

**GENERAL GUIDANCE FOR CHEMICAL ORDERING, RECEIPT,
DISTRIBUTION, USE & STORAGE**

(For assistance, please contact EHS at (402) 472-4925, or visit our web site at <http://ehs.unl.edu/>)

Ordering

- Prior to ordering, consider less hazardous substitutes (in terms of both physical and health hazards).
- Order and store chemicals in the smallest feasible quantity and container size to minimize associated hazards/risks. Review existing stocks prior to ordering to ensure that only needed quantities are on-hand.
- Understand that certain “chemicals of concern” are regulated by the United States Department of Homeland Security when they are present at any facility (including UNL) in quantities exceeding certain threshold quantities. In a laboratory setting, common chemicals of concern include: nitric acid, triethanolamine, triethanolamine hydrochloride, sodium azide, potassium nitrate, ammonium nitrate, boron trifluoride, boron trichloride, nitrobenzene, and cyanogen bromide, and many different gases (often used in semi-conductor or nanotechnology applications). In non-laboratory settings, chlorine gas and anhydrous ammonia are common. Possession of these or other chemicals of concern in any building/location in cumulative quantities above regulatory thresholds trigger certain federal reporting obligations. Consult EHS if there is any chance that your current or future intended possession may have implications under these regulations. See EHS SOP, ***Chemicals of Concern – United States Department of Homeland Security Chemical Facility Anti-Terrorism Standards***. Also be advised that certain chemicals of concern are regulated in **ANY** quantity when they are offered for transport. See EHS SOP, ***Packaging and Shipping Dangerous Goods***.
- Conduct a risk assessment to identify potential hazards (physical and health hazards). Evaluate the risk by considering the likelihood of an adverse event, possible magnitude of an adverse event, and possible receptors. Evaluate control strategies (e.g., substitution/elimination, engineering controls, administrative controls, Personal Protective Equipment). Document the control strategies, which will often include written protocols and procedures. For additional information, see EHS SOP, ***Job Safety Assessments***.
- Ensure that control strategies are effective and in place. Train employees to the established control strategies, including but not limited to: verification of function & use of engineering controls; written protocols and procedures, including the process for approval of deviations/amendments to protocols/procedures; appropriate use and care of Personal Protective Equipment (PPE); and reporting of accidents and near-misses.
- Update emergency, use, or handling procedures and door or other postings, as necessary.
- Do not use the “P-card” for purchase of hazardous or toxic chemicals.

Receipt

- Avoid accepting delivery of damaged or leaking packages. If delivery cannot be avoided, take the following actions:

- Consult the Material Safety Data Sheet (MSDS) to determine the hazards of the chemical.
- Don appropriate PPE as indicated by the MSDS (i.e., chemical resistant gloves, protective eyewear, outer garment, etc.).
- Place the container in secondary containment and isolate it and other visibly contaminated items, preferably in a chemical fume hood.
- Report the incident to EHS (402-472-4925). As appropriate, EHS will notify the delivering agency (Fed Ex, UPS) and file all necessary reports with regulatory authorities.
- Verify that the manufacturer's label is intact and legible.
- Open the chemical container only after having reviewed the MSDS and observed all precautions.

Distribution

- Ensure that a copy of the MSDS is readily accessible to workers.
- Update the hazardous chemical list/inventory for the area, as needed. The chemical name on the inventory/list must match the name of the chemical on the MSDS.
- It is advisable to record the date of receipt on the chemical label if the chemical has a limited shelf life or can become dangerous upon prolonged storage.
- Retain chemicals in their original, intact shipping packages while transporting from receiving to use or storage areas. Alternatively, use a shock-resistant outer secondary containment package.
- For heavy or awkward items, use an appropriate cart or hand truck for transport. See EHS SOP, **Cart and Hand Truck Safety**.
- Do not leave chemicals unattended in unsecured or common use areas (e.g., hallways, walkways, etc.).
- Whenever possible, transport chemicals on freight-only elevators.

Use

- Keep laboratory doors closed while operations are being conducted. Restrict access to those authorized by your supervisor.
- Know the hazards of your work as well as the work being conducted by others sharing the space.
- Acquaint yourself with the location and operation of supplies and equipment, including emergency materials.
- Review established protocols/procedures/risk mitigation plans before engaging in work with hazardous chemicals. Do not conduct unauthorized experiments or deviate from established protocols without prior approval from your supervisor.
- Review the MSDS for all chemicals being worked with to determine specific physical properties (including reactivity and incompatibilities) and health hazards. Consult your supervisor on the expected hazards and relative risk of reaction byproducts or chemicals being synthesized.
- Review the work processes to be conducted and equipment to be used with respect to the physical and health hazardous of the chemicals to ensure that the work can be conducted safely in the intended area of use, with the intended equipment, and appropriate engineering controls (e.g., ventilation, etc.) are available.
- Report personal concerns related to chemical sensitivity to your supervisor.
- Do not engage in horseplay while handling chemicals.
- Place the smallest feasible quantities of chemicals in process.

- Keep work areas clean and uncluttered. Good housekeeping prevents accidents. Promptly and thoroughly clean up spills, leaks, and drips.
- Avoid all chemical exposures, including skin contact. Do not eat, drink, smoke, apply cosmetics, chew gum, or store food, beverages, tobacco, cosmetics, or medications in areas where chemicals are used or stored. Do not use common glassware or utensils for foods and chemical handling. Do not smell or taste chemicals. Always use mechanical pipettes. Never use mouth suction.
- Avoid underestimation of the risk. Most chemicals have not been thoroughly evaluated for toxic effects. Assume that any mixture is more toxic than its most toxic component.
- Wear appropriate PPE. In general, this will usually consist of outer garment, chemical-resistant gloves, protective eyewear, and closed-toed shoes. See EHS SOP, **Personal Protective Equipment for Chemical Exposures**. Verify the integrity of gloves before use. Replace PPE at the recommended intervals (e.g., lab coats upon soiling or known contamination; nitrile gloves after chemical contact since these are a low-protection barrier; etc.)
- Conduct all processes that may release hazardous vapors or mists inside a functional fume hood or other adequate containment device. If airborne contaminants cannot be effectively controlled through local ventilation, a respirator may be needed. Users of respirators must be enrolled in UNL's Respiratory Protection Program.
- Avoid working alone when using hazardous chemicals. Do not leave potentially dangerous chemical processes unattended (i.e., hot surfaced equipment, open flames, condensers that use a continuous water supply, etc.).
- Confine long hair and loose clothing when using chemicals. Shoes should be closed-toed. In some cases, chemical resistant shoes or covers may be necessary.
- Handle and store glassware with care. Do not use cracked or chipped glassware. Properly dispose of damaged or broken glassware in broken glass/sharps receptacles, not the trash container.
- Always wash hands and other exposed skin areas after using chemicals, after removing PPE, upon exiting the chemical use area, and before eating or drinking.
- Notify EHS of suspected exposures that may exceed occupational limits or which are thought to produce signs or symptoms so an evaluation can be initiated. In some cases, it may be advisable to seek immediate medical attention following a chemical exposure. See EHS SOP, **On-The-Job Injuries**.
- Also report to EHS and your supervisor any incident involving a physical property of a chemical (e.g., explosion, fire, etc.) even if the event did not result in an employee injury.
- Periodically review risk mitigation plans and update as necessary to reflect changes to procedures/protocols or changes to engineering controls, administrative controls, or PPE.

Storage Considerations

- Chemicals should be secured from unauthorized access and theft. Heightened security measures may be appropriate for chemicals at high risk of illicit use and highly toxic materials. See EHS SOP, **Chemical Security**.
- Ensure that all containers are in good condition, labeled, and compatible with the contents. Refer to the EHS SOP, **Chemical Container Labeling** for specific labeling requirements. If acronyms or short-hand names are used to label working containers in laboratories, prepare a cross-reference sheet that is readily accessible, and clearly link the short-hand name to the chemical name as it appears on the MSDS.
- Storage locations should be dry, well-ventilated, and protected from direct sunlight and temperature extremes.
- Keep chemical containers tightly closed when not immediately in use.

- Store temperature sensitive chemicals in freezers or refrigerators that are set at the appropriate storage temperature, as determined by the chemical manufacturer. If used to store items that are usually considered “food stuffs” (but are actually used for research or testing purposes), the freezer or refrigerator should be labeled to indicate “Not for storage of food for human consumption.” In addition, the refrigerator or freezer must be specifically designed for the storage of flammable materials if the chemical(s) stored within possess this property.
- Segregate and store chemicals according to hazard class. For example, provide physical segregation between acids and bases, as well as oxidizers and flammables. Refer to the specific chemical MSDS or the chemical compatibility chart at http://ehs.unl.edu/chemicalinfo/chemical_compchrt.pdf for guidance on potential incompatibilities. Some chemicals present multiple hazards. In these cases, consult the MSDS to determine the “primary” hazard class of the material. For example, glacial acetic acid is both acidic and combustible. Its primary hazard is its acidity. Therefore, the best selection for storage classification would be organic acids, rather than flammable liquids.
- Observe special storage considerations for certain classes of materials, as described in other EHS SOPs, MSDSs, or other authoritative sources. For example:
 - Maximum volumes and cabinet requirements for flammable and combustible liquids are described in the EHS SOP, ***Storage and Use of Flammable and Combustible Liquids***.
 - Maximum cylinder volumes and ventilated cabinet requirements for toxic, corrosive, and pyrophoric gases are described in the EHS SOP, ***Compressed Gas Cylinders in Laboratories***.
- Storage shelves and/or secondary containment devices should be compatible with the stored chemicals. For example, metal is degraded by acids; wood and other organic materials may catch fire in contact with oxidizers.
- Avoid storing chemicals above eye level. Select low shelves or cabinets for heavy containers. Never store chemicals or any other items closer than 18” to the ceiling. Storing items close to the ceiling will impede the effectiveness of automatic fire suppression systems.
- Storage shelves are safer when equipped with doors or lips to prevent containers from accidentally falling from the unit.
- Hazardous liquids should be stored in secondary containment trays to capture leaks, spills, or other releases. Secondary containment also provides physical segregation of incompatible chemicals.
- Venting of flammable and corrosive liquids cabinets is generally not recommended. However, ventilated cabinets may be appropriate in cases where vapors can reasonably be expected to reach explosive or toxic concentrations, and when storing malodorous chemicals, lachrymators (chemicals that cause tearing of the eyes), or other chemicals with similar hazards. Specific design requirements apply when venting flammable and corrosive cabinets. Therefore, consult with UNL Facilities Management and Planning (FMP) prior to venting these types of cabinets.
- Secure gas cylinders away from heat sources, and segregate incompatible gases. Specialized ventilated cabinets may be required when storing or using toxic, corrosive, or pyrophoric gases. See the EHS SOP, ***Compressed Gas Cylinders in Laboratories***.
- Routinely inspect chemical storage areas and cabinets for hazardous conditions (i.e., leaked or spilled chemicals, misplaced and incompatible chemicals, loss of container integrity, lack of secondary containment devices, faded labels, etc.) and excess or unneeded stocks.
- Dispose of chemicals strictly in accordance with EHS procedures.