BASIC FLAMMABLE and COMBUSTIBLE LIQUIDS HANDLING STANDARD OPERATING PROCEDURE TEMPLATE

This SOP is for work in which flammable/combustible liquids are NOT used in operations that often generate static electricity which can act as an ignition source; including the pumping or pouring of solvents between metal containers. Those operations require grounding and/or bonding of the containers to prevent static buildup and a different SOP template in the UCSB SOP Library should be used: ADVANCED FLAMMABLE AND COMBUSTIBLE LIQUIDS HANDLING (See also these related UCSB SOPs: “Solvent Use: Extractions, Distillations & Still Quenching” and “Peroxide-Forming Chemicals”) Type of SOP: 0 Process 0 Hazardous Chemical 1 Hazard Class

1. HAZARD OVERVIEW Flammable and combustible organic solvents are amongst the most dangerous chemicals in the lab. A measure of how ignitable a particular solvent is the flashpoint ; defined as the lowest temperature at which a material can form an ignitable mixture with air and produce a flame when a source of ignition is present. The lower the flashpoint, the more easily the liquid can be ignited. Most common organic solvents in the lab are readily ignited, with the exception of chlorinated solvents like dichloromethane which require more extreme conditions to burn.

The international symbol (Globally Harmonized System) for a flammable liquids/gases/solids is:



Flammable liquids (flash point < 100oF) are divided into three classes:

Flammable Liquid Classes

Class	Flash Point	Boiling Point	Example
IA	Below 73°F	Below 100 °F	Ethyl Ether
IB	Below 73°F	At or above 100 °F	Acetone, Benzene, Toluene
IC	At or above 73°F	Below 100°F	Isopropanol, Xylene

Combustible liquids (flash point > 100oF) are divided into three classes:

Combustible liquids (flash point > 100oF)

Class	Flash Point	Example
II	100-139 °F	Acetic acid, cyclohexane, and mineral spirits
IIIA	140-199 °F	Cyclohexanol, formic acid and nitrobenzene

	Formalin and vegetable oil	200 °F or above
IIIB		

A particular organic solvent may have other hazards beyond their flammability. For example, benzene is recognized carcinogen. Check the Safety Data Sheet for the particular solvents in use.

2. PERSONAL PROTECTIVE EQUIPMENT (PPE) For routine solvent cleaning using IPA, Methanol, Ethanol or Acetone latex gloves are recommended. Nitrile gloves are acceptable for light cleaning of samples where solvent contact is trivial.

For other situations please see the PPE information under Sec. II of the UCSB Chemical Hygiene Plan regarding: • the UC PPE Policy and policy summary (what PPE is needed and when/where to use) • obtaining your PPE via use of the Laboratory Hazard Assessment Tool (LHAT) • glove selection criteria • respirator use, etc.

In general, workers who use flammable liquids will be issued a free fire-resistant Nomex lab coat via the LHAT process.

3. ENGINEERING/VENTILATION CONTROLS All chemicals should be transferred and used in an annually certified laboratory chemical fume hood with the sash at the certified position or lower. The hood flow indicator should be checked to be operating correctly prior to using the hood. For further information see the following pages in Sec. II of the UCSB Chemical Hygiene Plan: • Fume Hood Usage Guide • Criteria for Implementing Engineering Controls

• Safety Shielding: Shielding is required any time there is a significant risk of explosion, splash hazard or a highly exothermic reaction. All manipulations of flammable liquids which pose this risk should occur in a fume hood with the sash in the lowest feasible position. Portable shields, which provide protection to all laboratory occupants, are acceptable. • Special Ventilation: Manipulation of flammable liquids outside of a fume hood may require special ventilation controls in order to minimize exposure and reduce the fire risk. Fume hoods provide the best protection against exposure to flammable liquids in the laboratory and are the preferred ventilation control device. If your research does not permit the handing of large quantities of flammable liquids in your fume hood, contact EH&S to review the adequacy of all special ventilation.

4. SPECIAL HANDLING PROCEDURES AND STORAGE REQUIREMENTS Use in an area that is properly equipped with a certified eye wash and safety shower that is available within ten seconds of travel. Store in a tightly closed, labeled container and in a cool, dry, well-ventilated area. Segregate from incompatible materials. Repackaged chemicals must be labeled clearly. For example, squirt bottles and acid/base cleaning baths. Follow any substance-specific storage guidance provided in Safety Data Sheet documentation. • Flammable Liquid Storage Cabinets One or more Flammable Liquid Storage Cabinets (FLSC) are required by CA Fire Code for laboratories which store, use or handle more than 10 gallons of flammable or combustible liquids. Containers of flammable liquids that are one gallon and larger must be stored in a flammable-liquids storage cabinet. The storage of flammable and combustible liquids in a laboratory, shop, or building area must be kept to the minimum needed for research and/or operations. FLSC are not intended for the storage of highly toxic materials, acids, bases, compressed gases, or pyrophoric chemicals. In most UCSB laboratories, flammable liquids storage is provided under the chemical fume hood. These cabinets are clearly marked “Flammable Storage” and are often ventilated via a stainless steel hose into the fume hood

exhaust duct. Flammable liquids storage cabinets are constructed to limit the internal temperature when exposed to fire. When additional storage is needed, NFPA-approved FLSC may be purchased. All containers of flammable liquids must be stored in a FLSC when not in use. The following requirements apply: General Requirements o Cabinets shall be marked “Flammable - Keep Fire Away” o Cabinets should be kept in good condition. Doors that do not close and latch must be repaired or the cabinet must be replaced. Flammable liquids storage cabinets are equipped with a grounding system that can be connected to a building ground. If you are pouring from a container in the storage cabinet and if the container being poured into is conductive then a bonding strap must be attached between them as explained in PROCEDURES TO AVOID STATIC ELECTRICITY.

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  FLSC involved in fire
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• Labeling All flammable liquids must be clearly labeled with the correct chemical name. Handwritten labels are acceptable; chemical formulas and structural formulas are not acceptable. The label on any containers of flammable liquids should say “Flammable” and should include any other hazard information, such as “Corrosive” or “Toxic”, as applicable. Example: lab squirt bottles, or acid/base baths. • Heating/Open flame Do not permanently store flammable liquids in chemical fume hoods or allow containers of flammable liquids in proximity to heating mantles, hot plates, or torches. With the exception of vacuum drying ovens, laboratory ovens rarely have any means of preventing the discharge of material volatilized within them. Thus it should be assumed that these substances will escape into the laboratory atmosphere, but may also be present in sufficient concentration to form explosive mixtures within the oven itself. Venting the oven to an exhausted system will reduce this hazard. Drying ovens should not be used to dry glassware that has been rinsed with organic solvents until all of the solvent has had the opportunity to drain or evaporate at room temperature.

5. SPILL AND INCIDENT PROCEDURES See directions under the “Chemical Incident” and “Medical Emergency” tabs of the UCSB Emergency Information Flipchart – should already be posted in all labs.

For those that routinely use flammable liquids, it is strongly recommended that they attend the live version of the EH&S Fundamentals of Laboratory Safety class, where hands-on fire extinguisher training is conducted. All campus labs should have a fire extinguisher already on-site, generally near the exit door.

6. DECONTAMINATION Wear proper PPE, decontaminate equipment and bench tops using [soap and water]. Dispose of all used contaminated disposables as hazardous waste per below.

7. WASTE DISPOSAL See “Chemical Waste Disposal” in Sec. II of the UCSB Chemical Hygiene Plan. 8. PRIOR APPROVAL/REVIEW REQUIRED No prior approval is required for solvent cleaning of samples or lab test fixtures.

9. DESIGNATED AREA When possible solvent-related work should be carried out in the fume hood given the volatility and flammability of most solvents. When this is not possible, cleaning test fixtures or samples on the optical tables, for example, make sure that there are no ignition sources nearby.

10. SAFETY DATA SHEETS and OTHER REFERENCES Online SDS can be found at: http://ehs.ucsb.edu/labsafety/msds Prudent Practices in the Laboratory, 2011, see Secs. 4.D and 6.F for flammable liquids http://www.nap.edu/openbook.php?record_id=12654&page=R15

11. LAB-SPECIFIC INFORMATION (required) (Examples of appropriate content) In general solvents are used for simple cleaning of samples and tooling. Squirt bottles of solvents are stored in the white bin in the fume hood. These bottles can be refilled from the large bottles stored under the

fume hood.

Solvent waste is collected in a glass bottle stored under the fume hood. The waste bottle must have a waste label, and can only be used for 270 days.

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