

A. Flammables Storage Practices

1. Organic solvents¹ of all types shall not be stored on the floor or near spark sources.
2. Extremely flammable liquids (Class 1A)² shall be stored in flammable storage cabinets — regardless of storage limits for other flammables and combustibles.
3. Maximum storage of flammable liquids (outside of a flammable storage cabinet) in a non-sprinklered laboratory:
 - ◀ 10 gal for rooms >600 sq ft
 - ◀ 6 gal for rooms <600 sq ft
4. 5 gallon cans of flammable solvents shall be stored only in flammable storage cabinets³ or flammables storage room⁴
5. Flammable liquids (including waste) shall not be stored under or next to solvent distillation units.
6. Ethyl ether and other peroxide-forming⁵ chemicals shall have the date received marked on the container.
 - ◀ Discard within a year of the received date OR
 - ◀ Discard on or before manufacturer's expiration date, whichever is less.
7. Transfer of flammable liquids from metal containers >1 liter
 - ◀ Container must be grounded.
 - ◀ If receiving container is also metal, it must be bonded to the donor container.
 - ◀ Such transfers must be performed inside a fume hood or ventilated flammable storage room.
8. Flammable gas cylinders must be grounded when in use.
 - ◀ If receiving material is an instrument or metal container, it must be bonded to the flammable gas cylinder during transfer.
 - ◀ Oxygen and other oxidizing gases must be stored at least 20 ft away or separated by a fire wall.
9. Halogenated⁶ solvents shall not be stored with other organic flammable solvents. (forms phosgene gas when burning)
 - ◀ Flammable halogenated solvents may be stored separately or in a flammable storage cabinet in a separate secondary container tray.
 - ◀ Non-flammable halogenated solvents should be stored separately. When space is limited, may be stored in the same cabinet with corrosives or general chemicals but must be separated with secondary containment trays.
10. Flammable solids⁷, such as metal hydrides, must be stored separately from other chemicals, preferably in a metal or glass cabinet (never plastic) and protected from light and moisture.

¹ **Organic Solvent Examples:** hexane, methanol, methylene chloride, acetone, isopropyl alcohol

² **Extremely flammable liquids:** Chemicals classified as Class 1A or designated as NFPA 4 for flammability. Examples:

- acetaldehyde
- ethyl chloride
- ethyl ether
- ethylene oxide
- methyl ethyl ether
- pentane
- petroleum ether
- propylene oxide

³ **Flammables cabinet:** Storage cabinet designed to store flammable liquids that meets the design criteria of all applicable regulations i.e., OSHA, NFPA 30, & UFC 79

⁴ **Flammables storage room:** Room with spill containment and fire suppression system designated for storing flammable liquids.

⁵ **Peroxide formers:** Prone to forming potentially explosive peroxide crystals upon evaporation or distillation. Examples:

- diethyl ether
- isopropyl ether
- furan
- tetrahydrofuran (THF)
- cumene
- methyl-tert butyl ether (MTBE)



At left, clamps for Bonding and Grounding

⁶ **Halogenated Solvents:** Absorb easily through skin and can be harmful or lethal to biological organisms in sufficient quantities. Halogenated solvents include organic compounds with fluorine (F), chlorine (Cl), bromine (Br), and iodine (I). Examples:

- methylene chloride
- tetrachloroethane
- carbon tetrachloride
- chloroform
- trichloroethylene
- **dichloroethane** (*Exception: Since it is flammable, should be stored in flammable storage cabinet*)

⁷ **Flammable Solids:** include alkali metals, magnesium metal, metallic hydrides, some organometallic compounds, and sulfur: lithium aluminum hydride (LAH). Most are extremely water and air reactive.

B. Safe Work Practices for Hazardous Materials

Use of “Particularly”¹¹ hazardous substances requires provisions for additional employee protection:

- ◀ Designated (labeled) area
 - ◀ Use of fume hood or glove box
 - ◀ Instruction in specific health hazards
 - ◀ Procedures for safe use
 - ◀ Decontamination and waste procedures
2. Respirators, including dust masks, must be stored in a bag or other container where they may be kept clean and away from contaminated areas.
- Other requirements that users must meet:⁹
- ◀ Documented training in respirator use, limitations, and care
 - ◀ Assessment of the need (exposure control or nuisance) and the suitability of the respirator for the proposed use.
3. Signs indicating requirements for personal protective equipment such as safety goggles, gloves, lab coats, etc., must reflect current practice and be enforced.¹⁰
4. Warning or other signs indicating special hazards or rules must be current. Remove/deface outdated and irrelevant signs and labels.
5. When using house vacuum systems with bacteria, viruses, etc., the attached hose must be equipped with an inline filter to prevent contamination of the vacuum pump oil in the system.
6. All personnel must know the hazards in their room and where to find information such as MSDSs and safe operating procedures.
7. Emergency equipment must be checked at least monthly and maintained in a usable and accessible condition. Report problems with equipment to the stockroom manager of department office.
8. Use chemical fume hoods when working with toxic or volatile materials. Report malfunctioning fume hoods to the stockroom manager as soon as possible, mark it out of service, and do not use it until it has been put back into service.

⁸ Types of “Particularly” Hazardous Materials

a. Select Carcinogens

i.e., acrylamide, acetonitrile, formaldehyde

b. Reproductive Toxins

i.e., Ethidium bromide, toluene, ethyl ethers

c. High level Acute Toxins

i.e., hydrofluoric acid, osmium tetroxide, acrolein

Please see the COSE Chemical Hygiene Plan for more details and SOP examples.

⁹Note:

- For “air purifying” respirators with cartridges, prior approval from Campus EHOS is required, under the campus Respiratory Protection Program.
- For “dust mask” or “air filtration” masks, contact the department stockroom for information and release form before purchasing or using them.

¹⁰Example of a sign that is often misused and could result in an OSHA violation:

This sign means that any person walking into this lab must have goggles on during his/her entire stay.

**CAUTION
GOGGLES
MUST BE WORN
AT ALL TIMES**

Alternate wording:

but doesn't require visitors to wear them.

**WHEN WORKING
IN THE LAB**

Please note that both signs are acceptable if they reflect what is practiced and enforced in that particular lab.