ENVIRONMENT, HEALTH, & SAFETY

Laboratory Standard Operating Procedure for:

Perchloric Acid

Principal Investigator (PI) Approval is Required Prior to Performing this Procedure

Description

This standard operating procedure outlines the handling and use of perchloric acid. Review this document and supply the information required in order to make it specific to your laboratory. In accordance with this document, laboratories should use appropriate controls, personal protective equipment, and disposal techniques when handling perchloric acid.

Perchloric acid is used as a laboratory reagent in analytical chemistry, a catalyst in wet 'combustion', a dehydrating agent in fluoride determination, an ingredient of electrolytic bath in deposition of lead, and for electropolishing of metals. It is also used in the manufacture of explosives and various esters and in separation of potassium from sodium. Heating may cause an explosion. Perchloric acid is known to react violently with water. **Perchloric Acid causes severe burns and there's a risk of serious damage to eyes.**

Potential Hazards

- Consult your Safety Data Sheet (SDS) and the *Prudent Practices* Laboratory Chemical Safety Summary for Perchloric Acid and Inorganic Perchlorates for more hazard information.
- Perchloric acid can be irritating to the skin, eyes, and respiratory tract. Contact with exposed body parts can cause painful burns and even death.
- Anhydrous perchloric acid and certain perchlorate salts present a serious explosion hazard.
- Aqueous perchloric acid can cause explosions if concentrated to greater than the normally-available commercial concentration of 72%.
- Hot concentrated solutions are extremely dangerous – heated perchloric acid acts as a strong oxidizing agent. **Never heat perchloric acid in a standard fume hood, because perchlorates may accumulate in the ductwork and create an explosion hazard for employees servicing the hood.** If you suspect that heated perchloric acid has been used in a hood, contact EHS at (810) 766-6763 before having the hood tested or serviced.
- Do not use perchlorates as drying agents if there is any chance of contact with organic compounds or a dehydrating acid strong enough to concentrate the perchloric acid.
- Currently, there are no established occupational exposure limits for perchloric acid.

Engineering Controls

Perchloric acid must always be used in a fume hood. Do NOT heat perchloric acid in a standard chemical fume hood. An eyewash/drench hose combination unit must be available in the immediate work area for any work with corrosive materials. If perchloric acid will be heated, a special perchloric acid hood with water washdown system, and a safety shower will also be necessary. All new locations used for heated perchloric acid procedures must be approved by Environment, Health and Safety (EHS) at (810) 766-6763 prior to conducting any work.

Work Practice Controls

- Avoid personal contact and inhalation of dust, mist or vapors.
- Provide adequate ventilation.
- DO NOT repack or return unused portions to original containers.
- Withdraw only sufficient amounts for immediate use.
- NEVER smoke, eat or drink when handling perchloric acid.
- Consider alternate methods and use a less dangerous acid if possible.
- Purchase perchloric acid in the smallest amounts practicable. Purchase in shatter-resistant containers if available (such as PVC-coated glass).
- Set up a designated area for perchloric acid use and label it as such.
- Make sure that flammable and/or organic materials are not located in the work area.
- Hot concentrated solutions are extremely dangerous – heated perchloric acid acts as a strong oxidizing agent. NEVER heat perchloric acid in a regular chemical fume hood.
- Do not use perchlorates as drying agents if there is any chance of contact with organic compounds or a dehydrating acid strong enough to concentrate the perchloric acid.
- Once work with perchloric acid is complete, decontaminate the area by wiping it down with a 10% sodium carbonate (Na_2CO_3, also known as soda ash) solution.
- Contact EHS at (810) 766-6763 for more information.

Personal Protective Equipment

Wear a fully buttoned lab coat with sleeves extended to wrists, full face shield with chemical goggles, elbow length PVC gloves, long pants (or other clothing covering the entire leg), rubber apron, and closed toed shoes.

Transportation and Storage

- Transport corrosives in secondary containment, preferably a polyethylene or other non-reactive acid/solvent bottle carrier.
- Store in well-ventilated areas with secondary containment, such as a non-reactive plastic bin.
- Store below eye level.
- Store perchloric acid away from light, heat, flammables or combustibles, including organic materials. (Do not store under the sink, in wooden cabinets, or on paper-lined shelving.)
- Do not store on the floor.

Waste Disposal

Handle and store hazardous waste following the guidelines above for work practice controls, transportation and storage. Because most spent, unused and expired chemicals/materials are considered hazardous wastes, they must be properly disposed of. ***Do not dispose of chemical wastes by dumping them down a sink, flushing in a toilet or discarding in regular trash containers, unless authorized by UM Flint EHS.*** Contact Environment, Health and Safety (EHS) at (810) 766-6763 for waste containers, labels, manifests, waste collection and for any questions regarding proper waste disposal. Also refer to UM-Flint Hazardous Waste Management Program and EHS webpage http://www.umflint.edu/ehs/environment-health-and-safety for more information.

Exposures/Unintended Contact

 ***If the employee is in need of emergency medical attention, call 911 immediately.*** 

For an actual chemical exposure/injury:

- Remove contaminated clothing. Flush exposed eyes or skin with water for at least 15 minutes. Seek medical attention (see below).
- For situations with risk of inhalation exposure, remove all persons from the contaminated area.
- If an ambulance is needed, call the **University of Michigan-Flint Department of Public Safety (DPS) at 911** to request assistance.

Contact EHS for advice on symptoms of chemical exposure, or assistance in performing an exposure assessment.

Report all work related accidents, injuries, illnesses or exposures to UM-Flint DPS. Additionally, employees and supervisors must be sure to report the injury to EHS and complete and submit the Illness and Injury Report Form to WorkConnections within 24 hours. Follow the directions on the WorkConnections website Forms Instructions to obtain proper medical treatment and follow-up.

If you were involved in or observed an incident or near miss, please complete the EHS Laboratory Incident and Near-Miss Report Form. This will be valuable in improving laboratory safety on UM-Flint campus.

TREATMENT FACILITIES:

MAJOR INJURIES	MINOR INJURIES –During Business Hours	MINOR INJURIES –After Business Hours
Genesys Hospital One Genesys Parkway Grand Blanc, MI 48439 (810) 606-5710 **Hurley Medical Center** One Hurley Plaza Flint, MI 48503 (810) 262-9000 **McLaren Hospital Flint** 401 South Ballenger Hwy Flint, MI 48532 (810) 342-2000	**Genesys Occupational Health Network** 1460 Center Rd. Burton, MI 48509 (810) 715-4620 Mon. to Fri. 7:30 am to 10 pm Sat. & Sun. Noon to 8 pm **McLaren Flint-Burton OCC Center** 1459 S. Center Rd. Burton, MI 48509 (810) 496-0900 Mon. - Fri. 8 am to 8 pm Sat & Sun 10 am to 2 pm	**Downtown Flint** 420 S. Saginaw St. Flint, MI 48502 (810) 762-1550 **Genesys East** 1096 S. Belsay Rd, Suite F Burton, MI 48509 (810) 743-3351 **Genesys North** 4154 W. Vienna Rd Clio, MI 48420 (810) 686-7397 **Genesys South** 8447 N. Holly Rd Grand Blanc, MI 48439 (810) 603-0856 Mon. - Fri. 6 to 10pm / Sat. & Sun. 1-10pm

Click here for more information on the UM – Flint Emergency Preparedness and Response Plan.

Spill Procedure

- When a spill occurs, ***personal safety should always come first.***
- Alert and clear everyone in the immediate area where the spill occurred.
- On the UM-Flint campus, "large" spills of perchloric acid will require emergency response contractor to assist with clean up. EHS must be notified to coordinate with outside contractor.
- Small spills of perchloric acid can be neutralized by slowly pouring sodium carbonate (Na_2CO_3) or other appropriate inorganic neutralizing agent on the spill. The spill should NOT be wiped up with organic or combustible materials (paper towels, rags, etc) because perchloric acid is incompatible with these materials and when they dry, these materials can spontaneously ignite. Transfer the neutralized slurry to a container of water for disposal. A second neutralization, along with wiping/rinsing down the area with a soap and water solution is recommended.
- **If any large amount of perchloric acid solution is spilled, leave the lab and call UM-Flint DPS at 911 to request assistance from EHS.** Do not take any action to cover the spill. Post a warning on the lab and do not allow others to enter. Have a person available that has knowledge of the incident and laboratory to assist emergency personnel.

Additional Spill Links:

- www.oseh.umich.edu/pdf/chemspil.pdf
- http://www.oseh.umich.edu/emer-chemical.shtml.

Report all emergencies, suspicious activity, injuries, spills, and fires to the UM-Flint Department of Public Safety (DPS) at 911 from any university telephone or (810) 762-3333 from cell phone or non-university telephone. Register with the University of Michigan-Flint Emergency Alert System via Wolverine Access. Also, preprogram the UM-Flint DPS telephone number (810) 762-3333 into your cell phone for quick, easy use.

Training of Personnel

All personnel are required to complete Laboratory Safety Training. Documentation of the training is required. This training can be accomplished by completing the ***Comprehensive Laboratory Safety*** session (**BLS009** *or equivalent*) via MyLINC, or UM-Flint EHS on-line training or other equivalent approved by EHS. Furthermore, all personnel shall read and fully adhere to this SOP when handling perchloric acid.

Certification

I have read and understand the above SOP. I agree to contact my Supervisor or Lab Manager if I plan to modify this procedure.

Name	Signature	UM ID #	Date

Principal Investigator _____ **Revision Date** _____