CHEMICAL HYGIENE PLAN

The SDSU Laboratory Chemical Safety Program for Compliance with 29 CFR §1910.1450 and 8 CCR §5191: Occupational Exposure to Hazardous Chemical in Laboratories

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The SDSU Laboratory Chemical Safety Program

I. INTRODUCTION

In January 1990, the Occupational Safety and Health Administration (OSHA) amended 29 CFR 1910 to include a part entitled OCCUPATIONAL EXPOSURES TO HAZARDOUS CHEMICALS IN LABORATORIES. OSHA believes, based on incidences involving hazardous substances in laboratory settings, that there is evidence of sufficient risk to workers not protected by existing standards to justify a new standard, which was then codified in 29 CFR 1910.1450. This amendment is commonly referred to as the "Laboratory Chemical Safety Standard." In response to the amendment, Cal-OSHA has added Section 5191 to the California Code of Regulations, Title 8, General Industry Safety Orders.

The Laboratory Chemical Safety Standard is a performance-oriented standard which sets forth written requirements for procedures, equipment, personal protective equipment, and other control measures intended to protect the employee from health hazards associated with hazardous chemicals used in the laboratory. In an effort to assure compliance with the requirements of the Laboratory Chemical Safety Standard, the SDSU Chemical Hygiene Plan has been developed for implementation at SDSU. The SDSU Chemical Hygiene Plan provides the framework by which the requirements of the Laboratory Chemical Safety Standard are put into practice on a campus-wide basis. The SDSU Chemical Hygiene Plan prescribes specific requirements and assigns responsibilities for meeting those requirements. The SDSU Chemical Hygiene Plan provides the means by which the Laboratory Chemical Safety Standard is implemented. The book, *Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards*, National Academy Press, 2011, provides an overview of prudent practices for laboratory facilities and should be used as a reference.

II. PURPOSE, SCOPE AND APPLICATION

The SDSU Chemical Hygiene Plan is designed to provide an effective means to protect and minimize employees' exposure to hazardous chemicals from health hazards or simple asphyxiant in the laboratories. The SDSU CHP shall apply and have the written provisions for:

- Protecting employees (University and Foundation) and students engaged in the **laboratory use** of **hazardous chemicals** as defined in the Laboratory Chemical Safety Standard on property owned or operated by the University;
- Keeping exposures below the applicable Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV).

Where the SDSU CHP applies, it shall supersede, for laboratories, the requirements of Title 8 of the California Code of Regulations Section 5194: Hazard Communication and Article110: Regulated Carcinogens of the General Industry Safety Orders, except as follows:

- The requirement to limit employee exposure to the specific exposure limit.

- Where the **action level** (or in the absence of an action level, the exposure limit) is exceeded for a regulated substance with exposure monitoring and medical surveillance requirements.
- Prohibition or prevention of eye and skin contact where specified by any health regulation shall be observed.
- When those particular regulations states otherwise, as in the case of Section 5209(c)(6).
- The "report of use" requirements of Article 110, (Section 5200 et. seq.) Regulated Carcinogens regulations.
- Section 5217 shall apply to anatomy, histology and pathology laboratories.

The SDSU CHP shall not apply to:

- Uses of **hazardous chemicals** which do not meet the definition of **laboratory use**, and in such cases, the employer shall comply with the relevant regulations in Title 8, California Code of Regulations, even is such use occurs in a laboratory.
- **Laboratory uses** of **hazardous chemicals** which provide no potential for employee exposure. Examples of such conditions might include:
    - 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
    - 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.

The SDSU Chemical Hygiene Plan (CHP) shall be *readily available,* upon request, to University employees, Foundation employees working in SDSU Laboratories, employee representatives, students, and regulatory agencies. This Chemical Hygiene Plan represents a generic plan that is generally applicable to SDSU Laboratories. However, the SDSU CHP can be expressly tailored to make it applicable to the individual chemical workplace***.*** ***It is the responsibility of individual colleges, departments, divisions and/or PI's to implement laboratory specific Chemical Hygiene Plans for unique laboratory operation***.

Laboratory Specific Chemical Hygiene Plans must be reviewed initially by Environmental Health & Safety (EH&S), and annually thereafter by the Chemical Hygiene Officer. Revisions to the plans must be made as necessary.

NOTE - From this point forward, the following nomenclature will be used to distinguish the different types of plans: **SDSU CHP** refers to the generic Plan developed for campus-wide use, and **Laboratory Specific CHP** refers to a site specific Plan modified to apply to a specific College, Department, Laboratory or other entity.

III. DEFINITIONS

Action level. A concentration designated in Title 8, California Code of Regulations 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.

Carcinogen (see "Select carcinogen").

Chemical Hygiene Officer. 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. A written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that
(1) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular work place and
(2) meets the requirements of subsection 5191(e).

Chief. The Chief of the Division of Occupational Safety and Health.

Designated area. 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 as a laboratory hood.
Emergency. 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. An individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

Hazardous chemical. Any chemical which is classified as health hazard or simple asphyxiant in accordance with the Hazard Communication Standard (Section 5194).

Health hazard. A chemical that is classified as posing one of the following hazardous effects: Acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); aspiration hazard. The criteria for determining whether a chemical is classified as a health hazard are detailed in Appendix A of the Hazard Communication Standard (Section 5194) and Section 5194(c) (definition of "simple asphyxiant").

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

Laboratory-type hood. A device located in a laboratory, enclosed on five sides with a movable sash or fixed partial enclosure 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. Handling or use of such chemicals in which all of the following conditions are met:
(1) Chemical manipulations are carried out on a "laboratory scale";
(2) Multiple chemical procedures or chemicals are used;
(3) The procedures involved are not part of a production process, nor in any way simulate a production process; and
(4) "Protective laboratory practices and equipment" are available and in common use industry-wide to minimize the potential for employee exposure to hazardous chemicals.

Medical consultation. 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.

Mutagen. Chemicals that cause permanent changes in the amount or structure of the genetic material in a cell. Chemicals classified as mutagens in accordance with the Hazard Communication Standard (Section 5194) shall be considered mutagens for purposes of this section.

Physical hazard. A chemical that is classified as posing one of the following hazardous effects: Explosive; flammable (gases, aerosols, liquids, or solids); combustible liquid; oxidizer (liquid, solid, or gas); self-reactive; pyrophoric (gas, liquid or solid); self-heating; organic peroxide; corrosive to metal; gas under pressure; in contact with water emits flammable gas; water-reactive; or combustible dust. The criteria for determining whether a chemical is classified as a physical hazard are in Appendix B of the Hazard Communication Standard (Section 5194) and Section 5194(c) (definitions of "combustible dust," "combustible liquid," "water-reactive" and "pyrophoric gas").

Protective laboratory practices and equipment. 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. Chemicals which affect the reproductive capabilities including chromosomal damage (mutations), effects on fetuses (teratogenesis), adverse effects on sexual function and fertility in adult males and females, as well as adverse effects on the development of the offspring. Chemicals classified as reproductive toxins in accordance with the Hazard Communication Standard (Section 5194) shall be considered reproductive toxins for purposes of this section.

Select carcinogen. Any substance which meets one of the following criteria:

(1) It is regulated by Cal/OSHA as a carcinogen; or
(2) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (1985 edition); or
(3) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (Volumes 1-48 and Supplements 1-8); or
(4) 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^3;

(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.

IV. RESPONSIBILITIES

Success of the overall program depends upon the cooperative efforts of administration, departmental managers, supervisors, lab managers, EH&S, employees and students. Specific responsibilities are prescribed as follows:

A. Executive Administrators

(a) Has ultimate responsibility for chemical hygiene within the institution and must, with other administrators, provide continuing support to institutional chemical hygiene.

B. Environmental Health & Safety is responsible for:

(a) Developing and implementing a SDSU Chemical Hygiene Plan with standard operating procedures necessary for campus-wide compliance to the Standard.

(b) Performing laboratory inspections

(c) Working with the individual laboratories, colleges or departments to develop lab specific Chemical Hygiene Plans or Standard Operating Procedures that address specific requirements for their operations.

(d) Providing consultation, monitoring, and training support services on matters related to laboratory safety.

C. Deans and Department Chairs are responsible for:

(a) Has primary responsibility for chemical hygiene.

(b) Ensuring that requirements related to chemical hygiene, as prescribed in the SDSU Chemical Hygiene Plan, are adequately supported.

D. Chemical Hygiene Officers (and their assistants) are responsible for:

(a) Working with administrators to implement the SDSU Chemical Hygiene Plan.

(b) Monitoring the procurement, use, and disposal of chemicals in the laboratories.

(c) Performing audits and maintaining appropriate records.

(d) Develop precautions and adequate facilities

(e) Maintaining an awareness of the current requirements regarding regulated substances.

(f) Seek ways to improve the chemical hygiene program.

E. Laboratory Directors, Managers, Supervisors and Principal Investigators have overall responsibility for chemical hygiene in the laboratory by:

(a) Ensuring that workers know and follow the chemical hygiene rules that personal protective equipment is available and in working order, and that appropriate training has been provided.

(b) Providing regular chemical hygiene and housekeeping inspections including routine inspections of emergency.

(c) With assistance from EH&S, determining the necessary and required levels of personal protective clothing or equipment.

(d) Ensuring that laboratory safety training, which takes into consideration the specific procedures and substances involved, is administered to all personnel working in the laboratory under their direction.

F. Laboratory Workers are responsible for:

(a) Planning and conducting each operation in accordance with the institutional chemical hygiene procedures.

(b) Developing and maintaining good personal chemical hygiene work habits.

V. PROGRAM IMPLEMENTATION

This section addresses the general requirements related to chemical hygiene campus wide. Additional requirements may apply to specific laboratory operations, and should be so identified in the College, Departmental, or Laboratory Specific Chemical Hygiene Plan.

The Laboratory Standard is designed to provide a comprehensive approach for the protection of laboratory workers. The Standard requires that employers protect workers through the implementation of control measures tailored to the individual laboratory work place. The Program implementation involves:

A. Permissible Exposure Limits (PEL)

SDSU laboratory operations shall be conducted such that laboratory workers exposures to hazardous substances regulated by California OSHA or Federal OSHA do not exceed the PEL's specified in 8 CCR 5155 and 29 CFR 1910 part Z.

The legally acceptable levels for occupational exposure to many toxic chemicals by inhalation are codified by OSHA in Permissible Exposure Limit (PEL) values (CCR, Title 8, Chapter 4, §5155). These values are generally expressed in parts per million (or mg/m3) as determined over an 8-hour time-weighted average (a typical work day). Current PEL values are available at https://www.dir.ca.gov/title8/5155table_ac1.html and https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9992 including

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9993 .

B. 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 exceed the action level (or in the absence of an action level, the exposure limit). The person supervising, directing or evaluating the monitoring shall be competent in industrial hygiene practice.

(2) Periodic monitoring. If the initial monitoring prescribed by Subsection 5191(d)(1) discloses employee exposure over the action level (or in the absence of an action level, the exposure limit), the employer shall immediately comply with the exposure monitoring provisions of the relevant regulation.

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

(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.

In the absence of a PEL value for a chemical(s) suspected in an occupational exposure, EH&S shall determine the appropriate acceptable exposure level (e.g., the Threshold Limit Values published by the American Conference of Governmental Industrial Hygienists).

All suspected chemical exposures on campus shall be reported in a timely manner to EH&S by completing the Incident/Accident Report Form available on the EH&S website.

C. Employee Information and Training

(1) Principal Investigators (PI's), lab managers and supervisors shall provide employees and students with training and information to ensure that they are informed of the potential chemical hazards in their workplace. Information and training may relate to an entire class of hazardous substances to the extent appropriate.

(2) The information and training shall commence at the time of the employees' and students' initial assignment to an area where hazardous chemicals are present, and prior to the introduction of any new materials or exposure situations. Refresher training shall be at least annually or more often if deemed necessary by the PI or Chemical Hygiene Officer.

(3) Employees and students shall be informed of:

- Contents of the federal and state Laboratory Safety Standards and its Appendices and shall be made readily available.

- The location and availability of the SDSU Laboratory Safety Program (SDSU Chemical Hygiene) and all its Appendices;

- Location and availability of the Chemical Hygiene Plan (CHP);

- PEL's for OSHA and Cal/OSHA regulated substances, or recommended exposure limits for other chemicals where there is no applicable OSHA or Cal/OSHA PEL's;

- Signs and symptoms associated with exposures to hazardous chemicals in the laboratory;

- Location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals in the lab, including, but not limited to, the Safety Data Sheets (SDS).

(4) Training of employees and students shall include:

- Methods and observations that may be used to detect the presence or release of a chemical (such as continuous monitoring devices, odors or visual appearance),

- Physical and health hazards of chemicals in the work area;

- Measures employees and students can take to protect themselves from the hazards, including procedures implemented by SDSU, such as safe work practices, emergency procedures, and personal protective equipment to be used; and

- Applicable details of the SDSU Chemical Hygiene Plan.

D. Medical Consultation and Medical Examinations

The University shall provide employees who work with hazardous chemicals in the laboratory an opportunity to receive appropriate medical attention, including any follow up examinations which the examining physician deemed necessary whenever:

- An employee develops signs or symptoms associated with chemical exposure in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination;

- Exposure monitoring reveals exposure levels above the action level (or in the absence of an action level, the exposure limit) of an OSHA or Cal/OSHA regulated substance, 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;

- A spill, leak, or explosion takes place 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.

All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician without loss of pay or cost, and at a reasonable time and place to the employee.

SDSU, via the Chemical Safety Officer and Environmental Health and Safety, shall provide information to the physician regarding the identity of the hazardous substance to which the employee may have been exposed, descriptions of conditions under which the exposure occurred (including quantitative data if available), and a description of the signs and symptoms of exposure experienced by the employee.

For examination or consultation required under this standard, SDSU shall obtain a written opinion from the examining physician which shall include the following:

- Any recommendation for further medical follow-up;
- The results of the medical examination and any associated tests, if requested by the employee;
- 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
- A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

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

E. Hazard Identification

(1) With respect to labels and safety data sheets;

- PIs, Lab Mgr, and Supervisors shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.
- PIs, Lab Mgr,. and Supervisors shall maintain in the workplace any safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees during each work shift when they are in their work area(s).

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

- If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the PIs, Lab Mgr. and Supervisors shall determine if it is a hazardous chemical as defined in subsection 5191(b). If the chemical is determined to be hazardous, the PIs, Lab Mgr. and Supervisors shall provide appropriate training as required under subsection 5191(f): Employee Information and Training.
- If the chemical produced is a byproduct whose composition is not known, the PIs, Lab Mgr. and Supervisors shall assume that the substance is hazardous and shall implement subsection 5191(e): Chemical Hygiene Plan.
- If the chemical substance is produced for commercial purposes by another user outside of the laboratory, the PIs, Lab Mgr. and Supervisors shall comply with the

Hazard Communication Standard (Section 5194) including the requirements for preparation of safety data sheets and labeling.

F. Use of Respirators

The use of respirators is not a primary means by which exposures to hazardous substances are controlled. Rather, control should rely on proper ventilation and confinement of the substance. In some cases, however, when the use of respirators is required to maintain exposures below the PEL, the University shall provide, at no cost to the employee, the proper respiratory protective equipment in accordance with 29 CFR 1910.134 and 8 CCR 5144. The SDSU Respiratory Protection Program describes the proper selection, use, and care of respirators in accordance with the requirements of Section 5144.

G. Recordkeeping

(1) The university 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 regulation.
(2) The university shall ensure that such records are kept, transferred, and made available in accordance with 8 CCR 3204.

Recordkeeping also include training, inspections, etc. Guidance on the preparation and retention of safety-related records is provided in the SDSU Injury and Illness Prevention Program.

V. PROGRAM ELEMENTS

The elements of the SDSU Chemical Hygiene Plan shall include the following components and indicate specific measures that SDSU will implement to ensure laboratory employee protection:

a. Standard Operating Procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals. Environmental Health & Safety (EH&S) is to provide some generalized SOPs for common chemical hazard class, specific hazardous chemical, and laboratory process for PIs and lab supervisors to adopt or customized to fit the particular operation of the lab. This frees PIs and lab supervisors from having to develop numerous SOPs and also provides some measure of standardization of safety practices campus wide. However, given the enormous list of hazardous chemicals and diverse nature of laboratory work at SDSU, it is still incumbent on PIs and lab supervisors to develop a lab-specific SOPs if a generalized SOP is not applicable, readily available, or listed on the EHS website for their specific hazardous chemicals or laboratory process. The EHS Lab-Specific SOP Template is available on the EHS website http://bfa.sdsu.edu/ehs/labsafety/labsafety.htm. PIs and lab supervisors can provide any format of SOP as long as it contains the required

elements or framework of hazard exposure control and safety measures. Contact EHS for guidance, review and approval.

b. Criteria to Determine and Implement Control Measures to reduce laboratory employee exposure to hazardous chemicals. SDSU will employ the following criteria:

- Hazard classification of hazardous chemicals
  - Particularly Hazardous Substances
  - Regulated Hazardous Substances
  - Chemical Contaminants with Permissible Exposure Limits
- Hazard process

These control measures includes engineering controls, use of personal protective equipment, and application of prudent hygiene practices. It shall be the determination of EH&S, in consultation with the laboratory supervisor, as to which control measures are required to allow employees to safely and legally continue their work

c. Requirements for Fumehoods to comply with Section 5154.1. All safety and protective equipment shall function properly and specific measures shall be taken to ensure proper and adequate performance of equipment.

d. Provisions for Employee Information and Training to ensure that employees are apprised of the hazards present in the laboratory. PIs and lab supervisors are responsible for training and providing the information described in the SOPs of the lab. Training shall be documented and maintained by the PI or lab supervisor.

e. Circumstances requiring Prior Approval includes performing hazardous laboratory operations, procedures, or activities including working with particularly hazardous substances before implementation.

f. Provision for Medical Consultation and Medical Examination.

g. Designation of Responsible Personnel for implementation of the SDSU Chemical Hygiene Plan including the assignment of a Chemical Hygiene Officer.

h. 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:

1. Establishment of a designated area;
2. Use of containment devices such as fume hoods or glove boxes;
3. Procedures for safe removal of contaminated waste; and
4. Decontamination procedures.

Additional information regarding the SDSU Laboratory Chemical Safety Program or Chemical Hygiene Plan can be obtained in the EHS website or contacting EHS at 594-2865.