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

Flammable Liquids

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*Globally Harmonized System Hazard Class: Flammable Liquids*

*Examples: Ethanol, Isopropanol, Methanol, Acetone, n-Hexane, Benzene, Xylene, Hydrazine, Glacial Acetic Acid*

**Note**: This SOP is intended to provide general guidance on how to safely work with liquids and only addresses safety issues specific to flammable liquids. 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.**

# **Hazard Description**

* A flammable liquid is a liquid having a flash point of not more than 199.4 °F (93 °C).
* PHYSICAL HAZARDS
  + HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
  + Vapors may form explosive mixtures with air and may explode if ignited in an enclosed area.
  + Flashback along vapor trail may occur.
* HEALTH HAZARDS
  + Inhalation or contact with material may cause irritation and/or skin and eye damage.
  + Fire may produce irritating, corrosive and/or toxic gases.
  + Vapors may cause dizziness and suffocation.
  + May cause toxic effects if inhaled, ingested or absorbed through skin (e.g. kidney or liver damage; carcinogen).
* Refer to chemical specific SDS for 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 and use the smallest practical quantities for the work being performed.
* Purchase in shatter-resistant containers if available (such as PVC-coated glass).
* When not in use, keep container tightly closed and upright to prevent vapor escape and leakage.
* Return containers to the flammable cabinet immediately after use, including waste containers.
* Do not heat with an open flame.
* Avoid using near sources of ignition, hot surfaces, or static electricity.
* Do not use electrical devices with cracked or frayed electrical wiring.
* Know the location of the nearest eye wash, safety shower and fire extinguisher.
* When transferring flammable liquid from a bulk container (generally > 5 gallons), the containers must be electrically bonded and grounded. Consult with OEHS for proper bonding and grounding.
* Transfer flammable liquids from containers of five gallon-capacity or less inside a laboratory fume hood (or other area with similar ventilation) to prevent accumulation of ignitable fuel-air concentration of vapors.
* Transport glass bottles of flammable liquids in a bottle carrier to reduce breakage and contain any spills.

# **Engineering/Ventilation Controls**

Work in a chemical fume hood if:

* The chemical is irritating to the eyes or respiratory system, or hazardous by inhalation.
* Air concentrations could reach or exceed 10% of the lower flammable limit.
* Working with larger quantities (> 500mL).
* Working above room temperature and/or pressure.

If the process does not permit the handing of large quantities of flammable liquids in your chemical fume hood, contact OEHS 7-1200 to review the adequacy of all ventilation measures.

# **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.
  + When working with large volumes of flammables (≥1 liter) or heating large volumes (≥ 1 liter) near or above their flash point, use 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**

* Refer to SDS Section 7: Handling and Storage for chemical specific information.
* Store away from oxidizers and other incompatible agents.
* Store in a flammable cabinet. Limit the amount of flammable liquids outside of a flammable cabinet to what is in-active-use only. Refer to [Flammable Storage Cabinets Fact Sheet](https://research.wayne.edu/oehs/chemical/19-014f_factsheet-flammable-cabinets_ada.pdf) for more information.
* DO NOT store in a standard refrigerator or cold room. A flammable/explosion proof refrigerator is required for cold storage.
* Place corrosive flammable liquids in a secondary container prior to storing inside a flammable cabinet.
* Store below eye level but not directly on the floor.
* Storage must not obstruct safe egress.
* Consult OEHS and WSU Fire Marshal before ordering/storing large amounts of flammable liquids to ensure amounts are within safe guidelines and are properly stored.

# **Decontamination Procedures**

* Decontamination procedures vary depending on the material being handled.
* Non-sparking tools should be used in cleanup.
* All surfaces should be wiped with the appropriate cleaning agent following dispensing or handling.
* Waste materials generated should be treated as a hazardous chemical waste.

# **Waste Disposal**

* Collect as hazardous chemical waste in to a chemical compatible waste container.
* Store waste containers of flammable liquids in a flammable cabinet.

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**

## **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).

## **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 items to collect spilled material. Minimize dust generation.
  8. For liquid spills: Cover the liquid with appropriate absorbent material, 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.

## **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 (313) 577-1200 to report the exposure to OEHS 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.

## **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.

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