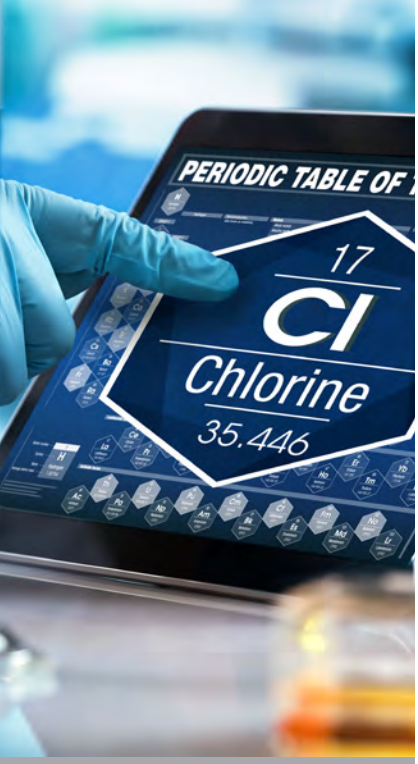


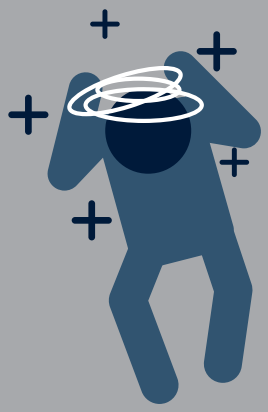
Safety Spotlight

Chlorine Handling and Safety[1]

Chlorine is a yellow-green gas with a strong, irritating odor that can be a liquid under pressure or cold temperatures. It can be used as a bleach and disinfectant in water purification and sewage treatment, and in making other chlorinated chemicals.

Chlorine can cause headaches, dizziness, nausea, and vomiting. When inhaled, it can irritate the nose, throat, and even lungs which can cause an asthma-like allergy. Higher exposure may cause a build-up of fluid in the lungs (pulmonary edema) with repeated exposure leading to permanent lung damage. Chlorine contact can severely irritate and burn the skin and eyes, and contact it in liquid form can cause frostbite.

> *Chlorine can cause* headaches, dizziness, nausea, and vomiting.[1]



Workplace Exposure Limits

The below exposure limits are for air levels only. When skin contact occurs, you may be overexposed, even though air levels are less than the limits listed.

- OSHA Exposure Limit: The legal airborne permissible exposure limit (PEL) is 1 ppm, not to be exceeded at any time.
- NIOSH Exposure Limit: The recommended airborne exposure limit (REL) is 0.5 ppm, which should not be exceeded during any 15-minute work period.
- ACGIH Exposure Limit: The threshold limit value (TLV) is 0.5 ppm averaged over an 8-hour work shift and 1 ppm as a short-term exposure limit (STEL).

Workplace Controls and Practices

Control measures include enclosing chemical processes for severely irritating and corrosive materials, using local exhaust ventilation for chemicals that may be harmful with a single exposure, and using general ventilation to control exposures to skin and eye irritants. The following work practices are also recommended:

- Label process containers.
- Provide employees with information and training concerning their hazards.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of a work shift.
- Change into clean clothing if clothing is contaminated; do not take the contaminated clothing home as special training is required to wash it.
- Do not eat, drink, or smoke in areas where chemicals are being handled, processed or stored. Always wash hands before eating, smoking, drinking, or using the toilet.

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[1] *"Right to Know: Hazardous Substance Fact Sheet." New Jersey Department of Health, Oct. 2015.*

Safety Spotlight

Chlorine Handling and Safety[1]

Handling and Storage

Prior to working with Chlorine, workers should be trained on proper handling and storage.

- Chlorine will react with water to form acid solutions (such as Hydrogen Chloride).
- Explosive compounds are formed or Chlorine reacts explosively with: Acetylene, Ether, Fluorine Compounds, Turpentine, alcohols, Hydrogen, finely divided metals, Ammonia, strong bases (such as Sodium Hydroxide and Potassium Hydroxide), and many other chemicals.
- Chlorine is a strong oxidizer which can ignite organics and combustibles (wood, paper, and oil).
- Store in tightly closed containers in a cool, well-ventilated area away from sunlight and temperatures over 125°F (52°C).

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment (PPE) for each hazard and to train employees on how and when to use the protective equipment. The following recommendations are only guidelines and may not apply to every situation:

Gloves and Clothing

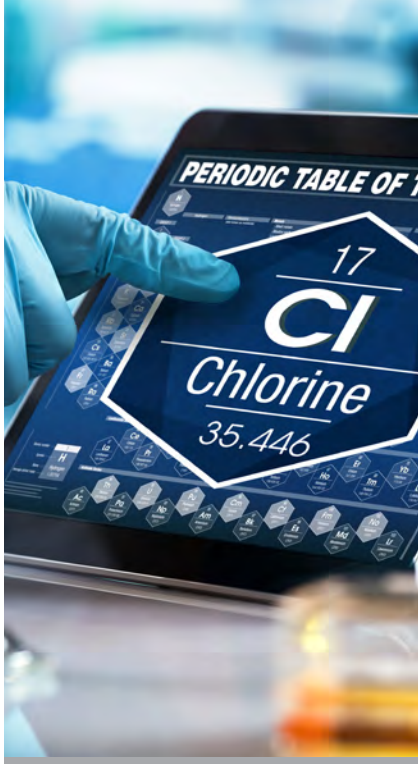
- Avoid skin contact with Chlorine and wear PPE made from material which cannot be permeated/degraded by this substance. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operations.
- Where exposure to cold equipment, vapors, or liquid may occur, employees should be provided with special clothing designed to prevent the freezing of body tissues.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear non-vented, impact resistant goggles when working with fumes, gases, or vapors.
- Wear a face shield along with goggles when working with corrosive, highly irritating, or toxic substances.

Respiratory Protection

- Improper use of respirators is dangerous. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).



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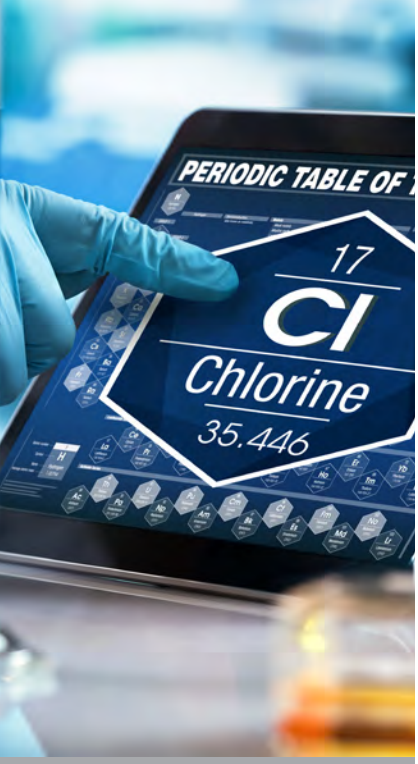

Safety Spotlight

Chlorine Handling and Safety[1]

- Where the potential exists for exposure over 0.5 ppm, use a NIOSH approved full facepiece respirator with an acid gas cartridge which is specifically approved for Chlorine. Increase protection by using full facepiece powered-air purifying respirators.
- Where the potential exists for exposure over 5 ppm, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection, use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to 30 ppm is immediately dangerous to life and health. If the possibility of exposure above 30 ppm exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

> *If employees are required to clean up spills,* they must be properly trained and equipped.

Spills and Emergencies

If employees are required to clean up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply. If there is a Chlorine gas leak, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Ventilate area of leak to disperse the gas.
- Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.
- Do not use water directly on the source of the Chlorine leak.

First Aid Procedures

Eye Contact

- Immediately flush with large amounts of cool water, continuing for at least 30 minutes, occasionally lifting upper and lower lids. If necessary, remove contact lenses while rinsing. Immediate medical attention is necessary.

Skin Contact

- Quickly remove contaminated clothing and immediately wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.

Breathing

- Quickly remove person from exposure and begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to medical facility.

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