 MOUNT ROYAL UNIVERSITY 1910	Standard Operating Procedure Hydrofluoric Acid	No. SOP-1005
		Page 1 of 8
		Version: 01
CONFIDENTIAL	Department: Science And Technology	Published Date: 29/10/2024
Document Approved Electronically		

1.0 PURPOSE

- 1.1. This procedure provides instructions for safe handling, storage, transport, and disposal of hydrofluoric acid (HF).

2.0 SCOPE

- 2.1 This procedure applies to all personnel (users) involved in receiving, handling, storage and disposal of 20% or less HF at Mount Royal University (MRU) and subsidiary locations for MRU employees and contractors. It does not cover the use, receiving, handling, storage and disposal of HF that exceeds 20% concentration and of any anhydrous hydrogen fluoride gas.

3.0 RESPONSIBILITIES

- 3.1. It is the responsibility of the user (or those who order the product) to ensure they are trained in the proper handling and storage of HF (refer to [section 4.1](#)). Laboratory workers who are not directly handling HF but are working in a laboratory where HF is used MUST receive [Hydrofluoric First Aid Response](#) and Emergency procedure training.
- 3.2. It is the responsibility of the user to comply with all requirements set out in this standard and laboratory safety standards.
- 3.3. It is the responsibility of the user to ensure the SDS is reviewed prior to handling and comply with all requirements outlined on the SDS.
- 3.4. It is the responsibility of the user to contact EH&S (EHS@mtroyal.ca) to ensure that all downstream individuals are informed about the product and its intended usage location.
- 3.5. It is the responsibility of the user to report any spills or exposure incidents immediately.


4.0 TRAINING REQUIREMENTS

- 4.1. Ensure personnel are familiar with the properties and hazards of the chemical they are working with. These include the following reference documents and associated training sessions.
 - Hydrofluoric Acid SDS for product being used/handled
 - [HF Spill Kit Directions](#)
 - SOP-1005 Hydrofluoric Acid (this SOP)
 - [Hydrofluoric Acid Safety Training](#)
 - [Chemical Spill Response Procedures](#) (For reference use only. Contact EHS to complete the training.)
 - [WI-2018 Chemical Spill Response](#)

5.0 PROCEDURES

HF is extremely hazardous, and may be fatal if inhaled, absorbed through the skin or swallowed. Both liquid and vapour can cause severe burns to all parts of the body. *Medical treatment is required for any exposure to HF acid.*

MRU permits a maximum concentration of 20% HF. Any solution exceeding this limit requires approval and must undergo evaluation via the [Chemical Pre-Purchase Checklist](#) before purchase. Only purchase minimum quantities of HF. To minimize the risk of decanting, ensure that the maximum container size purchased does not exceed 500mL.

 MOUNT ROYAL UNIVERSITY 1910	Standard Operating Procedure Hydrofluoric Acid	No. SOP-1005
		Page 2 of 8
		Version: 01
CONFIDENTIAL	Department: Science And Technology	Published Date: 29/10/2024
Document Approved Electronically		

5.1. As Hydrofluoric Acid is highly toxic and corrosive, low concentrations can be damaging, Alberta OHS legislation states a ceiling at 3 ppm, which must never be exceeded.



5.2. Working Alone with concentrations >5% is not permitted. Working Alone with concentrations <5% is not permitted after hours or on weekends.

5.3. All other personnel within the vicinity should be informed of the dangers of HF and the emergency procedures in case of an accident.

5.4. Do not eat, drink or smoke while using this product.

5.5. In addition to the required laboratory Personal Protective Equipment (PPE), users of HF are required to use additional PPE. It is important to always consult the manufacturer's glove selection guide when selecting a glove for HF.

5.5.1. Double glove with nitrile exam gloves under medium or heavy nitrile, neoprene, or polyvinyl chloride (PVC) gloves. For concentrated HF $\geq 30\%$, do not use nitrile rubber gloves for the outer layer.

NOTE: Inspect gloves prior to use. Additionally, inspect outer gloves frequently when handling HF for damage or contamination. Change gloves immediately whenever damage or contamination is noticed.


5.5.2. Wear a chemical resistant apron and sleeves when handling HF. Sleeves should be tucked under the cuff of the outer glove. It is recommended to use gloves that cover the hands, wrists, and forearms.

5.5.3. Eye and face protection should include a full face shield (CSA Approved) in conjunction with tightly fitting goggles or a full face respirator with acid gas filters. (Contact EHS to arrange for selection and fit testing of respirators.)

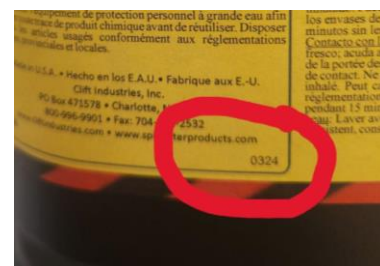
5.6. Follow proper glove removal technique to avoid skin contact with HF on contaminated gloves. Avoid touching the outer surface of the gloves during removal.


5.7. Always handle HF in a fume hood to decant and dilute, or to prepare samples, for use elsewhere. Conduct experiments in a fume hood whenever possible. Always lower the fume hood sash when access is not required.

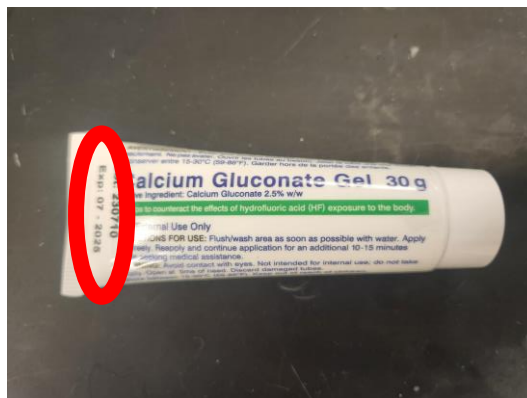
5.8. Keep in the original container and do not decant into an additional container unless its chemically compatible container (such as polyethylene or Teflon) and containers must be labeled with the name and concentration of the chemicals and its hazard symbol. Do not store in metal, ceramic, or glass containers or with incompatible materials and chemicals such as organic acids, ammonia, or other alkaline chemicals. Keep containers tightly closed in a dry, cool and well-ventilated corrosives area.

 <p>MOUNT ROYAL UNIVERSITY 1910</p>	<p>Standard Operating Procedure Hydrofluoric Acid</p>	No. SOP-1005
		Page 3 of 8
		Version: 01
CONFIDENTIAL	Department: Science And Technology	Published Date: 29/10/2024
<i>Document Approved Electronically</i>		

- 5.9. Clearly label all containers (including waste containers) as containing HF.
- 5.10. As HF is corrosive to metals, remove metals from workspace and storage areas as reactions could create flammable hydrogen gas.
- 5.11. Hydrofluoric acid can also corrode glazes, enamels, pottery, concrete, rubber, leather, and a variety of metals and organic compounds. When it reacts with metals, it can produce potentially explosive hydrogen gas.
- 5.12. Do not mix HF with sulfuric acid as it produces hydrogen gas and fluorosulfuric acid.
- 5.13. Never add water to acid. When diluting HF, always add a small amount of HF to a large volume of water. If using a dispenser, add HF under the surface of the water to minimize the generation of HF vapour and splashes.
- 5.14. Ensure that chemically compatible secondary containers are always used when working with HF.
- 5.15. Keep all containers containing HF securely supported to prevent spills.
- 5.16. When moving HF solutions between laboratories, the containers must be placed in secure, spill-proof outer containment.
- 5.17. Ensure that containers are closed to minimize exposure and to prevent etching of fume hood glass due to HF vapors.
- 5.18. After use, wash hands and exposed skin thoroughly.
- 5.19. This SOP should be posted or readily available within the designated area.
- 5.20. Verify the concentration and quantity of HF that is required, ensure this is within the safe operating limits of the control measures implemented and only what is required for the task.
- 5.21. At a minimum, a decanted HF must be labelled according to WHMIS regulations that includes:
 - Product Identifier
 - Hazard Pictograms
 - Hazard Statements
- 5.22. Ensure the HF Acid Eater Spill kit is in stock, within its shelf life, and nearby when working with HF. Spill kit has a shelf life of 2 years. The manufacturing date on the HF Acid Eater jug is located in the bottom label, indicated by the code "MMYY". (For example, "0324" means it was manufactured in March 2024 and will expire in March 2026.)
- 5.23. It is advisable to have a small supply of calcium carbonate or calcium hydroxide readily available near the work area in case of a minor spill.
- 5.24. Ensure the first aid kit and/or lab has Calcium gluconate gel and check to ensure Calcium gluconate gel is within the current best before date.



 <p>MOUNT ROYAL UNIVERSITY 1910</p>	<p>Standard Operating Procedure Hydrofluoric Acid</p>	No. SOP-1005
		Page 4 of 8
		Version: 01
CONFIDENTIAL	Department: Science And Technology	Published Date: 29/10/2024
<i>Document Approved Electronically</i>		



5.25. Always handle HF under a fully operational chemical fume hood that is identified with a sign stating “**Danger Hydrofluoric Acid Use Area**”.




NOTE: This sign is located by the HF spill kit. If more warning signs are required please contact [EH&S](#).

6.0 TRANSPORTING HF

6.1. If transporting an HF containing solution between lab areas:

- Ensure proper PPE is worn.
- Place the HF containing solution in a clean, chemically compatible secondary container such as polyethylene or Teflon. Ensure that the HF containing solution is sealed securely.
- Utilized carts for the transportation of items between locations, ensuring that the carts are in proper working order and that the HF items are secured.
- Prior to transport, discard your gloves to prevent potential chemical transfer onto the door handles and other surfaces.
- Alternatively, wear a single clean glove while carrying the container, keeping one hand ungloved to open doors and handle other objects.
- Alternatively, enlist a lab partner to assist with door opening and object handling during transport.

7.0 HF DISPOSAL

 MOUNT ROYAL UNIVERSITY 1910	Standard Operating Procedure Hydrofluoric Acid	No. SOP-1005
		Page 5 of 8
		Version: 01
CONFIDENTIAL	Department: Science And Technology	Published Date: 29/10/2024
Document Approved Electronically		

- 7.1. If there is any remaining HF in the waste, it should be placed in a designated HF residue container, clearly labeled for identification. These waste can be disposed of during regular hazardous waste pickup. It is important to verify the integrity of the container and avoid overfilling it. Before filling, ensure that the containers are inspected and sturdy.
- 7.2. If HF is used up during the reaction, any leftover solutions can be disposed of in standard laboratory waste containers. It is important to monitor the pH of such waste regularly. Small quantities of HF can be neutralized and diluted as needed.
- 7.3. The waste container must be segregated based on compatibility. Similarly, any solid waste (e.g., gloves, pipettes) that may have HF contamination should be segregated and disposed of separately as HF waste. Excess HF stocks should be disposed of promptly and not stored indefinitely.

8.0 EMERGENCY PROCEDURE

Symptoms resulting from HF exposure frequently manifest after several hours. If you suspect exposure without symptoms, immediately administer first aid. Prompt action significantly mitigates potential injuries! Refer to [Hydrofluoric First Aid Response](#) for more information.

8.1. Exposure:

8.1.1. Individuals exposed to HF should administer first aid to themselves whenever possible to prevent cross contamination. Any assisting individuals must utilize the specified gloves (nitrile exam gloves under medium or heavy nitrile gloves or Neoprene or polyvinyl chloride (PVC)) and additional PPE outlined in this document to avoid contamination (see [section 5.5](#)). Avoid using latex gloves as they do not effectively protect against HF chemicals.

8.1.2. Provide the following information to the EMS team/physicians.

- SDS for product in use when exposed
- HF Concentration
- Date, time of exposure, duration of exposure, and how exposure occurred.
- Body parts affected/exposed, and the percent of body surface area affected.
- Summary of the first aid given (include when the calcium gluconate gel was first applied, body area to which the treatment was applied, and the total times the treatment was applied).

8.2. Skin Exposure

8.2.1. Immediately flush with (cold) water for at least 15 minutes (preferable use a safety shower).


8.2.2. Remove all contaminated clothing as well as jewelry while flushing.

8.2.3. While the victim is flushing, call 911 then Security (403-440-5900), and inform them of a hydrofluoric acid exposure and the location where the victim can be found.

8.2.4. Wear a new pair of chemical resistant gloves (double gloves or use gloves in the spill kit).

8.2.5. Apply Calcium gluconate gel (found in the B281- front of the room situated on top of the HF Spill Kit).

NOTE: Affected area does not need to be dried prior to calcium gluconate gel application.

 <p>MOUNT ROYAL UNIVERSITY 1910</p>	<p>Standard Operating Procedure Hydrofluoric Acid</p>	No. SOP-1005
		Page 6 of 8
		Version: 01
CONFIDENTIAL	Department: Science And Technology	Published Date: 29/10/2024
<i>Document Approved Electronically</i>		

8.2.6. Continuously rub the gel in until the pain completely subsides. Calcium gluconate gel should be reapplied continually every 10-15 minutes and massage into the skin until medical assistance arrives. The gel will turn white (CaF₂ precipitate) upon reaction with the acid.

8.2.7. If calcium gluconate is not available, continue flushing the affected area with water for at least another 15 minutes or until medical treatment is given.

NOTE: Discard the tube and any unused gel after use (one tube per application).

8.3. Eye Exposure

8.3.1. Immediately rinse with (cold) water for at least 15 minutes, or sterile eyewash solution.

8.3.2. Hold the eyelids open and away from the eye during the irrigation to allow thorough flushing of the eyes.

8.3.3. While the victim is flushing, call 911 then Security (403-440-5900), and inform them of a hydrofluoric acid exposure and the location where the victim can be found.

8.3.4. Continue to flush with copious amounts of water for 15 minutes while holding eyelids apart. Do **NOT** use oil, salves, ointments, or calcium gluconate gel in the eyes.

8.3.5. Follow the flushing with an ice pack or ice water compressed.

8.3.6. While transporting the victim, continue to flush with sterile water then ice pack or ice water compressed to continue to irrigate the affected eye(s).

8.4. Inhalation Exposure

8.4.1. Immediately move the affected person to fresh air.

8.4.2. Call 911 then Security (403-440-5900) to inform them an inhalation HF exposure has occurred.

8.4.3. Keep the victim warm, comfortable, and quiet.

8.4.4. Administer CPR if the victim has stopped breathing. Ensure that there is respiratory protection and chemical resistant gloves, if attempting to provide assistance. Also ensure that the mouth and throat are free of foreign material.

8.4.5. If possible, administer 100% oxygen (10 to 12 L/min flow rate) by inhalation. *This should only be done by a trained individual.*


8.4.6. Do not give stimulants unless instructed by a physician.

8.5. Ingestion Exposure

8.5.1. Do NOT induce vomiting or give vomit inducing agents or baking soda. Never give anything by mouth to an unconscious person.

8.5.2. Immediately drink a large amount of water to dilute the acid. If available, drink several glasses of milk or Milk of Magnesia, Mylanta, Maalox or similar product, or take up to 30 antacid tablets (Tums and Caltrate). Do NOT administer bicarbonates as the carbon dioxide byproduct could severely injure the victim.

8.5.3. Call 911 for medical assistance.

 MOUNT ROYAL UNIVERSITY 1910	Standard Operating Procedure Hydrofluoric Acid	No. SOP-1005
		Page 7 of 8
		Version: 01
CONFIDENTIAL	Department: Science And Technology	Published Date: 29/10/2024
<i>Document Approved Electronically</i>		


8.6. Spill

Refer to [Hydrofluoric Acid SDS](#), [Chemical Spill Response Training](#), [HF Spill Kit Directions](#), and [WI-2018 Chemical Spill Response](#) for more information.

9.0 REFERENCE DOCUMENTS

- 9.1. Fisher Scientific Safety Data Sheet for Hydrofluoric Acid
- 9.2. Yale EHS Standard Operating Procedure for Hydrofluoric Acid
- 9.3. WHMIS 2015 legislation
- 9.4. Calgonate Hydrofluoric Acid Safety Information
- 9.5. Harvard University Guidelines for the Safe Use of Hydrofluoric Acid
- 9.6. The University of British Columbia Working Safely with Hydrofluoric Acid
- 9.7. Australian National University: Hydrofluoric Acid Handling

End of Record

 <p>MOUNT ROYAL UNIVERSITY 1910</p>	<p>Standard Operating Procedure Hydrofluoric Acid</p>	No. SOP-1005
		Page 8 of 8
		Version: 01
CONFIDENTIAL	Department: Science And Technology	Published Date: 29/10/2024
<i>Document Approved Electronically</i>		

9.0 APPROVAL

Title	Name	Signature	Date (mm-dd-yyyy)
Management/Supervisor Doc. Approver	Gwen O'Sullivan	 <small>Gwen O'Sullivan (Oct 30, 2024 08:20 MDT)</small>	10-30-2024
EH&S Representative Doc. Reviewer	Stuart Elle, BSc CRSP		07-23-2024
Originator Doc. Generator	Cristine Selirio & Lesley Pyne	 <small>Cristine Selirio (Oct 30, 2024 08:19 MDT)</small>	10-30-2024

10.0 HISTORY

Version	Approval Date (mm-dd-yyyy)	Summary of Changes	Justification	Revision Author
1	10-30-2024	New SOP	New SOP	Cristine Selirio & Lesley Pyne