



UNIVERSITY
OF OREGON

CHEMICAL HYGIENE
PLAN

ENVIRONMENTAL HEALTH AND SAFETY
72 ONYX BRIDGE
541-346-3192

Environmental Health and Safety

Staff and Services

Waste Collection Request -----	541-346-3192
Director of EHS -----	541-346-5421
Laboratory Safety Officer -----	541-346-3197
Laboratory Waste Specialist -----	541-346-2348
Indoor Air Quality -----	541-346-8397
Radiation Safety Officer -----	541-346-2864
Biosafety Officer -----	541-346-3476
Fire Safety Officer -----	541-346-3270
EHS FAX -----	541-346-7008

OTHER CONTACT NUMBERS

EMERGENCY -----	911
UOPD, Non-Emergency -----	541-346-2919
Occupational Medicine, University Health Center	541-346-2770
Risk Management (Worker's Compensation)-----	541-346-8316

CHEMICAL HYGIENE PLAN

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PREVIOUS EDITIONS ARE OBSOLETE.

CHEMICAL HYGIENE PLAN

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Purpose:

The purpose of the Chemical Hygiene Plan is to set forth policies and procedures in accordance with the federal Occupational Safety and Health Administration (OSHA) 1910.1450 standard and the Oregon-Occupational Safety and Health Administration (OR-OSHA) standard for Occupational Exposure to Hazardous Chemicals in Laboratories (Appendix A). The information contained within this plan explains general safety and safe work practices for employees in contact with hazardous chemicals in the laboratory. The provisions defined in this plan are capable of protecting employees from health hazards associated with hazardous chemicals in the laboratory, and are also capable of keeping exposures below the permissible exposure limit for OR-OSHA regulated substances.

Scope:

This Chemical Hygiene Plan applies to all employees of the University of Oregon engaged in the laboratory use of hazardous chemicals and working with these chemicals on a laboratory scale in which there is potential for exposure.

Responsibilities:

Chemical Hygiene Officer (CHO):

The Chemical Hygiene Officer for the University of Oregon will work with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices. This person will assist faculty, supervisors, laboratory managers and employees to develop precautions and design adequate facilities, and will know the current legal requirements concerning hazardous chemicals.

Departments:

Departments are responsible for cost incurred through the need for medical evaluations and exposure monitoring. Departments are responsible for their member's enaction of this Plan.

Employee:

Each laboratory employee is responsible for attending safety training sessions, following safety guidelines applicable to the procedures being carried out, assuring that required safety precautions are in place before work is started, and reporting hazardous conditions as they are discovered. Employees who have significant responsibility for directing their own laboratory work are responsible for assuring that potential hazards of specific projects have been identified and addressed before work is started.

Environmental Health and Safety (EHS):

Environmental Health and Safety is responsible for preparing and updating the Chemical Hygiene Plan. It also distributes the plan to applicable departments and

participates in providing resources for departments in the development of their individual Health and Safety Programs.

Laboratory Safety Committee:

The Laboratory Safety Committee, in conjunction with Environmental Health and Safety, is responsible for implementing the Chemical Hygiene Plan. It is also responsible for review of reports regarding laboratory safety practices and recommending appropriate changes to improve employee safety.

Supervisor:

The laboratory supervisor or principal investigator is responsible for enforcing safe work practices. The supervisor will schedule time for the employee to attend designated training sessions and will provide the employee with adequate safety equipment and personal protective equipment as is needed for specific projects. The supervisor identifies potential hazards of specific projects before work is started. The supervisor will inform the employee as to the location of the Chemical Hygiene Plan and make sure that the employee has read and understands the plan. The supervisor, or their designee, shall perform regular, formal chemical hygiene and housekeeping inspections.

University:

The University of Oregon is responsible for developing and supporting a broad-based Chemical Hygiene Program that will protect laboratory employees from health effects associated with hazardous chemicals.

Standard Operating Procedures:

Safe Work Practices with Hazardous Chemicals in the Laboratory at the University of Oregon will include the following:

- ◆ Assist support personnel who may have to enter laboratories by removing hazardous materials from equipment/facilities to be serviced and forewarning them of the need for protective equipment or work practices, etc.
- ◆ Avoid the release of toxic substances in work spaces, especially in cold rooms and warm rooms, since they have contained, recirculated atmospheres. Laboratory fume hoods shall be used for work with toxic substances in quantities where general laboratory ventilation is insufficient for hazard.
- ◆ Conduct all work within the hood at a distance of at least six inches behind the face opening, assure that airflow baffles at the back of the hood are not blocked by stored items, and position the vertical sliding sash at the height specified on the certification sticker. By following these steps, the hood provides adequate containment for most chemical operations.

- ◆ Employees with life threatening or very serious injuries or exposures should immediately call **911**. Also contact University of Oregon Police Department (UOPD) dispatch at **346-2919**.
- ◆ Ensure unimpeded access to safety showers and eyewash stations.
- ◆ Follow the established procedures for the decontamination and safe movement of scientific and medical equipment.
- ◆ Follow established procedures for the decontamination and decommissioning of laboratory work spaces when space use changes
- ◆ Follow hazardous material spill procedures immediately in the event of a hazardous chemical spill.
- ◆ Operate laboratory in a manner that keeps air supply and exhaust properly balanced. Opened laboratory doors can adversely affect hood performance.
- ◆ Keep food, beverages, cosmetics, and medications outside the area where laboratory chemicals are immediately present.
- ◆ Keep the work area clean and uncluttered. Properly label and store chemicals and equipment; clean up work area on completion of an operation or at the end of each day.
- ◆ Minimize hazardous chemical exposures and avoid underestimation of risks due to familiarity.
- ◆ Never mouth pipet.
- ◆ Protect your clothes and exposed skin by wearing laboratory coats. Open-toed shoes, sandals, shorts, and other apparel that leave skin exposed are not appropriate when handling potentially hazardous chemicals. **Laboratory coats should be removed immediately if they become contaminated. Laboratory coat laundering is available through EHS; costs are paid by the lab's department.**
- ◆ Refer to the Material Safety Data Sheet before work with a chemical. Pay particular attention to route of entry, protective measures, spill response, and symptoms of exposure.
- ◆ Remove your gloves carefully and thoroughly wash your hands and forearms upon completion of work and before leaving the laboratory.
- ◆ Use a chemical fume hood when opening, pouring or handling hazardous chemicals. Do not exceed the PELs (Permissible Exposure Limits of OR-OSHA, equivalent to Chapter 29 Code of Federal Regulations Part 1910, Subdivision Z). See Appendix B.

- ◆ Wear gloves and eye/face protection whenever handling hazardous chemicals. Select PPE based upon risk assessment and manufacturer's guidance on material properties.

Additional information is available in a National Research Council publication entitled *Prudent Practices in the Laboratory, Handling and Management of Chemical Hazards*. (Washington D.C.: National Academy Press, 2011). *Prudent Practices* is available in the Knight Library, call number: T55.3.H3 P78 1995, and is also available on the internet.

Control Measures:

Engineering Controls:

Engineering controls are physical structures used to minimize the hazards of a substance to the user.

Use of Fume Hoods:

A fume hood is a protective device used for manipulations which may result in the release of toxic chemical vapors, dust, or aerosols. The fume hood draws air from the laboratory to prevent or minimize the escape of air contaminants from the inside of the hood to the general laboratory area. Chemical manipulations are conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms.

Characteristics to be considered in requiring fume hood use are the physical state, volatility, toxicity, flammability, eye and skin irritation, odor, and the potential for producing aerosols.

A fume hood should be used when one of following occurs during a chemical procedure:

- ◆ Emits airborne concentrations which might approach the action level (or permissible exposure limit).
- ◆ Emits flammable vapors which might approach one tenth of the lower explosion limit.
- ◆ When materials of unknown toxicity are used or generated.
- ◆ Produces an odor that is annoying to laboratory occupants or adjacent units.

Safety Shields or Other Containment Devices:

Safety shielding, such as the sliding sash of a fume hood and benchtop safety shielding, is advised for a chemical procedure when the following occurs:

- ◆ Working with any substance that has a potential for splattering or explosion. This includes highly concentrated acids, bases, oxidizers or reducing agents.
- ◆ Working under non-ambient pressure (vacuum or high pressure).
- ◆ Working with a reaction for the first time.
- ◆ Working with a sealed up reaction.

Other containment devices such as glove boxes and vented gas cabinets are used when the following occurs:

- ◆ An inert atmosphere for the chemical procedure is needed.
- ◆ Capture of any chemical emission is needed.
- ◆ A standard laboratory fume hood does not provide adequate assurance that overexposure to a hazardous chemical will not occur.
- ◆ Toxic compressed gases are stored and used at volumes greater than that of a laboratory lecture cylinder.
- ◆ There are special containment requirements for certain biological or radioactive materials.

Highly localized exhaust ventilation (snorkel tubes) may be required for equipment that exhausts toxic or irritating materials to the laboratory environment.

Personal Protective Equipment:

Eye and Face Protection:

Eye protection is required for all personnel and any visitors whose eyes may be exposed to liquid chemical or physical hazards. Any personal protective equipment (PPE) designated for eye and face protection should meet the requirements listed in ANSI Z87.1 and OR-OSHA 1910.133 regulations.

General eye and face protective guidelines include the following:

- ◆ Safety glasses with side shields are required in any operation where there is limited potential for eye exposure to hazardous liquids or projectiles.
- ◆ Safety goggles are recommended for operations where there is significant potential for hazardous material splashes or projectiles.

- ◆ Face shields are recommended in operations where there is high potential for high risk hazardous material splashes or projectiles. Face shields provide maximum protection to the face and throat. Face shields should not be used as a substitute for eye protection; safety glasses or chemical goggles are required whenever using a face shield.

Foot Protection:

Bare feet, sandals, perforated shoes, or open-toed shoes are not allowed as working attire within laboratories where chemicals are used or stored.

Hand and Body Protection:

Hand and body protection is required when working with chemicals that can cause a significant exposure through skin contact. Appropriate gloves, lab coats, and other personal protection should be selected to meet the needs of the specific chemical work environment. General requirements for hand and body protection include the following:

- ◆ Lab coats should be worn by personnel in any area where chemicals are routinely used or stored. Lab coats are required when working with carcinogens, reproductive toxins, substances which have a high degree of acute toxicity, strong acids and bases, and any substance on the OR-OSHA list for Limits of Exposure to Toxic and Hazardous Substances that carries a "skin" notation. See Appendix B for chemical listings.
- ◆ **Lab coats will not be taken home to be laundered. Lab coat laundering is available through EHS; costs are paid by the lab's department.**
- ◆ Gloves made of appropriate material are necessary to protect the hands and arms from thermal burns, cuts, or chemical exposure that may result in absorption through the skin or reaction on the surface of the skin.
- ◆ Glove materials must be chosen with the specific chemical use in mind (type of material, thickness, breakthrough time and permeation rate). A glove reference chart is available at Environmental Health & Safety; others are available from glove manufacturers.
- ◆ Gloves are required for work involving pure or concentrated solutions of select carcinogens, reproductive toxins, substances which have a high degree of acute toxicity, strong acids and bases, cryogens, and any substance on the OR-OSHA PEL list carrying a "skin" notation.
- ◆ Inspect gloves for defects or tears before each use. Double-glove when working with particular hazardous materials, or when there are poor warning properties of glove breakthrough.

Hygiene Practices:

Laboratory workers should not eat, drink, smoke, chew gum, or apply cosmetics in areas where laboratory chemicals are present. Laboratory workers should wash hands before conducting these activities.

Laboratory workers should not store or prepare food or beverages in storage areas or refrigerators used for laboratory operations; in glassware which is used for laboratory operations; or in any other device used for laboratory operations (e.g. microwaves or ovens). Food and beverages should not be handled with laboratory utensils.

Keep the laboratory work area clean and uncluttered. Clean up the work area on completion of an operation or at the end of each day. Maintain required clearances around safety equipment, electrical equipment, and other areas as required by code.

Laboratory workers should wash hands thoroughly after removing PPE and before exiting the laboratory. Gloves should not be worn on both hands when traveling building corridors, or at any point when activating door hardware is necessary.

Respirators:

In certain situations where engineering controls cannot effectively control the amount of chemical air contaminants within the work environment, personnel may be required to wear respiratory protective equipment. Personnel designated to use respiratory equipment must first have appropriate approvals and training via the University Respiratory Protection Program offered by EHS. Availability of respiratory protection for emergency situations may be required when working with chemicals that are highly toxic and highly volatile or gaseous. If an experimental protocol creates exposure above the permissible exposure limit that cannot be reduced, respiratory protection will be required.

Performance Management

Monitoring:

Fume hoods should be monitored upon every use by the user to ensure that air is moving into the hood. The hood should have a continuous reading device, such as a pressure gauge, to indicate that air is moving correctly. Hood users should also attach a strip of tissue to the bottom of the vertical sliding sash as a visual indicator. To ensure adequate capture, users must also ensure that the hood and baffles are not blocked by equipment or storage containers.

Eye washes should be flushed weekly by the user. Should emergency use become necessary, this will ensure that the eye wash is working and that the water is clean.

Performance Verification:

Environmental Health and Safety will measure the average face velocity of each fume hood annually, and upon maintenance impacting the fume hood exhaust rate. Hood alarms and automatic sash positioning systems will also be tested. Performance will be verified and documented according to EHS procedure.

Environmental Health and Safety will ensure that the emergency showers and eye washes are checked for operation annually.

Equipment that does not meet the requirements of the performance check shall have a request for servicing submitted to Campus Operations. Nonfunctional equipment shall be labeled as such, and should not be used until repairs are complete. EHS will recheck performance upon notification of repair.

Information and Training

Information:

Oregon - Occupational Safety and Health Administration Laboratory Standard: "Occupational Exposure to Hazardous Chemicals in Laboratories" and its Appendices (Oregon Administrative Rule Chapter 437 Division 2 Part 1910.1450), a copy of which is found in Appendix A of this Chemical Hygiene Plan.

Reference Materials:

Material Safety Data Sheets (MSDS) for laboratory chemicals are available from Environmental Health and Safety and in many individual laboratories. Departments that receive MSDSs directly with chemical shipments will make such information available to the employees using the chemicals, and will also send a copy of the MSDS to Environmental Health and Safety.

Links to web based MSDS files are accessible on the Environmental Health and Safety website. Links are also available directly via the Environmental Health and Safety Assistant (EHSA) materials inventory database for those laboratories recording inventory within the database.

Signs and Symptoms:

The signs and symptoms associated with exposure to hazardous chemicals may be found in the following references: Laboratory Chemical Safety Summaries (LCSS's) for 88 commonly encountered laboratory chemicals, are located on pages 235 to 413 of Prudent Practices, 1995 edition and are available from Environmental Health and Safety. LCSS's are similar to Material Safety Data Sheets (MSDS), but are tailored to the hazards of laboratory use of those chemicals.

University of Oregon Chemical Hygiene Plan:

The University of Oregon's Chemical Hygiene Plan is available to all employees and can be found at Environmental Health & Safety, 72 Onyx Bridge and on the Environmental Health and Safety website.

Training:

Each laboratory supervisor is responsible for ensuring that laboratory employees are provided with training about the hazards of chemicals present in their laboratory work area, and methods to control exposure to such chemicals. Such training must be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new potential exposure situations. Training shall include the following topics.

Chemical Hygiene Plans:

Details of the University Chemical Hygiene Plan and an individual laboratory's Standard Operating Procedures and Laboratory-Specific Plans.

Emergency Response:

Appropriate actions for emergency response within individual laboratories.

Information Available:

The use and location of Material Safety Data Sheets and Laboratory Chemical Safety Summaries, and other laboratory-specific references.

Methods to Detect the Presence of Hazardous Chemicals:

Hazardous chemicals are identified through the observation of labeling and information available, odors present, real-time monitoring, air sampling, etc.

Physical and Health Hazardous:

Hazards to be reviewed include toxicity, exposure levels, routes of entry, acute and chronic effects, dose-response relationship, LD₅₀, threshold limit values and permissible exposure limits, exposure time, and health hazards related to classes of chemicals manipulated within a laboratory.

Prior Approval:

The responsibility for approval of the acquisition and use of toxic chemical agents rests with the laboratory supervisor. If there are questions concerning the need for university approvals contact Environmental Health and Safety.

Protective Measures:

Laboratory practices intended to reduce personal exposure and to control physical hazards, as well as specific protective mechanisms and warning systems used in individual laboratories. Appropriate use of fume hoods and required PPE is to be specifically addressed.

Prior Approval for Medical Consultation and Examination

Criteria for Consultation and Examination:

All University of Oregon employees who work with hazardous chemicals will have an opportunity to receive medical attention, including any follow-up examinations that the examining physician determines to be necessary 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 appropriate medical attention.

Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OR-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.

The Chemical Hygiene Officer shall be contacted whenever the need for medical consultation or examination occurs, or when there is uncertainty as to whether any of the above criteria have been met.

Documentation and Distribution of Medical Report:

The examining physician will provide the Office of Risk Management with information about the employee's physical restrictions that may affect the employee's performance or ability to be in contact with specific chemical. The Office of Risk Management, or Environmental Health and Safety, will notify the employee's department of these restrictions.

All employee medical information, such as diagnosis and prognosis will be kept on file by the health care provider.

Information for Examining Physician:

The employer shall provide the following information to the physician:

- ◆ The identity of the hazardous chemical(s) to which the employee may have been exposed. And, when available, specific written recommendations for treatment of chemical exposures (e.g. the UO Hydrofluoric Acid Hazard Alert).

- ◆ A description of the conditions under which the exposure occurred including quantitative exposure data, if available.
- ◆ A description of the signs and symptoms of exposure that the employee is experiencing, if any.

The above information will be collected and transmitted by the employee's supervisor or department and will be submitted to Environmental Health and Safety as well as the examining physician.

Medical Service Provider:

All medical examinations and consultation shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place. The University of Oregon's Office of Risk Management will coordinate those services for university employees.

For problems from exposures, the employee can contact a physician of his/her choice, including providers at an urgent care clinic or emergency room.

Written Report from the Examining Physician:

For examination or consultation, the examining physician will provide a written report that shall include the following:

- ◆ Any recommendation for further medical follow-up.
- ◆ Fitness for work based upon the results of the medical examination and any associated tests.
- ◆ Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous workplace.
- ◆ A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

The written opinion shall not reveal specific findings or diagnoses unrelated to occupational exposure.

Particularly Hazardous Substances

Protective Provisions:

Laboratory supervisors are responsible for assuring that laboratory procedures involving particularly hazardous chemicals have been evaluated for the level of employee protection required. It is important to understand that the OR-OSHA permissible exposure limits (PELs) and substance-specific standards do not include all hazardous chemicals. It is the laboratory supervisor's responsibility under the Laboratory Standard and the "general duty" clause to apply scientific knowledge in safeguarding workers against risks, even though there may be no specifically applicable OR-OSHA standard.

When Additional Protection is Needed:

Additional employee protection will be considered for work with particularly hazardous substances. These include select carcinogens, reproductive toxins, and substances that have a high degree of acute toxicity (see Appendix B).

Before working with a particularly hazardous substance, consideration should be given to the need for inclusion of the following special provisions:

- ◆ Establishment of a designated area.
- ◆ Use of containment devices such as fume hoods or glove boxes.
- ◆ Written Standard Operating Procedures (SOPs)
- ◆ Procedures for safe removal of contaminated waste.
- ◆ Decontamination procedures.

Evaluate, assess, and implement these special provisions as appropriate.

Review and Documentation of Chemical Hygiene Plan

Documentation

Documentation associated with the Chemical Hygiene Plan shall be maintained as follows.

Accident Records:

Records of accidents and near-misses will be written, retained, and reviewed by the Laboratory Safety Committee. Lessons-learned from incident investigations will be written and distributed among laboratory supervisors.

Hazardous Materials Inventories:

Inventory records of chemicals and other hazardous materials purchased and stored will be maintained by laboratories, and will be provided to Environmental Health and Safety for centralized data warehousing and reporting. Employee usage records should also be maintained for materials of known high hazard.

Facility Design:

Facility design records should be retained to indicate compatibility of design with knowledge and regulation current at the time of design.

Exposure Evaluation:

Any records of exposure evaluation carried out by individual departments (including continuous monitoring systems) should be retained by the department and a copy sent to Environmental Health and Safety. Results of exposure evaluations carried out by EHS will be kept by EHS and copies sent to the employee, the employee's supervisor, and the University Health Center. The evaluation report data collected by EHS will be retained for the term of employment plus 30 years.

Fume Hood Monitoring:

Data on annual fume hood monitoring will be kept at Environmental Health and Safety. Fume hood monitoring data are considered maintenance records and as such the data will be retained for five years.

Medical Consultation and Examination:

Results of medical consultations and examinations will be kept by the health care provider for a length of time specified by the appropriate medical records standard. This time will be at least 30 years as required within OR-OSHA 1910.1020.

Training:

Individual employee training should be recorded on the Training form provided in Appendix D (or equivalent) and should be kept in the individual's department for five years. Training records shall be available for inspection. Training conducted by Environmental Health and Safety (EHS) will be retained by EHS.

Periodic Review

On an annual basis, this Chemical Hygiene Plan will be reviewed and evaluated for effectiveness by Environmental Health and Safety and the laboratory safety committee. It will be updated as necessary. Any changes in the Chemical Hygiene Plan will be transmitted to all departments who are in possession of the plan.

References

Oregon Administrative Rules, Chapter 437 Division 2 Subdivision Z Part 1910, Toxic and Hazardous Substances, 1996

Office of the Federal Register National Archives and Records Administration, *Code of Federal Regulations, Title 29 Labor* (Washington D.C.: United States Government Printing Office, 1992)

National Research Council, *Prudent Practices for Handling Hazardous Chemicals in Laboratories* (Washington D.C.: National Academy Press, 1981)

National Research Council, *Prudent Practices in the Laboratory, Handling and Disposal of Chemicals* (Washington D.C.: National Academy Press, 1995)

National Research Council, *Prudent Practices in the Laboratory, Handling and Management of Chemical Hazards* (Washington D.C.: National Academy Press, 2011)

University of Oregon, Office of Environmental Health and Safety
<http://ehs.uoregon.edu>

Appendices to the UO Chemical Hygiene Plan
<http://ehs.uoregon.edu/ChemicalHygiene>

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