



**Physical, Biological, and Waste Water Science Departments  
Science, Engineering, and Math Division**  
6500 Pacific Boulevard SW  
Albany OR 97321

## **CHEMICAL HYGIENE PLAN**

Reference 29 CFR 1910.1450

Occupational Exposure to Hazardous Chemicals  
In the LBCC Science Laboratories

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## FOREWORD

In accordance with OSHA Occupational Exposure to Hazardous Chemicals in Laboratories (OSHA 29 CFR 1910.1450 and OR-OSHA Division 2/Z), the following program establishes policies, procedures, equipment, personal protective equipment and work practices to protect employees from the health hazards presented by hazardous chemicals used in the LBCC Science laboratories. These procedures are mandatory.

This Chemical Hygiene Plan (CHP) is available to employees, their representatives, and representatives of the Assistant Secretary of Labor. This CHP is located in Physical Sciences's laboratory storeroom in Madrone Hall (MH-207), the Science, Engineering and Math Dean's office (White Oak Hall 107A), and on the Public Safety website at <https://www.linnbenton.edu/faculty-and-staff/college-services/public-safety-emergency-planning-ehs/safety-plans.php>

The Division Dean has appointed an Instructional Specialist to act as the Chemical Hygiene Officer for the Division's Laboratories. This CHP will be reviewed, evaluated and updated at least annually.

### **Purpose**

Exposure to hazardous chemicals in the LBCC Science laboratories may represent a significant health risk. All laboratory personnel must know and follow the procedures outlined in this plan. All operations in the laboratory must be planned and performed in accordance with these procedures. Additionally, each employee is expected to develop safe personal chemical hygiene habits aimed at the reduction of chemical exposure to themselves and others.

The purpose of this CHP is to:

- Eliminate or reduce employee, student, and volunteer occupational exposure to harmful chemicals;
- Comply with OSHA Occupational Exposure to Hazardous Chemicals in Laboratories, found in OSHA 29 CFR 1910.1450 and OR-OSHA Division 2/Z.

### **Scope**

This plan covers all employees, students, volunteers or any other persons who perform tasks.

For student safety and health, these standards and procedures shall also be incorporated into the laboratory curriculum of students.

Kristina Holton

Dean, Science, Engineering and Technology Division

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## 1.0 Standard Operating Procedures for Laboratory Chemicals

### 1.1 Chemical Procurement

1.1.1 The decision to procure a chemical shall be a commitment to handle and use the chemical properly from initial receipt to ultimate disposal.

1.1.2 Requests for procurement of new chemicals shall be submitted to the Chemical Hygiene Officer for approval. The form entitled "New Chemical Purchasing Request," Appendix C to this plan, shall be used for this purpose. Information on proper handling, storage and disposal shall be known to all involved personnel prior to the procurement of the chemical. Chemicals utilized in the laboratory shall be those that are appropriate for the ventilation system.

1.1.3 All chemicals shall be received in a central location. Personnel who receive chemical shipments shall be knowledgeable of the proper procedures for receipt. Chemical containers shall not be accepted without accompanying labels, safety data sheets and packaging in accordance with all appropriate regulations. All chemical shipments should be dated when received and opened.

### 1.2 Chemical Storage

1.2.1 Received chemicals shall be immediately moved to the designated storage area. Extreme care shall be exercised when handling glass containers during transportation.

1.2.2 The storage area shall be well illuminated, with all storage maintained below a six-foot height level on edge-protected shelves. Large bottles shall be stored no more than two feet from ground level. Containers shall be stored so that content labels are visible.

1.2.3 Chemicals are segregated by hazard classification and compatibility in well-identified areas. See Appendix I for a description of the chemical storage classification system.

1.2.4 Mineral acids are stored separately from flammable and combustible materials in the acid storage cabinet (room MH-207). Acid-resistant material or trays shall be placed under bottles of mineral acids.

5. Flammables are stored separately from other chemicals in the flammable cabinet (Rm. MH-207).

1.2.6 Temperature-sensitive materials are stored in the flammable storage refrigerator in room MH-207; the **placement of food or beverages in this refrigerator is prohibited.**

1.2.7 Supplemental containment shall be used for opened highly toxic, water sensitive, air sensitive, light sensitive, or other conditions as appropriate to preserve chemical condition and area safety.

1.2.8 The storage areas shall not be used as a preparation or repackaging area; appropriate work areas shall be used for these activities.

1.2.9 The storage area shall be accessible during normal working hours to trained employees and authorized individuals only; public access is not permitted. This area shall be kept locked at all other times. The storage area is under the control of the Instructional Specialist.

1.2.10 When hazardous chemicals are moved from the storage area to the laboratories, supplemental containment shall be used. A containment bucket is required for all transfers of concentrated mineral acids stored in 2.5 liter or larger bottles.

1.2.11 Compressed gas bottles will be secured at all times and capped for transport or when not in use.

1.2.12 Storage of chemicals at the lab bench, fume hoods or other work areas shall be limited to those amounts necessary for one operation. The container size shall be the minimum convenient. The amounts of chemicals at the lab bench shall be as small as practical.

1.2.13 All secondary containers will be labeled in English to identify contents, hazards, preparation date, and ownership as detailed in the Physical Sciences Department's written "Hazard Communication Program". Secondary containers will be of a material suitable for safe storage of their contents.

1.2.14 Stored chemicals shall be examined at least monthly by the Chemical Hygiene Officer for replacement, deterioration, and container integrity. The inspection should determine whether any corrosion, deterioration, or damage has occurred to the storage facility as a result of leaking chemicals.

1.2.15 Periodic inventories of chemicals outside the storage area shall be conducted by the Chemical Hygiene Officer. Unneeded items shall be properly discarded or returned to the storage area.

### **1.3 Chemical Handling**

Each laboratory employee with the training, education and resources provided by supervision, shall develop and implement work habits consistent with this CHP to minimize personal and coworker exposure to the chemicals in the laboratory. The OSHA Laboratory Health Standard defines a hazardous chemical as any element, chemical compound, or mixture that is a physical hazard or health hazard. The designation applies to hazardous chemicals regardless of quantity. A chemical is a physical hazard if there is scientifically valid evidence that it is a combustible liquid, a compressed gas, an explosive, an organic peroxide, an oxidizer or pyrophoric, flammable or reactive. A chemical is a health hazard if there is statistically valid evidence that acute or chronic health effects may occur in exposed employees. Classes of health hazards include: carcinogens; reproductive toxins; sensitizers; hepatotoxins (liver); neurotoxins (nerve); nephrotoxins (kidney); irritants; corrosives; hematopoietic (blood) agents; and agents that damage the lungs, skin, eyes, or mucus membranes. Based on the realization that all chemicals inherently present hazards in certain conditions, exposure to all chemicals shall be minimized. Definitions found in Appendix L may be useful to understand chemical hazard terminology.

Health hazards may manifest themselves in measurable changes in the body and be evidenced by various signs and symptoms. The effects of over-exposure are influenced by many factors including exposure route, concentration level and the duration of exposure. Somewhat complicating is the fact that similar symptoms may be caused by non-occupational issues. Information regarding health issues may be found on chemical container labels, and in detail on the Safety Data Sheets. A useful pamphlet entitled "Understanding Toxic Substances" from California Department of Health Services is reproduced in Appendix P.

General precautions, which shall be followed for the handling and use of all chemicals, are:

1.3.1 Skin contact with all chemicals shall be avoided.

1.3.2 All employees shall wash all areas of exposed skin prior to leaving the laboratory.

1.3.3 Mouth suction for pipetting or starting a siphon is prohibited.

1.3.4 Eating, drinking, gum chewing, use of tobacco, or application of cosmetics in areas where laboratory chemicals are present is prohibited. These areas have been posted. Hands shall be thoroughly washed prior to performing these activities.

1.3.5 Storage, handling and consumption of food or beverages shall not occur in storage areas, refrigerators, glassware or utensils also used for laboratory operations.

1.3.6 Risk determinations shall be conservative in nature.

1.3.7 Any chemical mixture shall be assumed to be at least as toxic as its most toxic component.

1.3.8 Substances of unknown toxicity shall be assumed to be toxic.

1.3.9 Laboratory employees shall be familiar with the symptoms of exposure for the chemicals with which they work, the precautions necessary to prevent exposure, and where to find this information.

1.3.10 The intent and procedures of this Chemical Hygiene Plan shall be continuously adhered to.

1.3.11 In all cases of chemical exposure, neither the Permissible Exposure Limits (PELs) of OSHA and OR-OSHA, nor the Threshold Limit Values (TLVs) of the American Conference of Governmental Industrial Hygienists (ACGIH) shall be exceeded.

1.3.12 The engineering controls and safety equipment in the laboratory shall be utilized and inspected in accordance with Appendix A of this plan.

1.3.13 Specific precautions based on the toxicological characteristics of individual chemicals shall be implemented as deemed necessary by the Chemical Hygiene Officer (see 7.2). These special precautions are listed in Section 8.0.

## **1.4 Flammable Chemical Handling and Use**

1.4.1 Flammables will only be handled in the absence of open flames and other ignition sources. Be cognizant that many flammable organic vapors are heavier than air and can travel along the floor posing a fire risk some distance from their point of use. Check the laboratory for incompatible work in progress before using flammables. Always notify other laboratory workers before igniting any flame.

1.4.2 Use electric heating mantles for distillation, and water baths or steam baths for heating when working with flammables.

1.4.3 Use the fume hoods to the maximum extent possible when making flammable solvent transfers or working with open containers.

1.4.3 Metal storage containers will be grounded prior to flammable solvent chemical transfers. Special care is required when handling chemicals with flash points below 73°F.

## **1.5 Laboratory Equipment and Glassware**

Each employee shall keep the work area clean and uncluttered. All chemicals and equipment shall be properly labeled in accordance with Section 1.8. At the completion of each workday or operation, the work area shall be thoroughly cleaned and all equipment properly cleaned and stored.

In addition, the following procedures shall apply to the use of laboratory equipment:

1.5.1 All laboratory equipment shall be used only for its intended purpose.

1.5.2 All glassware will be handled and stored with care to minimize breakage; all broken glassware will be immediately disposed of in a broken glass container. Hand protection is required when handling broken glassware.

1.5.3 All evacuated glass apparatuses, such as Dewar flasks, shall be shielded to contain chemicals and glass fragments should implosion occur.

1.5.4 Care should be used when inserting or removing glass tubing from stoppers; a soap or glycerin solution should be used as a lubricant. Hand and eye protection is required. Use of the mechanical insertion tool is recommended. Old stoppers should be removed by cutting with a knife.

1.5.5 Labels shall be attached to all chemical containers, identifying the contents and related hazards. Care shall be used when removing labels from empty bottles for re-use.

1.5.6 Waste receptacles shall be identified as such.

1.5.7 All laboratory equipment shall be inspected on a periodic basis as specified in Appendix A, and replaced or repaired as necessary.

## **1.6 Personal Protective Equipment**

1.6.1 Safety glasses meeting ANSI Z87.1 are required for employees and visitors to the laboratory and will be worn at all times in the laboratories when hazardous chemicals or procedures are in use. The Laboratory Instructor or supervisor will make notification of the need for use of safety glasses as conditions warrant. Contact lenses are prohibited in the laboratory, except as approved by the Chemical Hygiene Officer and supervisor.

1.6.2 Chemical goggles and/or a full-face shield shall be worn during hazardous chemical transfer and handling operations as procedures dictate.

1.6.3 Sandals, perforated or cloth shoes, and bare feet are prohibited.

1.6.4 Lab coats are provided and must be worn in the laboratory when handling hazardous chemicals as procedures dictate. Laboratory coats will be laundered on a periodic basis. Laboratory coats shall be removed immediately upon discovery of significant contamination.

1.6.5 Appropriate chemical-resistant gloves based on the table in Appendix B shall be worn at all times when there may be skin contact with chemicals. Used gloves shall be inspected and washed prior to re-use; single-use gloves will be disposed of after use. Damaged or deteriorated gloves will be immediately replaced. Gloves shall be washed prior to removal from the hands.

1.6.6 Thermal-resistant gloves shall be worn for operations involving the handling of heated materials, exothermic reaction vessels, and cryogenic materials. Thermal-resistant gloves shall be non-asbestos and shall be replaced when damaged or deteriorated.

1.6.7 Respirator usage, when required, shall comply with OSHA Personal Protective Equipment & Respiratory Protection code 29 CFR 1910.134, found in OR-OSHA's Division 2/I, and LBCC's Respiratory Protection Program.

## **1.7 Personal Work Practices**

1.7.1 Laboratory supervision must ensure that each employee knows and follows the rules and procedures established in this plan. Basic safety rules for visitors and students are found in Appendix I.

1.7.2 All employees shall remain vigilant to unsafe practices and conditions in the laboratory and shall immediately report such practices and/or conditions to the laboratory supervisor. The supervisor shall correct unsafe practices and or conditions promptly.

1.7.3 Long hair and loose-fitting clothing shall be confined close to the body to avoid being caught in moving equipment parts or open flames.

1.7.4 Use only those chemicals appropriate for the ventilation system.

1.7.5 Avoid unnecessary exposure to all chemicals by any route. Do not smell or taste any chemicals.

1.7.6 Encourage safe work practices by setting the proper example. Horseplay is strictly forbidden.

1.7.7 Seek information and advice from knowledgeable persons, standards and codes about the hazards present in the laboratory. Plan operations, equipment and protective measures accordingly.

1.7.8 Use engineering controls in accordance with Section 3.0.

1.7.9 Inspect personal protective equipment prior to use, and wear appropriate protective equipment as procedures dictate and when necessary to avoid exposure.

## **1.8 Labeling**

1.8.1 All containers in the laboratory shall be labeled. This includes chemical containers and waste containers. The label shall be informative and durable, and at a minimum, will identify contents, source, date of acquisition or preparation, and indication of hazards. Secondary containers shall be constructed of materials suitable for the intended storage; no other labeling shall be visible. The NFPA labeling system, summarized in Appendix M, is used to provide additional hazard rating information.

1.8.2 Exemptions for labeling requirements shall be made for chemical transfers from a labeled container into a container that is intended only for the immediate use of the individual who performed the transfer.

1.8.4 The labeling program shall be periodically inspected by the Chemical Hygiene Officer to ensure that labels have not been defaced or removed. The form entitled "Chemical Hazard Audit Checklist", Appendix D to this plan, shall be used for this purpose.

## **2.0 Criteria for Implementation of Control Measures**

### **2.1 Air Sampling**

2.1.1 Air sampling for evaluating employee exposure to chemical substances shall be conducted periodically or as specified by specific codes or regulations.

2.1.2 Upon addition of new chemicals or changes in control procedures, additional air sampling will be considered to determine the exposures. Air sampling will be conducted if there is reason to believe that exposure levels for regulated substances that require sampling routinely exceed the action level, or in the absence of an action level, the PEL.

2.1.3 The results of any air sampling studies performed in the laboratory are maintained and recorded on the form shown in Appendix E to this plan.

## **2.2 Housekeeping**

2.2.1 Each laboratory worker is directly responsible for the cleanliness of his or her workspace, and jointly responsible for common areas of the laboratory. Laboratory management shall insist on the maintenance of housekeeping standards.

2.2.2 The following procedures apply to the housekeeping standards of the laboratory:

2.2.2.1 All spills on lab benches or floors shall be immediately cleaned and properly disposed of. The Instructional Specialist will advise on neutralization and cleanup procedures based on the nature of the spill components. Large spills will be addressed through procedures set out in LBCC's Emergency Management Procedures.

2.2.2.2 The lab benches shall be kept clear of equipment and chemicals except those necessary for the work currently being performed.

2.2.2.3 The work area shall be cleaned at the end of each operation or work shift.

2.2.2.4 All apparatuses shall be thoroughly cleaned and returned to storage upon completion of usage.

2.2.2.5 All floors, aisles, exits, fire extinguishing equipment, eyewashes, showers, electrical disconnects, gas shutoff valves, and other emergency equipment, shall remain unobstructed.

2.2.2.6 Chemical containers shall be clean, properly labeled, and returned to storage with labels facing front upon completion of usage.

2.2.2.7 All chemical wastes will be disposed of in accordance with the waste disposal plan.

## **2.3 Safety and Emergency Equipment**

2.3.1 Telephone numbers of emergency personnel, supervisors and other individuals as deemed appropriate have been posted. Protocols for various emergency situations are detailed in the "LBCC Emergency Procedures" pamphlet that is distributed to supervisors and posted in room MH-207. Assistance for fire or medical emergencies may be reached by dialing 911 and/or Campus Security at 411 or 4440 directly from any phone. A special telephone with a direct connection to Campus Security is located on the wall of the south hallway on the first and second floor of the MH building.

2.3.2 Available safety and emergency equipment includes: first aid kits, fire extinguishers, fire blankets, emergency showers and eyewashes, spill containment kits, broken glass containers, and personal protection equipment, in each laboratory work area. This equipment is positioned for use by trained personnel.

2.3.3 The MH building is equipped with an alarm system with visual and audible annunciation that may be activated from pull-boxes located in the hallways. This system also includes announcements to alert occupants of situations external to the building and emergency actions, such as evacuation or shelter-in-place, which are required.

2.3.3 All laboratory personnel will be trained in the proper response for fire, medical, and other emergency situations when hired and annually thereafter.

2.3.4 All employees who might be exposed to chemical splashes shall be instructed in the location and proper usage of emergency showers and eyewashes. The eyewash stations shall be inspected monthly and emergency showers quarterly. Inspection records shall be maintained.

2.3.5 Location signs for safety and emergency equipment have been posted.

## **3.0 Engineering Controls**

### **3.1 Intent**

The engineering controls installed in the laboratory are intended to minimize employee exposure to chemical and physical hazards in the workplace. These controls must be maintained in proper working order for this goal to be realized.

### **3.2 Modification**

No modification of engineering controls will occur unless testing indicates that worker protection will continue to be adequate.

### **3.3 Improper Function**

Improper function of engineering controls must be reported to the Chemical Hygiene Officer and Facilities immediately. The system shall be taken out of service until proper repairs have been executed.

### **3.4 Usage**

All employees shall follow proper work practices when using the engineering controls.

#### **3.4.1 Local Exhaust Ventilation**

The following procedures shall apply to the use of local exhaust ventilation:

3.4.1.1 Openings of hoods shall be placed as close as possible to sources of the air contaminant.

3.4.1.2 Clear the screen on the face of the hood prior to usage.

3.4.1.3 Hood fans shall operate when hoods are being used.

3.4.1.4 After using hoods, operate the fan for an additional period of time sufficient to clear residual contaminants from the duct work.

3.4.1.5 The ventilation system shall be inspected annually by Facilities or a certified contractor. The duct velocity shall be maintained at 3500 feet per minute, minimum. A record of each inspection shall be submitted to and maintained by Facilities and Safety & Loss Prevention.

3.4.1.6 Prior to a change in chemicals or procedures, the adequacy of the ventilation system shall be determined by the Chemical Hygiene Officer.

### **3.4.2 Laboratory Hoods**

The laboratory hoods shall be utilized for all chemical procedures that might result in release of hazardous chemical vapors or airborne particulates. As a general rule, the hood shall be used for all chemical procedures involving substances which are appreciably volatile and have a permissible exposure limit (PEL) less than 50 ppm.

The following work practices shall apply to the use of hoods:

3.4.2.1 Confirm adequate hood ventilation performance prior to opening chemical containers inside the hood. An inward flow of air can be confirmed by holding a piece of paper at the face of the hood and observing the movement of the paper.

3.4.2.2 Keep the sash of the hood closed to the point indicated for minimum draft at all times except when adjustments within the hood are being made. At these times, maintain the sash height as low as possible.

3.4.2.3 Be cognizant of incompatible chemical or flammability issues with other activities being conducted within the hood.

3.4.2.4 Minimize interference with the inward flow of air into the hood.

3.4.2.5 Leave the hood operating when it is not in active use if hazardous chemicals are contained inside the hood, or if it is uncertain whether adequate general laboratory ventilation will be maintained when the hood is non-operational.

3.4.2.6 The ventilation system shall be inspected annually by Facilities or a certified contractor. The hood face velocity shall be maintained between 75 and 125 feet per minute. A record of each inspection shall be maintained by Facilities and Risk Management.

3.4.2.7 The hood shall not be used as a means of disposal for volatile chemicals.

3.4.2.8 Prior to the introduction of new chemicals, the adequacy of hood ventilation systems shall be determined by the Chemical Hygiene Officer.

### **3.4.3 Glove Boxes and Isolation Rooms**

This equipment is not currently available at LBCC Physical Sciences.

### **3.4.4 Temperature Controlled Rooms & Equipment**

In event of electrical failure, the contents of the reagent refrigerator in room MH-207 and the drying ovens in rooms MH-213 and MH-214 will be examined by the Chemical Hygiene Officer for possible deterioration and remedial action as appropriate.

### **3.4.5 Storage Cabinets & Vaults**

Storage cabinets for flammable and hazardous chemicals will be ventilated as needed. Cabinets in MH-207 are vented.

## **4.0 Employee Information and Training**

### **4.1 Hazard Information**

All employees will be apprised of the hazards presented by the chemicals in use in the laboratory. Each individual shall receive training at the time of initial assignment to the laboratory, prior to assignments involving new exposure situations, and at a regular frequency as determined by the Chemical Hygiene Officer.

### **4.2 Forms**

The forms in Appendices F and G entitled "New Employee Chemical Hygiene Orientation and Training Checklist" and "Supplemental Chemical Hygiene Training Checklist" shall be used for these purposes.

### **4.3 Training**

This training shall include methods of detecting the presence of a hazardous chemical, physical and health hazards of chemicals in the lab, and measures employees can take to protect themselves from these hazards.

4.3.1 The training for employees shall present the details of the Chemical Hygiene Plan and the Hazard Communication Program, and shall include:

4.3.1.1 the contents of the OSHA laboratory standard, and its appendices;

- 4.3.1.2 the location and availability of the Chemical Hygiene Plan;
- 4.3.1.3 the permissible or recommended exposure limits for hazardous chemicals present;
- 4.3.1.4 methods and procedures for detecting, handling, and storing, hazardous chemicals;
- 4.3.1.5 signs and symptoms associated with exposure to the chemicals present in the laboratory;
- 4.3.1.6 the location and availability of reference material on chemical hygiene;
- 4.3.1.7 the appropriate responses for various emergency situations;
- 4.3.1.8 and this training shall be conducted by the Chemical Hygiene Officer. The following materials are used during training: audiovisual programs including Tracom's "Introduction to Laboratory Safety" video and the LBCC "Hazard Communication Training" and "Chemical Hygiene Plan Training" PowerPoints; written materials including the LBCC Chemical Hygiene Plan and SDS file; and a tour to identify work areas, storage areas, and safety equipment. Additional on-the-job training will be provided for both routine and specialized laboratory operations.

## **5.0 Prior Approval of Laboratory Activities**

### **5.1 Work Authorization Permit System**

A work authorization permit system shall be used for laboratory activities that present specific, foreseeable hazards to the employees. These activities include off-hours work, sole occupancy of building, hazardous operations, and unattended operations. The permit entitled "Chemical Hygiene Work Authorization Permit" is included in Appendix H to this plan and shall be executed prior to the performance of these activities. In general, it is desired to minimize the extent of such activities.

#### **5.1.1 Off-Hours Work Procedures**

Laboratory personnel are not permitted to work after hours in the lab, except when Authorized.

#### **5.1.2 Sole Occupancy**

At no time shall work be performed in the laboratory when the only person in the building is the laboratory person performing the work. Under unusual conditions crosschecks, periodic Public Safety Officer checks, video surveillance, or other measures may be taken when authorized.

#### **5.1.3 Hazardous Work**

All hazardous operations are to be performed during a time when at least two personnel are present at the laboratory. At no time shall a laboratory person, while working alone in the laboratory, perform work that is considered hazardous. The determination of hazardous

operations shall be made by the laboratory supervisor or Chemical Hygiene Officer.

#### **5.1.4 Unattended Operations**

When laboratory operations are performed which will be unattended by laboratory personnel (continuous operations, overnight reactions, etc.), the following procedures will be employed:

5.1.4.1 The work authorization permit system shall be utilized.

5.1.4.2 An appropriate sign will be posted at all entrances to the laboratory.

5.1.4.4 The overhead lights in the laboratory will be left on.

5.1.4.5 Precautions shall be made for the interruption of utility service during the unattended operation (loss of water pressure, electricity, etc.).

5.1.3.6 The person responsible for the operation will return to the laboratory at the conclusion of the operation to assist in the dismantling of the apparatus.

### **6. Medical Consultations and Examinations**

**6.1** An opportunity to receive medical attention is available to all employees who work with hazardous chemicals in the laboratory. The opportunity for medical attention will be made available to employees under the following circumstances:

6.1.1 whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory;

6.1.2 where exposure monitoring reveals an exposure level above the action level for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements;

6.1.3 and/or whenever an event takes place in the laboratory such as a spill, leak, explosion, or other occurrence resulting in the likelihood of a hazardous exposure, the employee will be provided an opportunity for medical consultation for the purpose of determining the need for medical examination.

**6.2** These medical consultations and examinations shall be provided without cost to the employees, without loss of pay and at a reasonable time and place.

**6.3** These medical consultations and examinations shall be administered by, or under the direct supervision of, a licensed physician. Except in emergency situations, examinations are conducted by the Occupational Medicine group of the Corvallis Clinic. Employees seeking the opportunity of medical consultation should see Kathy Withrow (x4426), or the HR designate for the appropriate Human Resource paperwork.

## **7.0 Chemical Hygiene Responsibilities**

### **7.1 Division Dean**

The Dean, Science, Engineering and Technology Division has the ultimate responsibility for chemical hygiene throughout the Physical Sciences laboratories and, with assistance of other program administrators, will provide continued support for chemical hygiene.

### **7.2 Chemical Hygiene Officer**

The Instructional Specialist for Physical Sciences will perform the duties of the Chemical Hygiene Officer, and shall:

7.2.1 work with administrators, instructors, the Safety Officer, and other employees, to develop and implement appropriate chemical hygiene policies and practices;

7.2.2 monitor procurement and use of chemicals in the lab, including determining that facilities and training levels are adequate for the chemicals in use;

7.2.3 perform regular, formal chemical hygiene and housekeeping inspections including inspections of emergency equipment;

7.2.4 help instructors develop precautions;

7.2.5 maintain current knowledge concerning the legal requirements of regulated substances in the laboratory;

7.2.6 review and improve the Chemical Hygiene Plan on an annual basis;

7.2.7 maintain overall responsibility for the laboratory operation;

7.2.8 ensure that workers know and follow the chemical hygiene rules;

7.2.9 determine the proper level of personal protective equipment, ensure that such protective equipment is available and in working order;

7.2.10 ensure that appropriate training has been provided to employees;

7.2.11 and monitor the waste disposal program.

### **7.3 Laboratory Workers**

The laboratory workers are individually responsible for planning and conducting each laboratory operation in accordance with the Chemical Hygiene Plan, and developing good personal chemical hygiene habits.

## **8.0 Special Precautions and Exclusions**

When laboratory procedures change to require the use of additional classifications of chemicals (allergens, embryo toxins, teratogens, potentially explosive, etc.), additional special precautions shall be implemented as deemed necessary by the Chemical Hygiene Officer. The authorization permit system shall be utilized for all special activities. All questions regarding the use of the authorization permit system should be addressed to the Chemical Hygiene Officer.

### **8.1 Working with Allergens and Embryo toxins (Special Precautions)**

8.1.1 Suitable gloves to prevent hand contact shall be worn when exposed to allergens or substances of unknown allergen activity.

8.1.2 Women of child-bearing age will handle embryo toxins only after hazard recognition is confirmed and in a hood with confirmed satisfactory performance and with use of protective equipment to prevent skin contact as prescribed by the supervisor and Chemical Hygiene Officer.

8.1.3 Embryo toxins will be stored in adequately ventilated areas in unbreakable secondary containers.

8.1.4 The supervisor, Chemical Hygiene Officer, and Safety and Loss Prevention Manager, will be notified of spills and other exposure incidents. A physician will be consulted when appropriate.

### **8.2 Working with Chemicals of High Acute Toxicity (Special Precautions)**

As all chemicals are harmful to some extent, OSHA has developed guideline definitions for toxicity using average LD<sub>50</sub> (lethal dose) and LC<sub>50</sub> (lethal concentration) criteria. Highly toxic chemicals are those with: ingestion LD<sub>50</sub> of less than 50 mg/kg body weight administered orally to albino rats; or skin contact LD<sub>50</sub> of less than 200 mg/kg body weight administered by continuous dermal contact over a 24 hour period to albino rabbits; or inhalation LC<sub>50</sub> of less than 200 ppm of gas or vapor or 2 mg/L of mist, fume, or dust administered by continuous inhalation for one hour to albino rats. Special precautions are applicable for these chemicals.

8.2.1 Areas where these chemicals are stored and used are of restricted access and have special warning signs.

8.2.2 All usage will be performed in a hood.

8.2.3 Gloves and long sleeves will be used in addition to other PPE. Hands and arms will be washed immediately after working with these chemicals.

8.2.4 Two people will always be present during work with these chemicals.

### **8.3 Working with Potentially Explosive Chemicals**

8.3.1 Procedures using explosive chemicals or reactions that, due to their rate or confines, may be potentially explosive shall be conducted in a designated area. A fume hood is the preferred area. Such designated area will be conspicuously posted with a warning sign and access shall be restricted.

8.3.2 A physical barrier, such as a portable acrylic shield or fume hood sash, shall be used to protect individuals from explosions. Minimum PPE shall include goggles, lab coat and gloves.

8.3.3 Two people will always be present during work with potentially explosive chemicals.

### **8.4 Exclusions**

This CHP does not include matters regarding the hazards, storage, use, record keeping, and disposal of radiological chemicals and blood-borne pathogens; these items are addressed in the LBCC Radiation Safety Plan and the LBCC Blood-borne Pathogen Plan.

### **9.0 Record keeping**

9.1 Investigation of accidents involving injuries to persons or exposure of persons will be conducted by the immediate supervisor and the Campus Public Safety office, with assistance from Human Resources.

9.2 Accident reports will be submitted to and maintained by the LBCC Safety & Loss Prevention for action and archiving. If an employee injury requires more than first aid, Worker's Compensation Form 801 shall be completed and submitted to Human Resources.

9.3 Exposure records for hazardous chemicals and harmful physical agents will be maintained for 30 years per 29 CFR 1910.20 by Human Resources.

9.4 Medical records for employees exposed to hazardous chemicals and harmful physical agents will be maintained for the duration of employment plus 30 years per 29 CFR 1910.20 by the Human Resources department.

9.5 Records of inspections of equipment will be maintained for three years in MH 207.

9.6 Records of training will be kept on file by the supervisor's designee (Chem. Hygiene Officer) in MH 207 and available for employee inspection upon request. Training records shall be maintained for three years from date of training. The following information shall be documented: the dates of the training session, the names and qualifications/title of the person conducting the training; and the names of the persons attending the training session.

9.7 If LBCC is closed and there is no successor employer to receive and retain these records for the prescribed period, the Director of OR-OSHA shall be contacted for final disposition.

## 10.0 Chemical Spills, Releases and Accidents

In the event of a chemical spill, release or other accident, the Chemical Hygiene Officer will adhere to the procedures outlined in the LBCC Emergency Response Plan and the LBCC Hazardous Materials Spill Response plans.

## 11.0 Annual Chemical Hygiene Plan Audit

The Chemical Hygiene Officer will conduct an audit of all phases of the Chemical Hygiene Plan each year in the fall during the annual chemical inventory using the Compliance Checklist. Results will be provided to the Division Dean and the Safety and Loss Prevention Director. Supervisors are responsible for taking corrective action. Appendix J will be used as a guide for the audit.

## 12.0 References and Recommended Reading

In addition to individual Safety Data Sheets for all chemicals used and stored in the laboratories, the Physical Sciences Department has on file the following reference materials in room MH-207:

American Chemical Society, *Safety in Academic Chemistry Laboratories, 6<sup>th</sup> Ed.*, ACS Committee on Chemical Safety, Washington DC, 1995.

JP Dux and RF Stalzer, *Managing Safety in the Chemical Laboratory*, Van Nostrand Reinhold, New York NY, 1988.

National Fire Protection Association, *Fire Protection Guide on Hazardous Materials*, NFPA, Quincy MA, 1986.

National Fire Protection Association, *Hazardous Chemicals Data*, NFPA, Boston MA, 1973.

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

D Pipitone, *Safe Storage of Laboratory Chemicals*, John Wiley & Sons, New York NY, 1984.

NI Sax and RJ Lewis, *Hazardous Chemicals desk Reference*, Van Nostrand Reinhold, New York NY, 1987.

NV Steele, *CRC Handbook of Laboratory Safety 2<sup>nd</sup> Ed.*, CRC Press, Boca Raton FL, 1979.

RS Stricoff and DB Walters, *Laboratory Health and Safety Handbook*, John Wiley & Sons, New York NY, 1990.

US Department of Health & Human Services, *NIOSH Pocket Guide to Chemical Hazards*, US Government Printing Office, Washington DC, 1990.

US Department of Transportation, *2004 Emergency Response Guidebook*, USDOT Research and Special Programs Administration, Washington DC, 2004.

The following Internet sites can be accessed for additional information:

National Institute for Occupational Safety and Health, <http://www.cdc.gov/niosh/homepage.html>,  
December 2004.

Oregon Occupational Safety and Health Division, <http://www.orosha.org>,  
December 2004.

Vermont Safety Information Resources Inc., <http://hazard.com/msds/index.php>, December  
2004.

US Department of Labor, Occupational Safety & Health Administration, <https://www.dol.gov/general/topic/safety-health/occupationalsafety>,  
[February 2019](#)

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APPENDIX A



**Quarterly Laboratory Safety Equipment Inspection Schedules & Logs**

Laboratory:				
Address:				
Division Director:			Telephone:	
Purpose:			The purpose of this schedule is to assure that all laboratory safety equipment is inspected on a routine basis by competent personnel.	This completed form shall comprise the inspection log; additional comments, such as remedial work performed, may be written on the back or attached. This record shall be retained on file.

Equipment	Location	Date	Inspection Procedure	Findings/ Disposition
Drench hose eyewash	MH 107		Wet test	
Fire extinguisher 1	MH 107		Visual check, gauge & current tag	
Fire extinguisher 2	MH 107		Visual check, gauge & current tag	
First aid kit	MH 107		Physical examination	
Spill kit	MH 107		Physical examination	
Drench hose eyewash	MH 113		Wet test	
Fire extinguisher	MH 113		Visual check, gauge & current tag	
First aid kit	MH 113		Physical examination	
Gas shut off	MH 113			
Safety shower/eyewash	MH 114		Wet test	
Drench hose eyewash	MH 114		Wet test	
ADA eyewash	MH 114		Wet test	
Fire extinguisher 1	MH 114		Visual check, gauge & current tag	
Fire extinguisher 2	MH 114		Visual check, gauge & current tag	
First aid kit	MH 114		Physical examination	
Fire Blanket	MH 114		Physical examination	
Drench hose eyewash	MH 207		Wet test	
Fire extinguisher	MH 207		Visual check, gauge & current tag	
First aid kit	MH 207		Physical examination	
Spill kit	MH 207		Physical examination	
Mercury spill kit	MH 207		Physical examination	
Fume hood	MH 207		Air velocity & physical inspection	
Gas shut off	MH 207			
Fire extinguisher	MH 207A		Visual check, gauge & current tag	
First aid kit	MH 207A		Physical examination	
Spill kit	MH 207A		Physical examination	
Gas shut off	MH 207 A			
Main gas shut off	MH 207A			

Equipment	Location	Date	Inspection Procedure	Findings/ Disposition
Safety shower/eyewash	MH 213		Wet test	
Drench hose eyewash 1	MH 213		Wet test	
Drench hose eyewash 2	MH 213		Wet test	

Drench hose eyewash 3	MH 213		Wet test	
ADA eyewash	MH 213		Wet test	
Fire extinguisher 1	MH 213		Visual check, gauge & current tag	
Fire extinguisher 2	MH 213		Visual check, gauge & current tag	
First aid kit	MH 213		Physical examination	
Fume hood 1	MH 213		Air velocity & physical inspection	
Fume hood 2	MH 213		Air velocity & physical inspection	
Fume hood 3	MH 213		Air velocity & physical inspection	
Fume hood 4	MH 213		Air velocity & physical inspection	
Fume hood 5	MH 213		Air velocity & physical inspection	
Fume hood 6	MH 213		Air velocity & physical inspection	
Fume hood 7	MH 213		Air velocity & physical inspection	
Fume hood 8	MH 213		Air velocity & physical inspection	
Fume hood 9	MH 213		Air velocity & physical inspection	
Gas shut off	MH 213			
Safety shower/eyewash	MH 214		Wet test	
Drench hose eyewash 1	MH 214		Wet test	
Drench hose eyewash 2	MH 214		Wet test	
Drench hose eyewash 3	MH 214		Wet test	
Drench hose eyewash 4	MH 214		Wet test	
ADA eyewash	MH 214		Wet test	
Fire extinguisher 1	MH 214		Visual check, gauge & current tag	
Fire extinguisher 2	MH 214		Visual check, gauge & current tag	
First aid kit	MH 214		Physical examination	
Fume hood 1	MH 214		Air velocity & physical inspection	
Fume hood 2	MH 214		Air velocity & physical inspection	
Gas shut off	MH 214			
Drench hose eyewash	WOH 205		Wet test	
Safety shower/eyewash	WOH 205		Wet test	
ADA eyewash	WOH 205		Wet test	
Fire extinguisher	WOH 205		Visual check, gauge & current tag	
Fire blanket	WOH 205			
First aid kit	WOH 205		Physical examination	
Gas shut off	WOH 205			
Drench hose eyewash 1	WOH 206		Wet test	
Drench hose eyewash 2	WOH 206		Wet test	
Safety shower/eyewash 1	WOH 206		Wet test	
Safety shower/eyewash 2	WOH 206		Wet test	
Fire extinguisher 1	WOH 206		Visual check, gauge & current tag	
Fire extinguisher 2	WOH 206		Visual check, gauge & current tag	
First aid kit 1	WOH 206		Physical examination	
First aid kit 2	WOH 206		Physical examination	
Bloodborn pathogens kit	WOH 206		Physical examination	
Spill kit	WOH 206		Physical examination	
Gas shut off	WOH 206			
Drench hose eyewash	WOH 206B		Wet test	
Fire blanket	WOH 206B			
Fume hood	WOH 206B		Air velocity & physical inspection	
Drench hose eyewash	WOH 206C		Wet test	

Drench hose eyewash	WOH 206C		Wet test	
Drench hose eyewash	WOH 206D		Wet test	
Drench hose eyewash	WOH 206E		Wet test	
Drench hose eyewash	WOH 206F		Wet test	
Safety shower/eyewash	WOH 214		Wet test	
Drench hose eyewash	WOH 214		Wet test	
ADA eyewash	WOH 214		Wet test	
Fire extinguisher	WOH 214		Visual check, gauge & current tag	
Fire blanket	WOH 214		Physical examination	
First aid kit	WOH 214		Physical examination	
Fume hood	WOH 214		Air velocity & physical inspection	
Gas shut off	WOH 214			
Drench hose eyewash	WOH 215		Wet test	
Safety shower/eyewash	WOH 216		Wet test	
Drench hose eyewash	WOH 216		Wet test	
Drench hose eyewash	WOH 216		Wet test	
ADA eyewash	WOH 216		Wet test	
Fire extinguisher 1	WOH 216		Visual check, gauge & current tag	
Fire extinguisher 2	WOH 216		Visual check, gauge & current tag	
Fire blanket 1	WOH 216			
Fire blanket 2	WOH 216			
First aid kit	WOH 216		Physical examination	
Bloodborn pathogens kit	WOH 216		Physical examination	
Gas shut off	WOH 216			
Extra exhaust fan	WOH 216A		Air velocity & physical inspection	
Safety shower/eyewash	WOH 218		Wet test	
Drench hose eyewash	WOH 218		Wet test	
ADA eyewash	WOH 218		Wet test	
Fire extinguisher	WOH 218		Visual check, gauge & current tag	
Fire blanket	WOH 218			
First aid kit	WOH 218		Physical examination	
Gas shut off	WOH 218			
Chemical Hygiene Officer signature:			Telephone: ext. 4747	

## APPENDIX B

### Resistance to Chemicals of Common Glove Materials

(This Table courtesy of S. Hausotter, Fire Marshal, City of Albany, November 2002)

CHEMICAL	NATURAL RUBBER	NEOPRENE	NITRILE	VINYL
Acetaldehyde	G	G	E	G
Acetic Acid	E	E	E	E
Acetone	G	G	G	F
Acrylonitrile	P	G	--	F
Ammonium hydroxide (sat)	G	E	E	E
Aniline	F	G	E	G
Benzaldehyde	F	F	E	G
Benzene <sup>a</sup>	P	F	G	F
Benzyl chloride <sup>a</sup>	F	P	G	P
Bromine	G	G	--	G
Butane	P	E	--	P
Butyraldehyde	P	G	--	G
Calcium hypochlorite	P	G	G	G
Carbon disulfide	P	P	G	F
Carbon tetrachloride <sup>a</sup>	P	F	G	F
Chlorine	G	G	--	G
Chloroacetone	F	E	--	P
Chloroform <sup>a</sup>	P	F	G	P
Chromic acid	P	F	F	E
Cyclohexane	F	E	--	P
Dibenzyl ether	F	G	--	P
Dibutyl phtalate	F	G	--	P
Diethanolamine	F	E	--	E
Diethyl ether	F	G	E	P
Dimethyl sulfoxide <sup>b</sup>	--	--	--	--
Ethyl acetate	F	G	G	F
Ethylene dichloride <sup>a</sup>	P	F	G	P
Ethylene glycol	G	G	E	E
Ethylene trichloride <sup>a</sup>	P	P	--	P
Fluorine	G	G	--	G
Formaldehyde	G	E	E	E
Formic acid	G	E	E	E
Glycerol	G	G	E	E
Hexane	P	E	--	P
Hydrobromic acid (40%)	G	E	--	E
Hydrochloric acid (conc)	G	G	G	E
Hydrofluoric acid (30%)	G	G	G	E
Hydrogen peroxide	G	G	G	E

Iodine	G	G	--	G
Methylamine	G	G	E	E
Methyl cellosolve	F	E	--	P
Methyl chloride <sup>a</sup>	P	E	--	P
Methyl ethyl ketone	F	G	G	P
Methylene chloride <sup>a</sup>	F	F	G	F
Monoethanolamine	F	E	--	E
Morpholine	F	E	--	E
Napthalene <sup>a</sup>	G	G	E	G
Nitric Acid (conc)	P	P	P	G
Perchloric acid	F	G	F	E
Phenol	G	E	--	E
Phosphoric acid	G	E	--	E
Potassium hydroxide (sat)	G	G	G	E
Propylene dichloride <sup>a</sup>	P	F	--	P
Sodium hydroxide	G	F	G	E
Sodium hypochlorite	G	P	F	G
Sulfuric acid (conc)	G	G	F	G
Toluene <sup>a</sup>	P	F	G	F
Trichloroethylene <sup>a</sup>	P	F	G	F
Tricresyl phosphate	P	F	--	F
Triethanolamine	F	E	E	E
Trinitrotoluene	P	E	--	P

(E=Excellent, G=Good, F=Fair, P=Poor)

(a) Aromatic and halogenated hydrocarbons will attack all types of natural and synthetic glove materials. Should swelling occur, the user should change to fresh gloves and allow the swollen gloves to dry and return to normal.

(b) No data on the resistance to dimethyl sulfoxide of natural rubber, neoprene, nitrile rubber, or vinyl materials are available; the manufacturer of the substance recommends the use of butyl rubber gloves.

# APPENDIX C

## New Chemical Purchasing Request



NEW CHEMICAL PURCHASING REQUEST		Date:
1.	Requesting Area: (i.e. Physical Science)	
2.	Requestor:	
3.	Chemical Substance:	
4.	Safety Data Sheet (SDS) Attached: YES	
<i>This request cannot be processed unless the SDS is attached.</i>		
5.	Proposed Chemical Use (course, amounts, duration, etc.):	
6.	Engineering Controls (enclosures, ventilation systems, etc.):	
7.	Storage Requirements:	
8.	Employee Exposure Limit:	
9.	Expected Workplace Exposure Levels:	
10.	Personal Protective Equipment Required:	
Respiratory Protection		
Eye and Face Protection		
Protective Clothing		
11.	Labeling Requirements:	
Carcinogen (known or suspected)    NFPA code:		
12.	Existing equipment/facilities/protocols adequate for use: YES    NO	
Modifications Required:		
13.	Request Approval by Chemical Hygiene Officer:	
Date:		

# APPENDIX D

## Chemical Hazard Audit Sheet



		No.
		Date:
1. Chemical Substance Audit		
2. Work Area Audited:		
3. Audit Performed by:		
4. Reason for Audit:	i.e. Routine	
Special -- Reason:		
5. Date Audit Performed:		6. Time of Audit:
7. Items Audited and Findings:	FINDING	RECOMMENDATIONS
Current SDS in work area		
Engineering controls maintained		
Employees trained		
Labels appropriate		
Emergency procedures known		
Personal protective equipment used		
Workplace monitoring performed		
Employees told of monitoring results		
Required medical tests performed		
Employee concerns, if any		
Supervisory concerns, if any		
8. Other Comments:		
9. Auditor's Signature:	:	Date
10. Route a copy to: 1- Dept	2- Chemical Hygiene Officer,	3-Safety & Loss Prevention Mgr.

Chair,		
--------	--	--

## APPENDIX E

### Air Sampling Data Record



#### AIR SAMPLING DATA TABLE NUMBER

Dept:	Location:	Survey Date:	Air Sampling For::		Sampled By:	
TYPE SAMPLE				ANALYTE:		
SAMPLE MEDIA:				ANALYTICAL METHOD:		
ACGIH TLV-TWA:		OSHA PEL:			OSHA STEL:	
Remarks:						

1- ppm - Parts of vapor or gas per million parts of contaminated air by volume at 25°C and 760 torr.

mg/m<sup>3</sup> - Approximate milligrams of substance per cubic meter of air.

C - Ceiling limit - limit which should never be exceeded even instantaneously.

## APPENDIX F

### New Employee Chemical Hygiene Orientation and Training Checklist



Date:	
NAME:	ID #: _____
JOB ASSIGNMENT:	Supervisor:
EMPLOYMENT DATE:	
<p>1. BY CHEMICAL HYGIENE OFFICER ON THE FIRST DAY OF EMPLOYMENT:</p> <ul style="list-style-type: none"> <li>Management's safety and health philosophy</li> <li>Management's, supervisor's, and employee's safety and health responsibilities</li> <li>General laboratory safety and health rules                             <ul style="list-style-type: none"> <li>Hazard Communication Program</li> </ul> </li> <li>Chemical Hygiene Training Program</li> <li>Location and availability of Chemical Hygiene Plan</li> <li>"Orientation to Laboratory Safety" video <span style="float: right;">Date: _____</span></li> </ul>	
<p>2. TOUR &amp; EXPLANATIONS BY CHEMICAL HYGIENE OFFICER:</p> <p>A. First Day In Work Area</p> <ul style="list-style-type: none"> <li>Introduction to operations, types of chemical and physical hazards</li> <li>SDS information Required</li> <li>work practices Personal</li> <li>protective equipment                             <ul style="list-style-type: none"> <li>Safety equipment locations and operation</li> </ul> </li> <li>Emergency procedures</li> <li>Detection of chemical hazards</li> <li>Labeling systems <span style="float: right;">Date: _____</span></li> </ul> <p>B. Follow-up</p> <ul style="list-style-type: none"> <li>Review work practices and procedures with employee</li> <li>Answer employee questions <span style="float: right;">Date: _____</span></li> </ul>	
Completed by:	Date:
Employee's Signature:	Date:





# APPENDIX H

## Chemical Hygiene Work Authorization Permit



	Page 1 of	
PERMIT NUMBER:		
DATE:		
LOCATION: _____ REQUESTED BY: _____		
Description of Activities:		
POTENTIAL HAZARDS AND REQUIRED CONTROLS		
Safety	Health	Fire
Hazards:	Hazards:	Hazards:

Precautions	Y	N	NA	Precautions	Y	N	NA	Precautions	Y	N	NA
Provide guards				Possible oxygen deficiency				Fire extinguishers			
Personal protective equip.				Special ventilation				Open flame permit			
Special safety training				Toxic materials				Explosion protection			
Special safety procedures				Personal protective equip.				Remove combustibles			

Lockouts required				Special rescue procedures				Test Atmosphere			
Unattended operation				Lockouts required				Emergency egress			
Work Alone				Exceed PELs				Pyrophorics			
Sole Occupancy								Unattended operation			
Special considerations:				Special considerations:				Special considerations:			
Additional Comments:											

**Approval of Chemical Hygiene Officer:**

**Name:**

**Date:**

## Appendix I

### Compatible Chemical Storage System

#### Location I – Room MH 207 Center Shelves:

##### Inorganics

1. Metals
  2. Acetates, Halides, Iodides, Sulfates, Sulfites, Thiosulfates, Phosphates, Halogens, Oxalates, Phthalates
  3. Nitrates (except ammonium), Nitrites
  4. Hydroxides, Oxides, Silicates, Carbonates, Carbon
  5. Sulfides, Carbides
  6. Chlorates, Bromates, Iodates
  7. Cyanates
  8. Borates, Chromates, Permanganates, Molybdates, Vanadates, Ammonium Nitrate
  9. Acids (solid)
  10. Sulfur
- Miscellaneous

##### Organics

1. Acids, Amino acids, Anhydrides
  2. Alcohols, Sugars, Amines, Amides, Imides
  3. Hydrocarbons, Esters, Aldehydes, Oils
  4. Halogenated hydrocarbons, Ketones
  6. Peroxides
  8. Phenols, Cresols
  9. Dyes, Stains Indicators
- Miscellaneous

##### Prepared Solutions for Laboratory Exercises

##### Household Chemicals

#### Location II – Room MH 207 Flammable Storage Refrigerator (Temperature Controlled Storage)

Hydrogen peroxide  
Volatile amines, volatile halogenated hydrocarbons  
Borane – tetrahydrofuran complex  
Temperature sensitive chemicals

#### Location III – MH 207 Vented Storage Cabinet

Reactive Metals (Top Shelf)  
Prepared Solutions for Laboratory Exercises

#### Location IV – MH 207 Vented Acid Cabinet

Mineral acids, liquid organic acids

#### Location V – MH 207 Vented Flammable Cabinet

Flammable organic liquids, halogenated organic liquid

**Location VI – MH 207 Vented Under Hood Cabinet**

Ammonium hydroxide, Sodium hydroxide solutions

**Location VII – MH 207A**

Helium gas

**Location VIII – MH 107**

Oxygen gas  
Hydrogen gas  
Spectrum tubes

**Location IX – WOH 206 Island shelves**

Prepared Solutions for Laboratory Exercises

**Location X – WOH 206 Center Storage Shelves**

Specimens in Formaldehyde solutions, Specimens in storage solutions (Carosafe, Perfect Solution and etc.)

**Location XI – WOH 206 Freezer**

Specimens and lab materials requiring subzero temperature storage.

**Location XII – WOH 206B Shelves on North & West Walls:**

**Inorganics**

1. Metals
2. Acetates, Halides, Iodides, Sulfates, Sulfites, Thiosulfates, Phosphates, Halogens, Oxalates, Phthalates
3. Nitrates (except ammonium), Nitrites
4. Hydroxides, Oxides, Silicates, Carbonates, Carbon
5. Sulfides, Carbides
6. Chlorates, Bromates, Iodates
7. Cyanates
8. Borates, Chromates, Permanganates, Molybdates, Vanadates, Ammonium Nitrate
9. Acids (solid)
10. Sulfur

Miscellaneous

**Organics**

1. Acids, Amino acids, Anhydrides
2. Alcohols, Sugars, Amines, Amides, Imides
3. Hydrocarbons, Esters, Aldehydes, Oils
4. Halogenated hydrocarbons, Ketones
5. Peroxides
6. Phenols, Cresols
7. Dyes, Stains Indicators

Miscellaneous

**Location XIII – WOH 206B Vented Flammable Storage Cabinet**

**Organics**

- #2. Alcohols, Glycols, etc.
- #3. Hydrocarbons, etc.

- #4. Ethers, Keytones, etc.
- #9. Alcohol-based Indicators, etc.

**Location XIV – MH 206B Acid Storage Cabinet 1**

All Acid Solutions, except Nirtic Acid

**Location XV – MH 206B Acid Storage Cabinet 2**

Nirtic Acid Only

**Location XVI – WOH 206B Under Hood Storage Cabinet**

Sodium hydroxide solutions, Calcium hydroxide solutions, etc.

**Location XVII – WOH 206D Storage Shelf on west Wall**

Microbiological stains and media  
Biotechnological reagents

**Location XVIII – WOH 206F Wash Room Under The Sinks**

Household Chemicals

**Location XIX – WOH 206G Refrigerated Storage (Cold Room)**

Specimens in Formaldehyde solutions, Specimens in storage solutions (Carosafe, Perfect Solution and etc.)

Miscellaneous prepared solutions, microbiological media, chemicals and/or materials requiring refrigeration.

**Location XX – WOH 214 Under Hood Flammable Storage Cabinet**

Alcohols

**Location XXI – WOH 214 Refrigerator**

Biotechnological Reagents and media

**Location XXII – WOH 214 Freezer**

Biotechnological Reagents and media

**Location XXIII – WOH 214 Shelves on North Wall**

Biotechnological Reagents and media

**Location XXIV – WOH 214 Cupboards on West Wall**

Electrophoresis reagents, buffers, and stains

**Location XXV – WOH 216A Cadaver Room**

Formaldehyde solution and wetting solution.

**Location XXVI – WOH 218 Storage Shelves and Cupboards on North and South Walls**

Specimens in Formaldehyde solutions, Specimens in storage solutions (Carosafe, Perfect Solution and etc.)



## APPENDIX J

### OSHA Hazardous Chemicals in Laboratories Standard

<b>OSHA HAZARDOUS CHEMICALS IN LABORATORIES STANDARD COMPLIANCE CHECKLIST</b>	
<p><b>PURPOSE:</b> This laboratory chemical hygiene program checklist is intended for use by companies in conducting annual chemical hygiene program evaluations to ensure continuing effectiveness and regulatory compliance.</p> <p><b>REFERENCE:</b> Refer to OSHA Standard 29 CFR 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories, for details concerning the requirements of the standard.</p>	
<b>ORGANIZATION:</b>	<b>LOCATION:</b>
<b>LABORATORY:</b>	<b>DATE OF AUDIT:</b>
<b>LAB MANAGER:</b>	<b>CHEMICAL HYGIENE OFFICER:</b>

ITEM	29 CFR 1910.1450 REQUIREMENT	REF NO.	YES	NO	COMMENTS
	<b>APPLICATION</b>				
1	Laboratory engaged in the use of hazardous chemicals as defined by standard	(a)(1)			
2	Work performed on laboratory scale	(b)			
	<b>OCCUPATIONAL EXPOSURE</b>				
3	Employee exposure to OSHA regulated substances do not exceed the permissible exposure limits specific in 29 CFR part 1910, subpart Z	(c)			
	<b>EXPOSURE MONITORING</b>				
4	Initial monitoring performed for employees exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL)	(d)(1)			
5	Exposure monitoring provisions of relevant standards complied with for employee exposures over the action level (or in the absence of an action level, the PEL)	(d)(2)			

6	Employee monitoring terminated in accordance with relevant standard	(d)(3)			
	<b>EMPLOYEE NOTIFICATION</b>				
7	Employees notified of monitoring results within 15 days of receipt)	(d)(4)			
	<b>CHEMICAL HYGIENE PLAN</b>				
8	A written Chemical Hygiene Plan is developed and implemented for hazardous chemical use as defined in the standard	(e)(1)			
9	The chemical Hygiene Plan is capable of protecting employees from health hazards associated with the chemicals in the laboratory	(e)(1)(i)			
10	The Chemical Hygiene Plan is capable of maintaining employee exposures below the permissible exposure limits specified in CFR part 1910, subpart Z	(e)(1)(ii)			

11	The Chemical Hygiene Plan is readily available to employees, employee representatives and, upon request, to the Assistant Secretary	(e)(2)			
12	The Chemical Hygiene Plan indicates specific measures to ensure laboratory employee protection and includes each of the following elements:	(e)(3)			
13	Standard operating procedures relevant to safety and health to be utilized when using hazardous chemicals	(e)(3)(i)			
14	Criteria for the implementation of control measures including engineering controls, personal protective equipment and hygiene practices	(e)(3)(ii)			
15	Measures to ensure adequate performance and proper usage of engineering controls	(e)(3)(iii)			
16	Provisions for employee information and training in accordance with the standard	(e)(3)(iv)			
17	Circumstances which require prior approval prior to implementation	(e)(3)(v)			

18	Provisions for medical consultation and examination in accordance with the standard	(e)(3)(vi)			
19	Designation of responsible personnel and responsibilities	(e)(3)(vii)			
20	<p>Identification of, and provisions for work with, particularly hazardous substances, including:</p> <ul style="list-style-type: none"> <li>● establishment of designated areas</li> <li>● use of containment devices</li> <li>● removal of waste</li> <li>● decontamination procedures</li> </ul>	<p>(e)(3)(viii)</p> <p>(e)(3)(viii)(A)</p> <p>(e)(3)(viii)(B)</p> <p>(e)(3)(viii)(C)</p> <p>(e)(3)(viii)(D)</p>			
	<b>PLAN REVIEW</b>				
21	The Chemical Hygiene Plan is reviewed and updated at least annually	(e)(4)			
	<b>EMPLOYEE INFORMATION AND TRAINING</b>				
22	Employees receive information and training to ensure that they are apprised of the hazards of chemicals present in their work area	(f)(1)			
23	Information and training provided at the time of initial assignment and prior to assignments involving new exposure situations	(f)(2)			
24	<p>Employees are informed of:</p> <ul style="list-style-type: none"> <li>● contents of the standard</li> <li>● location of Chemical Hygiene Plan</li> <li>● PELs or recommended exposure limits for substances in the laboratory</li> <li>● signs and symptoms associated with exposures to hazardous chemicals in the laboratory</li> <li>● location and availability of known referencematerial</li> </ul>	<p>(f)(3)(i)</p> <p>(f)(3)(ii)</p> <p>(f)(3)(iii)</p> <p>(f)(3)(iv)</p> <p>(f)(3)(v)</p>			

25	<p>Employee training includes:</p> <ul style="list-style-type: none"> <li>● methods to detect the presence of a hazardous chemical</li> </ul>	(f)(4)(i)(A)			
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	<ul style="list-style-type: none"> <li>physical and health hazards of chemicals in the work area</li> <li>measures employees can take to protect themselves from hazards</li> <li>details of the Chemical Hygiene Plan</li> </ul>	(f)(4)(i)(B) (f)(4)(i)(C) (f)(4)(ii)			
	<b>MEDICAL CONSULTATIONS</b>				
26	<p>Employees are provided an opportunity to receive medical attention under the circumstances defined in the standard</p> <p>Medical consultations are performed by or under the direct supervision of a licensed physician</p> <p>Medical consultations are performed without cost to the employee, without loss of pay and at a reasonable time and place.</p>	(g)(1)  (g)(2)  (g)(2)			
27	Information on chemical identity, exposure conditions and exposure symptoms is provided to the physician performing medical consultation	(g)(3)(i)-(iii)			
28	A written opinion is obtained from the examining physician which includes results, recommendations and any medical condition resulting in increase employee risk as a result of exposure to a hazardous chemical in the work area	(g)(4)(a)(A) -(D)			
29	The written opinion does not address diagnoses unrelated to occupational exposure	(g)(4)(ii)			
	<b>HAZARD IDENTIFICATION</b>				
30	Labels on incoming containers of hazardous chemicals are not removed or defaced	(h)(1)(i)			
31	All received safety data sheets are maintained and readily available to laboratory employees	(h)(1)(ii)			
32	Training is provided for all hazardous chemicals produced in the laboratory which are for the exclusive use of the laboratory	(h)(2)(i)			
33	Chemical byproducts of unknown composition produced in the laboratory are assumed hazardous and covered in the Chemical Hygiene Plan	(h)(2)(ii)			
34	Chemical production for a user outside of the laboratory comply with the Hazard Communication Standard, 29 CFR 1910.1200	(h)(2)(iii)			
	<b>RESPIRATORY PROTECTION</b>				
35	<p>Where respirators are used to maintain employee exposure below permissible exposure limits;</p> <ul style="list-style-type: none"> <li>respirators are provided at no cost to the employee</li> </ul>	(i)			

	<ul style="list-style-type: none"> <li>respirators are selected and used in accordance with 29 CFR 1910.134</li> </ul>	(i)			
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	<b>RECORDKEEPING</b>				
36	A recordkeeping system is established to maintain, for each employee, accurate records of measurements taken to monitor employee exposures and any medical consultations and examinations	(j)(1)			
37	Records are kept, transferred, and made available in accordance with 29 CFR 1910.20	(j)(2)			

Notes: (Use additional sheets as necessary)

)

Conducted By:	Title(s)	Date:
Reviewed By:	Title(s)	Date:

## Appendix K

### Basic Laboratory Safety Instructions for Employees, Visitors, and Students

#### General Safety Instructions

In the interest of safety, the following rules are to be followed by all employees in the Physical, Biological, and Waste Water Science Departments of Linn-Benton Community College. Working in the laboratory may involve some risks. Do not enter laboratory work or chemical storage areas unless you are authorized to do so.

1. Conduct yourself in a responsible manner at all times in the laboratory.
2. Visitors to the laboratory are prohibited except with explicit prior permission from the laboratory instructor.
3. Perform no unauthorized experiments. Equipment and materials should be used only in the manner indicated by the laboratory instructor.
4. Never leave experiments unattended. Any equipment not in use should be turned off.
5. The science storage and preparation rooms are off-limits to students. Do not enter these areas unless you have been specifically authorized to do so by your instructor.
6. To prevent possible transmission of blood-borne diseases, nitrile gloves must be worn when assisting in accidents involving open wounds or blood flow. Nitrile gloves are available in all laboratories.
7. Clothing sufficient to insure personal safety must be worn in the laboratory. This includes shoes with closed toes, shirts or other apparel which have sleeves that come to at least the mid-bicep, cover the chest area, belly and back of the student, and clothing that reaches at least the knee when the student is in a standard, seated position with the feet flat on the floor. Long hair must be confined when open flames are used, or during the use of certain mechanical equipment.
8. Food, chewing gum, and drink are prohibited in the laboratories.
9. Use electrical equipment with caution. When using exposed circuitry, make sure all persons are clear of the apparatus before energizing the circuit. De-energize circuits as soon as you are finished using the circuit or when changing wiring. Both high and low voltages present hazards.
10. Keep laboratory desks and floor areas clear of books, clothing, and other extraneous items. Keep drawers and cabinets closed. Cluttered desks and aisles lead to accidents.
11. Notify the lab instructor immediately of any accident or potentially hazardous incident involving yourself or other class members. Early treatment can prevent long-term effects or further injury.
12. Safety glasses must be worn during most laboratory sessions in chemistry and some laboratory sessions in physics. You will be advised when safety glasses are required in physics. Chemistry students must wear safety glasses for all labs in which chemicals are present. Wash the safety glasses with soap and water prior to use.
13. Contact lenses should not be worn in the chemical laboratories.
14. If you know you are sensitive to any chemical, or have any condition that may impair your ability to handle hazardous materials or participate safely in laboratory exercises, please inform your instructor. It is very important that you notify your instructor immediately if you are (or think you may be) pregnant.
15. Never "mouth pipette" chemical solutions.
16. Do not pick containers up by their lids. Never put chemicals back into containers once they have

been dispensed.

17. Always replace caps on chemical containers.
18. Dispose of all chemical waste and broken glass in the appropriate receptacles (i.e. chemical waste containers located in the fume hood and broken glass container). If the waste container is almost full notify your instructor.
19. You are responsible for ensuring that a clean workspace is maintained both in your own working area and in the common working areas. Prior to leaving the laboratory: (a) All laboratory countertops must be wiped down with a damp sponge or paper towel, (b) Trash must be thrown away and not left in sinks, drawers, or other areas other than a trash receptacle, (c) All equipment must be put away in its proper place, and (d) All glassware must be cleaned, dried, and put away.
20. Always wash your hands prior to leaving the laboratory.
21. You should be familiar with the location and the use of any and all of the following items contained in your lab room: first-aid kit, fire blanket, eye wash, safety shower, spill kit and fire extinguisher.

#### **SAFETY INFORMATION ACKNOWLEDGEMENT**

I have received and read a copy of the GeneralSafetyRules (on these two pages). I also received a briefing on the safety rules from the lab manager. I understand these rules are designed to protect me and keep me safe in the lab. I acknowledge I was given the opportunity to ask any questions of the lab manager, instructor, or instructional assistant on the SafetyRules during the safety briefing and/or at any other appropriate time. My signature (or the signature of my parent / guardian if I am under 18 years of age) below indicates that I voluntarily agree to abide by and follow these safety rules.

**Signature:**

**Date:**

**Emergency Contact & Phone:**

## STUDENT SAFETY RULES

(Please Print)

Name: \_\_\_\_\_

Course: \_\_\_\_\_

Section: \_\_\_\_\_

In the interest of safety, the following rules are to be followed by all students in laboratory sessions conducted by the Physical Sciences Department of Linn-Benton Community College. Working in the laboratory may involve some risks. Staff members are authorized to deny use of the laboratory to students who do not adhere to these rules or in instances when student safety might be jeopardized.

1. Conduct yourself in a responsible manner at all times in the laboratory.
2. Visitors to the laboratory are prohibited except with explicit prior permission from the laboratory instructor.
3. Perform no unauthorized experiments. Equipment and materials should be used only in the manner indicated by the laboratory instructor.
4. Never leave experiments unattended. Any equipment not in use should be turned off.
5. The science storage and preparation rooms are off limits to students. Do not enter these areas unless you have been specifically authorized to do so by your instructor.
6. To prevent possible transmission of blood-borne diseases, nitrile gloves must be worn when assisting in accidents involving open wounds or blood flow. Nitrile gloves are available in all laboratories.
7. Clothing sufficient to insure personal safety must be worn in the laboratory. This includes shoes with closed toes, shirts or other apparel which have sleeves that come to at least the mid-bicep, cover the chest area, belly and back of the student, and clothing that reaches at least the knee when the student is in a standard, seated position with the feet flat on the floor. Long hair must be confined when open flames are used, or during the use of certain mechanical equipment.
8. Food, chewing gum, and drink are prohibited in the laboratories.
9. Use electrical equipment with caution. When using exposed circuitry, make sure all persons are clear of the apparatus before energizing the circuit. De-energize circuits as soon as you are finished using the circuit or when changing wiring. Both high and low voltages present hazards.
10. Keep laboratory desks and floor areas clear of books, clothing, and other extraneous items. Keep drawers and cabinets closed. Cluttered desks and aisles lead to accidents.
11. Notify the lab instructor immediately of any accident or potentially hazardous incident involving yourself or other class members. Early treatment can prevent long-term effects or further injury.
12. Safety glasses must be worn during most laboratory sessions in chemistry and some laboratory sessions in physics. You will be advised when safety glasses are required in physics. Chemistry students must wear safety glasses for all labs in which chemicals are present. Wash the safety glasses with soap and water prior to use.
13. Contact lenses should not be worn in the chemical laboratories.
14. If you know you are sensitive to any chemical, or have any condition that may impair your ability to handle hazardous materials or participate safely in laboratory exercises, please inform your instructor. It is very important that you notify your instructor immediately if you are (or think you may be) pregnant.
15. Never "mouth pipette" chemical solutions.
16. Do not pick containers up by their lids. Never put chemicals back into containers once they have

been dispensed.

17. Always replace caps on chemical containers.
18. Dispose of all chemical waste and broken glass in the appropriate receptacles (i.e. chemical waste containers located in the fume hood and broken glass container). If the waste container is almost full notify your instructor.
19. You are responsible for ensuring that a clean workspace is maintained both in your own working area and in the common working areas. Prior to leaving the laboratory: (a) All laboratory countertops must be wiped down with a damp paper towel, (b) Trash must be thrown away and not left in sinks, drawers, or other areas other than a trash receptacle, (c) All equipment must be put away in its proper place, and (d) All glassware must be cleaned, dried, and put away.
20. Always wash your hands prior to leaving the laboratory.
21. You should be familiar with the location and the use of any and all of the following items contained in your lab room: first-aid kit, fire blanket, eye wash, safety shower, spill kit and fire extinguisher.

### **SAFETY INFORMATION ACKNOWLEDGEMENT**

I have received and read a copy of the StudentSafetyRules (on these two pages). I also received a briefing on the student safety rules from my lab instructor. I understand these rules are designed to protect me and keep me safe in the lab. I acknowledge I was given the opportunity to ask any questions of my lab instructor or instructional assistant on the StudentSafetyRules during the safety briefing and/or at any other appropriate time. My signature (or the signature of my parent / guardian if I am under 18 years of age) below indicates that I voluntarily agree to abide by and follow these safety rules.

Signature:

Date:

Emergency Contact Person:

Contact Person's Phone #:

# Appendix L

## Useful Definitions and Terms

The following terms have been defined by the US Department of Labor Occupational Safety & Health Administration (OSHA) and are reproduced here as a convenient reference source. Additional terms and information is found in OSHA publications and at their website <http://www.osha.gov>.

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

*“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.

The following terms have been defined by the Occupational Health Branch, Division of Environmental and Occupational Disease Control, California Department of Health Services and are reproduced here as a convenient reference source for understanding the CHP and other safety related documents:

**ACGIH** American Conference of Governmental Industrial Hygienists, a professional organization which recommends exposure limits (TLVs and BEIs) for toxic substances.

**Acid** A substance which dissolves in water and releases hydrogen ions (H<sup>+</sup>). Acids cause irritation, burns, or more serious damage to tissue, depending on the strength of the acid, which is measured by pH (see pH).

**Alkali** Same as Base. A substance which dissolves in water and releases a hydroxyl ion (OH<sup>-</sup>); it has the ability to neutralize an acid and form a salt. Strong alkalis are irritating and may damage tissue (see Caustic).

**Allergen** A substance that causes an allergy.

**Allergy** Same as hypersensitivity. An allergy is a reaction to a substance that occurs through a change in the immune system caused by the production of antibodies, and is usually experienced by only a small number of people exposed to a substance. Allergic reactions in the workplace tend to affect the skin (see Dermatitis) and lung (see Asthma).

**ANSI** American National Standards Institute, a private organization that recommends safe work practices and engineering designs.

**Asphyxiant** A vapor or gas that can cause loss of consciousness and death due to lack of oxygen.

**Asthma** Constriction of the airways (bronchial tubes) to the lungs, producing symptoms of cough and shortness of breath. It may be an allergic response.

**Base** See Alkali.

**BEI** Biological Exposure Index, the maximum recommended value of a substance in blood, urine or exhaled air, recommended by the ACGIH.

**Boiling Point** The temperature at which a liquid boils and changes rapidly to a vapor (gas) state at a given pressure (see Evaporation). Expressed in degrees Fahrenheit (F) or Centigrade (°C) at sea level pressure.

**Cal/OSHA** California Occupational Safety and Health Administration, a state agency in the Department of Industrial Relations which establishes and enforces worker health and safety regulations. Cal/OSHA consists of the Division of Occupational Safety and Health (DOSH), the Consultation Service, the Standards Board, and the Appeals Board.

**Carcinogen** A chemical or physical agent capable of causing cancer. Such an agent is often described as carcinogenic. The ability to cause cancer is termed carcinogenicity. Words with similar meaning include oncogenic

and tumorigenic.

**CAS Number** The Chemical Abstracts Service Registry Number is a numeric designation which is given to a specific chemical compound. This number may appear on the Safety Data Sheet (see SDS).

**Caustic** Something alkaline that strongly irritates, corrodes or destroys living tissue (see Alkali).

**Ceiling Limit** The maximum concentration of a material in air that must never be exceeded, even for an instant.

**Cell** The structured unit of which tissues are made. There are many types of cells, e.g. nerve cells, muscle cells, blood cells; each type of cell performs a special function.

**Chromosome** The part of a cell that contains genetic material (see Gene).

**Combustible** Able to catch on fire and burn. The National Fire Protection Association and the U.S. Department of Transportation generally define a "combustible liquid" as having a flash point of 100 degrees F (37.8 degrees C) or higher.

**Concentration** The amount of a specific substance mixed into a given volume of air or liquid.

**Corrosive** A liquid or solid that causes visible destruction or irreversible alterations in human skin tissue at the place where it touches the skin.

**Cubic Meter** A metric unit of volume, commonly used in expressing concentrations of a chemical in a volume of air. One cubic meter equals 35.3 cubic feet or 1.3 cubic yards. One cubic meter also equals 1000 liters or one million cubic centimeters.

**Decomposition** Breakdown of chemical into simpler parts, compounds or elements.

**Dermal** Referring to the skin.

**Dermatitis** Inflammation of the skin-redness (rash) and often swelling, pain, itching, cracking. Dermatitis may be caused by an Irritant or Allergen.

**Dose** The amount of a chemical that enters or is absorbed by the body. Dose is usually expressed in milligrams of chemical per kilogram of body weight (mg/kg).

**Edema** A swelling of body tissues due to water or fluid accumulation in tissues.

**Epidemiology** The study of the pattern of disease in a population of people.

**Evaporation** The process by which a liquid is changed into a vapor and mixed into the surrounding air.

**Evaporation Rate** The rate at which a liquid is changed to a vapor under standard conditions, usually compared to the rate of another substance that evaporates very quickly.

**Explosive Limits** The range of concentrations (% by volume in air) of a flammable gas or vapor that can result in an explosion from ignition in a confined space. Usually given as Upper and Lower Explosive Limits (see UEL and LEL).

**Flammable** Catches on fire easily and burns rapidly. The National Fire Protection Agency and the U.S. Department of Transportation define a flammable liquid as having a flash point below 100°F (37.8°C). Same as Inflammable.

**Flash Point** The lowest temperature at which a liquid gives off enough flammable vapor to ignite and produce a flame when an ignition source is present.

**Gene** The part of the chromosome that carries a particular inherited characteristic.

**Gram (g)** A metric unit of mass. One U.S. ounce equals 28.4 grams; one U.S. pound equals 454 grams. There are 1000 milligrams (mg) in one gram.

**IDLH** Immediately Dangerous to Life or Health. A term used to describe an environment which is very hazardous due to a high concentration of toxic chemicals or insufficient oxygen or both.

**Ignition Temperature** The lowest temperature at which a substance will catch on fire and continue to burn.

**Incompatible** A term used to describe materials which could cause dangerous reactions from direct contact with one another.

**Inflammable** Same as Flammable.

**Ingestion** Taking in and swallowing a substance through the mouth.

**Inhalation** Breathing in a substance.

**Irritant** A substance which can cause an inflammatory response or reaction of the eye, skin or respiratory system.

**Kilogram (kg)** A metric unit of mass. Equals 1000 grams. Also equals about 2.2 pounds.

**Latency** The time between exposure and the first appearance of an effect.

**LEL** Lower Explosive Limit (see Explosive Limits.)

**Lethal Concentration-50% (LC50)** A concentration of chemical in air that will kill 50% of the test animals inhaling it.

**Lethal Dose-50% (LD50)** The dose of a chemical that will kill 50% of the test animals receiving it. The chemical may be given by mouth (oral), applied to the skin (dermal), or injected (parenteral). A given chemical will generally show different LD50 values depending on how it is given to the animals. It is a rough measure of acute toxicity.

**Liter** A metric unit of volume. One U.S. quart is about 0.9 liter. One liter equals 1000 cubic centimeters.

**Melting Point** The temperature at which a solid substance changes to the liquid state.

**M** See Cubic Meter.

**Mg/kg** A way of expressing dose: milligrams of a substance (mg) per kilogram (kg) of body weight (see Dose).

**Mg/m<sup>3</sup>** A measure of concentration: weight of substance (mg) in a volume of air (m<sup>3</sup>), often used to express PELs and TLVs.

**Milligram (mg)** A metric unit of mass. One gram equals 1000 mg. One U.S. ounce equals 28,375 mg.

**MmHg** A unit of measurement for pressure, millimeters (mm) of the metal mercury (Hg). At sea level, the earth's atmosphere exerts 760 mmHg of pressure.

**Monomer** See Polymerization.

**SDS** Safety Data Sheet. A form which lists the properties and hazards of a product or a substance.

**MSHA** Mine Safety and Health Administration, an agency in the U.S. Department of Labor which regulates safety and health in the mining industry. This agency also tests and certifies respirators (see NIOSH).

**Mutagen** A chemical or physical agent able to change the genetic material in cells.

**NFPA** National Fire Protection Association. NFPA has developed a scale for rating the severity of fire, reactivity and health hazards of substances. References to these ratings frequently appear on SDSs.

**NIOSH** National Institute for Occupational Safety and Health, a federal agency which conducts research on occupational safety and health questions and recommends new standards to federal OSHA. NIOSH, along with MSHA, tests and certifies respirators.

**Odor Threshold** The lowest concentration of a substance in air that can be smelled. For a given chemical, different people usually have very different odor thresholds.

**OSHA, Federal** Occupational Safety and Health Administration, an agency in the U.S. Department of Labor which establishes workplace safety and health regulations. Many states, including California, have their own OSHA programs. State OSHA programs are monitored by federal OSHA to ensure they are "at least as effective as" the federal OSHA program.

**PEL** Permissible Exposure Level, a maximum allowable exposure level under OSHA regulations.

**pH** Expresses how acidic or how alkaline a solution or chemical is, using a scale of 1 to 14. For example, a pH of 1 indicates a strongly acidic solution, a pH of 7 indicates a neutral solution, and a pH of 14 indicates a strongly alkaline solution.

**Polymerization** A chemical reaction in which small molecules (monomers) combine to form much larger molecules (polymers). A hazardous polymerization is a reaction that occurs at a fast rate, and releases large amounts of energy. Many monomers are hazardous in the liquid and vapor states, but form much less hazardous polymers. An example is vinyl chloride monomer, which causes cancer but forms the relatively non-toxic polyvinyl chloride (PVC)

plastic.

**ppb** Parts per billion, a measure of concentration, such as parts of a chemical per billion parts of air or water. Ppb is one thousand times smaller than ppm.

**ppm** Parts per million, a measure of concentration, such as parts of a substance per million parts of air. PELs and TLVs are often expressed in ppm.

**psi** Pounds per square inch. A unit of pressure. At sea level, the earth's atmosphere exerts 14.7 psi.

**Pulmonary Edema** Filling of the lungs with fluid, which produces coughing and difficulty breathing.

**Reaction** A chemical transformation or change.

**Reactivity** The ability of a substance to undergo a chemical reaction (such as combining with another substance). Substances with high reactivity are often quite hazardous.

**Respirator** A device worn to prevent inhalation of hazardous substances.

**Solubility** The degree to which a chemical can dissolve in a Solvent, forming a Solution

**Solution** A mixture in which the components are uniformly dispersed. All solutions consist of some kind of a Solvent (such as water or other liquid) which dissolves another substance, usually a solid.

**Solvent** A substance, usually a liquid, into which another substance is dissolved.

**STEL** Short-Term Exposure Limit. A term used by ACGIH to indicate the maximum average concentration allowed for a continuous 15 minute exposure period.

**Teratogen** A chemical or physical agent which can lead to malformations in the fetus and birth defects in children (liveborn offspring). Such an agent is called teratogenic. The ability to cause birth defects is termed teratogenicity.

**TLV** Threshold Limit Value, an exposure limit recommended by the ACGIH.

**TWA** Time Weighted Average. The average concentration of a chemical in air over the total exposure time – usually an 8-hour work day.

**UEL** Upper Explosive Limit. See Explosive Limits.

**Vapor Pressure** A measure of the tendency of a liquid to evaporate and become a gas. The pressure exerted by a saturated vapor above its own liquid in a closed container at given conditions of temperature and pressure, usually expressed in mmHg. The higher the vapor pressure, the greater the tendency of the substance to evaporate (see also Evaporation Rate, mmHg, and Volatility).

**Volatility** A measure of how quickly a substance forms vapors at ordinary temperatures. The more volatile the substance is, the faster it evaporates, and the higher the concentrations of vapor (gas) in the air.

The following terms have been defined by the Department of Risk Management & Safety, Arizona State University, and are reproduced here as a convenient reference source to facilitate a better understanding of chemical hazards:

#### Physical Hazards

**Compressed gas** means a gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70°F (21.1°C); a gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130°F (54.4°C) regardless of the pressure at 70°F, or a liquid having a vapor pressure exceeding 40 psi at 100°F (37.8°C).

**Explosive** means a chemical that causes a sudden release of pressure, gas, and heat when subjected to sudden shock, pressure or high temperature.

**Oxidizer** means a chemical other than an explosive that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

**Organic peroxide** means an organic compound that contains the bivalent –O-O- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical. Organic peroxides are oxidizers and fuels in one, and are therefore unstable and

potentially explosive. "Peroxidizable" means a chemical which will form organic peroxides when exposed to air.

**Pyrophoric** means a chemical that will ignite spontaneously or explode in air at a temperature of 130°F (54.4°C) or below.

**Unstable (reactive)** means a chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure, or temperature.

**Water-reactive** means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

### Health Hazards

**Carcinogens** are chemicals which cause cancer. For the purpose of the CHP, chemicals which are known carcinogens include those which: are regulated by OSHA as carcinogens (29 CFR 1910); are listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program, or are listed under group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs.

**Cutaneous hazards** are chemicals which affect the dermal layer (skin) of the body. Examples of signs and symptoms include defatting (drying) of the skin, rashes, and irritation. Examples of chemicals which are cutaneous hazards include ketones and chlorinated compounds.

**Corrosives** are chemicals that cause visible destruction or, or irreversible alterations in, living tissue by chemical action at the site of initial contact.

**Eye hazards** are chemicals which affect the eye or visual capacity. Examples of signs and symptoms include conjunctivitis and corneal damage. Examples of chemicals which are eye hazards include acids, bases and organic solvents.

**Hematopoietic agents** are chemicals which act on the blood system. Examples of signs and symptoms include cyanosis and loss of consciousness. Examples of chemicals which act on the hematopoietic system include carbon monoxide and cyanides.

**Hepatotoxins** are chemicals which produce liver damage. Example of signs and symptoms include jaundice and liver enlargement. Examples of chemicals which are hepatotoxins include carbon tetrachloride, nitrosamines.

**Irritants** are chemicals which are not corrosive, but which cause a reversible inflammatory effect on living tissue by chemical action at the site of contact.

**Nephrotoxins** are chemicals which produce kidney damage. Examples of signs and symptoms include edema (retention of water) and proteinuria (protein in the urine). Examples of chemicals which are nephrotoxins include halogenated hydrocarbons and uranium.

**Neurotoxins** are chemicals which produce their primary toxic effects on the nervous system. Examples of signs and symptoms include behavioral changes, decrease in motor functions. Examples of chemicals which are neurotoxins include mercury and carbon disulfide.

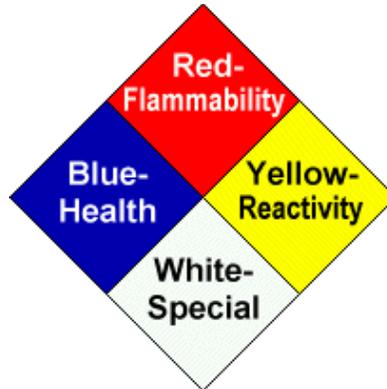
**Reproductive toxins** are chemicals which affect the reproductive capabilities including chromosomal damage (**mutagens**) and effects on the fetuses (**teratogens**). Examples of signs and symptoms include birth defects and sterility. Examples of chemicals which are reproductive toxins include lead and DBCP (dibromochloropropane).

**Sensitizers** are chemicals that cause a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical.



# Appendix M

## NFPA Chemical Hazard Labeling System



Hazard Rating Summary		
<b>Health (Blue)</b>		
4	<b>Danger</b>	May be fatal on short exposure. Specialized protective equipment required
3	<b>Warning</b>	Corrosive or toxic. Avoid skin contact or inhalation
2	<b>Warning</b>	May be harmful if inhaled or absorbed
1	<b>Caution</b>	May be irritating
0		No unusual hazard
<b>Flammability (Red)</b>		
4	<b>Danger</b>	Flammable gas or extremely flammable liquid
3	<b>Warning</b>	Flammable liquid flash point below 100° F
2	<b>Caution</b>	Combustible liquid flash point of 100° to 200° F
1		Combustible if heated
0		Not combustible
<b>Reactivity (Yellow)</b>		
4	<b>Danger</b>	Explosive material at room temperature
3	<b>Danger</b>	May be explosive if shocked, heated under confinement or mixed with water
2	<b>Warning</b>	Unstable or may react violently if mixed with water
1	<b>Caution</b>	May react if heated or mixed with water but not violently
0	<b>Stable</b>	Not reactive when mixed with water
<b>Special Notice Key (White)</b>		
<b>W</b>	Water Reactive	
<b>OX</b>	Oxidizing Agent	

## **Appendix N**

### **Chemical Inventory, Hazards, and Exposure Limits**

**Update in progress; similar to, but more info than the one in the Hazard Communication Program appendix**

The chemical inventory and corresponding SDSs containing information on hazards, exposure limits, precautions, and clean-up, can be found on LBCC's intranet at <http://msds/>

## Appendix O

OSHA 29 CFR 1910.1450 and OAR 437, Division 2/Z Regulations

Oregon Administrative Rules  
Oregon Occupational Safety  
and Health Division

### OCCUPATIONAL EXPOSURE TO HAZARDOUS CHEMICALS IN LABORATORIES

**Z** AO 9-1990

**(a)(1) - (a)(3)(ii) Z-3 1910.1450**

**SUBDIVISION Z**

**TOXIC AND HAZARDOUS SUBSTANCES**

**§1910.1450 Occupational Exposure to Hazardous Chemicals in  
Laboratories.**

**(a) Scope and application.**

**(1)** This section shall apply to all employers engaged in the laboratory use of hazardous chemicals as defined below.

**(2)** Where this section applies, it shall supersede, for laboratories, the requirements of all other OSHA health standards in 29 CFR Part 1910, Subpart Z, except as follows:

**(i)** For any OSHA health standard, only the requirement to limit employee exposure to the specific permissible exposure limit shall apply for laboratories, unless that particular standard states otherwise or unless the conditions of paragraph (a)(2)(iii) of this section apply.

**(ii)** Prohibition of eye and skin contact where specified by any OSHA health standard shall be observed.

**(iii)** Where the action level (or in the absence of an action level, the permissible exposure limit) is routinely exceeded for an OSHA regulated substance with exposure monitoring and medical surveillance requirements, paragraphs (d) and (g)(1)(ii) of this section shall apply.

**(3)** This section shall not apply to:

**(i)** Uses of hazardous chemicals which do not meet the definition of laboratory use, and in such cases, the employer shall comply with the relevant standard in 29 CFR Part 1910, Subpart Z, even if such use occurs in a laboratory.

**(ii)** Laboratory uses of hazardous chemicals which provide no potential for employee exposure. Examples of such conditions might include:

**(A)** Procedures using chemically-impregnated test media such as Dip-and-Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip; and

**(B)** Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit.

**(b) Definitions.**

**“Action level”** means a concentration designated in 29 CFR Part 1910 for a specific substance, calculated as an eight (8)-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

**“Assistant Secretary”** means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

**“Carcinogen”** (see “select carcinogen”).

**“Chemical Hygiene Officer”** 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 (i) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace and (ii) meets the requirements of paragraph (e) of this section.

**“Combustible liquid”** means any liquid having a flashpoint at or above 100° F (37.8° C), but below 200° F (93.3° C), except any mixture having components with flashpoints of 200° F (93.3° C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

**“Compressed gas”** means:

(i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70° F (21.1° C); or

(ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130° F (54.4° C) regardless of the pressure at 70° F (21.1° C); or

(iii) A liquid having a vapor pressure exceeding 40 psi at 100° F (37.8° C) as determined by ASTM D-323-72.

**“Designated area”** means an area which may be used for work with “select carcinogens,” reproductive toxins or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such

**“Emergency”** means any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the workplace.

**“Employee”** means an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

**“Explosive”** means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

**“Flammable”** means a chemical that falls into one of the following categories: (i)

**“Aerosol, flammable”** means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame protection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

(ii) **“Gas, flammable”** means:

(A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or

(B) A gas that, at ambient temperature and pressure, forms a range of flammable

mixtures with air wider than 12 percent by volume, regardless of the lower limit.

**(iii) “Liquid, flammable”** means any liquid having a flashpoint below 100° F (37.8° C), except any mixture having components with flashpoints of 100° F (37.8° C) or higher, the total of which make up 99 percent or more of the total volume of the mixture. **(iv)**

**“Solid, flammable”** means a solid, other than a blasting agent or explosive as defined in §1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

**“Flashpoint”** means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

**(i)** Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24-1979 (ASTM D 56-79)) – for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100° F (37.8° C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or

**(ii)** Pensky-Martens Closed Tester (see American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D 93-79)) – for liquids with a viscosity equal to or greater than 45 SUS at 100° F (37.8 ° C), or that contain suspended solids, or that have a tendency to form a surface film under test; or

**(iii)** Setaflash Closed Tester (see American National Standard Method of Test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)).

Organic peroxides, which undergo auto-accelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

**“Hazardous chemical”** means 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.

Appendices A and B of the Hazard Communication Standard (29 CFR 1910.1200) provide further guidance in defining the scope of health hazards and determining whether or not a chemical is to be considered hazardous for purposes of this standard.

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

**“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-type hood”** means a device located in a laboratory, enclosure on five sides with a moveable sash or fixed partial enclosed on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of

air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms.

Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

**"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.

**"Medical consultation"** means a consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

**"Organic peroxide"** means an organic compound that contains the bivalent -O-O-structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

**"Oxidizer"** means a chemical other than a blasting agent or explosive as defined in §1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

**"Physical hazard"** means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

**"Protective laboratory practices and equipment"** means those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

**"Reproductive toxins"** means chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis)

**"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/m<sup>3</sup>;

**(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.

**“Unstable (reactive)”** means a chemical which is the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become selfreactive under conditions of shocks, pressure or temperature.

**“Water-reactive”** means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

**(c) Permissible exposure limits.** For laboratory uses of OSHA regulated substances, the employer shall assure that laboratory employees’ exposures to such substances do not exceed the permissible exposure limits specified in 29 CFR Part 1910, Subpart Z.

**(d) Employee exposure determination.**

**(1) Initial monitoring.** The employer shall measure the employee’s exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL).

**(2) Periodic monitoring.** If the initial monitoring prescribed by paragraph (d)(1) of this section discloses employee exposure over the action level (or in the absence of an action level, the PEL), the employer shall immediately comply with the exposure monitoring provisions of the relevant standard.

**(d)(3) - (e)(3)(iv) Z-9 1910.1450**

**(3) Termination of monitoring.** Monitoring may be terminated in accordance with the relevant standard.

**(4) Employee notification of monitoring results.** The employer shall, within 15 working days after the receipt of any monitoring results, notify the employee of these results in writing either individually or by posting results in an appropriate location that is accessible to employees.

**(e) Chemical Hygiene Plan – General.** (Appendix A of this section is non-mandatory but provides guidance to assist employers in the development of the Chemical Hygiene Plan.)

**(1)** Where hazardous chemicals as defined by this standard are used in the workplace, the employer shall develop and carry out the provisions of a written Chemical Hygiene Plan which is:

**(i)** Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory and

**(ii)** Capable of keeping exposures below the limits specified in paragraph (c) of this section.

**(2)** The Chemical Hygiene Plan shall be readily available to employees, employee representatives and, upon request, to the Assistant Secretary.

**(3)** The Chemical Hygiene Plan shall include each of the following elements and shall indicate specific measures that the employer will take to ensure laboratory employee protection:

**(i)** Standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals;

**(ii)** Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices; particular attention shall be given to the selection of control measures for chemicals that are known to be extremely hazardous;

(iii) A requirement that fume hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment;

(iv) Provisions for employee information and training as prescribed in paragraph (f) of this section;

**1910.1450 Z-10 (e)(3)(v) - (f)(3)(iii)**

(v) The circumstances under which a particular laboratory operation, procedure or activity shall require prior approval from the employer or the employer's designee before implementation;

(vi) Provisions for medical consultation and medical examinations in accordance with paragraph (g) of this section;

(vii) Designation of personnel responsible for implementation of the Chemical Hygiene Plan including the assignment of a Chemical Hygiene Officer and, if appropriate, establishment of a Chemical Hygiene Committee; and

(viii) Provisions for additional employee protection for work with particularly hazardous substances. These include "select carcinogens," reproductive toxins and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate:

(A) Establishment of a designated area;

(B) Use of containment devices such as fume hoods or glove boxes;

(C) Procedures for safe removal of contaminated waste; and

(D) Decontamination procedures.

(4) The employer shall review and evaluate the effectiveness of the Chemical Hygiene Plan at least annually and update it as necessary.

**(f) Employee information and training.**

(1) The employer shall provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area.

(2) Such information shall 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 exposure situations. The frequency of refresher information and training shall be determined by the employer.

(3) **Information.** Employees shall be informed of:

(i) The contents of this standard and its appendices which shall be made available to employees;

(ii) The location and availability of the employer's Chemical Hygiene Plan;

(iii) The permissible exposure limits for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable

**(f)(3)(iv) - (g)(1)(ii) Z-11 1910.1450**

(iv) Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and

(v) The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Safety Data Sheets received from the chemical supplier.

**(4) Training.**

(i) Employee training shall include:

(A) Methods and observations that may be 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, etc.);

**(B)** The physical and health hazards of chemicals in the work area; and

**(C)** The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

**(ii)** The employee shall be trained on the applicable details of the employer's written Chemical Hygiene Plan.

**(g) Medical consultation and medical examinations.**

**(1)** The employer shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

**(i)** 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.

**(ii)** 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.

**1910.1450 Z-12 (g)(1)(iii) - (g)(4)(ii)**

**(iii)** 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.

**(2)** All medical examinations and consultations 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.

**(3) Information provided to the physician.** The employer shall provide the following information to the physician:

**(i)** The identity of the hazardous chemical(s) to which the employee may have been exposed;

**(ii)** A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and

**(iii)** A description of the signs and symptoms of exposure that the employee is experiencing, if any.

**(4) Physician's written opinion.**

**(i)** For examination or consultation required under this standard, the employer shall obtain a written opinion from the examining physician which shall include the following:

**(A)** Any recommendation for further medical follow-up;

**(B)** The results of the medical examination and any associated tests;

**(C)** 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 chemical found in the workplace; and

**(D)** 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.

(ii) The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.

**(h)(1) - (j)(2) Z-13 1910.1450**

**(h) Hazard identification.**

**(1)** With respect to labels and safety data sheets:

(i) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.

(ii) Employers shall maintain any safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees.

**(2)** The following provisions shall apply to chemical substances developed in the laboratory:

(i) If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the employer shall determine if it is a hazardous chemical as defined in paragraph (b) of this section. If the chemical is determined to be hazardous, the employer shall provide appropriate training as required under paragraph (f) of this section.

(ii) If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and shall implement paragraph (e) of this section.

(iii) If the chemical substance is produced for another user outside of the laboratory, the employer shall comply with the Hazard Communication Standard (29 CFR 1910.1200) including the requirements for preparation of safety data sheets and labeling.

**(i) 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.

**(j) Recordkeeping.**

**(1)** 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.

**(2)** The employer shall assure that such records are kept, transferred, and made **available in accordance with 29 CFR 1910.1020.**

## Appendix P

### California Department of Health Services, “Understanding Toxic Substances”

Booklet available for reading online at:

<http://www.cdph.ca.gov/programs/hesis/Documents/introtoxsubstances.pdf>