

## EPA CHEMICAL PROFILE

Date: October 31, 1985  
Revision: November 30, 1987

### CHEMICAL IDENTITY -- CHLORINE

CAS Registry Number: 7782-50-5

Synonyms: Bertholite; Molecular Chlorine

Chemical Formula:  $\text{Cl}_2$

Molecular Weight: 70.91

### SECTION I -- REGULATORY INFORMATION

#### CERCLA (SARA) 1986:

Toxicity Value Used for Listing Under Section 302:  $\text{LC}_{50}$  inhalation (mouse) 0.4 mg/liter/1 hour (\*NIOSH/RTECS 1985)

TPQ: 100 (pounds)

RQ: 10 (pounds)

Section 313 Listed (Yes or No): Yes

### SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Physical State: Gas

Boiling Point:  $-30.3^{\circ}\text{F}$ ,  $-34.6^{\circ}\text{C}$  (\*Weast 1983)

Specific Gravity ( $\text{H}_2\text{O}=1$ ): 1.424 at  $15^{\circ}\text{C}$  (Weiss 1986, p. 252)

Vapor Pressure (mmHg): 7600 at  $30^{\circ}\text{C}$  (\*Weast 1983)

Melting Point:  $-150^{\circ}\text{F}$ ,  $-101^{\circ}\text{C}$  (\*Weast 1983)

Vapor Density (AIR=1): 2.49 (Sax 1986, p. 32)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 0.57 g/100 mL at  $30^{\circ}\text{C}$  (\*Weast 1983)

Appearance and Odor: Greenish-yellow gas with suffocating odor (\*Merck 1983).

**CHLORINE****SECTION III -- HEALTH HAZARD DATA**

**OSHA PEL:** Ceiling 1 ppm, 3 mg/m<sup>3</sup> (OSHA 1984)

**ACGIH TLV:** TWA 1 ppm (3 mg/m<sup>3</sup>); STEL 3 ppm (9 mg/m<sup>3</sup>) (\*ACGIH 1980)

**IDLH:** 30 ppm (NIOSH 1987, p. 74)

**Other Limits Recommended:** Occupational Exposure to Chlorine Recommended Standard: 15-minute ceiling 0.5 ppm (\*NIOSH/RTECS 1985); EEGL 3.0 ppm (60 minutes) (NRC 1984b, pp. 5-11)

**Routes of Entry:** Inhalation: Yes (NIOSH/OSHA 1978, p. 64)  
Skin: Yes (NIOSH/OSHA 1978, p. 64)  
Ingestion: Not Found

**Health Hazards (Acute, Delayed, and Chronic):** Poisonous; may be fatal if inhaled. Contact may cause burns to skin and eyes (\*DOT 1984).

**Medical Conditions Generally Aggravated by Exposure:** Bronchitis or chronic lung conditions (\*ITI 1982).

**SECTION IV -- FIRE AND EXPLOSION HAZARD DATA**

**Flash Point (Method Used):** Not Found

**Flammable Limits:**

LEL: Not Found

UEL: Not Found

**Extinguishing Methods:** Will not burn, but most combustible materials will burn in chlorine as they do in oxygen; flammable gases will form explosive mixtures with chlorine (\*NFPA 1978). Dry chemical, carbon dioxide, water spray, fog or foam (DOT 1984, Guide 20).

**Special Fire Fighting Procedures:** Evacuate area endangered by gas. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and full protective clothing. Move container from fire area if you can do so without risk. Spray cooling water on containers that are exposed to flames until well after fire is out (DOT 1984, Guide 20). If it is necessary to stop the flow of gas, use water spray to direct escaping gas away from those effecting shut-off (\*NFPA 1978).

**Unusual Fire and Explosion Hazards:** May ignite other combustible materials (wood, paper, oil, etc.). Mixture with fuels may cause explosion. Container may explode in heat of fire. Vapor explosion and poison hazard indoors, outdoors or in sewers (DOT 1984, Guide 20). Hydrogen and chlorine mixtures (5-95%) are exploded by almost any form of energy (heat, sunlight, sparks, etc.) (\*NFPA 1978). May combine with water or steam to produce toxic and corrosive fumes of hydrochloric acid (\*Environ Canada 1981).

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### SECTION IV (continued)

NFPA Flammability Rating: 0

### SECTION V -- REACTIVITY DATA

Stability: Unstable:

Stable: Yes (\*NFPA 1978)

Conditions to Avoid: Heat and contact with hydrogen gas or powdered metals (\*NFPA 1978).

Incompatibility (Materials to Avoid): Plastics and rubber (\*NIOSH/OSHA 1981)

Hazardous Decomposition or Byproducts: Emits highly toxic fumes when heated (\*Sax 1975).

Hazardous Polymerization: May Occur: Not Found  
May Not Occur: Not Found

Conditions to Avoid: Not Found

### SECTION VI -- USE INFORMATION

Manufacture of chlorinated lime used in bleaching; manufacture of synthetic rubber and plastics; purifying water; detinning and dezincing iron (\*Merck 1983).

### SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE (Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Keep combustibles (wood, paper, oil, etc.) away from spilled material. Stop leak if you can do it without risk. Use water spray to reduce vapor but do not put water on leak or spill area. Isolate area until gas has dispersed. (\*DOT, 1984)

### SECTION VIII -- PROTECTIVE EQUIPMENT FOR EMERGENCY SITUATIONS

For emergency situations, wear a positive pressure, pressure-demand, full facepiece self-contained breathing apparatus (SCBA) or pressure-demand supplied air respirator with escape SCBA and a fully-encapsulating, chemical resistant suit. See the introductory information section at the beginning of the profiles for additional information.

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### SECTION VIII (continued)

#### SUIT MATERIAL PERFORMANCE (Based on EPA/USCG "Guidelines", 1987) (Chemical Resistance/Amount of Data)

Butyl	POOR/LIMITED*
Butyl/Neoprene	GOOD/LIMITED
CPE	GOOD/LIMITED*
Neoprene	GOOD/LIMITED
Nitrile	POOR/LIMITED*
PE	POOR/MANY
PVC	POOR/MANY
Saranex	GOOD/LIMITED
Viton	GOOD/LIMITED
Viton/Neoprene	GOOD/LIMITED

\*Based on qualitative performance information.

\*\*Based on a chemical analog.

### SECTION IX -- EMERGENCY TREATMENT INFORMATION

See Emergency First Aid Treatment Guide

**Emergency First Aid Treatment Guide  
for  
CHLORINE**

**(7782-50-5)**

This guide should not be construed to authorize emergency personnel to perform the procedures or activities indicated or implied. Care of persons exposed to toxic chemicals must be directed by a physician or other recognized authority.

**Substance Characteristics:**

Pure Form - Greenish-yellow gas.

Odor - Pungent, suffocating.

Commercial Forms - Gas in cylinders; liquid in 100- and 150-pound steel cylinders, tank cars and barges, motor trucks, pipelines.

Uses - Chemical synthesis, swimming pool sanitation, water purification, food processing, shrink proofing, metal processing, batteries, bleaching agent, intermediate for gasoline additives, flame-retardant compounds, refrigerants.

Other Names - Bertholite, molecular chlorine.

**Personal Protective Equipment:** See Chemical Profile Section VIII.

**Emergency Life-Support Equipment and Supplies That May Be Required:**

Compressed oxygen, forced-oxygen mask, soap, water, normal saline, D5W, Ringer's lactate, isoproterenol inhaler, sodium bicarbonate.

**Signs and Symptoms of Acute Chlorine Exposure:**

*Warning: Effects may be delayed. Caution is advised. Chlorine is corrosive and may be converted to hydrochloric acid in the lungs.*

Signs and symptoms of acute exposure to chlorine may include tachycardia (rapid heart rate), hypertension (high blood pressure) followed by hypotension (low blood pressure), and cardiovascular collapse. Pulmonary edema and pneumonia are often seen.

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The eyes, nose, throat, and chest may sting or burn following exposure to chlorine. Cough with bloody sputum, a feeling of suffocation, dizziness, agitation, anxiety, nausea, and vomiting are common. Dermal exposure may result in sweating, pain, irritation, and blisters.

### Emergency Life-Support Procedures:

Acute exposure to chlorine may require decontamination and life support for the victims. Emergency personnel should wear protective clothing appropriate to the type and degree of contamination. Air-purifying or supplied-air respiratory equipment should also be worn, as necessary. Rescue vehicles should carry supplies such as chlorine-resistant plastic sheeting and disposable bags to assist in preventing spread of contamination.

### Inhalation Exposure:

1. Move victims to fresh air. Emergency personnel should avoid self-exposure to chlorine.
2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support.
3. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.
4. Transport to a health care facility.

### Dermal/Eye Exposure:

1. Remove victims from exposure. Emergency personnel should avoid self-exposure to chlorine.
2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support.
3. Remove contaminated clothing as soon as possible.
4. If eye exposure has occurred, eyes must be flushed with lukewarm water for at least 15 minutes.
5. Wash exposed skin areas for at least 15 minutes with soap and water.

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6. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.
7. Transport to a health care facility.

**Ingestion Exposure:** No information is available.

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The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Chlorine gas; CAS 7782-50-5.

Trade Names: Bertholite, and others.

Uses: Bleaching fabrics, water purification, manufacture of rubber and plastics, detinning and dezincing of iron and manufacture of chlorinated hydrocarbons.

PHYSICAL INFORMATION

Appearance: Greenish-yellow gas, amber liquid under high pressure or refrigeration.

Odor: Strongly suffocating and irritating.

Behavior in Water: Soluble.

HEALTH HAZARD INFORMATION

OSHA Standard: 1 ppm.

NIOSH Recommended Limit: 0.5 ppm.

ACGIH Recommended Limit: Average 8 hour exposure -- 1 ppm.

Short Term Exposure:

Inhalation: 1.0 ppm may produce irritation of the nose, mouth and throat; at 1.3 ppm and above, irritation may be more pronounced with coughing and labored breathing; high concentrations may cause throat muscle spasm leading to suffocation and death; delayed effects may include accumulation of fluid in the lungs, bronchitis and pneumonia. Death may occur after a few breaths at 1000 ppm.

Skin: Strong irritant; may cause both chemical burns and freezing.

Eyes: Irritation reported at 1 ppm, splashed liquid may cause both chemical burns and freezing.

Ingestion: Severe irritant. May cause severe chemical burns and freezing of mouth, throat and stomach. May cause death.

Long Term Exposure:

Impairment of breathing functions, tooth erosion, anxiety and the formation of acne-like lesions on the skin have been reported.

\*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic is Toxic" available from the New York State Department of Health.

## Chlorine

### EMERGENCY AND FIRST AID INSTRUCTIONS

**Inhalation:** Give artificial respiration or oxygen as required. A positive pressure respirator may be necessary. If available give bronchodilators and decongestants. Seek immediate medical attention.

**Skin:** Remove soiled clothing after allowing to thaw. Wash with large amounts of water for at least five minutes. Treat as chemical burn. Seek medical attention.

**Eyes:** Wash with large amounts of water for at least 15 minutes. Seek medical attention.

**Ingestion:** Seek medical attention immediately.

**Note to Physician:** Chest x-rays should be followed and pulmonary function tests performed.

### FIRE AND EXPLOSION INFORMATION

**General:** Chlorine is non-flammable. However, it is a strong oxidizer and will support the burning of other materials.

**Extinguisher:** Use an extinguisher appropriate to the burning material.

### REACTIVITY

**General:** Chlorine and chlorine solutions are highly corrosive and strong oxidizing agents.

**Materials to Avoid:** Chlorine reacts with anything that burns. It will form explosive mixtures with nitrogen, acetylene, turpentine, ether, ammonia, fuel gas, hydrocarbons and finely divided metals.

**Conditions to Avoid:** Aqueous solutions of chlorine will react on long standing, especially if exposed to light, giving off oxygen and hydrochloric acid. Chlorine will react in a similar way when exposed to moisture.

### PROTECTIVE MEASURES

**Storage and Handling:** Protect containers against physical damage. Store cylinders and tin containers in a cool, dry, relatively isolated area, protected from weather and extreme temperature changes.

**Engineering Controls:** Ventilate work area to reduce exposure. Eye wash stations, showers and sinks should be available.

**Protective Clothing (Should not be substituted for proper handling and engineering controls):** Wear impervious clothing and goggles.

**Protective Equipment:** For levels up to 5 ppm use a chemical cartridge respirator providing protection against chlorine, a supplied-air respirator or a self-contained breathing apparatus. For levels up to 12.5 ppm use a supplied-air respirator operated in continuous-flow mode or a powered air-purifying respirator providing protection against chlorine. For levels up to 25 ppm use a chemical cartridge respirator with a full facepiece and cartridges providing protection against chlorine, a gas mask providing protection against chlorine, a powered air-purifying respirator with a full facepiece and providing protection against chlorine, a self-contained breathing apparatus with a full facepiece or a supplied-air respirator. For levels above 25 ppm or use in areas of unknown concentrations use a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or a combination Type C supplied-air respirator with an auxiliary self-contained breathing apparatus, both with a full facepiece and operated in a positive pressure mode. For escape use a gas mask providing protection against chlorine or an escape self-contained breathing apparatus.

**PROCEDURES FOR SPILLS AND LEAKS:** Get workers out of spill area. Put on protective equipment and ventilate thoroughly. For final disposal contact your regional office of the New York State Department of Environmental Conservation.

For more information:

Contact the Industrial Hygienist or Safety Officer at your worksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, 2 University Place, Albany, New York 12203.