**Acutely Toxic Solids and Liquids**

**STANDARD OPERATING PROCEDURE (SOP)**

**Type of SOP:** ☐ Process ☐ Hazardous Chemical ☒ Hazardous Class

**All personnel subject to these SOP requirements must review a completed SOP and sign the associated training record. Completed SOPs must be kept in the laboratory’s safety binder or be otherwise readily accessible to laboratory personnel. Electronic access is acceptable. SOPs must be reviewed, and revised where needed, as described in the** [**SJSU Chemical Hygiene Plan**](https://www.sjsu.edu/fdo/departments/ehs/lab/Chemical_Hygiene_Plan.pdf)**. Note that not all hazardous chemicals are appropriately addressed in a single Hazard Class SOP, and some chemicals are subject to several Hazard Class SOPs.**

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| Date SOP Written: | |  | |  | Approval Date: | | |  |
| SOP Prepared by: | | **REQUIRED - Insert Preparer's Name** | | | | | | |
| SOP Reviewed and Approved by (name/signature): | | | | **REQUIRED - Insert Approver's Name & Signature** | | | | |
| Department: | | **REQUIRED - Insert Department** | | | |
| Principal Investigator/ Laboratory Supervisor: | | **REQUIRED - Insert Name** | | | | Phone: | **REQUIRED - Insert Phone#** | | |
| Emergency Contact(s): | | **REQUIRED - Insert Name** | | | | Phone: | **REQUIRED - Insert Phone#** | | |
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| Location(s) covered by SOP: | Building: | | **REQUIRED - Insert Name** | | | Lab Phone: | **REQUIRED - Insert Phone#** | | |
| Room #(s): | | **REQUIRED - Insert Number** | | |

1. **HAZARD OVERVIEW**

There is a broad spectrum of Acutely Toxic Solid and Liquid materials. For these materials, a single short-term exposure at low concentrations can cause serious illness or death. Recognition of the hazards associated with the transportation, operation, storage, and disposal of these materials is essential.

1. **HAZARDOUS CHEMICAL(S)/CLASS OF HAZARDOUS CHEMICAL(S)**

An Acutely Toxic Solid or Liquid is a chemical falling within any of the following categories:

1. A chemical with a median lethal dose (LD50) of 50 mg or less per kg of body weight when administered orally to albino rats weighing between 200 and 300 gm each.
2. A chemical with a median lethal dose (LD50) of 200 mg or less per kg of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 kg each.
3. A chemical that has a median lethal concentration (LC50) in air of 200 ppm by volume or less of gas or vapor, or 2 mg per liter or less of mist, fume, or dust, when administered by continuous inhalation for 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 gm each.

Acutely Toxic Materials can be identified using the Globally Harmonized System Hazard Codes H300 (Fatal if swallowed), H310 (Fatal in contact with skin) and H330 (Fatal if inhaled). A few examples of common Acutely Toxic Materials used at SJSU include, but are not limited to, the following:

1. Sodium Azide
2. Mercaptoethanol
3. Cyanide salts
4. Mercury compounds
5. Isocyanates

Note that the above references to inhalation toxicity for Acutely Toxic Solids and Liquids refers to the vapor over the liquid. If the material is a gas, or the use procedure involves a solid or liquid being intentionally vaporized/aerosolized, the material should be handled according to Acutely Toxic Gas SOP. Acutely Toxic Gases are **not** covered by this SOP.

**REQUIRED:** List (or attach) the applicable chemical(s) for your inventory, and describe important properties and signs/symptoms of exposure.

1. **ENGINEERING/VENTILATION CONTROLS**

The following is a general plan for all Acutely Toxic Solids and Liquids:

1. Use containment devices (*e.g.,* chemical fume hoods, glove boxes, etc.) when:
   1. Using volatile and/or semi-volatile substances;
   2. Manipulating substances that may generate aerosols; and
   3. Performing laboratory procedures that may result in an uncontrolled release.
2. The tare method should be used to prevent inhalation of the chemical if weighing Acutely Toxic Solids and Liquids in a containment device is not feasible. To do this, the Acutely Toxic Solid/Liquid is added to a pre-weighed container, while working inside the fume hood. The container is then sealed and can be re-weighed outside of the fume hood. If a chemical needs to be added or removed, this manipulation is carried out in the fume hood. In this manner, all open chemical handling is conducted in the fume hood.

If you must use Acutely Toxic Solids or Liquids without/outside of engineering or ventilation controls, you must contact the Chemical Hygiene Officer or [ehs@sjsu.edu](mailto:ehs@sjsu.edu?subject=Carcinogens%20air%20monitoring%20request) for an exposure assessment.

**REQUIRED:** Describe the lab-specific engineering or ventilation controls and equipment safety features (if applicable) that will be used to reduce the risk of chemical exposures to Acutely Toxic Solid and Liquid chemical exposures.

1. **ADMINISTRATIVE CONTROLS**

The following elements are required:

1. Complete laboratory safety training prior to working in the laboratory;
2. Complete laboratory-specific safety orientation and training on laboratory-specific safety equipment, procedures, and techniques to be used, including the location of laboratory safety equipment (emergency eyewash, safety shower, fire extinguisher);
3. Demonstrate competency to perform the procedures described in this SOP to the Principal Investigator (PI) or trainer;
4. Be familiar with the location and content of any Safety Data Sheets (SDSs) for the chemicals used (online SDSs are available from [MSDS online](https://msdsmanagement.msdsonline.com/8511b604-100d-449a-9a6b-366eff19da04/ebinder/?nas=True));
5. Inspect all equipment and experimental setups prior to use;
6. Follow best practices for the movement, handling, and storage of hazardous chemicals (see Chapters 5 and 6 of [Prudent Practices in the Laboratory](http://ucanr.edu/sites/ucehs/files/133892.pdf) for more detail). An appropriate spill cleanup kit must be located in the laboratory. Chemical and hazardous waste storage must follow an appropriate segregation scheme and include appropriate labeling. Hazardous chemical waste must be properly labelled, stored in closed containers, in secondary containment, and in a designated location;
7. Do not deviate from the instructions described in this SOP without prior discussion and approval from the PI; and
8. Notify the PI of any accidents, incidents, near-misses, or unexpected outcomes involving the Acutely Toxic Solids and Liquids described in this SOP.

**REQUIRED:** Insert the laboratory-specific restrictions on maximum quantities to be used or stored, including any special handling or storage requirements.

**INSERT IF APPLICABLE:** Describe any additional administrative controls (e.g. restrictions on working alone/procedure/work equipment/work locations/unattended operations). Include any chemical-specific administrative controls (e.g. peroxide formers).

1. **PERSONAL PROTECTIVE EQUIPMENT (PPE)**

At a minimum, long pants (covered legs) and closed toe/closed heel shoes (covered feet) are required to enter a laboratory or technical area where hazardous chemicals are used or stored.

In addition to the minimum attire required upon entering a laboratory, the following PPE is required for work with Acutely Toxic Solids and Liquids:

1. **Eye Protection** (must be ANSI Z87.1-compliant)**:**
2. At a minimum safety glasses are necessary.
3. Splash goggles may be substituted for safety glasses, and are required for processes where splashes are foreseeable or when generating aerosols.
4. Ordinary prescription glasses are not acceptable eye protection and cannot be used in lieu of proper safety eyewear.
5. **Body Protection**: At a minimum a chemically-compatible laboratory coat that fully extends to the wrist is necessary. A chemically-compatible lab coat may be substituted for other types of body protection (e.g. apron, disposable sleeves, etc.) so long as the substituted protection provides similar or better protection to the researcher.
6. If a risk of fire exists, a flame-resistant laboratory coat that is NFPA 2112-compliant should be worn.
7. For chemicals that are corrosive and/or toxic by skin contact/absorption additional protective clothing (e.g. face shield, chemically-resistant apron, disposable sleeves, etc.) are required where splashes or skin contact is foreseeable.
8. **Hand Protection**: Hand protection is needed for the activities described in this SOP. Define the type of glove to be used based on:
9. The chemical(s) being used;
10. The anticipated chemical contact (e.g. incidental, immersion, etc.);
11. The manufacturers’ permeation/compatibility data; and
12. Whether a combination of different gloves is needed for a specific procedural step/task.

**REQUIRED:** Insert lab-specific descriptions of PPE and hygiene practices used with Acutely Toxic Solids and Liquids, including any specialized PPE needed for a procedural step or specific task.

1. **SPILL AND EMERGENCY PROCEDURES**

Do not attempt to clean up a chemical spill unless you have been trained and feel comfortable doing so. Contact the College Safety Team or Environmental Health & Safety (EH&S), for help with cleaning up a small chemical spill. For a large spill of Acutely Toxic Solids and Liquids, confine the spill within the fume hood or room, evacuate everyone from the lab, and call 911 (or 408-924-2222 from a non-campus phone).

For spills of solid materials, DO NOT dry sweep.

**REQUIRED:** Insert description of who to call in case of Acutely Toxic Solid or Liquid spill in the lab.

1. **WASTE MANAGEMENT AND DECONTAMINATION**

**Waste Management:**

Hazardous waste must be managed as outlined in [SJSU’s Chemical Hygiene Plan](https://www.sjsu.edu/fdo/departments/ehs/lab/Chemical_Hygiene_Plan.pdf), and must be [properly labeled](http://www.science.sjsu.edu/safety/HazWasteForm.pdf). In general, hazardous waste must be removed from your laboratory within nine months of the accumulation start date.

Note that empty chemical containers of many Acutely Toxic Solids and Liquids must be disposed of as hazardous waste. Containers that must be managed this way can be identified using the Environmental Protection Agency’s (EPA) [“P-list” of acutely hazardous materials](https://www.epa.gov/sites/production/files/2016-01/documents/hw_listref_sep2012.pdf) (see pages 59–76).

**REQUIRED:** Insert description(s) of laboratory-specific information on the waste streams generated, storage location, and any special handling/storage requirements.

**Decontamination:**

Decontamination procedures vary depending on the material being handled. The toxicity of some materials can be neutralized with other reagents. All surfaces and equipment should be wiped with the appropriate cleaning agent following dispensing or handling to prevent accumulation of Acutely Toxic Solid or Liquid chemical residue. Decontaminate vacuum pumps or other contaminated equipment before removing them from the designated area.

Carefully inspect work areas to make sure no hazardous materials remain. Clean contaminated work areas with an appropriate cleaning agent, and dispose of cleaning materials properly. Be sure all ignition sources are secured before beginning clean up with flammable liquids.

**REQUIRED:** Insert description(s) of decontamination procedures for equipment, glassware, and/or controlled areas (e.g. gloveboxes, restricted access hoods, or designated portions of the laboratory).

Upon completion of work with Acutely Toxic Solids or Liquids and/or decontamination of equipment, remove gloves and/or PPE to wash hands and arms with soap and water. Additionally, upon leaving a designated Acutely Toxic Solids and Liquids work area remove all PPE worn and wash hands and forearms as needed. Contaminated clothing or PPE should not be worn outside the lab. Soiled lab coats should be sent for professional laundering. Grossly contaminated clothing/PPE and disposable gloves must disposed of as hazardous waste.

1. **DESIGNATED AREA**

Designated area(s) for the use and storage of Acutely Toxic Solids and Liquids shall be established where limited access, special procedures, knowledge, and work skills are required. Signage indicating the corresponding [Globally Harmonized System (GHS) pictogram(s)](https://www.osha.gov/Publications/HazComm_QuickCard_Pictogram.html) should be visible at the entrance of the designated area (e.g. postings on the exterior of the laboratory door).

**REQUIRED:** Insert description(s) of the designated area(s) for Acutely Toxic Solids and Liquids in your laboratory. The entire laboratory, a portion of the laboratory, a fume hood, etc. can be designated.

1. **DETAILED PROTOCOL**

**REQUIRED:** Insert or attach the lab-specific protocol for the process, hazardous chemical(s), or hazard class described in this SOP. Include any relevant resources such as journal articles, patents, etc. as desired.

**TEMPLATE REVISION HISTORY**

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| --- | --- | --- | --- |
| **Version** | **Date Implemented** | **Author** | **Revision Notes:** |
| **1.0** | **4/3/2020** | **Alexi Ball-Jones** | **New template** |
| **1.1** | **10/27/2020** | **Alexi Ball-Jones** | **Updated links** |
| **1.2** | **5/11/2021** | **Alexi Ball-Jones** | **Added** [**ehs@sjsu.edu**](mailto:ehs@sjsu.edu) **link** |
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**LAB-SPECIFIC REVISION HISTORY**

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| --- | --- | --- | --- |
| **Version** | **Date Approved** | **Author** | **Revision Notes:** |
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**Documentation of Standard Operating Procedure Training**

*(Signature of all users is required)*

* Prior to using **Acutely Toxic Solids and Liquids**, laboratory personnel must be trained on the hazards described in this SOP, how to protect themselves from these hazards, and emergency procedures.
* Ready access to this SOP and to a Safety Data Sheet for each hazardous material described in the SOP must be made available.
* The Principal Investigator (PI), or the Laboratory Supervisor if the activity does not involve a PI, must ensure that their laboratory personnel have attended appropriate laboratory safety training or refresher training within the last three years.
* Training must be repeated following **any** revision to the content of this SOP. Training must be documented. This training sheet is provided as one option; other forms of training documentation (including electronic) are acceptable but records must be accessible and immediately available upon request.

**Designated Trainer:** *(signature is required)*

I have read and acknowledge the contents, requirements, and responsibilities outlined in this SOP:

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| **Name** | **Signature** | **Trainer Initials** | **Date** |
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