



Department of Environmental Health & Safety and Emergency Management

Subject: Hydrofluoric (HF) Acid Safe Handling Procedures

Date: January 2012

Revision: 01

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This Guideline is issued by the Department of Environmental Health & Safety and Emergency Management (EHSEM) to provide guidance and consistency in the use and storage of Hydrofluoric acid (HF) by University of Michigan Dearborn (UM-Dearborn) faculty and staff.

SUMMARY:

Hydrofluoric (HF) acid has a CAS (Chemical Abstracts Service) number of 7664-39-3 and also has the following synonyms: Hydrogen fluoride, Hydrofluoride, Fluorohydric acid, Fluoric acid and Hydrogen fluoride solution. It is highly corrosive and poses several hazards associated with its use that must be properly controlled to avoid exposure of the user to the chemical. This document describes safe practices for the use of HF, engineering controls as well as the personal protective equipment (PPE) necessary to protect personnel from exposure.

SCOPE:

This Guideline applies to all UM- Dearborn personnel that use HF.

REFERENCE

REGULATIONS:

[Hazardous Work in Laboratories](#): MIOSHA Part 431

[Hazard Communication](#): MIOSHA Part 430

[Personal Protective Equipment](#): MIOSHA Part 433

DEFINITIONS:

Chemical Hygiene Plan (CHP)- a written policy (per MIOSHA Part 431 developed and implemented by laboratory management, which sets forth procedures, equipment, personal protective equipment (PPE), and work practices that are capable of protecting employees from the health hazards associated with the use of hazardous chemicals in essence, it is a laboratory safety manual.

Recommendations for completing each section of a Chemical Hygiene Plan are provided on ESHEM website. The website contains a generic CHP that can be downloaded and modified (customized) for use in your Laboratory (http://www.umd.umich.edu/fileadmin/env-health-safety/public/files/CHP_Template.docx).



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The sections that must be customized specifically for a laboratory are in the CHP Notebook section. If you have any questions regarding the CHP, please contact ESHM at (3-4914)

Engineering Controls- methods of controlling employee exposures by modifying the source or reducing the quantity of contaminants released into the work environment, e.g., by process enclosure/isolation or through the use of local exhaust ventilation (LEV).

Local Exhaust Ventilation (LEV)- a ventilation system that captures air contaminants at their point of origin and moves the air to the external environment.

Material Safety Data Sheet (MSDS)- an informational tool developed by chemical manufacturers containing the following information for a hazardous chemical: substance identification and synonyms, hazardous components (if mixture), physical data, fire and explosion data, toxicity data, health effects and first aid, reactivity, storage and disposal procedures, spill and leak procedures, and recommended protective equipment. MSDS can be obtained from the chemical suppliers and many internet sites.

Permissible Exposure Limit (PEL)- [MIOSHA](#) (The Michigan Occupational Safety and Health Administration) sets enforceable permissible exposure limits (PELs) to protect workers against the health effects of exposure to hazardous substances. PELs are regulatory limits on the amount or concentration of a substance in the air. MIOSHA PELs are based on an 8-hour time weighted average (TWA) exposure

MIOSHA has set a PEL of 2.5 mg/m³ (3 ppm) for hydrogen fluoride as an 8-hour TWA concentration and a STEL of 5 mg/m³ (6 ppm).

Personal Protective Equipment (PPE)- devices worn by workers to protect against hazards in the environment. Examples include gloves, safety glasses, face shields, respirators*, hard hats, steel-toed shoes and hearing protection.

* *Contact EHSEM (3-4914) for more information regarding the use of respiratory protection*



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Short Term Exposure Limit (STEL)- is an employee's 15 minute, time-weighted average exposure (concentration) which shall not be exceeded at any time during a workday, established by the Michigan Occupational, Safety and Health Administration (MIOSHA).

Standing Operating Procedure (SOP)- the technical requirements necessary to complete laboratory procedures and actions safely. Once developed, SOPs are documented and implemented in the workplace and used for training purposes. Refer to EHSEM's SOP template for elements to include in an SOP.

RESPONSIBILITY:

Deans, Directors and Department Heads

Ensure that adequate facilities, ventilation, and equipment are provided for the safe use of HF, including but not limited to, access to a safety eyewash/shower, a corrosive or HF spill kit and a first aid kit that contains unexpired 2.5% calcium gluconate.

Ensure an environment where Principal Investigators and other personnel are encouraged to follow this Guideline.

Actively support this Guideline within individual units.

Principal Investigators (PI) and Laboratory Managers

Develop and implement written standard operating procedures (SOPs) in accordance with this Guideline.

Assure employees who are required to be trained receive training in accordance with this Guideline.

Maintain documentation of the training provided to (or received by) employees.

Assure employees practice safe work procedures in accordance with their training and use the proper equipment and controls.



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Assign resources to support the implementation of this Guideline.

Follow Work~Connections procedures if there is an accident or injury; <http://www.workconnections.umich.edu/pdf/iirf.pdf>

Contact EHSEM to request technical assistance.

EHSEM

Provide training to the Principal Investigator and Laboratory Manager upon request maintain records of training.

Provide technical assistance and conduct safety audits.

Conduct air monitoring for HF to evaluate employee exposure upon request and after an exposure incident if necessary.

Respond to assist with cleanup of any spills.

Employees

Comply with this Guideline and any further safety recommendations initiated by the Principal Investigator or Laboratory Manager

Conduct assigned tasks in a safe manner, wear appropriate personal protective equipment, and only use equipment for which they have been formally trained

Report to Principal investigator any job related injuries or illnesses, health and safety concerns, and unsafe or unhealthy working conditions.

Review chemical hazard information detailed on standard operating procedures or MSDS before beginning work with HF.

A. Develop Written Standard Operating Procedures (SOPs)



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Refer to EHSEM's [SOP template](#) for an example format when developing the laboratory's SOPs. SOPs should address the following items:

1. All safety precautions indicated on the hydrofluoric acid MSDS or noted in other technical literature for HF
2. Usage considerations:
 - a. Adequate exhaust ventilation is required. All work with HF must be performed in a wet bench or fume hood. Ventilation systems must meet all University standards and the MBC, IFC and the International Mechanical Code. Applicable LEV systems are also reviewed and periodically, e.g., annually, certified by EHSEM to ensure they are operating properly.
 - b. A personal protective equipment (PPE) assessment in accordance with the [EHSEM PPE Guideline](#) must be performed to determine the level of protection needed for the task. Typical PPE used to work with HF includes safety goggles with face shield, laboratory coat, acid-resistance apron, gloves and gauntles made of polyvinyl chloride (PVC), neoprene, butyl rubber or other glove as indicated in the individual glove manufacturer's glove selection guide. Refer to [EHSEM's glove use](#) webpage.
 - c. Long sleeve shirts, pants, and closed- toe leather or safety shoes must be worn when working with HF. *Sandals or other open-toed shoes must never be worn.*
 - d. Avoid working alone when using HF
 - e. Do not eat, drink or smoke in areas where HF is handled. Wash hands thoroughly after removing gloves and prior to leaving the laboratory.



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- f. Store all HF and HF waste in properly labeled, chemically compatible containers, e.g., polyethylene, polypropylene or Teflon, and store separately from metals, concrete, glass, strong bases, sodium hydroxide (NaOH), potassium hydroxide (KOH), and ceramics. *Never store in glass or other silicon containing materials or in metal containers.* Contact EHSEM (3-4914) for questions regarding waste management

3. Emergency Procedures:

- a. Document procedures for responding to a spill or other release of HF and for managing inhalation, ingestion or skin contact exposures.
- b. Ensure that unexpired 2.5% calcium gluconate gel is available in the laboratory in case of skin contact exposure. Note that EHSEM does not endorse any specific calcium gluconate supplier and the vendors listed below are simply companies known to offer the gel.

- **Fisher Scientific**
<http://www.fishersci.com/>
2000 Park Lane Drive
Pittsburgh, PA 15275
800.766.7000 (phone)
800.926.1166 (fax)
- **Life Safety Associates**
<http://www.lifesafety.com>
1876 Hartog Drive
San Jose, CA 95131
888.552.5433 (toll-free) 408.573.1900 (phone)
408.573.7336 (fax)
E-mail: email@lifesafety.com



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- c. **Note: Exposure to HF requires immediate and specialized first aid and medical treatment. Delays in first aid care or medical treatment will likely result in great damage or may, in some cases, result in a fatal outcome.**

B. Training

In addition to the information in SOPs, the following topics should be covered during training:

1. Properties of HF that make it more dangerous to use than other acids.
2. Exposure symptoms associated with handling and use.
3. Procedures for responding to an exposure incident.
4. Procedures to follow in the event of a spill.
5. Additionally, applicable staff should attend the Comprehensive Laboratory Safety Training provided by EHSEM. Contact EHSEM (3-0921) for more information.

REFERENCE DOCUMENTS:

Sprout, W.L., et al, *Treatment of Severe Hydrofluoric Acid Exposures* (Journal of American Occupational Medicine 25:12, 1993)

Bracken, W.M., et al, *Comparative Effectiveness of Topical Treatments for Hydrofluoric Acid Burns*, University of Kansas (Journal of Occupational Medicine 27:10:1985)

Burke, W.J., et al, *Systemic Fluoride Poisoning Resulting from A Fluoride Skin Burn* (Journal of Occupational Medicine 5,39:1973)



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[EHSEM - Chemical Hygiene Plan](#)

[EHSEM - Personal Protective Equipment \(PPE\)](#)

[EHSEM - Laboratory Fume Hood Guideline](#)

[EHSEM – Generic HF Standard Operating Procedure \(SOP\)
Template](#)

[EHSEM – Hydrofluoric Acid First Aid Instructions](#)

OSHA's Hydrofluoric Acid website:

<http://www.osha.gov/SLTC/healthguidelines/hydrogenfluoride/recognition.html>

CDC's Hydrofluoric Acid website:

<http://emergency.cdc.gov/agent/hydrofluoricacid/>

Honeywell's Hydrofluoric Acid website:

<http://www51.honeywell.com/sm/hfacid/>

TECHNICAL SUPPORT:

All referenced guidelines and regulations are available through EHSEM (3-4914) and at www.umd.umich.edu/ehsem

EHSEM can provide additional technical support for the proper use and storage of HF. EHSEM will also conduct evaluations of the engineering systems used to control exposures to HF and conduct personal exposure monitoring for laboratory workers when necessary.

Contact EHSEM at (3-5933) for assistance with clean-up in the event of a spill or other release of HF and for the disposal of HF and other wastes.