UNIVERSITY OF TEXAS ARLINGTON | ENVIRONMENTAL HEALTH & SAFETY

SAFE OPERATING PROCEDURE
Flammable Liquids Storage Limit Guide

The following guidelines have been developed for the safe handling, storage and use of flammable and combustible liquids in the laboratory. This information was extracted from the regulatory standards established under 29 CFR 1910.106, NFPA 30 and NFPA 45.

Definitions

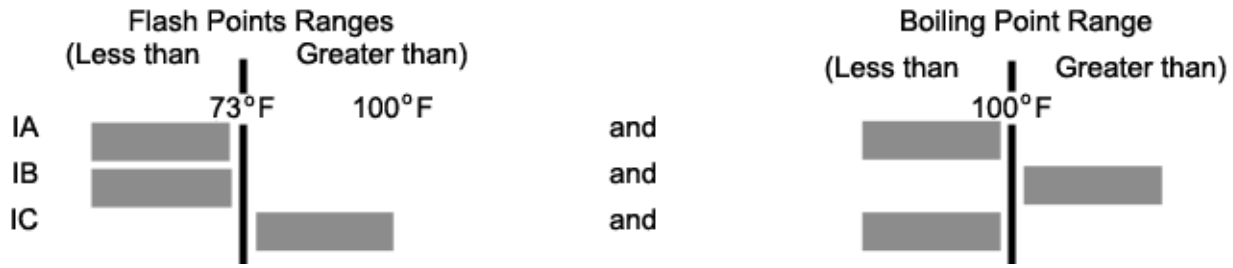
Flammable Liquid

Class IA liquids have a flash point at or below 73°F (22.8°C) and a boiling point at or below 100°F (37.8°C).

Class IB liquids have a flash point at or below 73°F (22.8°C) and a boiling point at or above 100°F (37.8°C).

Class IC liquids have flash points at or above 73°F (22.8°C) but below 100°F (37.8°C).

Flammable Liquids Classification



Combustible Liquid

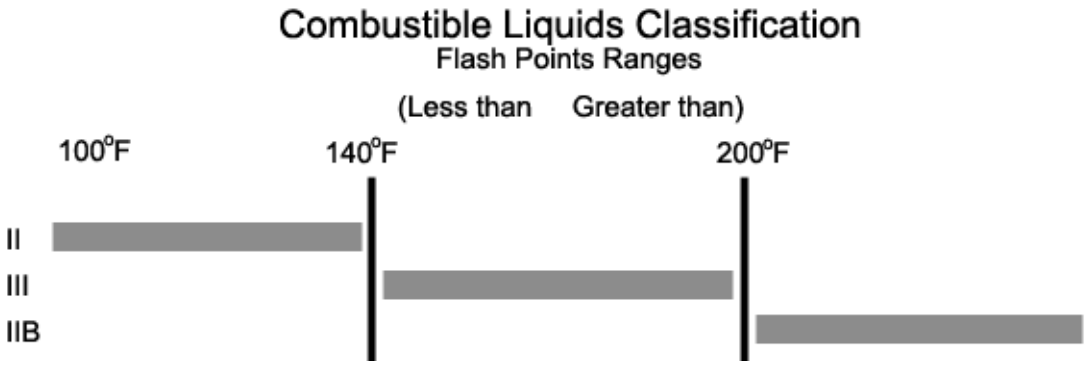
Class II liquids have a flash point at or above 100°F (37.8°C) and below 140°F (60°C).

Class IIIA liquids have a flash point at or above 140° (60°C) and below 200°F (93°C).

Class IIIB liquids have a flash point at or above 200°F (93°C).

Note: The flammability concern of Class IIIB liquids is so low that they do not usually present a fire hazard of these materials. Therefore this classification is not in the storage limits tables below. See "List of Flammable Liquids by Classification" for specific liquids in each class.

Combustible Liquids Classification



Storage Limits

Maximum quantities of flammable and combustible liquids and liquefied flammable gases in laboratory areas shall be in accordance with Table 1.

TABLE 1

		MAXIMUM QUANTITY ALLOWED OUTSIDE OF A STORAGE CABINET (Excluding Quantities in a Storage Cabinet or Safety Can)		**TOTAL QUANTITY ALLOWED IN A LABORATORY** (Including Quantities in Storage Cabinets or Safety Cans)	
		Maximum quantity per 9.3 m^2 (100 ft^2) of Laboratory Unit		Maximum quantity per 9.3 m^2 (100 ft^2) of Laboratory Unit	
Lab Type	Flammable and Combustible Liquid Class	Liters	Gallons	Liters	Gallons
Instructional	I	7.5	2	15	4
	I, II, IIIA	15	4	30	8
Research	I	20	5	38	10
	I, II, IIIA	38	10	76	20
CTY*	I	4	1	7.5	2
	I, II, IIIA	4	1	7.5	2

*When being used for CTY or for any instruction of grades 12 and below.
Maximum container size shall be in accordance with Table 2.

Table 2

Container Type	**Flammable Liquids**			**Combustible liquids**	
	IA	IB	IC	II	IIIA
Glass	500mL(1pt)*	1L(1qt)*	4L(1.1Gal)	4L(1.1Gal)	20L(5Gal)‡
Metal or Approved Plastic	4L(1.1Gal)	20L(5Gal)	20L(5Gal)‡	20L(5Gal)‡	20L(5Gal)‡
Safety Cans	10L(2.6Gal)	20L(5Gal)‡	20L(5Gal)‡	20L(5Gal)‡	20L(5Gal)‡
Metal Drums (DOT spec)	N/A	20L(5Gal)‡	20L(5Gal)‡	227L(60Gal)‡	227L(60Gal)‡
Polyethylene	4L(1.1Gal)	20L(5Gal)‡	20L(5Gal)‡	227L(60Gal)‡	227L(60Gal)‡

*****Glass containers as large as 4L (1.1 gal) shall be permitted to be used if needed and if the required purity would be adversely affected by storage in a metal or an approved plastic container, or if the liquid would cause excessive corrosion or degradation of a metal or an approved plastic container.

‡**In instructional or CTY laboratory work areas, no container for Class I or Class II liquids shall exceed a capacity of 4 L (1.1 gal). Safety cans shall be permitted to have an 8 L (2.1 gal) capacity.**

Note: Flammable liquids requiring refrigerated storage must be stored in UL Listed refrigerators specifically designed for the storage of flammable materials. Contact EHS for information regarding specific refrigerator storage concerns.

Handling

- Flammable liquids shall be kept in covered containers when not actually in use.
- Transfer operations must be provided with adequate ventilation. Sources of ignition are not permitted in areas where flammable vapors may travel.
- Bulk dispensing of flammable liquids into or out of drums require the use of a grounding and bonding system. Contact EHS for specific grounding and bonding information.

Use

- Eliminate sources of ignition (i.e. open flames, hot plates, etc.) from work areas where flammable and combustible liquids are used.
- All manipulations of flammable liquids which pose a risk of explosion, splash hazard, or a highly exothermic reaction should occur in a fume hood with the sash in the lowest feasible position.
- Safety shielding is required any time there is a risk of explosion, splash hazard, or a highly exothermic reaction. Portable shields, which provide protection to all laboratory occupants, are acceptable.
- Eye protection in the form of safety glasses must be worn at all times when handling flammable liquids.
- Gloves should be worn when handling flammable liquids. Disposable latex or nitrile gloves provide adequate protection against accidental hand contact with small quantities of most laboratory chemicals. Lab workers should contact EH&S for advice on chemical resistant glove selection when direct or prolonged contact with hazardous chemicals is anticipated.
- Transfer flammable and combustible liquids in a functioning fume hood.
- Ethers shall be used ONLY in a working fume hood from which all possible ignition sources have been removed.

Safe Handling of Flammable Gases

NFPA sets limitations on the number of cylinders that should not be exceeded in a laboratory. Do not acquire more than:

- three 10" x 50" flammable gas or oxygen cylinders and
- three 4" x 15" cylinders of toxic gases (such as arsine, chlorine, fluorine, hydrogen cyanide, nitric oxide)
- NFPA allows for the use of liquefied petroleum gas cylinders within the lab, however, Texas laws state that **no** liquefied petroleum gases (i.e., C_3 or C_4 such as butanes, propanes, etc.) may be kept within an occupied building.

List of Flammable Liquids by Classification

The following list of flammable and combustible liquids was developed to assist users in the proper classification and storage of flammable and combustible liquids in the laboratory. This information was obtained from the North Carolina State University EHS website, and is meant to be an illustrative list of common flammable and combustible liquids. If you are unsure of the material classification of materials you are working with, contact EH&S at 272-2185.

Class IA Flammable Liquids (Flash point at or below 73 F, boiling point at or below 100 F)		
1-1 Dichloroethylene	Ethyl Chloride	Pentane
Acetaldehyde	Isopentane	Petroleum Ether
Collodion	Isopropyl Chloride	Propylene Oxide
Ethylamine	Methyl Ethyl Ether	
Ethyl Ether	Methyl Formate	

Class IB Flammable Liquids (Flash point below 73 F, boiling point at or below 100 F)		
Acetone	Gasoline	Octane
Benzene	Hexane	Propyl Acetate
Butyl Alcohol	Methyl Acetate	Isopropyl Acetate
Carbon Disulfide	Methyl Alcohol	Isopropyl Alcohol
1,2-Dichloroethylene	Methylcyclohexan	Toluene
Ethyl Acetate	Methyl Ethyl Ketone	Butyl Acetate
Ethyl Alcohol	Methyl Propyl Ketone	
Ethyl Benzene	VM&P Naphtha	

Class IC Flammable Liquids (Flash point at or below 73 F, boiling point at or below 100 F)		
Amyl Acetate	Isopropanol	Styrene (Monomer)
Amyl Alcohol	Methyl Alcohol	Turpentine
Butyl	Methyl Isobutyl Ketone	Xylene
Dibutyl Ether	Naptha	
Isoamyyyl Acetate	Propyl Alcohol	

Class II Combustible Liquids (Flash point at or above 100 F, and below 140 F)		
Acetic Acid	Hydrazine	Methyl Lactate
Camphor Oil	Kerosene	Mineral Spirits
Cellosolve Acetate	Naptha (coal tar)	Varsol
Cyclohexane	Naptha (high flash)	
Fuel Oil #1, 2, 4 & 5	Methyl Cellosolve	

Class III A Combustible Liquids (Flash point at or above 140 F, and below 200 F)		
Aniline	Formic Acid	Isophorone
Butyl Cellosolve	Furfural	Nitrobenzene
Carbolic Acid	Furfuryl Alcohol	Phenol
Cyclohexanol	Naphthalenes	Pine Oil

Class III B Combustible Liquids (Flash point at or above 140 F, and below 200 F)		
Cellosolve Solvent	Formalin	Picric Acid
Ethylene Glycol	Glycerine	