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Flammable Liquids in the Laboratory

Document Type: Guidelines

I. PURPOSE AND OBJECTIVE:

To establish the requirements for the storage, use, and disposal of flammable liquid chemicals used in the laboratory. Liquids are categorized as flammable or combustible depending on whether their flash point is below or above 100°F (37.8°C), respectively. Personnel must take precautions as indicated here wherever these liquids are stored or used.

II. DEFINITIONS:

A. Flash point: Minimum temperature at which a liquid emits vapor sufficient to form an ignitable mixture with air near the surface of the liquid

B. Class I flammable: any liquid that has a flash point below 100°F (37.8°C) and a Reid vapor pressure not exceeding 2068.6 mm Hg at 100°F (37.8°C)

C. Class II combustible: any liquid that has a flash point at or above 100°F (37.8°C) and below 140°F (60°C)

D. Class IIIA combustible: any liquid that has a flash point at or above 140°F (60°C) but below 200°F (93°C)

III. PROCEDURE:

A. Smoking is not permitted and NO SMOKING signs shall be placed on the entrances to all areas containing flammable liquids.

B. A fire extinguisher and solvent cleanup kit must be readily available where flammable liquids

are used.

C. Storage

1. Containers larger than 1 gallon must be kept in the flammable liquid storage room or in a local fire rated cabinet.
2. Local storage under a hood is acceptable for 1 gallon, or smaller, glass or plastic containers depending on the class of the liquid.
3. Stored organic extracts of specimens must be stored only in an explosion-proof refrigerator or freezer.
4. Ethyl ether must be stored either in the flammable storage room or in an explosion-proof refrigerator which is so labeled on the door. Store only in safety cans no larger than 1 gallon in size.
5. Maximum allowable container sizes for flammable liquids in each laboratory area
    a. Up to one gallon (3.7 L) of Class I, II and IIIA liquids may be stored outside of fire rated cabinets for each 100 ft² (9.2 m²) of space defined by fire-resistant walls/doors
    b. Up to two gallons (7.5 L) of Class I, II, and IIIA liquids may be stored in safety cans and fire rated cabinets for each 100 ft² (9.2 m²)
    c. These amounts may be doubled if there is an automatic fire suppression system (eg, sprinklers). For example, a 1000 ft² (92.9 m²) laboratory defined by fire resistant walls/doors can store 10 gallons (37.8 L) outside a safety cabinet and 20 gallons (75.7 L) inside a safety cabinet and cannot exceed 120 gallons (460 L).
    d. Use safety cans for bulk storage of flammable and combustible liquid (National Fire Protection Association classes I and II). Safety cans may be used instead of glass bottles if the purity required does not mandate glass storage. Metal or DOT-approved plastic containers provide an intermediate level of hazard containment between glass and safety cans. For example, one pint (0.4 L) of a highly volatile liquid such as isopentane stored in glass has about the same ignitability risk as two gallons (7.5 L) stored in safety cans.

D. Safe use of flammable liquids

1. Unless drawing from a large drum or can in a flammable storage room, volatile solvents shall be poured in a hood.
2. Eye protection (goggles, face shield, etc.) must be worn when pouring or working with flammable liquids, as required by laboratory and corporate policies on personal protective equipment.
3. Wear chemical resistant neoprene or nitrile gloves.
4. When pouring flammable liquids, it is possible for an electrostatic charge to build up on a container which might cause a spark and ignite vapors. The best way to prevent this is to keep the containers in contact with each other or ground the delivery container by connecting it to a water pipe or other ground connection while

pouring. Clip connectors are available in the flammable solvent storage room for this purpose. If the recipient container is also metal, it is to be kept electrically connected to the delivery container during pouring to prevent any discharge between the two containers. For proper connection, the clips or the cans must contact bare metal. If glass or plastic containers are involved, no such precautions are necessary unless the delivery container is larger than 2 gallons.

5. Be sure that no flame or other source of possible ignition is in the vicinity where flammable liquids are being poured or used.
6. Centrifuge organic solvents or specimen extracts with screw cap tubes.
7. Containers of flammable liquids must be labeled as such according to the Hazard Communication Program.

E. Disposal

1. After use, non-water soluble organic liquids are discarded into a self-closing plastic or metal safety can designated for this purpose. These are ultimately emptied into larger storage drums for pickup by a commercial disposal firm. Under no circumstances must waste solvents be poured down the drain, the only exceptions being acetone and water soluble alcohols (ethanol or methanol) which may be poured down the drain with copious amounts of water.
2. Before pouring flammable liquid waste into the approved designated flammable waste drum, verify that the amount to be poured will not cause an overflow. If an overflow appears possible, return the flammable liquid waste to the lab department. Contact the commercial disposal firm to dispose of the contents of the waste drum.
3. If transferring waste flammable liquid from one metal can to another, keep the two cans in contact or connected by means of a grounding cable clamped to metal parts of the handles or other suitable bare metal components. The spout of the receptacle can is to be clamped open then re-closed immediately after transfer is complete.
4. Perform transfer with the recipient can in a hood and the door of the hood lowered as much as possible to protect the individual. Neoprene or nitrile gloves, goggles, and a lab coat or gown must be worn.
5. Prior to transferring flammable waste, all flames and sources of spark must be eliminated from the vicinity.

IV. FLAMMABLE LIQUID SAFETY AND ELECTRICAL GROUNDING:

To prevent the ignition of flammable liquids and employee injury due to static electricity, metal flammable liquid containers must utilize a complete bonding and grounding system which consists of a metal-to-metal conductive pathway from the metal container to a common ground within the facility.

Since non-conductive containers cannot be grounded, they should be limited to 2 L for Class IA liquids and 5 L for Class IB and Class IC liquids.

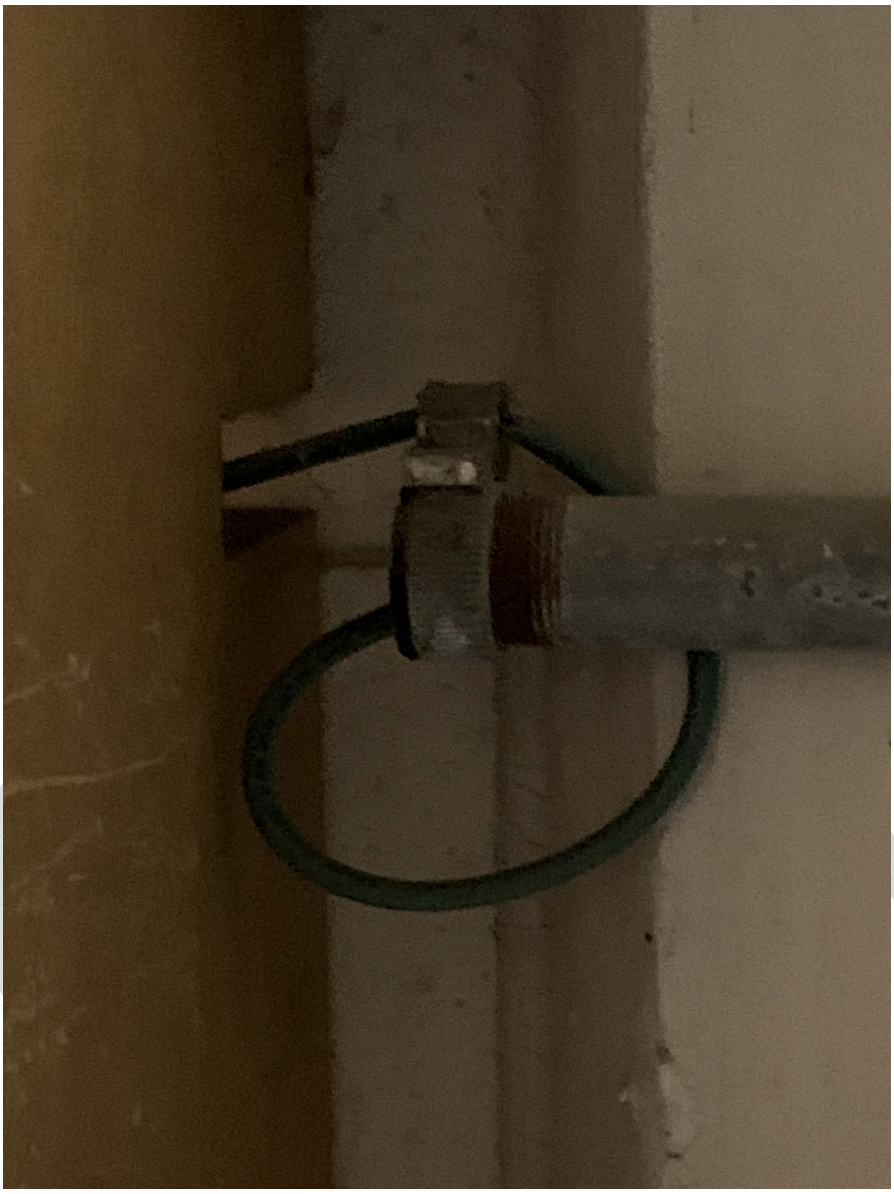
The *Complete Bonding and Grounding System Diagram* attachment and *Risk Assessment Pouring*

Flammable Liquids attachment provide additional information on this necessary safety precaution. The following pictures help illustrate the different components of this bonding and grounding system

- **Equipment Ground Wire Connected to a Metal Flammable Liquid Drum:**

- **Equipment Ground Wire Connected to a Ground Bar:**

- **Equipment Ground Wire Connected to a Grounding Conductor:**



V. REFERENCES:

A. College of American Pathologists Laboratory Accreditation Checklists; Laboratory General Checklist, 2021.

B. National Fire Protection Association Standard 30: Standard on Flammable and Combustible Liquids Code, 2021.

C. National Fire Protection Association Standard 45: Standard on Fire Protection for Laboratories Using Chemicals, 2019.

Attachments

Complete Bonding and Grounding System Diagram 10.28.22

Risk Assessment Pouring Flammable Liquids 3.22.23

Approval Signatures

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