

Laboratory-Specific Standard Operating Procedures: Requirements and Authorship Guidance

Standard Operating Procedures (SOPs) are a critical part of a research laboratory's safety strategy for preventing chemical exposures to laboratory personnel. SOPs describe lab-specific procedures for storing and using chemical hazards in a way that augments San Jose State University's [Chemical Hygiene Plan](#), as required by the California Occupational Safety and Health Administration (Cal/OSHA) [Laboratory Standard](#) and [CSU Executive Order 1039](#).

Laboratory-specific SOPs should provide sufficient detail such that they promote a positive safety culture and laboratory best practices. They are a critical training tool for researchers and provide guidance for safe research conduct.

To this end, San Jose State University requires laboratory-specific SOPs for research labs using or storing the below listed high-hazard materials. An excel file is provided for each chemical hazard-class SOP to aid in the identification of materials that fall into the hazard class. Note that the provided excel lists are extensive, though not exhaustive. The hyperlinked SOP templates below are available to make SOP authorship easier. It is highly recommended that you use these templates to ensure that all necessary safety elements of your procedure are addressed. You may, however, use your own written SOP so long as it meets the minimum elements provided for in SJSU's SOP template of the hazard classes identified below.

Required SOPs:

1. [Acutely Toxic Solids and Liquids](#)
 - Acutely Toxic Solids/Liquids (ATS/L) have an LD50 \leq 50 mg/kg when administered orally to albino rats -OR- an LD50 \leq 200 mg/kg when administered by continuous skin contact for 24 hours to albino rabbits -OR- an LC50 in air \leq 200 ppm by volume for gas and vapor, 2 mg/L for mist, fume, or dust, when administered by continuous inhalation for 1 hour to albino rats.
 - GHS hazard codes: **H300** (fatal if swallowed), **H310** (fatal in contact with skin), and/or **H330** (fatal if inhaled). In this case, the H330 code refers to the vapor over the ATS/L used in the solid/liquid state.
 - [List of Acutely Toxic Solid and Liquid Chemicals](#) as identified using GHS codes H300, H310 and H330.
2. [Carcinogens](#)
 - Carcinogens regulated by Cal/OSHA can be found in [Title 8 of California Code of Regulations \(8 CCR\), Article 110, §5200-5220](#). Additionally, Cal/OSHA defines guidelines for identification of carcinogens in [8 CCR §5191](#).
 - GHS hazard codes: **H350** (may cause cancer) and **H351** (suspected of causing cancer).
 - Note: This control band DOES NOT include [8 CCR 5209 Listed Carcinogens](#), as these materials cannot be used or stored on the SJSU campus due to special regulatory constraints and facility limitations.
 - [List of Carcinogenic Chemicals](#) as identified using GHS codes H350 and H351.

3. [Hydrofluoric Acid](#)
 - Hydrofluoric acid (HF, liquid or gas) greater than 0.05% HF or materials that generate HF on contact with water.
4. [Pyrophorics](#)
 - Pyrophorics, as defined by the California Fire Code, are materials that auto-ignite below 54.4 °C (130 °F).
 - GHS hazard code: **H250** (catches fire spontaneously if exposed to air).
 - [List of Pyrophoric Chemicals](#) as identified using GHS code H250.
5. [Reproductive Toxins](#)
 - Reproductive toxins are substances that may have adverse effects on various aspects of reproduction in both men and women.
 - GHS hazard codes: **H340** (may cause genetic defects), **H341** (suspected of causing genetic defects), **H360** (may damage fertility or the unborn child), **H361** (suspected of damaging fertility or the unborn child), and/or **H362** (may cause harm to breastfed children).
 - [List of Reproductive Toxins](#) as identified using GHS codes H340, H341, H360, H361, or H362.

The deadline for implementation of these required SOPs for existing research laboratory chemicals is December 31, 2021. Chemicals for research labs undergoing [Hazardous Material Purchase Review](#) that fall into one or more of these categories will need to have an SOP developed before the purchase of the new chemical can be approved.

Training on all relevant SOPs is required for all laboratory personnel working with or in the same research area as chemicals described in the above hazard classes. Those actually performing the processes described in the SOP (“users”) shall be trained on the SOP in its entirety, as well as on any specialized hands-on processes involved in the SOP. Those working in the same space as the chemical hazards (e.g. shared research spaces), but that do not use the hazards (“non-users”) must receive an awareness-level training, at a minimum. Awareness-level training must include information on the hazard, general safety control measures, and what to do in case of emergency. Both user and non-user training must be documented. There is a signature page provided at the end of each SOP template to document user training. Non-users may be trained on the entire SOP and use the same signature page to document training, or the PI may generate an abbreviated training for non-users which includes a signature page for documentation.

Lastly, it is recommended that labs using or storing Corrosives, Flammable Liquids, or Potentially Explosive Compounds develop SOPs using the available hazard class SOP templates below. While these SOPs may be required in specific scenarios, they are generally not required at this time, and may be added to the required list in the future (after December 31, 2021). Please note that this is not an exhaustive list of the SOPs that could be needed or used in a laboratory.

Recommended SOPs:

1. [Corrosives](#)
 - Corrosives are chemicals that cause visible destruction or irreversible alterations in living tissue and other materials by chemical action at the site of contact. Corrosives represent a broad range of chemicals and can be corrosive to metal and skin alike.
 - GHS hazard codes: **H314** (causes severe skin burns and eye damage), **H318** (causes serious eye damage) and **H290** (may be corrosive to metals).
2. [Flammable Liquids](#)
 - Flammable liquids, as defined by OSHA, are materials that have a flash point (f.p.) less than 37.8 °C (100 °F). Many laboratory solvents are flammable liquids, such as Acetone (f.p. = -4 °F), Acetonitrile (f.p. = 42 °F), Diethyl Ether (f.p. = -49 °F), Ethanol, (f.p. = 55 °F), Methanol (f.p. = 52 °F), Isopropanol (f.p. = 74 °F), and Toluene (f.p. = 40 °F).
 - GHS hazard codes: **H224** (extremely flammable liquid and vapor), **H225** (highly flammable liquid and vapor), and **H226** (flammable liquid and vapor).
3. [Potentially Explosive Compounds](#)
 - Any compound or mixture that, upon suitable ignition (e.g. heat, friction, etc.), undergoes rapid a chemical change producing large volumes of heated gases or vapors that exert pressure on the surrounding medium.
 - Potentially Explosive Compounds are a broad class of materials that are rarely labeled with a GHS code indicating their potentially explosive properties.
 - *Bretherick's Handbook of Reactive Chemical Hazards* (available via the SJSU library) is an excellent resource for identifying Potentially Explosive Compounds and the conditions under which they become explosive. Section 10 of the Safety Data Sheet (SDS) is another potential resource for this information.

Some practical guidance on filling in lab-specific information in an SOP template:

- The PI is responsible for reviewing and approving the completed SOP, as they are also responsible for the safe conduct of research in their laboratories.
- The templates include sections for the PI to fill out with their laboratory-specific information. These sections are **highlighted in yellow** and are either noted as REQUIRED or INSERT IF APPLICABLE. The text within these sections describes the type of information that should be included in these sections.
 - For example, the template might say "REQUIRED: insert a description of the ventilation controls to be used with Carcinogens." In this case, filling in this section with the lab-specific information is required, and could be as simple as stating "Carcinogens shall only be used in the chemical fume hoods within the Designated Area (room XXX)."
- Each SOP should include a detailed protocol for how the work is to occur. This should describe the type of chemistry or process that the chemical(s) are used in from start to finish, including final placement of the material into the appropriate hazardous waste container (if applicable).
 - The protocol for many chemicals can be grouped if they are handled in a similar way.

- The same chemical may fall under multiple SOP hazard classes (e.g. formaldehyde is both a reproductive toxin and a carcinogen). The protocol for its use can be listed under both SOPs, cross-referenced back to one SOP, or the chemical can be described in its own chemical-specific SOP; whatever makes the most sense or is of the most use to the PI and their laboratory.