University of North Texas at Dallas

Chemical Hygiene Plan

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Introduction

Policy Statement

The University of North Texas at Dallas (UNTD) recognizes its legal and social obligations to provide a safe working environment and believes students, faculty, and staff have a right to know about health hazards associated with their work. This manual includes responsibilities, policies, and procedures designed to develop an awareness of potentially hazardous chemicals in a laboratory and to promote safe laboratory practices.

The University of North Texas at Dallas assumes the responsibility for laboratory safety. Students and employees will obtain access to pertinent safety information through their supervisory staff or the departmental Laboratory Safety Officer. When safety concerns arise, students are encouraged to contact their instructor. An important aspect of the Chemical Hygiene Plan is that once a person is given the basic training and information, they will take every effort to protect themselves.

The eventual success of this safety and health program is a result of the joint efforts and responsibility of the laboratory students, instructors, and the administration of UNTD. The university places a high priority on the establishment of safe and healthful learning environment through the leadership and participation of all members of the organization.

Background

The Occupational Safety and Health Administration (OSHA) promulgated the Laboratory Standard, 29CFR 1910.1450, Occupational Exposures to Hazardous Chemicals in Laboratories. The standard mandates that any laboratory, or organization of laboratories, which handle hazardous chemicals will prepare and implement a chemical hygiene plan.

This Chemical Hygiene Plan (CHP) meets the standards set by OSHA. This guide includes specific measures taken to ensure personal protection and includes the following elements:

1. Standard Operating Procedures (SOP) relevant to safety and health considerations
2. Provisions for hazard identification and evaluation, including the criteria used to determine and implement control measures such as engineering controls and personal protective equipment
3. Requirements for the proper functioning of laboratory fume hoods and other protective equipment
4. Provisions for training and information
5. Procedures and laboratory usage that require prior approval
6. Provisions for medical consultation and examination
7. Designation of personnel responsible for implementation
8. Procedures for hazardous waste disposal
9. Procedures for spills
10. Procedures for record maintenance

Laboratory Definition

In 29 CFR 1910.1450, a laboratory is defined as:

> *Laboratory* means a facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

For the purposes of this document, the following definition of laboratory will apply:

> *Laboratory* is a room or space (to include closets and support chase ways) provided for instructional, observation, measurement, or other research activities that includes chemical, biological and/or radiological materials, or contains physical or mechanical equipment, in a non-production environment.

Categories of laboratories covered under this definition include:

- Art
- Biological
- Chemical
- Environmental
- Engineering
- Physical

Hazard Identification and Evaluation

Criteria for Control Measures

NOTE: Proposals must be submitted to Risk Management Services (RMS) for approval prior to starting any experiments using or producing highly toxic, flammable, explosive, or otherwise potentially dangerous conditions.

Evaluating whether special handling precautions are warranted will require examination of a number of factors in order to formulate handling recommendations, including:

- Potential for routine airborne exposure
- Potential for routine dermal exposure
- Potential for accidental exposure
- Quantities of chemicals processed
- Composition of mixtures containing special hazards
- Previous history of accidents or illnesses in the area
- Physical and chemical properties of the chemical
- Exposure controls currently utilized
- Chemical stability of the chemical
- Available toxicological and health effect data

Based on the results of the hazard evaluation, recommendations for special handling requirements could include:

- Application of written Standard Operating Procedures (required for especially hazardous substances, e.g., explosives and flammables)
- Training that must be completed prior to assigning any tasks
- Establishment of designated handling areas
- Posting of warning signage, experiment description, and emergency contact
- Exposure monitoring requirements
- Use of laboratory fume hoods or local exhaust
- Prior fit testing and instruction in the proper use of respiratory protection equipment (Risk Management Services (RMS) for more information)
- Special hygiene requirements
- Use of protective clothing
- Decontamination procedures
- Procedures for removal of contaminated material
- Proper method for hazardous waste removal. Contact Risk Management Services (RMS) to request a hazardous waste pickup.

Chemical Inventory

A chemical inventory is conducted annually that lists all hazardous chemicals in laboratories. Chemicals listed are those classified as hazardous by any of the following:

- Department of Transportation (DOT)
- Environmental Protection Agency (EPA)
- Occupational Health and Safety Administration (OSHA)
- Displaying a 3 or greater number in any section of the National Fire Protection Association (NFPA) diamond
- Listed in Schedules I through V in the DEA list of Controlled Substances (See Appendix F for the list of Controlled Chemicals)

DOT and EPA classifications as listed in their respective literature or listed in Schedules I through V in the DEA list of Controlled Substances (see Appendix F for the list of Controlled Chemicals and Appendix G for the list of Glassware Used in Drug Making). The Standard recommends that reproductive toxins, highly toxic materials and carcinogens be identified and listed on an additional chemical inventory for highly toxic materials and carcinogens.

Chemicals are listed alphabetically according to the product name. The chemical name, manufacturer, and amount in storage are listed. Appendix H includes chemicals of interest and Screening Threshold Quantities (STQ) from Homeland Security Department. Any chemicals exceeding the STQ quantities must be reported for security issues.

Safety Data Sheets (SDSs)

Safety Data Sheets (SDSs) are supplied by the chemical manufacturer, both physical copy and online, and provide information regarding the product's physical, chemical and toxicological characteristics, methods for safe handling, storage and disposal, and personal protective measures for contact and spills.

Hazard evaluation relies on the chemical manufacturer's provided information to ascertain whether or not the chemical is hazardous. Orders for chemicals shall include a request for the product SDS.

NOTE: The master binders containing SDSs are kept in each laboratory where the chemicals are used, that is rooms 247, 248, 255, and 256 in Founders Hall.

Labeling

29 CFR 1910.1450 contains specific chemical labeling requirements. Labeling is required for all hazardous chemicals that are manufactured, shipped, and used in the workplace. The manufacturer's labels must not be removed or defaced unless the chemical has been used completely, the container thoroughly cleaned, and there is a plan to repurpose it for waste.

Chemical manufacturers, importers, and distributors are required to label each container of hazardous chemical leaving their facility with the following information:

1. Identity of the hazardous chemical
2. Appropriate hazard warnings
3. Name and address of the manufacturer

Each chemical transferred outside of the laboratory that is not in its original container must also be labeled. These workplace labels must contain SDS information as follows:

1. Identity of the hazardous chemical
2. Route of entry (e.g. eyes, nose, ingestion, or skin)
3. Health hazard
4. Physical hazard
5. Target organ affected

An example of an in-house label is shown below:

Acetic Acid	
Route of Entry	Eyes, Skin, Nose
Health Hazard	Poison
Physical Hazard	Corrosive
Target Organs	Skin and Lungs

Standard Operating Procedures

Laboratory Safety Officers

Laboratory Safety Officers (LSOs) are department or area-specific resources who are qualified by training or experience to provide technical laboratory safety guidance in the school or unit assigned. LSOs are useful in helping to create and enhance a safe laboratory working environment.

Assignment of an LSO

Department chairs (or corresponding school deans) are responsible for assigning one or more LSOs for their department. Any department with active laboratories (instructional, research, and other types as identified) are required to have at least one LSO.

Duties of an LSO

The primary duty of an LSO is to act as a liaison on safety-related issues with RMS personnel as needed. Additionally, LSOs are to be familiar with and understand the Laboratory Safety Rules and Best Practices found in Appendix I of this plan.

Other duties of an LSO include:

- Laboratory Inspections
    - Assisting in laboratory inspection process and complete inspection reports as needed
    - Help resolve identified issues found in laboratories under area of responsibility
- General Safety
    - Respond to chemical or biochemical concerns as requested by RMS
    - Knowledge resource for safety-related inquiries and RMS requests to disseminate information
    - Assist in providing chemical inventory information to RMS from responsible parties within their area

Basic Rules for Non-Laboratory Personnel in Laboratories

Access to laboratories is restricted to instructors, authorized personnel, and students of the laboratory course that have been trained in proper laboratory techniques when performing work with hazardous chemicals, biologicals, radio nuclides and lasers. Instructors and students are required to enforce the restricted access rules.

Authorized visitors are to be accompanied by laboratory personnel. Authorized visitors in the laboratory shall be instructed in basic safety procedures and shall be provided with appropriate protective equipment such as safety glasses and gloves.

Laboratories utilizing highly toxic chemicals, carcinogens, infectious agents, or radiation hazards shall have emergency procedures posted conspicuously in the laboratory. Restricted access signs along with basic safety rules shall be posted in a conspicuous space near the entrance of these laboratories.

General Laboratory Rules

Safe work habits and general guidelines that apply to various types of laboratories are included in this section. Laboratory management should ensure that there is proper, basic laboratory training available for students that instructors should enforce early in the semester. Instructors are encouraged to develop laboratory-specific rules from the general guidelines or the references that have been incorporated into this safety manual.

As few laboratory chemicals are without hazards, general precautions for handling all laboratory chemicals require minimizing exposure. Skin contact with chemicals should be avoided. Avoid underestimation of the risk even when working with substances of no known significant hazard. One

should assume that any mixture of hazardous chemicals is more toxic than the most toxic component. Adequate ventilation provided by fume hoods is the best means of preventing exposure to airborne substances.

Prior to working with new chemicals, the Safety Data Sheet (SDS) must be read and the precautions for safe handling observed. The SDS provides laboratory personnel with the OSHA permissible Exposure Limits (PEL) and the ACGIH Threshold Limit Values (TLV). The PEL and TLV exposure limits shall not be exceeded.

Exposures to chemical substances above the PEL or TLV and regulated by a standard that requires monitoring, either initially or periodically, shall be monitored according to that standard. The standards require records of exposure, personal monitoring, and amounts of usage for highly toxic or carcinogenic chemicals. OSHA standards require maintaining for a period of time, generally 2, 20, or 30 years, records of personnel who were exposed to specific toxic chemicals.

A recommended procedure for laboratories to follow is to maintain an access log for these toxic chemicals in a bound book. The laboratory log should have entries for the following: date, type of work performed, chemicals utilized, monitoring equipment, procedures, results, and personnel in the laboratory. The laboratory log will become a part of the permanent record of the laboratory. The above procedures are only necessary if personnel are directly exposed at or above the PEL or TLV for the chemical substance regulated by a standard (see Appendix A - Definition of a Carcinogen and List of Known Human Carcinogens).

The general rules are directed primarily toward prevention of toxic exposure and do not include rules and procedures for prevention of physical injury. Safety in Academic Chemistry Laboratories (see https://www.acs.org/content/dam/acsorg/about/governance/committees/chemicalsafety/publications/safety-in-academic-chemistry-laboratories-students.pdf) contains recommended techniques for safety operation of equipment such as: electrical equipment, glassware, distillations, low and high temperature operations, vacuum and high pressure operations, and emergency procedures.

Any laboratory that desires to run experiments and/or equipment overnight unattended should fill out the UNTD Overnight Experiment Notice Form (see Appendix B). These experiments include hazardous procedures, highly reactive chemicals, highly exothermic reactions, reactions that generate hazardous waste, and equipment that generates high heat or pressure. The form should be posted on the door and the other copy should be submitted to Risk Management. Principal investigators (PIs) must train all the laboratory personnel on the emergency call list on how to shut down the operation.

All of the university laboratories will be inspected quarterly. A formal inspection report for each laboratory will be submitted electronically to the PI, Lab Safety Officer, and Risk Manager within 30 days of any inspection. Significant findings that pose an immediate threat to life or property require re-inspection and shall be addressed, corrected, or resolved by the responsible PI or the Lab Safety Officer to sufficiently prevent, mitigate, or limit the probability and/or severity of an occurrence. Laboratories with significant findings shall be re-inspected within 30 days of the notice to the PI. An unannounced re-inspection shall be performed after 30 days of inspection. Any uncorrected deficiencies will be reported to the Provost Office for enforcement.

The following procedures are used when working with chemicals:

Accidents and Spills

1. **Eye contact -** Promptly flush eyes with water for 15 minutes and seek medical attention.
2. **Ingestion -** Consult the product SDS health and first aid section. Generally, the victim should be encouraged to drink large amounts of water.
3. **Skin contact -** Promptly flush the affected area with copious amounts of water and remove any contaminated clothing; use an emergency shower when contact is extensive. If symptoms persist after washing, seek medical attention.
4. **Seek immediate medical attention –** Take the person to the Student Health Center immediately or call 911 when necessary.
5. **Clean-up -** Promptly clean up spills, using appropriate protective clothing and equipment, along with proper disposal methods.
6. **Report -** Accidents should be immediately reported to the Laboratory Safety Officer, who will fill out the proper forms and report the accident to Risk Management Services, (RMS) and the Police Department (Christopher.Shaw@untdallas.edu, 972.780.3009) for prompt reporting and investigation.

Spill Cleanup

Chemical spills are contained using the Think C.L.E.A.N. Plan:

1. **C**ontain the spill
2. **L**eave the area
3. **E**mergency: eye wash, shower, medical care
4. **A**ccess SDS
5. **N**otify a supervisor

All spills are to be contained using appropriate absorbent or spill kits. When spills involving large quantities of hazardous material occur, contact the Laboratory Staff (manager or assistant manager) who will direct clean-up or evacuation procedures. Spill kits will be provided upon request.

Rules for Safe Laboratory Work

Safe work habits

Procedures to avoid unnecessary exposure to chemicals

- Laboratory management (PIs and lab managers) are responsible for conducting weekly testing of eyewash fountains, and for the proper operation of all laboratory safety equipment, including emergency showers. Fire extinguishers should be inspected by RMS regularly.
- Laboratory personnel shall be aware of the location and proper operating of laboratory safety equipment including fire extinguishers; emergency showers; and eyewash fountains.
- Visitors to the laboratory shall abide by all laboratory safety rules, including requirements for the use of eye protection.
- Eye protection should be worn at all times in the laboratory. Spectacles, safety glasses, and other eye protection devices shall be kept clean at all times.
- Seek information (from SDS) and advice about hazards, plan appropriate protective procedures, and plan positioning of equipment before beginning any new operation.
- Use minimum amounts of chemicals to accomplish task.
- Substitute less hazardous materials whenever possible.

- Do not smell or taste chemicals. Avoid inhalation from apparatus that can discharge toxic chemicals such as vacuum pumps, distillation columns, and reflux columns, by venting the equipment into a local exhaust or fume hood.
- Do not allow release of toxic substances in rooms that have contained re-circulating atmospheres.
- Use only those chemicals for which the quality of the available ventilation system is appropriate.
- Handle and store laboratory glassware with care to avoid damage; do not use damaged glassware. Use extra care with Dewar flasks and other evacuated glass apparatus; shield or wrap them to contain chemicals and fragments should implosion occur. Use equipment only for its designed purpose.
- Wash areas of exposed skin thoroughly before leaving the laboratory.
- Avoid behavior that might confuse, startle or distract another worker.
- Do not use mouth suction for pipetting or starting a siphon.
- Avoid working alone in a laboratory while hazardous procedures are being conducted.
- Warning signs with personnel contact information shall be posted on the door and on equipment where special or unusual hazards exist.
- Provide for the containment of toxic substances in the event of failure of utility service when operating unattended equipment. Also, ensure that the warning signs are in place.
- Work areas shall be maintained clean and uncluttered with chemicals and equipment properly labeled and stored; clean up the work area on completion of an operation and at the end of each day.
- Hood operations: Use a hood for operations that might result in release of toxic chemical vapors or dust. Use a fume hood or other local ventilation device when working with any volatile substance with a TLV of less than 50 ppm. (Confirm adequate hood performance before use. Keep hood closed when operations are not being performed in the hood. Do not allow materials to block vents or air-flow. Do not store materials in the hood.)
- Be aware of unsafe conditions and see that they are corrected when detected.
- All the laboratories should be inspected by the Lab Safety Officer quarterly.

Personal Protective Equipment (PPE)

- A face shield or chemical goggles shall be worn when conducting operations utilizing glassware, distilling or refluxing, and transferring or mixing corrosives of toxic liquids.
- Confine long hair and loose clothing especially if working with moving machinery.
- The preferred footwear are shoes which completely encloses the foot.
- Wear appropriate impervious gloves when the potential for contact with toxic materials exists; inspect the gloves before each use, wash gloves prior to removal, and replace gloves that have deteriorated.
- Stop using the chemical when air contaminant concentrations are not sufficiently reduced by engineering controls. Inspect respirators prior to each use. Medical evaluations are required before the use of respiratory equipment.
- Use any protective and emergency apparel and equipment as appropriate.
- If contact lenses are worn in the laboratory, inform the supervisor so special precautions can be taken. We strongly recommend against the use of contact lenses in the lab. The potential for chemical buildup under them is too great.
- Remove laboratory coats or other clothing immediately upon significant contamination.
- Leave lab coats in the lab.

- Use proper handling and disposal methods of hazardous waste and materials; contact Risk Management Services (RMS) for a hazardous waste pickup.

Eating, drinking, smoking, gum chewing, or applying cosmetics is prohibited in the laboratories. Wash hands before conducting these activities.

Storing, handling, or consuming non-experiment related food or beverages in laboratories and storage areas is prohibited.

Laboratory Hygiene Requirements

Allergens and Embryo Toxins

Procedures and Precautions

- Allergens such as diazomethane, isocyanates, and bichromates, require wearing suitable gloves to prevent hand contact with allergens or substances of unknown allergenic activity. Laboratory hoods or glove boxes are a preferred enclosure for allergen work.
- Embryo toxins such as organomercurials, lead compounds, and formamide require women of childbearing age to only work with these substances in a hood whose satisfactory performance has been confirmed. Appropriate protective clothing is required to prevent skin contact.
- Procedures for safe handling, use, and storage of allergens and embryo toxins shall be reviewed annually and prior to the introduction of any new material.
- Allergens and embryo toxins shall be properly labeled and stored in unbreakable secondary containers in adequately ventilated areas.
- Spills and incidents of exposure to these materials require immediate notification of supervisor and consultation of a qualified physician when appropriate.
- Chemicals of moderate chronic or high acute toxicity (Appendix E - Acutely Toxic Chemicals) may not exceed TLV50 ppm, e.g. hydrogen cyanide and hydrofluoric acid (NFPA 3 or 4).

Moderate chronic and high acute toxicity

Additional precautions are appropriate when working with chemicals of moderate chronic and high acute toxicity (see Appendix E - Acutely Toxic Chemicals).

- Minimize exposure to these toxic substances by any route using all reasonable precautions and appropriate protective equipment, including washing of hands and arms thoroughly after removal of protective equipment.
- Use and store these substances only in areas of restricted access. The storage area containers require special warning signs to alert users of the hazards and safe handling procedures.

- Use in hoods that have been previously evaluated to confirm adequate performance. Trap released vapors to prevent their discharge into the hood exhaust.
- Maintain records of the amounts of these materials on hand, amounts used, and names of personnel working with the materials.
- Accidents and spills are prevented by preparing the work area prior to chemical handling.
- Assure that at least two people are present at all times when working with highly toxic materials.
- Cover the work area with containment devices such as plastic sheeting and absorbent materials.
- Prepare a waste disposal receptacle for the waste chemicals and containment material.
- If a major spill occurs outside of the hood, evacuate the area. Assure that cleanup personnel wear suitable protective equipment.

Chemicals with High Chronic Toxicity

Organic mercury compounds and carcinogens; see Appendix E - Acutely Toxic Chemicals (NFPA 3 or 4).

Carcinogens are those listed in the definition of a carcinogen in Appendix A - Definition of a Carcinogen and List of Known Human Carcinogens.

Procedures and Supplemental Rules

- Restrict all transfers and work with these substances to a "controlled area" such as a restricted access hood, glove box, or a portion of the laboratory designated for use of highly toxic substances. Personnel in the laboratory must be made aware of the substances being used and necessary precautions.
- Prior to introduction of highly toxic materials in the laboratory, prepare a plan for the use, disposal and decontamination of equipment. The controlled area must be decontaminated after using highly toxic materials.
- Personnel shall remove protective equipment and place it in an appropriate labeled container. Personnel will thoroughly wash hands, forearms, face, and neck after removing protective equipment.
- Laboratory personnel are responsible for cleaning the area when highly toxic materials are used. The area must be decontaminated prior to allowing Janitorial personnel to resume normal cleaning procedures.
- Medical surveillance is required if using significant quantities of a highly toxic material on a regular basis (three times per week). Consult a qualified physician concerning desirability of regular medical monitoring. Only if the Standard Operating Procedure (SOP) for the use of the chemical insures no exposure to personnel at or above the PEL and/or TLV can the material be used without medical monitoring.
- Maintain records of the amounts of these materials on hand, amounts used, and names of personnel working with the materials.
- Accidents and spills are prevented by preparing the work area prior to chemical handling.
- Assure that at least two people are present at all times when working with highly toxic materials.
- Cover the work area with containment devices such as plastic sheeting and absorbent. Prepare a waste disposal receptacle for the waste chemicals and containment material.
- If a major spill occurs outside of the hood, evacuate the area. Assure that cleanup personnel wear suitable protective equipment.

Explosive Chemical Management

An explosive chemical is a gas, solid or liquid chemical that is in itself capable by chemical reaction of producing gas at a temperature and pressure at a speed able to cause damage to the surroundings. This includes chemicals purchased from supplied by vendors or products and by-products generated from experiments or reactions. Examples of explosive chemicals are:

- Organic peroxides
- Oxidizers, includes salts containing nitrates
- Chlorates
- High concentration of perchloric acids

The following procedures must be followed to minimize the risk of explosion.

1. **Responsibility** - The PI involved in using explosive chemicals must perform a Risk Assessment prior to submitting a research proposal to the Risk Management Services for approval. Detailed Standard Operating Procedures must be attached with the proposal.
2. **Purchasing** - All chemicals must be purchased through EIS approval system.
3. **Chemical register** - A register of all used/stored chemicals on site shall be generated by the manager of the lab or PI. This list should submitted to Risk Management Services for review.
4. **Chemical user** - A list of chemical users includes name, employment status, contact email address, phone number, and training status must be submitted with Standard Operating Procedures (SOP) to Risk Management Services.
5. **New chemical hazard identification and risk assessment** - For all new chemicals, a hazard and risk assessment must be performed immediately.
6. **Training** - Staff and workers must receive related training before handling the chemicals and doing any hands-on experiments.
7. **Labeling** - The label must be specific and firmly secured on the container.
8. **Personal Protective Equipment** - Appropriate Personal Protective Equipment (PPE) must be worn during experiment.
9. **Handling and storage of chemicals** - Proper procedures found in the SDS sheets must be used.
10. **Waste disposal** - Chemical waste must not be mixed with other chemical waste unless the waste is the same type. Users must take “Hazardous Wastes” training prior to handling explosive waste.
11. **Updates and records** - All SDSs must be updated regularly. Risk Managements Services ensures that new chemicals are entered into the database inventory.
12. **Signage** - Warning signage must be posted on the wall or entrance to warn building occupants of any hazards.
13. **Emergency phone number** - Emergency contact numbers of responsible lab persons, the PI(s), and the UNT Police Department must be posted on the outside lab door.
14. **Overnight experiments** - Researchers should fill out the UNTD Overnight Experiment Notice Form. In this form, the researcher must: describe the experiment or reaction taking place, list the potential hazards, record the start time and planned end time, and describe how to stop the process or processes, or turn off the equipment if an emergency happens; also, attach a map showing all equipment locations in the lab. See Appendix B – UNTD Overnight Experiment Notice Form for details.
15. **Incident report** - Principal Investigator (PI), Lab Manager, or instructor must report any incident to the Risk Management Services within 7 working days by filling out the UNT Dallas Laboratory Incident Report Form. Injuries involving employees require a separate report to Risk Management Services Insurance and Claims (RMS).

Lasers

No person may use a laser of any type prior to training in laser safety.

Procedures

- The type and intensity of radiation from lasers varies widely with the instrument design. Prior to working with an instrument, the specifications for operation and protection must be consulted.
- Always wear goggles that offer protection against the specific wavelength of laser in use. If more than one wavelength is being used, additional goggles specific for each wavelength are required. No available spectacles protect against all laser wavelengths.
- Never look directly at the beam or pump source.
- Never view the beam pattern directly; use an image converter or other safe, indirect means. To decrease reflecting hazards, do not aim by looking along the beam.
- Do not allow any objects that cause reflections to be present in or along the beam. Even buttons on clothing and polished screw heads can be dangerous.
- Keep a high general illumination level in areas where lasers are in operation. Low light levels cause dilation of the pupils, thereby increasing the hazard.
- Display warning signs in laser areas.

Laboratory Use of Carcinogens

When carcinogens are used in a laboratory, access to the laboratory will be clearly restricted to personnel trained in safe handling of highly toxic material. See Appendix A for the criteria for a chemical being listed as a carcinogen and for listed carcinogens and suspected carcinogens. Anything categorized by IARC as Groups I and II is covered by the Hazard Communication Standard and the Laboratory Standard.

Group I	known human carcinogens
Groups IIA and IIB	probable human carcinogens
Group III	substances evaluated, but no human carcinogenicity classification could be made

Access and use of highly toxic substances and carcinogens shall be controlled and monitored. Instructors and graduate students using these materials shall record the amounts used, date, and persons working with the materials. A separate inventory list of carcinogens, suspected carcinogens, reproductive toxins, and highly toxic substances is recommended.

Control Measures Implementation

Chemical Storage

Chemicals are stored according to segregation systems that separate incompatible classes of chemicals. Flammables, acids, bases, oxidizers, water reactives, and peroxides require special attention for proper storage. A list of incompatible chemicals, which require special precautions for safe storage is provided in Appendix C - List of Incompatible Chemicals. Appendix C lists the maximum allowable container capacity

for containers such as: glass bottles, metal cans, plastic bottles or pails, safety cans and metal drums. Certain chemical manufacturers and suppliers provide additional storage and segregation information on the product label or SDS.

Storage of laboratory chemicals presents an ongoing safety problem. Amounts of chemicals in storage should be as small as practical. Storage on bench tops and in fume hoods is prohibited due to the potential for fire and spills. Certain reactive or unstable chemicals are stores in specially designed refrigerators. Flammable liquids are stored in an approved flammable storage cabinet.

Safety cans with a spring-loaded spout are preferred for transporting flammable liquids. Alternatively, when chemicals are hand carried, the container may be placed in an outside container or a plastic pail.

Stored chemicals shall be periodically inspected for deterioration and container integrity. Chemicals that are no longer used in the laboratory shall be discarded by labeling it with a chemical waste tag. Contact Risk Management Services to request a hazardous waste pickup.

Cylinders of compressed gases are to be strapped or chained to a wall or bench top and are capped when not in use.

Engineering Controls

Air flow through the laboratory should be relatively uniform and be exhausted to the exterior of the building.

All laboratory fume hoods are inspected annually and certified by a Chemical Hygienist. Any hood not passing inspection should be taken out of service immediately and not used until it has been repaired. Repair should be in a timely manner so as not to endanger the health and well-being of students and employees or place the facility at risk.

Ventilated storage cabinets for chemicals are provided as needed. The Lab Safety Officer shall maintain inspection and repair records for laboratory safety equipment. Annual inspections and/or testing are required for the following: eyewash fountains; emergency showers; and fire extinguishers.

Personal Protective Equipment (PPE)

Safety glasses are recommended for all laboratory work. Chemical goggles shall be worn when performing potentially hazardous operations.

Face shields and chemical goggles are worn to prevent injury from splashes or sprays of hazardous chemicals or biohazards if there is a potential for eye, nose, or mouth contamination. This equipment is located in the laboratories when there is a need for the equipment.

Laboratory personnel are required to wear appropriate impervious gloves when there is a potential for direct skin contact with hazardous chemicals or blood borne pathogens.

When the probability of chemical splashes is great, an impervious apron or lab coat appropriate for the task should be worn.

All personal protective equipment should be removed immediately upon leaving the work area; it must be cleaned and placed in an appropriate area.

Exposure Levels and Medical Monitoring

Exposure to chemical substances regulated by a standard that requires monitoring, either initially or periodically, shall be monitored according to the standard. If the initial monitoring discloses exposure over the PEL, then immediate compliance with the exposure and medical monitoring provisions of the relevant standard is required. Compliance with the standard may include more frequent monitoring and implementation of additional control measures.

Personnel shall be notified in writing of monitoring data within 15 days of receipt of those monitoring results.

Exposure records will be maintained for personnel exposed above the TLV and/or PEL of the following chemicals: chemicals covered by a standard; carcinogens; and highly toxic materials. Exposure, medical, and personnel monitoring records will be maintained for thirty years.

Monitoring is required in laboratories where chemicals specifically regulated by OSHA CFR 1910 subpart Z are used. See Appendix A - Definition of a Carcinogen and List of Known Human Carcinogens for the OSHA Carcinogens.

If any of the above-described chemicals are to be used in the laboratory, a work procedure that identifies each workstation/task in the laboratory and the required controls and equipment will need to be included in the corresponding Laboratory Safety Manual.

Nanoparticles

Nanotechnology is the use and control of particulates of roughly 1 to 100 nanometers. Nanoparticles can cross an alveolar wall into bloodstream. It also can spread to other organs, tissues, and the brain. Potential nanomaterial exposure routes include inhalation, dermal contact, and ingestion. To prevent exposure, always maintain good work practices like clean work areas, hand washing, and shower use/change of clothes.

Use engineering controls like source enclosure, local exhaust ventilation, and HEPA filters. During any experiment, wear NIOSH-approved personal protective equipment and respirator. Clean up any spill immediately and properly dispose of any nanomaterials. Report any accidents or near-miss accidents to your supervisor.

Training

Effective training is crucial to a successful laboratory safety program. Laboratory supervisors and managers must actively participate in the training process to ensure that all lab employees are effectively trained before any work with hazardous materials occurs. It should be noted that depending on the type of research or experiment being conducted and associated hazards, there may be additional training requirements. Within the first week of labs, students must complete appropriate training corresponding to the specific lab they are enrolled in; this will account for the unique risks associated with that lab. For more information, contact RMS.

Contaminated Waste Removal/Disposal

General Methods for Segregation and Disposal

To assure that minimal harm to people and the environment will result from the disposal of waste laboratory chemicals, segregation and disposal shall be in accordance with to provisions of the following:

1. Code of Federal Regulations, Title 49, Parts 172-173, Department of Transportation
2. Code of Federal Regulations, Title 40, Parts 261-262, Environmental Protection Agency

Certain non-hazardous chemicals are permissible for sanitary sewer disposal. In general, only those solutions from routine titrations and tests that do not contain any hazardous chemical will be allowed to be put into the sanitary sewer system.

The following types of hazardous materials must be segregated for disposal:

1. Non-flammable organic liquids or solids.
2. Solutions of heavy metals.
3. Hydrocarbons, halogenated hydrocarbons, nitro compounds, mercaptans, and most oxygenated compounds.
4. Organics that are explosive such as azides and peroxides.
5. Concentrated acids or bases (6 molar or higher).
6. Highly toxic, malodorous, or lachrymatory substances (such as cyanides or carcinogens; see Appendix A - Definition of a Carcinogen and List of Known Human Carcinogens).

Indiscriminate disposal by pouring waste down the drain or adding them to mixed refuse for landfill burial is unacceptable. Hoods are not to be used as a means of disposal for volatile chemicals.

Hazardous Waste

Waste in need of disposal is required to be tagged with a hazardous waste tag, with the contents listed on this tag. Complete a Hazardous Materials Pickup Request Form, if available, to have the material picked up. If not, contact the current Hazardous Waste disposal vendor (as of SP25: Triumvirate) to schedule pick up. For more information, contact RMS.

Radioactive Waste

Contact RMS before any radioactive materials and/or waste is handled on campus.

RMS Standard Operating Procedures (SOP)

For information on SOPs related to the Chemical Hygiene Plan contact RMS.

Revision

Last revision: 06/16/2025 ICP