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Guidance on the Safe Use Hydrofluoric Acid (HF)			
Policy...	Code of Practice...	Guidance✓	Procedure...
Organisation-wide✓		Local...	
Approved by the University Health & Safety Committee			
Chairperson Dr Derek Millard-Healy	Date	Oct 2023	Review date 2026

1 Introduction

The University has a responsibility under Health and Safety legislation to provide and maintain plant and systems of work, which are safe, and without risk to health (Health & Safety at Work etc. Act 1974). Accidents involving Hydrofluoric acid (HF) can cause serious injury or even death. Hydrofluoric acid (HF) is a colourless solution of hydrogen fluoride dissolved in water. Above approximately 60% solution HF fumes.

HF is of particular concern because whilst it can cause severe burns like many concentrated acids, its fluoride ions readily penetrate the skin and can cause systemic poisoning. These fluoride ions bind to primarily the body’s calcium and magnesium ions leading to electrolyte imbalance, decalcification of bone, cardiac arrhythmia and death.

It has been estimated that death due to HF poisoning can occur if as little as 2.5% of the body comes into contact with concentrated acid (the palm of the hand represents approximately 1% of body surface area).

2 Scope

This organisational guidance applies to the Uxbridge campus as a whole.

3 Responsibilities

3.1 Deans and Directors of College Operations, Institutes and/or Professional Services.

Deans and Director of College Operations, Institutes and/or Professional Services are responsible for making the following arrangements:

- Ensuring compliance with the requirements of this guidance and bringing this Guidance on the Safe use of Hydrofluoric acid to the attention of those within their areas of responsibility who work with Hydrofluoric Acid.

3.2 Divisional Managers / Head of Departments

Divisional Managers / Head of Departments are responsible for

- Ensuring that both staff and students must be trained in the correct procedures for the use of Hydrofluoric acid and ensure that all procedures are appropriately supervised. HSET must be informed of the use of hydrofluoric acid. and of the arrangements in place for its use. This includes existing users and new users.

3.3 Staff and Students (Users)

All users must attend any training required prior to working with Hydrofluoric Acid

4 Arrangements

If HF must be used then appropriate management arrangements and safe systems of work must be put in place for its purchase, storage, use and disposal. The only effective way to prevent HF injuries is through the implementation of a proper safety management system covers the areas below:

4.1 Training

Anyone who or uses Hydrofluoric acid must be suitably trained and have the necessary skills to carry out their job safely. In particular new employees or research students should receive training and be supervised closely. They should understand the risks associated with Hydrofluoric acid. Records of this training must be kept locally.

4.2 Handling and Use

NO WORK INVOLVING HF CAN BE CARRIED OUT OUTSIDE NORMAL WORKING HOURS. If it is not necessary to use Hydrofluoric acid then it must not be used. The lowest concentration and the smallest volume possible of HF should be used to achieve a task.

Prior to using hydrofluoric acid; a Risk and COSHH assessment for the dilution of commercially supplied HF to the correct concentration must be carried out and a separate COSHH and Risk assessment for any procedure, process or experiment involving Hydrofluoric Acid. This assessment should include arrangements for the disposal of any surplus acid. All HF solutions must be properly labelled.

Procedures that require the use of Hydrofluoric acid must have a standard operating procedure. Reactions involving hydrofluoric acid can only be carried out in designated labs in fume cupboards with a high extraction rate and good containment. HF warning notices should be on display, on the laboratory door and where the experiment is being carried out.

Never use Hydrofluoric acid outside of a fume cabinet. Users must stand at the fume cupboard rather than sit when working with HF to avoid spilling over the legs. Arrangements should be in place so that when hydrofluoric acid is being used individuals do not work on their own.

A buddy system should be operated whereby two HF trained people are wearing the appropriate PPE for the use of HF. So that in the event of a spill these two have access to an appropriate spill kit and can summon First Aid if necessary

4.3 Storage

Storage Considerations

- Always store HF in a clearly labelled container and always ensure that there is secondary containment of the primary container, i.e. a container within a container.
- Never store HF in glass or metal containers. Always store HF in polyethylene, polypropylene or Teflon containers. Be aware that prolonged storage of HF can cause plastic materials to become brittle.
- Ensure that concentrated HF is always stored in a secure chemical cabinet or laboratory.
- Storage of HF in fume hoods should be avoided where possible. Otherwise store small amounts of weak solutions in sealed containers when necessary.
- Store HF containers as close to the ground as possible away from pedestrian routes and away from incompatible chemicals, e.g. metals, organic compounds

5 Personal Protective Equipment (PPE)

When working with any concentration of HF suitable personal protective equipment (PPE) must be worn. In so far as is possible there should be no exposed /uncovered skin on a HF user. The use of PPE is to provide a last line of defence against HF exposure. PPE is not a substitute for safe systems of work.

5.1 Gloves

Gloves should always be considered as offering only a limited simple barrier protection and no protection against long term contact with HF. Assume a very short breakthrough time for all gloves. Once contaminated gloves should be removed immediately and the hands washed with running water. Before use all gloves should be inspected for damage. Damaged gloves should be discarded.

Two pairs of gloves should always be worn when working with HF. An inner disposable pair made from a suitable material such as nitrile (but not latex) should be worn under an outer heavy-duty pair. The nature of the outer pair will depend on the concentration of the acid being used and the nature of work process. The outer glove pair should always be constructed of a heavy-duty material which reaches to at least the mid forearms and where possible the elbows. Materials such as PVC, Neoprene and Natural Rubber are suitable for outer gloves.

When the outer gloves become contaminated they should be immediately removed and soaked in a caustic solution before being worn again. The outer gloves should be washed down with clean water before removing them.

The answering of telephones, the using the computers, etc. should be avoided when working with HF. Contaminated gloves should be washed in a caustic solution before disposal in an appropriate manner.

5.2 Protective Clothing

Protective clothing is designed to offer a simple physical barrier to HF contamination. Assume a very limited breakthrough time for all protective clothing.

Always wear a closed full-length laboratory coat. When handling concentrated acid also wear a chemical apron over the laboratory coat made from a suitable HF resistant material, e.g. PVV, Natural Rubber, etc.

Do not wear shorts, skirts or open toed shoes when working with any concentrations of HF. If desired a full body acid suit may be worn in lieu of a lab coat.

5.3 Face / Eye Protection

Always wear safety glasses or goggles when working with any concentration of HF.

When working with concentrated HF wear a full-face shield over the safety glasses / goggles.

5.4 Respiratory Protection

1. The use of respiratory protection when working with HF under normal circumstances is prohibited. The use of HF should never generate the need to wear respiratory protection. The need to wear respiratory protection under normal circumstances of use indicates a failure of safety management.

2. When dealing with HF spillages outside of a fume hood a full-face mask with inorganic / acid gas filters should be worn

Contaminated PPE and all normal clothing should be removed immediately and washed in a caustic solution before being examined for damage. Damaged PPE must be disposed of immediately. Face masks must be disposed of after dealing with a spillage.

6 Hydrofluoric Acid First Aid

In areas where HF work is taking place it is advisable that some members of staff are trained in Hydrofluoric acid first aid. It takes two people to affect a first aid response to a HF exposure.

Training Provider [Cognet HF- Hydrofluoric Acid First Aid Training Half-day Course](#)

The HSE, Chemical Industries Association and the National Poisons Service joint guidance for treatment for skin exposure is to immediately decontaminate with a high flow of water for a maximum of one minute.

Therefore, HF work should only be done where there is a high flow of water or an emergency shower.

[HFguidance.pdf \(npis.org\)](#) The neutralisation agent calcium gluconate will need to be applied for 15 minutes continuously.

7 Emergency Procedures

Spillage

All users of HF must be given guidance on what to do in the event of a spillage. Spillages can be neutralised and absorbed with calcium carbonate or calcium hydroxide.

Then transferred to a sealed container and disposed of as hazardous chemical waste. Contaminated surfaces can be washed down with calcium carbonate or calcium hydroxide solution. In the event of a large spillage outside of the fume cupboard, evacuate the lab immediately, prevent access and call assistance.

Fire

In a fire HF will release noxious, corrosive and toxic fumes. Operate the planned fire drill for the area in question. On arrival, emergency services should be informed that HF is present in the area affected. Carbon dioxide, water, halon or chemical foam extinguishers may be used. Self-contained breathing apparatus and a protective chemical suit will be required to fight fire.