



Flammable Liquids Fact Sheet

This fact sheet is for general safety awareness. Individual Standard Operating Procedures for all experiments and processes involving flammable liquids must be developed by the laboratory.

PROPERTIES & HAZARDS

Flammable and combustible liquids can pose a serious risk of injury and property damage if mishandled in the lab. Health hazards associated with flammable and combustible liquids can vary widely depending on the specific chemical and route of exposure. Flammable liquids can be irritants, central nervous system depressants, carcinogens or suspected carcinogens, reproductive toxins and/or systemic toxins. Routes of exposure include inhalation and skin absorption. Some chemicals can enter the body through the skin and contribute to your overall exposure. Refer to the Safety Data Sheet (SDS) for the health hazards associated with the specific chemicals you are working with.

Flammable and combustible liquids vaporize and form flammable mixtures with air. The vapor of a flammable or combustible liquid may be ignited by heat, sparks or flames. Vapors may travel to a source of ignition and flash back. Some flammable or combustible liquids may have other physical hazards associated with them, such as reactivity. Refer to the SDS for information on the physical hazards associated with the specific chemicals you are working with.

There are three categories for flammable liquids, Category 1, 2 and 3, and one category for combustible liquids, Category 4, that you may see on the safety data sheet (SDS). Categories 1 and 2 will have the signal word “Danger” while categories 3 and 4 will have “Warning”. In Section 2 – Hazard Identification of the SDS, a combination of the following hazard classifications, pictograms and hazard statements will be listed indicating a flammable or combustible material. More information on material hazards can be found in complete hazard statements.

| Hazard Classification and Category | Pictogram | Hazard Statement |
|---|--------------|--|
| Flammable Liquid – Category 1, 2, and 3 | | Extremely flammable liquid and vapor (Cat. 1) Highly flammable liquid and vapor (Cat. 2) Flammable liquid and vapor (Cat. 3) |
| Combustible Liquid – Category 4 | No Pictogram | Combustible liquid (Cat. 4) |

The National Fire Protection Association (NFPA) sets standards and regulation on storage and handling of flammable and combustible liquids. They classify materials based on flash point and boiling point.

Classification of flammable and combustible liquids.

| | Class | Flash Point | Boiling Point | Examples |
|-------------|-------|-----------------|---------------|--|
| Flammable | IA | <73°F | < 100°F | Acetaldehyde, Butyne, Dimethyl sulfide, Ethyl ether, Methyl ethyl ether, Pentane |
| | IB | <73°F | ≥ 100°F | Acetone, Acetonitrile, Benzene, Ethyl alcohol, Hexane, Isopropanol, Methyl alcohol, Toluene, Carbon disulfide, Ethyl acetate |
| | IC | ≥ 73°F - <100°F | NA | Amyl acetate, Butyl alcohol, Isobutyl alcohol, methyl isobutyl ketone, Styrene, Xylene |
| Combustible | II | ≥100°F - <140°F | NA | Acetic acid, Diesel fuel, Hexyl alcohol. Kerosene, Mineral spirits |
| | IIIA | ≥140°F - <200°F | NA | Benzaldehyde, Cyclohexanol, Formic acid, Nitrobenzene |
| | IIIB | ≥200°F | NA | Ethylene glycol, Benzyl alcohol, Formalin, Picric acid, Hydraulic fluids, Cooking oils |

Flammable liquid: Any liquid having a flash point below 100°F (37.8°C), with the exception of mixtures in which 99% of the components have flash points of 100°F or higher.

Combustible liquid: Any liquid having a flash point equal to or greater than 100°F (37.8°C).

Flash point: The temperature at which a liquid will give off enough flammable vapor to ignite in the presence of an ignition source.

Fire area: An area of a building separated from the remainder of the building by construction having a fire resistance of at least 1 hour. A fire area may be a single laboratory room, several laboratory and/or adjoining rooms or an entire floor depending on building construction.

Bonding: Eliminating the electrical potential between two containers by connecting a wire to the two conductive containers.

Grounding: Eliminating the difference in static potential charge between the conductive container and the ground.

CONTROLS

Engineering Controls

- Flammable Liquids Storage Cabinet
- Chemical Fume Hood

Personal Protective Equipment

- Splash Goggles
- Flame Resistant Lab Coat
- Gloves

Trainings

- Laboratory Specific Training must cover all processes using flammable liquids and include information on safe use and emergency response.

STORAGE

- Maximum allowable quantities for holding container are by liquid classification, container material, and the fire hazard rating for the lab, which takes specific building construction under consideration such as what floor the lab is on and how the walls are constructed. Maximum allowable quantities are assessed during annual fire safety inspections.
- A maximum of 150 gallons of Class I, Class II, Class III liquids may be stored in flammable liquid storage cabinets per laboratory. Of this total, not more than 10 gallons can be of Class I and II liquids and not more than 60 gallons can be of Class IIIA liquids. Note: These quantities are for labs on the 1st through 3rd floors. Allowable quantities are less than this for upper floors (above the third floor), and floors below grade, of a building. Contact the ESSR's Office of the Fire Marshal (firemarshal@umd.edu) if you have questions about the maximum allowable quantities of flammable and combustible liquids that you are permitted to store in your lab.
- Store containers with flammable or combustible liquids in a flammable liquid storage cabinet equipped with a grounding system that is marked "Flammable – Keep Fire Away." The cabinet must be specifically rated as a flammable liquid storage cabinet to ensure proper fire protection. Flammable liquids cabinets do not have to be ventilated. NFPA compliant safety cans can also be used.
- Storage cabinets containing flammable liquids should be located away from exits.
- Flammable liquids that must be kept cold should be stored in a flammable storage refrigerator, which is specially designed to isolate electrical components from the interior of the refrigerator where flammable vapors may build up. Do NOT store flammable liquids in a household refrigerator that has not been rated for flammable liquid storage. Where appropriate or necessary, flammable liquids may also be stored in explosion proof refrigerators which are designed for use in areas where the atmosphere surrounding the unit may be explosive. Generally, this level of protection is not required in normal laboratories. If you have questions about your particular storage needs, please contact ESSR.

USE

- Use the lowest possible quantities of flammable liquids necessary for the work performed. A maximum of 1 gallon/100 ft² of flammable liquid outside a storage cabinet is allowed per fire area. No more than a total of 5 gallons of flammable liquid outside a storage cabinet are permitted in a fire area. Keep in mind, a fire area may include other laboratories, so ensure that you put the materials away after you finish with your work.

- Keep sources of ignition away from areas where flammable liquids are used. This includes electrical outlets, light fixtures, and other electrical equipment.
- Do not heat flammable liquids with open flame.
- Make sure containers of flammable liquid are securely closed when not in active use.
- Dispensing of Class I liquids in containers greater than 1 gallon (4L) requires that devices (including plastic and glass containers) that can be grounded and/or bonded or demonstrated as not being capable of generating a static charge under operating conditions.
- Any flammable liquid spill outside of a fume hood has a high risk of igniting. Several ignition sources are located in laboratories, such as static electricity and electrical equipment. Take great caution when cleaning up even extremely small flammable liquid spills.

WASTE

- Waste should be managed so that incompatible materials are not mixed.
- Waste containers should be compatible with their contents and should be segregated by hazard class into separate secondary containers.
- Note that containers of flammable or combustible liquid waste count toward the limits in a fire area.
- For questions regarding waste management contact ESSR, Environmental Affairs (envaffairs@umd.edu).

SPILL CLEANUP

- Spill cleanup must follow the items specified in the Emergency Response Guide posted in the laboratory.
- If the laboratory is equipped and personnel are trained, minor spills can be handled by laboratory personnel.
- If a spill is beyond the capacity of the laboratory to address, call (301) 405-3333 from a safe location.

REFERENCES AND ADDITIONAL RESOURCES

1. OSHA [A Guide to the Globally Harmonized System of Classification and Labeling of Chemicals \(GHS\)](#)
2. National Fire Protection Association, NFPA 30 – Flammable and Combustible Liquids Code, 2015 Edition.
3. National Fire Protection Association, NFPA 45 – Fire Protection for Laboratories Using Chemicals, 2015 Edition.
4. University of Pittsburgh, [EH&S Safety Manual – Flammable and Combustible Liquids](#)