

Saint Louis University

CHEMICAL HYGIENE PLAN

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SAINT LOUIS UNIVERSITY
CHEMICAL HYGIENE PLAN

FOR:

(Principal Investigator/Laboratory Manager)

(Building/Room Location)

(Department)

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PURPOSE

All laboratories using hazardous chemicals are required to comply with the Occupational Safety and Health Administration (OSHA) [29 CFR 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories](#). This standard requires that the employer develop a written Chemical Hygiene Plan (CHP), which is capable of protecting employees from the health hazards associated with hazardous chemicals in the laboratory. This document is Saint Louis University's Chemical Hygiene Plan (CHP) and is intended to highlight those laboratory practices that are necessary for protecting work from exposure to hazardous chemicals. The CHP serves as a general safety document for laboratories. In addition to having the CHP available in the laboratory, each laboratory shall develop and provide laboratory site-specific standard operating procedures and training for all hazardous chemical substances.

POLICY

Saint Louis University is dedicated to providing safe laboratory facilities for employees and students, and for complying with federal, state, and local occupational health and safety standards. Principal investigators, laboratory managers, faculty, staff, and students all share the responsibility for minimizing their exposure to hazardous chemicals. Laboratory employees must not be exposed to chemicals in excess of the permissible exposure limits (PEL) specified in OSHA standard 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances. This standard applies where "laboratory use" of hazardous chemicals occurs. OSHA 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 specific laboratory practices and equipment are available and in common use to minimize the potential for employee exposures to hazardous chemicals. The Chemical Hygiene Plan (CHP) shall be reviewed and evaluated at least annually for its effectiveness, and updated as necessary. It shall be made available to all laboratory employees and employee representatives. Each laboratory must have access to a copy of the CHP. The electronic version of the CHP is located at <http://oess.slu.edu>

1. GENERAL PRINCIPLES FOR WORK WITH LABORATORY CHEMICALS

A. Minimize Chemical Exposures

It is prudent to minimize all chemical exposures and observe good laboratory practices by working in a chemical fume hood wearing eye and hand protection, and a laboratory coat or apron. The rule of thumb in working with hazardous chemicals is that all work with these materials in a laboratory should

Implementation of these CHP procedures is a regular, continuing effort requiring support from administration and faculty. Saint Louis University faculty and staff working in laboratories shall follow the safe regulations and recommendations within the CHP to ensure that laboratories are safe.

E. Observe the PELs and TLVs

The OSHA permissible exposure limits (PEL) and the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLV's) should not be exceeded. This may be achieved by a combination of experimental design and engineering controls. In general, use of a fume hood is recommended when working with a volatile substance.

- Providing for the disposal of hazardous chemical waste.
- Assisting Facilities Management with incorporating chemical safety in new construction and renovations.
- Remaining current on regulatory issues.
- Completion of annual and semi-annual laboratory safety inspections to ensure safety and regulatory compliance.
- Providing CHP and general laboratory safety training to all laboratory employees
- Providing disposal requirements and guidelines for both hazardous and non-hazardous chemical waste.
- Providing chemical hazard awareness training to ancillary employees.
- Conducting exposure assessments as needed, and upon request, for laboratory employees.
- Investigate reported workplace injuries from chemical exposures and incidents.

F. Principal Investigators/Laboratory Managers (PI/LM)

The Principal Investigators and/Laboratory Managers shall:

- Implement all provisions of the CHP for laboratory facilities under their control.
- Ensure all laboratory employees can easily access the CHP and review annually.
- Complete a laboratory specific training outline and document annual training.
- Maintain a hazardous chemical inventory and ensure annual review of the inventory.
- Maintain a hard copy of each Material Safety Data Sheet (MSDS) and update annually.
- Ensure that employees are familiar with the location of MSDS in the laboratory.
- Make available appropriate personal protective equipment (PPE) for all laboratory employees.
- Notify OEHS in advance when the need to use a respirator is identified.
- Ensure that designate eye wash stations in their laboratory are adequate and inspected weekly.
- Ensure that facilities, equipment, and materials are adequate for intended use.
- Ensure preparation, maintenance and implementation of written standard operating procedures (SOP) regarding safety and health considerations for each procedure involving hazardous chemicals.
- Train laboratory employees regarding the specific work practices and procedures according to the provisions of their laboratory specific SOPs.
- Complete or ensure completion of the injury/illness form and consult with Employee Health for workplace injuries.
- Report to the Chemical Hygiene Officer (CHO) all workplace injuries relating to chemical exposures, laboratory incidents, or other unsafe conditions.
- Report any use of or repair necessary for designated emergency equipment.

3. LABORATORY FACILITY

A. Design

Saint Louis University laboratories in which hazardous chemicals are present or used shall have the following minimum safety features within the immediate area or close proximity:

- An appropriate general ventilation system with air intakes and exhausts located so as to avoid intake of contaminated air.
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Laboratory Fume Hoods

Laboratory fume hoods shall be provided, installed and operated according to manufacturer specifications.

- When the hood sash is open approximately five inches, an average face velocity of 100 ft/min is required.
- The hood enclosure should be fire and chemical resistant.
- 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.
- All fume hood modifications shall be approved by OEHS; i.e., those that do not detract from the hood performance.
- 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.
 - The hood shall have a monitoring device to measure airflow.
- It is recommended that the utility controls be outside of the hood.
- The fume hood should be appropriate for the material used within (e.g., perchloric acid usage).
- Airflow shall be such that contaminants do not escape the fume hood. A smoke tube test may be performed to ensure airflow is adequate.
- Each laboratory fume hood at Saint Louis University is tested and certified annually for usage and performance. When 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.
- Non-venting hoods (e.g., laminar flow hoods with in-room venting) shall be clearly labeled as such.
- No work with volatile hazardous chemicals shall be performed in hoods that do not vent outdoors. Exhaust air from glove boxes and isolation rooms should release into the fume hood exhaust system.

Laboratory fume hoods are designed to protect the individual from exposure to chemicals and noxious gases. However, when laboratory work is performed inside a biological safety cabinet that is designed to protect the employee and environment from biological agents and to protect research materials from contamination. It is important to know the difference between a biological safety cabinet and a chemical fume hood prior to use.

Special Ventilation Devices

Procedures involving radioactive aerosols, powders or gaseous products, or procedures that could produce volatile radioactive effluents shall be conducted in an approved fume hood, glove box or other suitable closed system. Such fume hoods shall be designed with smooth, non-porous materials and possess adequate lighting to facilitate work within. The hoods shall have a minimum face velocity of 100 ft/min. Contact the

Radiation Safety Office for further information on fume hoods for radioactive materials.

Modifications

Laboratory hoods are not to be modified without consultation of the Chemical Hygiene Officer. Changes in airflow quantity and flow patterns can significantly affect laboratory exposure potential. Therefore, the Chemical Hygiene Officer will ensure that modifications will not degrade the safety of the laboratory environment. Modified hoods must be evaluated and tested by OEHS prior to use.

4. BASIC RULES AND PROCEDURES FOR WORKING WITH CHEMICALS

6. Exiting
 - Wash areas of exposed skin thoroughly with soap and water before leaving the laboratory.
7. Horseplay
 - Avoid distracting or startling other workers when they are handling hazardous chemicals.
8. Mouth Suction/Mouth Pipetting
 - Do not use mouth suction for pipetting or starting a siphon.
9. Personal Housekeeping
 - Keep the work area clean and uncluttered, with

13. Vigilance

- Always be alert to unsafe conditions and call attention to them so that corrective action can be taken as quickly as possible.

14. Waste Disposal

- Follow established University chemical waste disposal procedures in accordance with guidance and requirements provided by OEHS.
- 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.
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Safety and Security Services (SSS) of all incidents of exposure or spills. Consult the Employee Health physician or another qualified physician when appropriate.

D. Working with Chemicals of Moderate Chronic or High Acute Toxicity

Any intended use or possession of chemicals of moderate chronic or high acute toxicity must be reported to OHS prior to use. Examples of chemicals of moderate chronic or high acute toxicity include diisopropyl fluorophosphate, hydrofluoric acid, and hydrogen cyanide. Supplemental

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E. Working with Chemicals of High Chronic Toxicity

Any intended use or possession of chemicals of high chronic toxicity must be reported to OEHS prior to use. Examples of chemicals of high chronic toxicity include dimethylmercury, nickel carbonyl, benzopyrene, N-nitrosodiethylamine, and other human carcinogens or substances with high carcinogenic potency in animals.

Further supplemental rules to be followed in addition to all those mentioned above, for work with substances of known high chronic toxicity (in quantities above a few milligrams to a few grams, depending on the substance) include:

1. Preparation:

- Report the presence and intended use of these chemicals to OEHS prior to initial use.
- Develop and document adequate training for employees working with or in the presence of these chemicals.
- Prepare a plan for use and disposal of these materials and obtain the approval of the laboratory supervisor and chemical hygiene officer.

2. Location and Engineering Controls:

- Conduct all transfers and work with these substances in a "controlled area" such as a restricted access hood, glove box, or portion of a lab designated for use of highly toxic substances for which all people with access are aware of the substances being used and necessary precautions.
- For a negative pressure glove box, ventilation rate must be at least 2 volume changes/hour and pressure at least 0.5 inches of water. For a positive pressure glove box, thoroughly check for leaks before each use. In either case, trap the exit gases or filter them through a HEPA filter and then release them into the hood.
- Protect vacuum pumps against contamination with scrubbers or HEPA filters and vent them into the hood. Decontaminate vacuum pumps or other contaminated equipment, including glassware, in the controlled area before removing them from the controlled area. Decontaminate the controlled area before normal work is resumed there.

3. Personal Protective Equipment and Practices:

- On leaving a controlled area, remove protective apparel (placing it in an appropriate, labeled container) and thoroughly wash hands, forearms, face, and neck.
- Use a wet mop or a vacuum cleaner equipped with a HEPA filter instead of dry sweeping if the toxic substance was a dry powder.
- If using toxicologically significant quantities of such a substance on a regular basis (e.g., 3 times per week), consult the Chemical Hygiene Officer, the Office of Environmental Health and Safety, and the Employee Health physician concerning advisability of regular medical surveillance.

- Keep accurate records of the amount of these substances stored and used along with the dates and names of users.
 - Ensure that the controlled area is conspicuously marked with warning and restricted access signs and that all containers of these substances are appropriately labeled with identity and warning labels.
4. Prevention of Spills and Accidents:
- Ensure that contingency plans, equipment, and materials to minimize exposures of people and property in case of an accident, are available.
 - Store containers of these chemicals only in a ventilated, limited access area in appropriately labeled, unbreakable, chemically resistant, secondary containers.
 - Use chemical decontamination whenever possible. Ensure that containers of contaminated waste (including washes from contaminated flasks) are transferred from the controlled area to a secondary container under the supervision of authorized personnel.

F. Animal Work with Chemicals of Chronic Toxicity Including Carcinogens

Special facilities with restricted access are preferable when conducting animal work with chemicals of chronic toxicity. Other special precautions include:

1. Preparation:
 - All work with animals shall be approved by Comparative Medicine prior to use.
 - All animal protocols involving carcinogens shall be approved by the Chemical Hygiene Officer.
2. Engineering Controls/Aerosol Suppression:
 - When possible, administer the substance by injection or gavage instead of in the diet. If administration is in the diet, use a feeding system under negative pressure or in a certified Biological Safety Cabinet.
 - Devise and utilize procedures to minimize formation and dispersion of contaminated aerosols, including those from food, urine, and feces (e.g., use HEPA filtered vacuum equipment for cleaning).
 - Moisten contaminated bedding for removal from the cage.
3. Personal Protective Equipment and Practices:
 - Wear appropriate gloves, clothing, respiratory protection, and eye protection while working in the animal room.
4. Waste Disposal
 - Dispose of contaminated animal bedding and excreta properly and according to the protocol and standard operating procedures.

5. CHEMICAL PROCUREMENT, DISTRIBUTION AND STORAGE

A. 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. Consider using chemical from stocks already on campus. OEHS shall be notified in advance of any acquisition of chemicals that will not be purchased but transferred to Saint Louis University from another university or organization.

B. 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.

C. 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 secondary containment during transport. Chemicals should be transported on freight 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.

D. Laboratory Storage of Chemicals

Chemicals will be stored so that incompatible chemicals are separated by hazard class and shall not be double stacked. Complete information is available on the chemical's material 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 secured, 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 fume hoods and on bench tops should be

6. 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.

A. Environmental Monitoring and Surveillance

Air sampling may be performed for any chemical process where the laboratory fume hood, filtered glove box or comparable exposure control device 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 Principal Investigator, Laboratory Manager or laboratory employee. 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, includ

7. HOUSEKEEPING, MAINTENANCE, AND INSPECTIONS

A. Housekeeping

Safety comes from good housekeeping practices. Use the following guidelines to maintain an orderly laboratory:

- Keep work areas clean and uncluttered with chemicals and equipment.
- Clean up work areas upon completion of an experiment or procedure, or at the end of each work day.
- Dispose of waste regularly according to Chapter 14 (Waste Disposal Guidelines).
- A separate waste receptacle must be designated for non-contaminated broken glass. Follow SLU guidelines for disposal of contaminated glass.
- Clean non-hazardous spills immediately and thoroughly.
- Ensure a chemical spill kit is available and that employees know how to use it.
- Do not block exits, emergency equipment controls or use hallways and stairways as storage areas.
- Assure hazardous chemicals are properly segregated into compatible categories.

Stairways shall not be used for storage. Hallways and corridors shall not be used for storage. Access to exits, emergency equipment, and utility controls must never be blocked. Minimum egress routes must be maintained at all times.

B. Maintenance

Facilities Services should be contacted if safety equipment is malfunctioning.

1. Fume Hoods: Malfunctioning fume hoods should be clearly marked with warning signs such as "Do Not Use" or "Needs Repair"

Housekeeping and chemical hygiene inspections are recommended and should be routinely conducted by the principal investigator, laboratory manager, or appointed representative. Use of the Environmental Safety Laboratory Inspection Form is encouraged unless the laboratory PI affixes a checklist specific to their laboratories.

8. MEDICAL PROGRAM

9. PERSONAL PROTECTIVE EQUIPMENT AND APPAREL

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 whenever there is a possibility that the employee may be exposed to a hazardous chemical by absorption or inhalation. The level of protection required depends on the specific hazards involved and the quantities of materials handled.

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:

- Proper fit and selection
- Comfort vs. protection
- Restrictions to sight, hearing, touch, and movement
- Proper maintenance
- Equipment lifetimes

All laboratory employees 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 P.I. or Laboratory Manager in conjunction with OEHS and Employee Health, are responsible for assessing the risks present in their laboratory and determining the types and levels of protection required for the assigned tasks.

A. Respiratory Protection

When efficient engineering controls are not possible, suitable respiratory protection should be provided. Respirator use must be approved by OEHS and Employee Health. Prior to respirator use, the wearer must be medically cleared, fit tested, and properly trained to ensure that 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.

B. Protective Clothing

1. Lab Coats/Lab Aprons: One of the main forms of general protection is the lab coat. Lab coats shall be worn whenever there is a possibility of splashes, spills, or other clothing contamination to laboratory personnel. In situations where the possibility of a splash is high, such as acid washes, plasticized aprons and shoe coverings should be worn.
2. Shoes: Closed-toed shoes shall always be worn in laboratories to reduce the risk of injury to feet from spills, objects dropped in the laboratory. s to ad015 a spiTf 2, -d in t -.4

consulted as a resource for clothing selection. Protective clothing shall be inspected prior to each use.

C.

6. Foot Protection

Adequate foot protection guards against injury due to glass breakage or accidental chemical spills. Open-toe shoes are prohibited when working with or around hazardous chemicals/reagents or in laboratories where they are present.

10. RECORDS

The Saint Louis University Risk Management and Insurance Department maintains all university illness and accident reports. Employee Health maintains all medical records relating to all reported chemical exposures and potential chemical exposures. OEHS maintains all laboratory safety inspections and chemical fume hood certification records.

11. SIGNS AND LABELS

A. Basic Laboratory Signage

The following signs shall be prominently posted:

- Emergency telephone numbers (posted near the phone).
- Location signs for safety showers, eyewashes, fire extinguishers, and first aid equipment.
- Warning signs at areas or equipment where special or unusual hazards exist.
- Laboratory entry hazard warning signs with emergency contact numbers.

B. Refrigerator, Freezer, Cold Room and Microwave Signage

All standard laboratory refrigerators, freezers, cold rooms and microwaves used for chemical storage or preparation must have the following labels clearly posted:

- NOT FOR FOOD OR DRINK
- DO NOT STORE FLAMMABLES/SOLVENTS IN THIS REFRIGERATOR/
FREEZER

C. Hazardous Materials Containers

The following rules for hazardous materials containers shall be followed:

- Labels on incoming containers of hazardous chemicals are not to be removed or defaced until the container is empty and triple rinsed.
- 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.

12. SPILLS, ACCIDENTS AND EMERGENCY RESPONSE

A.

Personnel at the immediate scene of the event 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 DPSSS.

C. Accident Investigation and Reporting

Accidents involving injury or illness must be reported on the Injury/Illness Report form (available from Human Resources and Employee Health) and distributed as indicated on the form. All other accidents and near accidents (injuries, fires, spills, explosions) shall be reported in writing to OEHS as soon as possible after the occurrence. OEHS will analyze accidents and “near misses” and provide recommendations to the employee and report necessary to the proper authorities.

D. Emergency Response

The University Emergency Response Guide provided by the Department of Public Safety and Security Services is available from OEHS and should be posted in each laboratory. This document identifies the following response procedures:

- Fire
- Earthquake
- Tornado
- Police Emergency
- Bomb Threat
- Chemical Spill
- Radioactive Spill
- Loss of Utilities
- Medical Emergency
- Explosion
- Workplace Violence

13. TRAINING

A. Chemical Hygiene Plan Training

The purpose of Chemical Hygiene Plan training is to provide employees 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 employees must review the contents of the chemical hygiene plan on their first day of employment in the laboratory or prior to the start of laboratory

14. CHEMICAL WASTE DISPOSAL

To prevent injury, minimize environmental health hazards, and meet regulatory requirements, SLU hazardous waste generators (laboratory P.I.s, L.M.s, and staff) must comply with strict chemical waste disposal procedures. All laboratory faculty and staff are

disposal of the chemical waste containers within one year of the accumulation start date.

D. Properly Segregate Hazardous Waste

Chemical waste must be segregated into the appropriate hazard classes (flammables,

15. MATERIAL SAFETY DATA SHEET (MSDS)

The Occupational Safety and Health Administration (OSHA) requires all chemical manufacturers, wholesalers, and distributors to provide Material Safety Data Sheets (MSDS) for the products which they produce and sell. OSHA also requires that employers maintain in the workplace, copies of the MSDS for each hazardous chemical. MSDS are required to be accessible at all times work is being conducted. With any chemical, it is prudent to consult the MSDS before use. In general, MSDS consists of the following sections:

1. Chemical Identification
2. Composition/ Information on Ingredients
3. Hazards Identification
4. First-Aid Measures
5. Fire-Fighting Measures
6. Accidental Release Measures
7. Handling and Storage
8. Exposure Controls and Personal Protection
9. Physical/ Chemical Properties
10. Stability and Reactivity
11. Toxicological Information
12. Ecological Information
13. Disposal Considerations
14. Transport Information
15. Regulatory Information

Typically, MSDS are shipped with the chemical order or you may contact the manufacturer