



Environmental Health & Safety Policy Manual

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Policy # EHS-200.05

Chemical Ordering and Storage Procedures

1.0 PURPOSE:

The improper storage and handling of chemicals can result in a fire, explosion, or personal injury. These procedures provide general guidance for the ordering and proper storage of chemicals. More specific storage instructions on chemicals may be obtained from safety data sheets (SDS), container labels, and chemical reference books.

2.0 SCOPE:

This procedure applies to all LSU Health Sciences Center personnel that generate, accumulate, store, or handle chemicals.

3.0 RESPONSIBILITIES:

3.1 Environmental Health and Safety Department (EH&S) shall:

- Provide technical assistance with the safe handling and storage of chemicals.
- Provide evaluation of facilities, work practices, and investigation of potential exposure situations or events.
- Provide chemical spill kits and fire extinguishers for chemical storage areas.
- Maintain an inventory of all chemicals on the [SafetyStratus](#) web-based system.
- Perform random laboratory inventory checks to ensure that the laboratory inventory on hand matches the inventory in [SafetyStratus](#).

3.2 Principal Investigator/Laboratory Supervisor shall:

- Ensure that good work practices, containment systems, and engineering controls are fully implemented when chemicals are handled and stored.
- Maintain chemical inventory on [SafetyStratus](#) database.

- Maintain SDS for all chemicals handled and stored. The SDS are to be kept on the computer hard drive or in hard copy. [SafetyStratus](#) provides an SDS library that can be used to gather needed SDS materials.

3.3 Employees and students who work with chemicals shall:

- Understand the proper handling and storage of chemicals by reading the container labels and SDS.
- Know where the chemical spill kit, fire extinguishers, emergency showers and eye wash stations are located.
- Report unsafe storage conditions to the immediate supervisor.

4.0 IMPLEMENTATION:

4.1 General Operating Procedures:

The following procedures are intended to reduce risks associated with hazardous chemicals, minimize the amount of chemicals held in laboratories and storage areas; maintain a current chemical inventory; and provide safety data sheets for all chemicals.

4.2 Ordering Chemicals:

- Order only what is needed; EH&S recommends maximum of a six-month supply.
- Check inventory regularly and dispose of outdated or unnecessary chemicals.
- Avoid maintaining an excess of unused chemicals.
- Order solvents in safety cans rather than glass bottles; metal containers provide more protection against breakage and spillage.

4.3 Chemical Storage Area Guidelines:

- Maintain chemical spill kits and fire extinguishers in all chemical storage areas.
- Ensure storage areas are well ventilated.
- Store chemicals away from direct sunlight and any other heat sources.
- Store chemicals no closer than 18" to the ceiling so that the effectiveness of the automatic sprinkler system is not impacted.
- Provide adequate shelving to prevent chemicals from becoming overcrowded or inaccessible. Never store chemicals on the floor.
- Ensure that shelves used in chemical storage area are:
 - Secured to a permanent structure and strong enough to support the weight of all the containers
 - Fitted with a raised lip or tilted backward slightly so the containers won't slip off the edge
 - Painted or covered with chemical resistant materials.
- Never stack chemical containers on top of each other.
- Always place heavy chemical containers on lower shelves or at the bottom of cabinets.
- Never use laboratory fume hoods and bench tops for chemical storage areas.

- Always store hazardous liquid in secondary containment trays that are made with chemical resistant materials.
- Store quantities of 10 gallons or more of flammable materials in an approved Underwriter Laboratory (UL) or Factory Mutual (FM) listed flammable storage cabinet that meets OSHA 29CFR 1910.106 and NFPA 30 specifications.
- Store flammable materials needing refrigeration in an approved UL or FM listed flammable storage refrigerator that meets NFPA 45 and NFPA 70 guidelines.
- Label chemical storage refrigerators with the words “Caution-Do Not Store Food or Beverages in this Refrigerator”.
- All chemical containers must be:
 - Constructed of a material that is compatible with the chemical.
 - Labeled with the contents in English and the date of receipt.
 - In good condition with no rusting, bulging, or chemical encrustation.
 - Properly capped.
 - Periodically inspected for signs of deterioration and for label integrity.

4.5 SPECIFIC CHEMICAL STORAGE GUIDELINES

To avoid interaction between incompatible chemicals, all chemicals should be separated into compatible hazard groups then placed alphabetically within each group. For examples of incompatible chemicals, see Appendix A. Since many chemicals present multiple hazards, consult the SDS to determine the “primary” hazard class of the chemical. The following guidelines are provided for the safe storage of chemicals in accordance with their hazard group:

4.5.1 General Use Chemicals

- Store chemicals that pose no health risks and that do not have any significant incompatibilities together in an alphabetical system.
- Separate solids from liquids.

4.5.2 Acids

- Store in acid cabinets with other noncombustible materials.
- Separate oxidizing acids, organic acids, and mineral acids.
- Use secondary containment trays to provide separate areas in the same cabinet.
- Keep separate from incompatible materials such as bases, cyanides, sulfides, reactive metals, flammables, and combustible materials.

4.5.3 Bases

- Store in corrosive cabinets.
- Store in a dry place.
- Store concentrated bases on lower shelves in secondary containment trays.
- Keep separate from acids.

4.5.4 Flammables

- Store in UL or FM listed cans or cabinets that meet OSHA and NFPA specifications.
- Store away from any source of ignition.
- Use only explosion-proof or intrinsically safe refrigerators and freezers that are UL or FM listed and meet NFPA 45 and NFPA 70 guidelines.
- Keep separate from oxidizing acids and oxidizers.

4.5.5 Oxidizers

- Store in cabinets of noncombustible materials.
- Store in a cool dry place.
- Keep separate from flammables, combustibles, and reducing agents such as zinc, alkali metals, and formic acid.

4.5.6 Toxics

- Keep quantities on hand at a minimum.
- Store according to the nature of the chemical, using appropriate security when necessary.

4.5.7 Cyanides

- Store in a secure cabinet that can only be accessed by authorized personnel.
- Store away from acids and oxidizers.

4.5.8 Water Reactive Chemicals

- Store in a cabinet in a cool, dry place.
- Do not store under sinks, near water baths, or under sprinkler heads.
- Keep a class D fire extinguisher available when working with specific water reactive chemicals. Contact the Environmental Health and Safety Department if a Class D fire extinguisher is needed.

4.5.9 Pyrophoric Substances

- Store in a cool, dry place making provisions for an airtight seal.
- Store away from sources of ignition.
- Keep separate from flammables.

4.5.10 Peroxide Forming Chemicals

- Store in airtight containers in a dark, cool, and dry place.
- Label containers with receiving, opening, and disposal dates.
- Periodically check containers for formation of peroxides.
- For examples of common peroxide forming chemicals, see Appendix B.

5.0 EMPLOYEE TRAINING:

5.1 Initial Training

The Principal Investigator/Laboratory Supervisor is responsible to provide laboratory-specific training to all laboratory workers on chemical hazards before they handle, use, or store hazardous chemicals.

5.2 Training Elements

Training elements should include how to understand an Safety Data Sheet, the proper handling and storage of the different chemical hazard groups, and the location and how to use emergency equipment in the event of a spill.

6.0 RECORD KEEPING:

Principal Investigators/Laboratory Supervisors shall maintain their employee's training records for the current fiscal year and the previous three fiscal years.

7.0 INSPECTIONS:

Chemical storage areas should be inspected by a laboratory employee on a monthly basis for the following:

- Chemical container and label integrity.
- Outdated chemicals.
- Compounds that show signs of crystallization or discoloration.
- Adequate emergency equipment.

8.0 DEFINITIONS:

- **Acid** is a corrosive substance that when dissolved in water increases the concentration of hydrogen ions, H⁺. The strength of an acid solution is usually measured in terms of pH. Strongly acidic solutions have low pHs (0-3); while weakly acidic solutions have pHs in the range 3-6.
- **Base** is a corrosive substance that when dissolved in water increases the concentration of hydroxide ions, OH⁻. The strength of a base solution is usually measured in terms of pH. Strongly basic solutions will be in the range of 11-14.
- **Corrosives** are materials which cause destruction or irreversible damage to living tissue at the site of contact.
- **FM** is the acronym for Factory Mutual. FM conducts tests to investigate different fire situations and ways to reduce loss. FM employs engineers and scientists to conduct third-party testing and certification and is recognized by OSHA.

- **Safety Data Sheet (SDS)** is designed to provide both workers and emergency personnel with the procedures for handling or working with a particular chemical. SDS's include information such as physical data, toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and spill/leak procedures.
- **NFPA 30** is the National Fire Protection Association standard, "Flammable and Combustible Liquids".
- **NFPA 45** is the National Fire Protection Association standard, "Fire Protection for Laboratories using Chemicals".
- **NFPA 70** is the National Fire Protection Association standard, "National Electric Code".
- **OSHA** is the acronym for Occupational Safety and Health Administration.
- **Oxidizers** are chemicals that give off oxygen, thus causing or enhancing the combustion of other materials.
- **Pyrophoric Chemicals** are liquids or solids that, even in small quantities and without an external ignition source, can ignite within five minutes after coming into contact with air.
- **UL** is the acronym for Underwriters Laboratory. UL is a privately owned and operated independent, third-party product safety testing and certification organization which is approved by OSHA.
- **Water Reactive Chemicals** are chemicals that when in contact with water, are liable to become spontaneously flammable or emit flammable or toxic gases.

9.0 APPENDICES:

- Appendix A – Incompatible Chemicals Guide
- Appendix B – Peroxide Forming Compounds

INCOMPATIBLE CHEMICALS GUIDE

Provide separate storage areas for “incompatible chemicals”, which may react together and create hazardous conditions. Some examples of incompatible chemicals are:

<u>CHEMICAL</u>	<u>KEEP OUT OF CONTACT WITH</u>
Acetic acid	Chromic acid, Nitric acid, hydroxyl compounds, Ethylene glycol, Perchloric acid, peroxides, permanganates
Acetylene	Copper (tubing), Fluorine, Bromine, Chlorine I, Iodine, silver, mercury or their compounds
Alkaline metals (powdered Aluminum, Magnesium, Sodium, Potassium)	Water, Carbon tetrachloride, Carbon dioxide, or other chlorinated halogens
Ammonia, anhydrous	Mercury, Chlorine, Calcium hypochlorite, Iodine, Bromine, Hydrofluoric acid
Ammonium nitrate	Acids, metal powders, flammable liquids, chlorates, nitrates, Sulphur, and finely divided organics or other combustibles
Aniline	Nitric acid, Hydrogen Peroxide, or other strong oxidizing agents
Bromine	Ammonia, Acetylene, Butadiene, Butane, Hydrogen, Sodium carbide, Turpentine, or finely divided metals
Chlorates	Ammonium salts, acids, metal powders, sulfur, carbon, finely divided metals or other combustibles
Chromic acid	Acetic acid, Naphthalene, Camphor, alcohol, Glycerin, Turpentine, and other flammable liquids
Chlorine	Ammonia, Acetylene, Butadiene, Benzene and other petroleum fractions, Hydrogen sodium carbides, Turpentine, and finely divided metals
Cyanides	Acids

Hydrogen peroxide	Copper, Chromium, Iron, most metals and their respective salts, flammable liquids, and other combustible materials, Aniline, and Nitromethane
Hydrogen Sulfide	Nitric acid, oxidizing gases
Hydrocarbons, generally	Fluorine, Chlorine, Bromine, Chromic acid, Sodium peroxide
Iodine	Acetylene, Ammonia
Mercury	Acetylene, Fulminic acid, Hydrogen
Nitric acid	Acetic acid, Chromic acid, Hydrocyanic acid, Aniline, Carbon, Hydrogen sulfide, flammable liquids or gases, or materials which are easily nitrated
Oxygen	Oils, Grease, Hydrogen, flammable liquids, solids, and gases
Oxalic	Silver, Mercury
Perchloric acid	Acetic anhydride, Bismuth, and its alloys, alcohol, paper, wood, and other organic materials
Phosphorus pentoxide	Water
Potassium permanganate	Glycerin, Ethylene glycol, Benzaldehyde, Sulfuric acid
Sulfuric acid	chlorates, perchlorates, permanganates, and water

PEROXIDE FORMING COMPOUNDS

DISPOSAL RECOMMENDATION OF PEROXIDE FORMING COMPOUNDS

ACETAL	ISOPROPYL ETHER
CUMENE	METHYLACETYLENE
CYCLOHEXENE	METHYL CYCLOPENTANE
DIACETYLENE	METHYLISOBUTYLKETONE
DICYCLOPENTADIENE	POTASSIUM METAL
DIOXANE	SODIUM AMIDE
DIVINYL ACETYLENE	TETRAHYDROFURAN
ETHYL ETHER	TETRHYDRONAPHTHALENE
ETHYLENE GLYCOL DIMETHYL ETHER (GLYME)	VINYLDENE CHLORIDE
	VINYL ETHERS

LIST A (DISCARD AT 3 MONTHS)

PEROXIDE HAZARD FROM STORAGE

- DIVINYL ACETYLENE
- ISOPROPYL ETHER
- POTASSIUM METAL
- SODIUM AMIDE
- VINYLDENE CHLORIDE (1,1-Dichloroethylene)

LIST B (DISCARD AT 12 MONTHS)

PEROXIDE HAZARD FROM CONCENTRATION OR PEROXIDE INITIATION OF POLYMERIZATION

- ACETAL
- BUTADINENE*
- CHLOROPRENE*
- CUMENE
- CYCLOHEXENE
- CYCLOOCTENE
- CYCLOPENTENE
- DECALIN (decahydronaphthalene)
- DIACETYLENE
- DICYCLOPENTADIENE
- DIETHYLENE GLYCOL DIMETHYL ETHER (DIGLYME)
- DIOXANE (1,4-DIOXANE)
- ETHYL ETHER (DIETHYL ETHER)

- FURAN
- METHYLACETYLENE
- METHYLCYCLOPENTANE
- METHYL ISOBUTYL KETONE
- STYRENE
- TETRAFLUROETHYLENE*
- TETRAHYDROFURAN
- VINYL ACETATE
- VINYL CHLORIDE
- VINYL PYRIDINE

*When stored as a liquid, the peroxide-forming potential increases and the chemical should then be considered a List A compound.