

Hazardous Materials: Hydrochloric Acid Safe Handling Guideline

Department: Industrial Hygiene and Information Management

Program: Hazardous Materials

Owner: Program Manager

Authority: ES&H Manual, Chapter 40, Hazardous Materials¹

Chemical Name/Class

Hydrochloric acid

Synonyms

Hydrogen chloride, muriatic acid

Reactivity and Physical Concerns

Incompatible with hydroxides, amines, alkalis, cyanides, sulfides, sulfites, formaldehyde, copper, brass, and zinc. Hydrochloric acid solution in water is a strong acid: it reacts violently with bases and is corrosive. Reacts violently with oxidants forming toxic chlorine gas. Attacks many metals in the presence of water, forming flammable/explosive hydrogen gas. When heated to decomposition, emits toxic hydrogen chloride fumes and will react with water or steam to produce heat and toxic and corrosive fumes. Thermal oxidative decomposition produces toxic chlorine fumes and explosive hydrogen gas.

If involved in a fire use water spray and neutralize with soda ash or slaked lime.

Exposure Hazards

Routes of Exposure

Inhalation, ingestion, skin contact, eye contact

Skin contact will result in frostbite, serious skin burns, dermatitis and pain. Contact with mucous membranes will result in burning sensation, cough, labored breathing, shortness of breath, sore throat, symptoms may be delayed. The symptoms of lung edema often do not manifest until a few hours have passed and they are aggravated by physical effort.

Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

Contact with oxidizers liberates poisonous chlorine gas. If chlorine gas comes in contact with mucous membranes it may cause burning of eyes, nose, mouth; lacrimation (discharge of tears), rhinorrhea (discharge of thin mucus); cough, choking, substernal (occurring beneath the sternum) pain; nausea, vomiting; headache, dizziness; syncope; pulmonary edema; pneumonitis; hypoxemia (reduced oxygen in the blood); dermatitis; liquid: frostbite

Chronic Exposure

May have effects on the lungs, resulting in chronic bronchitis. May have effects on the teeth, resulting in erosion.

1 *SLAC Environment, Safety, and Health Manual* (SLAC-I-720-0A29Z-001), Chapter 40, "Hazardous Materials", http://www-group.slac.stanford.edu/esh/hazardous_substances/haz_materials/policies.htm

First Aid

In case of eye contact, immediately wash (irrigate) the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately.

In case of skin contact, immediately flush the contaminated skin with water. If this chemical penetrates the clothing, immediately remove the clothing and flush the skin with water. Get medical attention promptly. **In case of inhalation** of large amounts of this chemical, immediately move the exposed person to fresh air. If breathing has stopped, perform artificial resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible. **If this chemical has been ingested, do not induce vomiting**; get medical attention immediately.

Exposure Limits

- Permissible exposure limit: 7mg/m³; 5 ppm (OSHA TWA)
- NIOSH recommended exposure limit: 7mg/m³; 5 ppm (NIOSH ceiling limit)
- Immediately dangerous to life and health: 50 ppm

Exposure Controls

Engineering Controls

Local exhaust ventilation or breathing protection is required. Secondary containment of all storage and use is required if an exposure risk to employees or the environment is present.

Administrative Controls

Job hazard analysis and mitigation (JHAM) and procedures should be developed for the safe use and handling of hydrochloric acid in all applications. ESH can provide information and guidance. Depending upon quantities, certain regulatory permits and/or registrations may be required. Personnel working with the materials must receive detailed training on the hazards, safe use, and emergency procedures.

Personal Protective Equipment

Avoid all contact with substance. Prevent skin/eye contact through the use of impervious gloves, clothing, boots, apron, and eye goggles or full face shield. If the airborne exposure limit may be exceeded and engineering controls are not feasible; conditions of 50ppm or less a chemical cartridge respirator may be used with an acid gas cartridge or wear a NIOSH-approved self-contained breathing apparatus with full face-piece operated in the pressure demand or other positive pressure mode.

Disposal

Material is disposed of as a RCRA hazardous waste. Contact the Waste Management Group for specific disposal requirements and procedures. Containers and other materials that are contaminated with hydrochloric acid must also be treated as hazardous waste. Store waste acid separated from combustible and reducing substances, strong oxidants, strong bases, metals. Keep in a cool, dry, well-ventilated room.

Medical Monitoring (if applicable)

Initial medical examination may be required to detect any pre-existing conditions and establish a baseline for future monitoring. Contact Industrial Hygienist regarding exposure and medical monitoring requirements.

Emergency Response

In the event of a significant release that poses a threat to employees and/or the environment, immediately evacuate the area and notify the emergency operator (911). The Palo Alto Fire Department will respond. Then call Incident Notification (ext. 5555) and notify your supervisor.

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Small spills can be cleaned up with appropriate spill response supplies by trained employees who have this task authorized in their JHAM.

Standards/Regulations

- OSHA: PEL: 29 CFR 1910.1000, Table Z-1; Respiratory Protection: 29 CFR 1910.134
- EPA: Release: 40 CFR 355.40, 302, 116.4; Waste: 40 CFR 261.21-261.24
- *California Fire Code*: Chapters 27 through 41

Other References

- NLM, "TOXNET: Toxicology Data Network", <http://toxnet.nlm.nih.gov/>
- NIOSH, International Chemical Safety Card: Hydrogen Chloride (ICSC 0163), <http://www.cdc.gov/niosh/ipcsneng/neng0163.html>
- OSHA, *Occupational Health Guideline for Hydrogen Chloride*, <http://www.cdc.gov/niosh/pdfs/0332.pdf>