

Material Safety Data Sheet

Revision Issued: 11/29/2010 Supercedes: 2/09/2010 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	%
Chlorine	7782-50-5	99.5
Inert Ingredient		0.5%

See Section VIII for exposure guidelines

Section III - Hazard Identification

Label Warning:

DANGER POISON: Fatal if inhaled. Liquid Causes Severe Burns

EPA Reg. No. 266-35. EPA Est. No. 266-AZ-1

Hazards to Humans and Domestic Animals: Danger: Fatal if inhaled or absorbed through the skin. Corrosive: Causes irreversible eye damage and skin burns. Do not breathe vapors or get in eyes, on skin or clothing. Wear goggles, protective clothing and rubber gloves (see label warning in Section VIII). Wash hands thoroughly with soap and water after handling and before eating, drinking, or using tobacco. Remove contaminated clothing and wash clothing before reuse. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

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: Remove victim to fresh air. If not breathing, give artificial respirations, preferably mouth-to-mouth. Get Medical Attention Immediately. Keep the affected person warm and at rest. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

Skin: Wash with plenty of soap and water while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Destroy contaminated shoes.

Eyes: Hold eyelids open and flush with a steady, gentle stream of water for 15 minutes. 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

Make daily inspections for leaks. Stop a leak at once, since it will become worse with time. In case of a leak, evacuate everyone from the immediate area. For entry into the affected area to correct problem, wear personal protective equipment (including prescribed respirators) specified in the Hazards to Humans section of this labeling. When possible, move leaking or damaged cylinders outdoors or to an isolated location. Observe strict safety precautions. Work upwind if possible. Allow any liquid Chlorine to evaporate. Only correctly trained and Personal Protective Equipment (PPE)-equipped handlers are permitted to perform such cleanup. Do not permit entry into the leak area by any other person until the Chlorine has completely dispersed.

Section VII - Handling and Storage

Storage: Store cylinders and ton containers in a dry area away from sources of heat and protected from direct sunlight and precipitation. Do not store in excessive heat. Segregate Chlorine containers from other compressed gases, and never store near hydrocarbons, finely divided metals, turpentine, ether, and anhydrous ammonia or other flammable materials. All storage containers and cylinders must have a weather resistant label and must not be accessible to the general public. Do not drop container. If container is damaged or leaking, refer to procedures in the Chlorine

Institutes Pamphlet 1-Chlorine Basics and/or notify supplier immediately. Do not contaminate water, food, or feed by storage or disposal. Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal Law.

Other Precautions: Provide special training to workers handling chlorine. 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).

Section VIII - Exposure Controls/Personal Protection

Exposure Controls

Engineering Controls: 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. 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. Do NOT place food, coffee or other drinks in the area where dusting or splashing of solutions is possible.

Exposure Guideline(s): Chlorine: CAS Number 7782-50-5, Exposure Limits (TWAs) in Air: ACGIH TLV: 0.5 ppm, 1.5 mg/m³; OSHA PEL: 0.5 ppm, 1.5 mg/m³; STEL: 1 ppm, 3 mg/m³

Personal Protection

Personal Protective Equipment (PPE): Handlers must wear long-sleeved shirts, long pants, shoes, and socks. Under normal use-conditions, no protective eyewear, respirator, or gloves are required. However, in case of a spill or leak, handlers must wear chemical-resistant gloves (such as nitrile or butyl) and a full-face canister-style (gas mask) respirator with a canister approved for chlorine (MSHA/NIOSH approval number prefix TC-14G) OR a self-contained breathing apparatus (SCBA) (MSHA/NIOSH approval number prefix TC-13F). Since there is always the possibility of a spill or leak, gloves and a respirator of a type specified above must be available and are required for anyone entering into an affected area in the event of a leak or spill.

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.

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.

Physical and Chemical Hazards: Chlorine is a non-flammable gas, liquefied, under pressure. Do not drop container. Do not heat container. Keep away from intense heat or open sunlight. Corrosive to most metals in the presence of moisture.

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

Environmental Hazards: This pesticide is toxic or highly toxic to fish and aquatic invertebrates. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge

effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA.

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

Disposal of Container: Container is returnable and must be properly identified with return tag and returned as promptly as possible to supplier, in accordance with all applicable DOT regulations. All valves must be closed tight and closures or caps secured. It is illegal to ship a leaking Chlorine container.

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, (5.1, 8); UN1017, Poison-Inhalation Hazard, Zone B

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; Flammability - 0; Instability - 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.

Material listed for use under **NSF/ANSI Standard 60** – Drinking Water Treatment Chemicals. Maximum use level in potable water is 30 mg/L for Chlorine gas.

Section XVI - Other Information

Synonyms/Common Names: Chlorine; Cl₂

Chemical Family/Type: Halogen Gas

Change Made Since Last Revision: II, III, IV, VI, VII, VIII, IX, XI, XIII, 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.