

CHEMICAL HYGIENE PLAN

OCCIDENTAL COLLEGE

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Foreword

Occidental College is committed to providing a safe working environment in our academic and research laboratories. All employees who either direct the operation of and/or perform work in any laboratory where chemicals are used must become familiar with the requirements of the Chemical Hygiene Plan. The purpose of the Chemical Hygiene Plan is to make employees aware of potentially hazardous chemicals in the work place and to provide guidelines and training to work safely with hazardous chemicals. This plan is required by the State of California pursuant to Title 8, Section 5191 of the California Code of Regulations and is enforced by Cal/OSHA.

The Chemical Hygiene Plan is written to protect the health and safety of Occidental College faculty, staff, and students. It outlines safe work practices in the handling and storage of hazardous chemicals, requirements for safety equipment, training, and the handling of hazardous waste. It is applicable to all departments on campus that have laboratories where hazardous chemicals are stored or used.

Every laboratory employee is responsible for his/her own safety and is required to minimize the risks of potential over-exposure and the uncontrolled release of hazardous materials while working in the laboratory. **Employees should report unsafe conditions to their supervisor.**

Notify Campus Safety if emergency medical or fire assistance is needed: Dial x2599 on campus or (323) 259-2599.

Report any uncontrolled release to Lab Supervisor and Chemical Hygiene Officer immediately. An uncontrolled release is an unexpected release of a hazardous material that due to its configuration, nature, or volume poses a threat to human health or the environment.

CHEMICAL HYGIENE PLAN CONTACTS

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Dean of the College:	Wendy Sternberg
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Stock Room Manager:	Keiko Yokoyama
Mobile:	(323) 868-5529
Teaching Lab Coordinator:	Anne Yu
Mobile:	(626) 644-5129
Emergency Line:	(323) 259-2599

Chemical Hygiene Plan – Roles and Responsibilities

Chemical Hygiene Officer

The Chemical Hygiene Officer (CHO) has overall responsibility for the chemical hygiene program. The CHO:

- Works with faculty and staff to develop and implement appropriate chemical hygiene policies and practices.
- Monitors procurement, use, and storage of laboratory chemicals.
- Conducts inspections of laboratories with EHS Manager.
- Provides technical guidance to faculty and staff.
- Provides laboratory safety training.
- Performs near-miss incident and/or accident investigations in the chemistry department, and provide assistance on other parts of the campus.
- Reviews and evaluates the effectiveness of Chemical Hygiene Plan annually.

Environmental Health and Safety Manager

The Environmental Health and Safety (EHS) Manager:

- Inspects teaching and research labs with CHO annually.
- Oversees completion of chemical inventory and provides regulatory guidance to faculty and staff.
- Completes annual testing of fume hoods and maintains records.
- Performs checks of fire extinguishers, emergency eye wash stations and emergency showers and maintains records.
- Performs weekly inspection of main hazardous waste accumulation area.
- Performs industrial hygiene monitoring and accident investigations.
- Ensures issues with engineering controls and safety equipment are corrected by Facilities.

Stock Room Manager

The Stock Room Manager:

- Procures chemicals and manages the Stock Room and bulk chemical storage areas.
- Transports hazardous materials within the building and bulk chemical storage areas.

- Obtains, maintains, and provides access to Safety Data Sheets (SDSs) for all chemicals.
- Ensures labels on incoming chemicals are not removed or defaced. Place RSS inventory tags on incoming chemicals.
- Supplies proper personal protective equipment (PPE) to lab workers.

Department Chair

The Department Chair is responsible to ensure that the Chemical Hygiene Plan is implemented by faculty and Lab Supervisors within the department.

Principal Investigators/Laboratory Supervisors

The Principal Investigator (PI) of record shall serve as the Lab Supervisor in his or her research laboratory. In teaching labs, the professor shall serve as the Lab Supervisor. Each Lab Supervisor:

- Identifies and mitigates hazards in the laboratory.
- Enforces the Chemical Hygiene Plan requirements in his/her lab.
- Develops laboratory-specific standard operating procedures (SOPs) with support from the CHO.
- Ensures that employees receive safety training before beginning work with hazardous chemicals, equipment, or procedures.
- Reviews and approves the use of particularly hazardous substances in their labs.
- Trains other laboratory personnel on the SOPs specific to their duties.
- Understands the current legal requirements concerning regulated substances used in their labs.
- Any new addition or modification of teaching labs should be submitted to CHO, Teaching Lab Coordinator and Chemical Hygiene Committee for review before implementation.

Laboratory Employees

Laboratory employees:

- Work under the direction of the PI, planning and conducting each operation in accordance with the Chemical Hygiene Plan and SOPs.
- Use appropriate engineering controls and personal protective equipment.
- Practice good chemical hygiene, including keeping a neat, uncluttered work area.
- Review procedural changes with PI.

- Understand the hazards of chemicals used in the laboratory.
- Report issues with engineering controls or safety equipment to Regina Booth (NC111)/Facilities (323-259-2651, 7:30 am – 4:30 pm).
- Report all accidents, near misses, and injuries to the PI.
- Report any unsafe conditions to the CHO.

Students

Students working in laboratories:

- Work under the direction of their professor, planning and conducting each operation in accordance with the Chemical Hygiene Plan and SOPs.
- Use appropriate engineering controls and personal protective equipment.
- Practice good chemical hygiene, including keeping a neat, uncluttered work area.
- Review procedural changes with their professor.
- Understand the hazards of chemicals used in the laboratory.
- Report issues with engineering controls or safety equipment to their professor.
- Report all accidents, near misses, and injuries to their professor.
- Report any unsafe conditions to their professor.

Chemical Hygiene Committee

The Chemical Hygiene Committee is comprised of Chemistry Department faculty, the CHO, and other chemical hygiene stakeholders. The committee meets periodically as a department to discuss chemical hygiene program topics.

General Safe Operating Procedures

Basic First Aid – Chemical Exposure

For chemical exposures, follow the procedures below and refer to the chemical Safety Data Sheet (SDS) for first aid measures specific.

- Eye contact: Promptly flush eyes using emergency eye wash stations for a minimum of 15 minutes. Seek immediate medical attention.
- Ingestion: Refer to the SDS for first aid measures. Do not induce vomiting.
- Skin Contact: Remove any contaminated clothing. Promptly flush the affected area with water and use a safety shower if drenching is necessary. Rinse for a minimum of 15 minutes. Rinse contaminated clothing prior to removing from laboratory.

Clothing contaminated with acute toxins or highly hazardous chemicals must be bagged and disposed as hazardous waste. Launder contaminated clothing before wearing. Seek medical attention.

- Inhalation: Move to fresh air. Seek medical attention.
- Injection: Wash injection site thoroughly. Seek medical attention.

In Norris Hall, first aid kits are available and accessible on each floor in the middle of the main hallways.

For non-emergency guidance, contact the Emmons Wellness Center at 323-341-4141.

In a health emergency, dial 911 and arrange for an ambulance to transport the affected student or employee to the nearest medical treatment facility.

Uncontrolled Releases and Large Spills

Do not attempt to clean up a spill of 1 liter or larger of liquid or 1 kg or larger of hazardous material. Do not attempt to clean a spill of larger than 100 ml or 50 g of a particularly hazardous or highly reactive material. Spills that occur outside of the fume hood may be too hazardous or complicated to clean up without proper respiratory protection. If an uncontrolled release occurs, exit the area, place signage to warn others to keep away from the spill, and contact your Lab Supervisor and CHO immediately.

For small spills, below the thresholds above, employees may clean up the spill if comfortable to do so according to Occidental's procedures. Students should not attempt to clean up large spills.

Small Spill Clean-up Procedures

For spills of less than 1 liter of liquid or 1 kg of hazardous material (or less than 100 ml or 50 g of a particularly hazardous or highly reactive material), an Occidental employee trained on the CHP is authorized to clean up the spill. Employees should only clean up a small spill if comfortable to do so. Otherwise, contact the CHO for assistance. Students should consult their professor for spill clean-up guidance.

Follow the procedures below for small spill clean-up.

- Refer to the chemical's SDS for specific clean-up instructions.
- Wear appropriate PPE as recommended by the SDS.

- Use appropriate media to absorb or neutralize spill. Spill kits are available throughout Norris Hall.
- Notify your Lab Supervisor.
- If broken glass is involved, use tongs or scoop to place it in bag, then place the bag in a cardboard box or other rigid container. Glass must not be placed in laboratory broken glass bin unless it is free of contamination. Notify EHS of the contaminated broken glass to arrange for proper disposal.
- Use broom and dust pan to sweep absorbed or neutralized material, or use tongs to retrieve soaked spill pads.
- Place absorbent materials in hazardous materials bag.
- Clean spill area with detergent and water.
- Rinse tools with copious amount of water, air dry, and return to spill kit.
- Place disposable PPE in hazardous materials bag.
- Seal the hazardous materials bag with heavy tape and label appropriately as hazardous waste.
- Contact EHS to restock spill kit items.

General Methods

- An employee engaging in work with hazardous, caustic, explosive, or pyrophoric materials should never work alone. Use the buddy system when performing highly hazardous reactions or procedures.
- Every chemical storage container including temporary containers (e.g. beakers, flasks) must be properly labeled to identify its contents and hazards. The chemical name should be written out. Chemical formulas should not be used on labels.
- Novel chemicals must be labeled with the name of the producing chemist.
- Unknowns used in teaching laboratories must have an identification key stored with them. A hazardous materials label must describe the most toxic of the unknowns.
- If the hazards of a chemical are unknown, the container should have a label indicating that it is “undergoing evaluation.”
- Hazardous wastes held in containers in Laboratory Satellite Accumulation Areas must also include the date accumulation began, and the approximate amount of each compound of the waste.
- Waste Containers must be capped when not in use and at the end of the work period.
- Return flammables and other hazardous chemicals to their proper storage at the end of each workday.
- Provide appropriate warnings about experiments in process and restrict laboratory entry to authorized personnel only.
- The Laboratory Supervisor should provide signage and guidelines for any unattended, overnight, or weekend process. A response procedure should be established prior to beginning the work. Signage should include the name

- and phone number of the person(s) conducting the unattended procedure.
- Consult the necessary reference materials (including SDSs) about potential chemical hazards. Pre-plan appropriate protective procedures, equipment usage and process design before beginning any new operation. Leave the laboratory lights on and provide for containment of toxic substances in the event of a failure of a utility service (such as cooling water) in an unattended operation.
 - Dispose of broken glass or contaminated glass in appropriate containers.
 - Containers for broken glass should be labeled “Broken Glass Disposal”.
 - Hypodermic needles and syringes must be disposed of in rigid red plastic biohazard “sharps” receptacles. Needles and syringes contaminated with hazardous chemicals must be disposed of in a sharps receptacle to which a proper chemical hazardous waste label has been affixed. Biohazard sign must be covered.
 - Keep the work area neat and uncluttered. Clean up the work area after the completion of an experiment or procedure, or at the end of the day if feasible.
 - Use care when handling and working with glassware to avoid breakage. Do not use damaged glassware. Shield or wrap evacuated glassware, where feasible, to protect against injury from implosion.
 - Validate the integrity of partial containers of ether and other peroxide formers prior to use. Make a record of the date for any storage container of a peroxide former when it is received and **when it is first opened**.
 - When chemicals are hand-carried from the stockroom to the laboratory, they should be placed in a secondary container or bucket.
 - Use secondary containment, such as a Pyrex or rubber tray for procedures involving particularly hazardous materials.
 - Inspect glassware for cleanliness prior to use to prevent cross-contamination and/or mixture of incompatibles.

Personal Exposure Minimization

- Do not smell or waft chemical containers.
- Avoid eating, drinking, smoking, chewing gum, or applying cosmetics or lip balm in areas where laboratory chemicals are present. Decontaminate by washing your hands, and then exit the lab before conducting these activities.
- Consumption of food or beverages in the laboratory, preparation rooms, or chemical storage areas is prohibited. Laboratory refrigerators designated for chemicals and raw materials storage, glassware, and utensils are not to be used to hold or store food or beverages.
- Avoid skin contact with chemicals.
- Wash areas of exposed skin thoroughly before leaving the laboratory, even when gloves have been worn.

- Avoid practical jokes or other behavior that might confuse, startle, or distract another worker.
- Do not pipette or start a siphon by mouth. Confine long hair and loose clothing.
- Footwear must be worn while in the laboratory, and in buildings where chemicals are in use or transported. Sandals, open-toed, open-heeled, and perforated shoes are prohibited in the laboratory.
- Appropriate attire must be worn in the laboratory. Shirt must cover abdomen. Halter tops and tank tops are not allowed. Shorts and skirts must cover the thigh. Leggings are not appropriate lab wear and may increase risk of injury in the event of a spill due to close skin contact. Long pants are recommended and *must* be worn when working with highly toxic, highly flammable, or pyrophoric materials.
- Wear appropriate eye protection (goggles, safety glasses, face shields, etc.) when working in settings where chemical hazards exist.
- Fume hood sash must be kept at the lowest level at which procedure can be performed.
- Work in fume hood should be conducted at least six inches from the front.

Personal Protective Equipment

All PPE must be approved for use by the National Institute for Occupational Safety and Health (NIOSH), and meet the applicable American National Standards Institute (ANSI) requirements regarding exposure limits. The need for PPE must be reviewed and specified prior to beginning any chemical handling procedure. Safety glasses and chemical splash goggles must meet ANSI Z87.1 requirements. PPE must be used where engineering controls are unable to provide the required level of safety. PPE must be provided to employees and maintained by the employer. PPE for visitors is available from the Stock Room on the 2nd floor of Norris Hall.

CAUTION: The compatibility of the PPE materials with the chemical hazards to be encountered must be evaluated prior to selecting the protective equipment.

Refer to the PPE manufacturers' specifications and the SDS for the chemical to verify proper use application.

- Employees are required to wear gloves when there is the potential for direct skin contact with hazardous chemicals, blood, or infectious materials.
- Occidental provides and maintains flame-resistant lab coats for its employees. Lab coats are to be worn only in laboratory areas and should be buttoned to protect the employees' clothing from contamination.
- All PPE and contaminated lab wear must be removed immediately upon

leaving the laboratory areas and placed in designated control areas to minimize the potential for cross contamination or personal exposure.

- Remove and replace lab coat upon significant contamination.
- Lab coats contaminated with acute toxins or carcinogens must be disposed of as hazardous waste.
- Do not wear lab coats or gloves into “clean” areas such as restrooms, offices, or where food is consumed.
- Safety glasses or chemical splash goggles must be worn while working in areas where chemicals are in use or chemical hazards exist. Visitors and maintenance workers must also wear safety glasses in these areas.
- Face shields and/or blast shields may be used in addition to safety glasses or goggles.
- Employees are not permitted to wear respirators without first consulting the CHO.

Engineering Controls – Fume Hoods

Engineering controls are methods that are built into the design of the laboratory to minimize hazards. Fume hoods are critical engineering controls in the laboratory. Procedures for the use and maintenance of fume hoods are described below.

- Chemical fume hoods are to be used where feasible to minimize exposure of employees to emissions from flammable, volatile, toxic, or malodorous chemical processes. Fume hoods provide barrier protection from physical hazards such as fires, explosions, etc. Fume hoods must comply with CCR title 8 Section 5154, *Ventilation Requirements for Laboratory Type Hood Operations*.
- Each fume hood is to be inspected and certified annually for proper face velocity and the hood’s doorframe marked at maximum opening for the required face velocity, per standards set forth by the ANSI and the American Society for Heating, Refrigerant, and Air-Conditioning Engineers (ASHRAE). In process use is to be verified by an in-place gauge, calibrated in feet per minute (fpm) that can be easily read by the operator/scientist during the use of the fume hood.
- Laboratory fume hoods shall be labeled as to their fpm rating, date of last inspection, and any special use approvals (e.g. perchloric acid, carcinogens, or radioisotopes).

- All materials and apparatus must be at least 6 inches from face of fume hood. Work in the fume hood should be conducted 6 inches from the plane of the hood face.
- Keep hood sash at lowest possible level for performance of work, keeping glass between worker and chemical source. View work through the glass.
- Do not lean in to the hood so that head passes the plane of the hood face.
- Do not use fume hood for storage of chemicals or equipment.
- Keep baffle slots free from obstruction.
- Avoid rapid or sudden movements outside of hood as this may cause air turbulence sufficient enough to draw contaminated air from the hood.
- Keep hood sash closed when not in use.

Warning: Where perchloric acid is heated above ambient temperature, process vapors should be scrubbed or trapped prior to exhausting to the hood. Un-captured perchloric acid vapors can condense in fume hoods and duct work to form explosive perchlorates.

- Perchloric acid hoods should be washed down after each use and the final rinsate inspected using a 0.4% (v/v) solution of methylene blue in water. (For example, a violet precipitate will form in the presence of perchlorates when a few drops of methylene blue solution are added to about 25 mL of rinsate.)
- Evacuated systems capable of imploding and resulting in significant quantities of glass fragments or other flying debris must be protected using a cage, a shield, or other appropriate solid barrier. Smaller systems may be wrapped in tape/foil.
- Centralized vacuum systems must be inspected annually and should be protected from contamination using appropriate process equipment.
- Environmental rooms have re-circulated atmospheres. Precautions must be taken to prevent the release of toxic substances into the air in these areas.

Safety Devices

- Emergency eyewash stations and safety showers must be activated to flush the lines and tested to verify proper operation.
- Fire Extinguishers must be inspected monthly and tested annually.
- The chemical Stock Room and bulk storage rooms have been evaluated for safe chemical storage.
- Chemical Hygiene-related equipment shall be recommended by the CHO and/or EHS, in conjunction with faculty needs.

Administrative Controls

Administrative controls are procedural and policy measures to be taken in order to reduce or eliminate hazards. Administrative controls may include development of

standard operating procedures (SOPs), training requirements, and institutional policy regarding chemical use. SOPs are stored on the department's Google Drive site.

Personal Monitoring & Environmental Surveillance

Laboratory Supervisors are responsible for safety within their labs. Potentially hazardous chemical processes and/or procedures should be reviewed by the CHO for approval prior to implementation. Personal monitoring is conducted to determine exposure levels or for the need for medical consultation, examination and/or surveillance.

Occidental shall measure personnel exposure to any chemical regulated by a standard which requires monitoring or if there is reason to believe that exposure levels for that substance may exceed the Cal/OSHA action level (AL) or permissible exposure limit (PEL). The PEL is a Cal/OSHA-enforced legal standard. PELs for a given chemical are a concentration level of exposure determined to be safe for most workers. PELs are based on a time-weighted average (TWA) over an eight-hour work day and 40-hour work week for a lifetime of work.

Examples where personal monitoring may be conducted include when (1) chemicals are not used in a fume hood and/or (2) personnel develop signs or symptoms associated with **exposure to** hazardous chemicals.

- If the AL or PEL is exceeded during the initial monitoring, personal monitoring will be repeated per the relevant regulatory standards or consensus guidelines.
- Monitoring may be terminated in accordance with relevant regulatory standards or consensus guidelines.
- Monitoring results will be provided to personnel per the time requirements of the relevant regulation or within 15 days of the CHO's receipt of monitoring results.

Where exposure monitoring reveals an exposure above the AL or the PEL for a Cal/OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance will be established as prescribed therein.

Medical Surveillance & Overexposure

All staff, faculty, and students working with hazardous chemicals will be provided with the opportunity to have a medical examination, and a follow-up examination, if necessary, under any of the following circumstances:

- Development of signs or symptoms of overexposure associated with the chemicals to which they have been exposed in the laboratory. For specific substances regulated by Cal/OSHA (e.g. carcinogens) where environmental monitoring demonstrates routine exposure above the AL or PEL.
- In the event of an uncontrolled release of a hazardous material where there is a likelihood that the individual may have been overexposed to that hazardous material.

Occidental will provide the following information to the physician in the event of a possible exposure:

- 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 if available, quantitative exposure data.
- A description of the signs and symptoms of exposure.
- A copy of the SDS for the chemical(s) involved.

The physician will provide a written opinion that will not reveal specific findings or diagnosis unrelated to the exposure, but will include:

- Any recommendation for further medical follow-up.
- Results of the medical examination and any associated tests.
- Any medical conditions that may be revealed during the examination that may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace.
- A statement by the physician that the employee has been informed of the consultation/examination results and any medical condition that may require further examination or treatment.

Cleaning

All employees and students are responsible for practicing good chemical hygiene and keeping work areas clean and neat. This includes performing general cleaning in the laboratories, such as wiping down of countertops and fume hood workspaces after each use. As a best practice, laboratory surfaces including floors should be deep-cleaned on an annual basis to reduce chemical build-up.

Chemical Inventory Minimization

The quantities and types of chemicals stored on campus should be minimized to only what is needed and expected to be used. As a best practice, the chemical inventory should be evaluated annually to determine if specific chemicals are no longer needed. Chemicals that

are identified as no longer needed should be removed and donated, recycled, or properly disposed. Contact the CHO for support with removing chemicals that are no longer needed.

Chemical Inventory

An inventory must be maintained listing all chemicals in the laboratory, Stock Room, and bulk storage areas. Chemicals should be listed alphabetically by location according to the most commonly used name. The inventory records should also include the average quantity on hand, the physical state (e.g. solid, liquid, gas) of the material, the NFPA classification, if known, and the manufacturer's name.

Safety Data Sheets

SDSs provide information necessary for the safe handling of chemicals. SDSs should be consulted before working with an unfamiliar chemical. Formatting of SDSs adheres to policy set forth by the Globally Harmonized System (GHS) of classification and labeling of chemicals and CCR title 8 Section 5194, *Hazard Communication*.

SDSs for chemicals on-hand are available to students, faculty and staff. Contact the Stock Room Manager for access.

Designated Area

When working with particularly hazardous chemicals, such as acute toxins, reproductive toxins (mutagens, teratogens) or carcinogens, a designated area shall be established where entry is controlled. This may be a lab, bench, fume hood, or an entire lab. The designated area must be marked with a sign (e.g., "Warning! Reproductive Toxins in Use! No Unauthorized Access!")

Chemical Storage

Proper storage of chemicals and the avoidance of incompatible mixtures present an ongoing safety challenge. Quantities of chemicals should be kept as small as practical. Long-term storage of chemicals on working bench tops or in fume hoods may increase the risk of fires or spills and is discouraged. In addition, long-term routine storage of chemicals in fume hoods should not be permitted as the presence of non-process containers can disrupt the airflow in portions of the hood, which could compromise the performance of the engineering control.

Appropriate laboratory cabinets and special laboratory refrigerators are to be used

for chemicals storage where feasible. Flammable liquids may be stored in flammable storage cabinets or the Flammables bulk storage area, safety cans with flame-arrested, spring-loaded spouts, or specially designed refrigerators. Safety cans should be used for transporting flammable liquids in bulk. Flammables requiring refrigeration must be stored in flame-proof refrigerators built for that purpose.

Toxic chemicals (including but not limited to carcinogens, teratogens, mutagens or poisons) should be stored in access-controlled areas. Whenever possible these materials should be held in break resistant, chemically resistant secondary containers. All chemical storage containers must be appropriately labeled as to their content and hazards.

Gas Cylinder Handling

Compressed gas cylinders must be stored, handled, and used as outlined in CCR Title 8 Section 4650 *Storage, Handling, and Use of Cylinders*. Cylinders of compressed gases, whether empty or full, are required to be stored upright and tightly strapped or chained to a wall or bench top by a noncombustible system to prevent tipping. The valve stem must be capped when not in use so as to assure stability of the cylinder and prevent accidental damage to the tank and valve assembly. Cylinders must be strapped onto cylinder carts for transporting.

Cryogenics

Cryogenics are defined as materials with extremely low boiling points (at or below -150 °C, for example). Cryogenic materials include liquid nitrogen, liquid helium, liquid oxygen, and dry ice. They have a high-volume expansion in liquid to gas phase, thus having the potential to displace oxygen. Cryogenics hazards include skin burn, frostbite, and asphyxiation due to oxygen deficient atmosphere. Special precautions must be taken when working with cryogenics. Contact the CHO or your Lab Supervisor before working with cryogenics.

Labeling

All chemical containers that are stored or shipped must be properly labeled. Labels must not be removed or defaced. For the purposes of storage, “properly labeled”, means the label must state:

- The identity of the chemical.
- GHS pictogram.
- Signal word (Danger, or Warning).
- Hazard statements.
- Precautionary statements.

- The name and address off the chemical manufacturer.
- For laboratory prepped solutions, include the name of preparer and date of preparation.
- Any container that is left out of the immediate control of the user must include the full chemical name, (not in formula), and its hazards if any. This requirement applies to containers of water as well.

Particularly Hazardous Substances

The OSHA Laboratory Standard requires that special handling procedures be implemented for certain chemicals identified as “particularly hazardous substances.” Particularly hazardous substances include chemicals that are “select” carcinogens, reproductive toxins, and chemicals that have a high degree of acute toxicity. In addition, many chemicals used (including synthesized) in research laboratories have not been tested explicitly for carcinogenic or toxic properties and should therefore be handled as “particularly hazardous substances” since the hazards are unknown.

Select Carcinogens are substances that are either known to cause cancer in humans or animals, or are suspected of causing cancer in humans. These materials include substances that:

- Cal/OSHA regulates as a carcinogen.
- The National Toxicology Program (NTP) lists as “known to be a carcinogen” or “reasonably anticipated to be a carcinogen” in their Annual Report on Carcinogens.
- The International Agency for Research on Cancer (IARC) lists under Group 1 “carcinogenic to humans”, Group 2A “probably carcinogenic to humans”, or Group 2B “possibly carcinogenic to humans”.

Regulated Carcinogens refer to carcinogens that are regulated by Cal/OSHA and are a subset of Select Carcinogens. There are additional requirements that shall be observed for laboratories that handle Cal/OSHA Regulated Carcinogens listed below. Pursuant to Title 8 CCR title 5200-5220, requirements may include SOP training, establishment of a designated area, and exposure monitoring. Contact the CHO for support prior to working with Regulated Carcinogens.

Carcinogens Subject to Title 8 CCR 5209
<https://www.dir.ca.gov/title8/5209.html>

2-Acetylaminofluorene	4-Nitrobiphenyl
4-Aminodiphenyl	N-Nitrosodimethylamine
Benzidine (and its salts)	beta-Propiolactone
3,3'-Dichlorobenzidine (and its salts)	bis-Chloromethyl ether
4-Dimethylaminoazobenzene	Methyl chloromethyl ether
alpha-Naphthylamine	Ethyleneimine
beta-Naphthylamine	

Carcinogens Subject to Title 8 CCR 5200-5220
(<https://www.dir.ca.gov/title8/sb7g16a110.html>)

Acrylonitrile	Ethylene Oxide
Arsenic, Inorganic	Ethylene Dibromide
Benzene	Formaldehyde
1,3-Butadiene	Lead
Cadmium	Methylene Chloride
Chromium (VI)	4,4-Methylenebis(2-chloroaniline)
Coke Oven Emissions	Methylenedianiline
1,2 Dibromo-3-Chloropropane	Vinyl Chloride
Asbestos	
Beryllium	

Occupational **S**afety and **H**ealth **A**dministration (**OSHA**, US Department of Labor)

<https://www.osha.gov/dsg/hazcom/index.html>

Reproductive/Developmental Toxins are substances that cause chromosomal damage or genetic alterations (mutagens) or substances with lethal or teratogenic effects (malformations or physical defects) in a developing fetus or embryo. Reproductive toxins also include chemicals that affect the fertility of males and/or females.

Acutely Toxic Chemicals are chemicals which can cause a harmful effect after a single exposure. Acutely toxic chemicals can cause local toxic effects, systemic effects, or both. In general, acutely toxic chemicals have an oral LD50 of <50 mg (rats, per kg), skin contact LD50 <200 mg (rabbits, per kg), inhalation LC50 of <200 (rats, ppm for 1 hr) or, <2000 (rats, mg/m³ for 1 hr).

In general, environmental and personal monitoring shall be conducted to determine in process and use baseline levels for regulated carcinogens and acute toxins. Situations where the process, experiment, or research can be expected to result in exposures below the AL, which is calculated as an eight-hour TWA, will not require additional monitoring unless there are material changes in the laboratory protocols, Records should be maintained which describe the amount and context of use.

Contact the CHO prior to working with particularly hazardous substances for evaluation and guidance.

Hazardous Waste: Storage & Disposal

Laboratory Satellite Waste Accumulation

Hazardous waste is a waste with properties that make it potentially dangerous or harmful to human health or the environment. Hazardous waste is defined by the Resource, Conservation, and Recovery Act of 1976 (RCRA) and enforced by the Environmental Protection Agency and the California Department of Toxic Substance Control. Hazardous waste is defined as having one of the following characteristics: **ignitable, corrosive, toxic, or reactive**. RCRA also specifically lists certain chemicals that must be disposed of as hazardous waste.

Laboratories may accumulate hazardous wastes in satellite accumulation area provided the following criteria are met:

- Waste containers must be appropriately labeled. Labels must include the words "hazardous waste." If a mixture of compatibles, each container must also have a method for recording each material as it is introduced, its associated hazard(s), and the approximate quantity. Labels are available from the Chemistry Department Stockroom.
- The initial date that hazardous waste is placed in the container must be

clearly marked and visible.

- Establish protocols to prevent the accidental mixing of incompatible chemical wastes.
- Hazardous waste must be stored in secondary containment. Containers must be capped and free of drips.
- May not accumulate more than 55 gallons of a hazardous waste or more than one quart of any single extremely or acutely hazardous waste.
- The maximum accumulation time, for the satellite accumulation areas even if quantity limits are not reached is one year. Contact EHS at (323) 717-0725 to arrange for waste to be transported from your lab to the main waste accumulation area. EHS will coordinate with a licensed hazardous waste contractor to pick up the waste from the main accumulation area within 180 days.
- The waste accumulation area is managed and under the direct control of “one or more designated personnel who have received training commensurate with their responsibilities and authority for managing laboratory hazardous wastes...” (California Health & Safety Code, section 25200.3.1). This training is also required for unsupervised access to the hazardous waste area within a lab. Contact the CHO regarding Hazardous Waste Training.
- Storage space is adequate for the quantities and types of wastes present.
- Waste that is contaminated with both biological and chemical hazards must be disposed as chemical hazardous waste.

Laboratory hazardous waste that is properly labelled and inventoried will be picked up by EHS and transported to the main hazardous waste storage area located in NC 116. EHS will coordinate with a licensed vendor to pick up waste for removal and disposal within 180 days from when it arrives in the main storage area.

IMPORTANT: When stock chemicals are no longer needed and are “designated” as waste, removal must occur within 180 days. Laboratories are encouraged to inquire if a raw material may have value within another laboratory area on campus prior to designating the unneeded material a hazardous waste. Chemicals with damaged, unlabeled, mislabeled, or do not contain adequate hazard warnings must also be considered hazardous waste. Chemicals that are identified as hazardous waste will be labeled and transported by the CHO or EHS Manager from the lab or stockroom to the main hazardous waste storage area for vendor pick up and disposal within 180 days.

Disposal

All disposal of hazardous, regulated, and bio-hazardous waste is to be handled by commercial haulers and Treatment, Storage, and Disposal Facilities (TSDFs) licensed by the State of California and/or other appropriate regulatory agency. In

general, hazardous waste may not be disposed of in unregulated trash bins or released in to the sanitary sewer system via laboratory sinks.

Sharps

Sharps are defined as any device having acute rigid corners, edges, or protuberances capable of cutting or piercing, including but not limited to hypodermic needles, broken glass items such as Pasteur pipets and vials, and plastic pipet tips. Sharps must be placed in a rigid puncture resistant container that when sealed is leak resistant and cannot be reopened without great difficulty.

Sharps disposal containers in which the contents are contaminated with hazardous chemicals must be properly labeled as hazardous waste.

Prior Approval

Laboratory personnel shall obtain written approval from the Lab Supervisor prior to working with the following restricted chemicals.

- Toxic gases including carbon monoxide, diazomethane, hydrogen cyanide, hydrogen fluoride (anhydrous), nickel carbonyl
- Dimethylmercury

Inspections

Laboratory inspections are an essential function to identify and address potential health and safety deficiencies and to fulfill regulatory compliance requirements.

Laboratories will be periodically inspected by the CHO accompanied by the Lab Supervisor. Findings from the inspections will be communicated to the appropriate parties for corrective action.

Training

Training is a necessary and important part of the Chemical Hygiene Plan. The following trainings are required for Occidental employees and students.

General Lab Safety Training

All employees who work with or who may be exposed to hazardous chemicals

receive General Lab Safety Training at the time of initial assignment. The training will be performed by the CHO, EHS Manager, or Lab Supervisor and will cover the following topics:

- The details of this Chemical Hygiene Plan.
- Contents of Title 8 CCR Section 5191, *Occupational Exposure to Hazardous Chemicals in the Laboratory*, (The Lab Standard).
- Laboratory safety procedures.
- Hazard communication including routes and symptoms of chemical exposure.
- Explanation of SDSs and where to locate them.
- Identification of personal protective clothing and PPE requirements.
- Proper use of PPE.
- Proper use of fume hoods.
- Personal and environmental monitoring requirements.
- General first aid for chemical exposure including the use of safety equipment and evacuation procedures.
- Spill cleanup procedures.
- Hazardous waste collection and disposal procedures.

Students taking courses that involve working in the labs will also be provided with general safety training prior to working in the laboratory. This training may be provided by the CHO, EHS Manager, or Lab Supervisor.

All Facilities employees who enter the lab to perform cleaning must also be provided with general lab safety training.

Lab-specific Training

General Lab Safety Training is not all-encompassing. In labs where Particularly Hazardous Substances are in use, high-hazard research is being conducted, or specialized equipment is in use, Lab-specific Training may be warranted. Lab-specific Training is provided by the Lab Supervisor and may consist of:

- Instructions on specialized safety equipment in the lab and where it is located.
- Lab-specific emergency procedures.
- Safety procedures for high-hazard experiments.
- Instructions on instruments such as the automated liquid chromatography system (Teledyne ISCO CombiFlash) which has the potential to release volatile organic compounds.
- Information about particularly hazardous substances used in the lab.
- Lab-specific or experiment-specific SOPs.

All training must be documented with the following information:

- Subject matter of the training or name of the training
- Name of the person receiving the training
- Date of the training
- Name of the person providing the training

SOP training is documented when the trainee electronically signs off on the SOP through the Occidental Google Drive system.

Recordkeeping

The following records are maintained:

- Personal monitoring records are maintained according to the requirements of Title 8 CCR by the EHS Manager.
- Environmental monitoring records are maintained by Facilities or EHS.
- The CHO and/or the EHS Manager conducts accident investigations and maintains records of the investigations.
- Training records are maintained by the CHO and Lab Supervisors and signed SOPs are maintained on the Occidental Google Drive system.
- All medical surveillance records are kept, transferred, and made available in accordance with 8 CCR 3204.
- Periodic laboratory inspection records are maintained by the CHO.
- Hazardous Waste Accumulation Area inspections are maintained by EHS.
- Emergency shower, eye wash station, fume hood, and fire extinguisher checks are documented on tags or labels affixed to the equipment. Additional performance testing records for safety equipment is maintained by EHS.

