



SACRAMENTO
STATE

Flammable and Combustible Liquids

STANDARD OPERATING PROCEDURE (SOP)

Type of SOP: Process Hazardous Chemical Hazardous Class

All personnel who are subject to these SOP requirements must review a completed SOP and sign the associated training record. Completed SOPs must be readily accessible to laboratory personnel. Electronic access is acceptable. SOPs must be reviewed, and revised where needed, as described in the [CSUS Chemical Hygiene Plan](#). Note that not all hazardous chemicals are appropriately addressed in a single control-banded SOP, and some chemicals are subject to several control-banded SOPs. Unique properties of each chemical must be considered before including it into a control band.

Date SOP Written: _____ Approval Date: _____

SOP Prepared by: _____

SOP Reviewed and Approved by (name/signature): _____

Department: _____

Laboratory Supervisor/Principal Investigator: _____

Email: _____ Phone: _____

Emergency Contact(s): _____ Phone: _____

Location(s) Building (s): _____

covered by _____ Lab

SOP: Room #(s): _____ Phone: _____

1. HAZARD OVERVIEW

Flammable or combustible liquids are those which can ignite when exposed to an ignition source at or above the flash point of the liquid. For a fire to occur three elements are required: fuel, ignition source, and oxygen. Flammable and combustible liquids serve as fuel for a fire.

2. HAZARDOUS CHEMICAL(S)/CLASS OF HAZARDOUS CHEMICAL(S)

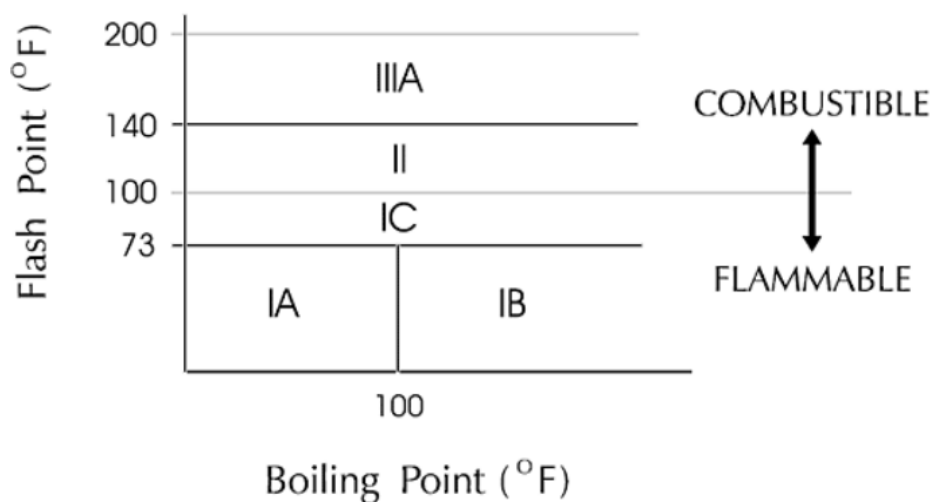
Flammable liquids are defined by OSHA and the Global Harmonized System (GHS) by their flash point: the minimum temperature at which vapors are formed in sufficient quantity to ignite when exposed to an ignition source. CA Fire Code further classifies flammable liquids by their flash and boiling points. A summary is provided below.

Flammable Liquids:

- A. Flashpoint: less than 37.8°C or 100 °F
- B. Classification: IA, IB, IC
- C. GHS code(s): H224, H225, or H226

Combustible Liquids:

- A. Flashpoint: greater than 37.8°C or 100 °F
- B. Classification: II, IIIA, and IIIB
- C. GHS code(s): H227



Note, many Flammable or Combustible liquids have additional chemical hazards. Review a current Safety Data Sheet for each chemical prior to use.

3. ENGINEERING/VENTILATION CONTROLS

Flammable liquids should be used in a certified chemical fume hood. Flammable liquids must not be used in reverse-flow laminar flow benches (e.g. clean bench), recirculating biosafety cabinets, poorly ventilated rooms, or near ignition sources.

Flammable Storage Cabinets

Flammable liquid and solid storage cabinets must meet NFPA 30 specifications, Flammable and Combustible Liquids Code, the California Fire Code, and Underwriter Laboratories 1275. Cabinets should have self-closing doors with a latching mechanism and located to not block or impede egress. Venting is recommended, but optional.

Refrigerator/Freezers

If flammable liquids must be stored at reduced temperature, a U.L. Listed Flammable Material Storage Refrigerator/Freezer designed to prevent ignition of flammable vapors must be used.

If you must use or store Flammable liquids without or outside of engineering/ventilation controls, contact EH&S for consultation.

4. ADMINISTRATIVE CONTROLS

The following elements are required:

1. Complete the [Laboratory Safety Fundamentals](#) (or approved equivalent) 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 prior to receiving unescorted access to the laboratory;
3. Demonstrate competency to perform the procedures to the Laboratory Supervisor, Principal Investigator (PI), Safety Officer, and/or trainer;
4. Be familiar with the location and content of any applicable Safety Data Sheets (SDSs) for the chemicals to be used (online SDSs can be accessed from [Risk & Safety Solutions](#));
5. Implement good laboratory practices, including good workspace hygiene;
6. Inspect all equipment and experimental setups prior to use;
7. Follow best practices for the movement, handling, and storage of hazardous chemicals (see Chapters 5 and 6 of [Prudent Practices in the Laboratory](#) 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;
8. Do not deviate from the instructions described in this SOP without prior discussion and approval from the PI and/or Laboratory Supervisor.
9. Notify the PI and/or Laboratory Supervisor of any accidents, incidents, near-misses, or upset condition (e.g., unexpected rise or drop in temperature, color or phase change, evolution of gas) involving Flammable or Combustible liquids described in this SOP; and
10. Abide by the department or college-specific working alone policy, if applicable.

For Flammable Liquids, the following are also required:

11. Areas where Flammable liquids are used or stored must have access to a safety shower/eye wash station within ten seconds of travel, and a Class A/B/C fire extinguisher. Dry sand, Met-L-X, soda ash, or dry lime extinguishing agents may be needed. All safety showers, eyewashes, and fire extinguishers in these areas must be fully functioning and inspected monthly.
12. No more than 10 gallons of flammable liquids, including hazardous waste, may be stored outside of an approved Flammable Liquid storage cabinet, at any time in any room. If you must store more than 10 gallons of flammable liquids outside a flammable cabinet, you must get approval by EH&S.
13. Each Flammable Liquid storage cabinet must have self-closing doors with a latching mechanism.
14. Flammable liquids must be separated from incompatible materials (e.g., oxidizers, alkali metals, pyrophorics, and water-reactive material(s)).
15. If stored outside of a Flammable Liquid storage cabinet, Flammable liquids shall not be stored near ignition sources.

5. 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 are required for work with Flammable or Combustible Liquids:

- A. Eye Protection: Eye protection is required for all work with Flammable or Combustible liquids.
 - i. At a minimum ANSI Z87.1-compliant safety glasses are necessary.
 - ii. Splash goggles may be substituted for safety glasses and are required for processes where splashes are foreseeable or when generating aerosols. Depending on the hazard assessment, a face shield may be required in place of safety eyewear.
 - iii. Ordinary prescription glasses will NOT provide adequate protection unless they also meet the Z87.1 standard and have compliant side shields.
- B. Body Protection: At a minimum a chemically-compatible laboratory coat that fully extends to the wrist is necessary.
 - i. Clothing worn under PPE should not be constructed from materials that can easily ignite such as synthetic materials.
 - ii. A flame-resistant laboratory coat that is NFPA 2112-compliant that fully extends to the wrist is required if using large quantities (>1 liter) or when using flammable liquids near an open flame or ignition source.
 - iii. Where splashes or skin contact is foreseeable, additional protective clothing is required such as a face shield, chemical-resistant apron, or disposable sleeves. Chemical-resistant body protection should be worn underneath any required flame-resistant body protection.
- C. Hand Protection: Hand protection is needed for the activities described in this SOP. Define the type of glove to be used based on: A) the chemical(s) being used, B) the anticipated chemical contact (e.g., incidental, immersion, etc.), C) the manufacturers' permeation/compatibility data, and D) whether a combination of different gloves is needed for any specific procedural step or task.
 - i. Flame-resistant gloves (e.g. neoprene) should be considered if using large quantities (>1 liter) or near an open flame or ignition source.
 - ii. Disposable gloves cannot be reused. Reusable gloves can be cleaned between uses according to manufacturer instructions.

6. SPILL AND EMERGENCY PROCEDURES

Follow the guidance for chemical spill cleanup from the [CSUS Chemical Hygiene Plan](#), unless specialized cleanup procedures are described below. Emergency procedure instructions for CSUS campus are contained in the campus [Chemical Hygiene Plan](#) and in building specific [Emergency Action Plans](#).

For spills of solid materials, DO NOT dry sweep.

7. WASTE MANAGEMENT AND DECONTAMINATION

Hazardous waste must be managed according to the [CSUS Chemical Hygiene Plan](#). Hazardous waste must be stored in compatible containers that are in good condition, must be stored in secondary containment in a designated area, and must be properly labeled. In general, hazardous waste must be removed from your laboratory within 9 months of the accumulation start date. Hazardous waste pick up requests must be completed through the RSS WASTE application ([Risk & Safety Solutions](#)) or EH&S [Hazardous Waste Pickup Request Form](#).

Upon completion of work with hazardous chemicals and/or decontamination of equipment, remove gloves and/or PPE to wash hands and arms with soap and water. Additionally, upon leaving a designated hazardous chemical work area remove all PPE worn and wash hands, forearms, face and neck as needed. Contaminated clothing or PPE should not be worn outside the lab. Grossly contaminated clothing/PPE and disposable gloves must not be reused.

8. DESIGNATED AREA

9. DETAILED PROTOCOL

Documentation of Standard Operating Procedure Training

(Signature of all users is required)

- ✓ Prior to using **Flammable or Combustible 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 Laboratory Supervisor 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:

Name	Signature	Trainer Initials	Date