


<p>Carnegie Mellon University Environmental Health & Safety FIRE LAB WORK</p>	<p>Environmental Health and Safety Flammable & Combustible Liquids - Guideline</p> 
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1. Purpose

The mission of Environmental Health and Safety is to support the University's mission and values by sustaining and enhancing a safe and healthy environment for the CMU community.

2. Scope

This guideline provides information for the safe preparation and use of flammable and combustible liquids, and applies to Carnegie Mellon University faculty, staff and students engaged in the storage or use of such materials.

3. Overview

This document describes the hazards, proper handling, disposal and emergency procedures for working with flammable and combustible liquids. Any handling of a flammable liquid is high risk and must be controlled with adequate system design, direct supervision and training. Failure to follow proper handling procedures can result in fire or explosion, leading to serious injuries, death and/or significant damage to facilities.

The flashpoint of a flammable liquid is the lowest temperature at which it can form an ignitable mixture with air and produce a flame when a source of ignition is present. Flammable liquids are defined by the National Fire Protection Association (NFPA), as a liquid with a closed-cup flash point less than 100°F (38°C). A combustible liquid is defined as a liquid with a closed-cup flash point greater than or equal to 100°F (38°C). For classification and examples of flammable and combustible liquids, see Tables 1 and 2 respectively.

Table 1- Classification of Flammable Liquids

Class	Flash Point	Boiling Point	Examples
IA	Below 73°F (23°C)	Below 100°F (38°C)	Diethyl Ether, Ligroin, Pentane, Heptane, Petroleum Ether
IB	Below 73°F (23°C)	At or Above 100°F (38°C)	Acetone, Benzene, Cyclohexane, Ethanol, Isopropyl Alcohol, Methyl Ethyl Ketone, Toluene,
IC	At or Above 73°F (23°C)	Below 100°F (38°C)	Xylene, Naphtha, Turpentine

Table 2 – Classification of Combustible Liquids

Class	Flash Point	Examples
II	At or above 100°F (38°C) and below 140°F (60°C)	Acetic Acid, Diesel Fuel, and Stoddard Solvent
IIIA	At or above 140°F (60°C) and below 200°F (93°C)	Aniline, Benzaldehyde, Butyl Cellosolve, Nitrobenzene, Pine Oil, Formaldehyde
IIIB	At or Above 200°F (93°C)	Animal Oils, Ethylene Glycol, Glycerin, Lubricating, Quenching, and Transformer Oils, Triethanolamine, Benzyl Alcohol, Hydraulic Fluids, Vegetable Oils

4. Roles and Responsibilities

- a. Carnegie Mellon University EHS is responsible for:
 - i. Developing the written Use and Storage of Flammable and Combustible Liquids Safety Guidelines and revising as necessary;
 - ii. Recommending engineering controls, administrative controls and personal protective equipment;
 - iii. Providing guidance to faculty, staff and students, as appropriate, and;
 - iv. Conducting inspections at least annually to ensure the proper use and storage of flammable and combustible liquids.
- b. Departments will be responsible for:
 - i. Understanding and complying with the requirements of this guideline;
 - ii. Contacting EHS at safety@andrew.cmu.edu if assistance is needed.
- c. Users will be responsible for:
 - i. Completing both [Laboratory Safety training and Hazardous Waste generator training](#) prior to initial use;
 - ii. Complying with the procedures outlined in this Guideline;
 - iii. Purchasing flammable and combustible liquids in accordance with the EHS "[Hazardous Materials Purchasing Guideline](#)";
 - iv. Maintaining a clean and hygienic work area where flammable and combustible liquids are prepared or used, and;
 - v. Informing the supervisor of concerns relating to preparation and use of flammable and combustible liquids.

5. Exposure Controls

- a. Engineering Controls
 - i. All work with flammable and combustible liquids with the potential to create exposure via inhalation must be done in a properly functioning chemical fume hood, glove box or ventilated enclosure.

- ii. Flammable and combustible liquids may not be handled or stored outside of an approved area. Approved areas are:
 - 1. Equipped with an automatic fire suppression system;
 - 2. Equipped with a Class B fire extinguisher within 50 feet of the flammable liquid storage or use area;
 - 3. Equipped with ventilation systems that provides at least 6 air changes per hour (ACH);
 - 4. Constructed with liquid-tight non-combustible flooring, and;
 - 5. Equipped with access control systems.
- b. Administrative Controls
 - i. Consult [Safety Data Sheets \(SDS\)](#) for hazard and exposure information for all flammable and combustible liquids.
 - ii. When applicable, particularly hazardous substance (PHS) forms must be completed. PHS forms can be found [here](#). Additional information on PHS use may be found in the [Carnegie Mellon University Chemical Hygiene Plan](#)
 - iii. Do not use flammable and combustible liquids if less-hazardous alternatives are possible.
 - iv. Purchase, dispense, and use the smallest quantity of flammable and combustible liquids possible.
 - v. Purchase the lowest concentration of flammable and combustible liquids that will meet your research needs.
 - vi. Do not purchase flammable and combustible liquids unless you have an appropriate storage location for them such as a flammable liquid storage cabinet.
 - vii. Newly received packages of flammable and combustible liquids should be transported in the same packaging designed for interstate transport.
 - viii. Store flammable and combustible liquids in a flammable storage cabinet or in a refrigerator rated for flammable storage. (Note: Areas with the potential for exterior ignition sources should use explosion proof refrigerators for cold storage.)
 - ix. All flammable and combustible liquids must be stored away from combustible materials, oxidizing acids, oxidizers, and aqueous solutions. In addition, careful consideration must be given when mixing flammable and combustible liquids with other materials that may form explosion hazards (e.g. Nital).
 - x. Flammable liquid storage cabinets must be clearly marked "Flammable Storage" or "Flammable - Keep Fire away." (Note: Flammable liquid storage cabinets are not required to be vented and vented cabinets can in fact hinder fire protection)
 - xi. Flammable and combustible liquids transferred to smaller containers must display labels that comply with the [Hazard Communication Standard \(HCS\)](#).
 - xii. Metal containers of flammable chemicals should always be grounded and bonded to the receiving container during transfer to avoid accumulation of static charge.
 - xiii. Always transfer flammable and combustible chemicals from glass containers to glassware or from glass container/glassware to plastic. Transferring these types of chemicals between plastic containers or unbonded metal containers may lead to a fire hazard due to static electricity.
 - xiv. Immediately close all containers of flammable and combustible liquids after use.

- xv. Inspect containers to insure they are in good condition and keep containers securely sealed when not in use.
- xvi. Open containers of flammable and combustible liquids must be placed in a leak-proof secondary container sized to accommodate a leak from the largest container size during use.
- c. Training
 - i. Laboratory Safety training and Hazardous Waste Generator training must be completed by all lab personnel using flammable and combustible liquids prior to initial use and every two years thereafter.
 - ii. Fire extinguisher training is strongly recommended for personnel using flammable and combustible liquids.
 - iii. For additional information on training, please visit the [CMU EHS Training Directory](#).
- d. Personal Protective Equipment (PPE)
 - i. Eye Protection
 - 1. Safety goggles and/or full-face shields must be worn when working with flammable and combustible liquids.
 - ii. Gloves
 - 1. Gloves compatible with each material that is used must be worn when working with flammable and combustible liquids. Please refer to Section 8 of Safety Data Sheet or Glove selection charts.
 - iii. Other
 - 1. Lab coats, closed toed shoes, and clothing that covers entire legs and arms must be worn when working with Flammable and combustible liquids. Lab coats should be flame/fire resistant. Contact EHS at safety@andrew.cmu.edu for guidance on flame/fire resistant lab coats.

6. Disposal

- a. Flammable and combustible liquids and items contaminated with flammable and combustible liquids must be disposed of through the University's chemical waste program. This includes, but is not limited to, solvent rinses and water rinses. Please visit [the EHS Regulated Waste Management website](#) for more information.
- b. Rags or other combustible materials that are contaminated with flammable and combustible liquids must be stored in self-closing metal containers.
- c. Incompatible waste chemicals must be segregated in waste storage containers (e.g., solvents, reactive materials and acids should not be mixed in the same container).

7. Emergency Procedures

- a. Personal Injury or Contamination
 - i. For eye contamination, flush with an eyewash for 15 minutes. Contact University Police at (412) 268-2323 and EHS at (412) 268-8182.
 - ii. For localized skin contamination, wash the impacted area with soap and water. Contact University Police at (412) 268-2323 and EHS at (412) 268-8182.

- iii. For widespread contamination, remove contaminated clothing and shoes and flush body with an emergency safety shower. Contact EHS at (412) 268-8182 and University Police at (412) 268-2323.
- b. Small Chemical Spills (less than 5 gallons)
 - i. Alert people in the immediate area of the spill.
 - ii. Avoid breathing vapors from the spill.
 - iii. Wear protective clothing and gloves when addressing spills.
 - iv. Confine spills to a small area.
 - v. Use the chemical spill kit to clean the area.
 - vi. Collect the residue, place in labeled container and contact [EHS](#) for disposal as chemical waste.
- c. Large Chemical Spills (greater than 5 gallons)
 - i. Alert people in the immediate area of the spill.
 - ii. Attend to your own needs first and then assist injured or contaminated people.
 - iii. Control the spread of contamination if safe to do so.
 - iv. Keep people away from the location.
 - v. Stop work, turn off equipment and close doors as you exit.
 - vi. Evacuate to a safe location.
 - vii. Contact University Police at (412) 268-2323 and EHS at (412) 268-8182.
 - viii. Remain safely in the area to inform emergency responders of:
 - 1. Number and extent of injured people;
 - 2. Name(s) of chemicals involved and volume; and
 - 3. Hazards associated with the material(s).
- d. Fires
 - i. Activate the nearest emergency pull station or request someone to do so.
 - ii. If a fire alarm pull station is not available, contact University Police at (412) 268-2323 and EHS at (412) 268-8182.
 - iii. If safe to do so, retrieve the nearest Class B rated fire extinguisher. Utilize the P.A.S.S. method to operate the fire extinguisher:
 - 1. Pull the pin
 - 2. Aim the nozzle at the base of the fire
 - 3. Squeeze the handles together
 - 4. Sweep the chemical back and forth
 - iv. If it is not safe to extinguish the fire, evacuate to a safe location.

8. Revisions

Date	Documented Changes	Initials
3/11/2024	Reviewed and no revisions necessary	AL