

**OREGON OCCUPATIONAL SAFETY AND HEALTH DIVISION
DEPARTMENT OF CONSUMER AND BUSINESS SERVICES**

PROGRAM DIRECTIVE

Program Directive A-204
Issued June 15, 1981
Revised February 27, 2020

SUBJECT: Hydrofluoric Acid and Hydrogen Fluoride (HF)

AFFECTED STANDARDS/

DIRECTIVES: Program Directive [A-63, Eyewash & Safety Showers](#)

REFERENCES: [NIOSH Pocket Guide to Chemical Hazards: Hydrogen Fluoride](#)
Honeywell: Hydrofluoric Acid Properties Honeywell: Recommended
Medical Treatment for Hydrofluoric Acid Exposure www.hfacid.com

PURPOSE: To warn of hazards involved in the use of HF solutions and give guidance in the evaluation of protective measures. Note: ammonium bifluoride is a common inorganic compound used as a substitute for HF. It has its own inherent hazards associated with its use.

BACKGROUND:

A. Hydrofluoric acid is a solution of hydrogen fluoride (HF) in water

HF is used in industry in the following processes:

- Producing semiconductors, as an etching agent of silicon products
- Etching, frosting, and polishing glassware and ceramics
- Removing rust or stains in the laundry industry
- Etching on stonework surfaces
- Packing meat
- Pickling stainless steel
- Electroplating operations
- Removing sand and scale from foundry castings
- Manufacturing chlorofluorohydrocarbons for refrigerants, aerosol propellants, specialty solvents, high-performance plastics and foaming agents
- Producing high-octane gasoline and synthetic cryolite for the aluminum reduction industry Polishing or “brightening” the rims of motor vehicles (e.g. metal wheel cleaning at carwash facilities)

B. Health Hazard Potential

1. HF is usually handled as a concentrated stock solution, which is then diluted on-site to solutions ranging down to 0.5 percent. Handling the concentrated acid in conjunction with the widespread

use of HF in industry contributes to the hazard potential. The chance of harmful exposure is enhanced due to the ability of the fluoride ion to penetrate tissue. In severe cases, this can lead to damage to underlying muscles, ligaments, and bones.

2. Hydrofluoric acid has the ability to penetrate tissue. Skin contact even with very diluted solutions should be considered dangerous. Solutions of less than 2 percent can cause burns, and the process of tissue destruction and neutralization of HF can be prolonged for days, unlike other acids which are rapidly neutralized. Damage occurs often without any warning sensation of pain in the early stages. For solutions of less than 20 percent, pain and erythema may not occur for up to 24 hours. With 20 to 50 percent solutions, this latent period can vary from one to eight hours. Solutions above 50 percent cause immediate pain and tissue destruction. The onset and severity of burns depends on the extent and duration of contact as well as the concentration of HF. Extensive skin burn areas should be considered very serious since one fatality was reported involving only 2.5 percent of skin surface area. It is common to see concomitant vapor inhalation exposures in cases where extensive skin burns have occurred and the exposed employee was not using respiratory protection.
3. Eye exposure to liquid HF can result in serious injury which rapidly penetrates the epithelium. The cornea and conjunctiva can be damaged by hydrogen fluoride gas exposure alone.
4. Repeated exposure to subacute concentrations of fluoride over a period of years can result in increased radiographic density of bone and possible crippling fluorosis.
5. Anhydrous HF will change from a colorless liquid to hydrogen fluoride gas at room temperature. In moist air the acid will fume strongly. At low air concentrations, around the permissible exposure limit (PEL) of 3 parts per million (ppm), minor irritations of the eyes, respiratory tract, and skin often occur. The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a threshold limit value (TLV) of 3 ppm as a ceiling limit. Splashes of concentrated HF, especially to the upper extremities, with resultant vapor inhalation can lead to severe or even fatal pulmonary edema. Symptoms can be delayed for one to two days.

GUIDELINES:

- A. Personal Protective Equipment (PPE) and Eyewash or Deluge Showers
 1. In order to comply with the general requirements of OAR 437-002-0134 the use of PPE must assure prevention of eye and skin contact. Since serious burns can result from extended contact with diluted

solutions of HF, protective equipment is necessary even at very low concentrations. Use glove selection charts to determine the appropriate glove protection based on glove manufacturer's permeation and degradation data.

Note: Leather apparel, including shoes, cannot be decontaminated and must be destroyed after exposure to HF.

2. Particularly important is the need for immediate and thorough drenching of areas where there was contact with HF solutions even if there is no immediate pain. It is critical that the workers are aware of this and the need for follow-up medical evaluation after washing.
 3. Consistent with the Respiratory Protection Standard, [1910.134](#), an evaluation of the respiratory hazards associated with airborne concentrations of HF to aid in the selection of respiratory protection must be completed. The use of a respirator even at concentrations below the PEL for HF is strongly recommended to guard against inhalation should a spill or leak occur.
 4. Eyewash and safety showers must conform to [OAR 437-002-0161\(5\)](#). Program Directive [A-63](#) provides guidelines for determining when an eyewash and safety shower is required and in assessing the adequacy of those devices.
- B. The Hazard Communication Rule, [1910.1200](#), is applicable to hydrogen fluoride gas and acid solutions. Consistent with 1910.1200(h)(1), employees must be informed of the health hazards associated with HF and hydrogen fluoride gas, the controls of such hazards, and proper use of control measures.
- C. For personnel responsible to deal with spills, leaks, or other releases of HF, an emergency response plan as specified in [1910.120\(q\)](#) is required. For those workers who will be evacuated in the event of a HF release, an emergency action plan is required according to [OAR-437-002-0042](#).
- D. First Aid and Medical Considerations
- [OAR 437-002-0161\(3\)\(a\)](#) requires that employers ensure the ready availability of medical services for the treatment of injured employees. An emergency medical plan that specifically addresses first aid and medical response must be developed. Immediate intervention and care of injured person(s) is essential for minimizing the adverse effects to be anticipated from HF exposure. Therefore, in most cases, a first-aid trained person must be onsite to provide assistance in the event of an exposure.

First aid for skin or eye contact with HF must include immediate washing of the affected area with water for at least 15 minutes. The use of water is

critical but may not stop all destructive action due to the acid. Application of a calcium gluconate gel or magnesium oxide paste to skin burns and sterile 1 percent calcium gluconate in saline drops for eye burns will limit tissue damage. This treatment should be applied by first-aid personnel thoroughly trained in their use preferably while en route to a medical treatment facility.

First aid should not replace medical treatment that is necessary for these burns. In the case of inhalation exposure or appearance of burns on the nose or mouth, transport the victim to a treatment facility immediately. If the treatment facility is not nearby and acid is concentrated, the victim can breathe 100 percent oxygen by mask at the worksite with a nebulized mist of 2.5 percent calcium gluconate. If acid is ingested and the person is conscious, give large quantities of water immediately. Do not attempt to make the person vomit. Transport to a treatment facility.

In all cases, speed of first aid and transportation to a treatment facility is important. These procedures, as applicable, need to be incorporated into an emergency medical plan according to [OAR 437-002-0161\(4\)](#). In order to assure rapid provision of medical care, the employer should contact a treatment facility and develop an emergency treatment agreement with them as well as keep necessary first-aid supplies on site. The first-aid procedures listed above are considered good practice; however, individual doctors may wish to substitute a procedure that is at least equivalent.

**EFFECTIVE
DATE:**

This directive is effective immediately and will remain in effect until canceled or superseded.

History: Issued 6-15-1981 Revised 11-8-1993, 11-14-2000, 8-25-2004, 1-29-2010 , 4-8-2013 and 2-27-2020