

MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT IDENTIFICATION

PRODUCT NAME: Chlorine

CHEMICAL NAME: Chlorine **FORMULA:** Cl₂

MANUFACTURER: Air Products and Chemicals, Inc.

7201 Hamilton Boulevard

Allentown, PA 18195-1501

PRODUCT INFORMATION: (800) 752-1597

MSDS NUMBER: 1007 **REVISION:** 7

REVIEW DATE: December 1998 **REVISION DATE:** December 1998

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

Chlorine is sold as a pure product >99%.

CAS NUMBER: 7782-50-5

EXPOSURE LIMITS:

OSHA: PEL = 1 ppm **ACGIH:** TWA/TLV = 0.5 ppm **NIOSH:** IDLH = 10 ppm

SECTION 3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Chlorine is a toxic, corrosive gas that can cause severe burns if inhaled or upon skin contact. It is a greenish-yellow nonflammable liquefied compressed gas packaged in cylinders under its own vapor pressure. It may fume white on contact with moist air. The degree of fuming is related to the amount of humidity in the air. It is also an oxidizer and will support combustion. Products of combustion are toxic. When entering release area wear Self-Contained Breathing Apparatus (SCBA) if concentrations exceed exposure limits or are unknown. Fully protective suits are required when responding to large releases.

EMERGENCY TELEPHONE NUMBERS

(800) 523-9374 Continental U.S., Canada, and Puerto Rico

(610) 481-7711 other locations

ACUTE POTENTIAL HEALTH EFFECTS:

ROUTES OF EXPOSURE:

EYE CONTACT: Irritation and/or burns to the cornea that may lead to vision impairment or loss.

INHALATION: Corrosive and irritating to the respiratory tract and mucous membranes. Excessive exposure to concentrations above the exposure limits may result in chemical pneumonitis (inflammation), pulmonary hemorrhage (bleeding) and edema (fluid buildup).

SKIN CONTACT: Chemical burn similar to one that is caused by an inorganic acid.

POTENTIAL HEALTH EFFECTS OF REPEATED EXPOSURE:

ROUTE OF ENTRY: Inhalation, eye or skin contact.

TARGET ORGANS: Airway, lungs, eyes, and skin.

SYMPTOMS: Burning/irritation in eyes. Coughing, irritation in the throat and nasal tract.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: Asthma, emphysema, or other respiratory diseases.

CARCINOGENICITY: This product is not listed as a carcinogen or potential carcinogen by NTP, IARC, or OSHA.

SECTION 4. FIRST AID MEASURES

EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes. Get immediate medical attention.

INHALATION: Remove person to fresh air. If not breathing, administer artificial respiration. If breathing is difficult, administer oxygen. Obtain prompt medical attention and continue with administration of oxygen. If airway obstruction occurs the placement of an artificial airway by an emergency medical technician may be necessary.

SKIN CONTACT: Immediately flush with large amounts of water. Remove contaminated clothing, including shoes, after flushing has begun. Applications of ice water compresses for 30 minutes after flushing may help limit extent of burn.

NOTES TO PHYSICIAN: Bronchospasm may be treated with the use of a bronchodilator such as albuterol and an anticholinergic inhalant such as Atrovent.

SECTION 5. FIRE FIGHTING MEASURES

FLASH POINT: AUTOIGNITION: **FLAMMABLE RANGE:**

Not applicable Not applicable Nonflammable

EXTINGUISHING MEDIA: Product is nonflammable. Use extinguishing media appropriate for surrounding fire.

SPECIAL FIRE FIGHTING INSTRUCTIONS: Evacuate all personnel from area. If possible without risk, move cylinders away from fire area. Keep cylinders cool with water spray until well after fire is out. Runoff from fire fighting may be contaminated; check pH. Cylinders exposed to high heat or flame may vent rapidly and may rupture violently. Most cylinders are designed to vent contents when exposed to elevated temperatures found in fire situations.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Upon exposure to intense heat or flame, cylinder will vent rapidly and/or rupture violently. Most cylinders are designed to vent contents when exposed to elevated temperatures. Pressure in a cylinder can build up due to heat and it may rupture if pressure relief devices should fail to function.

HAZARDOUS COMBUSTION PRODUCTS: None known.

SECTION 6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Evacuate immediate area. If the spill is small, ventilate area or remove cylinder to an outdoor location. Use appropriate protective equipment. If the spill is large, evacuate all personnel from affected area. Increase ventilation to release area. Use appropriate protective equipment. Materials that are contacted by releasing product must be decontaminated. Regardless of the size of the spill, shut off source of leak if possible. Isolate any leaking cylinder. If leak is from container, pressure relief device or its valve, contact your supplier. If leak is in user's system, close cylinder valve, safely vent pressure and purge with inert gas before attempting repairs.

SECTION 7. HANDLING AND STORAGE

STORAGE: Store cylinders in a well-ventilated, secure area, protected from the weather. Cylinders should be stored upright with valve outlet seals and valve protection caps in place. Do not allow storage temperature to exceed 125 ° F (52 ° C). Storage should be away from heavily traveled areas and emergency exits. Avoid areas where salt or other corrosive materials are present. Full and empty cylinders should be segregated. Use a first-in first-out inventory system to prevent full containers from being stored for long periods of time. Visually inspect stored cylinders on a routine basis, at least weekly, for any indication of leakage or other problems.

HANDLING: Do not drag, roll, slide or drop cylinder. Use a suitable hand truck designed for cylinder movement. Never attempt to lift a cylinder by its cap. Secure cylinders at all times while in use. Use a pressure reducing regulator or separate control valve to safely discharge gas from cylinder. Use a check valve to prevent reverse flow into cylinder. Use piping and equipment adequately designed to withstand pressures to be encountered. Never apply flame or localized heat directly to any part of the cylinder. Once cylinder has been connected to process, open cylinder valve slowly and carefully. If user experiences any difficulty operating cylinder valve, discontinue use and contact supplier. Never insert an object (e.g., wrench, screwdriver, etc.) into valve cap openings. Doing so may damage valve causing a leak to occur. Use an adjustable strap-wrench to remove over-tight or rusted caps.

Most metals are corroded by this product in the presence of moisture. Systems should be kept free of moisture. Purge system with dry inert gas (e.g. helium or nitrogen) before this product is introduced and when system is out of service. Carbon steel, stainless steel, Monel, or copper are suitable materials of construction for use when no moisture is present. Hastelloy, platinum or gold offer good resistance to corrosion when moisture is present. Kel-F or teflon are the preferred gasket materials. Pressure requirements should be considered when selecting materials and designing systems.

SPECIAL PRECAUTIONS: Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, Inc. (telephone 703-412-0900) pamphlet CGA P-1, *Safe Handling of Compressed Gases in Containers*. Local regulations may require specific equipment for storage or use.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:

VENTILATION: Provide good ventilation and/or local exhaust to prevent accumulation of concentrations above exposure limits.

RESPIRATORY PROTECTION:

Emergency Use: Use SCBA or positive pressure air line with mask and escape pack in areas where concentration is unknown or above the exposure limits.

EYE PROTECTION: Safety glasses and face shield.

SKIN PROTECTION: Leather gloves, safety shoes, and safety glasses for handling cylinders. Acid resistant gloves and splash suit when connecting, disconnecting, or opening cylinders.

Emergency use: Totally encapsulated chemical resistant suit.

OTHER PROTECTIVE EQUIPMENT: Safety shower and eyewash fountain.

OTHER USE PRECAUTIONS: CAUTION: Contact with cold, evaporating liquid on gloves or suit may cause cryogenic burns or frostbite. Cold temperatures may also cause embrittlement of PPE material resulting in breakage and exposure.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE, ODOR AND STATE: Greenish yellow gas with sharp, suffocating, distinctive, pungent odor.

MOLECULAR WEIGHT: 70.91

BOILING POINT (At 1 atm): -29.3 ° F

SPECIFIC GRAVITY (also called vapor density) (Air =1): 2.479

FREEZING POINT / MELTING POINT: -149.73 ° F

VAPOR PRESSURE (At 70 ° F (21.1 ° C)): 84.8 PSIG

GAS DENSITY (At 70 ° F (21.1 ° C) and 1 atm): 0.186 lb/ft³

SOLUBILITY IN WATER (Vol./Vol. at 32 ° F (0 ° C) and 1 atm): 4.610

SECTION 10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable

CONDITIONS TO AVOID: Cylinders should not be exposed to temperatures in excess of 125 ° F (52 ° C).

INCOMPATIBILITY (Materials to Avoid): Moisture, brass, aluminum, zinc, and zinc alloys.

REACTIVITY:

A) HAZARDOUS DECOMPOSITION PRODUCTS: None

B) HAZARDOUS POLYMERIZATION: Will not occur

SECTION 11. TOXICOLOGICAL INFORMATION

LC₅₀ (Inhalation): 293 ppm (rat; 1 hour)

LD₅₀ (Oral): None established

LD₅₀ (Dermal): None established

CARCINOGENICITY: Rats exposed to chlorine gas at a concentration of 2.5 ppm, 6 hours/day,

5 days/week for up to two years exhibited no increase in tumor incidence.

SKIN CORROSIVITY: Chlorine is corrosive to the skin.

ADDITIONAL NOTES: Rats exposed 6 hours/day, 5 days/week for 6 weeks to chlorine at a concentration of 1, 3, or 9 ppm exhibited respiratory tract effects and gained less weight than control animals. The severity of these effects was dose-related. In addition, liver and kidney effects were observed in the rats treated at ≥ 3 ppm.

SECTION 12. ECOLOGICAL INFORMATION

AQUATIC TOXICITY: The following aquatic toxicity data are available for Chlorine:

LC₅₀ Bluegill: 0.44 mg/l (96 hours)

LC₅₀ Yellow perch: 0.88 mg/l (1 hour)

LC₅₀ Channel catfish (fingerling): 0.07 mg/l (96 hours)

LC₅₀ Daphnia magna: 0.017 mg/l (46 hours)

MOBILITY: Not available

PERSISTENCE AND BIODEGRADABILITY: Not available

POTENTIAL TO BIOACCUMULATE: Not available

REMARKS: Do not release large amounts of this product to the atmosphere. It does not contain any Class I or Class II ozone depleting chemicals.

SECTION 13. DISPOSAL CONSIDERATIONS

UNUSED PRODUCT / EMPTY CONTAINER: Small amounts of this product may be disposed of by slowly discharging the gas into a scrubber to other suitable vessel containing approximately 20 percent sodium hydroxide, potassium hydroxide, or other alkali and water. It is necessary to place a reverse-flow check valve or trap in the discharge line to prevent the caustic solution from drawing back through the lines.

Return cylinder and unused product to supplier. Do not attempt to dispose of residual or unused quantities. Ensure cylinder valve is properly closed, valve outlet has been reinstalled and valve protection cap is secured before shipping cylinder.

SECTION 14. TRANSPORT INFORMATION

DOT SHIPPING NAME: Chlorine

Poison Inhalation Hazard - Hazard Zone B

HAZARD CLASS: 2.3

IDENTIFICATION NUMBER: UN1017

SHIPPING LABEL(s): Poison Gas (Primary), Corrosive

PLACARD (When required): Poison Gas

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure upright position in a well-ventilated truck. Never transport in passenger compartment of a vehicle. Ensure cylinder valve is properly closed, valve outlet cap has been reinstalled, and valve protection cap is secured before shipping cylinder.

CAUTION: Compressed gas cylinders shall not be refilled except by qualified producers of compressed gases. The filling and shipping of a compressed gas cylinder without the written consent of the cylinder's owner is in violation of federal law (49 CFR 173.301).

NAERG #: 124

SECTION 15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

EPA - ENVIRONMENTAL PROTECTION AGENCY

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980

(40 CFR Parts 117 and 302)

Reportable Quantity (RQ): 10 lbs.

SARA TITLE III: Superfund Amendment and Reauthorization Act

SECTIONS 302/304: Emergency Planning and Notification (40 CFR Part 355)

Extremely Hazardous Substances: Chlorine is listed.

Threshold Planning Quantity (TPQ): 100 lbs.

Reportable Quantity (RQ): 10 lbs.

SECTIONS 311/312: Hazardous Chemical Reporting (40 CFR Part 370)

IMMEDIATE HEALTH: Yes **PRESSURE:** Yes

DELAYED HEALTH: No REACTIVITY: Yes

FIRE: Yes

SECTION 313: Toxic Chemical Release Reporting (40 CFR Part 372)

Chlorine does require reporting under Section 313.

CLEAN AIR ACT:

SECTION 112 (r): Risk Management Programs for Chemical Accidental Release

(40 CFR PART 68)

Chlorine is listed as a regulated substance.

Threshold Planning Quantity (TPQ): 2500 lbs.

TSCA: Toxic Substance Control Act

This product is listed on the TSCA inventory.

OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR Part 1910.119: Process Safety Management of Highly Hazardous Chemicals

This product is listed in Appendix A as a highly hazardous chemical.

Threshold Planning Quantity (TPQ): 1500 lbs.

STATE REGULATIONS:

CALIFORNIA:

Accidental Release Prevention Program: Threshold Quantity (TQ): 100 lbs

Proposition 65: Chlorine is not a listed substance which the State of California requires warning under this statute.

SECTION 16. OTHER INFORMATION

NFPA RATINGS: HMIS RATINGS:

HEALTH: 4 HEALTH: 2

FLAMMABILITY: 0 FLAMMABILITY: 0

REACTIVITY: 0 REACTIVITY: 0

SPECIAL: Oxidizer