**{Your Company Name}**

**Chemical Hygiene Plan**

**Disclaimer. Responsibility for a Chemical Hygiene Plan rests entirely with each company/employer. While this template has been crafted to align with the Occupational Safety & Health Administration Standard 29 CFR 1910.1450, “Occupational exposure to hazardous chemicals in laboratories,” it is intended only as a guide. Each employer must work with its own Chemical Hygiene Officer to customize a Chemical Hygiene Plan that complies with all applicable laws, policies, and regulations.**

**If you are affiliated with a University of Maryland laboratory, do not use this template. Please refer instead to the University of Maryland Chemical Hygiene Plan provided on the ESSR website.**

**Make this template your own. To guide you, the places that require edits are highlighted and underlined in {yellow}.**

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# Purpose

The **{Your company}** Chemical Hygiene Plan (CHP) is readily available to all employees and complies with the Occupational Safety and Health Administration (OSHA) Occupational Exposure to Hazardous Chemicals in Laboratories standard “Laboratory Standard” found at 29 CFR 1910.1450. The Chemical Hygiene Plan protects employees from health hazards associated with hazardous chemicals in that laboratory and ensures exposures are below the permissible exposure limits. A copy of the contents of this standard and its appendices are available on the [OSHA website](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1450).

# Scope

The **{Your company}** Chemical Hygiene Plan shall apply to laboratory **{List your company lab(s)}** where laboratory scale hazardous chemicals are used and/or stored. In this plan, a laboratory is defined as being a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

[OSHA 1910.1450(b)] Small quantities refer to work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person. The effectiveness of the CHP is reviewed and evaluated at least annually and updated, as necessary.

## Establishing a Culture of Safety (29 CFR 1910.1450 Appendix A)

With the promulgation of the OSHA Laboratory Standard, a culture of safety consciousness, accountability, organization, and education has developed in industrial, governmental, and academic laboratories. Safety and training programs have been implemented to promote the safe handling of chemicals from ordering to disposal, and to train laboratory personnel in safe practices. Laboratory personnel must realize that the welfare and safety of each individual depends on clearly defined attitudes of teamwork and personal responsibility. Learning to participate in this culture of habitual risk assessment, experiment planning, and consideration of worst-case possibilities—for oneself and one's fellow workers—is as much part of a scientific education as learning the theoretical background of experiments or the step-by-step protocols for doing them in a professional manner. A crucial component of chemical education for all personnel is to nurture basic attitudes and habits of prudent behavior so that safety is a valued and inseparable part of all laboratory activities throughout their career.

Over the years, special techniques have been developed for handling chemicals safely. Local, state, and federal regulations hold institutions that sponsor chemical laboratories accountable for providing safe working environments. Beyond regulation, employers and scientists also hold themselves personally responsible for their own safety, the safety of their colleagues and the safety of the general public. A sound safety organization that is respected by all requires the participation and support of laboratory administrators, workers, and students. A successful health and safety program requires a daily commitment from everyone in the organization. To be most effective, safety and health must be balanced with, and incorporated into, laboratory processes. A strong safety and health culture is the result of positive workplace attitudes—from the chief executive officer to the newest hire; involvement and buy-in of all members of the workforce; mutual, meaningful, and measurable safety and health improvement goals; and policies and procedures that serve as reference tools, rather than obscure rules.

In order to perform their work in a prudent manner, laboratory personnel must consider the health, physical, and environmental hazards of the chemicals they plan to use in an experiment. However, the ability to accurately identify and assess laboratory hazards must be taught and encouraged through training and ongoing organizational support. This training must be at the core of every good health and safety program. For management to lead, personnel to assess worksite hazards, and hazards to be eliminated or controlled, everyone involved must be trained.

**General Safety Principles**

* Minimize all chemical exposures and risks
* Perform risk assessments for hazardous chemicals and procedures prior to laboratory work:
	+ **Identify chemicals** to be used, amounts required, and circumstances of use in the experiment. Consider any special employee or laboratory conditions that could create or increase a hazard. Consult sources of safety and health information and experienced scientists to ensure that those conducting the risk assessment have sufficient expertise.
	+ **Evaluate the hazards** posed by the chemicals and the experimental conditions. The evaluation should cover toxic, physical, reactive, flammable, explosive, radiation, and biological hazards, as well as any other potential hazards posed by the chemicals. For a variety of physical and chemical reasons, reaction scale-ups pose special risks, which merit additional prior review and precautions.
	+ **Select appropriate controls to minimize risk**, including use of engineering controls, administrative controls, and personal protective equipment (PPE) to protect workers from hazards. The controls must ensure that OSHA's Permissible Exposure Limits (PELs) are not exceeded. Prepare for contingencies and be aware of the institutional procedures in the event of emergencies and accidents.

One sample approach to risk assessment is to answer these five questions:

1. What are the hazards?
2. What is the worst thing that could happen?
3. What can be done to prevent this from happening?
4. What can be done to protect from these hazards?
5. What should be done if something goes wrong?
* Avoid underestimation of risk even for substances of no known significant hazard.
* Determine the physical and health hazards associated with chemicals before working with them.
* Review your plan, operating limits, chemical evaluations, and detailed risk assessment with other chemists, especially those with experience with similar materials and protocols.
* Before working with chemicals, know the policies and procedures for how to handle an accidental spill or fire. Emergency telephone numbers are posted in a prominent area.
* Know the location of all safety equipment and the nearest fire alarm and telephone.
* Adhere to the hierarchy of controls.

**General Rules for Laboratory Work with Chemicals [OSHA 1910.1450]**

* Contact the laboratory supervisor, principal investigator, Chemical Hygiene Officer or environmental health and safety lead, with all safety questions or concerns.
* Follow assigned work schedules unless a deviation is authorized by the laboratory supervisor.
* Follow standard operating procedures at all times; do not perform unauthorized experiments.
* Plan safety procedures before beginning any operation.
* Always read the Safety Data Sheet (SDS) and label before using a chemical.
* Know the location and proper use of safety equipment.
* Use appropriate ventilation when working with hazardous chemicals.
* Wear appropriate PPE at all times. To protect your skin from splashes, spills and drips, always wear long pants and closed-toe shoes.
* Hands should be washed with soap and water immediately after working with any laboratory chemical, even if gloves have been worn.
* Make others aware of special hazards associated with your work.
* Properly dispose of hazardous wastes.
* Notify supervisors of chemical sensitivities or allergies.
* Report all injuries, accidents, incidents, and near misses.
* Report unsafe conditions to the laboratory supervisor or CHO.
* Eating, drinking, smoking, gum chewing, applying cosmetics, and taking medicine in laboratories where hazardous chemicals are used or stored is strictly prohibited. Pipetting should never be done by mouth.
* Do not store food, beverages, cups, and other drinking and eating utensils in areas where hazardous chemicals are handled or stored.
* Laboratory refrigerators, ice chests, cold rooms, and ovens should not be used for food storage or preparation.
* Maintain situational awareness. Unauthorized persons should not be allowed in the laboratory.

# Regulations

In addition to OSHA’s Laboratory Standard, various other federal, state, and/or local regulations pertaining to specific chemicals, physical hazards, and controls such as personal protective equipment, may apply in the laboratory setting. For **{Your company}** the following regulations apply within the laboratory settings.

|  |  |
| --- | --- |
| **Topic/Hazard/Category** | **Applicable Regulation** |
| Personal Protective Equipment  | 29 CFR 1910.132 |
| Eye and Face Protection | 29 CFR 1910.133 |
| Hand Protection | 29 CFR 1910. 138 |
| Hazard Communication | 29 CFR 1910.1200 |
| Compressed Gas (General Requirements) \* | 29 CFR 1910.101 |
| **{List additional topics and regulatory citations}** |  |

\*Necessary only if utilizing compressed gases

# Definitions

The following definitions are from OSHA 1910.1450 describing a Chemical Hygiene Plan. Additional Definitions can be found on the [OSHA website](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1450).

**Acute Toxicity** refers to those adverse effects occurring following oral or dermal administration of a single dose of a substance, or multiple doses given within 24 hours, or an inhalation exposure of 4 hours.

**Carcinogen** is a substance capable of causing cancer. Select carcinogen means any substance which meets one of the following criteria:

(i) It is regulated by OSHA as a carcinogen; or

(ii) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or

(iii) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (latest editions); or

(iv) It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

(A) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m3;

(B) After repeated skin application of less than 300 (mg/kg of body weight) per week; or

(C) After oral dosages of less than 50 mg/kg of body weight per day.

**Chemical Hygiene Officer (CHO)** means 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. This definition is not intended to place limitations on the position description or job classification that the designated individual shall hold within the employer's organizational structure.

**Chemical Hygiene Plan** means a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment, and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace.

**Hazardous chemicals** are defined as chemicals that present health hazards or physical hazards, or a simple asphyxiant, combustible dust, pyrophoric gas, or hazard not otherwise classified. Chemicals with health hazards are classified as posing one of the following hazardous effects: Acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); aspiration hazard. Chemicals with physical hazards are classified as posing one of the following hazardous effects: Explosive; flammable (gases, aerosols, liquids, or solids); oxidizer (liquid, solid, or gas); self-reactive; pyrophoric (gas, liquid or solid); self-heating; organic peroxide; corrosive to metal; gas under pressure; in contact with water emits flammable gas.

**Laboratory scale** means work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials.

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

(i) Chemical manipulations are carried out on a "laboratory scale;"

(ii) Multiple chemical procedures or chemicals are used;

(iii) The procedures involved are not part of a production process, nor in any way simulate a production process; and

(iv) "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

**Particularly hazardous substances (PHS)** is defined by OSHA as a carcinogen, reproductive toxin or acute toxin.

**Permissible exposure limit (PEL)** is the level of exposure established as the highest level of exposure an employee may be exposed to without incurring the risk of adverse health effects**.** Specified in 29 CFR part

1910, subpart Z.

**Reproductive toxins** mean chemicals that affect the reproductive capabilities including adverse effects on sexual function and fertility in adult males and females, as well as adverse effects on the development of the offspring. Chemicals classified as reproductive toxins in accordance with the Hazard Communication Standard (§ 1910.1200) shall be considered reproductive toxins for purposes of this section.

# Laboratory Specific Information and Actions

This Chemical Hygiene Plan outlines the roles and responsibilities for key personnel and provides an overview of safe work practices for chemical handling, use, and storage.

**{Your company}** is responsible for adding the laboratory-specific information into the CHP appendices, and communicating information to laboratory personnel about the specific hazards that are present in their laboratory and the controls available to minimize exposures. A *Laboratory Action Checklist* is provided in Appendix A, outlining the required CHP laboratory specific content that must be completed.

**{Your company}** is responsible for updating this laboratory specific information at least annually, and whenever substantive changes are made in the activities being carried out.

# Roles and Responsibilities

The following parties have specific roles and responsibilities to ensure an effective chemical safety program.

**Chemical Hygiene Officer: {Name and Contact Number}**

1. Establishes, maintains, and revises the Chemical Hygiene Plan (CHP).
2. Creates and revises safety rules and regulations including the circumstances under which a particular laboratory operation, procedure or activity shall require prior approval before implementation.
3. Monitors procurement, use, storage, and disposal of chemicals.
4. Conducts regular inspections of the laboratories, preparations rooms, and chemical storage rooms, and submits detailed laboratory inspection reports to administration.
5. Maintains inspection, personnel training, and inventory records.
6. Assists laboratory supervisors in developing and maintaining adequate facilities.
7. Seeks ways to improve the chemical hygiene program.
8. Review and evaluate the effectiveness of the Chemical Hygiene Plan at least annually and update it, as necessary.
9. Other: **{** **Add additional information}**

**Laboratory Director: {Name and Contact Number}**

1. Assumes responsibility for personnel engaged in the laboratory use of hazardous chemicals.
2. Provides the Chemical Hygiene Officer (CHO) with the support necessary to implement and maintain the CHP.
3. After receipt of laboratory inspection report from the CHO, meets with laboratory supervisors to discuss cited violations and to ensure timely actions to protect trained laboratory personnel and facilities and to ensure that the department remains in compliance with all applicable federal, state, university, local and departmental codes, and regulations.
4. Provides budgetary arrangements to ensure the health and safety of the departmental personnel, visitors, and students.
5. Other: **{Add additional information}**

**Principal Investigator/Supervisor: {Name and Contact Number}**

1. Ensure that laboratory personnel comply with the departmental CHP and do not operate equipment or handle hazardous chemicals without proper training and authorization.
2. Always wear personal protective equipment (PPE) that is compatible to the degree of hazard of the chemical.
3. Follow all pertinent safety rules when working in the laboratory to set an example.
4. Review laboratory procedures for potential safety problems before assigning to other laboratory personnel.
5. Ensure that visitors follow the laboratory rules and assumes responsibility for laboratory visitors.
6. Ensure that PPE is available and properly used by each laboratory employee and visitor.
7. Maintain and implement safe laboratory practices.
8. Provide regular, formal chemical hygiene and housekeeping inspections, including routine inspections of emergency equipment;
9. Monitor the facilities, the chemical fume hoods, and all safety equipment (fire extinguishers, eye wash, etc.) to ensure that they are maintained and function properly. Contact the appropriate person, as designated by the department chairperson, to report problems with the facilities or the chemical fume hoods.
10. Other: **{Add additional information}**

**Laboratory Personnel: {Names and Contact Numbers}**

1. Read, understand, and follow all safety rules and regulations that apply to the work area;
2. Plan and conduct each operation in accordance with the institutional chemical hygiene procedures;
3. Promote good housekeeping practices in the laboratory or work area.
4. Notify the supervisor of any hazardous conditions or unsafe work practices in the work area.
5. Follow all pertinent safety rules when working in the laboratory to set an example.
6. Always wear personal protective equipment (PPE) that is compatible to the degree of hazard of the chemical.
7. Other: **{Add additional information}**

**Other leadership responsible for safety includes: {Add additional information - delete if does not apply}**

# Standard Operating Procedures (SOPs)

Standard operating procedures that include safe work practices and hazard controls are required for all hazardous laboratory tasks, including those involving hazardous chemicals and processes. A risk assessment should be performed prior to the development of an SOP so that appropriate controls can be selected to mitigate the identified risks. A list of SOPs is located in Appendix B.

SOPs should include:

* Summary of hazards inherent to the materials, equipment, and processes
* Safe work practices, including the use of the [Hierarchy of Controls](https://www.cdc.gov/niosh/topics/hierarchy/default.html): elimination, substitution, engineering controls, administrative controls, and personal protective equipment
* Identification of procedure-specific training required
* Identification of designated areas for storage and use of particularly hazardous substances (carcinogens, reproductive and developmental toxins, and acute toxins)
* Waste handling procedures that satisfy regulatory requirements
* Procedures for site and personal decontamination, both for routine experiments and in the event of a problem

# Training

All laboratory personnel must receive training on the specific hazardous materials, equipment, and processes present in the laboratory. Personnel must be trained to work with the hazards present in the laboratory to ensure that they are apprised of the hazards of chemicals present (29 CFR 1910.1450(f)). Laboratory personnel must complete all required training prior to participating in laboratory activities and before being given unescorted access to laboratory spaces.

Laboratory Training must cover:

* Chemical Hygiene Plan
* General laboratory rules and restrictions
* Physical and health hazards of chemicals in the laboratory
* Routine research-related activities (chemical use, storage locations, waste handling, equipment maintenance, etc.)
* Measures personnel must take to protect themselves from chemical hazards (e.g., engineering controls, personal protective equipment, emergency safety equipment)
	+ Proper training includes how to use the ventilation equipment, how to ensure that it is functioning properly, the consequences of improper use, what to do in the event of a system failure or power outage
	+ Special considerations
	+ Importance of signage and postings
* Hazardous materials storage and use locations
* Standard operating procedures
* Methods and observations used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released)
* Signs and symptoms of exposure to hazardous chemicals
* Clean-up and decontamination procedures
* Emergency response procedures
* Trained laboratory personnel must know shut-off procedures in case of an emergency
* Specialized training for high hazard tasks, including proficiency demonstration prior to independent work

Training documentation must include the name of the trainee, material covered, and the date completed. Training documentation is listed in Appendix D.

# Hazard Identification

Hazardous properties of chemicals can be found on chemical labels, in Safety Data Sheets, and in other reference materials. For chemicals developed in the laboratory:

* If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, determine if it is a hazardous chemical as defined by 1910.1450.
* If the chemical is determined to be hazardous, provide appropriate training.
* If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and shall implement the CHP.
* If the chemical substance is produced for another user outside of the laboratory, comply with the Hazard Communication Standard (29 CFR 1910.1200) including the requirements for preparation of safety data sheets and labeling.

# Waste Management

**{Company Name}** has a waste management plan in place for hazardous waste. The Waste Management Plan can be found: **{List location of Waste Management Plan}**

# Chemical Labeling

Laboratories must not accumulate materials of unknown composition. Unlabeled containers of chemicals are a violation of regulations, a serious hazard for laboratory personnel, and disposal of them is time-consuming and expensive.

Manufacturer labels must not be removed, altered, defaced, or become degraded while that chemical is stored in its original container. If a label is not legible, it must be replaced. If a chemical is transferred to a secondary container, or any in-lab dilutions are made from stock chemical bottles, the new container must be labeled as well. If there is adequate room on the secondary container, hazard information should be added to the label. All information on primary and secondary container labels must be legible.

For secondary container labeling, abbreviations or acronyms may be used in specific cases to label containers of chemicals generated in the lab as long as all personnel working in the lab understand the meaning of the labels and know the location of the approved abbreviation and acronym log sheet. A copy of this list must be present, either physically or digitally, in the laboratory and readily available for all personnel. A copy of this list is located **{List location}.**

Small vials and samples should be labeled with chemical name and hazard information, if at all possible. If it is not, laboratories must develop a labeling scheme that can easily identify the chemical contents. Boxes, bags, or test tube racks containing many small containers should be labeled with the chemical name(s) and hazard information.

Date of opening or last peroxide test should be manually added to the labels on peroxide-forming compounds. Additional information, such as date generated and name of generator, is useful and should be considered, if space allows. Alternatively, digital, or physical keys for sample names can be generated to provide more complete information for individual samples. Documentation of the labeling scheme must be present and available to all laboratory personnel.

Labeling requirements extend to containers holding non-hazardous compounds or water.

# Signage

Laboratory hazard warning signs are required at the entrance to every laboratory to alert laboratory personnel, visitors, and first responders to the specific hazards found in the laboratory. When Particularly Hazardous Substances are present in a laboratory, the laboratory hazard warning signage must include the identifying labels “Toxic Chemicals” or “Cancer Hazard,” as necessary.

Laboratory hazard warning signs must be updated whenever there are changes to the hazards or emergency contact personnel. The procedure for updating laboratory hazard warning signs is **{Describe}**.

# Chemical Inventory

A current inventory of all hazardous chemicals that are present in the laboratory is available **{List location}**. Inventories must be available upon request during emergency situations. Certain highly hazardous chemicals require tracking of specific information in the inventory (see below).

# Particularly Hazardous Substances and Other Highly Hazardous Chemicals

Particularly hazardous substances (PHS), including carcinogens, acute toxins, and reproductive toxins have specific regulatory requirements that must be met due to the risks related to working with these chemicals. Laboratories using these chemicals must have clearly labeled designated areas for use and storage, have procedures for the appropriate use of containment devices such as fume hoods or glove boxes, have safe removal procedures for contaminated waste, and have decontamination procedures for personnel, equipment, and other materials that come into contact with PHS. A list of all PHS substances is in Appendix C.

In addition to managing PHS, chemicals with chronic effects, explosive, or reactive chemicals that may be used in the laboratory may also require specific procedures and training to ensure safe use, handling, and disposal. If at all possible, substitutes for these chemicals should be considered prior to beginning work and used whenever possible.

Due to the increased risks related to using PHS, chemicals with chronic effects, explosive, or reactive chemicals, additional information is required to be tracked in the chemical inventory. There should be a record of the date of receipt, amount, location, and responsible individual for all acquisitions, syntheses, and disposal of these chemicals. A physical inventory reconciliation should be performed annually to verify active inventory records. A procedure must be in place to report security breaches, inventory discrepancies, losses, diversions, or suspected thefts. Procedures for disposal of these chemicals should also be established before any experiments begin, ideally before the chemicals are ordered to prevent possible problems with timely disposal. All waste should be accumulated in clearly labeled impervious containers that are stored in unbreakable secondary containment according to the Waste Management Plan and in compliance with applicable federal, state, and local regulations.

# Chemical Storage Requirements

**{Define Chemical Storage Requirements based on established best practices}**

The following are recommendations from Appendix A:

* Separate and store chemicals according to hazard category and compatibility.
* Follow SDS and label information for storage requirements.
* Maintain existing labels on incoming containers of chemicals and other materials.
* Include chemical identification and appropriate hazard warnings on containers used for storing hazardous chemicals.
* The contents of all other chemical containers and transfer vessels, including, but not limited to, beakers, flasks, reaction vessels, and process equipment, should be properly identified.
* Date chemical shipments upon receipt and stock rotated.
* Date peroxide formers upon receipt, again dated upon opening, and stored away from heat and light with tight fitting, nonmetal lids.
* Open shelves used for chemical storage should be secured, as necessary. Secondary containment devices should be used, as necessary. Waste must be in secondary containment.
* Consult the SDS and keep incompatibles separate during transport, storage, use, and disposal.
* Store oxidizers, reducing agents, and fuels separately to prevent contact in the event of an accident.
* Do not store chemicals in the chemical hood, on the floor, in areas of egress, on the benchtop, or in areas near heat or in direct sunlight.
* Store sealed chemical containers of flammable liquids that require cool storage within laboratory-grade, flammable-rated refrigerators, and freezers.
* Do not store food or beverages in the laboratory refrigerator.
* Store highly hazardous chemicals in a well-ventilated and secure area designated for that purpose.
* Store flammable chemicals in a spark-free environment and in approved flammable-liquid containers and storage cabinets. Ensure grounding and bonding are used to prevent static charge buildups when dispensing solvents.
* Control access to areas where chemical storage and handling occurs. Ensure proper ventilation, appropriate signage and all necessary safety controls and response equipment are present and functional.

# Compressed Gas Safety

All personnel must adhere to OSHA's guidelines (29 CFR 1910.101) encompassing comprehensive training on handling procedures, ensuring proper ventilation, employing suitable storage solutions, and promptly addressing any gas leaks or anomalies.

**{Company Name}** shall determine that compressed gas cylinders are in a safe condition to the extent that this can be determined by visual inspection. Compressed gas cylinders shall have pressure relief devices installed and maintained in accordance with Compressed Gas Association Pamphlets S-1.1-1963 and 1965 addenda and S-1.2-1963.

# Safety Data Sheets

Manufacturers, distributors, or importers of chemicals are required to provide a Safety Data Sheet to communicate the hazards of a chemical. An SDS provides detailed information about the chemical, the chemical hazards, chemical properties, reactivity, safe handling and storage, health effects and first aid measures, and toxicological information.

Safety Data Sheets for chemicals used and stored in the laboratory must be readily available to personnel in the laboratory. SDS collections, binders of print copies, or digital files stored on a shared computer, may be used.

A current inventory of all Safety Data Sheets is available **{List location}**.

# Criteria for Choosing Controls

Appropriate methods of controlling risk, or controls, must be available and used to minimize exposure during the handling, use, and storage of hazardous chemicals. Consider chemicals of unknown composition produced as a by-product or product of new reactions to be hazardous.

Not all controls are equally effective in minimizing exposures. As feasible, always implement the most effective controls possible. The order of effectiveness is as follows; each category is described in more detail below:

* Elimination of hazard
* Substitution with a less hazardous substance or process
* Engineering controls
* Administrative controls
* Personal protective equipment

# Elimination or Substitution

Elimination controls physically remove hazardous materials or equipment from the workspace. Substitution controls find alternative, less hazardous methods to achieve the same result. These methods are not always feasible based on research needs, but these controls should be considered and implemented whenever possible. For example, it may be possible to find procedures that use solvents with lower toxicity or lower pressure/temperature. In some cases, it may be essential to limit the scale of a reaction with volume restrictions. **{Company Name}** will document any required restrictions, prohibitions, or required substitutions.

# Engineering Controls

Engineering controls isolate the worker from the hazard. Engineering controls are built into the laboratory, equipment, or process, and include fume hoods and other local exhaust ventilation, equipment interlocks, and enclosures or shields.

All laboratory personnel must be trained on the proper use of the engineering controls present in the laboratory.

Laboratory personnel are not permitted to make any modification to a chemical fume hood, laboratory local exhaust ventilation system, plumbing, or building structure without appropriate facility approval.

# Administrative Controls

Administrative controls minimize exposure through altering worker behavior and establishing work practices. Administrative controls include general and specific laboratory safety training, standard operating procedures, laboratory safety rules, chemical storage plans, scheduling of work, and good laboratory housekeeping.

Laboratory personnel should have appropriate training and access to SOPs applicable to their work, as described in previous sections.

# Personal Protective Equipment (PPE)

PPE and laboratory attire are selected based on the specific hazards present in the laboratory. **{Company name}** must provide laboratory personnel with all required PPE and ensure that it is worn. PPE must be maintained in good working condition, sanitary condition, and must be replaced as needed.

At a minimum, PPE, and laboratory attire for working with or around hazardous chemicals must include long pants, closed-toe shoes, a lab coat, eye protection, and compatible gloves. Additional requirements may be necessary due to specific conditions present in the lab. For example, loose fitting clothing or jewelry may be restricted in laboratories where machinery is used. Lab attire or with specific fire or chemical resistance properties may be required. PPE requirements shall be designated in the applicable SOP.

Use of respirators. Where the use of respirators is necessary to maintain exposure below permissible exposure limits, the employer shall provide, at no cost to the employee, the proper respiratory equipment. Respirators shall be selected and used in accordance with the requirements of 29 CFR 1910.134.

##

# Exposure Monitoring

**{Company Name}** will make arrangements for exposure monitoring for laboratory personnel in the following circumstances:

* Initially, where there is reason to believe that exposure levels routinely exceed the action level, permissible exposure limit (PEL) for an OSHA-regulated substance, or other recognized occupational exposure limits
* Periodically, where the initial monitoring identifies employee exposure over the action level, PEL, or other recognized occupational exposure limits

**{Company Name}** is responsible for making determinations regarding the requirements for area and/or personal exposure monitoring. Written notification of monitoring results within 15 working days after receipt of monitoring results.

When initial monitoring identifies employee exposure over the action level or PEL, **{Company Name}** will evaluate the effectiveness and use of existing controls and will identify additional controls needed to reduce the exposure below the action level or PEL.

# Safety Equipment Management

All required safety equipment and engineering controls must be in working order at all times when work with hazardous chemicals is being performed in the laboratory.

## Laboratory Local Exhaust Ventilation

The best way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by the use of chemical fume hoods and other ventilation devices. All ventilated equipment relied on should have failure alarms, regular performance testing/certifications, and follow the manufacturers preventative maintenance recommendations. Employees should be advised not to use any ventilation and other engineering controls that are not functioning properly

|  |  |
| --- | --- |
| **Laboratory Ventilation: Engineering Controls** | **Performance & Maintenance**  |
| **{Chemical Fume Hoods}** | **{Describe specific measures that shall be taken to ensure proper use and adequate performance of equipment. Specify the name of designated maintenance personnel.}** |
| **{Ventilated Gas Cabinets}** | **{Describe specific measures that shall be taken to ensure proper use and adequate performance of equipment. Specify the name of designated maintenance personnel.}** |
| **{Glove Boxes}** | **{Describe specific measures that shall be taken to ensure proper use and adequate performance of equipment. Specify the name of designated maintenance personnel.}** |
| **{Add additional engineering controls}** | **{Describe specific measures that shall be taken to ensure proper use and adequate performance of equipment. Specify the name of designated maintenance personnel.}** |

## Emergency Equipment

Hands-free emergency eyewash stations and safety showers are required to be within the work area where corrosive and eye-injurious chemicals are used. Where these chemicals are used, emergency equipment must be installed and maintained to the specifications of the most current consensus safety standards (e.g., ANSI/ISEA Z358.1).

**{DESCRIBE Maintenance and Testing for eyewashes and safety showers:}**

|  |
| --- |
| ***{Example: Plumbed emergency eyewash stations and safety showers will be tested annually by [INSERT NAME]. In addition to annual testing, eyewash stations will be flushed by laboratory personnel on a weekly basis. During this test eyewashes will be activated and flushed until water runs clear. This flushing test will check for appropriate water temperature, appropriate flow, and overall functionality of the device. The flushing should be documented.}***  |

The identification of requirements regarding placement and maintenance of fire safety equipment (e.g., sprinkler systems, fire extinguishers, fire doors, etc.) are based on current Fire Code regulatory statutes. Storage within laboratories should not obstruct access to fire extinguishers, sprinkler heads, eyewashes, safety showers, and all other emergency equipment where they are installed.

|  |  |
| --- | --- |
| **Emergency Safety Equipment** | **Location and Policies/Procedures** |
| **{Eyewash Station}** | **{Describe location and policies/procedures}** |
| **{Safety Shower}** | **{Describe location and policies/procedures}** |
| **{Fire Extinguisher}** | **{Describe location and policies/procedures}** |
| **{First Aid Equipment}** | **{Describe location and policies/procedures}** |
| **{Fire Alarm Pull Stations}** | **{Describe location and policies/procedures}** |
| **{Telephones}** | **{Describe location and policies/procedures}** |
| **{Add Additional Emergency Safety Equipment}** | **{Describe location and policies/procedures}** |

# Safety Rules

**{Company Name}** has put these safety rules in place to maintain a safe laboratory.

|  |  |
| --- | --- |
| **Specific Topic** | **Safety program requirements, rules, approvals, etc. for laboratory operations** |
| General Housekeeping and Laboratory Layout | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |
| Working Alone | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |
| Prior Approvals Required for High Hazard Work | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |
| New Experiments/New Equipment  | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |
| Changes to SOPs | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |
| Scaling Up | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |
| Substituting Hazardous Materials | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |
| Chemical Procurement | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |
| Reporting Notifications/Accountability | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |
| Inspections and Follow-up | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |
| Reporting Spills and Incidents | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |
| Unattended Operations | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |
| Transporting Chemicals | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |
| Working with Sharps | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |
| Security | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |
| **{Add Additional Program Rules}** | **{Describe the safety program requirements, rules, approvals, etc. for laboratory operations.}****{Designate the responsible individual(s) for this program}** |

# Medical Consultation

**{Company Name}** must provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations that the examining physician determines to be necessary, whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory.

If an employee encounters a spill, leak, explosion, or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee must be provided an opportunity for a medical consultation by a licensed physician.

All medical examinations and consultations must be performed by or under the direct supervision of a licensed physician and must be provided without cost to the employee, without loss of pay and at a reasonable time and place. The identity of the hazardous chemical, a description of the incident, and any signs and symptoms that the employee may experience must be relayed to the physician.

Laboratory personnel who work with hazardous chemicals in the laboratory will be referred for medical consultation, examination, and/or surveillance whenever:

* An employee develops symptoms associated with exposure to a hazardous chemical in the laboratory
* An event takes place in the work area that creates the likelihood of hazardous exposure
* Exposure monitoring indicates an exposure level routinely above the action level or PEL

**{Point of Contact for Medical Consultations}**

**{Name/Entity:}**

**{Contact Address/Email/Phone Number:}**

# Spills and Incident Reporting

The Chemical Hygiene Officer is responsible for ensuring that all personnel are aware of the locations of fire extinguishers and chemical spill kits and are trained in their use. The fire extinguishers and spill kits must be appropriate for use with the materials present in the lab. All laboratory personnel must know the location of emergency equipment before beginning an experiment as well as **{Company Name’s}** policies and procedures for how to handle an accidental release of a hazardous substance, a spill or a fire.

Emergency response planning and training are especially important when working with acute toxins. Emergency telephone numbers should be posted in a prominent area. Know who to notify in the event of an emergency. Be prepared to provide basic emergency treatment. Keep your co-workers informed of your activities so they can respond appropriately.

Putting together a comprehensive emergency action plan involves conducting a hazard assessment to determine what, if any, physical or chemical hazards inside or from outside the workplaces could cause an emergency. The plan should describe how workers will respond to different types of emergencies, taking into account specific worksite layouts, structural features, and emergency systems. If there is more than one worksite, each site should have an emergency action plan.

|  |  |
| --- | --- |
| **Location of Local Emergency Hospital and Contact Information** |  |
| **Location of Local Urgent Care Centers and Contact Information** |  |
| **Location and Contact Information of Other Nearby Emergency Centers** |  |

|  |  |
| --- | --- |
| **Location of Emergency Response Plan(s) and Phone Numbers** |  |
| **Additional Laboratory Emergency Procedures and Specific Resources** |  |

# Appendix A: Laboratory Action Checklist for CHP Compliance

|  |  |  |  |
| --- | --- | --- | --- |
| **Laboratory Actions** | **Completed** | **Date of Last Update** | **Notes** |
| Laboratory hazard information current on laboratory hazard warning sign(s) | ☐ |  |  |
| Maintain current laboratory specific emergency response procedures in laboratory | ☐ |  |  |
| List of Standard Operating Procedures (Appendix B) | ☐ |  |  |
| Identification of Chemical Inventory and Safety Data Sheets Storage Location  | ☐ |  |  |
| Identification of Particularly Hazardous Substances (Appendix C) Particularly hazardous substances (carcinogens, acute toxins, and reproductive toxins) must also have clearly labeled designated areas for use and storage | ☐ |  |  |
| Laboratory Specific Training Records (Appendix D) | ☐ |  |  |
| Safety Reference Materials List/Location  | ☐ |  |  |

# Appendix B: Standard Operating Procedures

List the laboratory Standard Operating Procedures, the date of their last update, and the location where the procedure can be found. SOPs can be available either in paper or digitally.

|  |  |  |
| --- | --- | --- |
| **Standard Operating Procedure** | **Date of Last Update** | **Location** |
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# Appendix C: Chemical Inventory Including Particularly Hazardous Substances

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Chemical Name** | **Hazardous Characteristics1** | **PHS Designation2** | **Storage Location(s)** | **Approved Use Location(s)** | **PEL/OEL3** | **Signs and Symptoms of Exposure** | **Additional Toxic Effects4** |
|  |  |  |  |  |  |  |  |
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1 Hazardous Characteristics (N/A if none): indicate if chemical is (I) Ignitable, (COR) Corrosive, (RX) Reactive, or (T) Toxic

2 PHS Designation (N/A if none) : indicate if chemical is (A) Acute Toxin, (C) Carcinogen, or (R) Reproductive Toxin

3 PEL-Permissible Exposure Limit, OEL-Occupational Exposure Limit

4 Additional Toxic Effects: indicate if chemical effects the respiratory system, skin, liver, kidneys, cardiovascular system, reproductive system, hematologic system, or the neurological system

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# Appendix D: Laboratory Training Record Documentation

***Laboratory Training Records***

|  |  |  |
| --- | --- | --- |
| **Laboratory Member** **(Print and sign)** | **Date Completed** | **Content Covered** |
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# References & OSHA Guidance

[Permissible Exposure Limits](https://www.osha.gov/dsg/annotated-pels/)

[Full List of OSHA Standards](https://www.osha.gov/laws-regs)

[Laboratory Standard](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1450)

 [Appendix A: NRC Recommendations Concerning Chemical Hygiene in Laboratories](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1450AppA)

[Hazard Communication Standard](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1200)

[Bloodborne Pathogens Standard](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1030)

[Personal Protective Equipment Standard](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.132)

[Eye and Face Protection](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.133)

[Hand Protection](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.138)

[Respiratory Protection](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.134)

[OSHAs Hierarchy of Controls](https://www.osha.gov/sites/default/files/Hierarchy_of_Controls_02.01.23_form_508_2.pdf)

**{Add additional references as needed}**