**General Use Standard Operating Procedure (SOP)**

Corrosives

****

*Globally Harmonized System Hazard Class and Category(s): Corrosives to Metals; Skin corrosion; Serious eye damage*

*Examples: hydrochloric, phosphoric, formic, & acetic acids; sodium & potassium hydroxides; Sodium hypochlorite (bleach),* *bromine, hydrogen peroxide, chlorine and ammonia gasses, phosphorous and phenol.*

**Note**: This SOP is intended to provide general guidance on how to safely work with corrosives and only addresses safety issues specific to corrosives. Other hazard classes may also apply. Review Safety Data Sheets (SDS) and refer to other general use SOPs relevant to the chemical you are working with. Contact the Principal Investigator/ Laboratory Supervisor or the WSU Chemical Hygiene Officer for questions concerning the applicability of any item listed in this SOP (OEHS: 313-577-1200).

**If the chemical of interest is a particularly hazardous substance or a high risk chemical a lab specific SOP is required.**

**Note:** This SOP does not apply to hydrofluoric acid, perchloric acid, picric acid, aqua regia, or piranha solution.

# **Hazard Description**

A material is corrosive if it either can cause irreversible destruction of living tissue or materially damage/ destroy metals through chemical action at the point of contact. Corrosive chemicals can be liquids, solids, or gases. Liquid corrosive chemicals are those with a pH of 4.0 or lower or a pH of 9 or higher. Solid chemicals are considered corrosive are those with a pH of 4.0 or lower or a pH of 9 or higher when in solution. A highly corrosive chemical has a pH of 2 or lower or a pH of 12.5 or higher. Corrosive chemicals are mainly acids and bases. Corrosives can also be oxidizing, flammable, dehydrating, self-heating, water reactive or toxic.

Physical Hazards

* Will materially damage, or even destroy, metals.
* Contact with metals (e.g. Aluminum) may evolve flammable hydrogen gas.

Health Hazards

* Skin corrosion is the production of irreversible damage to the skin; namely, visible necrosis through the epidermis and into the dermis.
* Serious eye damage is the production of tissue damage in the eye, or serious physical decay of vision.
* Irreversible tissue damage at site of contact may also include respiratory tract.
* Vapors may be irritating and may cause burns.
* Fire may produce irritating, corrosive and/or toxic gases.
* Effects of contact or inhalation may be delayed.
* For work with Hydrofluoric Acid, see [Hydrofluoric Acid SOP](https://research.wayne.edu/oehs/chemical/general_sop-hf.docx).

Physical and/or health hazards may vary based on the type of corrosive. Refer Safety Data Sheet (SDS) for chemical specific hazard information.

# **Control of Hazards – General**

* Conduct a hazard assessment to identify proper use and handling techniques, fire safety, storage, and waste disposal issues specific to the chemical being used.
* Purchase the smallest containers at the lowest concentration practical.
* Eyewash required in immediate work area.
* Safety shower may be required when using large quantities.
* Do not add water to the corrosives. Add corrosives to water, slowly, in small amounts, with frequent stirring. Do not pour water into acid. Slowly add the acid to the water and stir.
* Open bottles or carboys slowly and carefully and wear protective equipment to guard hands, face, and body from splashes, vapors, gases and fumes.
* Plan work to avoid contact with gloves. *Change gloves immediately if contaminated.*
* Use designated areas when working with highly hazardous corrosives such as hydrofluoric acid, perchloric acid, picric acid, aqua regia, or piranha solution. Informed lab members prior to work. Label the area with appropriate signs.

# **Engineering/Ventilation Controls**

* Work in a chemical fume hood with volatile or powdered corrosives, or if there is any potential for inhalation exposure.
* Use a properly functioning lab fume hood when handling strong acids/ bases, or other chemicals that can form mists/ vapors upon contact with air (often referred to as “fuming”).
* Regular fume hoods may NOT be used when working with perchloric acid. Use a specialized perchloric acid fume hood with built-in wash down systems and non-reactive metal surfaces.

# **Personal Protective Equipment**

In addition to proper street clothing (long pants or equivalent that cover legs and ankles, close-toed non-perforated shoes that completely cover the feet), wear the following Personal Protective Equipment (PPE) when performing lab operations/tasks:

* Safety glasses (If splash potential exists, use goggles + face shield instead)
* Lab coat.
	+ Hazard assessment of procedures may indicate the need for a flame resistant lab coat, such as Nomex.
* Appropriate chemical‐resistant gloves.
* Refer to Section 8 “Exposure controls/personal protection” of SDS or a glove selection guide (e.g. [Ansell Chemical Protection Guide](https://www.ansellguardianpartner.com/chemical/home#hp)) to identify appropriate glove type.

# **Special Handling Procedures and Storage Requirements**

* Store liquids and solids separately.
* Most corrosive materials are incompatible with each other. Store away from incompatibles;

Acids away from bases

Oxidizing acids away from flammable, organic or reducing acids/ agents.

Oxidizing acids are incompatible with each other. Use spate secondary containments to segregate.

 e.g Nitric acid should be stored in separate secondary containment away from perchloric acid.

See SDS for specific incompatibility information or WSU Chemical Segregation Flow Chart.

* Store corrosives in well ventilated, non-metallic or epoxy painted cabinets.
* Corrosives will corrode most metal cabinets. If stored in metal cabinets place corrosives in non-reactive secondary containment (e.g. polypropylene trays)
* Store below eye level but not on the floor.
* Store away from metal.
* Do not store under the sink.
* If a corrosive is also flammable, store in a secondary container inside of a flammable cabinet.
* Transport corrosives in a bottle carrier.
* Corrosive gases;

Store in well ventilated areas or vented cabinets

Use inside a fume hood

Close regulators and valves when the cylinder is not in use

* For corrosives that are also considered particularly hazardous substances, a designated area shall be established.
* Follow any substance-specific storage guidance provided in SDS documentation.

# **Decontamination Procedures**

* Decontamination procedures vary depending on the material being handled.
* Consult SDS and other reference materials for guidance on appropriate decontamination.
* Ensure adequate ventilation during decontamination.
* Clean and decontaminate all work areas and equipment after use.
* Wipe/ soak up with inert absorbent material and collect as hazardous waste.
* Wipe corrosive chemical drips from containers and bench tops. Be especially careful to wipe up visible residues of sodium hydroxide and potassium hydroxide from all surfaces.
* Ensure outside surfaces of stock bottles are clean before placing in the storage areas.
* Skin contact with corrosives will result in burns.
	+ Hands shall be washed immediately after completion of work.
	+ Potentially contaminated PPE shall be removed before entering clean areas.
	+ All skin exposures to hydrofluoric acid, phenol, or other severe skin contact hazards require immediate medical attention.
	+ Seek medical attention if pain, numbness, redness, irritation or other health symptoms are apparent. Check the SDS to see if any delayed effects should be expected.

# **Waste Disposal**

* Corrosive chemicals are hazardous wastes. Waste streams that include a mixture of corrosive liquids and peroxides (such as Piranha etch, Chromerge, and Nochromex) produce gas and require special waste procedures.
* Bleach solution greater than 10% is considered hazardous waste and must be collected to be disposed by OEHS.

Do not dispose of waste by dumping down a drain or discarding in regular trash containers, unless authorized in writing by OEHS. [Submit requests to OEHS](https://research.wayne.edu/oehs/forms/chem-waste) for waste containers, labels, and waste collection. Also, refer to the [OEHS Hazardous Waste Management web page](http://research.wayne.edu/oehs/hazardous/index.php) and [WSU Chemical Hygiene Plan](http://research.wayne.edu/oehs/pdf/chemical-hygiene-plan.pdf) for more information.

# **Spill procedures**

1. **Spills**

For hazardous material spills or releases which have impacted the environment (via the storm drain, soil, or air outside the building) or which cannot be cleaned up by local personnel due to size of spill, hazard level, or hazards are unknown:

* 1. Call WSU Police (313) 577-2222. Available 24 hours a day, 7 days a week.
	2. Evacuate the spill area
	3. Post someone or mark-off the hazardous area with tape and warning signs to keep other people from entering.
	4. Remain in the vicinity until emergency personnel arrive and provide them with information on the chemicals involved.

For additional information regarding spill response procedures, refer to the [OEHS chemical spill response guidelines](http://research.wayne.edu/oehs/chemical/spills), [WSU Chemical Hygiene Plan](http://research.wayne.edu/oehs/pdf/chemical-hygiene-plan.pdf) and [American Chemical Society (ACS) guide for chemical spill response](https://www.acs.org/content/acs/en/about/governance/committees/chemicalsafety/publications/guide-for-chemical-spill-response.html).

1. **Small Spills**

In the event of a minor spill or release that can be safely cleaned up by local personnel using readily available equipment (e.g. absorbent materials) and appropriate PPE:

* 1. Alert personnel in the immediate area of spill and restrict access.
	2. Eliminate all sources of ignition.
	3. Increase ventilation in area of spill (turn on fume hood and open sash, open windows). Vent vapors to outside of building only.
	4. Review the SDS for the spilled material, or use your knowledge, to assess the hazards and to determine the appropriate level of protection.
		1. **DO NOT** clean up spills requiring respiratory protection. Contact OEHS for help (313-577-1200).
	5. Choose appropriate personal protective equipment (e.g. goggles, face shield, chemical resistant gloves, lab coat or apron).
	6. Protect floor drains, sinks or other potential avenues of environmental release as much as possible. Make a dike around the outside edges of the spill using absorbent materials.
	7. For solid spills: Use a scoop and brush or other suitable non-combustible items to collect spilled material. Minimize dust generation.
	8. For liquid spills: Cover the liquid with appropriate non-combustible absorbent material (NO paper towel), working from the spill's outer edges toward the center.
	9. Collect spill cleanup materials using a scoop or other suitable items and place in a tightly closed hazardous waste container.
	10. After spilled material is removed, decontaminate surfaces with water or other appropriate solvent.
	11. Place all contaminated materials, including contaminated items such as gloves, in the hazardous waste container.
	12. Label waste container with completed hazardous waste tag (available from OEHS).
	13. Submit online [waste pickup request](https://research.wayne.edu/oehs/hazardous/chemical-waste.php) to OEHS.

# **Emergency Procedures**

**\*\*If medical attention required, call WSU police (313-577-2222) immediately\*\***

* **Fire Extinguishers** – Refer to section 5 of the SDS for chemical specific firefighting measures. Both ABC dry powder and carbon dioxide extinguishers are appropriate for most fires.
* **Eyewash/Safety Showers** – Depending on the chemical hazard type, an ANSI approved eyewash station and safety shower may be required, easily accessed, and available within 10 seconds travel time for emergency use. Instruct personnel on the locations of eyewashes and safety showers, and how to activate them, prior to an emergency. Refer to [MIOSHA Fact Sheet: Eyewashes and Safety Showers](https://www.michigan.gov/documents/lara/lara_miosha_cet0199_628109_7.doc) to determine if an eyewash/safety shower is required for your specific chemical.

Please note: Additional hazards present in the laboratory may require that an eyewash or safety shower be present. This emergency equipment is required for treating exposures to workplace hazards such as chemical splashes, biological agents, welding sparks, metal shavings, or fine particulates like dust, dirt and sand.

1. **Health Threatening Emergencies**
	1. **Fire, explosion, health threatening hazardous material spill or release, compressed gas leak, or valve failure.**
		1. Call WSU Police (313) 577-2222.
		2. Alert people in the vicinity and activate the local alarm systems.
		3. Evacuate the area and go to your Emergency Assembly Point.
		4. Remain nearby to advise emergency responders.
		5. Once personal safety is established, call OEHS at (313) 577-1200.

Note: For compressed gas leaks, shut off gas supply only if this can be done safely, without risk to personnel.

* 1. **Injuries and Exposures:**
		1. Remove the injured/exposed individual from the area, unless it is unsafe to do so because of the medical condition of the victim or the potential hazard to rescuers.
		2. Call WSU Police (313) 577-2222.
		3. Administer first aid as appropriate.
			1. Eye contact: Promptly flush eyes with copious amounts of water for a prolonged period (at least 15 minutes). Seek medical attention.
			2. Ingestion: Seek medical attention IMMEDIATELY. See first aid section of chemical Safety Data Sheet.
			3. Skin contact: Remove any contaminated clothing. IMMEDIATELY flush contamination from skin using the nearest emergency shower for a minimum of 15 minutes. Seek medical attention.
			4. Inhalation: Get to a source of fresh air. Seek medical attention.
		4. Call OEHS (313) 577-1200, to report the exposure and complete [Report of Injury](https://risk.wayne.edu/files/rofi.pdf) form.
		5. Bring to the hospital copies of the Safety Data Sheets for all chemicals to which the victim was exposed.
1. **Non-Health Threatening Emergencies**
	1. **Injuries and Exposures**

For injuries and exposures that are not considered serious or a medical emergency, visit:

Henry Ford Occupational Health – Harbortown

3300 East Jefferson, Suite 100

Detroit MI 48207

(313) 656-1618

Monday – Friday 8:00 AM to 6:30 PM

If Henry Ford Occupational Health Center is closed or for serious injuries, visit:

Henry Ford Hospital – Emergency Room

2799 W. Grand Blvd.

Detroit MI 48202

(313) 916-8742

OR

Detroit Receiving Hospital - Emergency Room

4201 St. Antoine St, Detroit, MI 48201

Phone: (313) 745-3000

# **Minimum Training Requirements**

1. **General Training:**
* Online through the [Collaborative Institutional Training Initiative (CITI)](https://about.citiprogram.org/en/homepage/).
	+ Laboratory Safety Training (general lab & chemical safety issues) and Hazard Communication
* [Fire Safety](https://risk.wayne.edu/fire-safety).
1. **Laboratory Specific Safety Training:**
* [Laboratory-Specific Safety Training](https://research.wayne.edu/oehs/docs/lab-safety-training-checklist.doc) checklist
* Review of SDS for chemicals involved in process/experiment.
* Review of this SOP.
* Review [WSU Hazardous Waste Management](https://research.wayne.edu/oehs/hazardous/chemical-waste) guidelines.
* Other: \_\_\_\_\_\_\_\_\_

# **Laboratory Personnel Review**

Prior to initiating work, lab personnel using these types of chemicals must complete the table below confirming that they have read and understood the above SOP and the associated hazards.

|  |  |  |
| --- | --- | --- |
| **Name** | **Signature** | **Date** |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |