# LINDENWOOD

# **CHEMICAL HYGIENE PLAN**

# Lindenwood University System

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#### **CHP Document Abbreviations List**

ACGIH American Conference of Governmental Industrial Hygienists ANSI American National Standards Institute ASTM American Society of Testing and Materials **CFR Code of Federal Regulations CHO Chemical Hygiene Officer** CHP Chemical Hygiene Plan DOT Department of Transportation EHS Environmental Health and Safety **EPA Environmental Protection Agency** GHS Globally Harmonized System of Classification and Labeling of Chemicals **HEPA High-Efficiency Particulate Air** LEL Lower Explosive Limit NFPA National Fire Protection Association OSHA Occupational Safety and Health Administration PEL Permissible Exposure Limit PHS Particularly Hazardous Substance **PI Principal Investigator PPE Personal Protective Equipment RCRA Resource Conservation and Recovery Act** SDS Safety Data Sheet SOP Standard Operating Procedure **TLV Threshold Value Limit UEL Upper Explosive limit** 

#### 1. Purpose

Lindenwood University is dedicated to providing safe laboratory and working facilities for employees and students and to complying with federal, state, and local occupational health and safety standards. This document is the Chemical Hygiene Plan (CHP) for the Lindenwood University System. It is intended to highlight those laboratory policies and practices that are necessary for protecting workers from exposure to hazardous chemicals.

This CHP was prepared in compliance with the policies of the Occupational Health and Safety Administration (OSHA) Occupational Exposure to Hazardous Chemicals in Laboratories Standard found in 29 CFR 1910.1450. It also refers to best practices outlined in "Prudent Practices for Handling Hazardous Chemicals in Laboratories," published by the National Research Council and the OSHA guide to the "Globally Harmonized System of Classification and Labeling of Chemicals."

#### 2. Scope

Laboratory faculty, laboratory managers, and students all share the responsibility for minimizing their exposure to hazardous chemicals. The following definitions apply for the purposes of this CHP:

- 2.1. Laboratory Use: The standards for a CHP defined in 29 CFR 1910.1450 apply where "laboratory use" of hazardous chemicals occurs. OSHA defines a "laboratory" as a facility where the "laboratory use of hazardous chemicals occurs"; a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis. OSHA further defines "laboratory use" as handling or use of chemicals on a "laboratory scale," or when the work involves containers which can easily and safely be manipulated by one person, when multiple chemical procedures or chemical substances are used, and when protective laboratory practices and equipment are available and in common use to minimize the potential for employee exposures to hazardous chemicals.
- **2.2.** Health Hazard: For the purposes of this policy, "health hazard" refers to "a chemical that is classified as posing one of the following hazardous effects: Acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); aspiration hazard.

The criteria for determining whether a chemical is classified as a health hazard are detailed in Appendix A of the Hazard Communication Standard (§1910.1200) and §1910.1200(c)." (29 CFR 1910.1450(b))

**2.3.** Laboratory Workers: OSHA defines an employee or "laboratory worker" as "an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments" (29 CFR 1910.1450(b). This would apply to Lindenwood University faculty, staff, or any individual employed in a laboratory worker capacity. OSHA does not consider students in an academic laboratory to be laboratory workers. However, students and visitors are expected to adhere to the contents of the CHP.

#### 3. Chemical Hygiene Plan Use

- **3.1.** Adherence policy: The CHP defines Lindenwood University's Chemical Hygiene Program and shall be followed by all laboratories and laboratory workers. This includes all individuals working in academic teaching laboratories and individuals entering laboratories on a frequent basis.
- **3.2.** Laboratory and Site-Specific Policies: The CHP provides regulatory, best practice, and general information necessary for the safe operation of laboratories. It is not a comprehensive document. Schools, Departments, facilities, and laboratories engaged in work with potentially hazardous chemicals not specifically described in the CHP must provide information on additional standard operating procedures, hazard assessments, and any other lab-specific operating procedures that address risks posed by their specific health hazards.
  - **3.2.1.** Laboratory or Site-specific policies and procedures designed to minimize health hazards must be detailed on a Laboratory or Site-Specific CHP Addendum. These specific addenda to the CHP will be completed at least annually, and modified as needed to document new potential health hazards and controls.
  - **3.2.2.** These addenda to the CHP must be made available to the Health and Safety Committee in a timely manner, and prior to procurement of any Particularly Hazardous Substances.
- **3.3.** Updates and Revisions: The Chemical Hygiene Plan (CHP) shall be reviewed and evaluated at least annually for its effectiveness by the SC Campus Health and Safety Committee or designees and updated as necessary.

#### 1. General Principles

The following are outlined in 29 CFR 1901.1405, Appendix A as the general principles of the safe handling of chemicals from ordering to disposal, and serve as a basic conceptual guidance for the Chemical Hygiene Plan (CHP):

- 1.1. Minimize Chemical Exposures: Prior to working with any chemicals or laboratory work, the known risks and hazards associated with the activity should be assessed and all necessary safety precautions implemented. Each laboratory or site should have additional specific policies and procedures for handling potential health hazards, and minimizing the potential exposure of workers to risk or harm.
- **1.2.** Avoid Underestimation of Risk: All chemicals can be hazardous depending on the circumstances. Even for substances of no known significant hazard, exposure should be minimized. Special precautions should be taken for work with substances that present special hazards. All substances of unknown hazard must be considered hazardous until proven otherwise. One should assume that any mixture would be more hazardous than its most toxic component. It is important to maintain at least the same level of safe practice in the disposal of chemical waste and residues as in the preparation and use of chemicals.
- **1.3.** Adhere to the Hierarchy of Controls: When health hazards are present in a laboratory or workplace, there are different types of controls available to minimize potential hazards. The level of control implemented (e.g. engineering controls, administrative controls, work practice controls, or personal protective equipment) should commensurate with risk. All controls not outlined in the CHP should be documented in a Laboratory or Site-Specific CHP addendum.
- **1.4. Provide Laboratory Ventilation:** The primary way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by use of fume hoods and other adequate ventilation devices. Operations such as chemical reactions, heating or evaporating solvents, and transfer of chemicals from one container to another should be performed in a fume hood when there is a reasonable potential for hazardous material exposure. Fume hoods should be kept clean and clear of items that impede air flow and normal operation of the fume hood.

- 1.5. Institute a Chemical Hygiene Program: An institution is required to implement a comprehensive chemical hygiene program any time the Laboratory Standard (29 CFR 1910.1450) is applicable. This program should be designed to minimize exposures, injuries, and safety incidents. The program should be reviewed at least annually and updated to address new potential health hazards and shifts in roles and personnel.
- **1.6. Observe the PELs and TLVs:** The OSHA permissible exposure limits (PEL) and the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLV) should not be exceeded in laboratory environments. This may be achieved by a combination of experimental design, engineering controls, and other applicable hazard control strategies.

#### 2. Chapter Content

The OSHA Laboratory Standard in 29 CFR 1910.1450 requires that a Chemical Hygiene Plan describe a plan to implement and maintain the following elements:

- **2.1.** Standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals.
- **2.2.** Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices.
- **2.3.** A requirement that fume hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment.
- **2.4.** Provisions for employee information and training.
- **2.5.** The circumstances under which a particular laboratory operation, procedure or activity shall require prior approval from the employer or the employer's designee before implementation.
- **2.6.** Provisions for medical consultation and medical examinations.
- **2.7.** Designation of personnel responsible for implementation of the Chemical Hygiene Plan.
- **2.8.** Provisions for additional employee protection for work with particularly hazardous substances.

#### 1. Employee Rights and Responsibilities

The OHSA Laboratory Standard states that all laboratory workers have the right to be informed about any potential health hazards and to be properly trained to work safely with chemicals. This includes facilities or public safety personnel who work to maintain and secure laboratory spaces. All Lindenwood University personnel have a shared responsibility to maintain a safe work environment. All Lindenwood University personnel working directly with chemicals are responsible for completing required training, following safe work practices and SOPs, and using appropriate personal protective equipment (PPE) required for the safe performance of their laboratory work.

The description of roles and responsibilities in this chapter follow the recommendations outlined in 29 CFR 1910.1450 App A (B), unless otherwise noted as "additional duties".

#### 2. Administration

The Administration of the University is responsible for the health and safety of all Lindenwood University employees. The Administration will fulfill these responsibilities by appointing qualified, responsible employees to develop and implement safety policies. Designated offices or individuals shall provide administrative and financial support for laboratory safety issues. The Health and Safety Committee is charged with providing ongoing support for health and safety functions and development, including review and maintenance of the Chemical Hygiene Plan.

#### 3. Health and Safety Committee

The Health and Safety Committee on each campus will work with staff and faculty to develop and implement chemical hygiene policies and procedures. The Health and Safety Committee will be responsible for:

- **3.1.** Establishing, maintaining, revising the Chemical Hygiene Plan (CHP), and making a copy of the current CHP available to all applicable parties.
- **3.2.** Seeking ways to improve the Chemical Hygiene Plan (CHP).
- **3.3.** Providing support for regular inspections of the laboratories, preparations rooms, and chemical storage rooms, and submitting detailed laboratory inspection reports to

administration. Reviewing accident reports and makes recommendations to the Department Chairperson or Director, or appropriate designee, regarding proposed changes in the laboratory procedures.

- **3.4.** Assisting laboratory supervisors in developing and maintaining adequate facilities, by providing technical assistance and consultation as needed.
- **3.5.** Assisting Facilities Services with incorporating chemical safety and hazard controls in new construction and renovations.
- **3.6.** Providing disposal requirements and guidelines for both hazardous and non-hazardous chemical waste.
- **3.7.** Conducting exposure assessments as needed, and upon request, for laboratory employees.
- **3.8.** Providing up to date information on the Chemical Hygiene Plan and potential laboratory safety hazards to Public Safety. Public Safety will serve as liaison with Emergency Services in the area as necessary.

# 4. Facility Operations

The Facility Operations Department shall make repairs and maintenance of installed laboratory safety equipment. The Vice President, Operations is responsible for the prioritization of:

- **4.1.** Performance, maintenance, and repair work of installed laboratory safety devices, such as chemical fume hoods, safety showers, eyewash stations, and fire extinguishers.
- **4.2.** Providing service personnel with the necessary tools for installed safety system maintenance.
- **4.3.** The training of service personnel.

#### 5. Department Chairperson or Director

Deans, Department Chairpersons, or Directors shall be required to adhere to the CHP. This individual shall be designated as applicable by each School or Department. School or Departmental Chairpersons shall require laboratory faculty, laboratory supervisors, personnel, students, and visitors to adhere to the CHP. A Department Chairperson shall:

- **5.1.** Assume responsibility for personnel engaged in the laboratory use of hazardous chemicals.
- **5.2.** Provide the Chemical Hygiene Officer (CHO) and Health and Safety Committee with the support necessary to implement and maintain the CHP.

- **5.3.** After receipt of laboratory inspection reports from the CHO or other entities, meet with applicable faculty and staff to discuss cited violations and ensure timely actions to protect trained laboratory personnel.
- **5.4.** Provide budgetary arrangements to ensure the health and safety of the departmental personnel, visitors, and students.
- 5.5. Additional Duties include:
  - 5.5.1. Actively enforce all applicable standard operating procedures and ensure the CHP is followed; take actions when SOPs and the CHP are not followed.
  - 5.5.2. Providing direction and support in developing Laboratory or Site-Specific CHP addenda
  - 5.5.3. Identifying appropriate Laboratory Supervisors and Personnel to be listed on a Laboratory or Site-Specific CHP Addendum.

# 6. Laboratory Supervisor or Principal Investigator

A Laboratory Supervisor or Principal Investigator shall be required to adhere to the CHP when activities in the laboratory meet the OSHA definition of "laboratory use." Laboratory Supervisors or Principal Investigators shall require laboratory faculty, laboratory supervisors, personnel, students, visitors, and research participants to adhere to the CHP. A Laboratory Supervisor or Principal Investigator shall:

- **6.1.** Ensure that laboratory personnel comply with the departmental CHP and do not operate equipment or handle hazardous chemicals without proper training and authorization.
- **6.2.** Always wear personal protective equipment (PPE) that is compatible to the degree of hazard of the chemical.
- **6.3.** Follow all pertinent safety rules when working in the laboratory to set an example.
- **6.4.** Review laboratory procedures for potential safety problems before assigning to other laboratory personnel.
- **6.5.** Ensure that visitors follow the laboratory rules and assumes responsibility for laboratory visitors.
- **6.6.** Ensure that PPE is available and properly used by each laboratory employee and visitor.
- **6.7.** Maintain and implement safe laboratory practices.
- **6.8.** Provide regular, formal chemical hygiene and housekeeping inspections, including routine inspections of emergency equipment.

- **6.9.** Monitor the facilities and the chemical fume hoods to ensure that they are maintained and function properly. Contact the appropriate person, as designated by the department chairperson, to report problems with the facilities or the chemical fume hoods.
- **6.10.** Additional Duties include:
  - 6.10.1. Develop Laboratory or Site-Specific CHP Addendum when required.
  - 6.10.2. After receipt of laboratory inspection reports from the CHO or other entities, meet with applicable administrative entities to discuss cited violations and ensure timely actions to protect trained laboratory personnel.
  - 6.10.3. Maintain a hazardous chemical inventory and ensure annual review of the inventory to ensure an accurate on-line chemical inventory database.
  - 6.10.4. Maintain a Safety Data Sheet (SDS) digital consolidation point and update on an as needed basis.
  - 6.10.5. Ensure that employees are familiar with the location of SDS in the laboratory.
  - 6.10.6. Ensure that designated eyewash stations for their laboratory are adequate and inspected on a weekly and "As Used" basis. These inspections shall be carried out as outlined in ANSI Z358.1-2014 and Chapter 5 of this CHP.
  - 6.10.7. Ensure that facilities, equipment, and materials are adequate for intended use.
  - 6.10.8. Ensure adequate preparation, maintenance and implementation of written standard operating procedures (SOP) regarding safety and health considerations for each procedure involving hazardous chemicals.
  - 6.10.9. Providing for the disposal of hazardous chemical waste via contractual vendor as per Chapter 7 of this CHP.
  - 6.10.10. Report any exposures, incidents, or injuries and complete the Incident Investigation Report form as per Chapter 5 and 8 of this CHP.
  - 6.10.11. Report any use of or repair necessary for designated emergency equipment.
  - 6.10.12. Be aware of current Emergency Response plan and be able to engage local Emergency Response and Public Safety as needed.

#### 7. Laboratory Personnel

Many laboratories and workplaces are under the direct supervision of faculty or designated staff. Each Department or Division is responsible for defining and documenting these roles on a Laboratory or Site-Specific CHP Addendum. In these cases, the Laboratory Supervisors or Personnel designated in a supervisory capacity shall:

- **7.1.** Read, understand, and follow all safety rules and regulations that apply to the work area.
- **7.2.** Plan and conduct each operation in accordance with the institutional chemical hygiene procedures.
- **7.3.** Promote good housekeeping practices in the laboratory or work area.
- **7.4.** Notify the supervisor of any hazardous conditions or unsafe work practices in the work area.
- **7.5.** Use PPE as appropriate for each procedure that involves hazardous chemicals.
- 7.6. Additional Duties include:
  - 7.6.1. Any procedures, tasks, or hazard controls required by a Laboratory Supervisor or Principal Investigator, or otherwise described in a Laboratory or Site-Specific CHP Addendum.
  - 7.6.2. Report all workplace injuries, chemical exposures, or incidents as soon as possible.
  - 7.6.3. Assist with the maintenance of the inventory of all hazardous chemical substances, and identification of Potentially Hazardous Substances (PHS) on the inventory.
  - 7.6.4. Contact the appropriate Laboratory Supervisor or Personnel when safety questions arise.

#### 8. Student Researchers, Student Laboratory Employees, and Visitors

All Student Researchers, Student Laboratory Employees, and Visitors are required to complete all requisite safety and compliance training prior to any exposure to laboratory or workplace health. If an employee has been rehired for a position, they must complete the most recent version of all required training. In addition, all Student Laboratory Researchers, Student Laboratory Employees, and Visitors shall:

- **8.1.** Read, understand, and follow all safety rules and regulations that apply to the work area;
- **8.2.** Plan and conduct each operation in accordance with the institutional chemical hygiene procedures;
- **8.3.** Promote good housekeeping practices in the laboratory or work area.
- **8.4.** Notify the supervisor of any hazardous conditions or unsafe work practices in the work area.
- **8.5.** Use PPE as appropriate for each procedure that involves hazardous chemicals.
- 8.6. Additional Duties include:

- 8.6.1. Any procedures, tasks, or hazard controls required by a Laboratory Supervisor or Principal Investigator, or otherwise described in a Laboratory or Site-Specific CHP Addendum.
- 8.6.2. Report all workplace injuries, chemical exposures, or incidents as soon as possible.
- 8.6.3. Assist with the maintenance of the inventory of all hazardous chemical substances, and identification of Potentially Hazardous Substances (PHS) on the inventory.
- 8.6.4. Contact the appropriate Laboratory Supervisor or Personnel when safety questions arise.

#### 9. Radiation Safety Program

- **9.1.** The Radiation Safety Program provides a radiation protection program in accordance with the regulations, licenses, and permits issued by the Missouri Radiation Control Program (MCRP) and the National Council on Radiation Protections and Measurements for the safe use of and exposure to radiation producing equipment at Lindenwood University. The Radiation Safety Program is administrated by the Office of the Institutional Review Board.
- 9.2. The Radiation Safety Program shall:
  - 9.2.1. Work with laboratories to ensure all radiation producing equipment is registered and licensed in compliance with current MCRP requirements.
  - 9.2.2. Work with laboratories to develop training, safety, and Standard Operating Procedures (SOPs) for use of radiation producing equipment.
  - 9.2.3. Support requests for enhanced environmental or safety controls to minimize potential radiation safety hazards.
  - 9.2.4. Consult with laboratories to develop practices ensuring:
    - 9.2.4.1. All sources of radiation shall be shielded, transported, handled, used and kept so as to prevent all users thereof and all persons within effective range of them from being exposed to unnecessary radiation. (192.430, RSMo)
    - 9.2.4.2. Lindenwood University shall provide for radiation surveys and monitoring sufficient to assure compliance with other rules of 19 CSR 20-10. The radiation survey and monitoring shall be performed by, or under the

direction of, a qualified expert using suitable instruments and methods for measuring radiation. (19 CSR 20-10.050 (1))

9.2.4.3. The requirements for room shielding shall conform to the requirements defined in the various handbooks published by the National Council on Radiation Protection (NCRP Report 145, 147, 151 etc..., 19 CSR 20-10.190 (1)).

# **10.** Audit or Inspection Notification

Federal or State agencies may audit or inspect Lindenwood University facilities with or without advance notice.

- **10.1.** If advanced notice of audit or inspection is received, the recipient of this notification must forward the notice to the VP of Operations, Provost, and Dean or Department Chairperson of that area.
- 10.2. If an agency arrives without advanced notice, the VP of Operations and Dean or Department of that area must be notified immediately. The VP of Operations will contact the Chair of the Health and Safety Committee, who will make the Committee available for assistance in facilitating on-site inspection and responding to audit or inspection reports.

# 11. Recordkeeping

The Lindenwood University Human Resources Department, Operations Department, and Public Safety and Security maintain all university Incident Investigation Reports and records relating to all reported chemical exposures and potential chemical exposures. Facilities Services maintains all chemical fume hood certification records. Principle Investigators and their designees, and Laboratory Supervisors and Personnel are required to maintain all records of Laboratory Safety Inspections, Laboratory or Site-Specific CHP Addenda, and other documentation as necessary. Laboratories use a variety of safety controls to ensure potential exposure to chemical and physical hazards are minimized. Elements of engineering controls, administrative controls, and personal protective equipment (PPE) are commonly used in a layered approach, commensurate with the type and level of hazards present. The most effective way to minimize a hazard is to eliminate it from the workplace or substitute a less hazardous technique or substance. However, as the elimination of hazard is not always feasible, the types of controls listed in this chapter must be implemented and maintained by the responsible parties to ensure the safety of laboratory workers.

#### 1. General Laboratory and Facilities Design

- **1.1. Facilities Design:** Lindenwood University facilities within which hazardous materials are present and/or utilized shall have the following minimum safety features within the immediate vicinity/close proximity:
  - 1.1.1. An appropriate general ventilation system with air intakes and exhausts located so as to avoid intake of contaminated air.
  - 1.1.2. Adequate, well ventilated stockrooms/storerooms.
  - 1.1.3. Local exhaust ventilation for chemical usage (laboratory fume hoods).
  - 1.1.4. Chemical storage areas and cabinets.
  - 1.1.5. Laboratory sinks.
  - 1.1.6. Safety showers and eye washes.
  - 1.1.7. Fire extinguishers.
  - 1.1.8. Availability of waste disposal.
  - 1.1.9. An Emergency Plan readily available.
- **1.2. Facilities Maintenance:** Facilities ensures that laboratory safety systems (as noted in 1.1.1-1.1.8) are maintained in a serviceable condition, according to the manufacturer's specifications. Fire extinguishers are maintained under Facilities Operations. Work orders to repair or renovate laboratory facilities may be initiated by any designated personnel.
- **1.3. Facilities Usage:** Work conducted in Lindenwood University laboratories is for research or instructional purposes. Work is laboratory scale in nature, and activities are conducted appropriate to the physical limitations of the laboratory facilities and safety equipment available, and especially appropriate to the quality of ventilation, including

local exhaust systems. The Laboratory Supervisor or designee shall be informed where chemical usage falls outside of typical laboratory scale operations.

#### 2. Engineering Controls

- **2.1. General Ventilation:** General ventilation must not be relied on to control chemical vapors, gases or mists. Laboratory air must be continually replaced to prevent increases of air concentrations of toxic substances during the working day. Chemical Storage facilities should have ventilation appropriate to the hazards and quantities of the materials in storage. Airflow shall be directed into the laboratory from non-laboratory areas and out to the exterior of the building, falling within dilution ventilation parameters outlined within Section III: Chapter 3 of OSHA's Ventilation Investigation.
- **2.2. Laboratory Fume Hoods:** Laboratory fume hoods shall be provided, installed and operated according to manufacturer specifications. The University shall contract evaluation and certification of fume hoods within the parameters outlined within OSHA's 29 CFR 1910.1450 and on an "As Used/As Manufactured" basis as charted within current EPA "Performance Requirements for Laboratory Fume Hoods". The general procedures apply to the safe operation and use of fume hoods:
  - 2.2.1. When the hood sash is open approximately 18 inches, an average face velocity of 100 ft/min is required.
  - 2.2.2. The hood enclosure should be fire and chemical resistant.
  - 2.2.3. In new construction, consideration shall be given to locating the hood such that ambient air currents do not unacceptably reduce the containment efficiency of the hood.
  - 2.2.4. All fume hood modifications shall be approved by Facilities Management; i.e., those that do not detract from the hood performance.
  - 2.2.5. In new construction, the room in which the hood is located shall have a source of sufficient make-up air to replace the air that is exhausted out.
  - 2.2.6. The hood shall have a monitoring device to measure airflow.
  - 2.2.7. It is recommended that the utility controls be outside of the hood.
  - 2.2.8. The fume hood should be appropriate for the material used within (e.g., perchloric acid usage).
  - 2.2.9. Airflow shall be such that contaminants within do not escape the fume hood. A smoke tube test may be performed to ensure airflow is adequate.
  - 2.2.10. Each laboratory fume hood at Lindenwood University is tested and certified annually for usage and performance. Where performance parameters fall

outside specifications, work orders are initiated to repair the hoods. When appropriate, a notice is placed on the hood indicating that it is not to be used until its performance is within the specified performance parameters.

- 2.2.11. Non-venting hoods (e.g., laminar flow hoods with in-room venting) shall be clearly labeled as such.
- 2.2.12. No work with volatile hazardous chemicals shall be performed in hoods that do not vent outdoors.
- 2.2.13. Laboratory fume hoods are designed to protect the individual from exposure to chemicals and noxious gases.
- **2.3. Ventilation Modifications:** Laboratory hoods are not to be modified without the prior notification of the Laboratory Supervisor or designee, who will consult with the Health and Safety Committee prior to any modifications. Changes in airflow quantity and airflow patterns can significantly affect laboratory exposure potential. Therefore, the Laboratory Supervisor or designee will ensure that modifications will not degrade the safety of the laboratory environment. Modified hoods must be evaluated and tested prior to use.
- **2.4. Environmental Monitoring:** Regular instrumental monitoring of airborne concentrations is not usually necessary or practical on a routine basis in laboratories, but may be appropriate when testing or redesigning hoods or other ventilation devices, or when a highly toxic substance is used regularly (e.g., 3 times/week). All monitoring results shall be prominently posted and/or provided to applicable employees.
  - 2.4.1. Environmental Monitoring and Surveillance: Air sampling may be performed for any chemical process where the laboratory fume hood is not used to contain the contaminant. Air sampling will be performed where respiratory protection is required and/or will be performed upon the request of the Department Chair, Principle Investigator, or Laboratory Supervisor. Air sampling will be performed in any situation where there is reason to believe a PEL or similar exposure standard has been exceeded. Air sampling specifications, including frequency and test method, will be determined by the vendor doing the testing.
  - 2.4.2. **Routine Sampling:** Routine sampling will occur when initial monitoring results are at or above any applicable exposure limit or action level. National Institute of Occupational Safety and Health (NIOSH) or OSHA validated sampling methods, or equivalent methods, will be used to perform air sampling. Appropriate quality assurance will be used for all sampling and monitoring. Laboratory analysis shall

be performed by an American Industrial Hygiene Association (AIHA) accredited laboratory.

- 2.4.3. **Non-routine Sampling:** Non-routine sampling is conducted for short-term operations as necessary or when requested by laboratory personnel.
- **2.5. Eyewashes and Safety Showers:** Emergency eyewashes and showers are required through OSHA standard 1910.151 (c) to be present in all areas where "the eyes or body of any person may be exposed to injurious corrosive materials."
  - 2.5.1. Emergency eyewashes and showers should be located no more than 75 ft, or ten seconds travel time, from an area where hazardous materials are being used according to ANSI Z358.1-2014.
  - 2.5.2. Emergency eyewashes and showers should be clearly identified by a "highly visible sign."
  - 2.5.3. Eyewashes shall be inspected and flushed at least weekly to clear anything that might be present and to verify proper operation.
  - 2.5.4. All labs are required to document a weekly inspection and testing of the eyewash. Documentation of this testing should be kept visible in the laboratory.
  - 2.5.5. A safety shower should be present in or near all laboratory areas in which there is a potential for a toxicologically significant quantity of a hazardous chemical to be splashed onto the body. Safety showers are inspected and tested semiannually by Facility Operations and Laboratory Lead, Technician or Space Designee in conjunction with ANSI Z358.1-2014.
- **2.6. Fire Extinguishers:** A fire extinguisher must be present in or near each laboratory area. The fire extinguisher must be appropriate for the classes of fires possible in that particular laboratory. Laboratory Supervisors inspect fire extinguishers monthly and report deficiencies to Facilities. Facilities service fire extinguishers annually and corrects deficiencies as requested.

#### 3. Administrative Controls

**3.1. Standard Operating Procedures:** All Laboratory Workers, including students and visitors in areas where laboratory use of chemicals is conducted, will be aware of and follow the general principles for working safely with hazardous chemicals outlined in Chapter 5. These SOPs will be made easily accessible in each laboratory or working space. Additional SOPs for specific operations or working with Particularly Hazardous

Substances (PHS) will be detailed in Laboratory or Site-Specific CHP Addendum. Principle Investigators, Laboratory Supervisors, or designees are responsible for ensuring that all Laboratory works are trained in these additional SOPs prior to exposure to any hazards.

- **3.2. Training:** All Laboratory Workers, including students and visitors in areas where laboratory use of chemicals is conducted, must complete all laboratory safety training as outlined in Chapter 9 of this CHP. More specific training for particular materials, procedures, or hazards will be provided as necessary.
- **3.3. Prior Approval of Hazardous Operations:** Laboratory Workers anticipating using Particularly Hazardous Substances (PHS) must notify the Department Chairperson or designee prior to their initial use of the substance, by completing or revising an existing Laboratory or Site-Specific CHP Addendum. These plans will be reviewed by the Health and Safety Committee prior to the process of procuring and use of the substance. Responsibility for determining whether a chemical is a PHS lies with the individual planning to use the substance and the Department Chairperson or designee. PHS include, but are not limited to, reproductive toxins, carcinogens, and substances with a high acute toxicity (29 CFR 1900.1450(e)(3)(vii).
- **3.4. Signage and Labeling:** Laboratory Entrance and hazard signs are required by regulation and are a critical safety feature for laboratory personnel, public safety, and emergency responders. Laboratory signs should be posted at all entrances. In an open space laboratory design, each laboratory bench or working space will have signage indicating hazards specific to that area. The following signs are required for laboratories:
  - 3.4.1. Basic Laboratory Signage:
    - 3.4.1.1. Laboratory Entrance Sign, with the following information: Emergency Contact Information, Primary and Alternate Contact Information, List of Specific Hazards in Laboratory, List of PPE required for Laboratory, Prohibition against eating and drinking in Laboratory.
    - 3.4.1.2. Location signs for safety showers, eyewashes, fire extinguishers, and first aid equipment.
    - 3.4.1.3. Warning signs at areas or equipment where special or unusual hazards exist.

- 3.4.1.4. All standard laboratory refrigerators, freezers, and microwaves used for chemical storage or preparation must have "No food or drink allowed" labels clearly posted.
- 3.4.2. Hazardous Materials Containers:
  - 3.4.2.1. Labels on incoming containers of hazardous chemicals are not to be removed or defaced until the container is empty and triple rinsed.
  - 3.4.2.2. Secondary use containers (containers used for dispensing from bulk containers or containers of "made- up" chemical mixtures) should be labeled with complete chemical name, concentration, and the hazard class.
- **3.5.** Access Restriction: Areas in which Particularly Hazardous Substances, controlled substances, or sensitive materials are present may require access restriction as an administrative hazard control. Access will be restricted to individuals trained in minimizing potential exposure to the potential hazards and responding to unique incident or emergency response conditions related to these hazards. Access restriction may also take the form of limiting the length of exposure to a particular space or laboratory.
- **3.6. Housekeeping:** All Laboratory Workers, including students and visitors in areas where laboratory use of chemicals is conducted, will be aware of and follow the Standard Operating Procedures for housekeeping outlined in Chapter 5

#### 4. Personal Protective Equipment

Department Chairs and/or Directors or their designees are responsible for assessing laboratories or workplaces for any potential hazards that may require the use of Personal Protective Equipment (PPE). Laboratory workers will be trained in the effective use, adjustment, and removal of PPE for those areas, prior to exposure to any potential hazards. Principle Investigators, Laboratory Supervisors, and designees are responsible for ensuring proper care, maintenance, and disposal of PPE. PPE is not require in laboratories which have been appropriately designated and labeled as free of potential chemical hazards. PPE shall cover the following areas, as further outlined in the Standard Operating Procedures in Chapter 5 of this CHP: Respiratory Protection, Eye and Face Protection, Hand Protection, Foot Protection, Full Body Protection, Hearing Protection.

#### **1. General Prudent Practices:**

This Chemical Hygiene Plan requires that laboratory workers understand and follow basic procedures for working with chemicals. "Prudent Practices for Handling Hazardous Chemicals in Laboratories" may be used as a supplemental reference. The general principles listed below should be used for all laboratory work with chemicals.

 General Laboratory Safety Procedures: These procedures serve as general principles of safety in the laboratory, and are to be followed without exception by all Laboratory Workers, Students, and Visitors.

#### 2.1. Accidents and Spills

- 2.1.1. Know the appropriate emergency response procedures.
- 2.1.2. Eye Contact: Promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention.
- 2.1.3. Ingestion: Encourage the victim to drink large amounts of water only if this is an appropriate treatment for the exposure. This will be indicated in the SDS for that substance.
- 2.1.4. Skin Contact: Promptly flush the affected area with water and remove any contaminated clothing. If symptoms persist after washing, seek medical attention by contacting 911 or going to the nearest hospital emergency room.

#### 2.2. Avoidance of "Routine" Exposure

- 2.2.1. Avoid tasting or smelling hazardous chemicals.
- 2.2.2. Do not use mouth suction for pipetting or starting a siphon.
- 2.2.3. Wear adequate Personal Protective Equipment (PPE) at all times when working with chemicals or other hazards in the laboratory. Part 3 of this SOP includes more information on prudent use of PPE.
- 2.2.4. Wear closed-toed shoes at all times in the laboratory.
- 2.2.5. Shorts should not be worn in a laboratory.
- 2.2.6. Remove laboratory coats immediately upon significant contamination.
- 2.2.7. Remove gloves when exiting the laboratory or when handling clean items.

- 2.2.8. Do not allow toxic substances to be released in cold rooms and warm rooms, since these have contained, recirculated atmospheres.
- 2.2.9. Avoid distracting or startling other workers when they are handling hazardous chemicals.
- 2.2.10. Always be alert to unsafe conditions and actions and call attention to them so that corrective action can be taken as quickly as possible.
- 2.2.11. Determine the potential hazards and use appropriate safety precautions before beginning any new operation.

# 2.3. Choice of Chemicals

- 2.3.1. Carefully read the label before using an unfamiliar chemical and review the Safety Data Sheet (SDS) for special handling information.
- 2.3.2. Examine the known hazards associated with the materials being used and never assume all hazards have been identified.

#### **2.4.** Eating and Drinking in the Laboratory

- 2.4.1. Eating, drinking, smoking, handling contact lenses and applying cosmetics is strictly prohibited in areas where hazardous laboratory chemicals are used or are intended for use.
- 2.4.2. Storage of food and beverages in areas that are intended or are used for storage of hazardous laboratory materials is prohibited. Items used in areas of the laboratory that are contaminated with chemicals should remain in those areas.

#### 2.5. Equipment and Glassware

- 2.5.1. Handle and store laboratory glassware with care to avoid damage.
- 2.5.2. Inspect glassware before each use and do not use damaged glassware.

# 2.6. Exiting

- 2.6.1. Properly remove PPE, and dispose, store, or clean as required.
- 2.6.2. Wash areas of exposed skin thoroughly with soap and water before leaving the laboratory.

#### 2.7. Personal Housekeeping

- 2.7.1. Keep the work area clean and uncluttered, with chemicals and equipment properly labeled and stored.
- 2.7.2. Clean up the work area on completion of an operation and/or at the end of each day.

#### 2.8. Use of Fume Hoods

- 2.8.1. Use a fume hood for operations. This might result in release of toxic chemical vapors or dust.
- 2.8.2. Confirm adequate fume hood performance before use; keep fume hood closed at all times except when adjustments within the fume hood are being made.
- 2.8.3. Keep materials stored in fume hoods to a minimum and do not allow them to block vents or air flow.

#### 2.9. Waste Disposal

- 2.9.1. Follow established University chemical waste disposal procedures in accordance with guidance and requirements provided by OSHA.
- 2.9.2. Do not discharge to the sewer concentrated acids or bases; highly toxic, malodorous (bad smelling), or lachrymatory (causing the shedding of tears) substances; or any substances which might interfere with the biological activity of waste water treatment plants, create fire or explosion hazards, cause structural damage, or obstruct flow.

#### 2.10. Working Alone

- 2.10.1. Avoid working alone in the laboratory, particularly after hours for safety and security reasons,
- 2.10.2. The Laboratory Supervisor or Personnel is responsible for determining and implementing procedures to provide for emergency notification and periodic checks of an individual working "alone" in the laboratory or any unattended laboratory experiment. The extent of these precautionary measures will depend on the nature of the laboratory work and the degree of potential hazard.

- **3.** Personal Protective Equipment Selection Procedures: Personal protective equipment (PPE) is a term used to describe a variety of products worn by laboratory employees designed to protect those employees from safety and health hazards. Protective equipment is required anytime there is a possibility that the employee may be exposed to a hazardous chemical. The level of protection required depends on the specific hazards involved and the quantities of materials handled.
  - **3.1.** All laboratory personnel should have access to adequate PPE and all PPE should be examined before use to ensure that the equipment will be able to provide the needed level of safety. The Laboratory Faculty and/or Laboratory Manager, in conjunction with the Department Lead are responsible for assessing the risks present in each laboratory and determining the types and levels of protection required for the assigned tasks.
  - **3.2.** There are clear limitations to all types of PPE which must be considered when selecting equipment for any given task. Limiting factors for PPE protection include:
    - 3.2.1. Proper fit and selection
    - 3.2.2. Comfort vs. protection
    - 3.2.3. Restrictions to sight, hearing, touch, and movement
    - 3.2.4. Proper maintenance
    - 3.2.5. Equipment lifetimes
  - **3.3. Respiratory Protection** When efficient engineering controls are not possible, suitable respiratory protection should be provided. Respirator use must be approved by the Department Lead. Prior to respirator use, the wearer must be medically cleared, fit tested, and properly trained to ensure the respirator is adequate for the task and will function properly. All employees required to wear a respirator must be fit tested and trained annually for as long as they continue to have a need to wear a respirator.
  - **3.4. Eye Protection and/or Face Protection**: Eye protection is mandatory for all entries into a work area within a laboratory where hazardous chemicals are used. The Laboratory Faculty or Laboratory Lead will determine the level of eye protection required. All eye protection used should meet ANSI Z87.I requirements. Eye and/or face protection shall be worn whenever there is a procedure being performed on the bench top, in the chemical fume hood, or where there is a risk of splashes, explosion, or implosion.
  - **3.5. Hand Protection**: Wear appropriate gloves when the potential for contact with hazardous materials exists; inspect the gloves before each use, wash them before

removal, and replace them periodically. Gloves should not be worn outside of the laboratory. Disposable gloves should not be reused.

- **3.6. Foot Protection**: Adequate foot protection guards against foot injury due to glass breakage or accidental chemical spills. Open-toed shoes are prohibited when working with or around hazardous chemicals/reagents or in laboratories where they are present. Closed-toed shoes shall always be worn in laboratories to reduce the risk of injury to feet from spills, or objects dropped in the laboratory.
- **3.7. Full Body Protection:** One of the main forms of general protection is the lab coat. Lab coats shall be worn when required by a Laboratory Supervisor or as directed by a Laboratory or Site-Specific CHP Addendum. Lab coats are generally used whenever there is a possibility of splashes, spills, or other clothing contamination to anyone working in the laboratory. In situations where the possibility of a splash is high, such as acid washes, plasticized aprons and shoe coverings should be worn. Loose fitting long pants provide the best protection against accidental splashes. Shorts should not be worn in the laboratory.
- **3.8. Hearing Protection:** Hearing protection will be provided for anyone working in an area where the sound levels are at or above 85 dBa averaged over 8 working hours, or an 8-hour time-weighted average. Contact Facilities Services for measurement of noise levels, recommendations for proper hearing protection, and to evaluate the need for noise reduction engineering controls.
- **4.** Housekeeping and Maintenance Procedures: Housekeeping and Maintenance refer to activities done to ensure the cleanliness, orderliness, safety, and accessibility of laboratory spaces.

#### 4.1. Housekeeping:

- 4.1.1. Keep work areas clean and uncluttered while handling chemicals and equipment.
- 4.1.2. Clean up work areas upon completion of an experiment or procedure, or at the end of each workday.
- 4.1.3. Dispose of waste regularly according to Chapter 7 of this CHP.
- 4.1.4. A separate waste receptacle must be designated for non-contaminated broken glass. Follow Lindenwood University guidelines for disposal of contaminated glass.
- 4.1.5. Clean non-hazardous spills immediately and thoroughly.

- 4.1.6. Ensure a chemical spill kit is available and that employees know how to use the kit.
- 4.1.7. Assure hazardous chemicals are properly segregated into compatible categories.
- 4.1.8. Do not block exits, emergency equipment, or utility controls.
- 4.1.9. Do not use hallways and stairways as storage areas.
- 4.1.10. Minimum egress routes must be maintained at all times.

#### 4.2. Maintenance:

- 4.2.1. Fume Hoods: Laboratory Supervisors should clearly mark malfunctioning fume hoods with warning signs such as "Do Not Use" or "Needs Repair" if they are to be repaired. If the fume hood is not to be repaired, it should be labeled "Out of Service". Prior to resuming use of a fume hood that has been repaired or has been out of service, contact Facilities for re-certification by an approved vendor.
- 4.2.2. Eye Washes and Safety Showers: Malfunctioning eyewashes and safety showers should be marked "Do Not Use" and a portable wash station should be requested by the Laboratory Supervisor or designee. Laboratory personnel shall conduct and document weekly and "As Used" inspections (according to ANSI Z358.1-2014 standards) of the eyewash stations in their laboratory or the designated eyewash in the nearest common area. The weekly inspection should consist of operating the eyewash for several minutes, until the water runs clear, or as specified for the station type within Z358.1-2014.
- 4.2.3. Department Chairs, or designees and Facilities will coordinate semi-annual testing of all safety showers and eyewash stations.
- 5. Chemical Spill Response Procedures: Occasionally, and in spite of our best efforts to prevent them, accidents will occur in the laboratory. The most frequent accident in the laboratory is a chemical spill. The following procedures should be followed in the event of a chemical spill in your laboratory:
  - **5.1.** In the event of skin or eye exposure to a chemical, immediately flush the area with water for 15 minutes using the nearest eyewash or safety shower station.
  - **5.2.** Locate and implement the nearest Chemical Spill Kit, with special attention to any laboratory or site-specific SOPs for Particularly Hazardous Substances.
  - **5.3.** Evacuate the immediate area of the spill and adjacent areas.
  - **5.4.** Notify the Laboratory Supervisor and/or other Laboratory Workers in the area.

- 5.5. Contact the Department of Public Safety to report the spill and request assistance. Public Safety will contact the appropriate emergency personnel as needed. State that you have had a chemical spill. Provide Public Safety with:
  - 5.5.1. Correct spelling of the chemical name.
  - 5.5.2. Quantity of chemical spilled.
  - 5.5.3. Exact location of the spill, including building name and room number.
  - 5.5.4. Contact phone number at which you can receive a return phone call.

**5.6.** Follow all Accident or Injury Response Procedures outlined in this SOP.

- 6. Accident or Injury Response Procedures: Accidents involving fire or explosions will activate installed automatic alarm sensors and fire extinguishing systems. Where automatic systems do not exist, manual alarm pull stations are installed along egress routes and must be activated during evacuation. Accidents involving hazardous chemical spills, fires, or explosions shall be immediately reported to the Department of Public Safety. The Department of Public Safety will contact the appropriate emergency personnel.
  - **6.1.** Personnel at the immediate scene of the accident should take actions, based on their training, which will mitigate the extent of the accident without jeopardizing their health and safety. When in doubt, warn others in the area, evacuate the area, travel to a safe location, and contact the Department of Public Safety.
  - **6.2.** Reporting of accidents should be clear and concise, including the following information:
    - 6.2.1. Nature of the accident, type of hazardous material involved (biological, chemical, or radioactive).
    - 6.2.2. Specific hazardous material involved, if known (e.g. chemical name).
    - 6.2.3. Nature of any injuries.
    - 6.2.4. Location (Building and Room Number).
    - 6.2.5. Name of the caller.
    - 6.2.6. Return call phone number where caller can be reached (outside of the danger area).
  - **6.3.** Accidents involving exposure to Bloodborne Pathogens will follow all SOPs of the Bloodborne Pathogen Exposure Control Plan.

- **6.4.** Accident Investigation and Reporting: Accidents involving injury or illness must be reported on the Incident Investigation Report form, available from Human Resources. and distributed as indicated on the form. All other accidents and near accidents (injuries, fires, spills, explosions) shall be reported in writing to the Department Chair or designee as soon as possible after the occurrence. The Department Chair or designee, along with the Health and Safety Committee will analyze accidents and "near misses" and provide recommendations to the institutions for additional hazard controls and initiate reports as necessary to the proper authorities.
- 7. Prior Approval and Particular Hazardous Substance Procedures: In addition to adhering to general principles for laboratory safety, working with materials defined as Particularly Hazardous Substances requires additional consideration and approval.

#### 7.1. Working with Allergens and Reproductive Toxins

- 7.1.1. Allergens and Sensitizers: Allergens and Sensitizers are substances that cause most people to develop an allergic response after repeated exposure over time. Once sensitization to the substance occurs, allergic responses may occur from even minor exposure or low doses of the substance. Examples of allergens include diazomethane, isocyanates, bichromates, methyl methacrylate, and proteins (e.g. latex in rubber latex gloves).
- 7.1.2. Reproductive Toxins: Without special precautions, Reproductive Toxins may affect the reproductive health of women or men, including adverse effects on a fetus, chromosomal damage, malformations, and sterility. Examples of Reproductive Toxins include organomercurials (organic compounds containing mercury), lead compounds, and formamide.
- 7.1.3. The Department Chair or designee must review the use of Allergens or Reproductive Toxins prior to use, annually, and prior to implementing any procedural changes related to laboratory use of the substance. Plans for use of these substances must be detailed on a Laboratory or Site-Specific CHP addendum. These substances must be properly labeled and stored in an adequately ventilated area in an unbreakable secondary container.
- 7.1.4. A detailed plan for Preparation, Engineering and Administrative Controls, PPE, Spill and Accident Prevention, and related SOPs will be developed and approved prior to procuring and using any Allergens or Reproductive Toxins.

#### 7.2. Working with Carcinogens

- 7.2.1. Carcinogens are generally chronically toxic substances that cause cancer. Chronically toxic substances are particularly hazardous as they often have no immediately harmful effect, causing damage after repeated or long-term exposure. Select Carcinogens are materials identified by the National Toxicology Program or the International Agency for Research on Cancer as posing carcinogenic risk. Regulated Carcinogens are very hazardous carcinogenic substances requiring extensive engineering and administrative controls, adherence to regulatory limits for exposure, and personal exposure monitoring. Examples of chemicals of high chronic toxicity include, but not limited to, dimethylmercury, nickel carbonyl, benzo-a-pyrene, N-nitrosodiethylamine, and other human carcinogens or substances with high carcinogenic potency in animals.
- 7.2.2. The Department Chair or designee must review the use of chronically toxic substances prior to use, annually, and prior to implementing any procedural changes related to laboratory use of the substance. Plans for use of these substances must be detailed on a Laboratory or Site-Specific CHP addendum. These substances must be properly labeled and stored in an adequately ventilated area in an unbreakable secondary container.
- 7.2.3. A detailed plan for Preparation, Engineering and Administrative Controls, PPE, Spill and Accident Prevention, and related SOPs will be developed and approved prior to procuring and using any chronically toxic substances.

#### 7.3. Working with Chemicals of High Acute Toxicity:

- 7.3.1. A substance with a high acute toxicity may be fatal or cause significant health effects as the result of a single exposure or a series of exposures over a short amount of time. Substances of high acute toxicity may cause immediate health effects at low concentrations or exposures. High Acute Toxicity describes any chemical within the following OSHA categories ("Guidance for Hazard Determination":
  - 7.3.1.1. A chemical that has a median lethal dose (LD50) of more than 50 mg or less per kg of body weight when administered orally to test populations.
  - 7.3.1.2. A chemical that has an LD50 of 200 mg less per kg of body weight when administered by continuous contact for 24 hours to test populations.

- 7.3.1.3. A chemical that has a median lethal concentration (LC50) in air of more than 200 parts per million by volume or less of gas or vapor, or 2 mg per liter or less of mist, fume, or dust, when administered to certain test populations by continuous inhalation for one hour, provided such concentration and/or condition are likely to be encountered by humans when the chemical is used in any reasonably foreseeable manner.
- 7.3.2. The Department Chair or designee must review the use of chemicals with High Acute Toxicity prior to use, annually, and prior to implementing any procedural changes related to laboratory use of the substance. Plans for use of these substances must be detailed on a Laboratory or Site-Specific CHP addendum. These substances must be properly labeled and stored in an adequately ventilated area in an unbreakable secondary container.
- 7.3.3. A detailed plan for Preparation, Engineering and Administrative Controls, PPE, Spill and Accident Prevention, and related SOPs will be developed and approved prior to procuring and using any chronically toxic substances.

#### 1. Procurement of Chemicals

No chemical container shall be accepted without an adequate identifying label and delivery should be refused for any leaking containers. In order to minimize the presence of hazardous materials at the University, chemicals should be ordered in the smallest quantity needed to conduct the work. Limit the purchase of hazardous chemicals to containers equal to or less than five gallons each and consider using chemical from stocks already on campus. The Division of Sciences Chair and the Science Laboratory Lead shall be contacted in advance of any acquisition of chemicals that will not be purchased but transferred to Lindenwood University from another campus, university, or organization.

#### 2. Stockrooms/Storerooms

Hazardous substances should be segregated by hazard class, following manufacturer recommendations. Containers of potentially hazardous substance (PHS) materials should be placed in unbreakable secondary containers. Stored chemicals shall be examined periodically (at least annually) for replacement, deterioration, and container integrity. Stockrooms and storerooms should not be used as preparation or repackaging areas.

#### 3. Chemical Transport

Sealed chemical containers shall be transported in secondary containment, or on a wheeled cart with a design capable of containing leakage or spillage and negotiating uneven surfaces (e.g. expansion joints or floor drains) without tipping the chemical container or cart. Chemicals or chemical products (e.g. tubes in ice buckets, open flasks) that are not sealed shall be in closed containment during transport. Chemicals should be transported on elevators where possible and should always be sealed during transport.

Compressed gas cylinders should always be transported on cylinder carts which are equipped with straps or chains. It is always prudent to keep the valve cover in place while in transport and until the cylinder is secured in place and ready for use.

#### 4. Laboratory Storage of Chemicals

Chemicals will be stored so that incompatible chemicals are separated by hazard class and shall be stored upright and not be double stacked. Compatibility information is available on the chemical's safety data sheet and/or original container label. Refrigerators used for storage of flammable liquids should be explosion proof. New construction shall follow NFPA 45 for guidelines on flammable and combustible liquid storage. Cylinders of compressed gases shall be securely strapped or chained to a wall, bench top, or other sturdy structure. Close the gas cylinder valve at the top of the tank when not in use. Compressed gas cylinders shall be capped when in storage. All compressed gas cylinders and chemical containers should be stored away from heat sources and direct sunlight. Chemical storage in fume hoods and on bench tops should be minimized.

- To prevent injury, minimize environmental health hazards, and meet regulatory requirements, Lindenwood University hazardous waste generators (laboratory employees, Facilities Services workers, students, and visitors) must comply with strict chemical waste disposal procedures. All laboratory faculty and staff are accountable for the waste generated and disposed of in their laboratory.
- 2. The following information provides general guidance to ensure University waste is disposed of in a safe, environmental, and legal manner. Individuals may be held criminally liable for violations of applicable laws and regulations:
  - **2.1.** Do not dispose of hazardous chemicals via sink or trash cans.
  - **2.2.** Do not use fume hoods, ovens, or open containers to intentionally evaporate chemicals.
  - **2.3.** Do not store chemical waste outside the laboratory.
  - **2.4.** Do not abandon chemical waste in common areas.
- **3.** Minimize Initial Generation
  - **3.1.** Review each experimental protocol to assure that hazardous chemicals are used efficiently and that excess purchases are minimized. Laboratory faculty and staff are encouraged to conduct microscale processes to minimize hazardous materials used and generated. Whenever possible, use substances which can be neutralized or stabilized, either physically or chemically. Prior to purchasing chemicals consider substituting with a less hazardous material.

#### 4. Comply with Requirements for Waste Storage

- **4.1.** All chemical waste must be stored in appropriate containers designed for the chemical hazard class. Liquid waste must be in screw top containers only. The outside surfaces of containers must be clean and free of any contamination. Store chemical waste in a secure location or as designated by a Laboratory or Site-Specific CHP addendum.
- **4.2.** Chemical waste must be segregated into the appropriate hazard classes (flammables, acids, bases, oxidizers, toxics, etc.). When possible, keep solids, liquids, and gases separate.

#### 5. Appropriately Label Every Container Designated for Disposal

- **5.1.** All chemical waste containers must be identified and labeled with the words "Waste" or "Hazardous Waste".
- **5.2.** All chemical components must be listed. All constituents in solid and liquid mixtures must be identified. Their concentrations must also be listed, when such assessment is practicable.
- **5.3.** Any original label on the container must be defaced by clearly marking through the original label.
- **5.4.** The accumulation start date must be included, as chemical waste disposal is required at least within 365 days of accumulation.

# 6. Proper Chemical Waste Disposal

- **6.1.** Transferring chemical waste into appropriate containers is the generator's responsibility. Waste containers become the property of the waste removal vendor and cannot be returned to the laboratory.
- **6.2.** To discuss disposal procedures related to hazardous waste disposal, contact the Department Chairperson or Director, or Laboratory Supervisor.

# 7. Disposal of Non-hazardous Laboratory Waste Chemicals

- 7.1. Chemicals known to be non-hazardous and not RCRA-regulated may be discarded in the normal trash or sanitary sewer. Small amounts of non-hazardous chemicals may be placed in the regular trash if they are sealed, and clearly marked as "non-hazardous." Non-hazardous liquids may be discarded via sanitary sewer.
- **7.2.** To discuss disposal procedures related to non-hazardous waste disposal, contact the Department Chairperson or Director, or Laboratory Supervisor.

#### 1. Medical Consultation Policy

Medical consultation, surveillance, and follow-up treatment determined necessary by a physician will be provided to laboratory workers in the event of injury or hazardous exposure Additional policy and guidance for responding to exposures, incidents, and injuries can be found in the Bloodborne Pathogen Exposure Control Plan, the Faculty Handbook, and the Employee Handbook. These policies require reporting of incidents to Human Resources and other institutional entities as directed. Laboratory workers should seek medical attention, or will be provided with medical consultation or attention under the following conditions (as outlined in 29 CFR 1910.1450(g)(1):

- **1.1.** Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory.
- **1.2.** Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA-regulated substance for which there are exposure monitoring and medical surveillance requirements. The Health and Safety Committee is available for consultation in identifying OSHA-regulated substances and their monitoring or surveillance guidelines.
- **1.3.** Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure.

#### 2. Incident Reporting

In the event of a hazardous exposure or incident resulting in a likely hazardous exposure, laboratory works must notify the following:

- 2.1. The Laboratory Supervisor or immediate Laboratory Personnel
- **2.2.** Local emergency services, by calling 911 if the incident requires emergency response
- 2.3. Public Safety, at the number accessible in the Laboratory Entry Signage
- **2.4.** Human Resources, to initiate an Incident Report and authorization for medical treatment of Lindenwood University employees

#### 3. Medical Consultations

**3.1.** A medical consultation is a consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or

procedures, if any, are appropriate where a significant exposure to a hazardous chemical may have taken place. Where medical questionnaire, surveillance, or examination guidance exists for OSHA-regulated substances, these criteria will be included in the physician's exam. For examinations resulting from exposures to OSHAregulated substances, the examination frequency will be the period set within the OSHA standard. For examinations resulting from potential overexposure to other hazardous substances, the physician will determine the examination frequency.

- **3.2.** As part of the medical examination or consultation, the employer will provide the following information to the examining physician:
  - 3.2.1. The identity of the hazardous chemical(s) to which the employee may have been exposed.
  - 3.2.2. A description of the conditions under which the exposure occurred including quantitative exposure data.
  - 3.2.3. A description of the signs and symptoms of exposure that the employee is experiencing.
- **3.3.** Upon completion of the examination or consultation, the employer will obtain a written opinion from the examining physician. Reports from physicians about employees may not reveal specific findings or diagnoses unrelated to the occupational exposure. This report will include:
  - 3.3.1. Recommendations for any required medical follow-up.
  - 3.3.2. Results of the medical examination and any associated tests.
  - 3.3.3. Any medical condition revealed during the medical examination examination that may place the worker at increased risk as a result of exposure to a hazardous workplace.at increased risk of exposure to similar hazard in a laboratory environment

A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

#### 1. Scope of Training

- 1.1. The training requirements provided in this CHP apply to individuals operating at Lindenwood University as "laboratory workers," as defined by OSHA. This would apply to Lindenwood University faculty, staff, or any individual employed in a laboratory worker capacity. Students and visitors operating as laboratory workers are expected to adhere to these training requirements.
- **1.2.** If a laboratory worker is required to complete additional training, such as for use of Particularly Hazardous Substances, these additional requirements should be described in a Laboratory or Site-Specific CHP.
- 1.3. Applicable elements of this training policy serve as a guideline to all employees at Lindenwood University. Employees working with potentially hazardous substances outside of the "laboratory use" definition may have alternative or additional training requirements.

# 2. Chemical Hygiene Plan Training

- **2.1.** The purpose of Chemical Hygiene Plan training is to provide laboratory workers with general information about the physical and health hazards of hazardous chemicals in their work area and of the methods and procedures employees should follow to protect themselves from these materials. All laboratory workers must be aware of the location and availability of the CHP. The Principle Investigator, Laboratory Supervisor, or designee is responsible for ensuring CHP training has been completed and documented. Training specific to the CHP will be provided in the following ways:
  - 2.1.1. Laboratory workers who are employees of Lindenwood University will be provided the CHP and instructed to review it prior to engaging in the laboratory use of or exposure to chemicals.
  - **2.1.2.** Students are not considered Laboratory Workers by OSHA, but will be provided access to the CHP and required to complete all training assigned by their Instructor, Laboratory Supervisor, or designee.
  - **2.1.3.** Visitors will be provided access to the CHP and required to complete all training assigned by their Instructor, Laboratory Supervisor, or designee.

#### 3. Laboratory Safety and Compliance Training

**3.1.** Laboratory workers will be required to complete additional training specific to laboratory and chemical safety. These training requirements will be provided to laboratory workers, students, and visitors by each School and its designees. Lindenwood University provides laboratory and chemical safety in person, online, or through additional classroom-based or laboratory-specific modes. Safety training assigned as part of a course may meet the requirements of this policy. Principle Investigators, Laboratory Supervisors, and designated Laboratory Personnel are responsible for ensuring laboratory workers have completed and documented all required laboratory and chemical safety training prior to engaging in the laboratory use of or exposure to chemicals.

#### 4. Laboratory or Site-Specific Training

A Laboratory or Site- Specific CHP may require additional training specific to chemical hazards or exposures. The Principle Investigator, Laboratory Supervisor, or designee for a specific CHP is responsible for ensuring individuals covered by the CHP have completed and documented all required training. Additional training is required, but not limited to, the following circumstances:

- **4.1.** Use of any Particularly Hazardous Substance. These additional training requirements will be reviewed by the Health and Safety Committee on a case-by-case basis.
- 4.2. Use of any radiation producing equipment or materials with potential radiation exposure. These additional training requirements will be reviewed by the Radiation Safety Committee and reported to the Health and Safety Committee on a case-by-case basis.

- 1. The Occupational Safety and Health Administration (OSHA) requires all chemical manufacturers, wholesalers, and distributors to provide Safety Data Sheets (SDS) for the products which they produce and sell. OSHA also requires that employers maintain in the workplace, copies of the SDS for each hazardous chemical. Proper labeling of materials is required at all times as well as making every worker aware of an accessible online database containing all SDS sheets.
- 2. Laboratory Supervisors and Principle Investigators, or their designees, are responsible for ensuring compliance with SDS requirements and OSHA-compliant Hazard Communication standards outlined in the Lindenwood University Hazard Communication Plan (HazCom. The following platforms are available for ensuring compliance with this CHP:
  - **2.1.** Laboratories, studios, and spaces in which faculty, staff, and students engage in the use of chemicals for instruction, training, or research develop and maintain SDS libraries in approved management systems.
  - **2.2.** Facilities and operations spaces in which staff engage in the use of chemicals for daily operations and maintenance develop and maintain SDS libraries in the SafeColleges SDS management system.
- **3.** With any chemical, it is prudent to consult the SDS before use. In general, a SDS consists of the following sections:
  - 3.1. Chemical Identification
  - 3.2. Hazards Identification
  - 3.3. Composition/Information on Ingredients
  - **3.4.** First-Aid Measures
  - **3.5.** Fire-Fighting Measures
  - 3.6. Accidental Release Measures
  - **3.7.** Handling and Storage
  - 3.8. Exposure Controls and Personal Protection
  - 3.9. Physical/ Chemical Properties
  - 3.10. Stability and Reactivity
  - 3.11. Toxicological Information
  - 3.12. Ecological Information
  - 3.13. Disposal Considerations

- 3.14. Transport Information
- 3.15. Regulatory Information