
**Section 5.0: HAZARDOUS MATEIRAL STORAGE
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A. Regulations, Standards and References***Regulations:***

Biosafety in Microbiological and Biomedical Laboratories (BMBL)

National Sanitation Foundation (NSF) Standard 49

OSHA 29 CFR §1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories

International Fire Code (IFC)

International Mechanical Code (IMC)

National Fire Protection Association (NFPA) 2, Hydrogen Technologies Code

National Fire Protection Association (NFPA) 45, Standard on Fire Protection for Laboratories Using Chemicals

National Fire Protection Association (NFPA) 55, Compressed Gases and Cryogenic Fluids Code

National Fire Protection Association (NFPA) 56, Standard for Fire and Explosion Prevention during Cleaning and Purging of Flammable Gas Piping Systems

National Fire Protection Association (NFPA) 69, Standard on Explosion Prevention Systems

National Fire Protection Association (NFPA) 91, Standard for Exhaust Systems for Conveying of Vapors, Gases, Mist, and Particulate Solids

National Fire Protection Association (NFPA) 720, Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment

National Fire Protection Association (NFPA) 99, Health Care Facilities Code

Any addition referenced code or standard included in the IFC or NFPA as identified.

Consensus Standards and References:

ANSI/AIHA Z9.5 Laboratory Ventilation

ANSI/ASHRAE 62, Ventilation for Acceptable Indoor Air Quality

ANSI/ASHRAE 110, Method of Testing Performance of Laboratory Fume Hoods

ANSI/ASHRAE 111, Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-Conditioning, and

Refrigeration Systems

ANSI/ASHRAE 41.2, Standard Method for Laboratory Air-Flow Measurement

ANSI/ASHRAE 41.3, Standard Method for Pressure Measurement

Prudent Practices in the Laboratory, Committee on Prudent Practices for Handling, Storage, and Disposal of Chemicals in Laboratories

National Institutes of Health Design Requirements Manual for Biomedical Laboratories and Animal Research Facilities

National Research Council "Safe Handling of Radionuclides", International Atomic Energy Agency, Safety Series No. 1

ACGIH Industrial Ventilation Manual

B. Scope

1. The requirements of this Guide apply to all campus facilities, including leased properties in which hazardous materials are used, handled, or stored. It covers the design, construction, and installation of hazardous materials storage cabinets (including flammable liquid, corrosive material, and toxic material storage cabinets). ASU laboratory buildings, laboratory units, and laboratory work areas in which hazardous materials are used, handled, or stored.
2. Deviations from the Design Guideline must be reviewed and approved by EHS.
3. This document does not relinquish the owner or contractor from adhering to any and all applicable codes and standards for this project, requirements presented by the ASU Environmental Health and Safety (EHS), and including the requirements set forth in the ASU Design Guidelines.

C. Approvals and Listings

1. The purchase and installation of storage cabinets for both flammable liquids and toxic materials shall be subject to review and approval of EH&S.
2. Flammable liquid storage cabinets shall be listed by a Nationally Recognized Testing Laboratory such as Underwriters Laboratories or Factory Mutual, or State Fire Marshal.
 - a. NRTL listing or EH&S approval assures a minimum level of quality consistent with Code requirements and good practice. "UL Listing" is not required for corrosive or toxic material storage cabinets.

D. Design

1. Laboratories that store, use, or handle flammable or combustible liquids shall have one or more flammable liquid storage cabinets.
2. Flammable liquid storage cabinets shall not store in excess of the required quantities identified of any flammable or combustible liquids in accordance with the IFC and referenced NFPA codes and standards.
3. Flammable liquid storage cabinets shall be conspicuously labeled with the warning "FLAMMABLE — KEEP FIRE AWAY" in red letters on a contrasting background. Doors shall be well fitted, self-closing and equipped with a self-latching device.
4. When flammable or combustible liquids present multiple hazards, the storage requirements for each hazard shall be addressed. For example, acetic acid is a corrosive and combustible material. Therefore, if it is stored in a flammable cabinet with other flammable materials, it shall be segregated (i.e., secondary containment).
5. Laboratories that store, use, or handle toxic liquids or solids shall have one or more approved and vented toxic material storage cabinet.
6. Where necessary, vented cabinets should be provided to store toxic materials, separated by hazard class. The vents shall be connected, preferably at the top of the cabinet to a supply ventilation system and the bottom of the cabinet to an exhaust ventilation system in accordance with the provisions of Section D of this chapter. Interior balance of the cabinet should be neutral to the outside. The cabinets should be compatible with the materials being stored.
7. Corrosive/toxic material storage cabinet shelving shall be constructed to prevent spillage of contents with tight-fitting joints, a welded or riveted liquid-tight bottom, a door sill of at least 2 inches, and lockable cabinet doors that are self-closing and self-latching. Corrosive materials should not be stored in metal cabinets unless the materials of construction are specifically treated to be corrosion-resistant.

E. Venting Hazardous Material Storage Cabinets

1. Venting of storage cabinets is not required by Code and has not been demonstrated to be necessary for fire protection purposes. Additionally, if improperly performed, venting of a storage cabinet could compromise the ability of the cabinet to adequately protect its contents from involvement in a fire. However, there may be other health and safety considerations (e.g., odor control, control of potentially hazardous vapors) that dictate that the interior of a cabinet be ventilated. Early in the design phase, the designer shall discuss ventilation of hazardous material storage cabinets with Capital Programs Management Group, and Environmental Health and Safety.
2. If a flammable liquid storage cabinet is ventilated, then it shall be connected through the lower bung opening to an exterior exhaust in such a manner that it will not compromise the specified performance of the cabinet. The other metal bung shall be connected to an air supply located outside of the fire control area.
3. If the cabinet is not vented, then it shall be sealed with the bungs supplied or specified by the

manufacturer.

4. All toxic material storage cabinets should be vented.
5. Exhaust vent materials for hazardous material cabinets shall be compatible with contents of the cabinets. Vent materials for flammable liquid storage cabinets shall be resistant to high temperatures generated in a fire. Stainless steel, hard-soldered copper, and carbon steel are appropriate vent materials for flammable storage cabinets, provided the material is compatible with the intended service. Nonmetallic duct shall not be used to vent flammable storage cabinets. Compatible nonmetallic duct material, such as PVC, can be used for toxic material storage cabinet service. Polypropylene, which is combustible, is not appropriate vent duct material. The citation does not specifically authorize or forbid venting flammable storage cabinets. The citation states the following requirement: "Piping, valves, fittings, and related components intended for use with flammable and combustible liquids shall be designed and fabricated from suitable materials having adequate strength and durability to withstand the pressures, structural stresses, and exposures to which they could be subjected. Such equipment shall be in accordance with nationally recognized engineering standards, be listed for the application or be approved...."

F. General Installation Requirements

1. Flammable liquid storage cabinets shall NOT be located near exit doorways, stairways, or in a location that would impede leaving the area.
2. Flammable liquid storage cabinets shall NOT be wall mounted. Good Practice Wall-mounted cabinets are not UL Listed or EH&S Approved. The mounting could breach the fire-resistive integrity of the cabinet.
3. Flammable liquid storage cabinets shall NOT be located near an open flame or other ignition source. An open flame or other ignition source could start a fire or cause an explosion if an accident or natural disaster brought the ignition source and flammable liquids or vapors together.
4. One room shall not contain more than three flammable liquid storage cabinets unless those groups of three cabinets are separated from each other by a distance of not less than 100 feet (30 m) – OR – if the building is protected by an automatic sprinkler system, the number of cabinets in any one group shall be increased to six.
5. Flammable and toxic/corrosive liquid storage cabinets shall be seismically anchored to prevent spillage of contents. Anchoring must not compromise the integrity of the fire rating, i.e., drilling holes through a free-standing cabinet.