

## Section III: REGULATORY FRAMEWORK

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## A. THE LABORATORY SAFETY STANDARD

### 1. Background

The Standard for *Occupational Exposure to Hazardous Chemicals in Laboratories* (commonly known as the “Laboratory Safety Standard”, or “Chemical Hygiene Plan”) was adopted by the California Occupational Health & Safety Administration (Cal/OSHA) Standards Board on February 21, 1991. The Laboratory Standard is summarized on the following page and the [complete text](http://www.dir.ca.gov/Title8/5191.html) of the Laboratory Standard is available online. <http://www.dir.ca.gov/Title8/5191.html>

The intent of the Laboratory Standard is to protect laboratory employees from harm due to chemicals. The design of the Laboratory Standard is based on a recognition by OSHA, and other health and safety professionals, that laboratory work is typically different in character from industrial operations in their use and handling of chemicals. In contrast to many industrial operations, laboratory chemical work often involves a relatively large number of chemicals in relatively small scale procedures. In many labs, particularly those involved in research, the character of chemical usage can also change significantly over time to reflect evolving research conditions.

The Laboratory Standard is a performance standard. That is, there are few specific requirements to carry out procedures in a certain way. This allows the University administration and lab supervisors to make their own decisions, within the spirit (and limitations) of the Laboratory Standard, to determine the means for worker protection. These policy and procedure decisions are formalized within this written Chemical Hygiene Plan and within the lab-specific variations on campus.

### 2. Applicability

The Laboratory Standard does not apply to all places where hazardous chemicals are used in experiments and investigations. Labs meeting the following four criteria are subject to the Laboratory Standard:

- Chemical manipulations are carried out on a laboratory scale. That is, chemical containers are of a size that could be easily and safely manipulated by one person.
- Multiple chemical procedures are used.
- The procedures involved are not part of a production process, nor in any way simulate a production process.
- Protective laboratory practices and equipment are available and commonly used.

Clearly, most research and teaching laboratories here at UCSB, meet these criteria and therefore fall under the scope of the Laboratory Standard.

Students in campus teaching laboratories are not employees of the University and therefore do not fall under the provisions of the Laboratory Standard. Although not legally required to be given the same consideration as employees, it is the judgment of the University, that it is obligated to develop policies, procedures and course lab manuals which attempt to provide the same level of protection for students. It should also be noted that teaching assistants (TAs), faculty and staff who teach in instructional labs are covered by the Lab Standard and therefore need to be included in a Chemical Hygiene Plan.

EH&amp;S

Comment [1]:

### 3. Summary of the Laboratory Safety Standard

The [Laboratory Standard](#) contains the following elements. Each of these is addressed within the sections of this manual as noted

- **Chemical Hygiene Plan (CHP)**— A written plan must be developed to control and minimize chemical exposure in laboratories. The CHP must be readily available to affected employees, who need to be oriented to its provisions and relevance to their health and safety. *[this document]*
- **Responsibilities**— Personnel responsible for implementation of the CHP must be designated, including the appointment of a Chemical Hygiene Officer. *[Sec. III.B.2]*
- **Employee Information and Training**— The employer shall provide employees with information and training to ensure that they are informed of the hazards in their work area and their avoidance. *[Sec. III.C.1]*
- **Exposure Limits**— Occupational exposures to chemicals must not exceed specified Cal-OSHA levels. *[Sec. III.C.3]*
- **Employee Exposure Determination**— As appropriate, measurements must be taken to verify that exposure limits are not exceeded. *[Sec. III.C.3]*
- **Medical Consultation and Examinations**— Employees are entitled to medical attention when a significant chemical exposure is suspected. *[Sec. III.C.4]*
- **Hazard Identification**— Material Safety Data Sheets (MSDS) and other reference materials need to be available. Labeling of chemicals is strictly regulated. *[Sec. III.C.2.]*
- **Control Measures**— Criteria must be established that the employer will use to determine, implement and adequately maintain control measures to reduce employee exposures, including lab ventilation, personal protective equipment, etc. *[Sec. III.C.5]*
- **Standard Operating Procedures**— SOPs must be developed, as needed, relevant to safety and health considerations when lab work involves the use of hazardous chemicals. *[Secs. I and II]*
- **Prior Approval**— Circumstances must be stipulated under which a particular laboratory operation, procedure or activity requires prior approval from the lab supervisor. *[Sec. III.C.7]*
- **Particularly Hazardous Substances**— Provisions must be specified for additional employee protection for work with substances such as "select carcinogens", high acute toxicity substances and reproductive toxins. *[Secs. I and III.C.6]*

## **B. THE LABORATORY SAFETY STANDARD AT UCSB**

### **1. Introduction**

The UCSB *Policy on Environmental Health and Safety* (Policy P-5400) states:

The University shall maintain as safe and healthy an environment as is reasonably feasible for its students, faculty, staff and visitors by:

- Conducting its operations and activities in a safe manner to minimize the risks of injury to people and minimize property damage at all locations where University operations and/or activities occur.
- Complying with applicable regulations, safety and health consensus standards, and practices generally accepted by experts in the field.

Therefore the intent of the University is to abide by the provisions of the Laboratory Standard to as great an extent as is reasonably feasible.

### **2. Responsibilities**

#### **a. Management**

Department heads, deans, supervisors, vice-chancellors and the chancellor are responsible for ensuring that individuals under their management have the training and authority to implement appropriate health and safety policies and practices relative to the Laboratory Standard.

#### **b. Laboratory Supervisors/Principal Investigators**

The term “supervisor” at UCSB refers to anyone having direct supervisory authority, and includes staff administrators, class instructors, research assistants, managers, and faculty. Under Cal/OSHA’s Injury and Illness Prevention Program, supervisors are responsible for protecting the health and safety of employees and students under their supervision. A [helpful guideline](#) to many common specific tasks of a lab supervisor can be found online. Supervisors can delegate specific tasks, but can not delegate their overall responsibility. General responsibilities include the following:

- Ensure that all employees under their supervision (staff and students), are aware of potentially hazardous operations (materials, processes, equipment) that could be encountered in their lab.
- Ensure training requirements are fulfilled and records are maintained – see Sec III.C.1
- Enforce safety rules within the lab, such as the wearing of personal protective equipment (Sec. III.5.D)
- Monitor the proper procurement, use and disposal of chemicals used in laboratory operations.
- Seek ways to improve chemical hygiene and laboratory safety within their operation.
- Implement policies and procedures described in this CHP, including:
  - the development of written Standard Operating Procedures (Sec.I) for hazardous lab operations, which involves:
    - determination/implementation of appropriate control measures (Sec. III.C.5)

- development/implementation of provisions for additional employee protection from Particularly Hazardous Substances (Sec. III.C.6)
- establishing criteria for any needed prior approval processes (Sec. III.C.7)

**c. Environmental Health & Safety (EH&S)**

Develop safety education and monitoring programs to maintain a safe and healthy environment for faculty, staff, students and visitors in order to facilitate the research and teaching functions of the University. Support research and instructional activities by developing legally mandated programs, providing technical guidance and consulting with and assisting departments in program implementation and maintenance. Make every effort to keep operations functioning smoothly in labs while meeting health, safety and environmental obligations.

**d. Chemical Hygiene Officer**

The Lab Standard specifically calls for the appointment of a Chemical Hygiene Officer by the employer: *“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 role at UCSB is assigned to the EH&S Laboratory Safety Program manager. Duties: develop and distribute the *UCSB Chemical Hygiene Plan* to laboratory supervisors. Assist and advise faculty and staff in the customization and implementation of their CHP as requested/needed. Describe the provisions of the CHP to those attending EH&S lab safety trainings and orientations. Monitor and evaluate the effectiveness of the CHP. In cooperation with, and as a member of, the Laboratory Safety Committee, advise campus management on the effectiveness of CHP implementation and make recommendations for upgrades to the program.

**e. Chemical Safety Committee and Laboratory Safety Committee**

The Chemical Safety Committee reviewed and approved earlier versions of the *UCSB Chemical Hygiene Plan* as drafted by EH&S. In 2010 the committee was superseded by the Laboratory Safety Committee (LSC). The LSC assumed responsibility for overview and periodic review of the campus Chemical Hygiene Program.

**f. Departments and Organized Research Units**

- Under the campus *Injury and Illness Prevention Program* (Cal-OSHA requirement), and the associated [UCSB written program](#), the **department/unit Head or Chair** is identified as the individual with the authority and responsibility to implement the IIPP. The IIPP is the umbrella OSHA regulation, under which all worker safety programs - including laboratory safety - exist.
- To assist the Chair/Unit Head, each department has a *Department Safety Representative (DSR)* who coordinates health and safety program elements in the department and serves as a liaison with EH&S. The department may also have an Management Services Officer, safety committee, or lab manager.
- Responsible for maintaining a safe environment—including general oversight of department operations and communicating with supervisors/personnel any relevant safety issues, problem solving, and preplanning for emergencies.
- Per campus policy, departments are responsible for ensuring that all new lab workers attend one of the EH&S General Laboratory Safety orientations before access to departmental labs is granted - see also Sec. III.C.1.
- Ensure that all operations under departmental control develop and implement lab-specific CHPs.

While individual lab supervisors have the primary responsibility for CHP development, department administrations need to coordinate and support these efforts.

**g. Laboratory Workers (non-supervisors: graduate students, undergraduates, postdoctoral staff; permanent staff, visiting researchers, etc.)**

General responsibilities are below - a more [complete list](#) is online.

- Follow the established work procedures and safety guidelines in their area including those delineated in the campus and lab-specific Chemical Hygiene Plans.
- Attend and actively participate in appropriate safety training.
- Notify the laboratory supervisor or EH&S of any unsafe or potentially unsafe condition.

**h. Facilities Management**

(see also Section III: C(8))

- Ensure the timely repair of malfunctioning physical plant equipment such as fume hoods, eye washes, safety showers, alarms, etc.
- Notify lab personnel and/or EH&S as appropriate when equipment is inoperable or malfunctioning and may affect the safe operation of University laboratories.

### 3. *Standard Operating Procedures*

As touched on in the previous section, the incorporation of Standard Operating Procedures (SOP) into our Chemical Hygiene Plan is a requirement. In the development of this manual, it has been the strategy of EH&S and the Laboratory Safety Committee to provide, via this manual, some generalized SOPs for lab supervisors. To a large degree this frees individuals from having to develop numerous SOPs and also provides some measure of standardization of safety practices across the campus. However, given the diverse nature of laboratory work at UCSB, it is still **incumbent on individual lab supervisors to develop lab-specific SOPs for operations which they deem are "high hazard."** Guidance on when and how to prepare these SOPs are given in Section I.

In addition to the many chemical hazards in laboratories there are, of course, many associated *physical and biological hazards* such as electricity, radiation, high and low temperature operations, infectious organisms, etc. The Laboratory Standard does not stipulate that these be addressed within a Chemical Hygiene Plan. However, where deemed appropriate, these issues are addressed herein in a general way and more information is available through EH&S.

## C. CHEMICAL-USE POLICIES

### 1. Employee Information and Training

One of the major provisions of the Laboratory Standard - as well as the OSHA *Injury and Illness Prevention Program* - is a requirement for employee information and training. The employer must convey information to the employee regarding the general and specific occupational hazards identified in the workplace. In general, training is required for:

- All new employees
- Employees given new job assignments involving exposure situations for which training has not previously been received
- Whenever the employer is made aware of a new or previously unrecognized hazard for which training has not previously been received

**Regarding training specific to the Laboratory Safety Standard, an individual's supervisor has responsibility for ensuring that personnel have had training on the elements listed below as stipulated in the Standard. They are also responsible for ensuring that training records are maintained.** As a service to laboratory supervisors, EH&S regularly offers a three-hour general Laboratory Safety Class, or Web-based version for certain audiences, which address and document most of the training elements listed below. As of 2010, the UCSB policy titled: [Laboratory Safety Training - General](#) requires that all "lab workers" complete one of these trainings in order to be given access to their lab(s) by their department. Currently, there is a [Web interface](#) which allows EH&S training records to be searched by worker name, supervisor name, or department.

Participation in the EH&S class goes a long way toward satisfying training requirements and thereby reducing potential liability. However, this class is general and does not cover the specific hazards and associated safe work practices for a particular lab. The lab supervisor is still responsible for seeing that their employees are trained on the **specific** hazards and work practices appropriate for their laboratory.

#### Safety Training Required by the Laboratory Safety Standard

-Employee rights and responsibilities under the Cal/OSHA Laboratory Standard and other regulations. *[Covered in EH&S Lab Safety Class]*

-The contents of the generic portions of the *UCSB Chemical Hygiene Plan* and its relation to the Laboratory Standard. *[Covered in EH&S Lab Safety Class]*

-The contents of the lab-specific Chemical Hygiene Plan, including any Standard Operating Procedures (SOPs) that have been developed. *[Lab supervisor training responsibility]*

-The physical and health hazards of hazardous materials including signs and symptoms of overexposure, particularly those defined as Particularly Hazardous Substances (see Sec. I and Sec. III: C(6)). As appropriate, training can address entire classes of hazardous materials (e.g., carcinogens) rather than individual substances. *[Major classes of chemical hazards are covered in EH&S Lab Safety Class]*

-Appropriate use and maintenance of control measures including engineering controls, personal protective

equipment, and work practices. *[Generic control measures covered in EH&S Lab Safety Class]*

-The Permissible Exposure Limits for OSHA-regulated substances. *[PEL concept and access to PELs covered in EH&S Lab Safety Class]*

-Hazardous materials labeling, storage, and signage requirements. *[Covered in EH&S Lab Safety Class]*

-Relevance and access to MSDSs and other informational references and resources pertinent to the lab. *[Use of, and general access to, MSDSs covered in EH&S Lab Safety Class. Access to lab-specific MSDSs is the responsibility of the lab supervisor]*

-Hazardous waste minimization and disposal practices. *[Covered in EH&S Lab Safety Class]*

-Spill response and emergency procedures. *[Covered in EH&S Lab Safety Class]*

### Other EH&S Training Programs

Enrollment in regularly-offered EH&S training courses, and links to trainings at other universities are through the [EH&S website](#).

## 2. Hazard Identification

University policies on hazard identification with respect to labeling and Material Safety Data Sheets are as follows:

- Labels on incoming containers of hazardous chemicals are not to be removed or defaced.
- The primary campus access to Material Safety Data Sheets (MSDS) is through the internet, particularly the UC MSDS search engine. See EH&S website. Individual labs are encouraged to maintain their own hardcopy files as well.
- For chemical substances developed in University laboratories, the provisions for hazard determination, training and labeling shall be those stated in the Laboratory Standard.

## 3. Criteria for Establishing Exposure Monitoring

The legally-acceptable levels for occupational exposure to approximately 500 chemicals which are toxic by inhalation, or skin contact, are codified by OSHA in so-called [Permissible Exposure Limit \(PEL\)](#) values. These values are generally expressed in parts per million (or mg/m<sup>3</sup>) and can relate to short-term (15 min.), long-term (8 hour), or ceiling level exposures. In Sec. II is a list of PELs for some common laboratory chemicals.

The University policies on dealing with suspected chemical exposures and exposure monitoring shall be those expressed in the Laboratory Standard. The tasks of determining if exposure monitoring is required, performing or supervising exposure monitoring and other related duties shall be the sole responsibility of EH&S. All suspected chemical exposures on campus shall be reported in a timely manner to EH&S.

## 4. Medical Consultation and Examination

The Laboratory Standard states that: *“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”:*

- When an employee develops signs or symptoms associated with a hazardous chemical to which that employee may have been exposed
- Where exposure monitoring reveals an exposure level routinely above the action level or PEL for an OSHA-regulated substance
- Whenever an event takes place in the work area such as a spill, leak, or explosion resulting in the likelihood of a hazardous exposure”

The University has established the following policies and procedures, when it is known or suspected that an employee (or student) has been exposed to a hazardous chemical(s) or is otherwise injured on campus.

- All employees suffering from chemical exposure or other work-related injury incurred at UCSB shall be evaluated/examined at University expense. Non-employees such as students would be covered by their required medical insurance.
- If the injured/exposed person is safe and able to be transported, escort them to either Student Health Services on campus, Goleta Valley Community Hospital, or their primary physician for evaluation and examination. Contact EH&S at x3194 immediately.
- In some cases a work-related chemical exposure may be suspected but not certain. For example, some low-level but chronic exposures may be difficult to identify or relate to specific symptoms. In these instances, contact the Chemical Hygiene Officer at x4899 to arrange a review of the circumstances of the suspected exposure.
- The Laboratory Standard includes specific provisions regarding the employer’s exchange of information with the examining physician. The provisions of the Laboratory Standard be followed as stipulated in that section.

#### **5. Criteria for Determination and Implementation of Control Measures**

The Laboratory Standard states that the CHP “... shall include criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals ....”

Hazard controls are generally classified into three broad groups: engineering controls, administrative procedures and personal protective equipment. The University policies on determination and implementation of control measures are delineated here.

##### **A. General**

- Appropriate control measures shall be implemented in University laboratories to reduce chemical exposures and physical hazards to as low a degree as reasonably achievable.
- Lab supervisors shall determine and implement appropriate control measures.
- Environmental Health & Safety shall be responsible for assisting the above in determining and implementing these control measures. EH&S may do periodic evaluations of control measures on campus as deemed necessary and notify lab supervisors of their results and recommendations.

##### **B. Engineering Controls—Criteria for Implementation**

- **FUME HOODS, WET BENCHES, GAS CABINETS AND OTHER LOCAL EXHAUST VENTILATION**
  - When using volatile substances that present a significant inhalation hazard
  - When using toxic gases above exempt amounts as defined by CA Fire Code
  - When indicated in Standard Operating Procedures
  - As indicated in MSDSs
- **BIOSAFETY CABINETS**
  - With laboratory operations involving biohazardous material as directed by National Institutes of Health (NIH) and Centers for Disease Control (CDC) guidelines and the OSHA Bloodborne Pathogens Standard
  - When stipulated by the Biosafety Authorization issued by the campus Biosafety Committee
  - When indicated in Standard Operating Procedures
- **GLOVE BOXES**
  - When indicated in Standard Operating Procedures
- **APPROVED HAZARDOUS MATERIALS STORAGE CABINETS AND SAFETY CANS**
  - When CA fire code mandated volume limits for flammable liquids are exceeded
  - When indicated in Standard Operating Procedures
- **FLAMMABLE STORAGE REFRIGERATORS (APPROVED-TYPE)**
  - When refrigerated storage of flammable materials is needed

#### **C. Administrative Controls—Criteria for Implementation**

The variety of possible administrative controls to reduce hazard levels in laboratories is large. The controls instituted by a given laboratory shall be determined by the lab supervisor in consultation with EH&S, as required. In general, measures shall be implemented:

- As indicated in Standard Operating Procedures
- As necessary to reduce hazards as mandated by current health and safety regulations or as called for by accepted good practice

#### **D. Personal Protective Equipment—Criteria for Implementation**

The appropriate personal protective equipment (PPE) is stipulated in the UCSB policy: [Laboratory Personal Protective Equipment](#) (June 2011). The key provisions of the policy are summarized in a poster that is mounted in all campus laboratories and reproduced in Sec. II of this manual.

## 6. Particularly Hazardous Substances (PHS)

The Laboratory Standard states that: *“The Chemical Hygiene Plan shall include... provisions for additional employee protection for work with hazardous substances, including “select carcinogens,” reproductive toxins and substances which have a high degree of acute toxicity.”*

**SELECT CARCINOGENS** — Includes carcinogens as listed by the following organizations: OSHA; the National Toxicology Program; the International Agency for Research on Cancer.

**REPRODUCTIVE TOXINS** — A chemical which affects human reproductive capabilities, including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

**HIGH ACUTE TOXICITY SUBSTANCES** — Substances such as hydrogen cyanide, hydrogen sulfide, and nitrogen dioxide which may be fatal or cause damage to target organs as a result of a single exposure or exposures of short duration.

**It is the judgment and responsibility of individual laboratory supervisors whether to institute Standard Operating Procedure(s) for using a specific Particularly Hazardous Substance in their laboratories. See Section I for template forms and instructions, etc.**

Some recognized *general* safe work practices for the use of PHS are provided in this manual. A generic PHS Standard Operating Procedure is provided in the lab-specific CHP section of this manual. Due to its broad application, the information therein is very basic and common sense. However, again, lab supervisors are encouraged to expand upon this basic protocol as needed. These general procedures have been approved by the campus Chemical Safety Committee as reasonable Standard Operating Procedures by which all labs on campus should abide.

## 7. Prior Approval

Another provision of the Laboratory Standard is for incorporating policies into the CHP on: *“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.”*

Given the large diversity of chemical work performed in campus laboratories, it is impossible to specify the particular laboratory operations which would require prior approval. **It is therefore the responsibility of individual lab supervisors to establish these criteria for their operations. Establishment of prior approval criteria, if any, is solely the prerogative of the lab supervisor.** These criteria should be incorporated into the Standard Operating Procedures portion of their Lab-specific Chemical Hygiene Plan. In Section I of this document are provided template forms that lab supervisors can use for this purpose.

## 8. Maintenance of Engineering Controls and Emergency Equipment

As stated in the Laboratory Standard, provisions for maintenance of both control measures and emergency equipment must be included in the CHP: *“...a requirement that fume hoods comply with section 5154.1 (Title 8, CCR), and that all protective equipment shall function properly and that specific measures shall be taken to ensure proper and adequate performance of such equipment...”*

It is the policy of the University that all control measures designed to reduce chemical or physical hazards to employees shall be maintained in proper working order. If not functioning properly, or inadequate for the task, it is the responsibility of the campus entity responsible for the equipment to immediately inform affected

workers of its status. Such equipment shall be repaired/replaced on a timely basis.

**General Responsibilities:**

**FACILITIES MANAGEMENT (FM):** Responsible for routine maintenance, replacement and installation of University-owned building emergency systems and environmental controls.

**ENVIRONMENTAL HEALTH & SAFETY:** Responsible for evaluating effectiveness of engineering control measures and emergency equipment used on campus. Will make recommendations to FM and users on implementation of appropriate equipment and control measures.

**LAB SUPERVISOR/LAB PERSONNEL:** Responsible for monitoring status and effectiveness of equipment and control measures. Responsible for reporting to appropriate campus entity if equipment is not functioning properly or if new procedures require changes or additions to existing systems.

**Specific Responsibilities:**

**FUME HOODS/GAS CABINETS**

Maintenance: Facilities Management  
Annual certification: EH&S

**BIOSAFETY CABINETS**

Maintenance: Owner (generally lab supervisors)  
Annual certification: Generally, owner covers cost. Biosafety Committee typically requires cabinet use as part of their authorization

**OTHER LOCAL EXHAUST VENTILATION**

Maintenance: Facilities Management

**EMERGENCY SHOWERS AND EYEWASHES**

Maintenance: Facilities Management (FM shall check on a regular basis by running water through them until the water runs clear)

**RESPIRATORS**

Administration: EH&S has sole responsibility for approval, fit-testing and issuance. Lab supervisors are responsible for identifying and directing individuals to EH&S who may require respirators in their work.

Maintenance: Lab supervisor or designee

**OTHER PERSONAL PROTECTIVE EQUIPMENT**

Maintenance: Generally provided by the lab supervisor -- maintenance/replacement are the responsibility of the supervisor and lab personnel

**FIRE EXTINGUISHERS, DETECTORS, ALARMS, SUPPRESSION SYSTEMS**

Administration: The campus Fire Marshal 's office is responsible for evaluation and approval of these systems

Maintenance: Facilities Management

**GAS DETECTION/ALARM SYSTEMS**

Administration: EH&S has responsibility for evaluation and approval of code-required gas detection/alarm systems

Maintenance: Facilities Management/Cleanroom staff

**EMERGENCY PHONES**

Maintenance: Facilities Management

**HAZARDOUS MATERIALS SPILL RESPONSE EQUIPMENT**

Maintenance: EH&S is responsible for equipping, maintaining and using the primary

hazardous materials response equipment stores for the campus. Individual labs or departments may have local supplies which they maintain.