



University of Denver Chemical Hygiene Plan

In accordance with the
Occupational Safety & Health Administration
Laboratory Standard, 29 CFR 1910.1450

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1. Introduction

As part of the DU Laboratory Safety Program, the University of Denver Chemical Hygiene Plan (CHP) is a document that establishes protocols, in accordance with the Occupational Safety & Health Administration (OSHA) Laboratory Standard, 29 CFR 1910.1450, to ensure employees are protected from exposure to chemical hazards in the laboratory. Each Principle Investigator (PI) is to maintain a copy of the CHP, which contains general requirements implemented by the Environmental Health and Safety (EHS) Department and laboratory-specific documents such as hazard assessments, Standard Operating Procedures (SOP), accident and spill reports.

The CHP applies to any DU laboratory that engages in the use of hazardous chemicals. The CHP must be made readily available to all employees and regulatory officials. All laboratory employees are expected to use and comply with the CHP.

2. Regulations and Standards

Listed below is summary description of significant Federal regulations and industry standards, related to laboratory safety.

29 CFR 1910.1450, “Occupational Exposures to Hazardous Chemicals in Laboratories”

The Standard dictates that employers limit worker exposure to hazardous chemicals. The Standard requires that employees be apprised of the hazard of chemicals present in their work area through information and training.

29 CFR 1910.1200, “Hazard Communication”

The Standard provides employees with hazard information based on the concept that employees have both a need and a right to know the hazards and identities of the chemicals they are exposed to when working.

29 CFR 1910.132, “Personal Protection”

The Standard requires the use of personal protective equipment (PPE) to reduce employees’ exposure to hazards when engineering and administrative controls are not feasible or effective in reducing these exposures to acceptable levels. Employers are required to determine all exposures to hazard in their workplace and determine if PPE should be used to protect their workers.

29 CFR 1910.151, “Medical Services and First Aid”

The Standard states that where the eyes or body of any person may be exposed to injurious corrosive material, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

29 CFR 1910.133, “Eye and Face Protection”

The Standard states the employer shall ensure that each affected employee uses appropriate eye or face protection where there are exposures to eye or face hazards caused by liquid chemicals, acid or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.

ANSI Z9.5 2012, “Laboratory Ventilation Guidelines”

The American National Standard Institute (ANSI) in this Standard establishes minimum requirements and best practices for laboratory ventilation systems to protect personnel from overexposure to harmful or potentially harmful airborne contaminants generated within the laboratory.

ANSI Z358.1 2014, “Emergency Eyewash and Shower Equipment”

This standard establishes minimum performance and use requirements for eyewash and shower equipment for emergency treatment of the eyes or body of a person who has been exposed to injurious materials.

ANSI Z87.1 2015, “Occupational and Educational Eye and Face Protection”

This standard establishes minimum requirements for eye and face protective devices and guidance for the selection, use, and maintenance of these devices.

3. Definitions

Chemical Hygiene Officer (CHO) - an employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. The CHO is the Environmental Health and Safety Director.

Hazard – any existing or potential condition in the workplace that can result in death, injury, or property damage.

Hazard assessment -- determination of the health hazards associated with a process or task and the appropriate controls to implement to reduce the hazards.

Hazardous chemical - a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems and agents which damage the lungs, skin, eyes, or mucous membranes.

Laboratory use of hazardous chemicals - handling or use of such chemicals in which all of the following conditions are met:

- Chemical manipulations are carried out on a "laboratory scale;"
- Multiple chemical procedures or chemicals are used.
- The procedures involved are not part of a production process.

PI - Principal Investigator - the individual in charge of directing research in a particular laboratory.

4. Responsibilities

Department Head is responsible for:

- ensuring the department remains in compliance with the CHP
- providing the CHO with the support necessary to implement and maintain the CHP

The Principle Investigator is responsible for controlling hazards in his/her laboratory. These responsibilities include:

- performing a hazard assessment for hazardous procedures

- instructing laboratory personnel on potential hazards
- providing written Standard Operating Procedures (SOP) for laboratory activities involving hazardous chemicals
- ensuring employees have received required training
- training employees and students in safe practices, on SOP's, and on the specific hazards within the lab
- training employees and students on appropriate spill response measures and the use of the spill kit.
- correcting work errors and dangerous conditions
- investigating accidents or spills to determine cause and implement corrective action, as appropriate
- selecting and providing the proper personal protective equipment (PPE) for the hazard
- ensuring personnel wear appropriate attire and proper PPE.

The Chemical Hygiene Officer is responsible for:

- providing technical guidance in the establishment of hazard assessments and SOP's
- presenting OSHA mandated training applicable to laboratory personnel
- inspecting laboratories annually to identify any deficiencies and to verify compliance with the CHP.

Individual laboratory workers are responsible for:

- complying with the SOP's and the CHP
- ensuring that hazards are minimized and controlled
- wearing appropriate attire and proper PPE
- caring for their PPE
- appropriately responding to and reporting any chemical spills.

5. General Laboratory Rules

1. Laboratories shall be outfitted with safety equipment including safety showers, eyewash fountains, fire extinguishers, fire blanket, and access to emergency alarms and telephones.
2. Laboratories shall be provided with sufficient general ventilation for input to laboratory hoods to ensure that laboratory air is continually replaced and to prevent the increase of air concentrations of toxic substances. The exhaust air must pass directly to the exterior of the buildings
3. Personnel, whether working in or visiting the lab, shall wear appropriate attire and personal protective equipment relevant to potential hazards in the work area. **Note: Safety glasses are not designed to completely protect against chemical splash, only flying fragments, objects, particles, etc. Proper eye protection, i.e., goggles and/or faceshields, are necessary when the potential hazard of the splashing of hazardous liquids, especially corrosive chemicals, exists.**

4. Employees shall be aware of the location and proper operation of laboratory safety equipment including: fire extinguishers; safety showers; eyewash fountains; and, fire blankets in the laboratory.
5. Work areas shall be maintained clean and uncluttered with chemicals and equipment properly labeled and stored.
6. All employees shall avoid unnecessary exposure to chemicals.
7. The PI must approve laboratory work in which a worker will be performing alone, such as during the weekend or late at night. The approval of such work will be based on the associated hazard, i.e. the toxicity of the material and the potential for exposure.
8. Chemicals shall be dated when received and also when opened to prevent exceeding the manufacturer's recommended shelf life limitation. All containers containing chemicals shall be properly labeled.
9. The contents of waste containers must be identified on the container to preclude mixing of incompatible chemicals and to facilitate disposal. Disposal of any chemical waste in sanitary sewer drains is prohibited. Unknown waste may be rejected for pickup, or billed for laboratory analysis of constituents. Refer to the Hazardous Materials Management Policy for guidance on hazardous waste.
10. Malfunctioning laboratory equipment shall be labeled or tagged "out of service" and shall not be used until repairs have been performed.
11. Warning signs shall be posted at areas or on equipment where special or unusual hazards exist.
12. Laboratory and non-laboratory areas shall be sufficiently segregated to minimize the potential for chemical exposures in office areas.
13. Designated areas for eating or drinking shall be clearly identified and separated from work areas. These will only be allowed in selected locations/buildings.
14. Refrigerators or ice machines that are currently or have been used for storage of chemicals shall not be used for food or beverage storage and must be labeled appropriately.
15. Flammables shall not be stored in refrigerators or freezers unless designed for such storage.
16. Any spills or accumulations of chemicals on work surfaces shall be removed as soon as possible using techniques that minimize residual surface contamination.
17. Floors shall be cleaned regularly.

6. Hazard Identification - postings, labels, signs

Signage

Laboratories and other potentially hazardous work areas will have signage at all doors leading into the workspace. These signs shall have completed and current posting that identifies the general hazards, i.e., chemical, biological, radioactive, etc., within the room and lists the phone numbers of persons to be contacted in case of an emergency. Lab signage templates are available from [EH&S](#). Specific hazards, such as laser and ionizing radiation, should be identified on the piece of equipment or at the source and, also, at the entrance to the room.

Labels

Chemical containers shall be labeled with the full chemical or trade name of the contents. The manufacturer's label will provide personnel with specific information regarding the physical and health hazards of the substance. Directions found on the label shall be followed. Substances transferred from an original container to a secondary container shall be labeled with the full trade or chemical name of the contents, any dilution of the chemical, the date of the transfer, appropriate physical and health hazards. An exception is made to the labeling requirements in cases where one worker, during a process or task, completely uses the chemical in a secondary container during their work shift. No abbreviations or codes of the chemical name are acceptable. Chemical symbols are allowable only if the compound is a product of the research.

Chemical Inventory

Each laboratory shall maintain an inventory of their stored chemicals including approximate quantities. The inventory shall be maintained in the CHP and updated at least annually.

Safety Data Sheets (SDS's)

The SDS provides valuable information regarding hazardous characteristics, incompatible materials, and recommendations for storage and spill response. As required by the Hazard Communication Standard, an SDS must be available for each chemical used in the laboratory, and immediately accessible for laboratory staff review. The SDS for all hazardous chemicals should be used during the SOP training of lab staff. Electronic versions are acceptable, if the lab has provisions for a back-up system in case of power failures.

7. Hazard Assessment

Each PI is responsible for assessing the hazardous situations, chemicals, biological materials, and energy sources. The Hazard Assessment (Appendix A), which is a requirement of OSHA for PPE selection, is to be used to develop the SOP's. The purpose of the Hazard Assessment is to identify the potential hazards and then implement applicable measures to control such hazards. See Appendix B for an example of a Hazard Assessment.

Determining hazards is a subjective activity that is made clearer when looking at the two components of workplace hazards: the health effect potential and the frequency potential. The health effects could range from a trivial outcome such as irritation or a minor cut to the more serious result of a catastrophic injury or death. The frequency potential is the likelihood of an occurrence.

8. Standard Operating Procedures for Hazardous Work

OSHA mandates the development of the SOP for the lab scale use of hazardous chemicals. The SOP is a simple document that identifies a process or the use of a chemical, the associated hazards and hazard controls, special handling and storage requirements, and proper contingency response. There are two types of SOPs: a task or activity specific SOP (Appendix C) and an SOP that relates to a specific chemical. Either type of SOP can be selected and written. If a particular chemical is used in the same manner for multiple tasks, then one SOP is sufficient for all work involving that chemical. If a more complicated activity involves multiple chemicals or other types of hazards the task specific SOP would be appropriate. The SOP must include the following elements:

- **General identification**, including name of PI and location
- **Job or process identification or name of specific chemical**
- **Hazard information**, as identified on the Hazards Assessment
- **Required engineering controls and/or special precautions**
- **Required PPE** to be worn during the process
- **Transportation / storage requirements**
- **Accident / spill response**

These laboratory-specific SOPs must be included in the Chemical Hygiene Plan, as a separate section. The CHO will review these SOPs. The PI must ensure that laboratory personnel are trained on the use of the SOPs applicable to their activities.

9. Personal protective equipment

PPE must be worn whenever required as determined by posted areas, hazard assessments, the SOP, SDS or the PI/Laboratory Supervisor. PPE is not a substitute for engineering controls, but should be used in conjunction with engineering controls and safe practices. Refer to ANSI Z87.1, “Occupational and Educational Eye and Face Protection” for guidance in selecting proper PPE for eye and face protection. All safety eyewear must meet the requirements of ANSI Z87.1.

- Laboratory personnel are responsible for the care and cleaning of assigned PPE, such as eyewear and for the proper disposal of PPE, as appropriate.
- Adequate protective eyewear shall be worn when a splash hazard that could damage the eyes exists. Such hazards include pouring of corrosive materials or processes where component failure may release hazardous chemicals with velocity. The additional use of a face shield may be necessary based on the hazard assessment. Ordinary eyeglasses are NOT protective eyewear, unless labeled “Z87.1”.
- The appropriate gloves, laboratory coats, aprons, shoes or chemical resistant suits shall be used during work where a dermal exposure potential exists, as determined by the hazard assessment and during any chemical spill cleanup.
- If a laboratory procedure requires [respiratory protection](#), employees must have, prior to use, (1) respiratory protection training, (2) medical certification, and (3) documentation of fit testing. Contact the CHO for assistance.

10. Laboratory Fume Hood Operation

Every laboratory fume hood used for the control of air contaminants shall be tested annually to assure that adequate airflow is being maintained to provide continued protection against employee exposure. The hood shall be tested using a calibrated airflow anemometer and/or indicator smoke. The ANSI guideline of 80 to 120 feet per minute (fpm) as an average face velocity, at the working sash height,

will be used as acceptance criteria. A sticker will be affixed to the side of the hood indicating the hood has adequate airflow. Any hood that does not meet the acceptable airflow criteria shall be removed from service until repairs can be completed. Signs shall be posted indicating the hood is "Out of Service".

11. Use of Laboratory Fume Hoods

1. Laboratory equipment that may discharge hazardous chemicals shall be vented to local exhaust devices.
2. Laboratory fume hoods shall be used when working with any material that might release hazardous chemical vapors or dust. Work activities that would require the use of a fume hood would include (but not limited to):
 - handling chemicals with significant inhalation hazard, i.e. a chemical with an OSHA permissible exposure limit (PEL) of 100 parts per million (ppm) or less which has appreciable volatility
 - performing procedures with chances of splatter or splash of hazardous chemicals
 - operating processes where component failure may release hazardous chemicals with velocity
 - handling of heated chemicals
 - handling of corrosive materials
 - carrying out reactions with strong exothermic reaction
 - handling chemicals with significant vapor pressure, (highly flammable)
 - where monitoring shows significant exposure
3. Personnel using a fume hood shall confirm that it is operating properly prior to use. For hoods without static pressure or airflow gauges, an airflow indicator (telltale) such as an eight-inch strip of light material dangling from the sash, (like a kimwipe), can be used to verify air is flowing into the hood.
4. Equipment in fume hoods shall be kept to a minimum to avoid blockage of airflow or hood face turbulence effects.
5. Laboratory hood sashes shall be kept in the down or closed position when not in use. Hood sashes should be kept as low as practicable during actual use to utilize the barrier capabilities of the sash.

12. Chemical Storage

1. Both the storage amounts and working amounts of toxic, flammable or hazardous chemicals in a laboratory shall be kept to a minimum.
2. Chemicals shall only be stored in a cool, dry, well-ventilated location and in containers with which they are chemically compatible. All chemicals shall be segregated by hazard class.
3. No chemicals shall be brought into or stored in laboratory offices, equipment storage rooms or other locations not specifically intended for chemical storage.
4. Each lab shall maintain adequate control of known or suspected carcinogens and highly toxic materials. The lab shall post a warning sign, which is highly visible, that depict the carcinogens and highly toxic materials that are used within the lab.

5. Larger capacity storage containers shall be stored on lower shelves.
6. Use of laboratory hoods as permanent storage devices is not permitted.
7. Where under-hood cabinets are used for chemical storage, venting of the cabinet to the fume hood is desirable.
8. Metal containers involved in the transfer of a flammable or combustible liquid shall be grounded and bonded together to minimize potential for ignition by a static electricity discharge.
9. Flammable materials shall not be stored with water reactive, explosive or self-igniting materials or next to strong oxidizing agents.
10. Flammable liquids shall be stored in approved flammable liquid storage cabinets, in accordance with NFPA 45, Standard on Fire Protection for Laboratories Using Chemicals. Flammable storage cabinets shall **not** be vented to the laboratory. The cabinet shall have the port hole closed or be vented directly into an exhaust system.
11. Concentrated reagents and other chemicals which could be harmful on skin contact shall be stored below eye-level, well back on properly constructed shelves where they are not likely to be knocked off.
12. Chemical reagents shall be kept in closed containers when not in use.

Below is a concise guide to the storage of most lab scale chemicals.

- perchloric acid is separated from all other materials, and used in a fume designed for such use
- hydrofluoric acid is separated from all other materials
- concentrated nitric acid is separated from all other materials
- inorganic acids (except bulleted items above) are stored separately
- highly toxic materials (LD₅₀ of 50 mg/kg or less) are stored separately
- carcinogenic chemicals are stored separately.
- bases are stored separately
- strong oxidizing agents are stored separately
- strong reducing agents are stored separately
- water reactive, pyrophoric and explosive materials are stored separately
- flammable organic materials (solvents, organic acids, organic reagents) are stored separately.

The easiest and most efficient way to [separate chemicals by compatibility group](#) is to use secondary containments. Place the chemicals to be stored separately in a heavy gauge Nalgene (or similar plastic) tub. Plastic secondary containers must be compatible with the material being stored. Strong acids, especially perchloric, nitric and hydrofluoric are best stored in plastic containers designed to store strong mineral acids. Small containers of compatible chemicals may be stored in a dessicator or other secure container. This is especially useful for highly toxic materials and carcinogens.

13. Eyewash Stations, Emergency Showers, and Other Safety Equipment Installation and Operability

All laboratories must be equipped with eyewashes and safety showers wherever chemicals have the possibility of damaging the skin or eyes. ANSI Z358.1, “Emergency Eyewash and Shower Equipment” provides for minimum performance requirements (see below).

- The units should be marked with a highly visible sign.

- The units should be located in areas that will be immediately accessible (reachable within 10 seconds).
- The units should be free of obstructions at all times.
- The eyewash units shall be **checked weekly** by a designated lab worker, by flushing for 60 seconds. A [log sheet](#) shall be kept in the lab to document the weekly checks. Emergency showers should be tested every six months, by Facilities Maintenance, to be certain that water flows through it and to clear the lines of stale water and debris.
- Safety equipment, including fire extinguishers, fire blankets, emergency respiratory protection, and spill cleanup equipment should also be inspected monthly. Inspections shall be documented on the monthly inspection sheet (see below).

14. Inspections

Each laboratory should perform a monthly inspection that will cover general safety, safety equipment checks, housekeeping, condition and availability of PPE, chemical waste and fire safety. Stored chemicals shall be examined periodically for replacement, deterioration, and container integrity. Any problems noted with regard to any laboratory safety equipment shall be reported to the laboratory supervisor. Unneeded items shall be discarded or returned to a storage location. The monthly inspection will be signed and dated and should be appended to the CHP.

Additionally, the CHO will perform an annual laboratory inspection, to ensure compliance with the Standard. The inspection report will be submitted to the PI who is responsible for correcting identified deficiencies.

15. Training

The CHO will provide generic laboratory safety training to all laboratory employees on the contents of the OSHA Laboratory Standard, the Chemical Hygiene Plan, and any other applicable regulatory and industry standards. Laboratory personnel should take this training within 30 days of initial assignment to a laboratory, and annually thereafter. Lab Safety Training is now provided via the [CITI web portal](#) and is required annually. A [guide is available](#) to help you access the Lab Safety Course. Listed in the appendix is a table indicating required training per OSHA. The required frequency that is denoted may be increased at the discretion of the PI. Additionally, the PI will provide specific training to their employees on the associated hazards in their laboratory. This training shall include:

- health information on all hazardous chemicals used in the laboratory
- instruction on all Hazard Assessments
- instruction on SOP's

16. Accidents and Spills

Each lab is responsible for implementing measures to prevent accidents and spills and to appropriately respond to any spill that occurs. Spills should be treated as potentially dangerous until it is cleaned up or evidence exists indicating no hazard is present. In the event of a large or uncontrolled spill, call 1-3000 for assistance. Requirements for the lab include the following:

- Written accident and spill response procedures shall be implemented for tasks or processes

- involving hazardous chemicals
- Laboratories shall have a spill response kit available in the laboratory to adequately mitigate or control the spill
- Personnel shall be trained by the PI on spill procedures and the use of the spill kit

In the event of a spill or accident the following steps should be taken:

1. Alert associated laboratory personnel of the incident. If it is safe to do so, stop the source of the spill and turn off any ignition sources. If spill is uncontrolled, the room or building may need to be evacuated. Assess the size/seriousness of spill, retrieve the lab's chemical spill kit, don PPE and proceed with clean-up. Call 1-3000 if you need assistance with the spill. Spill clean-up debris will need to be picked up by EHS.
2. Assist individuals who may have been injured. If someone has been splashed with a chemical take him or her to an eye wash station or shower, as appropriate. Flush exposed tissue continuously for 15 minutes. Remove any clothing that may potentially be contaminated.
3. Call emergency services at 911 and Campus Safety at ext. 1-3000 if an individual is seriously injured, or if the spill is too hazardous for lab personnel to safely manage.
4. Before attempting to clean up a spill, personnel must confirm the identity of the material, the appropriate mitigation procedures and material, i.e. appropriate absorbent to use, and the appropriate to use. The CHO should be consulted to determine the best course of remediation. If feasible, read and follow the chemical's SDS recommendation for spill cleanup procedures.
5. Spills, accidents, and near accidents should be investigated by the PI for determining corrective actions and preventing like instances in the future. The CHO should be contacted for all investigations. Written findings and any recommendations should be distributed to all relevant departments as a safety to reduce future mishaps.
6. All injuries or exposures must be reported within 24 hours to Risk Management (1-2354). Refer to the Employee Workers Compensation Policy.

17. Hazardous Waste

Labeling:

All hazardous waste must be properly labeled. The label must be completely filled out and include:

1. Accumulation start date, reflecting the *day the container becomes full*. Full chemical names must be used; acronyms and chemical formulas are not acceptable
2. Percentage of the contents in the container

Segregation of Chemical Waste:

All chemical waste should be segregated by hazard class using appropriate secondary containment.

Secondary Containment:

Proper secondary containment must be used when incompatible chemicals are stored in the same area. The secondary containers must be of sufficient capacity to contain the contents of the primary container in case of breakage and must be chemically compatible.

Chemical waste Containers securely capped or sealed:

Securely capped means if the bottle is tipped, no leakage occurs. Aluminum foil and parafilm do not constitute a secure cap. If zip-top bags are used to contain contaminated pipette tips, the bag must be securely closed. Chemical waste containers should only be open during filling. Evaporating waste is never allowed.

Removal:

Do not put any hazardous waste down the sink or in the trash. If you are not sure if a chemical is hazardous, call the CHO. A [call or email](#) should be made to the CHO promptly when a waste container is marked as full.

18. Exposure Monitoring

Personal exposure monitoring will be performed if EH&S or the lab staff has reason to believe that the exposure level of any chemical may exceed the action level or Permissible Exposure Limit (PEL).

19. Medical Consultation and Examination

The employer must provide all employees who work with hazardous chemicals an opportunity to receive medical attention, under the following circumstances.

- Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination.
- 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, medical surveillance shall be established for the affected employee as prescribed by the particular standard.
- 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, the affected employee shall be provided an opportunity for a medical consultation. Such consultation shall be for the purpose of determining the need for a medical examination.

20. Recordkeeping

The employer shall establish and maintain for each employee an accurate record of any measurements taken to monitor employee exposures and any medical consultation and examinations including tests or written opinions required by this standard.

Appendix A Hazard Assessment

The purpose of the Hazard Assessment is to identify hazards and determine appropriate controls to eliminate or mitigate those hazards to reduce the risk of injury or illness. Hazards can be classified as chemical, physical, biological, or ergonomic. Examples of hazards include heating chemicals, handling any toxic, corrosive, flammable, reactive, or cryogenic material, pressurizing a system, handling liquids in open containers, using sharps, or working in awkward positions. Examples of controls include a lab hood, a closed system, keeping below a designated temperature, staying clear of the area, using specific ppe. The assessment should begin by denoting basic job or process steps. For each step, list the hazard(s) and the control(s) to be implemented. Refer to OSHA web sites on this subject: [Job Hazard Analysis](#), [Worksite Analysis](#), and [Hazard Prevention and Control](#).

Job or process: _____

Job step or process	Hazard	Controls

Appendix B Hazard Assessment Examples

A Hazard Assessment is about identifying unexpected events and establishing methods to control those events. This is a simple example of a two-step procedure. Each step had more than one potential hazard. For each hazard, controls are described. If the hazard cannot be eliminated the best controls are engineering controls, followed by the use of PPE. Often the control for minor hazards may simply be to use caution or to be aware of the surrounding area.

Job or process: Refilling a Dewar

Job step or process	Hazard	Controls
Wheel laboratory Dewar to room to refill it from a LN ₂ tank.	Back strain	Ensure Dewar is free wheeling
	Pinched toes or fingers	Survey route, use leather gloves
Insert hose into Dewar and open valve on LN ₂ tank.	Cryogenic burn or getting hit - from whip-like motion of hose disconnecting	Ensure hose is secured. Stay clear of hose Wear safety glasses, face shield, cryogenic gloves, long pants and long sleeve lab coat
	Oxygen deficient atmosphere - asphyxiation	Perform work in well ventilated area

Appendix C
Hazardous Activity Standard Operating Procedure

Principal Investigator: _____ Dept.: _____

Building: _____ Room(s): _____

Author: _____ Date: _____

Description of process: _____

Chemical(s) Used	Approx. Qty	Hazard Class	Health Hazards

Significant hazards (identified in the MSDS and Hazard Assessment):

Required engineering controls and special precautions: _____

Required PPE: _____

Transport / Storage Requirements: _____

Exposure / Accidental Contact: _____

Spill Response: _____

Appendix D
Standard Operating Procedure for Chemicals

Principal Investigator: _____ Dept.: _____

Building: _____ Room(s): _____

Date: _____

Hazardous Chemical name: _____

Description of Chemical Hazard: _____

Engineering controls to be implemented: _____

PPE to be worn: _____

Hazardous Material Transport/Storage Requirements:

Exposure / Accident Contact: _____

Spill Response: _____

Appendix E Monthly Laboratory Inspection Checklist

Department: _____ Principal Investigator: _____

Building & room: _____ Month/Year _____

Mark items as satisfactory (✓) or deficient (X). In comments section, describe any deficiencies and how and when they were abated.

Laboratory information

1. Entrance posting & room warning signs, i.e., radiation area, food only, no food, exit
2. CHP and SOP's available
3. Lab personnel (especially new hires) current on OSHA training and knowledgeable of SOP's

General Emergency/Safety Equipment

5. Eyewash stations accessible, tested weekly, and operational
6. PPE available, in good condition, and stored properly
7. Fire extinguishers present, inspected and posted
8. Sharps managed properly (razor blades, needles, broken glass, scalpels)
9. Absorbent bench covers routinely changed

Chemicals

10. Hazardous waste properly segregated, labeled

Equipment & Material Handling

11. Fume hoods – free from clutter, proper sash height, flow-indicating device, current sticker
12. Gas cylinders properly transported, secured, and capped when not in use

Comments:

Inspected by (print) _____ Date: _____ Signature _____

Appendix F
OSHA training requirements relevant to laboratory work.

Subject /Standard	Training Frequency	Description
Asbestos 1926.1101	Annual training	Awareness training for workers who may contact asbestos containing materials
Bloodborne Pathogens 1910.1030	Upon Hire and Annually Thereafter	Persons with occupational exposure
Fire Extinguishers 1910.157	Upon Hire and Annually Thereafter	Training to familiarize employees with the fire extinguisher use of and associated hazards.
Fire hazards 1910.38	Upon Hire and as needed	Training to familiarize each employee those parts of the fire prevention plan which the employee must know to protect the employee in the event of an emergency
Hazard Communication 1910.1200	Upon Hire and as needed	Training to ensure that chemical hazards in the workplace are evaluated and that this hazard information is transmitted to affected employers
Laboratories 1910.1450	Upon Hire and Annually Thereafter	Training on the location of hazardous chemicals, the methods to detect the presence and release of hazardous chemicals, specific implemented procedures to protect employees from exposures, such as appropriate work practices, emergency procedures, and ppe use, and on the applicable details of the Chemical Hygiene Plan.
Personal Protective Equipment 1910.132	When PPE is Issued and as Needed	Training on the use of PPE, when PPE is necessary; what type is necessary; how it is to be worn; and what its limitations are, as well as know its proper care, maintenance, useful life, and disposal.
Respiratory Protection 1910.134	When PPE is Issued and Annually Thereafter	Training on why the respirator is necessary and its proper use and maintenance, the limitations and capabilities of the respirator, how to inspect and store the respirator, how to recognize medical signs and symptoms that may limit or prevent the effective use of respirators.