HEALTH AND SAFETY PROCEDURE

201 CHLORINE STORAGE, HANDLING AND RESPIRATORY PROTECTION GUIDELINES

1.0 PURPOSE

1.1 This document outlines the requirements for the storage, handling and respiratory protection when working with equipment containing chlorine liquid or vapor.

2.0 SCOPE

2.1 The Occupational Safety and Health Administration (OSHA) has determined that the Chlorine Standard has 1 ppm ceiling limit. The odor threshold for chlorine (the level at which most people can smell chlorine) is approximately .1-.5 ppm. Physiologically, chlorine is a powerful respiratory irritant and in sufficiently high concentrations may cause death by its smothering action. Inhalation of small concentrations of chlorine causes nausea and coughing.

3.0 DEFINITIONS

3.1 Air Pack – (air supplied respirator) self-contained breathing apparatus is the preferred method for respiratory protection and is used in concentrations greater than 10 ppm. The air pack will provide (Grade D breathing air) for up to one-half hour depending on the breathing rate of the wearer. (The air packs must provide positive pressure protection)

3.2 Canister Mask (negative pressure respirator) - Although not the preferred method of respiratory protection, gas mask may be used in concentrations up to 10 ppm chlorine. The life of the canister is dependent on the concentration of gas and the breathing rate of the wearer. (May wear in higher concentrations for escape purposes only)

3.3 Air-supplied / Air-line Respirator - full face breathing air may be used in concentrations up to 25 ppm. An airline respirator must not be used by itself in situations where escape without it might become necessary. An emergency egress bottle must be worn with an airline respirator when entering/working in conditions at or above 1.0 ppm.

3.4 Cartridge respirator with cartridges – (negative pressure respirator) may be used for protection against levels of chlorine up to 10 ppm.

4.0 RESPONSIBILITIES

4.1 Site Management

4.1.1 Management is responsible for providing safe work practices procedures for development of safe work practices to protect against chlorine hazards.

4.2 Employees

4.2.1 All personnel that enter WVC owned area where chorine is being stored, loaded, or used in the process area responsible follow the requirements listed in this procedure.

5.0 PROCEDURE

5.1 Health: Chlorine is an irritant to the skin, mucous membrane and respiratory tract. Because of its pungent odor and irritating effect, traces of chlorine in air are readily detected. As the duration of exposure or the concentration increases, general excitement follows as indicated by restlessness, irritation to the throat, sneezing and copious salivation. Respiratory distress increases until eventually, death may occur from apparent asphyxiation. *Death may also occur due to chlorine poisoning and/ or pulmonary damage.*

5.1.2 Liquid chlorine and high concentrations of the gas in contact with the skin will cause marked irritation and blistering of the exposed area. Clothing that has been contaminated with liquid chlorine will continue to be a source of chlorine gas and irritation until the clothing has been removed.

5.2 First Aid: The following first aid should be given to a person who suffers from a gross exposure to chlorine;

5.2.1 Carry patient from gas area.

5.2.2 Keep patient warm and quiet.

5.2.3 Rest is essential.

5.2.4 Place patient on back with head and back elevated.

5.2.5 If possible, report to Dispensary **immediately** with patient.

NOTE: If chlorine exposure is too great or patient is unconscious or in distress, call for medical assistance immediately. If the patient's breathing is shallow or stopped, begin artificial respiration and call for medical assistance.

5.2.6 Clothing contaminated with liquid chlorine should be removed promptly and the exposed areas flushed with water. Keep patient warm with blankets.

5.2.7 If the patient still has control of his breathing *humidified air* may be administered.

5.2.8 Cough syrup may be given to provide temporary relief from throat irritation after a chlorine inhalation.

5.3 Fire and Explosion: Chlorine is neither flammable nor explosive with air, however, open flames and heat should not be used around chlorine storage tanks or lines. At temperatures in excess of 450°F, the corrosion rate of chlorine on mild steel is

extremely rapid and could result in equipment failure and consequential chlorine release. Chlorine will react (sometimes violently) with most organic materials. Rubber gaskets should never be used on chlorine lines. *Dry chlorine is flammable and will react violently when exposed to Titanium.*

5.4 Spill and Leakage: Liquid chlorine evaporates extremely rapidly when spilled. One volume of the liquid forms 460 volumes of gas and one pound of the liquid forms about five cubic feet of gas. Thus, a liquid chlorine leak may be extremely hazardous, as the quantity of chlorine given off is many times greater than from a gaseous leak. Leaks must be given immediate attention because they will become progressively worse. It must be kept in mind that chlorine vapor is 2-1/2 times heavier than air; therefore, it will travel with air currents and settle in low spots.

5.4.1 In the event of a chlorine release, the Plant Emergency Evacuation Alarm should be immediately sounded and Security should be contacted so the Facility Emergency Response Plan may be implemented.

5.4.2 Location of non-visible leaks can best be accomplished by checking with ammonia water. Always keep on the windward side of a leak. When the leak is found, isolate it from the source of chlorine by closing valves where possible. Often the isolated section of a chlorine line can be padded out to a tank, and thus reduce the amount of leakage. If the leak is found to be in a vessel, steps should immediately be taken to make a repair to stop or reduce the flow of liquid chlorine even if this repair is only temporary until the vessel can be evacuated. If conditions allow, pressure should be bled off the vessel thus reducing the rate of escape of the chlorine.

5.4.3 Spraying water directly onto a chlorine leak will not stop the leak. Water sprayed on leaking chlorine will always make the leak worse; it will never diminish it. Often a small leak can be protected from moisture or rain by covering the leak with plastic until it can be isolated. However, when a chlorine vapor cloud is moving via windy conditions, the vapor cloud can be controlled with water spray with trained personnel using air supplied respiratory protection.

5.4.4 Chlorine Emergency Repair Kits have been strategically located at the plant. Each kit contains equipment to stop a leak on various size pipe, railcar, or one-ton chlorine cylinder.

NOTE: If a leak occurs on a rail car or chlorine cylinder the leak should be immediately reported and the Fire Brigade *and ERT* assembled for emergency response. In cases where liquid chlorine is spilled, a dike can be used to contain the spill.

5.5 Personal Protective Equipment: All persons working with chlorine should be acquainted thoroughly with the location and use of the protective equipment necessary for safe handling of chlorine leaks. **When working *or responding* in heavy or**

unknown concentrations of chlorine, the following protective clothing should be worn: chemical resistant boots, suit and gloves (Nitrile or Neoprene) and a self-contained breathing apparatus. A stand-by is also necessary.

5.6 Respiratory Protection: All personnel that enter *into the facility* are required to have "on-their-person" a chorine escape respirator. Every person whose duties may cause exposure to chlorine should be thoroughly familiar with the location and operation of the types of respiratory protection for chlorine atmospheres. (See the WVC Respiratory Protection Safety Procedure.)

5.6.1 Any time equipment containing chlorine is being opened, air-supplied respiratory protection must be worn. This includes pulling pumps from bullets, opening bullets and hooking/unhooking loading hoses from railcars. Once a flange has been separated and the chlorine has been dispersed, the respirator is no longer required unless there is a continuing leakage of vapor.

5.6.2 The greatest likelihood of chlorine exposure occurs at:

5.6.2.1 The One Ton chlorine cylinders

5.6.2.2 The chlorine loading and unloading facilities

5.6.3WVC employees may obtain respiratory equipment from the Safety Department or from *Shift Supervisor* if after hours, holidays, or on weekends. Contractors are required to provide their employees with respiratory equipment.

5.6.4 Chlorine gas masks and Self-Contained Breathing Apparatuses are located in marked boxes strategically throughout the plant. Persons are to use this equipment only during an emergency when there is a possibility of a leak or a chlorine exposure.

5.6.5 Once a mask is used it should be returned to the Warehouse so it can be decontaminated, inspected and replaced as soon as possible.

5.7 Transportation: Chlorine is *shipped and* received in rail cars constructed of steel in compliance with the Department of Transportation and Chlorine Institute specifications.

5.7.1 Procedures covering *loading*, unloading and vaporization of chlorine should be strictly adhered to for the protection of all personnel involved.

5.8 Loading and Unloading Rail Cars: Department of Transportation regulations require warning signs be placed on the track or rail car until after the car is loaded/unloaded and disconnected from the discharge point. These signs must be blue in color with print that reads; "STOP - Tank Car Connected" or "STOP - Men at Work". All cars must be chocked and the hand brake and derail must be set.

5.9 Evacuation from Chlorine: When an upset occurs, which is likely to release chlorine or it is known that chlorine is being released, the WVC Emergency Evacuation Alarm will be sounded. The alarm is located on top of the VCM-E control room. Persons in the affected area should don proper respiratory protection and non-essential people leave the area.

5.9.1 Evacuation from chlorine gas should be made across the wind rather than down wind. Avoid evacuating toward the river in the event of a large release.

5.10 Chlorine Institute: The facility will follow recommendations of the Chlorine Institute for the handling and storage of chlorine.

6.0 TRAINING

6.1 Employees shall be trained to understand the specific hazards associated with the safe work practices when handling or working with chlorine.

7.0 RECORDKEEPING

7.1 The *Traffic* Department maintains the railcar list. *The Production departments maintain their separate lists of sources.*

7.2 The HSE Department will maintain employee training records.

8.0 PROCEDURE REVIEWS

8.1 This procedure will be reviewed and updated as needed every three years.

9.0 REFERENCES

9.1 Chlorine Institute

10.0 APPENDICES

10.1 N/A

Revision History

Rev	Changes	Approved	Date
1.0	*New format* *MOC: N/A*	Gregory Thorn	12/20/2017

1.0	Added treatment: Humidified Air. Added ERT to response. Clarified "All personnel that enter must have escape respirator. Changed from Security to Shift Supervisor to get respirator from warehouse after hours. *All reflect current practices MOC: HSE-21-1*	Gregory Thorn	11/17/2020