HYDROFLUORIC ACID MANAGEMENT GUIDELINES
# Contents

1. Introduction .................................................................................................................................. 3
2. Scope ............................................................................................................................................ 3
   2.1. Heads of School or Directors of Units ................................................................. 3
   2.2. Supervisors and Members of Research Groups ......................................................... 3
3. Risk Management ........................................................................................................................ 3
4. Purchasing .................................................................................................................................... 4
5. Competency and Training Requirements ..................................................................................... 4
6. Procedures for Using and Handling HF ....................................................................................... 5
   6.2. Personal Protective Equipment ....................................................................................... 6
   6.3. Transport and Storage ........................................................................................................ 6
   6.4. Labelling ............................................................................................................................ 6
   6.5. Waste Disposal/Neutralisation ....................................................................................... 7
7. Emergency and First Aid Procedures ........................................................................................... 7
   7.1. Spills ................................................................................................................................. 7
   7.2. First Aid ........................................................................................................................... 8
8. Related Documentation ................................................................................................................ 9
9. Reference Material ....................................................................................................................... 9
10. Program Evaluation .................................................................................................................. 9
11. Version Control Table ............................................................................................................. 10
1. Introduction

The University of Wollongong is committed to providing a safe and healthy workplace for all workers, visitors and students. To meet this commitment, the University shall endeavour to control any risk to workplace health and safety through the adoption of risk management principles into all work practices.

Hydrofluoric acid (HF) is a highly corrosive and toxic liquid. It should be handled with extreme care, beyond what is generally required to handle other mineral acids. Owing to its low dissociation constant, HF penetrates tissue more rapidly than typical mineral acids as it is a neutral lipid-soluble molecule. Because of the ability of hydrofluoric acid to penetrate tissue, poisoning can occur readily through exposure of skin or eyes, or when inhaled or ingested. Symptoms of exposure to hydrofluoric acid may not be immediately evident as it interferes with nerve function, meaning that burns may not initially be painful. Accidental exposures can go unnoticed therefore delaying treatment and increasing the extent and seriousness of the injury.

As a result, the University has put in place strict guidance surrounding purchasing, handling, storing and disposing of HF. The University of Wollongong is obligated to ensure any persons handling or being in an area where HF is used are without risk of exposure and comply with the safe work practices set out in this guideline.

2. Scope

This guideline is intended to provide a consistent approach to the management of HF across the University. Topics surrounding the management of HF covered by this document include training, purchasing, handling, storing, disposing and managing HF related emergencies.

All personnel who are intending to use HF need to be aware of the information set out in this guideline as well as their applicable responsibilities. Responsibilities

2.1. Heads of School or Directors of Units

Heads of School or Directors of Units are responsible for the approval of the use of HF in their areas and must approve any risk assessments and safe work procedures prior to use.

2.2. Supervisors and Members of Research Groups

Supervisors and members of research groups who are using HF must:

- plan work in the knowledge that any exposure may cause permanent incapacity or death
- ensure all personnel working in the laboratory containing HF are familiar with the properties and hazards of HF
- ensure all HF users are trained and deemed competent in the handling and using HF
- document a risk assessment for its intended use, prior to that use
- document and follow the appropriate safe work procedure
- undertake workplace inspections and competency assessment at least twice a year.

3. Risk Management

Every effort must be made to eliminate the use of HF. Investigation of alternate methods or use of alternative chemicals is recommended. If a substitute is not possible then a risk assessment must be completed in consultation with workers who could be exposed. A detailed risk assessment must be
completed prior to the initial use and purchase of any solutions containing HF and must be approved by the relevant head of school or director of unit.

It is recommended that the number of people using HF be minimised within a laboratory. Use of HF by HDR students should, when possible, be avoided and needs to be approved by the relevant Head of School or Director. Approval of HF use on UOW premises can be withdrawn if procedures within this document or other health and safety procedures are not adhered to. Laboratory workers have the right to refuse to handle HF if they are uncomfortable or have concerns in using HF.

4. Purchasing

The following considerations are to be made when purchasing HF:

- prior to the initial purchase of HF, the safety data sheet for the specific concentration of HF being ordered must be read by the requestor and they must ensure that the recommended risk control measures are in place in their work area prior to the introduction of the material (e.g. working fume cupboard, Australian standard designed storage cabinets, recommended personal protective equipment, secondary containers for transport etc)
- a detailed risk assessment must be completed and attached to the purchasing requisition form; else the order will not be processed. This risk assessment needs to be approved by the relevant head of school or director of a unit. **Repeat purchases can use the same risk assessment if the HF is to be used for the same purpose**
- ensure only minimum quantities of HF should be purchased at one time just prior to required use. Containers holding HF can degrade and should not be stored for long periods of time. Where practical smaller containers should be purchased to minimise decanting risks
- it should be clearly stated on the purchasing requisition form that HF is to be delivered directly to the laboratory and not to the Faculty distribution office. When placing an order it may be necessary to contact the Faculty purchasing office or suppliers to organise this direct delivery
- on arrival the container of HF should be clearly labelled with the arrival date
- storage and disposal considerations need to be identified during the purchasing process. Storage requirements can be identified on the product SDS.

5. Competency and Training Requirements

HF is only to be handled by laboratory workers who have been adequately trained and assessed as competent in its use.

There 2 parts to the training and competency process for HF:

- **Part 1: Online HF Awareness Training** is to be completed by ALL laboratory workers who are working in a laboratory where HF is handled, even if they are not actually handling or using HF (laboratory workers are not permitted to work in a laboratory where HF is stored and used, unless they have completed the HF awareness training). This training involves a presentation followed by a competency assessment task in the form of a quiz. A 100% pass mark is required in the quiz before access to the relevant laboratory is granted.
- **Part 2: HF Use in the Laboratory** is a practical assessment based in the relevant laboratory. The HF Use Competency Checklist shall be used as a record of completing the practical assessment. The trainer describes and demonstrates the method to be used involving HF. The trainee must then successfully and safely complete the task based on the safe work procedure and is marked against specific required actions on the HF Use Competency Checklist. The trainee is also shown and described the use of HF spills kits, HF first aid kits, HF scrubber fume-hood and other information as relevant to the specific laboratory and safe work procedure.
Depending on the frequency of use of HF, competency of the user must be reviewed at least twice a year against the HF Use Competency Checklist. These checks should be documented and recorded in a training record. It is the responsibility of the Supervisor to monitor handling of HF by HDR students.

Competent trainers are essential when training laboratory workers in a new high risk procedure. There are no formal accreditation processes available for HF trainers, however, personnel who undertake HF training Part 2: HF Use in the Laboratory must be able to demonstrate extensive experience in using HF, specific to the task, a knowledge of UOW policies and procedures and have the skills and attributes to successfully train new users.

6. Procedures for Using and Handling HF

6.1. General Safe Work Practices

All activities involving HF must have a documented risk assessment and safe work procedure completed in SafetyNet prior to use and these must have been approved by the Head of School or Director. There should be limited access to HF, with a minimum number of people required to handle this substance.

Anyone using HF must be trained and competent in its use and a second trained and competent person must always be in attendance, aware of the use of HF and be prepared to assist in the event of an emergency. The following are the general safe work practices that must be followed when using HF:

- all work should be conducted in a HF scrubber fume cupboard
- specimen storage areas must be marked as containing HF solutions
- solutions containing HF must be stored in polyethylene or Teflon containers as HF reacts with glass and solutions containing HF are incompatible with glass storage vessels and equipment
- eyewash stations, emergency showers and hand washing facilities must be available in each work area
- a first aid kit, which includes calcium gluconate, must be available in each work area
- an appropriate spill kit must be located in the lab where the HF is being used and stored
- laboratory space and placement of equipment should not create a crowded working environment nor inhibit cleaning
- all skin and eye contact must be avoided
- restriction of laboratory access is important
- waste containers for the safe disposal of acids and contaminated items must be provided & labelled
- **no persons are permitted to work alone with HF** or after 6.00pm, before 8.00am or on weekends, when normal emergency assistance services, for example, first aid, building wardens are not available
- alert other workers in the laboratory that you are using HF and place signage to that effect either on the fume-hood sash or laboratory door. Always lower fume-hood sash when not working at the hood
- never add water to the acid. In dilution, a small amount of HF should be added to plenty of water. If using a dispenser it is preferable to add HF under the surface of the water in order to minimise the generation of HF vapour and splashes
- regular inspection and testing programs should include fume-hood function (integrity of scrubber, fume-hood surfaces, pH of tank water), first aid kit and spill kit, and safety shower and eyewash stations.
6.2. Personal Protective Equipment

There are specific Personal Protective Equipment (PPE) requirements for handling HF. It is essential that PPE be worn correctly and is regularly checked that it is in good repair. No areas of skin should be exposed.

In addition to standard laboratory PPE (lab coat, enclosed shoes, long pants and sleeves), the following PPE is also recommended when working with HF:

- a face shield for handling and transferring
- safety glasses are suitable for concentrations less than 1% or where the likelihood of a splash is low (for example where only a few mLs is being used) - at concentrations greater than this or where there is a high likelihood of a splash safety goggles should be used
- a PVC apron
- neoprene (most desirable) or PVC gloves, sleeve protectors or gauntlet style gloves and nitrile gloves worn underneath the outer glove. Double gloving is recommended and gloves should be regularly inspected and replaced as all glove materials eventually degrade in the presence of HF.

6.3. Transport and Storage

Handling and storage of HF requires special materials and technology for containers, pipes and valves etc. HF is highly reactive with most metals, glass, ceramics and fibreglass and should only be stored in polyethylene or PVC containers All HF storage containers must be inspected regularly for any leaks or damage. All containers and pipework must be clearly labelled.

HF should be stored in a secure area that is in a restricted, locked laboratory in a ventilated storage cupboard away from strong oxidising agents, organic compounds, metals and strong bases. It should also be stored in a cool, dry well-ventilated area away from heat and within a bunding tray (i.e. secondary container that can withhold the volume if primary container ruptures). All Storage areas must be clearly labelled. Ensure the storage location of HF is explicit in ChemAlert laboratory stock holdings.

Solutions of HF should not be routinely transported out of or around a laboratory. If transport is required keep volumes to a minimum, ensure caps are secure and always use secondary containment. Never transport in squirt bottles.

Transport between areas should not be a routine exercise, but it may be necessary for example during renovations or refurbishments.

When transporting from another lab or area ensure that:

- your route is planned so that there are obstacles or obstructions in your way
- all containers are bunded in an appropriate container to contain any spills
- 2 people are present during the transport
- containers are tied down or secured so they will not fall off when using manual handling aids
- if using any lifts ensure the transport of dangerous goods procedure is followed
- a spill kit is readily available in case of an emergency

6.4. Labelling

All containers holding HF solutions and waste must be labelled in line with the Working with Hazardous Chemicals and Dangerous Goods Guidelines. Labels can be printed from ChemAlert if required.

It is recommended that HF containers are visually easy to identify. Placing red electrical tape around the container is a simple way to distinguish HF containers from others in the lab.
6.5. Waste Disposal/Neutralisation

If HF is consumed within the reaction then residue solutions can be placed in normal laboratory waste containers. The pH of the waste from such procedures should be regularly checked. Never recycle solutions.

Small amounts (<100ml) of HF can be neutralised and diluted.

Neutralization Reaction

\[2\text{HF} + \text{CaCO}_3 + \text{excess } \text{H}_2\text{O} \rightarrow \text{CaF}_2 + 2\text{H}_2\text{O} + \text{CO}_2\]

Guidelines for neutralising small amounts of HF are:

- all neutralisation must be performed in the appropriate fume hood for HF
- wear all PPE required for the use of HF
- slowly add neutralising agent (sodium bicarbonate or calcium carbonate) until the pH reaches 7
- dilute the neutralised solution with excess water and flush to drain.

**Note:** Only solutions that are not contaminated with residual metals are allowed to be disposed of down the drain.

If there is residual HF in the experiment waste then there should be a dedicated HF residue container. This waste container should be clearly labelled with a Hazardous Waste Disposal Identification Label and the Waste Tracking Log should clearly state the presence of HF. The waste can then be disposed of as per the Hazardous Waste Disposal Guidelines.

The residue container should be segregated according to compatibility. Similarly, any solid waste (e.g. gloves) that may be contaminated with HF, should be segregated and disposed of separately as HF waste. Redundant stock of HF should be disposed. Do not store indefinitely.

7. Emergency and First Aid Procedures

7.1. Spills

Before attempting to clean any spills:

- always consider the need for evacuation when a spill occurs especially if vapours are being given off or if respiratory or eye irritation occurs
- always check yourself for any contamination especially your shoes. You do not want to spread HF around the laboratory or to other areas. Apply appropriate first aid measures if you have been exposed.
- avoid contact with liquid and inhalation of vapours
- never clean a spill on your own
- always wear all of the correct PPE
- ensure you have the right equipment and spill kit
- **never use any organic materials such as vermiculite, sand or kitty litter to absorb spills**

The procedure and equipment required to clean a HF spill primarily depends on the volume and concentration. Below are the methods to be used to clean HF spills:

<table>
<thead>
<tr>
<th>Method 1: For small volumes of HF &lt;10mL (any concentration)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Note:</strong> If the HF is heated or excessively off-gassing method 2 should be used</td>
</tr>
<tr>
<td><strong>Inside the fume hood</strong></td>
</tr>
<tr>
<td>Make a solution of calcium carbonate or sodium carbonate</td>
</tr>
<tr>
<td>Follow procedure for inside fume hood</td>
</tr>
</tbody>
</table>
Hydrofluoric Acid Management Guidelines

7.2. First Aid

All research groups using HF must have:

- personnel trained in the correct first aid treatment for HF
- a HF first aid kit easily accessible within the laboratory
- calcium gluconate gel available and a program to regular check that it is within the ‘use by’ date (the gel must be discarded and replaced after the expiry date)
- safety showers and eye wash facilities in the laboratory where HF is used and a program to check regularly, with checks recorded on a placard behind the safety shower

Those administering first aid need to be protected from exposure to HF by wearing the appropriate PPE as recommended in the risk assessment. Seek urgent medical assistance and continue first aid measures until medical assistance arrives. In all cases, a copy of the SDS must accompany the patient to hospital.
<table>
<thead>
<tr>
<th>Exposure</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye contact</td>
<td>Hold eye open and flood eye with gently running water for at least 15 minutes ensuring that the flow of water does not contaminate the unaffected eye</td>
</tr>
</tbody>
</table>
| Skin contact | Wear suitable gloves and PPE as self-protection  
IMMEDIATELY remove all contaminated clothing including jewellery/watches/shoes and place in a labelled plastic bag to be disposed of following the [Hazardous Waste Disposal Guidelines](#)  
Wash skin - keep washing with running COLD water for 15 minutes  
Apply calcium gluconate gel on and around the affected area  
Continue to reapply every 15 minutes until medical help arrives  
The tube of calcium gluconate gel must accompany the patient to hospital and be discarded after use |
| Ingestion  | If conscious and cooperative rinse mouth with water  
Give further water to drink in order to dilute acid  
**Never induce vomiting**                                                                                                           |
| Inhalation | Remove to fresh air  
Administer CPR as necessary (always use a resuscitation mask and gloves to avoid direct contact)                                                                                           |

8. Related Documentation

- [Hazardous Waste Disposal Guidelines](#)
- [Incident Management and Reporting Guidelines](#)
- [Risk Management Guidelines](#)
- [Working With Hazardous Chemicals and Dangerous Goods Guidelines](#)
- [WHS Policy](#)
- [WHS Purchasing Guidelines](#)

9. Reference Material

- [NSW WHS Act 2011](#)
- [NSW WHS Regulation 2011](#)

10. Program Evaluation

In order to ensure that these guidelines continue to be effective and applicable to the University, these guidelines will be reviewed regularly by the WHS Unit in consultation with the WHS Committee.

Conditions which might warrant a review of the guidelines on a more frequent basis would include:

- reported hazards or injuries
- non-conforming systems
- WHS Committee concern.

Following the completion of any review, the program will be revised/updated in order to correct any deficiencies. These changes will be communicated via the WHS Committee.
## 11. Version Control Table

<table>
<thead>
<tr>
<th>Version Control</th>
<th>Date Released</th>
<th>Approved By</th>
<th>Amendment</th>
</tr>
</thead>
</table>
| 1               | Sep 2012      | Prof. Will Price, Dean of Science  
Prof. Chris Cook, Dean of Engineering  
Prof. Elena Pereloma, AIIM  
Mr Darren Smith, Manager WHS | Formation of document |
| 2               | July 2014     | Manager WHS | Removed specific quantity restrictions for ordering HF from Section 3.3 |
| 3               | April 2017    | WHS Manager | Reviewed entire document |