

A blue silhouette of two hands holding a globe. The globe is surrounded by several pills, symbolizing the safe handling of pharmaceuticals.

*Safe Handling
of
Chlor Alkali Products*

Safe Handling of Chlorine



Table of Contents

- 1. Regulatory Information**
- 2. Production of Chlorine**
- 3. Product Information**
- 4. Fire Hazards**
- 5. Health Concerns**
- 6. Personal Protective Equipment**
- 7. Containers**
- 8. Emergency Response**

Occupational Safety and Health Administration (OSHA) Hazard Communication

PURPOSE :

- ❖ Ensure that the hazards are identified and risks evaluated for all chemicals produced and/or introduced into **the workplace**
- ❖ Ensure that the information concerning those hazards is properly communicated to all persons in the workplace.

TRANSMISSION OF INFORMATION :

- ❖ 1 - Labels
- ❖ 2 - Material Safety Data Sheet (MSDS)
- ❖ 3 - Employee Training

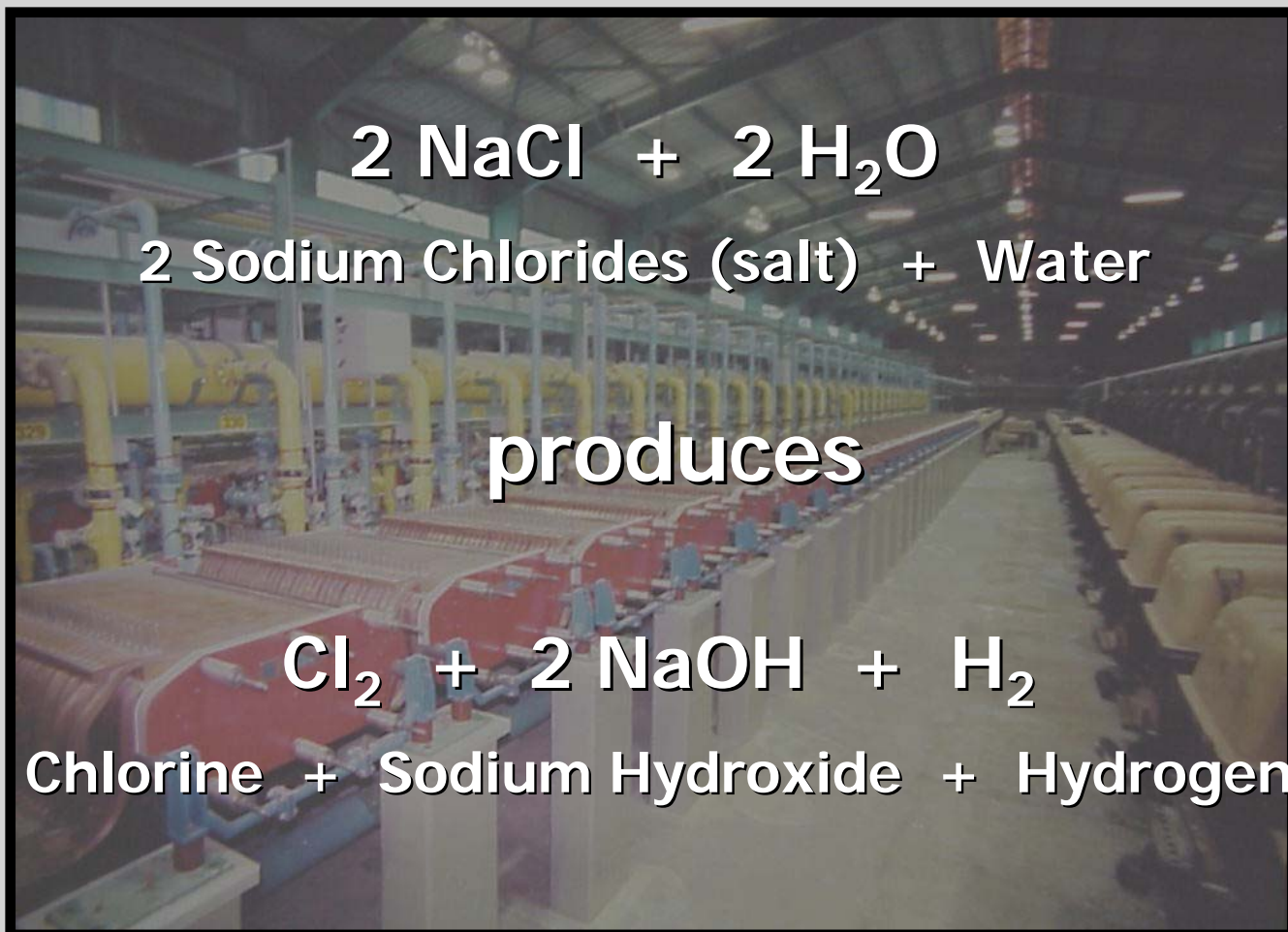
Environmental Protection Agency (EPA)

RMP – EPA's Federal Risk Management Plan must be in place when Chlorine is stored in excess of 2500 pounds.

***CALARP @ 100lb.**

**FIFRA – Federal Insecticide, Fungicide, and Rodenticide Act.
Requires suppliers to have materials approved by the state for use in public utilities. EPA registration numbers can be found on the bottom of the label attached to the container.**

Chlorine Production



Electrolytic Cells

Currently, 3 different cell technologies to produce chloralkali products:

- ✓ Membrane Cells
- ✓ Diaphragm Cells
- ✓ Mercury Cells



Product Information

Molecular Formula:	Cl ₂
Shipping Name:	Chlorine
Synonyms:	Chlorine Gas
Vapor Density:	2.48
Boiling Point:	-30°F
Freezing Point:	-150°F
Product Identification Number (PIN):	UN 1017

Other Useful Info

- ❖ Cl_2 has a low boiling point
- ❖ Liquid rapidly flashes to a gas at STP
- ❖ Cl_2 expansion ratio = 456 : 1
- ❖ Cl_2 is 2.48 times heavier than air.
- ❖ Odor threshold is <1 ppm
- ❖ Liquid Cl_2 expands as it warms producing hydrostatic pressure



Reactivity

Dry chlorine is defined by the Chlorine institute as having less than 150 ppm water by weight.

- ❖ **Dry chlorine will not react with steel.**
- ❖ **Chlorine will react with water to form Hydrochloric Acid which is very corrosive.**
- ❖ **Wet Chlorine will be very corrosive to most metals (including steel) except for titanium.**
 - ✓ Compressed air in contact with chlorine needs to be dry, dew point of -40°C (-40°F) or less.

Reactivity

- ❖ **Chlorine will react with most metals at high temperatures (risks of fire or explosion).**
 - ✓ Metal powders should not be exposed to chlorine.
 - ✓ Steel will burn at 482°F. No welding should be done on steel exposed to chlorine.

Reactivity

- ❖ **Chlorine will react with organic compounds:** oil/grease, gasoline, alcohols, hydrogen, ammonia (risks of fire or explosion).
 - ✓ Important to clean equipment free of organics before using it in the presence of chlorine.
 - ✓ Ammonia will react to form a dense white cloud. Ammonia vapors are used to detect chlorine leaks.

Fire Concerns

- ❖ Cl_2 is non flammable and non explosive.
- ❖ Cl_2 is a strong oxidizer which will support combustion.
- ❖ Best way to extinguish a Cl_2 fire, remove the source of Cl_2 .
- ❖ If water is used to extinguish a Cl_2 fire, the runoff water will be acidic and must be contained.
- ❖ Fumes from a Cl_2 fire are often more toxic than the equivalent oxygen fire.

Health Concerns

- ❖ **Cl₂ is primarily an inhalation hazard.**
- ❖ **Chlorine is a poisonous gas that is dangerous, even life threatening.**
- ❖ **If your eyes burn and nose and throat tickle, chlorine may be present in your work area.**
- ❖ **It is a good idea to carry an escape type respirator when you enter a chlorine storage area.**

Health Concerns

Chlorine gas can also be a skin hazard. Exposure to 3500 ppm produced a skin pH of 4 (similar to carbonated H₂O).

- ✓ 0.2 – 0.4 ppm • odor threshold
- ✓ 1 – 3 ppm • mild irritation of mucous membranes
- ✓ 5 – 15 ppm • moderate irritation of mucous membranes
- ✓ 30 ppm • immediate chest pain, vomiting, pulmonary edema
- ✓ 40 – 60 ppm • toxic pneumonitis and pulmonary edema
- ✓ 430 ppm • lethal in 30 minutes
- ✓ 1000 ppm • lethal within a few minutes

Health Concerns

❖ Eye Contact

- ✓ **Gas:** • burning sensation, rapid blinking
- ✓ **Liquid:** • frostbite hazard

Flush with warm water for 20 minutes then cover BOTH eyes with a sterile bandage and seek immediate medical attention

Health Concerns

❖ Skin Contact

- ✓ **Gas:** • not a significant hazard at low concentrations but may cause some irritation. High concentrations may require gas tight suits.
- ✓ **Liquid:** • frostbite hazard

Flush with warm water for 20 minutes then cover with a sterile bandage and seek immediate medical attention

Personal Protective Equipment

- ❖ **Hard hat**
- ❖ **Chemical suit, gloves and boots** (PVC, neoprene, rubber, nitrile)
- ❖ **Full face air purifying respirator (as a minimum), Pioneer recommends SCBA**
- ❖ **No contact lenses**

- ❖ **Liquid leak:**
 - ✓ Enhanced Level B including self contained breathing apparatus
- ❖ **Gas leak:**
 - ✓ Level B (**not enhanced**) including self contained breathing apparatus
- ❖ **Safety showers and eye wash fountains**
- ❖ **Portable Air Monitoring Equipment**

Personal Protective Equipment

Notes to Remember:

- ❖ **An escape type respirator or APR can not be used for rescues or to enter a chlorine cloud. Air monitoring must be done to use this type of respirator or used for ESCAPE only.**
- ❖ **The IDLH for chlorine is 10 ppm. SCBA must be used above this concentration or if the concentration is unknown.**
- ❖ **MSDS for chlorine will provide information regarding PPE selection.**

Other Useful Information

- ❖ **Of all chlorine operations, transfer and delivery have proven to be the safest.**
- ❖ **While working with chlorine, ensure SOP's for all work processes including the operation of valves and emergency shut-downs are clearly defined and understood.**
- ❖ **Purge all residual chlorine before disconnecting container.**

Cylinders

Cylinders: 150 pounds

- ✓ **Store and use cylinders upright**
- ✓ **Secure cylinders to a solid support**
- ✓ **Remove regulators and replace bonnet when not in use**
- ✓ **Use regulators approved for chlorine use**
- ✓ **Store away from heat in a well ventilated area**
- ✓ **Do not store or use near incompatible materials**

Ton Containers

❖ **Ton Containers**

- ✓ Use only Chlorine Institute approved fittings and hoses
- ✓ Use only approved lifting devices when moving cylinders
- ✓ Wear Respiratory Protection when changing cylinders (full face air purifying respirator at a minimum)
- ✓ Chlorine sensors and automatic isolation valves are recommended in the cylinder storage area.

Site Security

Site security is an important part of the safe handling of chlorine.

Here are a few suggestions to keep your chlorine inventory safe.



Production of a Hazard Assessment

This includes :

❖ **Exposure Assessment:**

- ✓ Where is escaped product going to go?

❖ **Threat Assessment:**

- ✓ What is the likelihood of a security breach?

❖ **Vulnerability Assessment:**

- ✓ Where will security breaches take place?

Site Security

❖ **Site Security can be enhanced by the following:**

- ✓ Security Camera's
- ✓ Visual contact with the storage facility
- ✓ Lighting (local and perimeter)
- ✓ Security guards
- ✓ Visitor sign-in log book
- ✓ Fenced enclosure for the storage facility (with locks)
- ✓ Other electronic monitoring including alarms and panic buttons



Other Risk Reduction Alternatives

- ❖ **Employee training and awareness program**
- ❖ **Site security officer**
- ❖ **Security checklists**
- ❖ **Communication with local Emergency Services (Fire, Police, Ambulance)**

Emergency Response

For all on-site Chemical Emergencies involving Chlorine products call

Canada

Canutec : (613) 996-6666

U.S.

Chemtrec : (800) 424-9300

Where can you get further information?

- ❖ **Check the Chlorine Institute Website**

[<http://www.cl2.com>]

