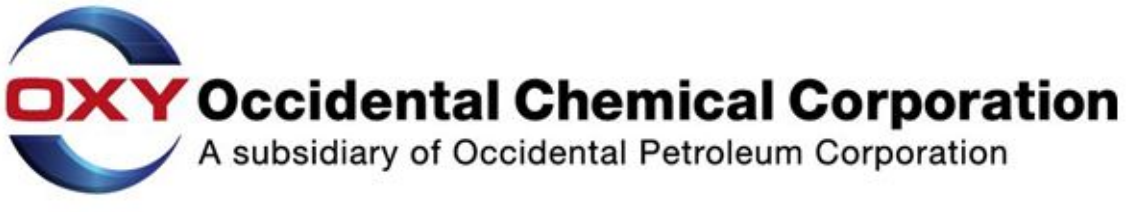
SAFETY DATA SHEET

M35410 - ANSI - EN



CHLORINE (LIQUEFIED GAS UNDER PRESSURE)

SDS No.: M35410 **Rev. Date:** 04-Nov-2019
Rev. Num. 08

SECTION 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Company Identification:	Occidental Chemical Corporation 14555 Dallas Parkway, Suite 400 P.O. Box 809050 Dallas, TX 75254
24 Hour Emergency Telephone Number:	1-800-733-3665 or 1-972-404-3228 (USA); CANUTEC (Canada): 1-613-996-6666; CHEMTREC (within USA and Canada): 1-800-424-9300; CHEMTREC (outside USA and Canada): +1 703-527-3887; CHEMTREC Contract No: CCN16186
To Request an SDS:	MSDS@oxy.com or 1-972-404-3245
Customer Service:	1-800-752-5151 or 1-972-404-3700
Product Identifier:	**CHLORINE (LIQUEFIED GAS UNDER PRESSURE)**
Synonyms:	Chlorine; Chlorine - liquefied gas; Chlorine gas; Chlorine (Liquid or Gas); Elemental Chlorine
Product Use:	Process chemical; Process cleaner; plastic manufacture; Chemical synthesis; chlorinating/oxidizing agent; Water treatment chemicals; Production of water treatment chemicals; Hypochlorite (bleach) synthesis
Uses Advised Against:	This product is NOT a pesticide product. Do not use in pesticide applications. See SDS M30816 for pesticide product. NOT FOR USE IN COMMERCIAL/INDUSTRIAL APPLICATIONS NOT PROPERLY DESIGNED TO ACCOMMODATE THE SAFE USE OF THIS CHEMICAL*.

*NOTE: REFER TO THE CHLORINE INSTITUTE INFORMATIONAL PAMPLETS FOR ADDITIONAL INFORMATION ON SAFE HANDLING, STORAGE, SHIPPING, AND EMERGENCY RESPONSE PROCEDURES

(https://bookstore.chlorineinstitute.org/).

SECTION 2. HAZARDS IDENTIFICATION

OSHA REGULATORY STATUS: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

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EMERGENCY OVERVIEW:

Color: Green to yellow gas; Amber liquid
Physical State: Liquefied gas
Appearance: Liquefied compressed gas
Odor: Stringent

Signal Word: **DANGER**

MAJOR HEALTH HAZARDS: FATAL IF INHALED. CAUSES DAMAGE TO THE RESPIRATORY SYSTEM. ACUTE EXPOSURE MAY CAUSE DELAYED PULMONARY EDEMA. MAY CAUSE RESPIRATORY IRRITATION. CAUSES DAMAGE TO RESPIRATORY SYSTEM THROUGH PROLONGED, REPEATED EXPOSURE. CAUSES SEVERE SKIN BURNS AND SERIOUS EYE DAMAGE. CONTACT WITH LIQUID MAY CAUSE FROSTBITE TO EXPOSED TISSUE.

PHYSICAL HAZARDS: CONTAINS GAS UNDER PRESSURE, MAY EXPLODE IF HEATED. OXIDIZER. Hazardous gas under pressure. May ignite or explode on contact with combustible materials. May react explosively with organic materials. Corrosive to most metals in the presence of moisture.

ECOLOGICAL HAZARDS: VERY TOXIC TO AQUATIC LIFE WITH LONG LASTING EFFECTS. This material is very toxic to fish and aquatic organisms.

PRECAUTIONARY STATEMENTS: Do not breathe gas or vapors. In case of inadequate ventilation, wear respiratory protection. Wash skin and contaminated clothing thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves, protective clothing, eye, and face protection. Use only outdoors or in a well-ventilated area. Keep reduction valves free from grease and oil. Avoid release to the environment. Protect from sunlight. Store in well-ventilated place. Keep container tightly closed.

ADDITIONAL HAZARD INFORMATION: Toxicity may be delayed, and may not be readily visible. Significant exposures must be referred for medical attention immediately. There is no specific antidote.

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HAZARD CLASSIFICATION:

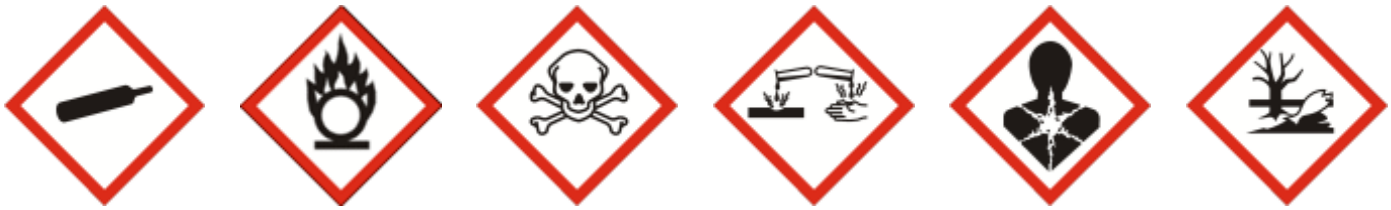
GHS: PHYSICAL HAZARDS:	• Gas Under Pressure - Liquefied

CHLORINE (LIQUEFIED GAS UNDER PRESSURE)

SDS No.: M35410
Supersedes Date: 2018-03-April
Rev. Date: 04-Nov-2019
Rev. Num. 08

	• Oxidizing Gas
GHS: CONTACT HAZARD - SKIN:	Category 1A - Causes severe skin burns and eye damage
GHS: CONTACT HAZARD - EYE:	Category 1 - Causes serious eye damage
GHS: ACUTE TOXICITY - INHALATION:	Category 2 - Fatal if inhaled
GHS: TARGET ORGAN TOXICITY (SINGLE EXPOSURE):	Category 3 - May cause respiratory irritation
GHS: TARGET ORGAN TOXICITY (REPEATED EXPOSURE):	Category 1 - Causes damage to respiratory system through prolonged or repeated exposure
HAZARDS NOT OTHERWISE CLASSIFIED (HNOC):	• Hazardous to Aquatic Environment (Acute Hazard): Category 1 - Very toxic to aquatic life • Hazardous to Aquatic Environment (Chronic Hazard): Category 1 - Very toxic to aquatic life with long lasting effects

GHS SYMBOL: Gas cylinder, Oxidizer, Skull and Crossbones, Corrosive, Health hazards, Environmental hazard



GHS SIGNAL WORD: **DANGER**

GHS HAZARD STATEMENTS:

GHS - Physical Hazard Statement(s)
• Contains gas under pressure; may explode if heated
• May cause or intensify fire; oxidizer

GHS - Health Hazard Statement(s)
• Fatal if inhaled
• Causes severe skin burns and eye damage
• Causes serious eye damage
• May cause respiratory irritation
• Causes damage to respiratory system through prolonged or repeated exposure by inhalation

Additional Hazards - GHS Hazards Not Otherwise Classified (HNOC):
• ACUTE AQUATIC HAZARD - CATEGORY 1: Very toxic to aquatic life
• CHRONIC AQUATIC HAZARD - CATEGORY 1: Very toxic to aquatic life with long lasting effects

GHS - Precautionary Statement(s) - Prevention
• Do not breathe gas or vapors
• Wear protective gloves/protective clothing/eye protection/face protection
• In case of inadequate ventilation, wear respiratory protection
• Wash skin and contaminated clothing thoroughly after handling
• Use only outdoors or in a well-ventilated area
• Do not eat, drink or smoke when using this product
• Keep away from clothing and other combustible materials
• Keep reduction valves free from grease and oil

• Avoid release to the environment

GHS - Precautionary Statement(s) - Response
• IF INHALED: Remove person to fresh air and keep comfortable for breathing
• Immediately call a POISON CENTER or doctor/physician
• Specific treatment is urgent (see Section 4 of SDS or first aid information on this label)
• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
• IF ON SKIN (or hair): Remove/Take off Immediately all contaminated clothing. Rinse skin with water/shower
• Wash contaminated clothing before reuse
• IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
• IF exposed: Call a POISON CENTER or doctor/physician
• Get medical advice/attention if you feel unwell
• In case of fire: Stop leak if safe to do so

GHS - Precautionary Statement(s) - Storage
• Store in a secure manner
• Protect from sunlight
• Store in a well-ventilated place. Keep container tightly closed

GHS - Precautionary Statement(s) - Disposal
• Dispose of contents and container in accordance with applicable local, regional, national, and/or international regulations

Physical Hazards Not Otherwise Classified
• Hazardous gas under pressure
• May ignite or explode on contact with combustible materials
• May react explosively with organic materials
• Corrosive to most metals in the presence of moisture

Hazard Not Otherwise Classified (HNOC)-Health
• ACUTE EXPOSURE MAY CAUSE DELAYED PULMONARY EDEMA
• Direct contact with liquid or rapidly expanding gas may cause frostbite to contacted tissue (eyes, skin, etc.)

See Section 11: TOXICOLOGICAL INFORMATION

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS Number	Percent [%]
Chlorine	7782-50-5	99.5 - 100

SECTION 4. FIRST AID MEASURES

INHALATION: If inhalation of vapor or gas occurs and adverse effects result, remove to uncontaminated area.

Evaluate ABC's (is Airway constricted, is Breathing occurring, and is blood Circulating) and treat symptomatically. Exposed individuals may benefit from humidified air and or humidified oxygen. GET MEDICAL ATTENTION IMMEDIATELY. Significant acute exposures may result in delayed pulmonary edema. There is no specific antidote, treat symptomatically.

SKIN CONTACT: Immediately flush contaminated areas with water. Exposure to liquid may cause frostbite burns. Remove contaminated clothing, jewelry and shoes. Do not attempt to remove frozen clothing from frostbitten areas. Wash contaminated areas with large amounts of water. Thoroughly clean and dry contaminated clothing and shoes before reuse. GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT: Immediately flush contaminated eyes with a directed stream of water for as long as possible. Remove contact lenses, if present, then continue rinsing. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION: Not a likely route of exposure. Contact with liquid may cause frostbite. If swallowed, GET MEDICAL ATTENTION IMMEDIATELY.

Most Important Symptoms/Effects (Acute and Delayed):

Acute Symptoms/Effects:
Inhalation (Breathing): Respiratory System Effects: Inhalation exposure may cause irritation, redness of upper and lower airways, coughing, laryngeospasm and edema, shortness of breath, bronchoconstriction, and possible pulmonary edema. Severe and permanent scarring may occur. The pulmonary edema may develop several hours after a severe acute exposure.
Skin: Skin Corrosion. Skin exposure to gas or liquid may cause redness, irritation, burning sensation, swelling, blister formation, first, second, or third degree burns.
Eye: Serious Eye Damage: Acute eye exposure to 3-6 ppm in air causes sensations of stinging and burning in some individuals, with associated eyelid spasm, redness, and watering. Exposure to eyes may cause irritation and burns to the eyelids, conjunctivitis, corneal edema, and corneal burn. Contact with liquid could cause frostbite and severe injury.
Ingestion (Swallowing): No known effects. Ingestion is not a likely route of exposure.

Delayed Symptoms/Effects:
Repeated exposures in workers have been associated with decreases in pulmonary functions, decreases in diffusing capacity, reactive airways, and hyper-responsiveness to methacoline challenge. Prolonged frequently repeated skin contact may cause allergic reactions in some individuals.

Protection of First-Aiders: Stay out of areas where there is liquid or gaseous chlorine. Use personal protective equipment. Refer to Section 8 for specific personal protective equipment recommendations. Remove contaminated clothing and wash before reuse. Remove affected individuals from exposure. At minimum, treating personnel should utilize PPE sufficient for prevention of bloodborne pathogen transmission.

Notes to Physician: Symptomatic individuals without hypoxia may benefit from humidified air. Delayed pulmonary edema may occur in the context of severe and symptomatic airway exposure. There is no specific antidote. Treat symptoms with supportive care. Follow normal parameters for airway, breathing, and circulation. Probable mucosal damage may contraindicate the use of gastric lavage.

Medical Conditions Aggravated by Exposure: Pulmonary diseases such as hyperactive airways, restrictive and obstructive pulmonary diseases such as COPD, bronchitis, emphysema, interstitial pulmonary disease. Skin disorders that compromise the integrity of the skin. Eye disorders that decrease tear production or have reduced

integrity.

SECTION 5. FIRE-FIGHTING MEASURES

Fire Hazard: Chlorine is not combustible, but it enhances the combustion of other substances. Most combustibles will burn in this material producing irritating, corrosive, and/or toxic gases. In water, chlorine is a strong acid, corrosive, and an oxidizer. Run-off from fire control may cause pollution. If the situation allows, control and properly dispose of run-off (effluent). May ignite or explode on contact with combustible materials. May react explosively with organic materials. Pressurized containers may vent or explode when exposed to high temperatures.

Extinguishing Media: Use extinguishing agents appropriate for surrounding fire.

Unsuitable Extinguishing Media: Do not direct water at source of leak or safety devices; icing may occur. Do not direct water at the source of the leak, because chlorine and water react to form acids and the leak will get worse.

Fire Fighting: Do not direct water at the source of the leak or at safety devices; icing may occur. Flame impingement on steel chlorine container can result in over pressurization or iron/chlorine fire causing rupture of the container. Do not get water inside containers. Move containers from the fire area if it is possible to do so without risk to personnel. Damaged cylinders should handled only by specialists trained and properly protected by PPE as described in Section 8. For large fires and fires involving tanks or tank cars, fight the fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after the fire is out. Do not direct water at the source of the leak, because chlorine and water react to form acids and the leak will get worse. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tanks. Always stay away from tanks engulfed in fire, withdraw from the area and let the fire burn.

Advice for Firefighters: Wear NIOSH approved positive-pressure self-contained breathing apparatus operated in pressure demand mode. Avoid inhalation of material or combustion by-products. Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind and keep out of low areas.

Component	Immediately Dangerous to Life/ Health (IDLH)
Chlorine 7782-50-5	10 ppm IDLH

Sensitivity to Mechanical Impact: Not sensitive.

Sensitivity to Static Discharge: Not sensitive.

Lower Flammability Level (air): Not applicable

Upper Flammability Level (air): Not applicable

Flash point: Not flammable

Auto-ignition Temperature: Not determined

GHS: PHYSICAL HAZARDS:
- Gas Under Pressure - Liquefied
- Oxidizing Gas

Physical Hazards Not Otherwise Classified
- Hazardous gas under pressure
- May ignite or explode on contact with combustible materials
- May react explosively with organic materials
- Corrosive to most metals in the presence of moisture

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Evacuate unprotected personnel upwind or crosswind for at least 100 feet (800 feet for large spills) out of danger area. Isolate area. Keep unnecessary and unprotected personnel from entering the area. Vapors tend to accumulate in low areas. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection. Refer to Section 7, Handling and Storage, for additional precautionary measures.

Personal Protective Equipment: Exposure to chlorine may occur wherever chlorine is handled or used. Therefore, self-contained positive pressure breathing apparatus, approved for emergency chlorine use, should be located strategically outside chlorine work areas, near entrances and away from contamination. Such equipment shall have a rating of at least 30 minute use, and be equipped with a low-pressure warning alarm. Any person entering a chlorine emergency area must be protected by this respiratory protective equipment and trained to properly wear / use the equipment.

Emergency Procedures: For chlorine leaks, immediately implement pre-determined emergency response plan. Pre-determined emergency response plan should identify where the specific chlorine emergency kits are located for handling any site emergency involving chlorine cylinders, ton containers, tank cars or barges. Chlorine emergency kits are maintained by producers and are located strategically throughout the United States and Canada. In addition, kits can be borrowed in an emergency situation from other chlorine users, distributors and some fire departments. If an emergency kit is not readily available, contact CHEMTREC or a CHLOREP team to facilitate locating a kit and to provide support for the emergency response.

Environmental Precautions: Keep out of water supplies and sewers. See Section 12 for additional ecological information. Call supplier, CHLOREP team, or CHEMTREC when help is needed. Releases should be reported, if required, to appropriate agencies.

Methods and Materials for Containment, Confinement, and/or Abatement: Remove sources of ignition. Stop leak if possible without personal risk. If a chlorine container is leaking, try to position it so that gas rather than liquid leaks. Apply emergency kit device if possible. For other than minor leaks, immediately implement predetermined emergency plan. Do not apply water directly to a leak. Reacts with water to form corrosive acid (hydrochloric acid). Call supplier, CHLOREP team, or CHEMTREC when help is needed.

Methods and Materials for Clean-up :

Recovery: In case of spill or leak, stop the leak as soon as possible. Do not apply water directly to a leak. Moisture hydrolyzes chlorine, forming hydrochloric acid and attacks the metal, thus enlarging the leak. If a container is leaking chlorine, position the container so the liquid remains inside and allows the gas to vent. The quantity of escaping chlorine is significantly less from a gas than a liquid leak, since one volume of liquid is equal to approximately 460 volumes of gas.

Neutralization: Absorb chlorine in an alkaline solution (caustic soda, soda ash or hydrated lime) while maintaining an excess of base at all times. Refer to p. 15 of the OxyChem Chlorine Handbook for the recommended alkaline solutions for absorbing chlorine. Destroy resulting hypochlorite by adding sodium bisulfite or treating the basic hypochlorite at 122-158 F in the presence of copper, nickel, or iron. Control pH at the discharge to sewer or the receiving water and comply with all federal, state, and local regulations.
Final Disposal: Runoff may pollute waterways. Control pH at the discharge to sewer or the receiving water and comply with all federal, state, and local regulations.

Additional Disaster Prevention Measures: Vapors are heavier than air and will tend to collect in low areas. Reduce vapors with water spray. Evacuation of surrounding area may be necessary for large spills. Keep unnecessary people away, isolate hazard area and deny entry.

SECTION 7. HANDLING AND STORAGE

General: Do not attempt to store, handle or use without complete review of The Chlorine Institute Chlorine Manual (Phone: (703) 894-4140).

Handling:

Precautions for Safe Handling: Use only approved materials of construction and lubricants. Chlorine should only be used in sealed systems. Piping and equipment must be thoroughly cleaned of organics and moisture before use. Corrosive to most metals in the presence of moisture. Liquid lines must have suitable expansion chambers between block valves due to the high coefficient of expansion.

Technical measures/precautions: Use product only in closed system. Handling should only be performed by competent personnel trained in handling hazardous chemicals and the specific hazards associated with this product.

Other precautions: Every site handling chlorine in bulk containers should have a Risk Management Plan (RMP) and Process Safety Management (PSM) programs. See Section 15 for related threshold quantities for RMP and PSM programs.

Prevention of contact: Do not breathe gas. In case of inadequate ventilation, wear respiratory protection. Wash skin and contaminated clothing thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves, protective clothing, eye, and face protection. Use only outdoors or in a well-ventilated area. Avoid release to the environment.

Storage:

Safe Storage Conditions: Store and handle in accordance with all current regulations and standards. Keep container tightly closed. Store in a well-ventilated area. Protect from sunlight. Do not apply heat. Keep away from heat, sparks and open flames. Keep separated from incompatible substances (see below or Section 10 of the Safety Data Sheet). Avoid contact with water or moisture. Reacts with water to form a corrosive acid. The vapor is heavier than air. Most vapors that are heavier than air will spread along ground and collect in low or confined areas (drains, basements, tanks). Store away from basements, pits or other confined spaces. Make daily inspections for leaks. Protect from physical damage.

Technical measures: Valves used in chlorine service should be manufactured specifically for use with chlorine. For additional information, consult The Chlorine Institute, Inc., Pamphlet #6

[https://bookstore.chlorineinstitute.org/safe-production-handling-packaging.html]. Liquid chlorine has a high coefficient of thermal expansion. If liquid chlorine is trapped between two valves, high hydraulic pressure may develop and lead to a rupture of the line or its fittings. Expansion chambers should be installed any place liquid chlorine can be trapped between two valves. Expansion chambers are fabricated from extra heavy pipe and have a capacity equal to at least 20 volume percent of the protected section of pipe.

Incompatible Substances: ammonia, elemental metals, metal hydrides, carbides, nitrides, oxides, phosphides, sulfides, easily oxidized materials, organic materials, (e.g., petrochemicals, oils, greases), unstable and reactive compounds.

Packaging Material: Chlorine can be transported via pipeline, rail cars, tank trucks, barges, ton containers and cylinders. Please contact OxyChem Technical Services or the Chlorine Institute for information on the proper handling and use of these containers.

GHS: PHYSICAL HAZARDS:
- Gas Under Pressure - Liquefied
- Oxidizing Gas

Physical Hazards Not Otherwise Classified
- Hazardous gas under pressure
- May ignite or explode on contact with combustible materials
- May react explosively with organic materials
- Corrosive to most metals in the presence of moisture

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

REGULATORY EXPOSURE LIMIT(S):
Listed below for the product components that have regulatory occupational exposure limits (OEL's).

Component	OSHA Final PEL TWA	OSHA Final PEL STEL	OSHA Final PEL Ceiling
Chlorine	-----	-----	1 ppm 3 mg/m^3

OEL: Occupational Exposure Limit; OSHA: United States Occupational Safety and Health Administration; PEL: Permissible Exposure Limit; TWA: Time Weighted Average; STEL: Short Term Exposure Limit
OSHA Ceiling values indicate the exposure limit, which at no time shall be exceed. Instantaneous monitoring is the preferred method to determine compliance with OSHA Ceiling values. If instantaneous monitoring is not feasible, then the ceiling shall be assessed as a 15-minute time weighted average exposure which shall not be exceeded at any time during the working day [29CFR1910.1000(a)(1)]

NON-REGULATORY EXPOSURE LIMIT(S):
Listed below are the product components that have advisory (non-regulatory) occupational exposure limits (OEL's) established.

Component	ACGIH TWA	ACGIH STEL	ACGIH Ceiling	Skin Absorption - ACGIH	OSHA TWA (Vacated)	OSHA STEL (Vacated)	OSHA Ceiling (Vacated)
Chlorine	0.1 ppm	0.4 ppm	-----	-----	0.5 ppm	1 ppm	-----

					1.5 mg/m³	3 mg/m³	

- The Non-Regulatory United States Occupational Safety and Health Administration (OSHA) limits, if shown, are the Vacated 1989 PEL's (vacated by 58 FR 35338, June 30, 1993).

- The American Conference of Governmental Industrial Hygienists (ACGIH) is a voluntary organization of professional industrial hygiene personnel in government or educational institutions in the United States. The ACGIH develops and publishes recommended occupational exposure limits each year called Threshold Limit Values (TLVs) for hundreds of chemicals, physical agents, and biological exposure indices.

Listed below are the product components that have advisory (non-regulatory) occupational exposure limits (OEL's) established

ENGINEERING CONTROLS: Do not use in poorly ventilated or confined spaces. Use closed systems when possible. Provide local exhaust ventilation where vapor or mist may be generated. Ensure compliance with applicable exposure limits.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Wear safety glasses with side-shields. Wear chemical safety goggles with a face shield to protect against eye and skin contact when appropriate. Provide an emergency eyewash fountain and quick drench shower in the immediate work area.

Skin and Body Protection: Wear appropriate chemical resistant clothing. When responding to accidental release of unknown concentrations, wear one-piece, total encapsulating suit of Butyl coated nylon or equivalent.

Hand Protection: Wear chemical resistant, insulated gloves such as Perfect Fit NL-56(TM) or Best 6781R(TM). Consult a glove supplier for assistance in selecting an appropriate chemical resistant glove.

Protective Material Types: Perfect Fit NL-56(TM), Best 6781R(TM), Best Nitri Solve 727(TM), Tychem 10000 (TM)

Respiratory Protection: Where vapor concentration exceeds or is likely to exceed applicable exposure limits, a NIOSH approved respirator is required. When an air-purifying respirator is not adequate for spills and/or emergencies of unknown concentrations, an approved self-contained breathing apparatus operated in the pressure demand mode is required. A respiratory protection program that meets 29 CFR 1910.134 must be followed whenever workplace conditions warrant use of a respirator.

Component	Immediately Dangerous to Life/ Health (IDLH)
Chlorine 7782-50-5	10 ppm IDLH

HYGIENE MEASURES: An emergency eye wash fountain and quick drench shower should be provided in the immediate work area. Personnel should test equipment on a routine basis to ensure adequate water flow and temperature.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquefied gas
Appearance:	Liquified compressed gas
Color:	Green to yellow gas; Amber liquid
Odor:	Stringent
Molecular Weight:	70.91
Molecular Formula:	Cl2
pH:	Not applicable
Melting Point/Range:	Not applicable
Freezing Point/Range:	-150 °F (-101 °C)
Boiling point °C	-29.27 °F (-34.04 °C)
Flash point:	Not flammable
Explosion limits:	Not applicable
Vapor Pressure:	678.0 kPa (5085 mm Hg) @ 20°C 778.7 kPa (5841 mm Hg) @ 25°C
Vapor Density (air=1):	2.4
Relative Density/Specific Gravity (water=1):	1.4 @ 15.6 °C
Density:	11.7 lbs/gal @ 15.6 °C
Water Solubility:	0.7% @ 20 C
Partition Coefficient (n-octanol/water):	No data available
Auto-ignition Temperature:	Not determined
Odor Threshold [ppm]:	0.31 ppm (approximate)
Evaporation Rate (ether=1):	No data available
Volatility:	100%
Flammability (solid, gas):	Not flammable
Lower Flammability Level (air):	Not applicable
Upper Flammability Level (air):	Not applicable
Viscosity:	13.3 mPa · s (dynamic) @ 20°C

SECTION 10. STABILITY AND REACTIVITY

Chemical Stability: Stable at normal temperatures and pressures.

Reactivity: Oxidizer.

Possibility of Hazardous Reactions: Dry material is highly reactive with titanium and tin. Reacts with most metals at high temperatures or in the presence of moisture. Avoid contact with water. Reacts with water to form corrosive acid (hydrochloric acid). May react explosively with organic materials.

Conditions to Avoid (e.g., static discharge, shock, or vibration): No information available.

Incompatible Substances: ammonia; elemental metals; metal hydrides; carbides; nitrides; oxides; phosphides; sulfides; easily oxidized materials; organic materials; (e.g., petrochemicals, oils, greases); unstable and reactive compounds

Hazardous Decomposition Products: None known.

Hazardous Polymerization: Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

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POTENTIAL HEALTH EFFECTS:

ACUTE TOXICITY:
This material is corrosive to the skin, eyes, and respiratory tract. Breathing this material is harmful and can causedeath. Harmful effects include burns and permanent damage to the airways, including the nose, throat, and lungs.
The extent of injury following chlorine exposure depends upon concentration and duration of exposure as well aswater content of the tissue involved.
Estimated effects are as follows:
- 0.2 - 0.4 ppm odor detection (some tolerance develops)
- 1 - 3 ppm mild mucous membrane irritation (can be tolerated ~ 1 hour)
- 5 - 15 ppm moderate irritation of upper respiratory tract
- 30 ppm immediate chest pain, vomiting, dyspnea, cough
- 40 - 60 ppm toxic pneumonitis and pulmonary edema
- 430 ppm lethal over 30 minutes
- 1000 ppm fatal within a few minutes

Its action in the respiratory tract is due to its strong oxidizing capability; it forms both hypochlorous acid andhypochloric acid on contact with moist mucous membranes. Symptoms of pulmonary congestion and edema maydevelop after a latency period of several hours following severe acute exposure to chlorine.

Eye contact: Causes serious eye damage. Liquid exposure may cause frostbite.
Skin contact: Causes skin burns. Liquid exposure may cause frostbite.
Inhalation: May cause irritation (possibly severe), chemical burns, and pulmonary edema. Significant exposures may be fatal.
Ingestion: Not a likely route of exposure. Ingestion of product may cause irritation and burns to the contacted tissue.

CHRONIC TOXICITY:
Prolonged frequently repeated skin contact may cause allergic reactions in some individuals. Repeat exposures in workers have been associated with decreases in pulmonary functions, decreases in diffusing capacity, reactive airways, and hyper-responsiveness to methacholine challenge. Long term overexposure may produce upper airway changes leading to an increased prevalence of colds, shortness of breath, and reactive airway dysfunction syndrome.

ADDITIONAL DATA: Odor does not provide an adequate warning of exposure. In workers exposed to chlorine for a 2 to 5 year period, all had some degree of olfactory impairment. Sensory irritation tolerance developed in rats when they were pretreated with 1 ppm chlorine.

Chronic Effects: Pulp mill workers who reported transient exposure to high levels of chlorine gas showed increased airflow obstruction on pulmonary function tests compared to controls.

SIGNS AND SYMPTOMS OF EXPOSURE:

Inhalation (Breathing): Respiratory System Effects: Inhalation exposure may cause irritation, redness of upper and lower airways, coughing, laryngeospasm and edema, shortness of breath, bronchoconstriction, and possible

pulmonary edema. Severe and permanent scarring may occur. The pulmonary edema may develop several hours after a severe acute exposure.

Skin: Skin Corrosion. Skin exposure to gas or liquid may cause redness, irritation, burning sensation, swelling, blister formation, first, second, or third degree burns.

Eye: Serious Eye Damage: Acute eye exposure to 3-6 ppm in air causes sensations of stinging and burning in some individuals, with associated eyelid spasm, redness, and watering. Exposure to eyes may cause irritation and burns to the eyelids, conjunctivitis, corneal edema, and corneal burn. Contact with liquid could cause frostbite and severe injury.

Ingestion (Swallowing): No known effects. Ingestion is not a likely route of exposure.

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GHS HEALTH HAZARDS:

GHS: CONTACT HAZARD - SKIN: Category 1A - Causes severe skin burns and eye damage
GHS: CONTACT HAZARD - EYE: Category 1 - Causes serious eye damage
GHS: ACUTE TOXICITY - INHALATION: Category 2 - Fatal if inhaled
GHS: TARGET ORGAN TOXICITY (SINGLE EXPOSURE): Category 3 - May cause respiratory irritation
GHS: TARGET ORGAN TOXICITY (REPEATED EXPOSURE): Category 1 - Causes damage to respiratory system through prolonged or repeated exposure

TOXICITY DATA:

PRODUCT TOXICITY DATA: See component data below

The component toxicity data is populated by the LOLI database and may differ from the product toxicity data given.

Component	LD50 Oral:	LD50 Dermal:	LC50 Inhalation:
Chlorine 7782-50-5	6800 mg/kg (Rat) 5800 mg/kg (Rat)	No information available	293 ppm (1 hr - Rat)

Eye Irritation/Corrosion: Moisture in the eyes can react with chlorine to form hydrochloric acid. Corrosive to the eyes and may cause severe damage including blindness. Contact with liquid or rapidly expanding gas may cause frostbite to contacted tissue (eyes, skin, etc.). Low concentrations in air may cause burning discomfort, spasmodic blinking or involuntary closing of the eyelids, redness, conjunctivitis, and tearing.

Skin Irritation/Corrosion: Chlorine gas is irritating and can be corrosive to the eyes, skin, and mucous membranes. Liquid chlorine may cause cutaneous burns; gaseous chlorine will irritate the skin and may cause burns in high concentrations. Exposure can cause complete destruction of skin or mucous membrane and may result in partial or total thickness burns. Symptoms of skin exposure include irritation with sensations of burning or prickling, inflammation or blister formation.

Skin Absorbent / Dermal Route: Yes.

RESPIRATORY OR SKIN SENSITIZATION: Not classified as a skin or respiratory sensitizer per GHS criteria.

CARCINOGENICITY: Not classified as a carcinogen per GHS criteria. This product is not classified as a carcinogen by NTP, IARC or OSHA.

SPECIFIC TARGET ORGAN TOXICITY (Single Exposure): Category 3 - Respiratory Irritation.

SPECIFIC TARGET ORGAN TOXICITY (Repeated or Prolonged Exposure): Category 1 - Respiratory System (Lungs).

INHALATION HAZARD: The extent of injury following chlorine exposure depends upon concentration and duration of exposure as well aswater content of the tissue involved. Estimated effects are as follows:
- 0.2 - 0.4 ppm odor detection (some tolerance develops)
- 1 - 3 ppm mild mucous membrane irritation (can be tolerated ~ 1 hour)
- 5 - 15 ppm moderate irritation of upper respiratory tract
- 30 ppm immediate chest pain, vomiting, dyspnea, cough
- 40 - 60 ppm toxic pneumonitis and pulmonary edema
- 430 ppm lethal over 30 minutes
- 1000 ppm fatal within a few minutes.

Chlorine is a severe irritant of the nose, throat and lining of the respiratory tract. When inhaled at high concentrations, the gas causes necrosis of the trachea and bronchial epithelium as well as pulmonary edema, atelectasis and emphysema, and damage to the pulmonary blood vessels. Its action in the respiratory tract is due to its strong oxidizing capability; it forms both hypochlorous acid andhypochloric acid on contact with moist mucous membranes. Symptoms of pulmonary congestion and edema maydevelop after a latency period of several hours following severe acute exposure to chlorine. Delayed effects may include bronchopneumonia, lobar pneumonia, purulent pleurisy, and tubercular meningitis.

GERM CELL/IN-VITRO MUTAGENICITY: Not classified as a mutagen per GHS criteria. This material has tested positive in one or more in vitro mutagenicity studies.

REPRODUCTIVE TOXICITY: Not classified as a reproductive toxin per GHS criteria.

DEVELOPMENTAL TOXICITY: Not classified as a developmental or reproductive toxin per GHS criteria.

TOXICOKINETICS: Not available.

METABOLISM: Not available.

BIOLOGICAL DISTRIBUTION: No information available.

PATHOGENICITY AND ACUTE INFECTIOUSNESS (ORAL, DERMAL, AND INHALATION): Not applicable.

ENDOCRINE DISRUPTOR: Not available.

NEUROTOXICITY: Not Available.

IMMUNOTOXICITY: Not available.

Hazard Not Otherwise Classified (HNOC)-Health
ACUTE EXPOSURE MAY CAUSE DELAYED PULMONARY EDEMA
Direct contact with liquid or rapidly expanding gas may cause frostbite to contacted tissue (eyes, skin, etc.)

SECTION 12. ECOLOGICAL INFORMATION

ECOTOXICITY (EC, IC, AN LC):

Component:	*Freshwater Fish:*	*Invertebrate Toxicity:*	*Algae Toxicity:*	*Other Toxicity:*
Chlorine	*LC50 Lepomis	*LC50 Daphnia	No data available	No data available

	macrochirus: 0.44 mg/L 96h flow-through *LC50 Oncorhynchus mykiss: 0.014 mg/L 96h flow-through *LC50 Oncorhynchus mykiss: 0.104 - 0.168 mg/L 96h static *LC50 Oncorhynchus mykiss: 0.014 mg/L 96h *LC50 Pimephales promelas: 0.08 mg/L 96h flow-through *LC50 Pimephales promelas: 0.1 mg/L 96h	magna: 0.017 mg/L 48h		

Aquatic Toxicity:
This material is highly toxic to fish and aquatic organisms.

Fish Toxicity:
LC50 Fathead minnow: 0.07 to 0.15 (96 hour)
LC50 Bluegill: 0.44 mg/l (96 hour)

Invertebrate Toxicity:
LC50 Daphnia: 30 to 150 ug/L (48 hour)

FATE AND TRANSPORT:

PERSISTENCE: The atmospheric half-life and lifetime of this material due to photolysis is estimated at 10 and 14 minutes, respectively. The half-life of free residual material in fresh water has been estimated at 1.3 to 5 hours.

BIODEGRADATION: This material is an element and not subject to biodegradation.

BIOCONCENTRATION: This material is not expected to bioconcentrate in organisms.

BIOACCUMULATIVE POTENTIAL: Chlorine does not bioaccumulate or bioconcentrate because of its water solubility and high reactivity.

MOBILITY IN SOIL: Adsorption to solid soil phase is not expected.

Other adverse effects: According to GHS criteria, the product is classified as highly toxic to aquatic life and highly toxic to aquatic life with lasting effects (H400 - H410, category 1).

ADDITIONAL ECOLOGICAL INFORMATION: This material has exhibited toxicity to terrestrial organisms.

SECTION 13. DISPOSAL CONSIDERATIONS

Waste from material:
Use or process if possible. Chlorine may be absorbed into an alkaline solution such as caustic soda, soda ash or hydrated lime. Dispose in accordance with all applicable regulations.

Container Management:
Return empty chlorine tankcars and cargo tanks containing residual gas and/or liquid to supplier in compliance with applicable DOT regulations. See product label for container disposal information.

Contaminated Material:
Dispose according to appropriate regulations

SECTION 14. TRANSPORT INFORMATION

LAND TRANSPORT

U.S. DOT 49 CFR 172.101:

UN NUMBER: UN1017
PROPER SHIPPING NAME: Chlorine
HAZARD CLASS/ DIVISION: 2.3 (5.1, 8)
LABELING REQUIREMENTS: 2.3, 5.1, 8
MARINE POLLUTANT: Chlorine

RQ (lbs.): RQ 10 Lbs. (Chlorine)

Special provisions for transport: 2, B9, B14, N86, T50, TP19.
ADDITIONAL INFORMATION: Toxic-Inhalation Hazard Zone B. An Emergency Kit "C" must be on chlorine tank cars and trucks. Proper training on the use of emergency equipment is required (OSHA 29CFR 1910.134).

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

*** NOTE:** Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code. Consult regulations before transporting via ocean bulk.

UN NUMBER: UN1017
SHIPPING NAME: Chlorine
CLASS OR DIVISION: 2.3, 5.1, 8
LABELING REQUIREMENTS: 2.3, 5.1, 8
OTHER INFORMATION: Emergency Response Assistance Plan (ERAP) may be required

MARITIME TRANSPORT (IMO / IMDG)

*** NOTE:** Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code. Consult regulations before transporting via ocean bulk.

UN NUMBER: 1017
PROPER SHIPPING NAME: Chlorine
HAZARD CLASS / DIVISION: 2.3
5.1
8
Packing Group: Not applicable
LABELING REQUIREMENTS: 2.3, 5.1, 8, Environmental hazard
MARINE POLLUTANT: Chlorine

AIR TRANSPORT (ICAO / IATA)

Status - ICAO/IATA: Transport by passenger and cargo aircraft is forbidden

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

SECTION 15. REGULATORY INFORMATION

U.S. REGULATIONS

OSHA REGULATORY STATUS:
This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
If a release is reportable under CERCLA section 103, notify the state emergency response commission and local emergency planning committee. In addition, notify the National Response Center at (800) 424-8802 or (202) 426-2675.

Component	U.S. DOT Hazardous Substances/ RQs	CERCLA Hazardous Substances / RQs	CERCLA Section 302 EHS EPCRA RQs	Section 302 Threshold Planning Quantity (TPQs)
Chlorine 7782-50-5 (99.5 - 100)	10 lbs(RQ)	10 lb(final RQ)	10 lb(EPCRA RQ)	100 lb TPQ

SARA EHS Chemical (40 CFR 355.30)
If a release is reportable under EPCRA, notify the state emergency response commission and local emergency planning committee. If the TPQ is met, facilities are subject to reporting requirements under EPCRA Sections 311 and 312.

EPCRA SECTIONS 311/312 HAZARD CATEGORIES (40 CFR 370.10):
Acute Health Hazard, Chronic Health Hazard, Fire Hazard, Sudden Release of Pressure, Extremely Hazardous

SARA HAZARD CATEGORIES ALIGNED WITH GHS (2018):
Physical Hazard - Gas Under Pressure
Physical Hazard - Oxidizer (liquid, solid or gas)
Health Hazard - Acute Toxin (any route of exposure)
Health Hazard - Skin Corrosion or Irritation

Health Hazard - Serious eye damage or eye irritation
Health Hazard - Specific Target Organ Toxicity (STOT) Single Exposure (SE)
Health Hazard - Specific Target Organ Toxicity (STOT) Repeat Exposure (RE)

EPCRA SECTION 313 (40 CFR 372.65):
The following chemicals are listed in 40 CFR 372.65 and may be subject to Community Right-to Know Reporting requirements.

Component	SARA 313 - Emission Reporting	SARA 313 PBT
Chlorine 7782-50-5 (99.5 - 100)	1.0% (de minimis concentration)	Not Listed

DEPARTMENT OF HOMELAND SECURITY (DHS)- Chemical Facility Anti-Terrorism Standards (6 CFR 27):
This product is regulated under the U.S. Department of Homeland Security (DHS) Chemical Facility Anti-Terrorism Standards (CFATS) as follows:

Component	DHS - Security Issues	DHS-Sabotage Screening Threshold Qnty.	DHS-Sabotage Min. Conc.	DHS-Theft Screening Threshold Qnty.	DHS-Theft Min. Conc.	DHS-Release Screening Threshold Qnty.	DHS-Release Min. Conc.	CWC Toxic Chemicals:
Chlorine 7782-50-5 (99.5 - 100)	Release - Toxic; Theft - Weapons of Mass Effect	Not Listed	Not Listed	500 lb STQ	9.77 % Minimum Concentration	2500 lb STQ	1.0%Minimum Concentration	Not Listed

OSHA PROCESS SAFETY (PSM) (29 CFR 1910.119):
CHLORINE: 1500 LBS TQ.

Component	EPA RMP Toxic or Flammable TPQ	PSM - Highly Hazardous Substances	Flash Point
Chlorine 7782-50-5 (99.5 - 100)	Toxic (2500 lb threshold quantity)	1500 lb TQ	NA

EPA'S CLEAN WATER AND CLEAN AIR ACTS:
Regulated as noted in table below.

Component	Clean Water Act - Priority Pollutants	CAA - ODS CLASS 1 AND CLASS 2	CAA - Volatile Organic Compounds (VOCs) in SOCMI	CAA - HON Rule - Organic HAPs	CAA - Hazard Air Pollutants	CAA - Urban HAPs List (Integrated Urban Strategy)	SNAP - Substitutes for ODS	EPA RMP Toxic or Flammable TPQ
Chlorine	Not Listed	Not Listed	Not Listed	Not Listed	Present	Not Listed	Not Listed	Toxic (2500 lb threshold quantity)

NATIONAL INVENTORY STATUS

Component	TSCA Inventory	TSCA ACTIVE LIST	TSCA 12(b)	TSCA - Section 4	TSCA - Section 5	TSCA - Section 6	TSCA - Section 8
Chlorine 7782-50-5	Listed	ACTIVE	Not Listed	Not listed	Not Listed	Not listed	Not listed

CANADIAN CHEMICAL INVENTORY: All components of this product are listed on either the DSL or the NDSL.

Component	DSL	NDSL
Chlorine	Listed	Not Listed

7782-50-5 (99.5 - 100)		

STATE REGULATIONS

Component	California Proposition 65 Cancer WARNING:	California Proposition 65 CRT List - Male reproductive toxin:	California Proposition 65 CRT List - Female reproductive toxin:	Massachusetts Right to Know Hazardous Substance List	Rhode Island Right to Know Hazardous Substance List
Chlorine	Not Listed	Not Listed	Not Listed	Listed	Listed

Component	New Jersey Right to Know Hazardous Substance List	New Jersey Special Health Hazards Substance List	New Jersey - Environmental Hazardous Substance List	Pennsylvania Right to Know Hazardous Substance List	Pennsylvania Right to Know Special Hazardous Substances	Pennsylvania Right to Know Special Hazardous Substances	Pennsylvania Right to Know Environmental Hazard List
Chlorine	0367	Not Listed	Listed	Listed	Not Listed	Not Listed	Present

CANADIAN REGULATIONS

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.

Component	Canada - CEPA - Schedule I - List of Toxic Substances	Canada - NPRI	Canada - CEPA - 2010 Greenhouse Gases (GHG) Subject to Mandatory Reporting	CANADIAN CHEMICAL INVENTORY:	NDSL:
Chlorine 7782-50-5 (99.5 - 100)	Not listed	Part 1, Group 1 Substance	Not Listed	Listed	Not Listed

SECTION 16. OTHER INFORMATION

Prepared by: Occidental Chemical Corporation - HES&S Product Stewardship Department

Rev. Date: 04-Nov-2019

Reason for Revision:
- Change of company physical address: SEE SECTION 1
- Added emphasis on Uses Advised Against: SEE SECTION 1
- Emergency Overview was revised: SEE SECTION 2
- Changed the GHS classification: SEE SECTION 2

CHLORINE (LIQUEFIED GAS UNDER PRESSURE)

• GHS Symbol(s) added or changed: SEE SECTION 2
• Modified GHS Hazard and Precautionary Statements: SEE SECTION 2
• Added Hazards Not Otherwise Classified (HNOC): SEE SECTION 2
• Modified Fire Fighting Measure Recommendations: SEE SECTION 5
• Revised Accidental Release Measures: SEE SECTION 6
• Revised Handling and Storage Recommendations: SEE SECTION 7
• Added Hygiene Measures SEE SECTION 8
• Updated Physical and Chemical Properties. SEE SECTION 9
• Added Hazardous Decomposition product. SEE SECTION 10
• Toxicological Information has been revised: SEE SECTION 11
• Ecological Information has been modified: SEE SECTION 12
• Updated Transportation Information: SEE SECTION 14
• Updated TSCA Status Table: SEE SECTION 15
• WHMIS Classifications were removed from format: SEE SECTION 15
• Added NFPA 704 Symbol: SEE SECTION 16

IMPORTANT:
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OSHA Standard 29 CFR 1910.1200 requires that information be provided to employees regarding the hazards of chemicals by means of a hazard communication program including labeling, safety data sheets, training and access to written records. We request that you, and it is your legal duty to, make all information in this Safety Data Sheet available to your employees.

CHLORINE (LIQUEFIED GAS UNDER PRESSURE)

End of Safety Data Sheet