

Material Safety Data Sheet

Revision Issued: 10/13/2005 Supercedes: 10/16/2003 First Issued: 11/14/1986

Section I - Chemical Product And Company Identification

Product Name: Chlorine

CAS Number: 7782-50-5

HBCC MSDS No. CC16000



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Section II - Composition/Information On Ingredients

Chemical Name	CAS Number	%	Exposure Limits (TWAs) in Air		
			ACGIH TLV	OSHA PEL	STEL
Chlorine	7782-50-5	99.5	.5 ppm	.5 ppm	1 ppm
			1.5 mg/m ³	1.5 mg/m ³	3 mg/m ³

Section III - Hazard Identification

Summary of Acute Health Hazards

Ingestion: Chlorine is a gas at room temperature. Ingestion of liquid chlorine may result in severe irritation or ulceration of the mouth, throat and digestive tract which may be displayed by nausea, pain, vomiting, cyanosis (lack of oxygen in the blood), and, in severe cases, collapse, shock and death.

Inhalation: Major potential route of exposure. Exposure to chlorine gas may cause severe irritation of mucous membranes of the nose, throat, and respiratory tract followed by severe coughing, burning, chest pain, vomiting, headache, anxiety, and feeling of suffocation. Severe breathing difficulties may occur which may be delayed in onset. Severe exposure may lead to pneumonitis and pulmonary edema and may be fatal. Repeated or prolonged exposure may result in reduced pulmonary capacity and dental erosion.

Skin: Contact with liquid chlorine may cause serious burns, blistering and tissue destruction. Chlorine vapors can cause irritation, burning and blisters.

Eyes: Exposure to chlorine gas may cause severe eye damage. Direct contact of the eyes with liquid chlorine will produce serious eye burns even blindness.

Summary of Chronic Health Hazards: Repeated or prolonged exposure to chlorine may cause corrosion of the teeth and skin irritation. A study of 600 diaphragm cell workers exposed to 0.006 to 1.42 ppm, showed no statistically significant increase in abnormal chest x-rays, ECG's or pulmonary function tests.

Summary of Toxic Effects: Inhalation is expected to be the primary route of

occupational exposure to chlorine. Chlorine liquid is corrosive to the eyes, mucous membranes and skin. At normal atmospheric pressure and temperature, liquid chlorine readily vaporizes to gas. Chlorine gas causes severe irritation of the eyes and respiratory tract with eye injury, restlessness, shortness of breath, cough, choking sensation, sneezing, running nose, chest pain, dizziness, headache, nausea, cyanosis (lack of oxygen in the blood) and respiratory failure. Following respiratory tract injury, onset of severe breathing difficulties, including bronchitis, lung edema (accumulation of fluid in the lungs) and pneumonia, may be delayed and life threatening. High concentrations of chlorine over a short period of time may aggravate pre-existing heart conditions, and cause congestive heart failure. At high concentrations, chlorine gas irritates the skin and can produce sensations of burning and pricking of the skin, with inflammation and blister formation. Exposure to concentrations as low as 5-10 ppm is reported to cause severe irritation of the eyes, nose and respiratory tract which is intolerable after a few minutes. Overexposure to chlorine can trigger asthma attacks in susceptible individuals. Due to potential for chlorine to produce severe respiratory tract irritation and aggravate heart conditions, workers with lung disease, compromised lung function or cardiovascular conditions should have limited exposure to this material. The threshold odor concentration of chlorine is reported to range from 0.3-3.5 ppm. Repeated exposure to chlorine can result in loss of the ability to detect the odor of chlorine. Chronic overexposure to chlorine has been associated with erosion of the teeth, chest pain, hemoptysis (coughing up blood), nose bleeds, chronic bronchitis and an increased susceptibility to tuberculosis.

Section IV - First Aid Measures

Ingestion: Never give anything by mouth to an unconscious person. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. If vomiting occurs spontaneously, keep airway clear and give more water. GET MEDICAL ATTENTION IMMEDIATELY.

Inhalation: If a person breathes in large amounts of chlorine, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

Skin: If liquid chlorine or high concentrations of chlorine gas get on the skin, immediately flush the contaminated skin with water for at least 15 minutes. If liquid chlorine or high concentrations of chlorine gas penetrate through the clothing, remove clothing under a safety shower and continue to wash the skin for at least 15 minutes. If irritation is present after washing, GET MEDICAL ATTENTION. Do not apply greases unless ordered by a physician. Wash clothing before reuse. Destroy contaminated shoes.

Eyes: If liquid chlorine or high concentrations of chlorine gas get into the eyes, flush eyes immediately with a directed stream of water for at least 15 minutes while forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissue. Do not attempt chemical neutralization of any kind. GET MEDICAL ATTENTION IMMEDIATELY. Contact lenses should not be worn when working with chlorine.

Medical Conditions Generally Aggravated by Exposure: : Chlorine is a respiratory irritant. Persons with asthma, bronchitis, emphysema or other lung diseases, and chronic

nose, sinus or throat conditions may be at increased risk from exposure.

Note to Physicians: No known antidote. Treatment for inhalation is symptomatic and supportive. Keep patient at rest until respiratory symptoms subside. Sedation for apprehension or restlessness may be considered as well as diuretics and antibiotics to alleviate edema and protect against secondary infection. Administer oxygen under exhalation pressure not exceeding 4 cm water for 15 minutes each hour until symptoms subside (except in presence of impending or existing cardiovascular failure). Steroid therapy, if given early, has been reported effective in preventing pulmonary edema. It is recommended that anyone exposed to chlorine gas by inhalation obtain a chest x-ray to check for pulmonary edema.

Section V - Fire Fighting Measures

Flash Point: Non-flammable

Autoignition Temperature: N/A

Lower Explosive Limit: N/A

Upper Explosive Limit: N/A

Unusual Fire and Explosion Hazards: Noncombustible in air, many metals ignite in presence of chlorine-for example, steel at about 4850°F. May react to cause fire and/or explosion upon contact with turpentine, ether, ammonia, hydrocarbons, certain metal hydrides, carbides, nitrides, oxides, sulfides, phosphides, easily oxidized materials, organic materials or other flammables. Forms Hydrogen Chloride when contacted with water.

Extinguishing Media: Use water spray to keep fire-exposed containers cool, but avoid area where chlorine is leaking. Use extinguishing media as appropriate for materials in the surrounding fire.

Special Firefighting Procedures: Firefighters MUST use self contained breathing equipment, eye protection and full protective clothing when fighting fires in which chlorine is involved. Use water spray to keep fire-exposed containers cool, but avoid area where chlorine is leaking.

Section VI - Accidental Release Measures

In event of leak or spill, keep up wind, notify safety personnel, provide ventilation, wear full protective equipment and shut off supply at source. Keep combustibles (wood, paper, oil, etc.) away from spilled material. **DO NOT** apply water to point leak or spill area. Exclude from area all except specially trained, assigned personnel with approved equipment and clothing. Uncontrollable leaks may require evacuation of surrounding area. Keep material out of water courses and sewers. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair the leak or allow the cylinder to empty through a reducing agent, such as caustic soda, soda ash, or hydrated lime solutions. Isolate area until gas has dispersed.

Section VII - Handling and Storage

Store chlorine containers in well ventilated areas of low fire potential, away from incompatible materials and away from sources of heat and ignition. Protect containers from weather and physical damage. Regularly test and inspect piping and containment used for chlorine service. Liquid levels should be less than 85% of tank or cylinder capacity. Spills of chlorine of 10 or more pounds must be reported to the National Response Center (800-424-8802).

Other Precautions: Provide special training to workers handling chlorine. Regularly test and inspect piping and containment used for chlorine service.

Section VIII - Exposure Controls/Personal Protection

Respiratory Protection: Minimum respiratory protection required with a gas concentration above 1 ppm but less than 25 ppm: a chemical cartridge respirator with a full facepiece and cartridge(s); a gas mask with a chin-style or a front- or back-mounted canister; any supplied-air respirator with a full facepiece, helmet, or hood; any self-contained breathing apparatus with a full facepiece. In a gas concentration greater than 25 ppm, a self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode must be used. Only NIOSH-approved or MSHA-approved equipment providing protection against chlorine should be used.

Ventilation: Provide general and local exhaust ventilation to meet TLV of 0.5 ppm. Provide suitable venting for low lying areas. Use enclosed, isolated processing and handling whenever possible.

Protective Clothing: Employees should be required to use impervious clothing, rubber or neoprene gloves, face shields (eight-inch minimum) and other appropriate protective clothing necessary to prevent any possibility of skin contact with liquid chlorine, and to prevent the skin from becoming frozen from contact with vessels containing liquid chlorine.

Eye Protection: Employees should be required to use splash-proof safety goggles and face shield where there is any possibility of liquid chlorine contacting the eyes. Contact lenses must not be worn when working around chlorine.

Other Protective Clothing or Equipment: Eyewash stations and safety showers must be available in the immediate work areas.

Work/Hygienic Practices: Avoid contact with skin and avoid breathing vapors. Do not eat, drink, or smoke in work area. Wash hands before eating, drinking, or using restroom.

Section IX - Physical and Chemical Properties

Physical State: Compressed Gas **pH:** 5.5 @ 0.7% Solution

Melting Point/Range: -101° C; -149.8° F **Boiling Point/Range:** -34° C; -29.3° F

Appearance/Color/Odor: Greenish-yellow gas or a clear, amber colored liquid with a suffocating, pungent, irritating odor

Solubility in Water (g/100g): 0.7 @ 20° C; 68°F

Vapor Pressure(mmHg): 85 PSIG @ 21.1° C; 69° F

Specific Gravity(Water=1): 1.467 @ 0° C

Molecular Weight: 70.914

Vapor Density(Air=1): 2.49 @ 0° C; 32° F

% Volatiles: 100%

Odor Threshold: 0.2 ppm

Freezing Point: -101° C; -150° F

How to detect this compound : Smell. The odor threshold for chlorine is between 0.02 and 0.2 ppm.

Section X - Stability and Reactivity

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions to Avoid: The presence of moisture in gaseous and liquid chlorine increases corrosive attack on most common metals. Will react with water or steam to produce toxic and corrosive fumes of hydrogen chloride.

Materials to Avoid: Chlorine is a powerful oxidizing agent which reacts violently with a variety of substances over a broad range of conditions including reducing agents and combustible materials. It should be kept away from materials such as acetylene, turpentine, other hydrocarbons, ammonia, hydrocarbons, certain metal hydrides, nitrides, oxides, sulfides, phosphides, easily oxidized materials, organic materials, hydrogen, ether, powdered metals, sulfur, and aluminum. Chlorine reacts with hydrogen sulfide and water forming hydrochloric acid. It combines with carbon monoxide and sulfur dioxide to form phosgene and sulfuryl chloride, respectively, which are toxic and corrosive substances.

Hazardous Decomposition Products: Chlorine does not decompose but reacts violently to form Hydrochloric Acid and other potentially toxic and/or corrosive substances. Chlorine is stable in steel containers at room temperature when dry. Intense local heat on steel walls can cause the steel to react and glow in presence of chlorine.

Section XI - Toxicological Information

Toxicology Testing Data: Numerous studies have been conducted to determine the potential chlorine has to cause chronic effects. In rats exposed to concentrations up to 9 ppm for 6 hours a day, 5 days a week for 6 weeks, decreases in body weight and inflammation of the respiratory tract were observed. At exposures of 3 and 9 ppm changes in the liver and kidneys were also noted. Rabbits and guinea pigs exposed to 1.7 ppm for 9 months showed weight loss and a decreased resistance to disease. No adverse effects were observed in rabbits and guinea pigs at levels of 0.7 ppm. Guinea pigs exposed to 1.6 ppm for 5 hours a day, for 47 days and injected with tuberculosis (bacteria) displayed shorter life cycles than those exposed to just one of the agents. Rhesus monkeys exposed to concentrations up to 2.3 ppm for 6 hours a day, 5 days a week for one year did not exhibit any signs of chronic toxicity.

The hazard at different concentrations is reported to be as follows:

0.2-0.5 ppm=No toxic, long term effect

1-3 ppm=Definite odor: irritation of eyes and nose

5-8 ppm=Throat, eye, and mucous membrane irritation

30 ppm=Intense coughing fits

34-51 ppm=Lethal in 1 to 1.5 hours exposure

40-60 ppm=Exposure for 30-60 minutes without effective respiration may cause bronchitis, pulmonary edema or bronchopneumonia

100 ppm=May be lethal after 50 minutes of exposure (estimated)

430 ppm=Lowest concentration known to cause lethality after 30 minutes of exposure

1000 ppm=May be fatal with a few deep breaths

Reproductive Toxicity: Two studies have been conducted to assess the ability of chlorine to cause reproductive effects. Rabbits exposed by inhalation to concentrations up to 1.5 ppm and rats exposed by ingestion to highly chlorinated drinking water daily for seven generations did not display any adverse reproductive effects. NSF Standard 60 Maximum Use 30 mg/L

Section XII - Ecological Information

N/A

Section XIII - Disposal Considerations

Chlorine gas will disperse to the atmosphere leaving no residue. When possible, move leaking container to an isolated area. Position to release gas, not liquid. One volume of liquid chlorine is equivalent to about 460 volumes of gas. Absorb in alkaline solution of caustic soda, soda ash, or hydrated lime. Liquid or solid residues must be disposed of in a permitted waste management facility. Consult federal, state, or local disposal authorities for approved procedures.

Section XIV - Transport Information

DOT Proper Shipping Name: Chlorine

DOT Hazard Class/ I.D. No.: 2.3, (8); UN1017

Section XV - Regulatory Information

This product contains the following toxic chemical(s) subject to the reporting requirements of SARA TITLE III of the Emergency Planning and Community Right-To Know Act (EPCRA) of 1986 and of 40 CFR 372:

Section 302 Extremely Hazardous Substance (EHS): CAS # 7782-50-5
100 Lbs. (45.4 Kilograms) (8.77 Gals.) Threshold Planning Quantity (TPQ)

Section 304 Extremely Hazardous Substance (EHS): CAS # 7782-50-5
10 Lbs. (4.54 Kilograms) (0.877 Gals.) Reportable Quantity (RQ)

CERCLA Hazardous Substance: CAS # 7782-50-5

10 Lbs. (4.54 Kilograms) (0.877 Gals.) Reportable Quantity (RQ)

Section 313 Supplier Notification: CAS # 7782-50-5, % by Weight: 99.5%

CAA Section 112(r) Listed Substance for Accidental Release Prevention

Chlorine, CAS # 7782-50-5, 2,500 Lbs. Threshold Quantity (TQ)

NFPA Rating: Health - 4; Fire - 0; Reactivity - 0; Other - (Oxidizer)

0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme

Carcinogenicity Lists:

National Toxicology Program (NTP): No

International Agency for Research on Cancer (IARC) Monograph: No

Occupational Safety & Health Administration (OSHA) Regulated: No

IDLH Value*: 10 ppm

***The Immediately Dangerous to Life and Health Value**

Chlorine is contained on a list as required under Sec 101(14) of CERCLA, which includes substances designated pursuant to SEC 311 of the Clean Water Act, Hazardous Wastes under SEC 3002 of RCRA, Toxic pollutants under SEC 307 of the Clean Water Act, Hazardous Air Pollutants under SEC 112 of the Clean Air Act, Imminently Hazardous Chemicals under Sec 7 of TSCA. Chlorine is designated a hazardous substance by 29 CFR Sec 1910, Subpart Z. The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) is applicable if chlorine is used as a pesticide or in water or sewer treatment applications.

NSF Standard 60

Maximum Use

30 mg/L

Section XVI - Other Information

Synonyms/Common Names: Chlorine; Cl₂

Chemical Family/Type: Halogen Gas

Change Made Since Last Revision: XIV, XV

IMPORTANT! Read this MSDS before use or disposal of this product. Pass along the information to employees and any other persons who could be exposed to the product to be sure that they are aware of the information before use or other exposure. This MSDS has been prepared according to the OSHA Hazard Communication Standard [29 CFR 1910.1200]. The MSDS information is based on sources believed to be reliable. However, since data, safety standards, and government regulations are subject to change and the conditions of handling and use, or misuse are beyond our control, **Hill Brothers Chemical Company** makes no warranty, either expressed or implied, with respect to the completeness or continuing accuracy of the information contained herein and disclaims all liability for reliance thereon. Also, additional information may be necessary or helpful for specific conditions and circumstances of use. It is the user's responsibility to determine the suitability of this product and to evaluate risks prior to use, and then to exercise appropriate precautions for protection of employees and others.