College of Natural Sciences & Mathematics

CHEMICAL HYGIENE PLAN (CHP)

Science Safety Office

California State University, Long Beach

November 2022

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Introduction

The California State University Long Beach (CSULB) College of Natural Sciences and Mathematics (CNSM) Chemical Hygiene Plan (CHP) has been designed to fulfill the Cal/OSHA requirement regarding "Occupational Exposure to Hazardous Chemicals in Laboratories", California Code of Regulations (CCR), Title 8, General Industry Safety Orders, Section 5191.

The contents of this regulation and its appendices are available to employees at the CNSM Safety Office. These regulations mandate that where hazardous chemicals are used in the workplace, the employer shall develop and carry out the provisions of a written CHP which is:

1. Capable of protecting employees from the health hazards associated with hazardous chemicals present in the workplace.
2. Capable of keeping exposures below Cal/OSHA-regulated limits.
3. Readily accessible to employees via hard-copy at the CNSM Safety Office in MIC-207 and electronically on the CNSM Science Safety Office website.
4. Reviewed annually and updated as appropriate.

This CHP, along with the CNSM Safety Manual, CNSM Science Safety Office website (with training links), Campus Injury and Illness Protection Program (IIPP), Campus Hazard Communication Program (HAZCOM), and Emergency Operations Plan constitute the foundation of our employee Health and Safety program. Student health and safety are also covered by these (and/or parallel) policies and procedures where applicable.

The information presented in the CHP represents best practices and provides a broad overview of the information necessary for the safe operation of laboratories that utilize potentially hazardous chemicals. It is not intended to be all inclusive. Departments, divisions or other work units engaged in work with potentially hazardous chemicals that have unusual characteristics, or are otherwise not sufficiently covered in the written CHP, must customize the document by adding additional sections addressing the hazards and how to mitigate their risks, as appropriate. Such modifications should be reviewed by CNSM Science Safety Office before implementation.

Definitions

10 CFR Part 20—Code of Federal Regulations, Title 10. Energy Part 20. Standards for Protection Against Radiation.

Action Level—used by OSHA and NIOSH to express a health or physical hazard. They indicate the level of a harmful or toxic substance/activity which requires medical surveillance, increased industrial hygiene monitoring, or biological monitoring.

Administrative Controls—Also known as work practice controls which are changes in work procedures such as written safety policies, rules, supervision, schedules, and training with the goal of reducing the duration, frequency, and severity of exposure to hazardous chemicals or situations.

Biohazardous Waste—Also called infectious waste (such as blood, body fluids, and human cell lines), is waste contaminated with potentially infectious agents or other materials that are deemed a threat to public health or the environment.

Cal/OSHA—California Division of Occupational Safety and Health. Regulatory agency charged with setting and enforcing standards, providing outreach and issuing permits.

Carcinogen—Any substance, radionuclide or radiation that promotes carcinogenesis, the formation of cancer.

CCR Title 8—California Code of Regulations Title 8. Regulations pertaining to workplace safety.

CHO—Chemical Hygiene Officer. Responsible for ensuring implementation of Chemical Hygiene Plan.

Corrosive—DOT hazard classification; a liquid or solid that causes full thickness destruction of human skin at the site of contact within a specified period of time.

DEA—Drug Enforcement Administration. Federal agency charged with enforcement of the controlled substances laws and regulations of the United States.

DOT—United States Department of Transportation

EH&S—Environmental Health and Safety office. Involved in environmental protection, safety at work, occupational health and safety, compliance and best practices.

Engineering Controls—Strategies designed to protect workers from hazardous conditions by placing a barrier between the worker and the hazard or by removing a hazardous substance through air ventilation.

EPA—United States Environmental Protection Agency

Flammable—DOT hazard classification; usually pertaining to liquids with flash point of 140° F or less.

GHS—Globally Harmonized System of classification and labelling of chemicals. GHS defines and classifies the hazards of chemical products, and communicates health and safety information on labels and safety data sheets.

Hazardous Materials—Any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors.

Hazardous Waste—A waste with properties that make it potentially dangerous or harmful to human health or the environment. Can be in the form of liquid, solid or contained gases. Highly regulated and must be collected and handled as per strict campus guidelines.

HAZCOM—The campus Hazard Communication Program.

HSCI—Hall of Sciences. One of three science buildings at CSULB.

IIPP—Injury and Illness Protection Program. Campus-wide program which details the means and methods CSULB uses to ensure the safety and health of its employees.

Ionizing Radiation—Radiation consisting of particles, X-rays, or gamma rays with sufficient energy to cause ionization in the medium through which it passes. Sources of ionizing radiation include X-Ray devices and radioactive materials.

Laboratory Supervisor—Used synonymously with PI. Person in charge of laboratory operations. Can also be a designated supervisor such as a post-doc working under a PI.

Local Exhaust Ventilation—A type of engineering control to reduce exposures to airborne contaminants such as dust, mist, fume, vapor or gas in the workplace. Simply put it is something that sucks an airborne contaminant out of the workplace.

MIC—Microbiology building. One of three science buildings at CSULB.

MLSC—Molecular and Life Sciences Center. One of three science buildings at CSULB.

Mutagen—An agent such as radiation or a chemical substance, that causes genetic mutation.

NCRP—National Council on Radiation Protection.

Near-miss—A narrowly avoided collision or other accident.

NIOSH—National Institute for Occupational Safety and Health. United States federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. Part of the Centers for Disease Control and Prevention, within the U.S. Department of Health and Human Services.

NRC—United States Nuclear Regulatory Commission. Independent agency of the United States Government tasked with protecting public health and safety related to nuclear energy.

Oxidizer—DOT hazard classification; By yielding oxygen, these materials can cause or enhance the combustion of other materials.

PEL—Permissible Exposure Level. A legal limit in the United States for exposure of an employee to a chemical substance or physical agent such as loud noise. For chemicals, the chemical regulation is usually expressed in parts per million (ppm), or sometimes in milligrams per cubic meter (mg/m^3).

PHS—Particularly Hazardous Substances. Dangerous chemicals that are known to have immediate or long term toxic health effects. Divided into three primary groups:

1. Acute Toxins
2. Reproductive Toxins
3. Carcinogens

PI—Principle Investigator. Usually a professor in charge of a laboratory or set of laboratories who is actively undertaking research. They are considered the front-line supervisor and are responsible for training and personnel safety in the laboratory.

Poison—DOT hazard classification;

- a liquid with an LD50 oral not more than 500 mg/Kg,
- or a solid with an LD50 oral not more than 200 mg/Kg,
- or a compound with a LD50 dermal not more than 1000 mg/Kg,
- or a dust/mist with a LC50 or not more than 10 mg/L.

PPE—Personal Protective Equipment. Protective clothing, helmet, goggles, gloves or other garments or equipment designed to protect a worker from injury exposure or infection.

PPFM—Physical Plant and Facilities Management.

REACTIVE—Any chemical described by the Safety Data Sheet or Risk & Safety Solutions inventory software as self-reactive, pyrophoric liquids, pyrophoric solids, self-heating chemicals, or as chemicals which, when in contact with water emit flammable and/or toxic gases.

rem—A unit of effective absorbed dose of ionizing radiation in human tissue, equivalent to one roentgen of X-rays.

SDS—Safety Data Sheets. An essential component of the GHS and are intended to provide comprehensive information about a substance or mixture for use in workplace chemical management.

Sharps Container—Hard plastic container that is used to safely dispose of hypodermic needles and other sharp medical instruments, such as an IV catheters and disposable scalpels.

Sievert—(Sv) The SI unit of dose equivalent (the biological effect of ionizing radiation), equal to an effective dose of a joule of energy per kilogram of recipient mass.

SOP—Standard Operating Procedure. A written set of instructions that document how to safely perform work involving hazardous chemicals or hazardous operations. Includes training documentation.

Teratogen—An agent or factor which causes malformation of an embryo.

Scope

The scope of this CHP includes all personnel working in laboratories within the following:

- College of Natural Sciences and Mathematics
- Institute for Integrated Research in Materials, Environments and Societies (IIRMES)
- Animal Research Facility located in the Hall of Science
- Environmental Science and Policy laboratory in Peterson Hall 1 room 231
- Psychology laboratory rooms 400, 402, and 404.

Responsibilities

Responsibilities of Principal Investigator (PI)/Laboratory Supervisor

The PI/Laboratory Supervisor has responsibility for the health and safety of all personnel working in his or her laboratory who handle hazardous chemicals. The PI/Laboratory Supervisor may delegate safety duties, but remains responsible for ensuring that delegated safety duties are adequately performed.

The PI/Laboratory Supervisor is responsible for:

- Knowing all applicable health and safety rules and regulations, training and reporting requirements and standard operating procedures associated with chemical safety for hazardous materials.
- Identifying hazardous conditions or operations in the laboratory or other facility containing hazardous materials and determining safe procedures and controls, and implementing and enforcing standard safety procedures.
- Creating Lab Hazard Assessments in Risk & Safety Solutions program and recertifying annually to develop and implement appropriate chemical hygiene policies and practices.
- Establishing standard operating procedures (general and protocol specific) and performing literature searches relevant to health and safety for laboratory-specific work.
- Providing prior-approval for the use of hazardous chemicals in the PI/Laboratory Supervisor's laboratory or other facility with hazardous chemicals.
- Obtaining prior approval from CNSM Science Safety Office, Departmental Safety Committees, and EH&S, as appropriate for the purchase and use of hazardous materials including particularly hazardous substances, as defined in section labeled "*Provisions for Additional Employee Protection for Work with Particularly Hazardous Substances*" in this document, or conducting higher risk experimental procedures so that special safety precautions may be taken.
- Maintaining an updated chemical inventory for the laboratory or facility. As per the Chancellor's Office, laboratory inventories of hazardous chemicals are to be maintained using the Risk & Safety Solutions (RSS) software system. As per direction from campus Environmental Health and Safety, for REACTIVE chemicals (as defined above) the PI/supervisor shall set an expiration date of three years in the RSS inventory system and notify CNSM Science Safety Office that a chemical fitting this description is on their inventory. Continued possession of an expired REACTIVE chemical requires written permission from CNSM Science Safety Office.
- Ensuring laboratory or other personnel under his/her supervision have access to and are familiar with the appropriate Safety Data Sheets, SOPs and Safety Manual(s).
- Training all laboratory or other personnel he/she supervises to work safely with hazardous chemicals and maintain written records of laboratory-specific or other specialized training in the appropriate Laboratory Safety Notebook(s). Training must include information of the location and availability of hazard information.
- Promptly notifying CNSM Science Safety Office (562.985.5623) and/or Facilities Management (562.985.4357) should he/she become aware that work place engineering controls (e.g., fume

hoods) and/or safety equipment (e.g., emergency showers/eyewashes, fire extinguishers, etc.) become non-operational.

- Ensuring availability of all appropriate personal protective equipment (PPE) (e.g., laboratory coats, gloves, eye protection, etc.) and that available PPE is maintained in working order.
- Promptly reporting accidents and injuries to CNSM Science Safety Office, Administrative Services Manager and/or the Workers' Compensation Manager at 562.985.2366. Serious injuries MUST be reported to the Workers' Compensation Manager immediately to allow for compliance with the CAL/OSHA 8-hour reporting time frame. Any doubt as to whether an injury is serious should favor reporting.
- Providing funding for medical surveillance, consultation and/or examination for potentially exposed personnel as required.
- Informing facilities personnel, other non-laboratory personnel and any outside contractors of potential laboratory-related hazards when they are required to work in the laboratory environment.
- Identifying and minimizing potential hazards to provide a safe environment for after-hours repairs and renovations.
- Providing timely response and resolution to all hazards identified and reported by CNSM Science Safety Office or CSULB EH&S during periodic inspections.
- Establishing, and keeping current, a listing of your personnel as a group within the Risk & Safety Solutions program and ensuring the group members acknowledge the Lab Hazards Assessment annually.

Responsibilities of Personnel Who Handle Potentially Hazardous Chemicals

Personnel in research or teaching laboratories that use, handle or store potentially hazardous chemicals are responsible for:

- Reviewing and following requirements of the CHP and all appropriate Safety Manuals and Policies.
- Following verbal and written laboratory safety rules, regulations, and standard operating procedures required for the tasks assigned.
- Developing good personal chemical hygiene habits, including but not limited to, keeping the work areas safe and uncluttered.
- Planning, reviewing and understanding the hazards of materials and processes in their laboratory research or other work procedures prior to conducting work.
- Utilizing appropriate measures to control identified hazards, including consistent and proper use of engineering controls, personal protective equipment, and administrative controls.
- Understanding the capabilities and limitations of PPE issued to them.
- Gaining prior approval from the PI/Laboratory Supervisor for the use of restricted chemicals and other materials.

- Consulting with the PI/Laboratory Supervisor before using particularly hazardous substances (PHS) or conducting certain higher-risk experimental procedures.
- Properly storing, handling, labeling and disposing of hazardous waste.
- Immediately reporting all accidents and unsafe conditions to the PI/Laboratory Supervisor.
- Completing all required health, safety and environmental training and providing written documentation to their supervisor.
- Acknowledging the laboratory hazard assessment created by your PI/supervisor in the Risk & Safety Solutions software system.
- Participating in the medical surveillance program, when required.
- Informing the PI/Laboratory Supervisor of any work modifications ordered by a physician as a result of medical surveillance, occupational injury or exposure.
- When working autonomously or performing independent research or work:
    a. Reviewing the plan or scope of work for their proposed research with the PI/Laboratory Supervisor.
    b. Notifying in writing and consulting with the PI/Laboratory Supervisor, in advance, if they intend to significantly deviate from previously reviewed procedures (Note: Significant change may include, but is not limited to, change in the objectives, change in PI, change in the duration, quantity, frequency, temperature or location, increase or change in PPE, and reduction or elimination of engineering controls.)
    c. Preparing Standard Operating Procedures (SOPs) and performing literature searches relevant to safety and health that are appropriate for their work.
    d. Providing appropriate oversight, training and safety information to laboratory or other personnel they supervise or direct.

Responsibilities of Chemical Hygiene Officer (CHO) and CNSM Science Safety Office Personnel

The CNSM CHOs have primary responsibility for ensuring the implementation of all components of the CHP including, but not limited to:

- Informing PIs/Laboratory Supervisors of all health and safety requirements and assisting with the selection of appropriate safety controls, including laboratory and other workplace practices, personal protective equipment, engineering controls, training, etc.
- Conducting periodic inspections and immediately taking steps to abate hazards that may pose a risk to life or safety upon discovery of such hazards. Documenting findings and relaying to PIs/Laboratory Supervisors using the inspection program in the Risk & Safety Solutions Software package when applicable.
- Assist with creating hazard assessments, upon request. Assist PI/Laboratory Supervisors to develop and implement appropriate chemical hygiene policies and practices.

- Having working knowledge of current health and safety rules and regulations, training, reporting requirements and SOPs associated with regulated substances. Such knowledge may be supplemented and developed through research and training materials.
- Working with Departmental Safety Committee to review existing and developing new SOPs for handling hazardous chemicals.
- Providing technical guidance and investigation, as appropriate, for all accidents and injuries.
- Helping to determine medical surveillance requirements for potentially exposed personnel.
- Reviewing plans for installation of engineering controls and new facility construction/renovation, as requested.
- Reviewing and evaluating the effectiveness of the CHP at least annually and updating it as appropriate.
- Working with the office of Environmental Health and Safety (EH&S) to develop or alter programs and policies as laws and regulations evolve.

Required Sections of the Chemical Hygiene Plan

Standard Operating Procedures

A Standard Operating Procedure (SOP) is a written set of instructions that document how to safely perform work involving hazardous chemicals or hazardous operations. An effective SOP will help ensure a safe, predictable outcome when working with hazardous chemicals or operations. SOPs are required by Cal/OSHA and can be written in any suitable format as there are no specific legal requirements regarding their content.

SOPs may focus on any of the following:

- Processes (e.g., novel nanomaterial synthesis, distillation)
- Hazardous chemicals (e.g., carbon monoxide, hydrofluoric acid)
- Class of hazardous chemicals (e.g., organic solvents, pyrophoric material)

An example SOP for concentrated mineral acids is shown in the following pages. SOP forms may be found on the CNSM Safety Website and downloaded for use in any laboratory. They can be used for many hazardous processes or chemical manipulations conducted in lab.

In addition to the templates found on the CNSM Science Safety Office website, additional templates are available via UCLA's Hazardous Chemical SOP Library.

Sample SOPs for chemical classes are also available.

Some laboratories work with specific hazards that are novel or unique and not covered by the templates available online. In cases such as this, laboratory/process-specific SOPs are required. Sharing SOPs between research groups and/or forming small groups to write SOPs together can save time and effort. For common laboratory equipment (e.g., ultracentrifuges), the manufacturer's operations and maintenance manual may serve as, or supplement, the SOP.

Standard Operating Procedure Example

This document covers basic chemical safety information for corrosives. The use of any corrosive chemical is subject to pre-approval by the Principal Investigator (PI) and/or Supervisor. DO NOT USE CORROSIVES UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL.

CORROSIVES

Corrosives are materials that cause the destruction of exposed tissues and mucous membranes. They can be encountered as solids, pure liquids, solutions, or gases. Strong corrosive solutions typically have a pH <2.5 (acids) or >11 (bases), and include inorganic or organic substances dissolved in water.

Corrosives cause damage either through the presence of hydronium (H3O+) or hydroxide (OH-) ions in solution, reaction with skin and eye moisture to generate these same ions, or by damaging cell membranes through lipophilic action (e.g., certain detergents). All corrosives can cause serious eye damage or skin burns in the event of an exposure.

Chemicals covered by this SOP **do not** include corrosives with additional hazardous properties (e.g., hydrofluoric acid, nitric acid, corrosive flammables, tetramethylammonium hydroxide, etc.).

Personal Protective Equipment & Personnel Monitoring

Lab Coat

Traditional white lab coat and chemical-resistant apron when working with large volumes.

Gloves

Nitrile or neoprene gloves. Consult glove selection chart for heavy handling of corrosives. **Do not wear latex gloves.**

Eye Protection

ANSI Z87.1-compliant safety glasses or safety goggles, and face shield if a splash hazard is present.

Labeling & Storage

Store upright & tightly closed in a dry and well-ventilated place. Keep away from incompatible materials (e.g. segregate acids and bases). Consult the safety data sheet for additional storage compatibility information. Always store strong acids and bases in chemically-resistant secondary containers (e.g. polypropylene trays or tubs). Containers holding corrosives must be stored below eye level. Also, if not plainly visible (e.g., through a cabinet window), labeling must be applied to storage locations where these are stored to avoid an inadvertent encounter.

Engineering Controls, Equipment, & Materials

Fume Hood It is mandatory to use a fume hood when working with materials that are toxic or otherwise hazardous by inhalation. If your protocol does not permit the handing of such materials in a fume hood, contact Science Safety and/or EH&S to determine whether additional respiratory protection is warranted.

Housekeeping

Spills Notify others in the area of the spill, including your supervisor. Evacuate the location where the spill occurred. Call 911. Report any exposures to first responders and Science Safety. Remain on-site (at a safe distance) to provide detailed information to first responders.

Decon Decontamination methods will vary based on the materials handled and equipment being used. Please review the chemical Safety Data Sheet for guidance on cleaning materials.

Waste Refer to the Science Safety Program Manual and Chemical Hygiene Plan for details.

Place Yellow Hazardous Waste sticker on waste container and complete all Fields. Make certain to call for pickup within 6 months.

First Aid & Emergencies

Skin or Eye Contact Immediately remove contaminated clothing and shoes; flush skin with water for at least 15 minutes. Use Safety Shower as appropriate. Get medical attention immediately. Using Emergency Eyewash station, immediately flush eyes with water for at least 15 minutes. Lift eyelids while rinsing. Check for and remove contact lenses. Get medical attention immediately.

Inhalation Move person into fresh air. Get medical attention immediately.

Ingestion Call Poison Control Center at 1-800-222-1222. Get medical attention immediately.

Chemicals Covered by the SOP

Chemical Name	CASE Number

Chemical Name	CASE Number

Training Documentation

Name	Signature	Date

Criteria to Be Used For Implementation of Measures to Reduce Exposures

Use of any hazardous chemical in CNSM laboratories requires the appropriate engineering controls, safe work practices, administrative controls and personal protective equipment. Consideration of type of chemical and exposure routes must be taken into account. Safety Data Sheets (SDSs) shall be maintained by each laboratory supervisor and be readily available to all laboratory personnel.

Engineering controls specified in SDSs and SOPs will be used to control level of exposure to the chemical in use. Examples of these engineering controls include, but are not limited to, chemical fume hoods, glove boxes, physical shields or barriers, local exhaust ventilation and biological safety cabinets. All chemicals that generate hazardous fumes, mist or vapors shall be handled inside a properly functioning fume hood or other process enclosure.

Laboratory personnel generally do not use personal 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 CCR Title 8, Section 5144. The criteria used to determine control measures required to reduce an employee's occupational exposure include:

1. Verbal information obtained from employees regarding chemical usage;
2. Visual observations of chemical use or laboratory operations;
3. Evaluation of existing engineering control measures or administrative practices;
4. Recommendations expressed in SDSs;
5. Regulatory requirements of Cal/OSHA;
6. Recommendations from professional industrial hygiene organizations;
7. Direct reading instrumentation results;
8. Employee exposure monitoring results; and/or
9. Medical evaluation, examination and/or surveillance findings.

Particular attention shall be given to the selection of safety control measures for chemicals that are known to be extremely hazardous. See section labeled "*Provisions for Additional Employee Protection for Work with Particularly Hazardous Substances*" in this document.

Fume Hood Performance and Other Protective Equipment

All fume hoods in CNSM are checked annually for proper performance using the procedure outlined below.

Fume Hood Survey/Inspection Procedure

Background

General use chemical fume hoods must be inspected/surveyed a minimum of once per year. Hoods used for some Cal/OSHA - regulated carcinogens must undergo the process twice per year (see 8CCR 5154.1). The inspection/survey process consists of quantitative airflow measurement, qualitative inward airflow

check, check of the permanent, quantitative, airflow indicator, label check, lighting check, noting special use/conditions, and signing the inspection/survey label and data sheet. Any hood that fails the airflow tests must be immediately posted "Out of Service". The data sheets are then reviewed by Safety personnel to generate a list for hood repairs, and prioritizing the repairs with respect to employee safety.

Cal/OSHA mandates that the hood-inspection records (the completed data sheets generated by the process) be retained for FIVE YEARS. Original data sheets or similar documentation (computerized data) are retained in the CNSM Safety Office. Hoods should be re surveyed after critical hardware has been changed or repaired (motor, changed pully size) or if inadequate performance is suspected (as evident by the airflow indicator).

This hood check procedure is to be performed by persons specifically trained to do so. Appropriate personal protective clothing/equipment must be worn (typically a lab coat, goggles and disposable gloves are adequate). The inspector should minimize handling items in the room or fume hood. If an item in the hood obstructs airflow, the inspector is not obliged to move the offending item even if the item in question causes the hood to "fail" the airflow test.

If the hood fails due to inadequate flow, the inspector should move the sash lower in an attempt to attain proper flow (no lower than the 12" minimum).

Fume Hood Specifications/Requirements

1. Average airflow rate (with the hood completely open, opened to the mechanical "sash- stop" or opened to the level marked with "arrows") must be at least 100 linear feet per minute (LFM). A minimum of nine sample points must be measured, and no single sample point may have a value of less than 70 LFM. Sample points must be taken no closer than one inch from any hood surface. The sash may be lowered to increase airflow then resurveyed, proper airflow must be attained with a sash opening of at least 12 inches. If the sash is lowered, the position of the "arrows" must be changed accordingly.

2. A permanent, quantitative, airflow indicator (electronic or vane) must be present and operational. When equipped with an alarm test button and/or emergency purge button, they shall be tested and their performance documented. Vane-O-Meters must also be checked to confirm proper function.

3. A hood survey/inspection label must be present. The label must be signed/initialed by the inspector at least once per year. "Hood Numbers" that were arbitrarily designated in the past only appear on this label in some cases (PH1 & MIC). MLSC has one sticker on the bottom of each alarm box, and a "CEPA" number on the original aluminum check-tag.

4. Sash opening arrows (2) must be present if the hood sash must be lowered from the fully open or "sash-stop" position to achieve adequate airflow. Most hoods are equipped with "sash-stops" Sash stops are usually designed to produce ≥100 LFM with the sash raised to the sash-stop.

5. A use/fan label is sometimes affixed to a hood stating the type of materials used in the hood and hood exhaust location information; usually a "fan code" number is used. (NFPA 45 requirement). MLSC and HSCI hood fans rotate three fans per wing, so the fan code cannot be indicated.

Fume Hood Survey/Inspection Procedure

i. Fume Hood Check Materials List:

1) Airflow measurement tool—Properly functioning/calibrated Velometer or "Vane O Meter" (for periodic follow-up spot checks only).
2) Non-toxic “smoke bottle” used to qualitatively check the inward flow of air across the hood face.
3) List of hoods due for checking (printed from the CNSM master hood spreadsheet).
4) "Blank" Fume Hood Survey Data Forms.
5) Fume hood check signature labels.
6) Cell phone or two-way radios. Do a radio check before leaving.
7) Fume hood sash opening "arrow" stickers (use in pairs).
8) Pens (ballpoint or thin sharpie) for signing inspection tags.
9) Safety razor blade scraper for removing old labels/arrows as needed.
10) "Inadequate airflow" signs and tape.
11) Goggles, lab coat, and a supply of disposable gloves.
12) Digital camera, white board and dry-erase writing pen to indicate location of each photo.
13) Pencil, sharpie and clipboard.
14) Measuring tool to confirm minimum sash opening.
15) Keys needed for the task - from CNSM Safety.
16) Soft brush for dusting off Vane-O-Meters.

ii. Fume Hood Check - Detailed Instructions

1) Label check:
    a) Make sure that required Chemical Fume Hood Inspection sticker is in place. Re-label as needed. Please place the new label OVER the old one to minimize clutter.
    b) If an Exhaust fan code/use label is present (PH1 & Micro), make sure it's legible.
2) Airflow measurement:
    a) Move sash to the "arrow" sash-height indicators if present or to the "hood stop". In MLSC, move the 3-position lever to the middle setting. Take readings at nine sample points (at least 1 inch from the opening perimeter. Rotate velometer wand or move level Vane O Meter as needed to obtain the highest flow value. Do not block airflow with your body. Recall that items in hood can create airflow zones of less than 70 LFM. If airflow is inadequate, the sash may be lowered until the average LFM is adequate (12 inch minimum opening). If the

sash opening has been changed, the arrow indicators must also be changed at this time.

b) Perform the qualitative airflow measurement using smoke bottle. Slowly puff smoke across the face of the hood. The smoke must always be pulled into the hood. Any blowback of smoke is grounds for failure.

3) Airflow Indicator check:

a) Electronic Alarming Flow Indicator (MLSC/IIRMES/HSCI): These devices must indicate proper velocity or go into alarm mode if flow is inadequate. Your measurements will confirm that. Push the "emergency purge" button, when that function is present (not used in IIRMES) to confirm that elevated airflow immediately begins. Push the Test/Reset button to confirm the alarm sounds. Note any problems on the check form. If safe to do, test the low flow alarm by lifting the sash all the way open. You will need to defeat the sash stop. The low flow alarm should sound when the sash is fully opened.

b) **Vane-O-Meter:** (PH1 & Micro) This indicator must remain firmly attached, level and read accurately. Use the brush to clear dust from the device. Be careful NOT to disturb the fragile vane. If it is damaged, the vane must be replaced.

4) Hood lighting check: Hoods are equipped with fluorescent lights. Properly operating lights are required for safe hood use. Test the lights and record results.

5) Immediate action: In some cases, immediate action is required:

a) If the airflow is inadequate, post the hood with an "Inadequate Airflow" warning sign. If the absence of a properly-functioning hood is imperative to department needs, contact CNSM Safety, x55623, to initiate corrective action.

b) If unsafe practices are encountered (unlabeled hazmat, incompatible chemicals, open containers, waste problems etc.) CNSM safety will work with the responsible party, and the department chair to get the problem fixed promptly. NEVER ENDANGER YOURSELF! Do not perform the survey if it is not safe!

6) Documentation/Recordkeeping:

a) If the unit passes, sign/initial the hood inspection tag and write the inspection date. If it fails, mark "FAIL" and the test date.

b) Complete the Hood Inspection Data Form. Note special problems in the "comments" section.

c) CNSM Safety will prioritize the findings and coordinate repairs for problems as appropriate. CNSM Safety maintains the survey data sheets, etc. per the Cal/OSHA 5-year mandate.

In addition to fume hood performance, all users of chemical fume hoods must familiarize themselves with the operation of the fume hood(s) they are working in. Fume Hood Guidelines (PDF) have been disseminated to all research laboratory PIs, which should be provided to all workers in CNSM laboratories.

Other protective equipment such as Safety Shower/Eyewash Stations and Fire Extinguishers are regularly inspected and serviced by PPFM Plumbers and/or outside licensed contractors.

Employee Information and Training

All employees and students engaged in laboratory research covered under this CHP are required to participate in the CNSM Introductory Safety Training Program prior to beginning work. This training consists of a PowerPoint presentation followed by an objective examination that tests comprehension of the materials presented. All personnel working in laboratories are required to take the lab-specific training that includes a Safety Shower/Eyewash training module. Laboratory training requires a perfect test score to complete. Reading of the CNSM Safety Manual (PDF) is also required in order to pass the test. Key elements of CNSM Introductory Laboratory Safety Training include:

- HAZCOM/GHS Labeling;
- Safety Data Sheets- use, storage and retrieval information;
- Employee information postings;
- Eye Protection, Laboratory Attire, PPE; Conduct/Housekeeping;
- Incident Reporting; Medical Emergencies; Safety Equipment and Engineering Controls;
- Emergency Procedures/Spill Response; Chemical and Equipment Hazards;
- Compressed Gas and Cryogenic Liquids; Slips, Trips and Falls; Laboratory Security;
- Driving/Field Trips; Safety Shower/Eyewash training;
- Hazardous Waste collection;
- Methods and observations that may be used to detect the presence or release of a hazardous chemical; (such as monitoring conducted by EH&S, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
- The physical and health hazards of chemicals in the work area;
- And 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.

Employees shall be trained on the applicable details of this written CHP.

Training is documented by submission of the CNSM Safety Program Form to the CNSM Science Safety Office. The document is signed by both trainee and laboratory supervisor (See the following page). Upon submitting the form, personnel are added to the CNSM Science Safety Office database. The database is used to log all trainings provided by CNSM Safety. Hard copies of the CNSM Safety Program Form are maintained at the CNSM Science Safety Office.

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 CCR Title 8 Section 5191.

The employer shall ensure that such records are kept, transferred, and made available in accordance with CCR Title 8 Section 3204.

Records are maintained in accordance with the CSU Records/Information Retention and Disposition Standard.

Task-specific training is conducted by laboratory supervisors and/or qualified laboratory personnel and may be part of an SOP presentation. This training must be documented. SOP forms should include training sign-up sheets.

OFFICE USE ONLY

Pass Tests: ☐ Yes ☐ No Form Entered:_____ Key Personnel Notified:_____

Safety Program Form

Directions: Please answer the questions below. Email the form with the trainee section completed to your supervisor. Your supervisor will fill in their portion of the form and email the fully completed form to CNSM-Safety@csulb.edu. Please use Adobe Acrobat or Reader to fill out this form.

Trainee Section

Last Name:_____ **First Name:**_____ **Dept:**_____

Your Supervisor(s):_____ **Campus ID#:**_____

What is your *job*? (select one):

O Faculty O Staff O Undergrad Student O Grad Student O SA/Work Study

O TA O GA O Post-doc/Research Assoc. O Formal Volunteer O Guest

Participation Agreement: I have undergone CNSM General Safety Training. I understand my rights and obligations as an employee, student, volunteer, and/or supervisor under the provisions of the Cal/OSHA "Right-to-Know" hazard communication regulations. I agree to work at all times in complete accordance with all CNSM Safety policies and procedures, the CNSM Chemical Hygiene Plan, the campus Injury and Illness Prevention Program (IIPP) and to protect the health and safety of myself and those around me. I will not knowingly undertake a potentially hazardous task for which I have not been adequately trained. I am aware of the environmental, health and safety resources provided by the University, College and the Department, and will use them as necessary.

I understand and agree to the Participation Agreement *(please type your initials)*:_____ **Date**:_____

Supervisor Section

This section must only be filled out by the above-named individual's supervisor.

Work by the trainee identified above will require involvement with the following (check ALL that apply):

ITEM	CATEGORY	CHECK HERE
a.	Radioactive Materials	☐
b.	X-Ray Generating Machines	☐
c.	Human Blood, OPIM or Biohazardous Agents (BSL-2)	☐
d.	Lasers (open beam Class 3B or Class 4)	☐
e.	Compress Gas Cylinders	☐
f.	Cryogenic Materials (liquid nitrogen, dry ice, liquid helium)	☐
g.	Hydrofluoric Acid	☐
h.	Peroxide Forming Compounds (ether, THF, etc.)	☐
i.	Laboratory Instruction (computer labs excluded)	☐
j.	Particularly Hazardous Substances (PHSs)	☐
k.	Heat Exposure (outdoor work, field trips, field work, etc.)	☐

The above-named individual is authorized for after-hours facility use (see the CNSM Lab Security Regulations):

O Yes O No

Supervisor Agreement: I certify that the above-named individual has or will receive additional safety training related to specific hazards associated with research projects under my direction. Examples include, but are not limited to, hazardous chemical SOPs, Cal OSHA carcinogens, lab-specific procedures and equipment. Project work cannot be performed unless required training is provided and documented.

I understand and agree to the Supervisor Agreement *(please type your initials)*:_____ **Date**:_____

Note: *CSULB uses the Risk & Safety Solutions (RSS) software system to provide hazard assessment information to CNSM employees, volunteers, and students working in laboratory or research work environments. If you are a supervisor, you may be required to complete a risk assessment in RSS and build a group for those under your supervision. If you are joining an established group, you will be asked to review and acknowledge an assessment for each group in which you become involved. For more information, contact your supervisor, or the Science Safety Office at 562.985.5623 or CNSM-Safety@csulb.edu*

Refresher Training Policy

Employees must stay current with respect to safety and environmental issues. In the CNSM this refresher training is achieved through a variety of means. The CNSM Science Safety Office website is regularly updated and employees are trained to regularly check for updated procedures listed there. Blanket e-mail updates to college personnel are sent out by CNSM Science Safety Office regularly. Established policies are referenced as a reminder. Other times modified or new safety mandates are thus disseminated. Each supervisor is expected to maintain compliance with the policies communicated, or to implement the applicable policies in their workplace. Each supervisor is tasked with relaying the safety information in the e-mails to their people, be they employees or students.

Another key refresher mechanism in place for all faculty and Teaching Assistants with laboratory duties involves the mandatory student safety training and verification process. Each semester all employees who teach a laboratory present basic and task-specific safety information during the first week of class. The same safety policies and procedures used for introductory employee safety training are presented to the students by the laboratory instructor during the first week of instruction. In addition to the basic tenants of the CNSM Cal/OSHA based Chemical Hygiene Plan (CHP), specific safety instruction is conveyed relating to the chemical and physical hazards of that particular laboratory. The instructor who presents this safety information signs the training form, as do the students. This training documentation is kept on file for five years. Many of these employees present this safety information and sign the document several times in one semester.

Supervisors are also responsible for updating procedures as needed to comply with the information in these refresher announcements. Safety/environmental refresher information is also presented annually at the CNSM College meeting.

Confirmation that the new information is conveyed and implemented is verified through periodic workplace safety inspections as appropriate. Follow-up Science Safety Office e-mails remind these employees of the CNSM Safety policies that were found not to be in place. Mandatory, individualized refresher training sessions are conducted in cases whenever it is observed that current policy or refresher input has not been adequately implemented.

Room Access Restrictions and Safety Rules

I. Room Access Label Policy

This handout is part of a safety program developed to protect both contract workers and CSULB people. For your protection, every room in the CNSM has been checked for safety hazards, and labels indicating room access restrictions have been put on every room entry door. These "ROOM ACCESS" labels say how much safety training is required to enter the room when you are not "escorted" by people (students, professors etc.) who are familiar with the hazards in the room. Everyone is required to read and comply with the ROOM ACCESS LABELS each time unescorted entry into a science area is made.

This access training program was designed to give you the training you need to safely enter and/or work in nearly all unoccupied science areas. Managers, Supervisors and Contractors are responsible for communicating and enforcing these rules for their workers. Extra copies of this guide and Safety Data Sheets for chemicals present in science areas can be provided by the CNSM Science Safety Office – 562.985.5623 (located in MIC-207).

II. Room Access Labels: What Do They Mean and What Do They Look Like?

There are three different ROOM ACCESS labels:

1. **“ANY KEYHOLDER” (WHITE)**
   Anyone who has a key may enter these rooms unescorted. Everyone who enters still must follow the simple safety rules in "section III" of this handout. Some of these rooms may contain small amounts of hazardous materials.

2. **“SPECIAL PERMISSION REQUIRED” (WHITE WITH BLUE DOT OR BLUE)**
   Once you have understood and agreed to follow the safety rules in this handout, you may enter these rooms unescorted. Understanding the safety rules in this handout gives you the “special permission” you need to enter. People who enter these rooms when no science people are around need to be especially careful because of the chemicals and/or equipment in these locations. There may be especially dangerous and/or large amounts of chemicals. Potentially dangerous equipment may be running or could start automatically. You are allowed to physically escort untrained people (like subcontractors) or train them yourself using this handout.

3. **“DO NOT ENTER - SAFETY ESCORT REQUIRED” (ORANGE OR RED)**
   You MAY NOT enter these rooms unless you are escorted by the person whose name is posted at the doorway or by a CSULB Safety person, or by the appropriate CNSM administrator. About 12 rooms are marked with these ORANGE/RED labels. Most of these rooms have items that make unescorted entry dangerous. Access to these rooms should be requested in advance to prevent delays in your work schedule.

   EMERGENCY NOTE: Normally these rooms are safe enough for allow for immediate rescue removal of an injured person.

III. Safety Rules When Working in Science Areas

1. **LOCK UP!** If YOU unlocked a room, never leave it unattended. If you leave a room that you unlocked, you could be held responsible if someone gets in and hurts themselves, or steals or damages items in that room in your absence. Nearly every room has expensive items and dangerous chemicals. **ALWAYS LOCK UP WHEN YOU LEAVE!**

2. No food or drink are allowed in labs. Smoking is not permitted at CSULB.

3. Follow safety instructions or warnings given by people who use the space. If instructed to exit the premises, please do so.

4. Special Permission is granted to ancillary personnel upon completion of this training module. Enter and do your work following these rules.

5. **Do not enter a room posted on the outside with a temporary sign stating "KEEP OUT", "DANGER" etc.** Sometimes conditions inside are especially dangerous or sensitive that outside people must keep out for a period of time. Contact Science Safety or laboratory personnel for updated conditions.

6. When entering areas containing hazardous chemicals or hazardous equipment do not touch items on laboratory benches, in fume hoods, etc. **DO NOT PUT ANY TOOLS OR OTHER ITEMS ON LABORATORY BENCHES OR SINK AREAS THAT ARE MARKED WITH WARNING LABELS** (see below).

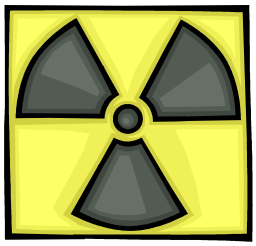
7. If equipment or chemicals are in your way, ask a person who works in the room or someone from the science contact list (below) to move them to a safe location. **Do not move them yourselves.** For example, you might find chemicals stored under a sink which you must repair. You must not work on the sink if the chemical containers block your way, or could be tipped or broken during your job. Someone from the CNSM must move the chemicals for you.

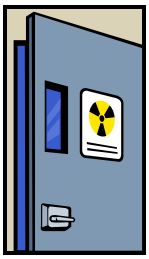
8. **Always read warning signs** and labels on items in the rooms, such as "Danger - High Voltage", or "corrosive", "poison", "flammable", "oxidizer", etc. Don't touch these items and use extreme caution when working in the room.

9. Always read signs placed on trash cans in rooms. Plastic and metal trash cans or baskets are sometimes used for special purposes. For example, some containers are used for the collection of broken glass. DON'T TOUCH containers used for the collection of radioactive waste (see labels below) or biohazardous/Medical Waste (containers with RED bags and "biohazard" labels).

   NEVER THROW BROKEN GLASS OR SHARP ITEMS IN THE REGULAR TRASH. Use specially labeled box used to collect broken laboratory glass, found in most labs. CUSTODIANS: If you see sharp things in the trash, do not touch, leave it there and notify your supervisor.

10. Do not touch areas marked "RADIOACTIVE". Here are several examples of radioactive materials labels:





"Caution – Radioactive Materials"

These labels usually have red letters on a yellow background. All rooms containing radioactive materials have been labeled "Caution - Radioactive Materials" and require access training for anyone who is unescorted. If you need to work on anything labeled RADIOACTIVE you must first call the Radiation Safety Office at 562.985.5623 to get their help.

11. **Always read signs placed on sinks.** Most rooms that use radioactive material have at least one sink used for the rinsing of radioactive glassware; these sinks are clearly labeled and the sink, drain pipes, counter top and faucet areas may be contaminated.

12. **Note the locations of eyewash/shower units** as you enter the laboratories. Look at how they work. Once turned on, they must be turned-off by hand (turn-off is NOT automatic). Knowing how they work can prevent a flood if a falling object accidentally turns one on. DOWN = ON. UP = OFF.

    a. Use this equipment yourself if you get chemicals on your body or in your eyes - either from accidents involving laboratory chemicals or from YOUR own service chemicals such as corrosive cleaners, strippers, solvents, battery acid, etc. To use the shower or eyewash, turn it on and flush the contaminated body part for 15 minutes. The floor will flood (most units have no drains) but do not worry about that. Your health is more important!

b. The area beneath eyewash/shower units MUST remain clear of boxes, trash cans, equipment or other items at all times. Do not place any items beneath eyewash/shower units that would block access during an emergency. Report any blocked units to your supervisor or the CNSM Science Safety Office.

13. **NEVER clean up or touch a puddle of liquid unless it is OBVIOUSLY from a water leak** (it could be acid or a poisonous chemical). Report suspicious spills to your supervisor.

14. **Always check for natural gas problems** when you enter a room. Some labs have more than 20 outlets and students occasionally forget to turn one off.

15. If an item is knocked-over or **there seems to be any problem** with materials or equipment in a room (noise, smell, heat, smoke, etc.) **please report it to your supervisor**, the CNSM Science Safety Office, and/or public safety. Use an emergency phone box or 911 from an office phone as necessary.

16. Some CSULB buildings have **RADIOACTIVE EXIT** signs. Never touch an EXIT sign without first getting radiation safety training from the campus Radiation Safety Office. Report any missing or damaged signs to your supervisor, who should immediately call Radiation Safety Office (562.985.5623).

17. The CSULB Office of Research and Economic Development (ORED) has incorporated this CNSM policy into their vivarium animal facility health and safety procedures. Vivarium access is strictly limited and completion of CNSM Access Training and full compliance with this policy is required for unescorted access to the facility within HSCI. Entering areas where animals are present can expose you to allergens and some individuals may have personal health issues (e.g., pregnancy, illness, immunocompetence) which may make them more susceptible to illness. Notify your supervisor if you think your health might be adversely impacted by your entry into the vivarium.

IV. On-Campus Phone Contact List for Entry, Questions or Problems

FOR EMERGENCIES: DIAL 911

Office/Person	Phone Number
Public Safety	562.985.4101
CNSM Science Safety Office	562.985.5623
Chris Frost Cell	562.577.0504
Jessica Lyon Cell	310.869.3738
Dean Curtis Bennett	562.985.1521
Associate Dean Barbara Taylor	562.985.5545
CNSM Facilities Coordinator	562.985.4841
Biology Department	562.985.4806
Biology Staff	562.985.4038
Chemistry Department	562.985.4941
Chemistry Laboratory Manager	562.985.4954
Microbiology Staff Diane Graham	562.985.4857
Geology Department	562.985.4809
Physics Department	562.985.4924
Physics Staff	562.985.4853
ORED Vivarium Staff	562.985.5483
Environmental Health and Safety	562.985.2283

Requirements for Prior Approval of Laboratory Activities

Anyone who plans to use strictly regulated or hazardous chemicals (see section labeled "*Provisions for Additional Employee Protection for Work with Particularly Hazardous Substances*" in this document) or conduct non-standard hazardous activities must obtain prior approval from CNSM Science Safety Office before commencing said activities. Materials which are extremely hazardous or reactive, which require special monitoring equipment, or are used in such a way that could subject the user to unhealthful levels of exposure would trigger this requirement.

Examples include, but are not limited to, the use of hydrofluoric acid, inhalation hazard gases, and perchloric acid. Approval is granted only if appropriate SOPs, engineering controls, monitoring equipment, training and emergency procedures are in place. Other requirements deemed appropriate by CNSM Science Safety Officers must also be met. In some instances, department chair, campus EH&S and Dean approval are required.

Provisions for Medical Consultation and Medical Examinations

1. The CNSM shall provide all employees who work with hazardous materials an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances;

    - Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination through the University's Worker's Compensation program.

    - Where exposure monitoring reveals an exposure level above the action level (or in the absence of an action level, the exposure limit) for a Cal/OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance shall be established for the affected employee as prescribed by the particular standard.

    - Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee shall be provided an opportunity for a medical consultation. 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 and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place.

2. Information provided to the physician. The employer shall provide the following information to the physician:

    - The identity of the hazardous chemical(s) to which the employee may have been exposed.

    - A description of the conditions under which the exposure occurred including quantitative exposure data, if available.

    - A description of the signs and symptoms of exposure that the employee is experiencing, if any.

3. Physician's written opinion. For examination or consultation required under this standard, the employer 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.
    - 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.
    - Student laboratory workers who exhibit signs and symptoms of adverse health effects from work-related exposure to a hazardous chemical should report to the Student Health Center or personal physician.
    - Refer to the Injury and Illness Prevention Program (IIPP) for procedures on how to obtain medical evaluation under the above-listed circumstances.

Medical Surveillance

Medical surveillance is the process of using medical examinations, questionnaires and/or biological monitoring to determine potential changes in health as a result of exposure to a hazardous chemical or other hazards. Certain Cal/OSHA standards require clinical examination as part of medical surveillance when exposure monitoring exceeds an established Action Level or PEL.

Occupational medical service providers will conduct medical surveillance services. Medical surveillance is required of employees who are routinely exposed to certain hazards as part of their job description (such as asbestos) and may be offered to other employees based upon quantifiable or measured exposure.

Examples of hazards that are monitored through the medical surveillance program may include:

- Asbestos
- Formaldehyde
- Lead
- Methylene Chloride
- Noise (Hearing Conservation Program)
- Radioactive Chemicals (Bioassay Program)
- Respirator Use (Respirator Protection Program)
- Other Particularly Hazardous Substances

Designation of Personnel Responsible for Implementation of the CHP

The CNSM employs two full-time safety officers, responsible for implementation of the Chemical Hygiene Plan. The CNSM CHOs are and Christopher Frost and Jessica Lyon.

Provisions for Additional Employee Protection for Work with Particularly Hazardous Substances

Substances that pose such significant threats to human health are classified as "particularly hazardous substances" (PHS). The OSHA Laboratory Standard and Cal/OSHA regulation require that special provisions be established to prevent the harmful exposure of researchers to PHS, including the establishment of designated areas for their use.

Particularly hazardous substances are divided into three primary types:

1. Acute Toxins
2. Reproductive Toxins
3. Carcinogens

Acute Toxins

Substances that have a high degree of acute toxicity are interpreted by OSHA as being substances that "may be fatal or cause damage to target organs as the result of a single exposure or exposures of short duration.” These chemicals, associated chemical waste, and storage containers must be handled with care to prevent cross contamination of work areas and unexpected contact. These chemicals must be appropriately labeled. Empty containers of these substances must be triple rinsed and the rinsate discarded as hazardous waste without rinsing trace amounts into the sanitary sewer system.

Reproductive Toxins

Reproductive toxins include any chemical that may affect the reproductive capabilities, including chromosomal damage (mutations) and effects on fetuses (teratogenesis). Reproductive toxins can affect the reproductive health of both men and women if proper procedures and controls are not used. For women, exposure to reproductive toxins during pregnancy can cause adverse effects on the fetus; these effects include embryolethality (death of the fertilized egg, embryo or fetus), malformations (teratogenic effects), and postnatal functional defects. For men, exposure can lead to sterility. Examples of embryotoxins include thalidomide and certain antibiotics such as tetracycline. Women of childbearing potential should note that embryotoxins have the greatest impact during the first trimester of pregnancy.

Because a woman often does not know that she is pregnant during this period of high susceptibility, special caution is advised when working with all chemicals, especially those rapidly absorbed through the skin (e.g., formamide).

Pregnant women and women intending to become pregnant should consult with their laboratory supervisor and their physician before working with substances that are suspected to be reproductive toxins.

Consult the CNSM Reproductive Health Policy for further details pertaining to working with reproductive toxins.

Carcinogens

Carcinogens are chemical or physical agents that cause cancer. Generally they are chronically toxic substances; that is, they cause damage after repeated or long-duration exposure, and their effects may only become evident after a long latency period. Chronic toxins are particularly insidious because they may have no immediately apparent harmful effects.

- **Select Carcinogens** as defined in CCR Title 8 § 5191 include any substance regulated by Cal/OSHA as a carcinogen, any substance listed under the category "known to be carcinogens" in the Annual Report on Carcinogens published by the National Toxicology Program (NTP), any substance 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 any substance listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP.
- **Regulated Carcinogens** are those select carcinogens regulated by Cal/OSHA as carcinogens and fall into a higher hazard class and have extensive additional requirements associated with them. The use of these agents may require personal exposure sampling based on usage. When working with Regulated Carcinogens, it is particularly important to review and effectively apply engineering and administrative safety controls as the regulatory requirements for laboratories that may exceed long term (8 hour) or short term (15 minutes) threshold values for these chemicals are very extensive. A list of Regulated Carcinogens can be found in the CNSM Safety Manual. Approval must be granted by CNSM Science Safety Office prior to commencing work with this class of chemicals.
- **Listed Carcinogens** are a special subset of Regulated Carcinogens and are listed in CCR Title 8 § 5209. The use of these materials is strictly regulated and must be registered with CNSM Science Safety Office and Campus EH&S.

Training and Documentation

The following provisions must be addressed and followed when working with Particularly Hazardous Substances.

1. All laboratory personnel who work with or may be exposed to particularly hazardous substances (PHS) must be provided laboratory-specific training and information by the PI or their designee prior to beginning their initial assignment. Laboratory-specific training should cover specific policies and procedures, SOPs, etc. and is in addition to the basics covered in the CNSM Introductory Laboratory Safety Training. Records of laboratory-specific training must be maintained in the laboratory and should include an outline of the topics covered. It is recommended that training documentation be maintained in Laboratory Safety Notebook.

   Training shall include:

   - The hazards/toxicological effects associated with the chemicals being used.
   - Routine procedures and decontamination methods.
   - Emergency response practices and procedures.
   - Methods and observations for detecting the presence or release of hazardous chemicals.

- Available protection measures, including engineering controls, appropriate work practices and (PPE).
- A review of written SOPs, SDSs and the CHP.
- A review of this Policy.

2. All laboratory personnel are responsible for understanding and complying with all safety guidelines, regulations, and procedures required for the task assigned and for reporting unsafe conditions, accidents or near misses to the Principal Investigator, immediate laboratory management staff or CNSM Science Safety Office.
3. Continuing training shall be conducted as needed to maintain a working knowledge of hazards and the safety requirements for all laboratory personnel who work with particularly hazardous substances, including an annual refresher for particularly hazardous substances. Re-training will be performed whenever there is a change in process, procedure or equipment. Written records must be maintained for each training session.

Use in Designated Areas

1. Designated area(s) for use of particularly hazardous substances must be formally established by developing SOPs and posting appropriate signage. This designated area(s) may be an entire laboratory, a specific work bench, or a chemical fume hood. When particularly hazardous substances are in use, access to the designated area shall be limited to personnel following appropriate procedures and who are trained in working with these chemicals.
2. Access to areas where particularly hazardous substances are used or stored must be controlled by trained employees. Working quantities of particularly hazardous substances should be kept as small as practical and their use should be physically contained as much as possible, usually within a laboratory fume hood or glove box. It is the responsibility of each Principal Investigator, or their designee, to train and authorize their staff for these operations and to maintain documentation of this training and authorization.
3. Signage is required for all containers, designated work areas and storage locations in accordance with the CNSM Chemical Labeling Policy. In addition to this, containers, designated work areas and storage locations of Listed Carcinogens must state the following as appropriate for the specific chemical hazard:

   “DANGER – (CHEMICAL IDENTIFICATION) – MAY CAUSE CANCER”

   Entrances to designated work areas and storage locations of Listed Carcinogens must also include signage, “AUTHORIZED PERSONNEL ONLY”, in addition to the above specific hazard warning identification.
4. Work surfaces should be stainless steel, plastic trays, dry absorbent plastic-backed paper, chemically-resistant epoxy surfaces, or other chemically impervious material.
5. Protocols, procedures, and experiments must be designed and performed in a manner to safely maintain control of the particularly hazardous substances. Laboratory personnel must specifically consult with their PIs if a special hazard is involved (e.g., material under pressure) or if they are uncertain of the potential hazards.

Personal Protective Equipment (PPE)

1. PPE must be sufficient to protect eyes and skin from contact with the hazardous agents. At minimum, chemical splash goggles, lab coat, long pants, closed toe shoes, and gloves are required when working with PHSs. Flame resistant lab coats may be required if the chemicals being used are flammable or when handling pyrophoric chemicals outside of a glove box.
2. Refer to the specific chemical's SDS and SOP for specific information on additional PPE and glove selection.
3. Contaminated PPE and clothing must be disposed of as hazardous waste.

Engineering Controls

1. Benchtop work with PHSs is prohibited. Containment systems (such as fume hoods or glove boxes) must be used. Laboratories and rooms where PHSs are used must have local exhaust ventilation such as chemical fume hoods or be used/stored in glove boxes for containment purposes. Air from these ventilation systems must be vented externally; recirculation is not permitted. Doors providing access from public areas must be kept closed.

Special Handling and Storage Requirements

1. Particularly hazardous substances must be stored in a designated area and used in a manner that will minimize the risk of accidental release (e.g., capped tightly, use of chemical resistant secondary containment, whenever possible). Laboratory personnel should remove chemicals from storage only as needed and return them to storage as soon as practical.
2. Chemicals should be segregated from incompatible materials, as described in the CNSM Safety Manual. The use of PHSs must be confined to an established designated area.
3. Additional requirements for the safe storage of a specific chemical may be found in the manufacturer's instructions or in the SDS.
4. When transporting chemicals beyond the immediate laboratory environment, containers should be protected from breakage by using a bottle carrier or other effective containment.
5. Contact CNSM Science Safety Office for guidance on the planned use of chemicals that may require further controls.

Spill and Accident Procedures

1. Immediate measures must be available to prevent the possible spread of contamination in the event of a small spill of a particularly hazardous substance. Absorbent materials and clean up materials should be available in all laboratories sufficient to contain and decontaminate individuals and equipment and areas. Any known spills must be contained and decontaminated as soon as possible. Additional spill cleanup materials are available in the CNSM emergency cabinets.
2. In the event of a large spill (greater than 1 liter/500 gm) that is beyond a laboratory group's immediate response capabilities, the following procedures should be followed:
    - Evacuate the area immediately.

- Restrict access to the affected areas to emergency responders and post signage and barriers as needed to prevent unauthorized entry.
- Contact EH&S Hazmat immediately for response and remediation. Call 911 from any phone. The dispatcher will prompt you to describe the emergency and location. Stay on scene, in a safe location to direct first responders to the spill site.

3. In the event of direct skin contact with a particularly hazardous substance, the affected person must shower or flush the affected areas for a minimum of 15 minutes. Emergency eyewash stations should be used to more effectively flush eyes or other mucous membranes when involved. Whenever personal contamination occurs, the event must be reported to CNSM Science Safety Office and an incident report will be completed and forwarded to campus EH&S and Risk Management.
4. If the spill involves acutely toxic materials, the spill should be treated as a large spill if there is any doubt about the group's ability to safely mitigate the spill.
5. If the spill involves regulated carcinogens, a Report of Use may need to be filed. Contact CNSM Science Safety Office for details.

Routine Decontamination Procedures

1. To limit the spread of contamination, laboratory work surfaces should be decontaminated at the conclusion of each procedure and at the end of each day on which PHSs are used.
2. All equipment should be decontaminated before removing it from the designated area; this decontamination should be carried out in a glove box or fume hood where practical.
3. Contaminated PPE must not be removed from the designated area until properly decontaminated; After working with these chemicals, gloves must immediately be removed and disposed of as hazardous waste and hands and arms washed with soap and water.

Waste Disposal Procedures

1. Disposal of waste materials that include PHSs must comply with the hazardous chemical waste disposal procedures found in the CNSM Safety Manual and on the CNSM Science Safety Office website.
2. In addition to general hazardous waste labeling requirements, waste containers containing Listed Carcinogens must also be labeled as appropriate for the specific chemical hazard:

   "DANGER – (CHEMICL IDENTIFICATION) – MAY CAUSE CANCER"

3. All non-radioactive chemical waste must be disposed of through the CSULB Hazardous chemical Waste Program. Mixed wastes of hazardous chemicals and radioactive material are disposed of through the Radiation Safety Office. Due to regulatory restrictions and the high cost of disposal, the Radiation Safety Office must be contacted prior to producing mixed wastes.

Regulated Carcinogens and Report of Use Requirements

1. Regulated Carcinogens are a specific subset of select carcinogens which have special additional requirements associated with their use under certain circumstances. See the CNSM Safety Manual for the specific list. Every effort should be made to keep exposure levels below regulatory threshold limits by using engineering and administrative controls, appropriate PPE

and following customized SOPs designed to reduce exposure. If exposures cannot be kept below regulatory thresholds, work shall cease until measures can be put in place to reduce exposure to acceptable levels. Before work may resume, additional requirements may include:

- Required medical evaluations.
- Additional documented training.
- Use of respirators with required initial and ongoing training, medical evaluations, and maintenance documentation.
- Additional documented hazard evaluations.

2. Listed Carcinogens are a further subset of regulated carcinogens. A list of these compounds can be found in CCR title 8 section 5209 (e) (1) (D). The use of these materials is strictly regulated and must be registered with CNSM Safety and Campus EH&S. An evaluation will be completed to assess safety requirements for groups that use these materials.

   Report of Use Requirements must be met for each group when they:

   - Begin the use of, or make significant changes to existing use of any Listed Carcinogen.
   - Use Regulated Carcinogens such that there is a reasonable expectation that exposure limits may be exceeded.
   - In the event of an emergency in which employees have been exposed to any Regulated Carcinogen.

Campus and CNSM Science Safety Office Policies and Procedures

New Personnel Guide to CNSM Safety Program Requirements

This safety program outline was specifically prepared to help acquaint new staff and faculty members with the requirements of the CNSM safety program and the campus EH&S program. For questions or clarification on these policies, please contact CNSM Science Safety Office personnel via the CNSM Science Safety Office website or call 562.985.5623.

Campus policy requires that all personnel participate in the IIPP. As such, the CNSM Science Safety Office has implemented policies and procedures, including the CHP, to guide personnel on safety matters. Careful control of all hazardous chemicals and potentially dangerous equipment are key aspects of these safety programs. The employer (CSULB/CNSM) is required to communicate program information to the employee and ensure that the applicable health, safety and environmental requirements are met.

Some EH&S issues and program requirements are so important that this document has been prepared to alert new employees to issues that must be addressed both prior to and within 30 days of arriving on campus.

I. Introductory Safety Training

Participation in the CNSM Safety Training program is required for all personnel including faculty.

A. All personnel: Please contact your Department Office WITHIN YOUR FIRST WEEK at CSULB to do the following:

   1) Complete the online Introduction Safety Training. Return the signed Safety Program Form to the Science Safety Office, located in Micro-006 (562.985.5623 or x55623 from an on-campus phone). Office workers may complete online Office Worker Training instead.

   2) Personnel should then contact the CNSM Science Safety Office and complete a Project Authorization Form if required.

II. Continuing Education/Training

Current health and safety problems or changes in regulations are brought to the attention of faculty and staff via website updates, Department meetings, biannual College meetings, and "blanket email" Safety Memos that are periodically issued to CNSM faculty and staff. The campus Office of EH&S also publishes EH&S information. Occasionally faculty and staff are required to personally participate in an EH&S training exercise. Faculty and staff are responsible for adopting/implementing new EH&S policies communicated through continuing education.

III. Faculty Responsibilities as a "Supervisor"

You are a supervisor if you direct or oversee the work of any students (class/labwork, student research projects, thesis work) and/or student employees, including Teaching Assistants, Graduate Assistants, Research Assistants/Associates, Student Assistants, College Work Study Students, volunteer workers etc. Student safety is paramount at CSULB. As such, students are provided the same level of training and

oversight as that of employees. They are expected to follow CNSM Science Safety Office policies and procedures as well as SOP and special procedures presented to them in your laboratory.

Each faculty who is a supervisor is responsible for ensuring that all persons being supervised have received the appropriate safety training, including special training in the use of hazardous chemicals and/or equipment, and have been informed of all new EH&S policies/information previously communicated to the supervisor via email, Safety Memos, meetings etc. The supervisor must verify that all employees she/he supervises have obtained the CNSM Safety Training prior to beginning work. This mandatory, general-level training is available online as described above. The supervisor is also responsible for monitoring all work practices to ensure that safety rules are followed. The supervisor is required to serve as a safety information resource person for supervised individuals, and must therefore be careful to be well informed about applicable safe work practices. The CNSM Science Safety Office, x55623, is available to help faculty in this important area.

REMEMBER - Employees are responsible for ALL chemicals, equipment and procedures used by any student/employee they supervise! Chemicals acquired/used for student work belong to the supervising faculty, not the students.

Additionally, the CSU Chancellor's Office has mandated that all campuses in the CSU System shall use Risk & Safety Solutions (RSS) software to enhance laboratory Safety. As supervisor, you are responsible for establishing your personnel as a group within the program and certifying a lab specific hazards assessment for your group. Each group member will be required to acknowledge the assessment you certified and will be provided with the hazard information and safety requirements (including PPE) specific to your lab. For more information including the direct link to RSS, visit the CNSM Science Safety Office website. For help using RSS, contact CNSM Science Safety Office to receive helpful guides and direct assistance.

IV. Room Responsibilities: Your Designated Work Areas

A. Room Labels: Faculty are typically assigned specific workspace(s). The CNSM uses warning labels for each work area that indicates the hazards within. Research labs work under a strict security policy. Persons allowed in the laboratory are named on a form on the door.

B. Room Contents: The person responsible for a room is required to coordinate with other room users (if any) to ensure that all equipment in the room is in safe working order, that all hazardous chemicals are properly stored and labeled, and that the hazardous chemicals inventory (see item V. below) for that room is current. Please report any abandoned chemicals or other problems to your Department Chair and the CNSM Science Safety Office promptly upon discovery. You should not have to "inherit" problems left over from a previous occupant.

C. Housekeeping: Housekeeping in laboratory or office space is a matter of safety as well as good work practice. Aisles and eyewash stations must not be blocked, chemicals must be stored properly, electrical cords must not dangle across spaces, spills must be cleaned up promptly, etc. Prompt spill clean-up is especially essential when mercury, radioisotopes or other hazardous chemicals are in use. Master's Theses should not be approved until the project materials have been cleaned up, materials labeled, etc.

   Departing PI/supervisors responsible for laboratory areas must work with Science Safety in addition to other members of their department and the College to complete a CNSM Safety Clearance Checklist for Departing Staff/Faculty form in order to verify all laboratory materials have been properly managed and facilities are in good order prior to departure.

D. Reporting Problems/Incidents: Workplace injuries, spills, malfunctioning safety equipment, dangerous unsecured items (missing earthquake bracing) and other safety problems must be reported promptly to the CNSM Science Safety Office and your Department Chair. Department Offices stock a standard "Incident Report Form" which you must fill out and return to your Department Office in the event of an injury to yourself or someone you supervise; a hazardous/large chemical spill; dangerous “near-miss” event; etc.

V. Hazardous Materials General

A. Personal transport of hazardous material: Any faculty member who brings or arranges for the transport of any chemicals or other hazardous materials to CSULB must check with the CNSM Science Safety Office prior to transporting to ensure compliance with U.S. Department of Transportation regulations. Approval by the Director of EH&S is required. Shipments of hazardous chemicals from campus also require EH&S Director approval.

B. Inventory and Management: The RSS software package mandated to be used by the CSU Chancellor’s Office includes a program supervisors must use to inventory all hazardous laboratory chemicals. Chemicals is a barcoding-based software system for maintaining chemical inventory of existing and new chemicals. As supervisor, you are responsible for the hazardous chemicals in your inventory on campus and are required to keep your inventory up to date including any novel synthesized compounds. For more information including the direct link to RSS, visit the CNSM Science Safety Office website. For help using RSS Chemicals or to request barcode stickers, contact CNSM Science Safety Office.

C. Prohibited/Restricted Hazardous Materials: Cal/OSHA regulated carcinogens (see Safety Program Manual and above), Risk Group Level 3 or 4 biohazardous materials, DEA regulated "drugs" such as sodium barbital etc., human blood and blood products, and highly unstable/water reactive materials are either prohibited on campus, or very highly regulated. Explosives are prohibited on campus. Contact CNSM Science Safety Office for details.

VI. Radioactive Materials

A faculty or staff member must become an "Authorized User" of radioisotopes via the CSULB Radiation Safety Committee PRIOR TO bringing (or placing an order for) radioactive materials, radiation-producing machines onto this campus. The CSULB Authorization can be initiated several months prior to the projected arrival new faculty. Contact the Campus Radiation Safety Officer in the CNSM Science Safety Office at 562.985.5623.

VII. Hazardous Equipment

Equipment that produces ionizing radiation such as x ray machines/electron microscopes must be registered with the State of California, and the use/ordering of these devices must be pre-approved by the Campus Radiation Safety Officer in the CNSM Science Safety Office. Faculty intending to use Class 3B or 4 lasers must meet with CNSM Science Safety Office personnel prior to laser use on this campus. Other hazardous equipment such as furnaces, sonicators, machining equipment, high voltage/amperage items, high pressure devices, etc. must be approved by campus EH&S prior to acquisition. These equipment items shall be in safe working condition and be equipped with provisions to minimize the potential injury to employees and students.

Even common "non-hazardous" equipment brought onto campus must be carefully evaluated for hazards. Frayed, damaged, or non-specification electrical wiring, missing belt/chain guards, or similar hazardous conditions on any device is a safety hazard and is in violation of state law. Essential

equipment that is out of compliance with safety requirements can be brought on campus if tagged "out of service until repaired/upgraded". Details regarding the repair of incoming equipment/donations must be addressed within the Department/institute to be sure that funding is available for the repair. Bringing "white elephant" equipment items that cannot be repaired onto campus is highly discouraged.

VIII. Research

Faculty are responsible for ensuring that student projects they approve have incorporated proper safety and environmental protection measures. All project work conducted outside of the regularly-scheduled classroom/laboratory must be reviewed for EH&S provisions, often at both the Department and College levels. Standard "Project Safety Review and Authorization Application" forms should be completed and submitted to CNSM Science Safety Office if you intend to work on projects outside of scheduled laboratory classes. Project descriptions should be broad enough to encompass all faculty research and authorized student projects.

P.I.s/supervisors are responsible for knowing and communicating hazards associated with their operations, especially chemical hazards, to their personnel, Science Safety Office, campus EH&S staff, and any other individual that may be impacted by their operations. This responsibility extends to materials or chemicals created at the PI or supervisor's direction that may have new or unusual properties such as increased reactivity or explosive potential.

IX. Animals in Instruction/Research

This is another highly regulated area. The University Animal Welfare Committee is charged with reviewing any project that employs living vertebrates. You must contact the Animal Facility Coordinator at 562.985.5314 prior to working with ANY living vertebrates (including field projects).

X. Injury Response Procedures

A. Employee Injuries: All employees injured "on the job" must contact (or have their supervisor contact) the designated administrative representative for University employees (CNSM Science Safety Office personnel at x55623); or the Human Resources Officer for Foundation employees (x57635). Unless the injured employee has previously filed a "Employee's Choice of Physician" form with the Worker's Compensation Manager or Foundation's Human Resources, treatment should be sought ONLY at the approved facilities. The office workplace safety bulletin board at Hall of Science room 160 and at FO3-120 has an informative poster. Contact CNSM Science Safety Office for forms and/or questions.

B. Faculty Responsibilities Regarding Student Injuries: Faculty must first determine if the student was injured while performing work for which they are paid by either the University or the Foundation. If the student was injured while working as an employee, the above "Employee Injuries" section fully applies. Employees include paid teaching associates (TAs), graduate assistants (GAs), student assistants (SAs), work-study students, etc. If the student was injured while in class, doing research or other student activity, the student should be directed to Student Health Services or their personal physician for treatment.

CNSM HAZCOM and Container Labeling Policy

Whenever a chemical is taken from its original container, the container it is transferred into must have a secondary label affixed to identify its contents and any relevant hazards.

CNSM uses a DOT (Department of Transportation) based container labeling scheme with the addition of GHS pictograms.

CNSM Label Policy. Label any unattended container of materials as follows. Full name – do not only use abbreviations or formulas such as H_2O, HCl, ETOH. Hazards – write the word or use a sticker that says the hazards, e.g., flammable, corrosive, poison, oxidizer, carcinogen, biohazard. Make sure any old, inappropriate labels are completely unreadable (you may erase, deface, or remove labels). Permanently-labeled bottles may not be used for a different material (your label may fall off or your ink may wash off to show the old wrong label).

Container Label Addendum

The College of Natural Sciences Material label system is designed to indicate the identity, and hazards, if any, of any given material. In the case of hazardous chemicals, the PRIMARY safety hazard(s) for that substance is indicated, as designated by GHS, Federal/State codes or scientific literature.

The information contained in this guide is intended to be an addendum to “secondary container” labels created by college personnel.

This official label supplement is to be posted on the Official CAL/OSHA Workplace Safety Bulletin Board. All unattended containers must be marked. Notify the person in charge of your area or CNSM Science Safety Office if you encounter unlabeled/inadequately labels containers or unlabeled bulk/loose material.

Material Label Program Supplementary Information

1. **Treat materials that bear any hazard warning as toxic.** Avoid inhalation, skin contact and contamination of surfaces. Do not mix or store them with other materials unless you know the reactive properties. Employees and students are required to know the hazardous properties of each material they handle.
2. **Any properly labeled material may have additional hazardous properties.** The safety-trained faculty or staff person in charge of your workplace will be able to provide more specific chemical safety information (as is contained in Safety Data Sheets, "SDS's," and other sources).
    a. **Toxic effects of chemicals are varied.** Materials marked "POISON," for example, may be toxic through very different mechanisms. Route of entry, exposure time, temperature, your physical condition, etc. all influence toxic effects.
    b. **Target organ.** Many toxic agents focus on specific tissue, organ, or organ system. The affected organ can be remote from the point of exposure. The eye, for example, can be affected from skin exposure to methanol.
3. **Compatibility cannot always be determined by the hazard label.** While hazard labels indicate the gross hazard class, do not assume that all materials of the same hazard class are compatible e.g., acids and bases are both labeled as corrosive. Refer directly to SDS-type information or to the College employee in charge of the area.
4. **Spills of hazardous chemicals must be handed by qualified persons.** Contact CNSM Safety or call Campus POLICE if you have ANY DOUBT about the severity of a chemical spill. Even a few milliliters or milligrams of some materials require trained persons using Self Contained Breathing equipment to avoid overexposure. A generic spill response guide for handling minor spills is on the CNSM Science Safety Office website and posted in many locations.
5. **The college labeling procedure is written and is on the CNSM Science Safety Office website.** College employees and many laboratory students have been instructed in proper labeling as part of their introductory safety training. The details for the label system are among the official "Right-to-Know"/"Hazard Communication procedures" adopted by the College and/or University.

CNSM Hazardous Waste Collection and Labeling Policy

Control of Waste-Producing Operations

Faculty (course coordinators, thesis advisors, principal investigators, etc.), staff (technicians, trades persons, supervisors, researchers, etc.) and administrators (program directors, Deans, Chairs) must anticipate and prepare for the responsible management of any hazardous waste generated from the campus activities they perform and/or oversee. Cal/OSHA has strict requirements regarding who may handle hazardous waste; you and your personnel may handle ONLY the waste generated by yourselves at your own worksite (usually a lab).

This written procedure is designed to help campus personnel fulfill this obligation. Nearly any use of a hazardous chemical can generate hazardous waste. Regulated hazardous waste can be created from "non-hazardous" materials. When hazardous waste must be produced, CNSM Science Safety Office personnel will help in the development of a process-specific plan to ensure safety and regulatory compliance. If possible, a non-hazardous or less-hazardous option will be proposed.

1. **Generation Point Hazardous Waste Containers:** Selection of an appropriate container or containers to hold the waste routinely generated by workplace operations is a critical step. As the containers used are typically NOT the final "over-the-road" containers that require new and specific types of containers, almost any safe and effective container will suffice. If in doubt, contact CNSM Safety at x55623 or EH&S at x52283 for details.

   Sound containers may be used over and over again for the same waste stream (emptied by specifically trained personnel into larger waste containers and then returned to the generation site) OR they may be one use containers (the disposition of unwanted emptied waste containers is the responsibility of the hazardous waste contractor). The following container selection/use guidelines must be observed at all times:

   a. Container material: The container must be compatible with the waste, i.e. No acids in steel containers, no gasoline in styrofoam, no picric acid or perchloric acid solutions in lead soldered or zinc coated containers. No food or drink containers.

   b. Container condition: The container must be in sound condition including the closure(s) and gasket(s) as appropriate. No brittle, degraded plastics, structurally corroded metal, etc.

   c. Container closure: The container must be equipped with a leak proof mechanical closure such as a threaded cap. The cap must be equipped with a gasket that contains the material when being carried or if it is tipped over. Cap threads must match the container. Friction fit stoppers or film seals are unacceptable.

   d. Container size: Whenever possible, the container size should be matched to the volume of waste generated within 6 months. 100 ml of waste liquid in a 5 liter bottle can be a very wasteful situation as some waste contractors simply place the bottle in a drum rather than transfer/consolidate the material. Always leave room in the full container to allow for expansion. In the case of extremely hazardous chemicals however, a small volume, including an un-rinsed "empty" container, can be an acceptable waste item.

   e. Container spill control: Hazardous waste containers shall be stored in secondary containment. Fume hoods themselves do not function as secondary containment units. Secondary containment units are often available at no cost through the CNSM Science Safety Office.

2. **Required Labeling for Hazardous Waste Containers:** State and Federal EPA regulations are very strict as to the labeling of hazardous waste. **Never write the word "WASTE" on any container.** For this reason, self-adhesive EPA-compliant Hazardous Waste Labels are widely distributed to CNSM personnel. The use of this waste label IS REQUIRED BY LAW. A supply of these yellow labels is provided in packets on or near most fume hoods and they are also available from the CNSM Safety Office, Department offices and issue rooms.

   The generator information on the label must be legibly completed *by lab/workplace personnel* at the time the label is affixed (see detailed instructions below as points a through e). **If using an empty chemical bottle for waste, remove or deface all conflicting information on the old**

container label. The person who sets up the waste collection container must write in information by hand, check boxes and circle categories to complete the label.

When waste containers are too small for the CNSM Hazardous Waste label, put the completed label on a 4 mil re-closable bag, add containers to bag and zip closed. Bags are available from CNSM Safety. Contact the department issue room or the CNSM Safety Office for more information regarding the data required on the label or any other waste related question.

3. **Instructions for Completing the Hazardous Waste Label:** Please have a label in your hand as your read this information.

    a. **Start date:** The date waste was first placed in the container or date the material was designated as waste must be indicated. Mark the date directly on the label. **IN NO CASE MAY GENERATION POINT WASTE BE ACCUMULATED FOR MORE THAN NINE MONTHS -- EVEN IF THE CONTAINER IS NOT YET FULL.** Request a pickup from your department issue room or the Science Safety Office when the waste is six months old. This will prevent the risk of costly fines by regulatory agencies.

    b. **Name/identity of the waste material:** The box marked "*This container is to be used for the collection of:*" requires a general name for the waste. This name must, where possible, be a recognized chemical or product name (such as "toluene" or "pump oil"). **When the waste consists of a mixture of materials** (such as "halogenated solvents", "animal preservative", or "HPLC waste") **each component of the mix must be listed** and the approximate percent of the total mixture volume indicated. If the mixture contains more than 10 components, write the other components on an attached sheet. For example:

        - This container is to be used for the collection of: "Mixed solvents". Components: "acetone 60%", "isopropanol 5%", "chloroform 5%", "water 30%".

    Below the "This container" box, **circle the properties that apply to the waste**. In the case of this example, circle "Solvents (non-halogenated)" and "Solvents (Halogenated)".

    c. **Physical state:** Check the box to indicate Solid, Liquid or Gas. This MUST be done -- even if the waste is in a clear bottle and the physical state is obvious.

    d. **Hazards(s):** Check box(es) to indicate Flammable, Oxidizer, Corrosive, Poison, etc. as appropriate. Hazard information may be taken from the original product label, or ask your issue room or Safety Office (hazards assigned per DOT: 49CFR Sect. 172.101). For the example above in part b, Flammable, Poison and perhaps Carcinogen would be appropriate.

    e. **Contents:** As discussed under point "b" above, use these 10 spaces to **list** the *Components and Amount in %* of the waste.

    f. **Faculty or staff name:** The name of the faculty, staff or administrator **responsible** for the contents and oversight of the waste container must be indicated on the label. Please note that official responsibility for effective, ongoing **oversight of a waste generating operation cannot be delegated to a student**. The person listed is responsible for ensuring compliance and conveying these hazardous waste guidelines to everyone who generates waste. Having a person's name on the label also facilitates timely return of re-usable waste containers.

g. **DEPT (Department):** Write in the department responsible. It may be an academic department, College, trades group (like Paint Shop, Auto Shop, Grounds), Animal Facility, etc. The department that acquired the original material is typically the group responsible for the waste created by its use.

h. **Room #:** List the room/location where the waste was created. Only waste generated on the CSULB campus may be managed by the CSULB program. Transport of waste to the campus from elsewhere is prohibited.

i. A**cc. Fac. S.D.:** Generators do not use this box. Campus Safety personnel indicate here when a full container has been moved to an approved on-campus storage area.

4. **Generation Site Waste Management Practices:** The faculty and/or staff considered responsible for a given waste-generating process should regularly examine the container(s) and monitor compliance.

   The responsible person must:

   - Ensure that all persons adding waste are **trained** in waste compatibility and policies.
   - Ensure that all material added to the container is **chemically compatible**.
   - Ensure that hazardous waste is collected -- **not dumped** in a sink or trash can.
   - Ensure that the **container is sound** and compatible with the waste.
   - Ensure that the container is **KEPT CLOSED** except when adding waste.
   - Ensure that the container is **kept in a containment tub**, tray or other type of secondary containment.
   - Ensure that the container, **label and any log sheet lists contents and amount**.
   - Ensure that any **spills** are dealt with promptly.
   - Ensure that the department issue room or **CNSM Science Safety Office (x55623) is notified** when (1) The **container is full**, or (2) The six-month anniversary date (from first use) is approached, *whichever comes first.*

Spill Response

General Chemical Spill

- If it is an inhalation hazard, extremely hazardous, or you don't know what it is, warn people and vacate the premises. Tell everyone who may be in danger that there is a spill, and to leave the danger zone. Shut the door. Contact University Police via callbox/911 or pull the building fire alarm if area evacuation is necessary.
- Call CNSM Science Safety Office 562.985.5623 (MIC-207) or University Police 911 to report the spill. Request assistance as needed.
- Identify the spilled chemical if safe to do so. If you don't know its hazards (flammable, corrosive, poison etc.), FIND OUT NOW. Ask someone who works with the chemical or Issue Room/Safety people and/or read the Safety Data Sheet (SDS) BEFORE proceeding. Even a few grams or

milliliters of some materials pose an inhalation hazard and must only be cleaned up by professionals wearing self-contained breathing gear and HAZMAT suits.

- Spill cleanup: If it is safe to remain in the room, you're sure an overexposure is not possible, the spill is smaller than 1 liter/500gm and you are capable of safely cleaning it up yourself, proceed as follows (stop if you feel affected by exposure):
    1) If spilled material is flammable, extinguish all sources of heat and keep sparks away.
    2) Keep people away from the spill.
    3) Put on fully enclosed chemical splash goggles.
    4) Put on two pair of gloves; check glove chart to be sure of protection from the chemical!
    5) Stop the flow of the spill and soak it up. Use "kitty litter" or absorbent "pillows". Do not use paper towels unless spill is very small and not an oxidizer.
    6) Carefully put soaked material into a compatible bag/container that can be well sealed.
    7) Put the closed container in a hood. Label it with a yellow "Hazardous Waste Label".
    8) Decontaminate surfaces/tools promptly. Use an appropriate cleaning agent. Contaminated cleanup materials go in the waste container too.
- Gloves, glove chart, absorbent, spill clean-up procedure, goggles, bags, labels etc. are in the Safety Cabinets: 300 level of MLSC, 100 level of MIC, and in the HSCI-385 Emergency Response Room. Any key for the respective building will open these.
- Complete an INCIDENT REPORT form (from the web, Department Office, or Safety Cabinet). Alternately call/visit CNSM Science Safety Office and relay what happened.

Acid Spills

Call CNSM Science Safety Office for acid spill kit.

Instructions for spill cleanup of small < 50 ml releases in chemical fume hood:

- Warn others and isolate the spill by closing the hood sash.
- Make sure you are wearing acid-resistant gloves, chemical splash goggles lab coat, Tyvek suit/sleeves or other appropriate protective clothing.
- Proceed with cleanup by placing an absorbent pad on the spill to contain the liquid. Remove acid pad and place into plastic ziplock bag.
- Sprinkle acid neutralizer around perimeter of spill, then cover spill completely with neutralizer. Heat will be generated as neutralization occurs. The absorbent pad should have soaked up much of the liquid, so you are neutralizing the residue such that the hood may be safely used again.
- Stir with plastic scraper to increase neutralization effect.
- Wait at least 20 minutes for mixture to cool.
- After 20 minutes, scoop up neutralizer/acid mix and place in plastic ziplock bag for disposal. Use acid pads for further cleaning as necessary. Fill out yellow waste label and place on plastic bag.

- Call CNSM Science Safety Office for waste pickup.
- Confirm surface pH is neutral using test strip and small amount of water.

Contact CNSM Science Safety Office to report larger spills, spills outside the chemical fume hood or if you are incapable of performing or have not received training in this procedure.

CNSM Science Safety Office: 562.985.5623

CNSM Science Safety Officers are Chris Frost 562.577.0504 and Jessica Lyon.

If CNSM Science Safety Officers cannot be reached, contact Campus EH&S at 562.985.2283 or contact University Police at 562.985.4101 (non-emergency), or 911 for emergencies.

Reproductive Health Policy

Male or female, you should never work with a chemical or radioactive material without knowing how it may affect the reproductive system, and the length of time the material could remain in your body if ingested, inhaled or absorbed. The use of some agents should be stopped well in advance of conception. The following Regulatory Guide published by the U.S. Nuclear Regulatory Commission should be consulted by pregnant women, those who plan to become pregnant and other personnel, to help them make decisions regarding radiation exposure during pregnancy. U.S. NRC Regulatory Guide 8.13. Rev. 3. June, 1999.

Pregnant women and those who plan to become pregnant are strongly encouraged to consult their physician regarding the evaluation of workplace hazards as they relate to reproductive health and fertility. The physician should be provided with specific information regarding type of work, chemicals and radiologic agents used, SOPs and be provided Safety Data Sheets for all chemicals and radioisotopes use.

If working with radioactive and/or other hazardous materials, you may find the following documents helpful, all available from CNSM Safety and on the web:

- U.S. NRC Regulatory Guide 8.29 – Instruction Concerning Risks from Occupational Radiation Exposure. Rev. 1. February, 1996
- U.S. NRC Regulatory Guide 8.36 - Radiation Dose to the Embryo/Fetus. July, 1992
- "NIOSH Pocket Guide to Chemical Hazards", from the U.S. Department of Health and Human Services
- Campus Safety Data Sheet online source MSDSonline.

Please feel free to contact your supervisor, CNSM Science Safety Office or Campus Environmental Health and Safety with any further requests for information required by you or your physician regarding reproductive hazards in the workplace.

Conditions Requiring Individual Monitoring of External and Internal Occupational Dose

Licensees are required to monitor the occupational dose to a declared pregnant woman, using an individual monitoring device, if it is likely that the declared pregnant woman will receive, from external sources, a deep dose equivalent in excess of 0.1 rem (1 mSv). It is the policy of CSULB that all declared pregnant women working in areas where ionizing radiation is or may be present shall be issued an individual monitoring device for both the prospective mother and fetus.

CSULB will employ, where possible, administrative controls (e.g., reassignment of affected personnel to non-ionizing radiation work, minimizing hours exposed, etc.) to reduce or eliminate employee exposure prior to or in conjunction with monitoring.

In compliance with 10 CFR part 20, section 20.1208, "Dose equivalent to an embryo/fetus", the licensee shall ensure that the dose equivalent to the embryo/fetus during the entire pregnancy, due to the occupational exposure of a declared pregnant woman, does not exceed 0.5 rem (5 mSv).

While exposure to ionizing radiation by a radioisotope worker at CSULB is expected to be minimal, significant chemical exposures ARE possible. All are asked to be especially vigilant about chemical exposure from all routes of exposure when considering matters of family planning.

Responsibility of Authorized Radioisotope User

It is the responsibility of each Authorized Radioisotope User to:

a) Ensure all personnel alone in a laboratory where ionizing radiation is present complete Introductory Safety Training and either Awareness-Level radiation Safety Training or full Radiation Worker Training. Radiation worker training includes discussion of this reproductive health document.

b) Ensure that laboratory personnel sign the appropriate training documentation forms in your white Radiation Safety Notebook to further document laboratory personnel training.

c) Encourage early disclosure of pregnancy (intent or fact) to the Radiation Safety Office. Assure the student/employee that this disclosure will remain confidential.

d) Notify the Radiation Safety Office immediately upon receiving information regarding a student/employee's declared intent, or confirmation of pregnancy. Pregnancy must be declared in writing for the fetal dosimetry program to be implemented.

e) Advise students/employees of their personal responsibilities with regard to limiting their exposure to radiation and toxic chemicals while pregnant (see below).

f) Review student/employee work assignments in order to reduce the potential of radiation and toxic chemical exposures and implement exposure reduction whenever possible.

Responsibility of Radiation Safety Office

It is the responsibility of the Radiation Safety Office (RSO) to:

a) Ensure that pregnant students/employees receive a monthly fetal dosimeter in addition to the quarterly whole body badge if she uses radioactive materials or works near radioactive materials. The student/employee must wear the fetal badge at waist level, beneath/behind any shielding employed.

b) Monitor the dose accumulated by the student/employee and the fetus. The dose to an embryo/fetus shall be determined according to 10 CFR part 20, section 20.12081, and the NRC Regulatory Guide 8.36, "Radiation Dose to the Embryo/Fetus", July 1992.

c) Work with the student/employee and the Authorized Radioisotope User to endeavor to reduce radiation exposure to background readings if any monthly dose exceeds 25 mrem (0.25 mSv). If the accumulated dose approaches a total of 500 mrem (5 mSv), or exceeds 300 mrem (3 mSv) within six months, transfer or leave from the area of exposure is mandatory.

Responsibility of Female Employees

It is the responsibility of each female employee to consider informing the Authorized Radioisotope User, Department Chair and/or the Radiation Safety Office of your intent, suspicion or confirmation of pregnancy. Radiation Safety personnel will determine whether radiation levels in your working areas are such that you might receive 0.5 rem (5 mSv) or more over the gestational period. You must decide whether the exposure you are receiving is sufficiently low to protect the fetus; you are welcome to review the literature the Radiation Safety Office has available on this topic. If you decide to continue working in these areas, you must work with your supervisor and RSO personnel to reduce your exposure by employing the use of shielding, increasing your distance from the radiation source and decreasing the amount of time you spend in the radiation field.

Please consider the following. The National Council on Radiation Protection (NCRP) recommends a total dose equivalent limit of 0.5 rem (5 mSv) for the fetus. Once a pregnancy becomes known, exposure of the embryo/fetus shall be not greater than 50 mR (0.5 mSv) in any month. The total dose equivalent limit for the whole period of pregnancy is important for the limitation of the risk of cancer induction and of developmental anomalies, while the monthly limit is important to ensure that exposures of the embryo-fetus during particularly critical periods of organogenesis and development are adequately restricted. The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) indicates that for doses smaller than 2 rem (0.02Sv) over the gestation period, the risk for defects is relatively small in relation to the natural incidence or probability, which is assumed to be of the order of 6 x 10-2 for anomalies of all kinds that may seriously affect health and viability of newborn children (National Council on Radiation Protection and Measurements. NCRP Report No. 91, "Recommendations on Limits for Exposure to Ionizing Radiation". June 1, 1987).

Laboratory Security Regulations

SCOPE: This policy is mandatory for all CNSM personnel.

- Research Labs shall be locked outside of normal work hours (7:00am to 5:00pm, Monday through Friday) and when unoccupied. Laboratory supervisors will determine the policy of locking doors during normal working hours.
- Entry to all research (non-teaching) labs in the CNSM is restricted to trained, authorized key holders and other individuals authorized by the faculty in charge. The exception being that escorted guests are allowed into these labs by the laboratory supervisor, appropriate administrator, or staff member in charge.
- Supervising faculty/staff shall use the standard form, page two of this policy, to create a list of authorized individuals or labs. This list, posted on the interior of the laboratory entry door(s), shall be updated as safety-trained personnel join or leave the lab.
- Students (graduate and undergraduate) may work alone in the laboratory outside of normal work hours if permission is granted by the laboratory supervisor and that permission is indicated on the posted Approved Personnel list. Hazardous work, as determined by the laboratory supervisor and CNSM Science Safety Office, may not be carried out after hours unless approved in writing by the laboratory supervisor and CNSM Science Safety Office.
- Key holders are responsible for the security of their keys. Keys shall remain on their person or otherwise secure when working in lab. Keys are not to be left on tables, desks, benches, or other areas in plain sight.

- Loaning of State keys is strictly regulated by California Penal Code 469.
- Keys to common-use areas shall be stored out of sight in secure locations within labs.
- Room access by custodians, FM workers, police, and other first responders is governed by the CNSM Access Policy, which is on the CNSM Science Safety Office website.
- If an unauthorized individual gains access to your lab, inform them of the security policy and politely ask them to leave the lab. If needed, call Campus Police 911. Do not place yourself in danger by aggressively confronting unauthorized people. Let the police handle it.

Laboratory Security Form

College of Natural Sciences and Mathematics

Building and Room #: _____

Laboratory Supervisor: _____

Room Security/Lock Policy (status of door during normal work hours when occupied): ☐ Locked ☐ Unlocked

List of Authorized Personnel:

Name	**Role/Status** (faculty, undergraduate or graduate student, volunteer, staff member)	**After Hours Authorized?** (yes or no)

Students from the Following Faculty Lab(s) are Authorized for Equipment Use: (Name of Faculty Member or Director)

Sharps and Needle Handling Policy

Abbreviated version for those who use no biohazards.

The purpose of this policy is to protect students, employees and the general public from injury and/or exposure to chemicals via needle stick. You must consistently follow the safe work practices listed below to reduce the likelihood of chemical exposure and/or injury from needles.

1. **Used disposable needles/sharps shall be discarded immediately after use WITHOUT RECAPPING** into an approved **SHARPS CONTAINER**. These containers are available free from the CNSM safety office. **Your sharps container** may also be used for the disposal of razor blades, glass fragments, syringes, pins, unused needles etc. Never put syringes containing significant amounts of hazardous chemicals in the sharps container; expel the liquid into the appropriate Hazardous Waste container prior to disposal into a sharps container.

2. Disposable needles contaminated with trace amounts of hazardous chemicals should never be removed from their original syringes. Throw the ENTIRE needle/syringe assembly (needle attached to the syringe) into a dedicated plastic sharps container. Multi-use uncapped needle/syringes must be stored and/or transported in a safe manner e.g. placed in a pan, needle inserted into test tube etc. Uncapped or uncovered needles should never be left unattended.

3. **IF A SYRINGE/NEEDLE WILL BE RE-USED AND FOR SOME REASON ABSOLUTELY MUST BE RECAPPED**, (please consult with CNSM Safety about this) the recapping task must be done using mechanical means or a one-handed recapping process. Training demonstration must be provided to employees before needles and other sharps are used in the laboratory.

4. **NEEDLES MUST NEVER BE BENT OR BROKEN prior to disposal in the sharps containers.** These processes present a sharps injury hazard and can cause any hazardous material on/in the needle to splash and/or become airborne. Needle cutters, once common devices, are now prohibited.

5. The sharps containers shall be maintained upright throughout use and not be allowed to overfill. **Never rearrange, compress or "push down" on the contents of any sharps container with your hands. Contact the CNSM Science Safety Office at x55623, MIC 207, when the sharps containers are 2/3 full.** They will arrange for proper and timely disposal, and will provide a replacement container.

6. **In the event a sharps injury occurs, CNSM Science Safety Office must be informed immediately** of the event and of any contaminant possibly present in the needle (chemical or biohazard). Treat the injured party as you would for any other incident: if the person was injured while working as a student, send her/him to the Student Health Center and immediately fill out a departmental Incident Form. If the person was an employee and was injured while working "on the job, follow standard Workers Compensation injury procedures. A sharps injury report will be required to be completed as well.

Chemical Fume Hood Use

Chemical fume hoods constitute an important safety resource for CNSM personnel. See Figure 1 for a standard fume hood diagram. Hoods are used instead of strap-on respirators to protect personnel from airborne chemical hazards. When used PROPERLY hoods provide protection from hazardous vapors, gases, fumes, mists and dusts that may arise from the materials being handled. General guidelines for the use of a chemical fume hood are listed below. ***All ten considerations below MUST be understood and followed*** when using a hood to protect you from harmful concentrations of hazardous chemical (levels above the Cal/OSHA Threshold Limit Value).

1. The unit must have passed a **performance inspection** by CNSM Science Safety Office within the past year. A sticker near the sash will indicate the most recent inspection date. Hoods that do not pass inspection are posted with a **warning sign**. These hoods MAY be used for "open bench" type operations that only generate nuisance levels of airborne contaminants. Do not use such a hood for protection as you WILL LIKELY BE EXPOSED to the material being handled.

2. A continuously-operating **airflow indicator** must be present, operational and demonstrate proper airflow.

    - MICRO and PH2 hoods are equipped with simple Vaneometers (Figure 2) which show velocity in linear feet per minute (LFM). Verify airflow is in excess of 100 LFM prior to each use.

    - MLSC hoods have grey *Phoenix Controls* airflow indicators (Figure 3). When the green light next to “Standard Operation” is lit the hood is working properly.

    - HSCI hoods have ivory *Phoenix Controls* airflow indicators (Figure 4). When the green light next to “Standard Operation” is lit, the hood is working properly.

    NOTE: MLSC and HSCI hoods are equipped with motion sensors that automatically reduce the airflow rate when the hood is not in use. Such changes in airflow are normal and a green light will appear on the control panel next to “Standby Operation.”

3. Use the hood with the sash no higher than the mechanical stop or point indicated by the **"arrow" stickers**. Temporarily raising the sash above the arrow/stop position (to facilitate equipment or container movement) may not be done for more than a few minutes or when hazardous chemicals are in use. Keep the hood sash closed when not using the hood.

4. To ensure proper performance, minimize the amount of material inside the fume hood. An item as large as a basketball can cause an airflow “dead zone” preventing the hood from meeting proper airflow standards and allowing hazardous emissions out into the lab. All items in the hood should be no closer than 6 inches from the front airfoil. Also, maintaining 1 inch of space between items and under large objects helps ensure adequate airflow. If you place a large item inside the hood, call CNSM Safety for an airflow survey to ensure the airflow is still adequate.

5. **Do not manipulate hazardous chemicals in a malfunctioning hood** as you will be exposed to the material being handled. In the event of a hood failure or ventilation malfunction, STOP WORK IMMEDIATELY, close the hood sash and inform others in the room. Report any hood problems promptly to your supervisor, CNSM Science Safety Office (ext. 55632) or the campus HELP line (ext. 54357).

    a. MICRO and PH2 hoods DO NOT have lights or audible alarms. Frequently check the velocity on the Vaneometer and listen for any changes in airflow velocity.

b. MLSC hoods have audible alarms that will sound and a red light will appear on the control panel next to “Caution – Flow Alarm”.

c. HSCI hoods have audible alarms that will sound and a red light will appear on the control panel next to “Flow Alarm”.

6. The "Emergency Exhaust” button on MLSC and HSCI airflow indicators is used to clear the hood or room in the event of a spill, smoke etc. (NOT for an actual fire as it will "fan the flames"). Push the mute button to silence the resultant alarm if desired. MLSC hoods have a three position knob on the right side of the hood that should be kept in the middle position for normal laboratory use. The upper position is for exceptionally HOT operations or when significant amounts of hydrogen gas are produced. The lower position is best for pulling away very dense, heavy vapors/gases.

7. In the event of fire, close the sash (if safe to do so) and exit room. Do not push the Emergency Exhaust button! Use the hallway fire alarm as appropriate.

8. **Do not use the hood to intentionally dispose of (evaporate) hazardous chemicals.** Containers of volatile materials in the hood must be kept closed when not in use.

9. Hood use for a **Cal/OSHA-regulated carcinogen** requires more stringent standards. These carcinogens are listed on pages 30-31 of the C*NSM Safety Program Manual*.

10. Hoods should be **cleaned periodically**. Annual cleaning is recommended.

Additional Considerations

- Section 36 of our Safety Program Manual provides more detailed hood use guidelines.
- Hazardous waste containers in hoods must be inside a secondary container tray, tub or bucket.
- Laboratory Coordinators for CNSM instructional labs: Please make sure all your laboratory instructors have been trained on these guidelines.
- After addition of large items, the airflow must be re-surveyed. Also, contact CNSM Science Safety Office for a check anytime the indicator suggests diminished performance.
- Users may NEVER put their head into the hood.

Examples

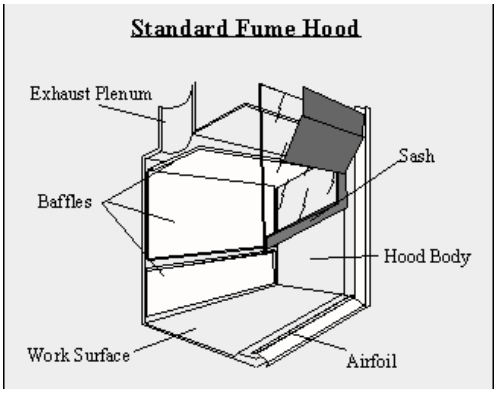


Figure 1. Basic features of a chemical fume hood.

Figure 2. MICRO hood Vaneometer. Note airflow reading above 100 LFM (arrow).

Figure 3. MLSC hood *Phoenix Controls* unit indicating proper operation. Note green light lit.

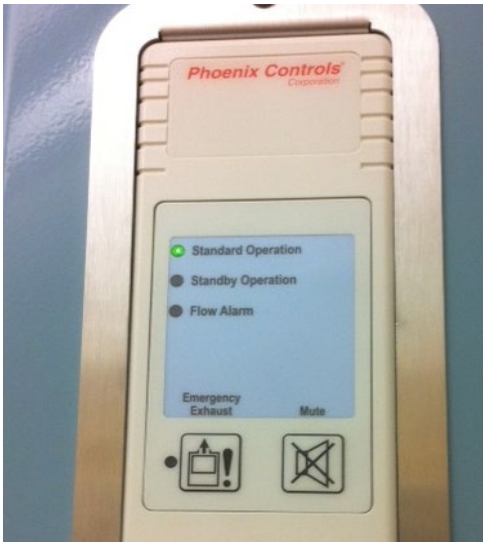


Figure 4. HSCI hood *Phoenix Controls* unit indicating proper operation. Note green light lit.

Protocols for Setting up Storage of Electronic Safety Data Sheets (SDSs)

Using the MSDSonline System

1. To use the MSDSonline system, all laboratory SDSs sheets must be present within the CNSM location. Once entered in the system, your SDSs will be automatically updated. After clicking on the MSDSonline link, click the Log In link at the top left hand side of the page.
2. Type "peer.gerber@csulb.edu" in the Username box.
3. Type "CSULBEHS" in the Password box.
4. On the "eBinder" tab, select CNSM under California State University Long Beach. Click on search.
5. Type the name of the manufacturer and the name of the product in the MSDSonline search box. If your specific product is found, move onto your next item and repeat the steps above. If your product is not found, search for it in the MSDSonline database. This can be done by clicking on the MSDSonline Search tab and entering the product information as above. (*See note below)
6. Select your product by checking the box to the left of the product name. Then click the "Assign to Locations" link shown below the arrow in the box appearing at the right side of the screen.
7. Select the location where the product is or will be stored in the CNSM directory. Any product placed in any listed department will also automatically be added to the college's overall inventory. If a particular branch is not shown, select the CNSM location. This transfer requires administrative approval and may take 1-2 days to process.
8. Click "Save".
9. Click on "Log Out" when finished.
10. Follow the separate instructions below for creating a link from your computer desktop to the CNSM location. Creating a link to the general MSDSonline database for finding SDSs is not specific enough to the workplace to be acceptable.

Creating a PC/Mac Desktop Link to the CNSM Location

1. No login necessary- After clicking on the MSDS Online link found at the Campus Environmental Health and Safety website, click the Locations box along the left side of the page.
2. Scroll down to California State University Long Beach and click on the CNSM branch.
3. Highlight the web address bar and drag it to the PC desktop. The computer(s) used must not have any barriers that would prevent immediate access.

Note: If the SDS for your product is not found in the database, click on Upload a Local Safety Data Sheet under "Alternative Options" and follow the instructions for uploading a .PDF to the eBinder. Once the uploaded SDS has been approved, move it from the eBinder to the CNSM Location. Be aware the University is limited in the number of uploads allowed each year. Prior to making an upload, confirm with certainty that your SDS is not available through the MSDSonline search. Contact CNSM Science Safety Office for assistance if necessary.

CSULB is transitioning to the use of RSS for the storage and accessing of SDSs. CNSM Science Safety Office will update CNSM personnel when additional information is received from campus EH&S.

CNSM Safety Forms

A. Laboratory Inspection Form

B. Incident Report Form

C. Project Authorization Form

D. Student Safety Verification Form

These forms to follow.

Laboratory Inspection Form

College of Natural Sciences and Mathematics

Location(s): _____ Department: _____

Responsible Party: _____ Inspection Date: _____

1. Safety Documentation

Laboratory Safety Notebook available and up to date	YES___	NA___	NO___	_____
Standard operating procedures documented	YES___	NA___	NO___	_____
Training of personnel is documented	YES___	NA___	NO___	_____
Authorized personnel list posted	YES___	NA___	NO___	_____
Current project authorization is on file	YES___	NA___	NO___	_____
Safety Data Sheets (SDSs) readily accessible	YES___	NA___	NO___	_____

2. Electrical Safety

All electrical cords are proper and in good condition	YES___	NA___	NO___	_____
Electrical equipment and panels in compliance	YES___	NA___	NO___	_____

3. Earthquake Safety

Cabinets/shelves (>6 ft.) are secured to walls	YES___	NA___	NO___	_____
Shelves have protection so items will not fall off	YES___	NA___	NO___	_____

4. Housekeeping

Room is tidy, passageways are not blocked	YES___	NA___	NO___	_____
Chemical containers are closed and no spills/leaks	YES___	NA___	NO___	_____

5. Labeling

Room is properly labeled with correct "NFPA Diamond''	YES___	NA___	NO___	_____
Refrigerators/storage units are properly labeled	YES___	NA___	NO___	_____
Materials/containers are properly labeled	YES___	NA___	NO___	_____

6. Fire Extinguishers

Extinguishers have seal, inspection tag and mounted	YES___	NA___	NO___	_____
Extinguishers have been inspected within past month	YES___	NA___	NO___	_____

7. Safety Equipment

Safety Shower/Eyewash stations are inspected/signed off	YES___	NA___	NO___	_____
Safety Shower/Eyewash stations are not blocked	YES___	NA___	NO___	_____
Laboratory personnel are wearing coats, goggles as req'd	YES___	NA___	NO___	_____

8. Food Storage

No food is present in unauthorized areas	YES___	NA___	NO___	_____

9. Gas Cylinders

Gas cylinders/cryogenics are stored and used properly YES___ NA___ NO___ _____

10. Chemical Compatibility

Incompatible chemicals are stored separately YES___ NA___ NO___ _____

11. Chemical Storage

Hazardous chemicals are stored as required YES___ NA___ NO___ _____
Chemical Inventory is on file YES___ NA___ NO___ _____

12. Hazardous Waste

Waste is properly labeled and stored as required YES___ NA___ NO___ _____
Waste container is closed when not in use YES___ NA___ NO___ _____

13. Miscellaneous (Other)

All other aspects of the area appear safe YES___ NA___ NO___ _____

Additional Information

_____

_____

_____

_____

All statements with a "NO" response are briefly described. The inspection team should mark problem items in some way.

Inspection Person/Group: _____

Signature: _____

Date Inspected Party Notified: _____

Incident Report Form

College of Natural Sciences and Mathematics

Date of Incident: _____ **Time:** _____ **Location:** _____

Incident Description: _____

_____

_____

_____

Name(s) Of Impacted Personnel: _____

"(E)" For Employee or "(S)" for student must follow name(s)

Name(s) Of Relevant Witnesses: _____

Individual(s) In Charge of Area/Operation: _____

Responsible Department: _____ **Date Form Initiated:** _____

Incident Form Initiated By: _____

INVESTIGATION

This section to be completed only by administrative and/or CNSM Science Safety Office personnel only.

Investigated By: _____ **Investigation Date(s):** _____

Apparent Cause of Incident: _____

_____

Appropriate PPE/Engineering Controls Employed? ☐ YES ☐ NO

List: _____

Corrective Measures Taken: _____

_____

_____

Sent To Appropriate Administrator:

Name: _____ Date: _____

OFFICE USE ONLY

Incident Number: _____-_____

year number

Received by CNSM Science Safety Office:

(date) _____

Project Review and Authorization Form

College of Natural Sciences and Mathematics

This review/approval process is designed to ensure that CNSM faculty and staff projects/activities are as safe and environmentally responsible as possible. It will also help ensure that such activities are conducted in compliance with local, State and Federal regulations. CSULB and College of Natural Sciences and Mathematics (CNSM) maintain professionally-staffed Safety Offices that will work with you to achieve these goals. Please take the time to complete one of these forms for each type of project you oversee. College personnel will review the project materials and methods, respond as appropriate, then document College approval. This review/approval process will save you time and money in the long run. It should also reduce your personal liability should a problem arise. Faculty are responsible for ensuring that all aspects of their own projects and those of their student(s)/guest researcher(s)/personnel comply with the CNSM Safety Manual and all CNSM policies and procedures.

Form Instructions

1. **Applicant:** Put your name.
2. **Project Title:** Briefly describe the project/research you supervise. Multiple projects that use the same locations, materials and methods can be combined. Significantly different projects require separate Project Review and Authorization Forms.
3. **Locations:** Be as specific as possible. Include other institutions and field sites associated with the project.
4. **Alternate Contact:** Give the name of a person who is able to provide project information when you are not available. This can be a colleague at another institution.
5. **Potential Hazards and Safety Measures Employed:**

    a) **Project Hazards:**

    - **Chemicals:** List the types of the hazardous chemicals used in the project, including significant amounts of hazardous consumer products (gasoline, coatings, adhesives, resins). You may list chemicals by general type/class, but please list key “Extremely Hazardous” chemical used (see CNSM Science Safety Office website for list). Also declare use of all Cal/OSHA Regulated Carcinogens (see the CNSM Safety Program Manual or website for this list).
    - **Physical Hazards:** List hazardous equipment/operations associated with the project: Motor vehicle travel, rock climbing, mine or cave entry, open flames, U.V. light, hazardous lasers, high voltages, microwaves, radiation, plasmas, cryogenics, high pressures, dangerous animals, tools, centrifuges, autoclaves etc.
    - **Biological Hazards:** List any pathogenic organisms involved in the project. State if you intend to work with human tissues, blood or blood components and circle that “bullet” in section 6.

    b) **Training Plan:** CNSM Safety provides standard introductory safety training. Describe methods you will use to provide documented safety training related to the materials and methods employed in this project.

    c) **Safety Procedures, Equipment, etc.:** Briefly describe safety procedures and equipment that will be employed to protect personnel from the hazards listed in part 5(a). If necessary, refer to the CNSM Safety website Program Manual’s, "Green Sheet" Safety Memos (or go to “Safety Memos” on the CNSM Science Safety Office website) for guidance in these areas. Required use of fume hoods, protective clothing, spill prevention/control equipment, fire extinguishers, radiation shielding, flame cabinets, etc. are examples of protective equipment. A mandatory buddy system policy and requiring drivers to obtain a CSULB Defensive Driver's Certificate are examples of safety procedures.

6. **Specifically Regulated Activities:** Circle the applicable activities that relate to the project. Feel free to write-in a regulated activity not furnished with the standard choices, such as use of human subjects.

7. **KALEIDOSCOPE or Other "Outreach" Activities:** Demonstrations during such events will put you in contact with the public and often minors. An extra level of safety must be introduced into such activities. Specific approval for each such project is required – and other forms/approvals must be obtained in advance. Contact CNSM Safety for details. Circle the Bullet in sect. 6.

8. **Hazardous Waste:** Please indicate if this project will generate hazardous waste, e.g., chemicals, oil, batteries, sharps, etc.

9. **Review and Approval:** Your signature certifies that you have made a good-faith effort to disclose Project hazards and you are committed to addressing them in conformance with State, Federal, University and College safety/environmental laws, policies, and regulations. The Department Chair signature indicates that the Project has been reviewed and approved at the department level. The Safety Office signature documents that the project, as described, incorporates adequate safety controls, environmental measures and regulatory compliance, and the indicated facilities are suitable for the materials and methods indicated. Special guidelines may be set by the Chair or CNSM Safety and indicated in this section of the form. Review of Project Authorizations shall occur as needed or every 3 years.

CNSM Project Safety Review and Authorization

1. Applicant: _____

Department: _____ Telephone: _____

2. Project Title(s): _____

3. List buildings, rooms and outlying locations to be used: _____

4. Please indicate the name(s) of personnel involved in the project (faculty, staff, or student) who is/are familiar with the project(s) and is able to answer questions relating personnel, materials and procedures.

Alternate Contact: _____ Telephone: _____

Alternate Contact: _____ Telephone: _____

5. Potential hazards and safety measures employed:

(a) Describe chemical, physical and biological hazards associated with the project, including field work hazards:

_____

_____

_____

(b) Describe project-specific safety training:

_____

_____

(c) List safety procedures, equipment, etc. used to protect against hazards listed in item (5a) above:

_____

_____

_____

6. SPECIFICALLY REGULATED ACTIVITIES: Please mark all of the following activities associated with the project.

- ☐ RADIOACTIVE MATERIALS/RADIATION MACHINES
- ☐ CLASS 3b OR CLASS 4 LASER
- ☐ RECOMBINANT DNA
- ☐ HUMAN BLOOD/TISSUE/CELL CULTURES
- ☐ DRUGS (barbital, ketamine, etc.)
- ☐ TRANSPORT OF HAZARDOUS MATERIAL (by motor vehicle)
- ☐ REGULATED CARCINOGENS (arsenic, benzidine, formalin etc.)
- ☐ FOREIGN SOIL
- ☐ PYROPHORIC OR EXPLOSIVE MATERIALS
- ☐ FIELD TRIP/TRAVEL
- ☐ ANIMAL STUDIES

7. Do you plan science demonstrations or other "outreach" activity? ☐ YES ☐ NO

8. Will this project generate Hazardous Waste? ☐ YES ☐ NO

9. Applicant Certification: *I certify that applicable CSULB-linked projects under my supervision have been accurately described on this CNSM Project Authorization Form(s) to the best of my ability. I pledge to employ and/or enforce the appropriate health, safety and environmental measures indicated, and to comply with all CNSM policies and procedures, and the CNSM Safety Program Manual.*

Applicant Signature: _____ **Date:** _____

College Health and Safety Review and Approval

Safety/Regulatory Requirements/Conditions:

_____

_____

_____

_____

Dept. Chair Signature of Approval: _____ **Date:** _____

Safety Office Signature of Approval: _____ **Date:** _____

Student Safety Instruction and Verification Form

College of Natural Sciences and Mathematics

Student Laboratory and/or Field Work

TO THE INSTRUCTOR: Please read the applicable information printed on the "Instructions for Student Safety Verification Form" to your class (document available in your Department Office/Issue Room and CNSM Safety Website). Check off each topic on this form as you discuss it with them. Write "N/A" for topics that do not apply. Return the completed sheet to your Dept. Office or Issue Room. It is your responsibility to describe the hazards associated with the course and the appropriate health and safety measures needed to minimize the risks posed by the hazards. This document was designed to facilitate this task. Throughout the semester, it is your responsibility to ensure that the appropriate health and safety measures are followed. Any questions regarding this safety training and documentation and enforcement should be directed to the Department Chair, or the CNSM Science Safety Office (x55623).

TO THE STUDENT: It is your responsibility to be knowledgeable in the safety related matters associated with this course and to abide by the safety policies and procedures presented by the instructor. Part of the evaluation of your performance in this laboratory will be based upon your strict attention to these safety policies. Failure to meet these requirements may result in expulsion.

Instructor Name:_____ **Course:**_____ **Section No.:** _____

Part I. GENERAL SAFETY MATTERS: This entire section is required information for everyone.

____ 1. Right to know/Hazard Communication – Labeling containers and rooms
____ 2. Safety Data Sheets (SDS)
____ 3. Goggle/Eye protection policy for liquids, lasers, UV light, flying particles
____ 4. No eating/drinking/food and no smoking policies
____ 5. Housekeeping/clean-up
____ 6. Conduct in the laboratory or field site, no personal electronic devices may be used unless for instructional or emergency use**
____ 7. Reporting of accidents, exposures, and injuries (Instructor must turn in an *Incident Report Form* too)
____ 8. Student medical costs (no coverage!)

Part II. SAFETY EQUIPMENT AND PROCEDURES: Points 5 and 6 apply to everyone.

____ 1. Safety shower
____ 2. Eyewash
____ 3. Fire extinguishers
____ 4. Proper Laboratory Attire (closed-toe shoes REQUIRED AT ALL TIMES in labs that use corrosive/toxic chemicals – NO sandals!)
____ 5. Emergency evacuation route (required information for everyone)
____ 6. Emergency phone procedures (required information for everyone)
____ 7. College safety supply cabinet—Note locations
____ 8. Chemical and/or biological hood

Part III. CHEMICAL AND EQUIPMENT HAZARDS: Point 10 applies to everyone. Point 15 may apply to many.

_____ 1. Chemical storage and incompatibilities
_____ 2. Proper disposal of chemical wastes
_____ 3. Use and handling of concentrated acid and bases
_____ 4. Use and handling of toxic chemicals & exposure routes
_____ 5. Use and handling of carcinogenic chemicals
_____ 6. Use and handling of radioactive materials
_____ 7. Use and handling of biohazards
_____ 8. Use of scientific glassware
_____ 9. Handling and reporting of chemical spills
_____ 10. Proper disposal of broken glassware/sharps (required information for everyone)
_____ 11. Use and handling of water reactive chemicals
_____ 12. Use and handling of oxidizing and reducing chemicals
_____ 13. Use and handling of reproductive toxins
_____ 14. Use and handling of compressed and/or liquefied gas
_____ 15. Equipment hazards e.g., centrifuges, Bunsen burners etc.
(list the equipment to be used on this line): _____

Part IV. FIELDWORK AND TRAVEL HAZARDS: Additional documentation required prior to departure. See NOTE to instructors below.

NOTE: All instructors/trip leaders who conduct field trips/projects MUST review the current CNSM Field Trip/Project Safety Manual. This Manual is available in Department Offices/ Issue Rooms and on the CNSM Safety website. Prior to the first field exercise, the instructor/trip leader shall present the applicable portions of the Manual to the students and require the students to sign a separate training sheet at that time. You must give the sign-up sheet to your Dept. Office.

_____ 1. Motor vehicle and driver requirements
_____ 2. Field Trip/Project Safety Manual (covers equipment, buddy system, emergencies, climate, terrain, wildlife etc. details.)

***The CSULB policy states: "**Disciplinary action:** The University, through appropriate administrators, may take the following disciplinary actions against employees or students who violate proper safety procedures willfully or through negligence. The severity of this action will be determined by circumstances of the violation:*

(a) Oral reprimand, (b) Written reprimand placed in his/her official folder, (c) Temporary suspension, (d) Demotion (CSULB employee), (e) Dismissal or expulsion

SIGNATURES ON NEXT PAGE

Instructor Certification

I certify that I presented the applicable safety and health information to the students of this class/laboratory as indicated above based upon the current CNSM Instructions for Student Safety Verification Form.

Print Instructor's Name: _____

Instructor Signature: _____ **Date:** _____

Student Certification

I hereby acknowledge that I have been instructed in and understand the applicable safety and health information, and safe use of materials, equipment and machinery as given by the instructor for this online course/laboratory as appropriate. I realize that inappropriate behavior and/or the misuse of equipment, materials etc. can lead to serious injury. I hereby agree to follow all instructions for student safety as given by my instructor now and in the future. I hereby agree to fully comply at all times with all CNSM and University policies and procedures associated with safety as pertains to this online course/lab. I hereby agree to work safely at all times, protecting both myself and those around me. I hereby agree to handle materials, equipment, machinery and other items identified by the instructor in accordance with the safety instructions provided at all times during this online course/lab. I further agree that I will not operate any equipment or machinery or use any materials or other items identified as applicable by the instructor without appropriate instruction. I'm aware of the risk associated with this online course/laboratory and agree to assume all related risks, both known and unknown, as a result of my participation. I agree to hold the University harmless from any and all claims, including damage to my personal property that may occur as a result of my participation in this online course/lab. If I am injured and require medical treatment, I agree to be financially responsible for any costs incurred as a result of such treatment. I am aware and understand that I should carry my own health insurance.

Print Name	Signature	Print Name	Signature

Additional Resources

- CNSM Safety Manual (PDF)
- CNSM Science Safety Office
- CSULB Injury and Illness Protection Program (IIPP) (PDF)
- CSULB Campus Hazard Communication Program (HAZCOM) (PDF)
- CSULB Emergency Operations Plan
- CSULB Environmental Health and Safety

Appendix

See following pages.

TABLE AC-1
PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number [a]	Skin[b]	Name[c]	PEL [d] ppm[e]	PEL [d] mg/M3[f]	PEL [d] Ceiling[g]	STEL [o] ppm[e]	STEL [o] mg/M3[f]
75070		Acetaldehyde	25	45	C		
64197		Acetic acid	10	25	40 ppm	15	37
108247		Acetic Anhydride	5	20	C		
67641		Acetone	500	1200	3000 ppm	750	1780
75868		Acetone cyanohydrin as CN	4.7	5	C		
75058	S	Acetonitrile	40	70		60	105
98862		Acetophenone	10	49			
53963	S	2-Acetylaminofluorene; N-fluoren-2-yl acetamide; see Section 5209					12
74862		Acetylene	(h)				
540590		Acetylene dichloride; see 1,2-Dichloroethylene					
79276		Acetylene tetrabromide:1,1,2,2-tetrabromoethane	1	14			
79345		Acetylene tetrachloride; see 1,1,2,2-Tetrachloroethane					
50782		Acetylsalicylic acid (Aspirin)		5			
107028	S	Acrolein	0.1	0.25	C		
79061	S	Acrylamide	--	0.03			
79107	S	Acrylic acid	2	5.9			
107131	S	Acrylonitrile; see Section 5213	2	4.5			
124049		Adipic acid	--	5			
111693	S	Adiponitrile	2	8.8			
309002	S	Aldrin; 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-endo-1,2-exo-5,8-dimethanonaphthalene	--	0.25			
107186	S	Allyl alcohol	0.5	1.25		4	10
107051		Allyl chloride	1	3		2	6
106923	S	Allyl glycidyl ether; AGE	0.2	0.93			
2179591		Allyl propyl disulfide	2	12		3	18
1344281		Alumina; see Particulates not otherwise regulated					
		Aluminum, alkyls (not otherwise classified)	--	2			
		Aluminum soluble salts	--	2			
		Aluminum metal and oxide	--				
		Total dust	--	10			
		Respirable fraction[n]	--	5[n]			
		Aluminum pyro powders	--	5			
		Aluminum welding fumes	--	5			
300925		Aluminum distearate	--	10			
7047849		Aluminum stearate	--	10			
637127		Aluminum tristearate	--	10			
1300738		Aminodimethylbenzene; see Xylidene					
92671	S	4-Aminodiphenyl; see Section 5209					
141435		2-Aminoethanol; see Ethanolamine					
91598		2-Aminonapthalene; see beta-Naphthylamine, Section 5209					
504290		2-Aminopyridine	0.5	2			
61825		Amitrole	--	0.2			
7664417		Ammonia	25	18		35	27
3825261	S	Ammonium perfluorooctanoate	--	00.1			

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12125029		Ammonium chloride fume	--	10		--	20
1002897		Ammonium stearate	--	10			
7773060		Ammonium sulfamate	--				
		Total dust	--	10			
		Respirable fraction[n]	--	5			
620111		3-Amyl acetate; See Pentyl acetate					
628637		n-Amyl acetate; See Pentyl acetate					
626380		sec-Amyl acetate (all isomers and mixtures); See Pentyl acetate					
625161		tert-Amyl acetate; See Pentyl acetate					
62533	S	Aniline	2	7.6			
29191524	S	Anisidine (ortho and para isomers)	0.1	0.5			
		Antimony and compounds, as Sb	--	0.5			
86884		ANTU; 1-(1-naphthyl)-2-thiourea; Bantu; Rattrack	--	0.3			
7440371		Argon	(h)				
7440382		Arsenic and inorganic arsenic compounds; see also Section 5214		0.01			
		Arsenic, organic compounds, as As	--	0.2			
7784421		Arsine; AsH_3	0.05	0.2			
1332-21-4		Asbestos (including actinolite, amosite anthophyllite, chrysotile, crocidolite, and tremolite); see Section 5208					
8052424		Asphalt (petroleum) fumes	--	5			
1912249		Atrazine	--	5			
86500	S	Azinphos methyl; o,o-dimethyl S-(4-oxo-1,2,3-benzotriazin-3(4H)-ylmethyl) phosphorodithioate	--	0.2			
3333526	S	2,2'-Azobisisobutyronitrile decomposition product, see Tetramethyl succinonitrile					
7440393		Barium, soluble compounds, as Ba	--	0.5			
7727437		Barium sulfate; see Particulates not otherwise regulated					
17804352		Benomyl					
		Total dust	--	10			
		Respirable fraction[n]	--	5			
71432	S	Benzene; see also Section 5218	1			5	--
92875	S	Benzidine; 4,4'-diaminobiphenyl, see Section 5209					
71432		Benzol; see Benzene					
106514		D-Benzoquinone; see Quinone					
98884		Benzoyl chloride	0.2	1.1	C		
94360		Benzoyl peroxide; dibenzoyl peroxide	--	5			
140114		Benzyl acetate	10	61			
100447		benzyl chloride; alpha-chlorotoluene	0.03	0.16			
7440417		Beryllium, and beryllium compounds as Be (see also Sections 1535.1, 5205 and 8359.1)	--	0.0002	0.025mg/M3	--	0.002
92524		Biphenyl; diphenyl; phenylbenzene	0.2	1.5			
542881		Bis(chloromethyl) ether, see bis-Chloromethyl ether, Section 5209					
3033623	S	Bis (Dimethylaminoethyl) ether (DMAEE)	0.05	0.328		0.15	0.983
1304821		Bismuth telluride					

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PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number [a]	*Skin*[b]	*Name*[c]	*PEL* [d] *ppm*[e]	*PEL* [d] *mg/M*3[f]	*PEL* [d] *Ceiling*[g]	*STEL* [o] *ppm*[e]	*STEL* [o] *mg/M*3[f]
		Total dust	--	10			
		Respirable fraction[n]	--	5			
		Bismuth telluride (selenium-doped)	--	5			
		Borates, tetra, sodium salts					
		Anhydrous	--	5			
		Decahydrate	--	5			
		Pentahydrate	--	5			
1303862		Boron oxide	--	10			
10294334		Boron tribromide	1	10	C		
7637072		Boron trifluoride	1	3	C		
314409		Bromacil	1	10			
7726956		Bromine	0.1	0.7	C		
7789302		Bromine pentafluoride	0.1	0.7			
74975		Bromochloromethane; see Chlorobromethane					
74964		Bromoethane; see Ethyl bromide					
75252	S	Bromoform; tribromomethane	0.5	5			
74839		Bromomethane, see Methyl bromide					
106945	S	1-bromopropane, n-propyl bromide	5	25			
75638		Bromotrifluoromethane; see Trifluorobromomethane					
106990		1,3-Butadiene (see also section 5201)	1	2.2		5	11
106978		Butane	800	1,900			
109795		1-Butanethiol; see Butyl mercaptan					
71363		1-Butanol; see n-Butyl alcohol					
78933		2-Butanone; see Methyl ethyl ketone					
111762	S	2-Butoxyethanol (EGBE)	20	97			
123864		n-Butyl acetate	150	710		200	950
105464		sec-Butyl acetate	200	950			
540885		tert-Butyl acetate	200	950			
141322		Butyl acrylate	2	11			
71363	S	n-Butyl alcohol; 1-butanol	50	150	C		
78922		sec-Butyl alcohol	100	305			
75650		tert-Butyl alcohol	100	300		150	450
109739	S	Butylamine	5	15	C		
1189851	S	tert-Butyl chromate; di-tert-butyl					
		chromate, as CrO_3	--	0.1	C		
		as Cr		0.005			
		(see also Sections 1532.2, 5206 & 8359)					
2426086		n-Butyl glycidyl ether; BGE; 1-butoxy-2,3-epoxypropane	25	135			
138227		n-Butyl lactate	5	25			
109795		n-Butyl mercaptan	0.5	1.5			
89725	S	o-sec-Butylphenol	5	30			
98511		p-tert-Butyltoluene	1	6.1		20	120
7440439		Cadmium metal dust, as Cd					
		(see also Sections 1532 & 5207)	--	0.005			
		Cadmium, soluble salts, as Cd					
		(see also Sections 1532 & 5207)	--	0.005			
1306190		Cadmium oxide fume, as Cd					

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		(see also Sections 1532 & 5207)	--	0.005			
7778441		Calcium arsenate; see Arsenic,inorganic (see also Section 5214)					
471341		Calcium carbonate; see Particulates not otherwise regulated		--			
156627		Calcium cyanamide	--	0.5			
1305620		Calcium hydroxide	--	5			
1305788		Calcium oxide	--	2			
		Calcium silicate; see Particulates not otherwise regulated					
1344952		Calcium silicate (synthetic): see Particulates not otherwise regulated					
1592230		Calcium stearate	--	10			
7778189		Calcium sulfate; see Particulates not otherwise regulated					
76222		Camphor (synthetic)	--	2			
105602		Caprolactam dust	--	1		--	3
105602		Caprolactam vapor	5	20		10	40
2425061	S	Captafol	--	0.1			
133062		Captan	--	5			
63252		Carbaryl; 1-naphthyl N-methylcarbamate	--	5			
1563662		Carbofuran	--	0.1			
1333864		Carbon black	--	3.5			
124389		Carbon dioxide	5,000	9,000		30,000	54,000
75150	S	Carbon disulfide	1	3	30 ppm	12	36
630080		Carbon monoxide	25	29	200 ppm		
558134		Carbon tetrabromide	0.1	1.4		0.3	4
56235	S	Carbon tetrachloride	2	12.6	200 ppm	10	63
75445		Carbonyl chloride; see Phosgene					
353504		Carbonyl fluoride	2	5		5	15
120809	S	Catechol; pyrocatechol	5	20			
9004346		Cellulose (paper fiber); see Particulates not otherwise regulated					
21351791		Cesium hydroxide		2			
57749	S	Chlordane; 1,2,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4,7-methanoindane	--	0.5			
8001352	S	Chlorinated camphene; toxaphene	--	0.5		--	1
		Chlorinated diphenyl oxide	--	0.5			
7782505		Chlorine	0.5	1.5		1	3
10049044		Chlorine dioxide	0.1	0.3		0.3	0.9
7790912		Chlorine trifluoride	0.1	0.4	C		
107200		Chloroacetaldehyde	1	3	C		
78955	S	Chloroacetone	1	3.8	C		
532274		alpha-Chloroacetophenone;phenacyl chloride	0.05	0.3			
79049	S	Chloroacetyl chloride	0.05	0.2		0.15	0.69
108907		Chlorobenzene; monochlorobenzene	10	46			
2698411	S	o-Chlorobenzylidene malononitrile; OCBM	0.05	0.4	C		
74975		Chlorobromomethane; bromochloromethane	200	1,050			
126998	S	2-Chloro-1,3-butadiene; see Chloroprene					
75456		Chlorodifluoromethane; Fluorocarbon 22	1,000	3,500			
53469219	S	Chlorodiphenyl (42% chlorine)	--	1			
11097691	S	Chlorodiphenyl (54% chlorine)	--	0.5			
106898		1-Chloro-2,3-epoxypropane; see Epichlorohydrin					

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			ppm[e]	*mg/M*3[f]	*Ceiling*[g]	*ppm*[e]	*mg/M*3[f]
75003		Chloroethane; see Ethyl chloride					
107073		2-Chloroethanol; see Ethylene chlorohydrin					
75014		Chloroethylene, see Vinyl chloride, Section 5210					
67663		Chloroform; trichloromethane	2	9.78			
74873		Chloromethane, see Methyl chloride					
107302		Chloromethyl methyl ether; see Methyl chloromethyl ether, Section 5209					
542881		bis-Chloromethyl ether, see also Section 5209	0.001	0.005			
100005		1-Chloro-4-nitrobenzene; see p-Nitrochlorobenzene					
600259		1-Chloro-1-nitropropane	2	10			
76153		Chloropentafluoroethane	1,000	6,320			
76062		Chloropicrin; trichloronitromethane	0.1	0.7			
126998	S	Chloroprene; 2-chloro-1,3-butadiene	10	36			
598787	S	2-Chloropropionic acid	0.1	0.44			
2039874		o-Chlorostyrene	50	285		75	428
95498	S	o-Chlorotoluene	50	250			
1929824		2-Chloro-6-(trichloromethyl)pyridine; see Nitrapyrin					
2921882	S	Chlorpyrifos	--	0.2			
		Chromite ore processing (chromate), as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.005			
7440473		Chromium metal	--	0.5			
		Chromium (II) compounds, as Cr	--	0.5			
		Chromium (III) compounds, as Cr	--	0.5			
		Chromium (VI) compounds, as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.005	0.1mg/M^3		
14977618		Chromyl chloride	0.025	0.15			
2971906		Clopidol	--				
		Total dust	--	10			
		Respirable fraction	--	5			
		Coal (Bituminous) dust					
		<5% quartz, respirable fraction[n]	--	0.9			
		>5% quartz, respirable fraction[n]	--	0.1			
		Coal tar pitch volatiles[i]	--	0.2			
7440484		Cobalt, metal fume and dust, as Co	--	0.020			
		Cobalt carbonyl, as Co	--	0.1			
16842038		Cobalt hydrocarbonyl, as Co	--	0.1			
		Coke oven emissions, see Section 5211		0.15			
7440508		Copper metal fume, as Cu	--	0.1			
		Copper salts, dusts and mists, as Cu	--	1			
		Corundum, see Particulates not otherwise regulated					
		Cotton dust, see also Section 5190	--	1[j]			
1319773	S	Cresol (all isomers)	5	22			
123739	S	Crotonaldehyde; beta-methylacrolein			0.3		
4170303							
299865		Crufomate	--	5			
98828	S	Cumene; isopropylbenzene	50	245			
420042		Cyanamide	--	2			

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	S	Cyanide, as CN	--	5			
460195		Cyanogen	10	20			
506774		Cyanogen chloride	0.3	0.6	C		
110827		Cyclohexane	300	1,050			
108930	S	Cyclohexanol	50	200			
108941	S	Cyclohexanone	25	100			
110838		Cyclohexene	300	1,015			
108918	S	Cyclohexylamine	10	40			
121824	S	Cyclonite; RDX; cyclotrimethylenetrinitramine	--	0.07			
542927		Cyclopentadiene	75	200			
287923		Cyclopentane	600	1,720			
13121705		Cyhexatin; tricyclohexyltin hydroxide		5			
94757		2,4-D;2,4-dichlorophenoxyacetic acid	--	10			
50293	S	DDT; 1,1,1-trichloro-2,2-bis-(p-chlorophenyl)ethane	--	1			
62737		DDVP, see Dichlorvos					
17702419	S	Decaborane	0.05	0.3		0.15	0.9
8065483	S	Demeton; a mixture of o,o-diethyl o-2(ethylthio)ethyl phosphorothloate and o,o'-diethyl S-2(ethylthio)ethyl phosphorothioate	0.01	0.1			
123422		Diacetone alcohol; 4-hydroxy-4-methyl-2-pentanone	50	240			
107153		1,2-Diaminoethane; see Ethylenediamine					
		Diatomacous earth; see Silica-amorphous					
333415	S	Diazinon; o,o-diethyl o-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate	--	0.1			
334883		Diazomethane	0.2	0.4			
94360		Dibenzoyl peroxide; see Benzoyl peroxide					
19287457		Diborane	0.1	0.1			
2528361	S	Dibutyl phenyl phosphate	0.3	3.5			
96128		1,2-Dibromo-3-chloropropane; DBCP; see Section 5212	.001	.01			
75616		Dibromodifluoromethane; see Difluorodibromomethane					
106934	S	1,2-Dibromomethane; see Ethylene dibromide, Section 5219					
102818	S	2-N-Dibutylaminoethanol	2	14			
107664		Dibutyl phosphate	1	5		2	10
84742		Dibutyl phthalate	--	5			
7572294		Dichloroacetylene	0.1	0.4	C		
95501	S	o-Dichlorobenzene	25	150	50 ppm		
106467		p-Dichlorobenzene; 1,4-dichlorobenzene	10	60	200 ppm	110	675
91941	S	3,3'-Dichlorobenzidine; 4,4'-diamino-3,3'-dichlorobiphenyl; see Section 5209					
764410	S	1,4 -Dichloro-2-butene	0.005	0.025			
75718		Dichlorodifluoromethane	1000	4950	6200 ppm		
118525		1,3-Dichloro-5,5-dimethyl hydantoin	--	0.2		--	0.4
75343		1,1-Dichloroethane	100	400			

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107062		1,2-Dichloroethane, see Ethylene dichloride					
75354		1,1-Dichloroethylene; see Vinylidene chloride					
540590		1,2-Dichloroethylene; acetylene dichloride	200	790			
111444	S	Dichloroethyl ether; bis(2-chloroethyl) ether	5	30		10	60
75434		Dichlorofluoromethane; Fluorocarbon 21	10	42			
75092		Dichloromethane; see Methylene chloride					
594729		1,1-Dichloro-1-nitroethane	2	10			
78875		1,2-Dichloropropane; see Propylene dichloride					
542756	S	Dichloropropene	1	5			
75990		2,2-Dichloropropionic acid	1	6			
76142		1,2-Dichlorotetrafluoroethane; Fluorocarbon 114	1,000	7,000			
62737	S	Dichlorvos (DDVP); 2,2-dichlorovinyl dimethyl phosphate	0.1	1			
141662	S	Dicrotophos	--	0.25			
5124301		Dicyclohexylmethane-4,4'-diisocyanate; see Methylene bis-(4-cyclohexylisocyanate)					
77736		Dicyclopentadiene	5	30			
102545		Dicyclopentadienyl iron	--				
		Total dust	--	10			
		Respirable fraction[n]	--	5			
60571	S	Dieldrin; 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo-exo-5,8-dimethanonaphthalene	--	0.25			
111422	S	Diethanolamine	0.46	2			
109897	S	Diethylamine	5	15	C		
112367	S	Diethylene glycol diethyl ether, Ethyl diglyme	5	33			
111966	S	Diethylene glycol dimethyl ether, Diglyme	1	5.5		5	27
100378	S	2-(Diethylamino) ethanol	2	9.6			
123911		1,4-Diethylene dioxide; see p-Dioxane					
111400	S	Diethylenetriamine	1	4			
60297		Diethyl ether; see Ethyl ether					
117817		Di-(2-ethylhexyl) phthalate; see Di-sec-octyl phthalate					
96220		Diethyl ketone	200	705		300	1057
84662		Diethyl phthalate	--	5			
75616		Difluorodibromomethane; dibromodifluoromethane	100	860			
2238075		Diglycidyl ether; DGE; bis(2,3-epoxypropyl) ether	0.1	0.5			
123319		p-Dihydroxybenzene; see Hydroquinone					
108838		Diisobutyl ketone; 2,6-dimethyl-4-heptanone	25	150			
108189	S	Diisopropylamine	5	20			
108203		Diisopropyl ether; see Isopryl ether					
109875		Dimethoxymethane; see Methylal					
127195	S	Dimethylacetamide	10	35			
124403		Dimethylamine	5	9.2		15	27.6
60117		4-Dimethylaminoazobenzene, see Section 5209					
1300738		Dimethylaminobenzene; see Xylidene					

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121697	S	N,N-Dimethylaniline; dimethylphenylamine	5	25		10	50
1330207		Dimethylbenzene; see Xylene					
108849		1,3-Dimethylbutyl acetate; see sec-Hexyl acetate					
300765		o,o-Dimethyl o-(1,2-dibromo-2,2-dichloroethyl) phosphate; see Naled					
14857342		Dimethylethoxysilane	0.5	2.1		1.5	6.4
68122	S	Dimethylformamide; DMF	10	30			
108838		2,6-Dimethyl-4-heptanone; see Diisobutyl ketone					
57147	S	1,1-Dimethylhydrazine	0.01	0.025			
67641		Dimethyl ketone; see Acetone					
62759		N,N-Dimethylnitrosamine; see N-Nitrosodimethylamine, Section 5209					
131113		Dimethyl phthalate	--	5			
77781	S	Dimethyl sulfate; methyl sulfate	0.1	0.5			
148016		Dinitolmide; 3,5-Dinitro-o-toluamide	--	5			
528290, 99650, 100254	S	Dinitrobenzene (all (isomers) ortho, meta and para isomers	0.15	1			
534521	S	4,6-Dinitro-o-cresol; 2-methyl-4,6-dinitrophenol	--	0.2			
25321146	S	2,4-Dinitrotoluene	--	0.15			
123911	S	p-Dioxane; 1,4-dioxacyclohexane; 1,4-diethylene dioxide	0.28	1.0			
78342	S	Dioxathion	--	0.2			
92524		Diphenyl; see Biphenyl					
122394		Diphenylamine; N-phenylaniline	--	10			
101688		Diphenylmethane diisocyanate; see Methylene bis(phenylisocyanate)					
123193		Dipropyl ketone	50	235			
34590948	S	Dipropylene glycol methyl ether	100	600		150	900
85007		Diquat; 1,1'-ethylene-2,2'-dipyridinium dibromide	--				
		Total dust	--	0.5			
		Respirable fraction[n]					
117817		Di-sec-octyl phthalate; bis(2 ethylhexyl) phthalate	--	5		--	
97778		Disulfiram	--	2			
298044	S	Disulfoton; o,o-diethyl S-2-(ethylthio)ethyl phosphorodithioate	--	0.1			
128370		2,6-Di-tert-butyl-p-cresol	--	10			
330541		Diuron	--	10			
68122		DMF; see Dimethylformamide					
57147		DMH; see 1,1-Dimethylhydrazine					
1321740		Divinyl benzene	10	50			
		Dust, nuisance dust and particulates, see Particulates not otherwise regulated					

TABLE AC-1
PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number [a]	Skin[b]	Name[c]	PEL [d] ppm[e]	PEL [d] mg/M3[f]	PEL [d] Ceiling[g]	STEL [o] ppm[e]	STEL [o] mg/M3[f]
12415348		Emery; see Particulates not otherwise regulated					
115297	S	Endosulfan; 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3-benzodioxathiepin-3-oxide	--	0.1			
72208	S	Endrin; 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo-endo-5,8-dimethanonaphthalene	--	0.1			
13838169		Enflurane	2	15			
106898	S	Epichlorohydrin; 1-chloro-2,3-epoxypropane	0.05	0.19			
2104645	S	EPN; o-ethyl o-(p-nitrophenyl) phenylphosphonothioate	--	0.1			
75569		1,2-Epoxypropane; see Propylene oxide					
556525		2,3-Epoxypropanol; see Glycidol					
74840		Ethane	(h)	--			
75081		Ethanethiol; see Ethyl mercaptan					
64175		Ethanol; see Ethyl alcohol					
141435		Ethanolamine; 2-aminoethanol	3	8		6	15
563122	S	Ethion	--	0.4			
110805	S	2-Ethoxyethanol	5	18			
111159	S	2-Ethoxyethyl acetate	5	27			
141786		Ethyl acetate	400	1,400			
140885	S	Ethyl acrylate	5	20		25	100
64175		Ethyl alcohol; ethanol	1,000	1,900			
75047	S	Ethylamine	5	9.2	C		
541855		Ethyl sec-amyl ketone; 5-methyl-3-heptanone	25	130			
100414		Ethylbenzene	5	22		30	130
74964	S	Ethyl bromide	5	22			
106354		Ethyl butyl ketone; 3-heptanone	50	230		75	345
75003	S	Ethyl chloride; chloroethane	100	264			
7085850		Ethyl cyanoacrylate	0.2	1.02			
673923		Ethyl tert-butyl ether	5	21			
74851		Ethylene	(h)	--			
107073	S	Ethylene chlorohydrin; 2-chloroethanol	1	3	C		
107153		Ethylenediamine; 1,2-diaminoethane	10	25			
106934	S	Ethylene dibromide; 1,2-dibromoethane, see Section 5219	0.13	1	C		
107062		Ethylene dichloride; 1,2-dichloroethane	1	4	200 ppm	2	8
107211		Ethylene glycol (vapor)	40	100	C		
629141	S	Ethylene glycol diethyl ether, 1,2-diethoxyethane	5	24			
110714	S	Ethylene glycol dimethyl ether, 1,2-dimethoxyethane, Glyme	1	3.7		5	18
628966	S	Ethylene glycol dinitrate		(k)		--	0.1
110805	S	Ethylene glycol monoethyl ether, see 2-Ethoxyethanol					
109864	S	Ethylene glycol monomethyl ether, see 2-Methoxyethanol					
110496	S	Ethylene glycol monomethyl ether acetate;					

TABLE AC-1
PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number [a]	*Skin*[b]	*Name*[c]	*PEL* [d] *ppm*[e]	*PEL* [d] *mg/M*3[f]	*PEL* [d] *Ceiling*[g]	*STEL* [o] *ppm*[e]	*STEL* [o] *mg/M*3[f]
		see 2-Methoxyethyl acetate					
151564	S	Ethyleneimine; see also Section 5209	0.5	1			
75218		Ethylene oxide; see Section 5220	1	2		5	
60297		Ethyl ether	400	1,200		500	1500
109944		Ethyl formate	100	300			
75343		Ethylidene chloride; see 1,1-Dichloroethane					
16219753		Ethylidene norbornene	5	25	C		
75081		Ethyl mercaptan; ethanethiol	0.5	1			
78933		Ethyl methyl ketone; see Methyl ethyl ketone					
100743	S	N-Ethylmorpholine; 4-ethyl-1, 4-tetrahydrooxazine	5	23			
78104		Ethyl silicate; tetraethyl silicate	10	85			
22224926	S	Fenamiphos		0.1			
115902		Fensulfothion	--	0.1			
55389	S	Fenthion	--	0.2			
14484641		Ferbam; ferric N,N-dimethylthiocarbamate	--	10			
12604589		Ferrovanadium dust	--	1		--	3
14808607		Fibrous glass, see Glass					
		Flour dust		0.5[s]			
		Fluorides, as F	--	2.5			
7782414		Fluorine	0.1	0.2			
75694		Fluorocarbon 11; see Trichlorofluoromethane					
75718		Fluorocarbon 12; see Dichlorodifluoromethane					
75434		Fluorocarbon 21; see Dichlorofluoromethane					
75456		Fluorocarbon 22; see Chlorodifluoromethane					
76120		Fluorocarbon 112; see 1,1,2,2-Tetrachloro-1,2-difluoroethane					
76131		Fluorocarbon 113; see 1,1,2-Trichloro-1,2,2-trifluoroethane					
		Fluorocarbon 114; see 1,2-Dichlorotetrafluoroethane					
75694		Fluorotrichloromethane; see Trichlorofluoromethane					
944229	S	Fonofos	--	0.1			
50000		Formaldehyde, see Section 5217	0.75	--		2	--
75127	S	Formamide	10	18			
64186		Formic acid	5	9		10	19
98011	S	Furfural	2	8			
98000	S	Furfuryl alcohol	10	40		15	60
8006619		Gasoline	300	900		500	1500
7782652		Germanium tetrahydride	0.2	0.6			
		Glass, fibrous	1.0 f/cc[q]				
111308		Glutaraldehyde [t]	0.05	0.2	C		
56815		Glycerin mist; see Particulates not otherwise regulated					
123944		Glyceryl stearate	--	10			
556525		Glycidol; 2,3-epoxy-1-propanol	2	6.1			
111762		Glycol monobutyl ether; see 2-Butoxyethanol					
110805		Glycol monoethyl ether; see 2-Ethoxyethanol					

TABLE AC-1
PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number [a]	Skin[b]	Name[c]	PEL [d]			STEL [o]	
			ppm[e]	mg/M3[f]	Ceiling[g]	ppm[e]	mg/M3[f]
109864		Glycol monoethyl ether; see 2-Methoxyethanol					
107222		Glyoxal, 1,2-ethanedione		0.1[s], [u]			
		Grain dust (oat, wheat, barley)	--	10			
7782425		Graphite, natural respirable dust		2.5			
		Graphite, synthetic					
		Total dust	--	10			
		Respirable fraction[n]	--	5			
13397245		Gypsum; Calcium sulfate dihydrate; see					
		Particulates not otherwise regulated					
7440586		Hafnium	--	0.5			
151677		Halothane	2	16			
822060		HDI; see Hexamethylene diisocyanate					
7440597		Helium	(h)	--			
76448	S	Heptachlor; 1,4,5,6,7,8,8-hepta-chloro-					
		3a,4,7,7a-tetrahydro-4,7-methanoindene	--	0.05			
142825		n-Heptane	400	1,600		500	2000
118741	S	Hexachlorobenzene	--	0.002			
87683	S	Hexachlorobutadiene	0.02	0.24			
77474		Hexachlorocyclopentadiene	0.01	0.11			
67721	S	Hexachloroethane; perchloroethane	1	10			
1335871	S	Hexachloronaphthalene	--	0.2			
684162	S	Hexafluoroacetone; 1,1,1,3,3,3-hexafluoro-					
		2-propanone	0.1	0.7			
822060		Hexamethylene diisocyanate; HDI	0.005	0.034			
110543	S	n-Hexane	50	180			
		Hexane, other isomers	500	1800		1000	3600
124094		1,6-Hexanediamine	0.5	2.3			
591786		2-Hexanone; see Methyl butyl ketone					
592416		1-Hexene	50	180			
108101		Hexone; see Methyl isobutyl ketone					
108849		sec-Hexyl acetate; 4-methyl-2-pentyl acetate;					
		1,3-dimethyl-butyl acetate	50	300			
107415		Hexylene glycol	25	125	C		
302012	S	Hydrazine	0.01	0.013			
10035106		Hydrobromic acid; see Hydrogen bromide					
7647010		Hydrochloric acid; see Hydrogen chloride					
74908		Hydrocyanic acid; see Hydrogen cyanide					
7664393		Hydrofluoric acid; see Hydrogen fluoride					
1333740		Hydrogen	(h)	--			
61788327		Hydrogenated terphenyls	0.5	5			
10035106		Hydrogen bromide	3	10	C		
7647010		Hydrogen chloride	0.3	0.45	2 ppm		
74908	S	Hydrogen cyanide	4.7	5	C		
7664393	S	Hydrogen fluoride, as F	0.4	0.33		1	0.83
7722841		Hydrogen peroxide, as H_2O_2	1	1.4			
7783075		Hydrogen selenide, as Se	0.05	0.2			
7783064		Hydrogen sulfide	10	14	50 ppm	15	21
123319		Hydroquinone; 1,4-benezendiol	--	2			

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PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number [a]	Skin[b]	Name[c]	PEL [d] ppm[e]	PEL [d] mg/M3[f]	PEL [d] Ceiling[g]	STEL [o] ppm[e]	STEL [o] mg/M3[f]
999611	S	2-Hydroxypropyl acrylate	0.5	3			
95136		Indene	10	48			
7440746		Indium	--	0.1			
		Indium compounds	--	0.1			
7553562		Iodine	0.1	1	C		
75478		Iodoform	0.6	10			
4098719		IPDI; see Isophorone diisocyanate					
1309371		Iron oxide fume	--	5			
13463406		Iron pentacarbonyl, as Fe	0.1	0.8		0.2	1.6
		Iron salts, soluble, as Fe	--	1			
123922		Isoamyl acetate; 3-methylbutyl acetate; see Pentyl acetate					
123513		Isoamyl alcohol; 3-methylbutanol	100	360		125	450
110190		Isobutyl acetate; 2-methylpropyl acetate	150	700			
78831		Isobutyl alcohol; 2-methylpropanol	50	150			
26675467		Isoflurane	2	15			
26952216	S	Isooctyl alcohol	50	270			
78591		Isophorone; 3,5,5-trimethyl-2-cyclohexene-1-one	4	23			
4098719	S	Isophorone diisocyanate; IPDI	0.005	0.045		0.02	--
109591		Isopropoxyethanol	25	105			
108214		Isopropyl acetate	250	950		310	1185
67630		Isopropyl alcohol	400	980		500	1225
75310		Isopropylamine	5	12		10	24
768525	S	N-isopropylaniline	2	10			
108203		Isopropyl ether; diisopropyl ether	250	1,050			
4016142		Isopropyl glycidyl ether; IGE; 1,2-epoxy-3-isopropoxypropane	50	240		75	360
1332587		Kaolin; (respirable dust containing no asbestos and <1% crystaline silica)	--	2			
463514		Ketene; ethenone	0.5	0.9		1.5	3
		Lead arsenate, see Sections 5214 and 5198					
7758976		Lead chromate, as Pb	--	0.02			
		as Cr	--	0.005			
		(see also Section 5198, 1532.1, 1532.2, 5206 & 8359)					
		Lead (metallic) and inorganic compounds, dust and fume, as Pb (see also Section 5198)	--	0.05			
78002		Lead tetraethyl, see Tetraethyl lead					
75741		Lead tetramethyl, see Tetramethyl lead					
1317653		Limestone; calcium carbonate; see Particulates not otherwise regulated					
58899	S	Lindane; 1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer	--	0.5			
7580678		Lithium hydride	--	0.025			
		L.P.G.; liquefied petroleum gas	1,000	1,800			
4485125		Lithium stearate	--	10			
13717005		Magnesite; magnesium carbonate; see Particulates not otherwise regulated					
1309484		Magnesium oxide fume, as Mg	--	10			

TABLE AC-1
PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number [a]	Skin[b]	Name[c]	PEL [d]			STEL [o]	
			ppm[e]	mg/M3[f]	Ceiling[g]	ppm[e]	mg/M3[f]
557040		Magnesium stearate	--	10			
121755	S	Malathion; o,o-dimethyl S-1(1,2-dicarboethyoxyethyl) phosphorodithioate	--	10			
108316		Maleic anhydride; cis-butenedioic anhydride	0.1	0.4			
		Manganese and compounds, as Mn	--	0.2			
7439965		Manganese fume, as Mn	--	0.2		--	3
12079651	S	Manganese, cyclopentadienyl-tricarbonyl, as Mn	--	0.1			
		Manganese tetroxide	--	0.2			
		Marble; calcium carbonate; see Particulates not otherwise regulated					
101779	S	MDA; see 4,4'-Methylene dianiline					
101688		MDI; see Methylene bis(phenylisocyanate)					
7439976	S	Mercury alkyls, as Hg	--	0.01	0.04 mg/M3	--	0.03
7439976	S	Mercury, metallic and inorganic compounds as Hg	--	0.025	0.1 mg/M3		
7439976	S	Mercury aryl compounds as Hg	--	0.01	C		
108678		Mesitylene; see 1,3,5-Trimethylbenzene					
141797		Mesityl oxide; 4-methyl-3-pentene-2-one	15	60		25	100
79414	S	Methacrylic acid	20	70			
74828		Methane	(h)	--			
74931		Methanethiol; see Methyl mercaptan					
67561		Methanol; see Methyl alcohol					
16752775	S	Methomyl	--	2.5			
72435		Methoxychlor; 1,1,1-trichloro-2, 2-bis(p-methoxyphenyl)ethane	--	10			
109864	S	2-Methoxyethanol	5	16			
110496		2-Methoxyethyl acetate	5	24			
76380		Methoxyflurane	2	13			
150765		4-Methoxyphenol	--	5			
79209		Methyl acetate	200	610		250	760
74997		Methyl acetylene; propyne	1,000	1,650			
		Methyl acetylene-propadiene mixture; MAPP	1,000	1,800		1250	2250
96333	S	Methyl acrylate	10	35			
126987	S	alpha-Methylacrylonitrile	1	3			
624419		2-Methylbutyl acetate; see Pentyl acetate					
109875		Methylal; dimethoxymethane	1,000	3,100			
67561	S	Methyl alcohol; methanol	200	260	1000 ppm	250	325
74895		Methylamine	5	6.4		15	19
108112		Methyl amyl alcohol; see Methyl isobutyl carbinol					
110430		Methyl n-amyl ketone; 2-heptanone	50	235			
100618	S	N-Methylaniline; monomethylaniline	0.5	2			
95534		o-Methylaniline; see o-Toluidine					
74839	S	Methyl bromide	1	3.88	20 ppm		
591786	S	Methyl n-butyl ketone; 2-hexanone	1	4		10	40
74873		Methyl chloride	50	105	300 ppm	100	210
71556		Methyl chloroform; 1,1,1-trichloroethane	350	1900	800 ppm	450	2450
107302		Methyl chloromethyl ether; see Section 5209					

TABLE AC-1
PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number [a]	Skin[b]	Name[c]	PEL [d] ppm[e]	PEL [d] mg/M3[f]	PEL [d] Ceiling[g]	STEL [o] ppm[e]	STEL [o] mg/M3[f]
75058		Methyl cyanide; see Acetonitrile					
137053		Methyl 2-cyanoacrylate	0.2	0.908			
108872		Methylcyclohexane	400	1,600			
25639423		Methylcyclohexanol (meta- and para-isomer mixture)	50	235			
583608	S	o-Methylcyclohexanone	50	230		75	345
12108133	S	2-Methylcyclopentadienyl manganese tricarbonyl, as Mn	--	0.2			
8022002	S	Methyl demeton; a mixture of o,o-dimethyl o-(2-(ethylthio)ethyl) phosphorothioate and o,o-dimethyl S-(2-(ethylthio)-ethyl) phosphorothioate	--	0.5			
101144	S	4,4'-Methylene bis(2-chloroaniline), see also Section 5215	--	0.01			
5124301		Methylene bis(4-cyclohexylisocyanate); hydrogenated MDI	0.005	0.054			
101688		Methylene bis(phenylisocyanate); MDI; diphenylmethane diisocyanate	0.005	0.051			
75092		Methylene chloride; dichloromethane (see also section 5202)	25	87		125	435
101779	S	4,4'-Methylene dianiline; MDA (see also Sections 1535 and 5200)	0.01	0.08		0.1	0.8
78933		Methyl ethyl ketone; MEK; 2-butanone; ethyl methyl ketone	200	590		300	885
1338234		Methyl ethyl ketone peroxide	0.2	1.5	C		
107313		Methyl formate	100	250		150	375
60344	S	Methyl hydrazine; monomethyl hydrazine	0.01	0.019			
74884	S	Methyl iodide	2	10			
110123		Methyl isoamyl ketone	50	234			
108112	S	Methyl isobutyl carbinol; 4-methyl-2-pentanol; methyl amyl alcohol	25	100		40	165
108101		Methyl isobutyl ketone; Hexone	50	205		75	300
624839	S	Methyl isocyanate	0.02	0.05			
563804		Methyl isopropyl ketone	200	705			
74931		Methyl mercaptan	0.5	1			
80626		Methyl methacrylate; methyl 2-methyl-2-propenoate	50	205		100	410
298000	S	Methyl parathion; o,o-dimethyl o-(p-nitrophenyl) phosphorothioate	--	0.2			
107879		Methyl propyl ketone; 2-pentanone	200	700		250	875
872504	S	N-Methylpyrrolidone (NMP); 1-Methyl-2-pyrrolidone; N-Methyl-2-pyrrolidone; 1-Methyl-2-pyrrolidinone	1	4			
681845		Methyl silicate; tetramethyl silicate	1	6			
98839		alpha-Methylstyrene; 1-methyl-1-phenylethene	50	240		100	485
77781		Methyl sulfate; see Dimethyl sulfate					

TABLE AC-1
PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number [a]	Skin[b]	Name[c]	PEL [d] ppm[e]	PEL [d] mg/M3[f]	PEL [d] Ceiling[g]	STEL [o] ppm[e]	STEL [o] mg/M3[f]
1634044		Methyl tert-butyl ether; MTBE	40	144			
78944	S	Methyl vinyl ketone	0.05	0.14	C		
21087649		Metribuzin	--	5			
7786347	S	Mevinphos; 2-carbomethoxyl-					
		1-propen-2-yl dimethyl phosphate	0.01	0.1		0.03	0.3
		Mica, see Silicates					
		Mineral wool fiber; see Particulates not otherwise regulated					
7439987		Molybdenum, insoluble compounds, as Mo	--				
		Total dust	--	10			
		Respirable fraction [n]	--	3			
		Molybdenum, soluble compounds, as Mo	--	0.5[n]			
6923224		Monocrotophos	--	0.25			
100618		Monomethylaniline; see N-Methylaniline					
60344		Monomethylhydrazine; see Methyl hydrazine					
110918	S	Morpholine; tetrahydro-4H-1, 4-oxazine	20	70		30	105
7647010		Muriatic acid; see Hydrogen chloride					
300765	S	Naled; o,o-dimethyl o-					
		(1,2-dibromo-2,2-dichloroethyl) phosphate	--	3			
8030317		Naphtha, coal tar	100	400			
91203	S	Naphthalene	0.1	0.5			
134327		alpha-Naphthylamine; 1-naphthylamine, see Section 5209					
91598		beta-Naphthylamine; 2-naphthylamine, see Section 5209					
63252		1-Naphthyl N-methylcarbamate; see Carbaryl					
25551284		Naphthalene diisocyanate; NDI	0.01	0.085	C		
7440019		Neon	(h)				
13463393		Nickel carbonyl; $Ni(CO)_4$	0.001	0.007			
7440020		Nickel metal, as Ni	--	0.5			
		Nickel, insoluble compounds, as Ni	--	0.1			
		Nickel, soluble compounds, as Ni	--	0.05			
12035722		Nickel subsulfide	--	0.05			
54115	S	Nicotine; 1-methyl-2-(3-pyridyl)-pyrrolidine	0.075	0.5			
1929824		Nitrapyrin	--				
		Total dust	--	10			
		Respirable fraction[n]	--	5			
7697372		Nitric acid	2	5		4	10
10102439		Nitric oxide; NO	25	30			
100016	S	p-Nitroaniline	--	3			
98953	S	Nitrobenzene	1	5			
100005	S	p-Nitrochlorobenzene;					
		1-chloro-4-nitrobenzene	0.1	0.64			
92933		4-Nitrodiphenyl, see Section 5209					
79243		Nitroethane	100	310			
7727379		Nitrogen	(h)	--			
10102440		Nitrogen dioxide				1	1.8
		Nitrogen tetroxide; N_2O_4; see Nitrogen dioxide					
7783542		Nitrogen trifluoride	10	29			

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Chemical Abstracts Registry Number [a]	*Skin*[b]	*Name*[c]	*PEL* [d] *ppm*[e]	*PEL* [d] *mg/M*3[f]	*Ceiling*[g]	*STEL* [o] *ppm*[e]	*STEL* [o] *mg/M*3[f]
55630	S	Nitroglycerin		(k)		--	0.1
75525		Nitromethane	2	5			
108032		1-Nitropropane	25	90			
79469		2-Nitropropane	10	35			
62759		N-Nitrosodimethylamine, see Section 5209					
1321126, 99081, 88722, 99990	S	Nitrotoluene	2	11			
76062		Nitrotrichloromethane; see Chloropicrin					
10024972		Nitrous oxide	50	90			
111842		Nonane	200	1,050			
		Nuisance particulates, see Particulates not otherwise regulated					
		Total dust	--	10			
		Respirable fraction[n]	--	5			
2234131	S	Octachloronaphthalene	--	0.1		--	0.3
111659		Octane	300	1,450		375	1800
8012951		Oil (mineral) mist, particulate	--	(5)[l]			
		Oil (vegetable) mists (except castor, cashew nut or similar irritant oils); see Nuisance particulates					
		Organic arsenic compounds; see Arsenic, organic					
20816120		Osmium tetroxide, as Os	0.0002	0.002		0.0006	0.006
144627		Oxalic acid	--	1		--	2
7783417		Oxygen difluoride	0.05	0.1	C		
10028156		Ozone	0.1	0.2		0.3	0.6
8002742		Paraffin wax fume	--	2			
1910425, 2074502	S	Paraquat, total particulates	--	0.5			
1910425, 2074502	S	Paraquat, respirable sizes	--	0.1[n]			
56382	S	Parathion; o,o-diethyl o-(p-nitrophenyl) phosphorothioate	--	0.1			
		Particulates not otherwise regulated					
		Total dust	--	10			
		Respirable fraction[n]	--	5			
		Particulate polycyclic; aromatic hydrocarbons (PPAH) see Coal tar pitch volatiles					
		PCB; see Chlorodiphenyl					
87865	S	PCP; see Pentachlorophenol					
19624227		Pentaborane	0.005	0.01		0.015	0.03
1321648	S	Pentachloronaphthalene	--	0.5			
87865	S	Pentachlorophenol; PCP	--	0.5			
115775		Pentaerythritol; tetrakis-(hydroxymethyl)methane; tetra-methylolmethane; see Particulates not otherwise regulated					

TABLE AC-1
PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number [a]	Skin[b]	Name[c]	PEL [d] ppm[e]	PEL [d] mg/M3[f]	PEL [d] Ceiling[g]	STEL [o] ppm[e]	STEL [o] mg/M3[f]
109660		Pentane	600	1,800			
107879		2-Pentanone; see Methyl propyl ketone					
628637; 626380; 123922; 625161; 620111; 624419		Pentyl acetate	50	266		100	532
67721		Perchloroethane; see Hexachloroethane					
127184		Perchloroethylene	25	170	300 ppm	100	685
594423		Perchloromethyl mercaptan; trichloromethanethiol	0.1	0.8			
7616946		Perchloryl fluoride; ClO_3F	3	14		6	28
382218		Perfluoroisobutylene	0.01	0.082	C		
		Perlite					
		Total dust	--	10			
		Respirable fraction[n]	--	5			
108952	S	Phenol	5	19			
92842	S	Phenothiazine; dibenzothiazine	--	5			
106503	S	p-Phenylenediamine	--	0.1			
101848		Phenyl ether, vapor	1	7			
100425		Phenylethylene; see Styrene					
122601	S	Phenyl glycidyl ether, PGE;1,2-epoxy-3-phenoxypropane	0.1	0.6			
100630	S	Phenylhydrazine	5	20		10	45
108985		Phenyl mercaptan	0.5	2			
638211		Phenylphosphine	0.05	0.25	C		
298022	S	Phorate; o,o-diethyl S-(ethylthio)methyl phosphorodithioate	--	0.05		--	0.2
75445		Phosgene; carbonyl chloride; $COCl_2$	0.1	0.4			
7803512		Phosphine; PH_3	0.3	0.4		1	1
7664382		Phosphoric acid	--	1		--	3
7723140		Phosphorus, yellow	--	0.1			
10025873		Phosphorus oxychloride	0.1	0.6			
10026138		Phosphorus pentachloride	0.1	1			
1314803		Phosphorus pentasulfide; P_2S_5	--	1		--	3
7719122		Phosphorus trichloride	0.2	1.5		0.5	3
85449		Phthalic anhydride	1	6			
626175		m-Phthalodinitrile	--	5			
1918021		Picloram	--				
		Total dust	--	10			
		Respirable fraction[n]	--	5			
88891	S	Picric acid; 2,4,6-trinitrophenol	--	0.1			
83261		Pindone; 2-pivalyl-1, 3-indandione		0.1			
142643		Piperazine dihydrochloride	--	5			
26499650		Plaster of Paris; calcium sulfate hemihydrate; see Particulates not otherwise regulated					
7440064		Platinum, metal	--	1			
		Platinum, soluble salts, as Pt	--	0.002			

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PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number [a]	Skin[b]	Name[c]	PEL [d] ppm[e]	PEL [d] mg/M3[f]	PEL [d] Ceiling[g]	STEL [o] ppm[e]	STEL [o] mg/M3[f]
		Polychlorobiphenyls, see Chlorodiphenyl					
		Polytetrafluoroethylene, decomposition products	--	(m)			
		Portland Cement; see Particulates not otherwise regulated					
1310583		Potassium hydroxide; caustic potash	--	2	C		
593293		Potassium stearate	--	10			
74986		Propane	1000	1800 [h]			
107197	S	Propargyl alcohol; 2-propyn-1-o1	1	2			
57578		beta-Propiolactone, see Section 5209	0.5	1.5			
79094		Propionic acid	10	30			
114261		Propoxur; 2-isopropoxyphenyl N-methyl carbamate		0.5			
109604		n-Propyl acetate	200	840		250	1050
71238	S	n-Propyl alcohol	200	500		250	625
115071		Propylene	(h)	--			
78875		Propylene dichloride; 1,2-dichloropropane	75	350		110	510
6423434	S	Propylene glycol dinitrate; PGDN	0.05	0.3			
107982	S	Propylene glycol monomethyl ether	100	360		150	540
108656	S	Propylene glycol monomethyl ether acetate	100	541		150	811
75558	S	Propyleneimine; 2-methylaziridine	2	5			
75569		Propylene oxide; 1,2-epoxy-propane	2	4.75			
627134		n-Propyl nitrate	25	107		40	170
74997		Propyne; see Methylacetylene					
8003347		Pyrethrum	--	5			
110861		Pyridine	5	15			
106514		Quinone	0.1	0.4			
121824		RDX; see Cyclonite					
		Refractory ceramic fiber		0.2f/cc[q]			
108463		Resorcinol	10	45		20	90
7440166		Rhodium, metal	--	0.1			
		Insoluble compounds, as Rh	--	0.1			
		Soluble salts, as Rh	--	0.001			
299843		Ronnel; o,o-dimethyl o-(2,4,5-trichlorophenyl) phosphorothioite	--	10			
		Rosin core solder, pyrolysis products, as formaldehyde	--	0.1			
83794		Rotenone, commercial	--	5			
1309371		Rouge; see Particulates not otherwise regulated					
		Rubber solvent (Naphtha)	400	1,600			
		Selenium compounds, as Se	--	0.2			
7783791		Selenium hexafluoride	0.05	0.4			
136787		Sesone; sodium 2,4-dichloro-phenoxyethyl sulfate					
		Total dust	--	10			
		Respirable fraction[n]	--	5			
61790532		Silica, amorphous					
		Diatomaceous earth					
		Total dust	--	6			
		Respirable fraction[n]	--	3			

TABLE AC-1
PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number [a]	*Skin*[b]	*Name*[c]	*PEL* [d] *ppm*[e]	*PEL* [d] *mg/M*3[f]	*Ceiling*[g]	*STEL* [o] *ppm*[e]	*STEL* [o] *mg/M*3[f]
		Precipitated and gel	--	6			
		Silica, crystalline					
14464461		Silica, crystalline, respirable dust [n] Cristobalite (see also Sections 1532.3 & 5204)	--	0.05			
14808607		Quartz (see also Sections 1532.3 & 5204)	--	0.05			
60676860		Silica, fused, respirable dust	--	0.1			
15468323		Tridymite (see also Sections 1532.3 & 5204)	--	0.05			
1317959		Tripoli, (as quartz) (see also Sections 1532.3 & 5204)	--	0.05			
		Silicates (<1% crystalline silica)					
12001262		Mica (respirable dust)	--	3			
		Soapstone, total dust	--	6			
		Soapstone, respirable dust	--	3			
		Talc (containing asbestos); see Section 5208					
14807966		Talc (containing no asbestos fibers), respirable dust	--	2			
		Tremolite (containing no asbestos fibers), respirable dust	--	2			
7440213		Silicon; see Particulates not otherwise regulated					
409212		Silicon carbide; SiC; see Particulates not otherwise regulated					
7803625		Silicon tetrahydride; silane	5	7			
7440224		Silver metal, as Ag	--	0.01			
		Silver, soluble compounds, as Ag	--	0.01			
		Soapstone, see Silicates					
26628228	S	Sodium azide	0.1	0.3	C		
7631905		Sodium bisulfite	--	5			
136787		Sodium 2,4-dichlorophenoxyethyl sulfate; see Sesone					
62748	S	Sodium fluoroacetate	--	0.05		--	0.15
1310732		Sodium hydroxide; caustic soda	--	2	C		
7681574		Sodium metabisulfite	--	5			
822162		Sodium stearate	--	10			
9005258		Starch; see Particulates not otherwise regulated					
7789062		Strontium chromate, as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.0005			
		Stearates; see specific compound					
7803523		Stibine; SbH_3	0.1	0.5			
8052413		Stoddard solvent	100	525			
57249		Strychnine	--	0.15			
100425	S	Styrene (monomer); phenylethylene	50	215	500 ppm	100	425
9014011		Subtilisins (as pure crystalline proteolytic enzymes)	--				0.00006[r]
57501		Sucrose; see Particulates not otherwise regulated					
74222972		Sulfometuron methyl	--	3.5			
3689245	S	Sulfotep; tetraethyl dithionopyrophosphate		0.2			
7446095		Sulfur dioxide	2	5		5	10
2551624		Sulfur hexafluoride	1,000	6,000			
7664939		Sulfuric acid	--	0.1		--	3

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Chemical Abstracts Registry Number [a]	Skin[b]	Name[c]	PEL [d] ppm[e]	PEL [d] mg/M3[f]	PEL [d] Ceiling[g]	STEL [o] ppm[e]	STEL [o] mg/M3[f]
10025679		Sulfur monochloride; S_2Cl_2	1	6	C		
5714227		Sulfur pentafluoride; S_2F_{10}	0.01	0.1	C		
7783600		Sulfur tetrafluoride	0.1	0.4	C		
2699798		Sulfuryl fluoride; SO_2F_2	5	20		10	40
35400432		Sulprofos		1			
93765		2,4,5-T;2,4,5-trichlorophenoxyacetic acid	--	10			
		Talc; see Silicates					
7440257		Tantalum metal dust, as Ta	--	5			
1314610		Tantalum oxide dust, as Ta	--	5			
78308		TCP; see Triorthocresyl phosphate					
584849		TDI; see Toluene-2,4-diisocyanate					
3689245	S	TEDP; see Sulfotep					
		Tellurium and compounds, as Te	--	0.1			
7783804		Tellurium hexafluoride	0.02	0.2			
3383968		Temephos; o,o,o' ,o'-tetramethyl o,o'-thiodi-p-phenylene phosphorothioate					
		Total dust	--	10			
		Respirable fraction[n]	--	5			
107493	S	TEPP; tetraethyl pyrophosphate;	0.004	0.05			
100210		Terephthalic acid	--	10			
		Terphenyls	0.5	5	C		
79276		1,1,2,2-Tetrabromoethane; see Acetylene tetrabromide					
76119		1,1,1,2-Tetrachloro-2,2-difluoroethane	500	4170			
76120		1,1,2,2-Tetrachloro-1,2-difluoroethane; fluorocarbon 112	500	4,170			
79345	S	1,1,2,2-Tetrachloroethane; acetylene tetrachloride	1	7			
127184		Tetrachloroethylene; see Perchloroethylene					
56235		Tetrachloromethane; see Carbon tetrachloride					
1335882	S	Tetrachloronaphthalene	--	2			
3689245		Tetraethyl dithionopyrophosphate; see Sulfotep					
78002	S	Tetraethyl lead; tetraethylplumbane, as Pb	--	0.075			
107493		Tetraethyl pyrophosphate; see TEPP					
109999		Tetrahydrofuran	200	590		250	735
75741	S	Tetramethyl lead; tetramethylplumbane, as Pb	--	0.075			
115775		Tetramethylolmethane; see Pentaerythritol					
3333526	S	Tetramethyl succinonitrile (decomposition product of 2,2'-azobisisobutyronitrile)	0.5	3			
137268		Tetramethyl thiuram disulfide, see Thiram					
509148		Tetranitromethane	0.005	0.04			
7722885		Tetrasodium pyrophosphate	--	5			
479458	S	Tetryl; 2,4,6-trinitrophenylmethylnitramine	--	1.5			
	S	Thallium, soluble compounds, as Tl	--	0.1			
109999		THF; see Tetrahydrofuran					
96695		4,4'-Thiobis(6-tert-butyl-m-cresol)	--				
		Total dust	--	10			
		Respirable fraction[n]	--	5			

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Chemical Abstracts Registry Number [a]	Skin[b]	Name[c]	PEL [d] ppm[e]	PEL [d] mg/M3[f]	PEL [d] Ceiling[g]	STEL [o] ppm[e]	STEL [o] mg/M3[f]
68111	S	Thioglycolic acid	1	3.8			
7719097		Thionyl chloride	1	5	C		
137268		Thiram; bis(dimethylthiocarbamoyl) disulfide	--	5			
	S	Tin, organic compounds, as Sn	--	0.1		--	0.2
21651194		Tin, tin oxide and inorganic compounds, except SnH_4, as Sn	--	2			
13463677		Titanium dioxide, as Ti; see Particulates not otherwise regulated					
137268		TMTD; see Thiram					
118967		TNT; see 2,4,6-Trinitrotoluene					
108883	S	Toluene; toluol	10	37	500 ppm	150	560
584849		Toluene-2,4-diisocyanate; TDI	0.005	0.04	0.02 ppm	0.02	0.15
108441	S	m-Toluidine	2	9			
95534	S	o-Toluidine; o-methylaniline	2	9			
106490	S	p-Toluidine	2	9			
8001352		Toxaphene; see Chlorinated camphene					
115866		TPP; see Triphenyl phosphate					
		Tremolite, nonasbestiform; see Silicates					
75252		Tribromomethane; see Bromoform					
126738		Tributyl phosphate	0.2	2.5			
76039		Trichloroacetic acid	1	5			
120821		1,2,4-Trichlorobenzene	5	40	C		
50293		1,1,1,-Trichloro-2,2-bis(p-chlorophenyl)ethane; see DDT					
71556		1,1,1-Trichloroethane; see Methyl chloroform					
79005	S	1,1,2-Trichloroethane	10	45			
79016		Trichloroethylene; trichloroethene	25	135	300 ppm	100	537
75694		Trichlorofluoromethane; Fluorocarbon 11	1,000	5,600	C		
67663		Trichloromethane; see Chloroform					
594423		Trichloromethanethiol; see Perchloromethyl mercaptan					
1321659	S	Trichloronaphthalene	--	5			
76062		Trichloronitromethane; see Chloropicrin					
93765		2,4,5-Trichlorophenoxyacetic acid see 2,4,5-T					
96184		1,2,3-Trichloropropane	10	60			
76131		1,1,2-Trichloro-1,2,2- trifluoroethane	1000	7600	2000 ppm	1250	9500
78308		Tricresyl phosphate; see Triorthocresyl phosphate					
13121705		Tricyclohexyltin hydroxide; see Cyhexatin					
102716		Triethanolamine	--	5			
121448	S	Triethylamine	1	4.1	C		
112492	S	Triethylene glycol dimethyl ether, Triglyme	5	36			
75638		Trifluorobromomethane	1,000	6,100			
2451629		1,3,5-Triglycidyl-s-triazinetrione		0.005			
552307		Trimellitic anhydride	0.005	0.04	C		
75503		Trimethylamine	5	12		15	36
		Trimethylbenzene, all isomers	25	125			

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121459		Trimethyl phosphite	2	10			
88891		2,4,6-Trinitrophenol; see Picric acid					
479458		2,4,6-Trinitrophenylmethyl nitramine; see Tetryl					
118967	S	2,4,6-Trinitrotoluene; TNT	--	0.5			
78308	S	Triorthocresyl phosphate	--	0.1			
603349		Triphenylamine	--	5			
115866	S	Triphenyl phosphate; TPP	--	3			
7440337		Tungsten metal, as W	--	5			
		Tungsten, insoluble compounds, as W	--	5		--	10
		Tungsten, soluble compounds, as W	--	1		--	3
8006642		Turpentine	100	560			
		Uranium (natural), insoluble compounds, as U	--	0.2		--	0.6
		Uranium (natural), soluble compounds, as U	--	0.05			
110623		Valeraldehyde	50	175			
1314621		Vanadium pentoxide (V_2O_5), respirable dust and fume	--	0.05[n]			
75014	S	VC; see Vinyl chloride, Section 5210					
		Vegetable oil mists (except castor, cashew nut or similar irritant oils); see Particulates not otherwise regulated					
108054		Vinyl acetate	10	30		15	45
100425		Vinylbenzene; see Styrene					
593602		Vinyl bromide; bromoethylene	0.1	0.44			
75014	S	Vinyl chloride, see Section 5210	1				
107131	S	Vinyl cyanide, see Acrylonitrile, Section 5213					
100403	S	4-Vinyl cyclohexene	0.1	0.4			
106876	S	Vinyl cyclohexene dioxide	0.1	0.57			
75025		Vinyl fluoride	0.2	0.38			
75354		Vinylidene chloride; 1,1-dichloroethylene	1	4			
75387		Vinylidene fluoride	100	262			
25013154		Vinyltoluene	50	240			
8030306		VM & P (Varnish Makers and Painters) Naphtha	300	1,350		400	1800
81812		Warfarin; 3-(alpha-acetonyl-benzyl)-4-hydroxycoumarin	--	0.1			
		Welding fumes; total particulates (see also individual constituents)	--	5			
		Wood dust	--				
		All soft and hard woods, except Western red cedar	--	2		--	5
		Wood dust, Western red cedar--	--	0.5			
1330207		Xylene; xylol; dimethylbenzene	100	435	300 ppm	150	655
1477550	S	m-Xylene-a,a'-diamine	--	0.1	C		
1300738	S	Xylidine; aminodimethylbenzene	0.5	2.5			
		Yttrium compounds, as Y	--	1			
7646857		Zinc chloride fume	--	1		--	2
13530659		Zinc chromate, as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.005			

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15930946		Zinc chromate hydroxide, as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.005			
1314132		Zinc oxide fume	--	5		--	10
		Zinc oxide dust, see Particulates not otherwise regulated					
11103869		Zinc potassium chromate, as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.005			
557051		Zinc stearate	--	10			
37300235		Zinc yellow, as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.005			
		Zirconium compounds, as Zr	--	5		--	10

S

Footnotes to Table AC-1

(a) The Chemical Abstracts Service Registry Number is a designation used to identify a specific compound or substance regardless of the naming system; these numbers were obtained from the Desk Top Analysis Tool for the Common Data Base and from the Chemical Abstracts Indexes.

(b) Refer to section 5155(d) for the significance of the Skin notation.

(c) Trade Names Removed from Table AC-1.

Trade Name		Chemical/Generic Name
Abate	see	Temephos
Ammate	see	Ammonium Sulfamate
Aqualin	see	Acrolein
Arasan	see	Thiram
Azodrin	see	Moncrotophos
Baygon	see	Propoxur
Bidrin	see	Dicrotophos
Butyl Cellosolve	see	2-Butoxyethanol
Cellosolve	see	2-Ethoxyethanol
Cellosolve Acetate	see	2-Ethoxyethyl acetate
Compound 1080	see	Sodium Fluoracetate
Coyden	see	Clopidol
Crag Herbicide	see	Sesone
Cythion	see	Malathion
Dasanit	see	Fensulfothion
Delnav	see	Dioxathion
Dibrom	see	Naled
Difolatan	see	Captafol
Disyston	see	Disulfoton
Dowtherm A	see	Phenylether and Biphenyl
Dursban	see	Chloropyrifos
Dyfonate	see	Fonofos
Fermate	see	Ferbam
Freons	see	Fluorocarbons
Furadan	see	Carbofuran
Guthion	see	Azinphos Methyl

Korlan	see	Ronnel
Lannate	see	Methomyl
Mariate	see	Methoxychlor
MLT	see	Malathion
Moxie	see	Methoxychlor
Nialate	see	Ethion
Nankor	see	Ronnel
Phosdrin	see	Mevinphos
Pival	see	Pindone
Plictran	see	Cyhexatin
Santobrite	see	Pentachlorophenol
Sevin	see	Carbaryl
Systox	see	Demeton
Teflon	see	Polytetrafluoroethylene
Thimet	see	Phorate
Thiodan	see	Endosulfan
Tordon	see	Picloram
Trolene	see	Ronnel
Vapona	see	Dichlorvos
Weedone 638	see	2, 4-D
Zoalene	see	Dinitolmide

(d) For the definition and the application of the Permissible Exposure Limit (PEL), refer to section 5155(b) and (c)(1).

(e) Parts of gas or vapor per million parts of air by volume at 25°C and 760mm Hg pressure.

(f) Milligrams of substance per cubic meter of air at 25°C and 760mm Hg pressure.

(g) Refer to section 5155(b) and (c)(3) for the significance of the Ceiling notation. A "C" notation in this column means the values given in the PEL columns are ceiling values. A numerical entry in this column represents a ceiling value in addition to the TWA values.

(h) A number of gases and vapors, when present in high concentrations, act primarily as asphyxiants without other adverse effects. A concentration limit is not included for each material because the limiting factor is the available oxygen. (Several of these materials present fire or explosion hazards.)

(i) Coal tar pitch volatiles (benzene or cyclohexane-soluble fraction) include fused polycyclic hydrocarbons (some of which are known carcinogens) which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the "coal tar pitch volatiles" standard.

(j) This standard applies to the cotton waste processing operations of waste recycling (sorting, blending, cleaning, and willowing) and garnetting. It does not apply to cotton gins, cottonseed oil industry, or operations covered by section 5190.

(k) A PEL of 0.05 ppm shall apply to exposures involving a mixture of ethylene glycol dinitrate and nitroglycerin.

(l) As sampled by method that does not collect vapor.

(m) Thermal decomposition of the fluorocarbon chain in air leads to the formation of oxidized products containing carbon, fluorine and oxygen. An index of exposure to these products is possible through their alkaline hydrolysis followed by a quantitative determination of fluoride content. No particular concentration limit is specified pending evaluation of the toxicity of the products but concentrations should be kept below the sensitivity of the analytical method.

(n) The concentration and percentage of the particulate used for this limit are determined from the fraction passing a size selector with the following characteristics:

Aerodynamic Diameter in Micrometers (unit density sphere)	*Percent Passing Selector*
0	100
1	97
2	91
3	74
4	50
5	30
6	17
7	9
8	5
10	1

(o) Refer to sections 5155(b) and (c)(2) for the definition and application of the Short Term Exposure Limit (STEL).

(p) (Reserved)

(q) Fibers per cubic centimeter of air at 25°C and 760mm Hg pressure. To be considered a fiber for this limit the glass particle must be longer than 5µm, have a length to diameter ratio of three or more, and have a diameter less than 3µm. The National Institute for Occupational Safety and Health (NIOSH), Method 7400, Issue 2, August 15, 1994, which is hereby incorporated by reference, shall be used for measuring airborne fiber concentrations.

(r) Compliance with the subtilisins PEL is assessed by sampling with a high volume sampler (600-800 liters per minute) for at least 60 minutes.

(s) The concentration and percentage of the particulate used for this limit are determined from the fraction passing a size selector with the following characteristics:

Aerodynamic Diameter in Micrometers (unit density sphere)	*Percent Passing Selector*
0	100
1	97
2	94

5	.....	87
10	.....	77
20	.....	65
30	.....	58
40	.....	54.5
50	.....	52.2
100	.....	50

(t) Glutaraldehyde can cause occupational asthma and skin sensitization responses such as contact dermatitis. Exposure related symptoms may include one or more of the following: shortness of breath, chest tightness, wheeze, cough, skin rash, hives, and irritation of the nose, throat, skin or eye. Hazard communication training required by sections 5191 or 5194 shall address these health hazards and symptoms along with the measures taken by the employer to evaluate and control exposures that can include medical evaluations, exposure monitoring, ventilation systems, work practices, and personal protective equipment. The communication system required by section 3203 shall inform employees where to report possible health symptoms and where to ask questions, report concerns, and receive information about the employer's evaluation and control measures.

(u) This PEL applies to the sum of the exposures to the substance in the vapor state and from the particulate fraction specified in footnote (s) in this table.

Note: Authority cited: Section 142.3, Labor Code. Reference: Sections 142.3 and 144.6, Labor Code.