATURE Not applicable.
--	---

FLAMMABLE LIMITS IN AIR, % by volume:	LOWER: Not applicable.	UPPER: Not applicable.
--	-------------------------------	-------------------------------

EXTINGUISHING MEDIA:

Oxidizing agent. May accelerate combustion. Use media appropriate for surrounding fire.

SPECIAL FIRE FIGHTING PROCEDURES:

DANGER! Evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately cool containers with water spray from maximum distance until cool, then move cylinders away from fire area if without risk. If containers are leaking, reduce vapours with water spray or fog. Do not spray water directly on leak as this may cause leak to increase. Shut off leak if without risk. Move containers away from fire area if without risk.

UNUSUAL FIRE AND EXPLOSION HAZARD:

Oxidizing agent, may accelerate combustion. Contact with flammable materials may cause fire or explosion. Container may rupture due to heat of fire. No part of a container should be subjected to a temperature higher than 52 C. Most containers are provided with a pressure relief device designed to vent contents when they are exposed to elevated temperatures.

HAZARDOUS COMBUSTION PRODUCTS:

Burning may produce toxic fumes of chlorides.

SENSITIVITY TO IMPACT:

Avoid impact against container.

SENSITIVITY TO STATIC DISCHARGE:

Not applicable.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

DANGER! Immediately evacuate all personnel from danger area. **DANGER:** Corrosive, toxic gas. Use self-contained breathing apparatus and protective clothing where needed. Contact with flammable materials may cause fire or explosion (See Section V). Reduce vapours with fog or fine water spray. Do not spray water directly on leak as this may cause leak to increase. Reverse flow into cylinder may cause rupture. Shut off leak if without risk. Ventilate area of leak or move leaking container to well ventilated area. Prevent runoff from contaminating surrounding environment. Corrosive, toxic vapours may spread from spill. Before entering area, especially confined areas, check atmosphere with appropriate device.

WASTE DISPOSAL METHOD:

Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, provincial, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN STORAGE:

Store and use with adequate ventilation. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Store only where temperature will not exceed 125°F(52°C). Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods. Keep away from oil, grease, and other hydrocarbons. Keep away from oil, grease, and other hydrocarbons.

PRECAUTIONS TO BE TAKEN IN HANDLING:

Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. For other precautions, see Section 16.

For additional information on storage and handling, refer to Compressed Gas Association (CGA) pamphlet P-1, *Safe Handling of Compressed Gases in Containers*, available from the CGA. Refer to Section 16 for the address and phone number along with a list of other available publications.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE:

Toxic, corrosive liquid and gas under pressure. Do not breathe gas. Do not get vapour in eyes, on skin, or on clothing. Have safety showers and eyewash fountains immediately available. Use only in a closed system. Use piping and equipment adequately designed to withstand pressures to be encountered. Store and use with adequate ventilation. Close valve after each use; keep closed even when empty. **Prevent reverse flow.** Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder. **When returning cylinder to supplier,** be sure valve is closed, then install valve outlet plug tightly. **Never work on a pressurized system.** If there is a leak, close the cylinder valve. Vent the system down in a safe and environmentally sound manner in compliance with all federal, provincial, and local laws; then repair the leak. **Never place a compressed gas cylinder where it may become part of an electrical circuit.**

8. Exposure Controls/Personal Protection**VENTILATION/ENGINEERING CONTROLS:**

LOCAL EXHAUST: A corrosion-resistant system is acceptable.
See SPECIAL.

MECHANICAL (general): Inadequate.
See SPECIAL.

SPECIAL: Use only in a closed system.
A corrosion-resistant, forced-draft fume hood is preferred.

OTHER: See SPECIAL.

PERSONAL PROTECTION:

RESPIRATORY PROTECTION: For concentrations up to 10 times the applicable exposure limit any NIOSH/MSHA approved supplied air respirator is recommended. Up to 50 times the TLV, a NIOSH/MSHA approved respirator with a full face piece or self-contained breathing apparatus is recommended. For higher concentrations use only self-contained breathing apparatus operated in the pressure demand mode.

Select in accordance with provincial regulations, local bylaws or guidelines. Selection should also be based on the current CSA standard Z94.4, "Selection, Care and Use of Respirators". Respirators should also be approved by NIOSH and MSHA.

SKIN PROTECTION: Neoprene gloves.

EYE PROTECTION: Select in accordance with the current CSA standard Z94.3, "Industrial Eye and Face Protection", and any provincial regulations, local bylaws or guidelines.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Protective clothing where needed. Cuffless trousers should be worn outside the shoes. Select in accordance with the current CSA standard Z195, "Protective Foot Wear", and any provincial regulations, local bylaws or guidelines.

9. Physical and Chemical Properties

Product Name: Chlorine

MSDS# E-4580-H

Date: 10/15/2004

PHYSICAL STATE: Gas.	FREEZING POINT: -100.97°C (-149.7°F)	pH: Not applicable.
BOILING POINT: -33.97°C (-29.1°F)	VAPOUR PRESSURE: 689.2 kPa (@ 20°C)	MOLECULAR WEIGHT: 70.906 g/mole
SPECIFIC GRAVITY: LIQUID (Water = 1): 1.4667 (Water = 1)	SOLUBILITY IN WATER: Slight.	
SPECIFIC GRAVITY: VAPOUR (air = 1): 2.485	EVAPORATION RATE (Butyl Acetate=1): >1 compared to (Butyl Acetate=1)	COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable.
VAPOUR DENSITY: 0.0032 g/mL @ 0 C	% VOLATILES BY VOLUME: 100% (v/v).	ODOUR THRESHOLD: > 1.0 ppm

APPEARANCE & ODOUR: Greenish-yellow Odour: Pungent. Irritating and choking. (Strong.)

10. Stability and Reactivity

STABILITY:	The product is stable.
CONDITIONS OF CHEMICAL INSTABILITY:	Not available.
INCOMPATIBILITY (materials to avoid):	Chlorine reacts violently with most materials including metals (e.g., aluminium, copper, brass), especially flammable materials and other reducing agents, including carbonsteel, at temperatures above 483 C.
HAZARDOUS DECOMPOSITION PRODUCTS:	Burning may produce toxic fumes of chlorides.
HAZARDOUS POLYMERIZATION:	Will not occur.
CONDITIONS OF REACTIVITY:	Forms explosive compounds in presence of: alcohols, alkyl isothiourea salts, ammonia, aziridine, calcium chlorite, diethyl ether, ethylene imine, s-ethyl isothiourea sulfate, oxygen difluoride, sulfamic acid. Reacts vigorously with phosphorous isocyanate, dimethylformamide solution, hydrochloric acid and dinitroaniline mixtures, and iodine.

11. Toxicological Information

See section 3.

12. Ecological Information

No adverse ecological effects expected. This product does not contain any Class I or Class II ozone-depleting chemicals. The components of this mixture are not listed as marine pollutants by TDG Regulations.

13. Disposal Considerations

WASTE DISPOSAL METHOD:

Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

TDG/IMO SHIPPING NAME:

Chlorine

HAZARD CLASS:

 CLASS 2.3: Poisonous gas.
 Class 8: Corrosive material

IDENTIFICATION #:

UN1017

PRODUCT RQ: All

SHIPPING LABEL(s):

Poison gas, Corrosive material

PLACARD (when required):

Poison gas, Corrosive material

SPECIAL SHIPPING INFORMATION:

Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of vehicle can present serious safety hazards.

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, provincial, and local regulations.

WHMIS (Canada)

 Class A: Compressed gas.
 Class C: Oxidizing material.
 Class D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
 Class E: Corrosive gas.

International Regulations
EINECS

Not available.

DSCL (EEC)

 R8- Contact with combustible material may cause fire.
 R26- Very toxic by inhalation.

International Lists No products were found.

16. Other Information

MIXTURES:

When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

HAZARD RATING SYSTEM:
HMIS RATINGS:

HEALTH 2

FLAMMABILITY 0

PHYSICAL HAZARD 0

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED:	CGA-728 standard, 634 limited-std (obsolete 1/1/98)
PIN-INDEXED YOKE:	Not available.
ULTRA-HIGH-INTEGRITY CONNECTION:	Not available.

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlets V-1 and V-7 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, Fax (703) 961-1831, website: www.cganet.com.

AV-1	Safe Handling and Storage of Compressed Gas
P-1	Safe Handling of Compressed Gases in Containers
P-14	Accident Prevention in Oxygen-Rich, Oxygen-Deficient Atmosphere
SB-2	Oxygen-Deficient Atmospheres
V-1	Compressed Gas Cylinder Valve Inlet and Outlet Connections
V-7	Standard Method of Determining Cylinder Valve Outlet Connections for Industrial Gas Mixtures
---	Handbook of Compressed Gases, Fourth Edition

PREPARATION INFORMATION:

DATE:	10/15/2004
DEPARTMENT:	Safety and Environmental Services
TELEPHONE:	905-803-1600

The opinions expressed herein are those of qualified experts within Praxair Canada Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair Canada Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair Canada Inc. requests the users of this product to study this Material Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

Praxair and the *Flowing Airstream* design are trademarks of
Praxair Canada Inc.

Other trademarks used herein are trademarks or registered trademarks of their respective owners.



Praxair Canada Inc.
1 City Centre Drive
Suite 1200
Mississauga, ON L5B 1M2