NORTHERN ARIZONA UNIVERSITY

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STORAGE OF CHEMICALS IN STOCKROOMS AND LABORATORIES

1. General Considerations
    a. In general, store materials and equipment in cabinets and on shelving provided for such storage.
    b. Avoid storing materials and equipment on top of cabinets. If you must place things there, however, maintain a clearance of at least 18 inches from the sprinkler heads to allow proper functioning of the sprinkler system.
    c. Do not store materials on top of high cabinets where they will be hard to see or reach.
    d. Avoid storing heavy materials up high.
    e. Keep exits, passageways, areas under tables or benches, and emergency equipment areas free of stored equipment and materials.

In addition to the basic storage area guidelines above, these general guidelines should be followed when storing chemicals:

2. Specific Storage Requirements
    a. Label all chemical containers appropriately:
        1. Chemical Name (no codes or chemical abbreviations)
        2. Hazard Class: Flammable, reactive, corrosive, etc. (NFPA Diamond meets these requirements
    b. Provide a definite storage place for each chemical and return the chemical to that location after each use.
    c. Avoid storing chemicals on bench tops, except for those that are being currently used.
    d. Avoid storing chemicals in laboratory hoods, except for those that are being currently used.
    e. Store volatile toxics and odoriferous chemicals in a ventilated cabinet.
    f. If a chemical does not require a ventilated cabinet, store it inside a closable cabinet or on a shelf that has a lip to prevent containers from sliding off in the event of a fire, serious accident, or earthquake.
    g. Do not expose stored chemicals to heat or direct sunlight.
    h. Observe all precautions regarding the storage of incompatible chemicals.
    i. Separate chemicals into compatible groups.
    j. Store flammable liquids in approved flammable liquid storage cabinets.
    k. In seismically active regions, storage of chemicals requires additional consideration for the stability of shelving and containers. Shelving and other storage units should be secured. Shelving should contain a front edge

lip to prevent containers from falling. Ideally, containers of liquids should be placed on a metal or plastic tray that could hold the liquid if the container broke while on the shelf. All laboratories, not only those in seismically active regions, can benefit from these additional storage precautions

3. Containers and Equipment
    a. Use corrosion-resistant storage trays or secondary containers to retain materials if the primary container breaks or leaks.
    b. Use chemical storage refrigerators *only* for storing chemicals.
        1. Label these refrigerators with the following signage: NO FOOD—CHEMICAL STORAGE ONLY
        2. Seal containers to minimize escape of corrosive, flammable, or toxic vapors.
        3. Label all materials in the refrigerator with contents, owner, date of acquisition or preparation, and nature of any potential hazard.
        4. Do not store flammable liquids in a refrigerator unless it is approved for such storage. Such refrigerators are designed not to spark inside the refrigerator. If refrigerated storage is needed inside a flammable-storage room, it is advisable to choose an explosion-proof refrigerator.

4. Storing Flammable and Combustible Liquids
    a. The container size for storing flammable and combustible liquids is limited both by NFPA Standards 30 and 45 and by OSHA. Limitations are based on the type of container and the flammability of the liquid, as shown in table H-12. This is for flammable and combustible liquids outside a flammable cabinet:

TABLE H-12 - MAXIMUM ALLOWABLE SIZE OF CONTAINERS AND PORTABLE TANKS

Container type	Flammable liquids			Combustible liquids	
	Class IA	Class IB	Class IC	Class II	Class III
Glass or approved plastic	1 pt	1 qt	1 gal	1 gal	1 gal.
Metal (other than DOT drums)	1 gal	5 gal	5 gal	5 gal	5 gal.
Safety cans	2 gal	5 gal	5 gal	5 gal	5 gal.
Metal drums (DOT specifications)	60 gal	60 gal	60 gal	60 gal	60 gal.
Approved portable tanks	660 gal	660 gal	660 gal	660 gal	660 gal.

NOTE: Container exemptions: [a] Medicines, beverages, foodstuffs, cosmetics, and other common consumer items, when packaged according to commonly accepted practices, shall be exempt from the requirements of 1910.106(d)(2)(i) and (ii).

5. Storing Gas Cylinders
    a. Always label cylinders so you know their contents; do not depend on the manufacturer's color code.
    b. Securely strap or chain gas cylinders to a wall or bench top. In seismically active areas, it may be advisable to use more than one strap or chain. When cylinders are no longer in use, shut the valves, relieve the pressure in the gas regulators, remove the regulators, and cap the cylinders.
    c. Segregate gas cylinder storage from the storage of other chemicals.
    d. Keep incompatible classes of gases stored separately. Keep flammables from reactives, which include oxidizers and corrosives.
    e. Segregate empty cylinders from full cylinders.
    f. Keep in mind the physical state—compressed, cryogenic, and/or liquefied—of the gases.
    g. *Warning: Do not abandon cylinders in the dock storage*

6. Storing Reactive Chemicals
    a. Consider the storage requirements of each highly reactive chemical prior to bringing it into the laboratory.
    b. Consult the MSDSs or other literature in making decisions about storage of highly reactive chemicals.
    c. Bring into the laboratory only the quantities of material you will need for your immediate purposes (less than a 3- to 6-month supply, the length depending on the nature and sensitivity of the materials).
    d. Label, date, and inventory all highly reactive materials as soon as received. Make sure the label states, DANGER! HIGHLY REACTIVE MATERIAL!
    e. Do not open a container of highly reactive material that is past its expiration date. Call NAU's hazardous waste supervisor for special instructions.
    f. Do not open a liquid organic peroxide or peroxide former if crystals or a precipitate are present. Call NAU's hazardous waste supervisor for special instructions.
    g. Dispose of highly reactive material prior to expiration date. Contact NAU's hazardous waste supervisor.
    h. Store highly reactive liquids in trays large enough to hold the contents of the bottles.
    i. Segregation
        1. Segregate the following materials:
            1. oxidizing agents from reducing agents and combustibles
            2. powerful reducing agents from readily reducible substrates
            3. pyrophoric compounds from flammables,
            4. perchloric acid from reducing agents.
    j. Specific Storage requirements
        1. Store perchloric acid bottles in glass or ceramic trays.
        2. Store peroxidizable materials away from heat and light.

3. Store materials that react vigorously with water away from possible contact with water.
4. Store thermally unstable materials in a refrigerator. Use a refrigerator with these safety features: all spark-producing controls on the outside,
    1. a magnetic locked door, and
    2. an alarm to warn when the temperature is too high.
5. Store liquid organic peroxides at the lowest possible temperature consistent with the solubility or freezing point. Liquid peroxides are particularly sensitive during phase changes.
6. Inspect and test peroxide-forming chemicals periodically (these should be labeled with an acquisition or expiration date) and discard containers that have exceeded their safe storage lifetime.
7. Store particularly sensitive materials or larger amounts of explosive materials in explosion relief boxes.

7. Storing Toxic Substances
    a. Store chemicals known to be highly toxic (including carcinogens) in ventilated storage in unbreakable, chemically resistant secondary containers.
    b. Keep quantities at a minimum working level.
    c. Label storage areas with appropriate warning signs, such as
    d. CAUTION! REPRODUCTIVE TOXIN STORAGE or CAUTION! CANCER-SUSPECT AGENT STORAGE
    e. Limit access to those areas.