

SCHOOL OF LIFE SCIENCES AND TECHNOLOGIES

Chemical Hygiene Program

Updated June 2018

A. PURPOSE

1. The Chemical Hygiene Program (CHP) sets forth policies, procedures, equipment, personal protective equipment, and work practices that are capable of protecting employees and students from the health hazards presented by hazardous chemicals used in laboratories.

B. SCOPE

1. This CHP applies to our Biology and Health Science Laboratories where employees work with substances in which the containers used for reactions, transfers, and other handling of substances *are* easily and safely manipulated by one person. The objective of this program is to provide guidance to all laboratory personnel who use chemicals, so that they can perform their work safely.
2. Laboratory Employees
 - Each individual working in a laboratory should be informed about hazards associated with that laboratory and its specific work. This includes all faculty, staff, students, and assistants.
3. Support Personnel
 - Storeroom, janitorial, maintenance, and delivery personnel may be exposed to potential physical and chemical hazards from work carried out in the laboratory. They must be informed about the risks involved and trained how to avoid potential hazards.

C. RESPONSIBILITIES

1. Chemical Hygiene Officer

Dr. Diana Hurlbut will provide continued direction for the Chemical Hygiene Program.

- Dr. Hurlbut shall:
 - Work with administrators and other faculty and staff to develop and implement acceptable, appropriate chemical hygiene policies and practices.
 - Monitor procurement and use of chemicals in the lab; determining that laboratory facilities and training levels are adequate for chemicals in use.
 - Perform regular, formal chemical hygiene and housekeeping inspections that include inspections of emergency equipment.
 - Maintain a current chemical inventory of science chemicals present within the MSE Division.
 - Review and improve the Chemical Hygiene Program on, at a minimum, an annual basis.
 - Maintain overall responsibility for the safe operation of the Biology and Health Science Laboratories.
 - Ensure that employees and students know and follow chemical hygiene rules.
 - Determine the proper level of personal protective equipment; ensure that such protective equipment is available and in working order.
 - Ensure that the appropriate training has been provided to employees.
 - Monitor the waste disposal program.

2. Supervisors/Instructors
 - The supervisor is directly responsible for chemical hygiene in the laboratory. The supervisor/instructor is required to ensure that provisions of the CHP are being followed in the laboratory.
3. Students
 - Responsible for planning and conducting each operation in accordance with prescribed chemical hygiene procedures.

D. STANDARD OPERATING PROCEDURES FOR LABORATORY CHEMICALS

1. Chemical Procurement
 - The decision to procure a chemical shall be completed by the Senior Lab Tech/Supervisor in each department; they will ensure a commitment to the safe handling and use of the chemical from initial receipt to ultimate disposal.
 - Irvine Valley College policy is to aggressively and continually evaluate current inventory and properly dispose of unnecessary materials.
 - Requests for procurement of new chemicals shall be submitted to the appropriate administrator for approval.
 - The appropriate Senior Lab Technician/Supervisor, prior to procurement of a chemical, shall identify information on proper handling, storage, and disposal. If upon investigation, the chemical is extremely hazardous (e.g., mutagenic, carcinogenic, teratogenic), extremely flammable and/or explosive, or difficult to dispose of, the appropriate administrator shall not approve procurement.
 - Chemicals used in the laboratory shall be appropriate for the ventilation system.
 - All chemicals must be received in the Biological Sciences prep areas. Personnel who receive chemical shipments shall be knowledgeable of the proper procedures for receipt.
 - Chemical containers shall not be accepted without accompanying labels, safety data sheets (SDSs/website for hazardous material look-up: <http://hazard.com/msds/>), and packaging in accordance with College policy. All chemical shipments should be dated when received and opened.
2. Chemical Storage
 - Received chemicals shall be immediately moved to the designated Chemical Storage area by one of the Senior Lab Technicians. Large glass containers shall either remain in their original shipping container or be placed in carrying containers (e.g., rubber "boots") during transportation.
 - The storage area shall be well illuminated, with storage maintained at or below eye level.
 - Flammables will be stowed in the designated flammable storage cabinets in lab prep areas.
 - Chemicals must be segregated by hazard classification and compatibility in a well-identified area, with good, general exhaust ventilation.
 - Mineral acids should be segregated from flammable and combustible materials. Separation is defined by NFPA 49 as storage within the same fire area but separated by as much space as practical or by intervening storage from incompatible materials.
 - Nitric acid will be stored in an acid cabinet. Acid resistant trays shall be placed under bottles of mineral acids.
 - Acid sensitive materials, such as cyanides and sulfides, shall be separated from acids or protected from contact with acids and water.

- Highly toxic chemicals or other chemicals, whose containers have been compromised, shall be stored in unbreakable secondary containers.
- The storage area shall NOT be used as a preparation or repackaging area. The storage area shall be accessible during normal working hours. The storage area is under the control of the Biology Department.
- The amount of chemicals at the lab bench shall be as small as practical.
- Stored chemicals shall be examined at least annually by the appropriate technical staff for container integrity and/or deterioration. The inspection should determine whether any corrosion, deterioration, or damage has occurred to the storage facility as a result of leaking chemicals.
- The appropriate technical staff shall conduct periodic inventories of chemicals outside the storage area. Unneeded items shall be properly discarded or returned to the storage area.

3. Chemical Handling

- Each laboratory employee/student (with the training, education, and resources provided by college personnel) shall develop work habits consistent with requirements of Irvine Valley College's CHP to minimize potential personal and coworker exposure to chemicals. Based on the realization that all chemicals inherently present hazards in certain conditions, exposure to all chemicals shall be minimized.

4. General precautions that shall be followed for the handling and use of all chemicals are:

- Skin contact with chemicals shall be avoided at all times.
- Employees shall wash all areas of exposed skin prior to leaving the laboratory. Hand soap or washing solution is provided at each sink.
- Mouth suction for pipetting or starting a siphon is prohibited.
- Eating, drinking, smoking, chewing gum, or application of cosmetics in the laboratory is prohibited.
- Storage of food or beverages is not allowed in storage areas or refrigerators used for laboratory operations.
- Determination of risks shall be conservative in nature.
- Any chemical mixture shall be assumed to be as toxic as its most toxic component.
- Substances of unknown toxicity shall be assumed to be toxic.
- Laboratory employees and students shall be familiar with the symptoms of exposure for the chemicals with which they are working, and take the precautions necessary to prevent exposure.
- All laboratory employees and students shall adhere to the CHP.
- In all cases of chemical exposure, neither the Permissible Exposure Limits (PEL's) of OSHA, nor the Threshold Limit Values (TLV's) of the American Conference of Governmental Industrial Hygienists (ACGIH) shall be exceeded.
- Engineering controls and safety equipment in the laboratory shall be utilized and inspected in accordance with guidelines established in the CHP.
- The appropriate technical staff shall maintain an inspection log that documents eyewash and safety shower functions.
- Specific precautions based on the toxicological characteristics of individual chemicals shall be implemented as deemed necessary by the CHP.

5. Laboratory Equipment and Glassware
 - Each employee and student shall keep the work area clean and uncluttered. All chemicals and equipment shall be properly labeled, in accordance with MSE Division CHP guidelines.
 - At the completion of each workday or operation, the work area shall be thoroughly cleaned and all equipment cleaned and put away.
6. The following procedures shall apply to the use of laboratory equipment:
 - All laboratory equipment will be used only for its intended purpose.
 - All glassware will be handled and stored with care to minimize breakage; all broken glassware will be immediately disposed of in the broken glass container.
 - All evacuated glass apparatus shall be shielded to contain chemicals and glass fragments should implosion occur.
 - Labels shall be attached to all chemical containers, identifying the contents and related hazards.
 - Waste receptacles shall be labeled as such.
 - All laboratory equipment shall be inspected on a periodic basis and replaced or repaired as necessary.
7. Personal Protective Equipment
 - Safety glasses, meeting ANSI Z87.1, are required for employees and visitors to the Biology and Health Science laboratories when chemicals are being used or manipulated in the laboratory.
 - The wearing of contact lenses in the laboratory is discouraged.
 - Chemical goggles and/or a full-face shield shall be worn during chemical transfer and handling operations as procedures dictate.
 - Appropriate chemical-resistant gloves shall be worn at all times when there exists the potential for skin contact with chemicals.
 - Used gloves shall be inspected and if damaged or contaminated, will be immediately replaced.
 - Thermal resistant gloves shall be worn for operations involving the handling of heated materials and exothermic reaction vessels. Thermal resistant gloves shall be non-asbestos and shall be replaced when damaged or deteriorated.
 - Respirator usage shall comply with OSHA Respirator Protection Standard, 29 CFR 1910.134, and the MSE Division's Respirator Protection Program.
8. Personal Work Practices
 - Laboratory supervision must ensure that each student knows and follows laboratory-specific rules and procedures established by this plan.
 - All employees and students shall remain vigilant to unsafe practices and conditions in the laboratory and shall immediately report such practices and/or conditions to the laboratory supervisor. The Supervisor/Instructor must PROMPTLY correct unsafe practices or conditions.
 - Long hair or loose-fitting clothing shall be confined close to the body to avoid contact with chemicals or being caught in moving machine/equipment parts.
 - Use only those chemicals appropriate for the ventilation system.
 - Avoid unnecessary exposure to all chemicals by any route.

- Do not smell or taste any chemicals.
- Encourage safe work practices in coworkers by setting the proper example. Horseplay is strictly forbidden.
- Seek information and advice from knowledgeable persons regarding Standards and Codes about hazards present in the laboratory; plan operations, equipment, and protective measures accordingly.
- Use engineering controls in accordance with CHP procedures.
- Inspect personal protective equipment prior to use, and wear appropriate protective equipment as procedures dictate and when necessary to avoid exposure.

9. Labeling

- All containers in the laboratory shall be labeled. This includes chemical containers and waste containers. The labels shall be informative and durable, and at a minimum, will identify contents, source, date of acquisition, and indication of hazard.
- Portable containers shall be labeled by the person using the container. Exemptions for labeling requirements are made for chemical transfers from a labeled container into a container that is intended only for the immediate use of the employee.
- The labeling program shall be periodically inspected by the appropriate technical staff to ensure that labels have not been defaced or removed.

E. CRITERIA FOR IMPLEMENTATION OF CONTROL MEASURES

1. When to use fume hoods:

- Hoods should be used **WHENEVER POSSIBLE** to contain and exhaust toxic, offensive, or flammable materials. Processes that have the potential for generating hazardous, airborne chemical concentrations should be carried out within the fume hood.

2. When to use safety shields or other containment devices:

- Safety shields must be used where the possibility exists for laboratory scale detonation. Protective devices, such as long- and short-handled tongs for holding or manipulating hazardous items should be used **WHENEVER POSSIBLE**.

3. When to use personal protective equipment:

- Eye Protection – Safety goggles or laboratory splash glasses must be worn by all personnel in the laboratory whenever hazardous chemicals are in use. **NO EXCEPTIONS.**
- Gloves – Gloves should be worn to protect the skin from chemical and physical (e.g. heat, cold) exposures. Soiled or damaged gloves should be decontaminated and disposed of properly.
- Respirators – Respirator protection may be necessary to maintain chemical exposure below OSHA's PEL. Respirators will be provided, if necessary.

4. When to institute special work practices:

- The Supervisor/Instructor must approve special work practices. If particularly hazardous chemicals are to be used (e.g. carcinogens, reproductive toxins, teratogens, or acutely toxic chemicals), specific work practices and work locations must be designated.

F. FUME HOOD MANAGEMENT

1. Frequency and type of monitoring
 - All local exhaust hoods used for primary containment control will be monitored for adequate airflow on a semi-annual schedule. The survey will be completed with a calibrated velometer.
2. Acceptable operating range
 - MEI recommended minimum face velocities of at least 100 linear fpm must be maintained for each hood. If the face velocity does not meet this minimum, maintenance personnel must be contacted to repair or upgrade the hood.
3. Maintenance schedule
 - Maintenance of local exhausts or fume hoods will be completed on an "as needed" basis, or annually, whichever comes first. Results will be documented and included in the CHP binder.

G. EMPLOYEE INFORMATION AND TRAINING

1. Information
 - A copy of 29 CFR 1910.1450 can be found in the Standard Section of the compliance manual.
 - The THRESHOLD LIMIT VALUES published by the American Conference of Governmental Industrial Hygienists can be found in the Documentation Section of the compliance manual. Recommended exposure limits for other hazardous chemicals, information on signs and symptoms associated with exposures to hazardous chemicals, material safety data sheets, and other information on the hazards, safe handling, storage, and disposal of hazardous chemicals can be found in the compliance manual.
 - A list of OSHA health hazard definitions and lists of select carcinogens, reproductive toxins, and high acute toxicity materials are included in the Documentation Section of the compliance manual.
2. Training
 - Employees will be provided with training to ensure that they are apprised of the hazards of chemicals present in their work areas. Such training will be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. Refresher training will be provided annually.
 - Employee training will include:
 - Methods and observations that may be used to detect the presence or release of a hazardous chemical.
 - The physical and health hazards of chemicals in the work area.
 - The measures employees can take to protect themselves from these hazards.
 - The applicable details of the Chemical Hygiene Program.
 - Students will receive safety training in conjunction with the course curriculum, as provided by the instructor.
 - The MSE Division and/or Keenan & Associates will manage training documentation. Documentation of training should be filed in the Training Section of the compliance manual.

H. REQUIRED APPROVALS

- Certain laboratory procedures, which present serious health hazards upon exposure, require prior approval of the appropriate department supervisor before work may begin.
- Prior approval is required before working with the following carcinogens, teratogens, or mutagens.

Lead Nitrate
Methylene Chloride
Nickel
Formaldehyde
Chromium Metal
Phenolphthalein
Toluene

Note: Some chemicals within this category are stored in the chemical storage area, but are NOT currently used in any experiments.

I. MEDICAL CONSULTATION AND EXAMINATION

1. An employee who works with hazardous chemicals and/or:
 - Develops symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory.
 - Works where exposure monitoring reveals an exposure level routinely above the OSHA action level or, in the absence of a designated action level, exposure above the OSHA Permissible Exposure Limit (PEL), (as published in 29 CFR 1910.1000, 1990) for OSHA regulated substances for which there are medical monitoring and medical surveillance requirements. Chemicals that fall within this category are:
 - Asbestos
 - Acrylonitrile
 - Benzene
 - Carbon Tetrachloride
 - Coke Oven Emissions
 - Cotton Dust
 - Ethylene Oxide
 - Formaldehyde
 - Inorganic Arsenic
 - Lead
 - Vinyl Chloride
 - 1,2-Dibromo-3-Chloropropane
 - 2-Aminonaphthalene
 - Is exposed to a hazardous chemical during a spill, leak, explosion, or other occurrence resulting in exposure, said employee is entitled to medical attention including an examination and follow-up exams as deemed necessary by the medical center physician listed on the “District’s Protocol for Injuries.” An examination is provided without cost to the employee, without loss of pay, and conducted at a reasonable time and place.

2. Procedures to secure medical consultation and examination are as follows:
 - Report exposure to the Chemical Hygiene Officer and the immediate supervisor
 - Seek medical care at the medical center listed on the District's Protocol for Injuries.
 - The employer will provide the following information to the physician:
 - Identity of hazardous chemical.
 - Description of conditions under which exposure occurred.
 - Description of signs and symptoms employee is experiencing.
 - A written opinion from the physician shall be provided to the employer including:
 - Recommendation for further medical follow-up.
 - Results of medical exam and tests.
 - Any medical condition revealed during the exam that places the employee at increased risk.
 - A statement that the employee has been informed by the physician of the results of the exam and any medical condition that may require further treatment or examination.

J. ADDITIONAL PROTECTION FOR WORKING WITH PARTICULARLY HAZARDOUS SUBSTANCES

1. Specific consideration will be given to:
 - Establishment of a designated area.
 - Use of containment devices such as fume hoods or glove boxes.
 - Procedures for safe removal of contaminated waste.
 - Decontamination procedures.
2. Operating procedures that are at least as protective as those described on pp. 30-56 of *Prudent Practices*, (Procedures for Working with Substances that Pose Hazards Because of Acute Toxicity, Chronic Toxicity, or Corrosiveness), will be used when working with particularly hazardous substances.

K. EMERGENCY RESPONSE/CHEMICAL SPILLS

1. All Science Instructors and Lab Technicians should be familiar with the College Emergency Procedures Action Plan and the Chemical and Hazardous Material Spill Plan. These plans contain emergency telephone numbers and spill response contacts for the college.
2. When chemical spills occur within the laboratory, the following procedures are to be followed to prevent injury or property loss:
 - Provide any first aid (if necessary) to affected person. Use eyewash station and/or safety shower liberally to flush affected areas. MEI recommends that flushing continue for AT LEAST FIFTEEN MINUTES. Exposure to a large part of the body merits ambulatory service.
 - Notify supervisor of spill. If spill is large or extremely hazardous, the Campus Police and/or Maintenance & Operations will be notified. First Aid personnel may require notification.
 - Evacuate students from the area.
 - If spilled materials exhibit flammability, eliminate ignition sources such as hot plates, Bunsen burners, etc.

- Avoid all contact with spilled material. If necessary, use protective gloves, gown, goggles, and/or respirator.
- Obtain supplies from Chemical Spill Clean-Up Kit (located in Biology Prep Rooms).
- Neutralize acids and bases.
- Contain collected materials and label container with name of contents and also as Hazardous Waste.
- Always refer to SDS (website: <http://hazard.com/msds/>) for special precautions or spill cleanup requirements.

3. Liquid Spills

- Confine spill to as small an area as practical.
- For small quantities of acids or bases, use the neutralizing agent from the chemical spill clean-up kit. An absorbent material specially prepared for acid/base spills may also be used.
- For small quantities of other materials, such as organic solvents, utilize an absorbent material to clean up the spill. Examples of absorbent materials are vermiculite, dry sand, paper towels, etc.
- For large quantities of inorganic acids and bases, flush with large amounts of water, preferably toward a containment area or drain. ***CAUTION*** must be taken not to add too much water that would create a flood that may react with water-reactive materials and cause spattering and additional personnel exposure.
- If possible, utilize a mop to pick up as much of the spilled material. An excellent clean-up device is the mop bucket and wringer to collect the liquid.
- Carefully pick up and decontaminate any bottles, broken glass, and/or other containers. Decontaminate over the bucket or pail to collect contaminated wash.
- Avoid using any shop vacuum that is not rated for chemical clean up. A potential exists for atomizing hazardous wastes and creating a potential human inhalation exposure.
- If the spill is extremely volatile (high vapor pressure), allow the spill to evaporate and exhaust out the laboratory exhaust (fume hood).
- Properly containerize, label, store, and/or dispose of collected hazardous waste. (See waste disposal section for methods).

4. Solid Spills

- If possible, sweep solid spills of low toxicity into a designated, easily decontaminated, dust pan and place in a labeled container for storage and/or disposal.

5. Additional Spills

- Mercury
 - Clean up with pre-purchased spill clean-up kit. Collect Hg in a sealed container to prevent exposure to vapors. Large spills or spills that render some Hg unavailable for clean up (e.g., in floor cracks or beneath lab benches), an airborne evaluation of Hg vapor content may be required.
- Compressed Gas Cylinders
 - Any compressed gas cylinders used in science laboratories must be transported, handled, and stored as described in the College's Compressed Gas Compliance Plan.

- Incident Report
 - An incident investigation should take place after each spill and/or accident, no matter how small. The incident report or unusual occurrence report should be completed by the Supervisor/Instructor and forwarded to the MSE Division Office.

L. SUGGESTED CHEMICAL STORAGE PATTERN

1. Storage of laboratory chemicals presents an ongoing safety hazard, as many chemicals are incompatible with each other. The common method of storing chemicals in alphabetical order may result in incompatibly-shelved materials. Chemicals can be separated into their organic and inorganic families and then further divided into related, compatible families.

M. ADDITIONAL STORAGE SUGGESTIONS

1. Avoid floor chemical storage (even temporary).
2. No top shelf chemical storage.
3. No reactive liquid chemicals stored above eye-level.
4. Shelf assemblies must be firmly secured to walls; avoid island shelf assemblies.
5. Provide anti-roll-off lips on all shelves.
6. Ideal shelving assemblies would be of wood construction.
7. Avoid metal, adjustable shelf supports and clips; fixed, wooden supports are to be used.
8. Store acids in dedicated acid cabinet(s). Store nitric acid in that same cabinet ONLY if isolated from other acids. Store both inorganic and some organic acids in the acid cabinet.
9. Store flammables in a dedicated and ventilated flammables cabinet.
10. Store severe poisons in a dedicated poisons cabinet.
11. Segregate known or suspect carcinogens from other chemicals.
12. **If you store volatile materials (ether, hydrocarbons, etc.) in a refrigerator, the refrigerator must be explosion-proof. The thermostat switch or light switch in a standard refrigerator may spark and set off the volatile vapors in the refrigerator and cause an explosion.**

N. REVIEW AND UPDATE

1. This Chemical Hygiene Program will be reviewed and updated annually.