

Chemical Hygiene Plan (updated 10/10/16)

INTRODUCTION

The State University College at Oneonta encourages and supports all programs which promote the safety, good health, and well-being of faculty, staff, students, participants in College sponsored programs, and visitors. SUNY Oneonta will provide safe and healthful conditions and to reduce injuries and illnesses to the lowest possible level. No task is so important and no service so urgent that it cannot be done safely. In keeping with this commitment, this Chemical Hygiene Plan was developed as part of the Laboratory Safety Program.

The Chemical Hygiene Plan (CHP) is designed to protect laboratory personnel from potential hazards associated with the use of chemicals and therefore, manage risk. Each individual working in a College laboratory is a risk manager. Compliance is mandatory for all employees working in campus laboratories due to requirements of the Occupational Safety and Health Administration (OSHA) standard on "Hazardous Chemicals In Laboratories". While these regulations pertain specifically to employees, provisions of the CHP may apply to students and visitors depending on their activities.

A variety of hazardous chemicals are used in small quantities in research and teaching laboratories creating a unique environment with a number of risks. These chemicals may cause injury or damage because they are toxic, flammable, corrosive, or reactive with water and other materials. How these substances are handled will determine the degree of risk. The objective of this CHP is to provide uniform requirements for safe use of potentially hazardous substances in college laboratories. General standard operating procedures (SOPS) are outlined, including work with select carcinogens, reproductive toxins, and highly acute substances.

Maintaining a safe and healthy environment in the laboratory is ultimately the responsibility of the faculty member instructing or conducting research in the laboratory. However, each individual is expected to conduct all operations and procedures involving chemicals in a safe and prudent manner.

I. ROLES AND RESPONSIBILITIES

A. Faculty conducting instruction and research:

Has responsibility for implementation of the Chemical Hygiene Plan (CHP) in his/her laboratory. They

1. ensure that workers and students are trained and follow the CHP outlined in this document;
2. ensure that the necessary protective and emergency equipment is available, in working order, and that appropriate training has been provided;
3. ensure that periodic laboratory self inspections are performed know current legal requirements concerning regulated substances;
4. review and evaluate the effectiveness of your laboratory specific chemical safety protocol at least annually and update as necessary.

B. Non-faculty Laboratory Employees are responsible for:

1. planning and conducting each operation in accordance with practices and procedures established in this CHP and by the faculty in charge of each lab's experiments and instruction.
2. using equipment only for its designed purpose;
3. being familiar with emergency procedures, including knowledge of the location and use of emergency equipment for the laboratory, as well as how to obtain additional help in an emergency;
4. knowing the types of protective equipment available and using the proper type for each procedure;
5. being alert to unsafe conditions and actions and calling attention to them so corrections can be made as soon as possible.

C. The Chemical Hygiene Officer (CHO) is an employee designated by the College who is qualified by training or experience to provide technical guidance in the development and implementation of the provisions of the CHP.

The Chemical Hygiene Officer shall:

1. assist faculty and other laboratory employees with development and implementation of appropriate chemical hygiene procedures and practices, including providing consultation and information;
2. keep abreast of legal requirements concerning regulated substances and communicate any changes to PI's and laboratory employees.

D. Each science department will assign a CHO for the department with similar responsibilities. In the absence of a specific designee, the chair will be assigned duties as department CHO.

II. LAB EMPLOYEE INFORMATION AND TRAINING

Department CHO's shall ensure that information and training are provided at the time of a lab employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. Refresher information and training shall be conducted at least annually and documented.

A. Information. All laboratory personnel shall be informed of:

1. Requirements of the OSHA Standard, "[Occupational Exposure to Hazardous Chemicals in Laboratories](#)",
2. The contents and availability of this Chemical Hygiene Plan,
3. [Permissible Exposure Limits](#) (PELs) for OSHA regulated substances or recommended exposure limits where there is no applicable OSHA standard,
4. Signs and symptoms associated with exposures to hazardous chemicals used in their laboratory,
5. The location of reference materials on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Material Safety Data Sheets (MSDS's).
6. The applicable portions of the [OSHA Hazard Communication standard \(29CFR1910.1200\)](#).

B. Training. Employee training shall include:

1. The physical and health hazards associated with chemicals stored and used in their work area,
2. The contents of this Chemical Hygiene Plan,
3. Methods and observations that may be used to detect the presence or release of a hazardous chemical; e.g., exposure monitoring conducted by the CHO, visual appearance or odor of hazardous chemicals when being released, etc.

III. PRIOR APPROVAL CIRCUMSTANCES

Employees must obtain prior approval to proceed with a laboratory task from the faculty in charge of a lab or his/her designee when:

- A. Radioactive materials will be used,
- B. Recombinant DNA or biological material of Risk Group 3 or assigned Biosafety Level 3 or greater will be used,
- C. It is likely that exposure limit concentrations could be exceeded or that other harm is likely,
- D. There is failure of any equipment used in the process, especially of safeguards such as chemical fume hoods.
- E. Members of the laboratory staff become ill, suspect that they or others have been exposed, or otherwise suspect a failure of any safeguards.

IV. STANDARD OPERATING PROCEDURES

A. General Rules

1. For chemicals they are working with, all employees should know:
 - a) the chemical's hazards, as determined from MSDS and other appropriate references;
 - b) appropriate safeguards for using that chemical, including personal protective equipment;
 - c) how to properly store the chemical when it is not in use;
 - d) proper chemical waste disposal procedures
 - e) proper personal hygiene practices
 - f) appropriate procedures for emergencies, including first aid, evacuation routes, and spill cleanup procedures
 - g) As part of the safety program, each department is required to have a current chemical inventory.
2. Employees should avoid working alone. Arrangements should be made between individuals working in separate laboratories outside of regular working hours to crosscheck each other periodically. An employee who is alone in the laboratory should not undertake experiments known to be hazardous.

B. Personal Hygiene

1. Wash promptly whenever a chemical has contacted your skin. Flush for at least 15 minutes prior to seeking medical attention.
2. Avoid inhalation of chemicals. Do not "sniff" to test chemicals.
3. Do not use mouth suction to pipette anything. Pipetting aids must be used at all times.
4. Do not bring food (including gum and candy), beverages, tobacco, or cosmetic products into chemical storage or use areas. Eating, drinking, and applying cosmetics is allowed in designated areas only. Smoking is prohibited in all college facilities.
5. Wash well with soap and water before leaving the laboratory. Avoid the use of solvents for washing skin. Solvents remove the natural protective oils from skin and can cause irritation and inflammation. In some cases, washing with solvent may facilitate absorption of toxic chemicals.

C. "Housekeeping"

"Housekeeping" is directly related to safety and must be given importance of equal value to other procedures. Lack of good housekeeping reduces work efficiency and may result in accidents. Laboratory personnel must adhere to the following:

1. Access to emergency equipment, showers, eyewashes, fire extinguishers, exits and circuit breakers shall never be blocked or obstructed. Chemical containers should be regularly monitored for proper labeling and container integrity. Labels which are fading, falling off, or deteriorating must be promptly replaced. If abbreviations are used, they should be kept to a minimum and clearly identify the contents of the container as well as hazards associated with use; i.e., HgCl_2 /poison, HCl /corrosive, MeOH /flammable, H_2O_2 /corrosive-oxidizer, Nonhazardous buffer, etc. Improperly labeled or unlabeled chemicals make hazard identification and disposal difficult, and may create a hazard.

2. All chemicals should be placed in their proper storage areas at the end of each workday. Chemicals shall not be stored on desks, laboratory bench tops, floors, fume hoods or in aisles. Liquids should be stored below solids.
3. Each laboratory must have a puncture resistant (e.g., cardboard) container specifically designated for glassware disposal.
4. At the end of each workday, the contents of all unlabeled containers are to be considered waste and disposed of appropriately.
5. Collection containers for wastes must be clearly labeled including hazard identification.
6. All work areas, especially laboratory bench tops, should be kept clear of clutter.
7. All aisles, corridors, stairs, and stairwells shall be kept clear of chemicals, equipment, supplies, boxes, and debris.
8. Overhead storage must be kept no closer than 18" to the ceiling for sprinkled rooms, 24" for non-sprinkled rooms.
9. Food and drink for human consumption shall not be kept in the same refrigerator used to store chemicals and laboratory samples. Eating and office areas must be clearly separated from laboratory and chemical storage areas.
10. Empty containers shall be treated in the following manner:
 - a) For water-soluble solvents: triple rinse, deface the label, re-label as "Empty" and dispose with normal trash.
 - b) For non water-soluble solvents: triple rinse using a solvent capable of removing the chemical. ALL rinsate must be collected in a hazardous waste disposal container. Deface the label, re-label as "Empty" and dispose with normal trash.

D. Protective Clothing and Equipment for Students and Employees

1. Carefully inspect all protective equipment prior to use. Do not use defective equipment.
2. Eye protection (safety glasses, chemical-resistant goggles, or a face shield) shall be worn at all times in laboratories where chemicals are being used. This includes visitors. Ordinary prescription glasses are not considered effective eye protection since they lack necessary shielding. Chemical-resistant goggles should be worn over the glasses or prescription safety glasses be provided to employees required to wear corrective lenses.
3. With regard to the wearing of contact lenses, employees and students should consult with their optometrist prior to wear in the laboratory. Safety glasses or chemical-resistant goggles shall be worn over contacts at all times.
4. When working with corrosive, toxic, allergenic, or sensitizing chemicals, rough or sharp-edged objects, very hot or very cold materials, gloves made of material known to be resistant to permeation by the substance shall be worn. No one glove can protect against all hazards. Refer to a glove selection guide. Consult the manufacturer's performance chart or contact the department Chemical Hygiene Officer to determine the proper choice of glove material.
5. Low-heeled shoes with fully covered uppers shall be worn at all times in the laboratory. Shoes or sandals with open toes shall not be worn.
6. Long pants and long sleeves should be worn when working with or around chemicals.

7. Long hair should be held in place behind the head.
8. Loose clothing, especially loose trouser legs and sleeves, should not be worn in the laboratory.
9. A full-body-length rubber, plastic, or neoprene apron appropriate for the material being handled should be worn if there is risk of splash or spill of a hazardous material.

E. Flammable Materials

Precautions for safe handling of flammable materials include the following:

1. Storage of flammable substances shall be limited to quantities specified by each department CHO.
2. Flammable substances shall be handled only in areas free of ignition sources.
3. Flammable substances should never be heated by using an open flame. Preferred heat sources include steam baths, water baths, oil baths, heating mantles, and hot air baths.
4. Class I liquids shall not be transferred from one vessel to another in any exit way.
5. Transfer of flammable liquids from 5-gallon containers (or less) to smaller containers shall be conducted in a laboratory fume hood. Flammable liquids must not be stored in a refrigerator unless that refrigerator has been manufactured, purchased, and maintained as a flammable safe (also sometimes referred to as "laboratory-safe" or "flammable material") refrigerator. Flammable liquids must not be stored in an "ordinary" household-type refrigerator.

F. Reactive Chemicals

A reactive chemical is one that:

1. Fits the [OSHA definition of "unstable"](#) in 1910.1450(b):
"Unstable (reactive) means a chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure, or temperature
2. Is ranked by the National Fire Protection Association (NFPA) as 3 or 4 for reactivity,
3. Is identified by the Department of Transportation (DOT) as:
 - a) An oxidizer,
 - b) An organic peroxide, or
 - c) A class A, B, or C explosive,
4. Violently reacts with exposure to water or air.
5. Handle reactive chemicals with all proper safety precautions. This includes designating a separate storage area, monitoring periodically for degradation, and using appropriate personal protection.

G. Corrosive Chemicals

1. Materials are classified as corrosive if they:

- a) are capable of rapidly eroding building materials or metals, or
- b) burn, irritate or destructively attack organic tissues such as skin, eyes, lungs and stomach.

Examples of commonly used chemicals that have corrosive properties:

| | | |
|---------------------|---------------------|------------------|
| glacial acetic acid | nitric acid | sodium hydroxide |
| hydrofluoric acid | bromine | fluorine |
| hydrochloric acid | potassium hydroxide | sulfuric acid |
| acetic anhydride | chlorine | |

Safe handling procedures will vary with each operation and the type and concentration of the corrosive chemical.

2. The following general guidelines should be followed for procedures involving acids and bases:

- a) Never pour water into acid. Slowly add the acid to the water and stir.
- b) Open bottles or carboys slowly and carefully, wearing protective equipment to guard hands, face, and body.
- c) OSHA requires suitable facilities, such as a safety shower and eyewash, to be located within the work area. The American National Standards Institute (ANSI) recommends that the safety shower and eyewash be within 100 feet of the work area for quick drenching or flushing of the eyes and body.
NOTE: Eyewash stations and Showers will be operationally tested on a semiannual basis by Facilities Operations personnel
- d) Procedures requiring the use of concentrated acids and bases must be conducted in a fume hood.
- e) Never mix acid wastes with other materials such as solvents, metal-contaminated solutions, etc. Noncontaminated acid wastes can be easily disposed by neutralization. Specific procedures are outlined in Appendix 1.
- f) When disposable containers are completely emptied of their contents, flush them thoroughly with water before throwing them away.
- g) Never dispose of acids or bases in the sanitary sewer system (i.e., down the drain) until neutralized (pH 6.0-8.0). Neutralization may be conducted in the laboratory when included as part of an experiment, and should be conducted in a fume hood. The solution should then be poured slowly down the drain with copious amounts of water; i.e., leave the water running for approximately 5 minutes. The neutralization tanks at Cooperstown, Science II, and Human Ecology provide an extra measure of security in this area but do not negate the need for this protocol.
- h) Contact Facilities Planning at Ext. 3224 for assistance with disposal of large quantities (more than 1 gallon or 1/2 pound) of acids and bases.
- i) Each laboratory should have access to a spill kit that includes acid and base neutralizer; follow Spill Response Procedures in section V. B. of this template. Never use combustible organic materials (sawdust,

excelsior, wood scraps and shavings, paper, rags, or burlap bags) to absorb or clean up spillage.

H. Compressed Gas Cylinders (Compressed Gas Standards)

3. Receiving and Storage

- a) Arrange a return agreement with suppliers prior to purchase.
- b) Ensure laboratory door placard is current each time gases are received. (Contact Facilities Planning for updated labels for door placards)
- c) Cylinder contents must be clearly labeled. Color code does not constitute adequate labeling
- d) Valve caps shall be in place any time that the cylinder is not connected to a regulator.
- e) Always transport cylinders with valve caps securely in place.
- f) Do not accept cylinders which are damaged, not clearly labeled, or do not have a valve protection cap.
- g) Keep oxygen cylinders a minimum of twenty feet from flammable gas cylinders or combustible materials. If this can not be done, separation by a non-combustible barrier at least 5 feet high having a fire rating of at least one-half hour is required.
- h) Components used for other gases and purposes must never be interchanged.
- i) Cylinders, upon filling, should have a current hydrostatic test date (normally less than 5 years old for steel and 3 years old for aluminum) engraved on the cylinder.
- j) All gas cylinders shall be secured in an upright position with upper and lower restraints in racks, holders, or clamping devices. The lower restraint may be exempted only if impractical. When cylinders are grouped together, they should be individually secured and conspicuously labeled on the neck area.
- k) Do not place cylinders near heat, sparks, or flames or where they might become part of an electrical circuit.
- l) Do not store cylinders in exit or egress routes.
- m) Store cylinders in a well ventilated area.

4. Handling and Use

- a) Wear sturdy shoes (no open-toed, sandals, etc.) when engaging in moving or transporting cylinders.
- b) Use a cylinder cart and secure cylinders with a chain during transport.
- c) Only Compressed Gas Association (CGA) fittings and components are permitted for use with gas cylinders. Only use regulators approved for the type of gas in the cylinder. Do not use adapters to interchange regulators.
- d) Gas lines must be labeled. Color-coding is not allowed.
- e) Contents of the cylinder must be visibly labeled as installed including hazard class (i.e., poison, flammable, inert, etc.). The label facing the wall is not acceptable.
- f) Ensure all connections are tight via leak testing. Cylinders, connections, and hoses should be checked regularly for leaks. Use a

flammable gas leak detector (for flammable gases only) or soapy water and look for bubbles. At or below freezing temperatures, the glycerin solution should be used instead of soapy water.

NOTE: When the gas to be used is a flammable oxidizing or highly toxic gas, the system should be checked first for leaks with an inert gas (helium or nitrogen) before introducing the hazardous gas.

g) Leak tests should be witnessed by a third party.

h) When a special wrench is required to open a cylinder or manifold valve, the wrench shall be left in place on the valve stem when in use; this precaution is taken so the gas supply can be shut off quickly in case of an emergency. Nothing shall be placed on top of or near a cylinder that may damage the safety device or interfere with the quick closing of the valve.

i) Open cylinder valves slowly and away from the direction of people (including yourself). Never force a gas cylinder valve. If the valve cannot be opened by the wheel or small wrench provided, the cylinder should be returned; do not attempt to repair a cylinder valve or regulator yourself.

j) No attempt shall be made to transfer gases from one cylinder to another, to refill cylinders, or to mix gases in a cylinder in the laboratory.

k) Keep cylinder valves, regulators, couplings, hoses, and apparatus clean and free of oil and grease.

l) Compressed gases must not be used to clean your skin or clothing.

m) Never heat cylinders to raise internal pressure.

n) Use flashback connectors and reverse-flow check valves to prevent flashback when using oxy-fuel systems.

o) Regulators must be removed when moving cylinders, when work is completed, and when cylinders are empty.

p) Do not use copper (>65%) connectors or tubing with acetylene. Acetylene can form explosive compounds with copper, silver, and mercury.

q) Always leave at least 30 psi minimum pressure in all *Empty* cylinders.

r) Label all cylinders when "Empty". All cylinders are to be considered full unless labeled as empty by the user. Empty cylinders must be returned to the supplier and not accumulated.

s) Do not leave an empty cylinder attached to a pressurized system.

NOTE: The use of lecture bottles is discouraged if other cylinders are available. Lecture bottles are very difficult to dispose of and they use universal threads and valves (some of which are interchangeable), thus increasing the potential for unintentional mixing. If lecture bottles are used, label all associated equipment with the gas name to prevent unintentional mixing.

V. CONTROL MEASURES

A. Ventilation

1. Laboratory ventilation is normally designed to provide a minimum of eight air changes per hour. This flow is not necessarily sufficient to prevent accumulation of chemical vapors. Laboratory work shall be conducted in a fume hood, glove box, or similar device when:
 - a) Procedures call for work with toxic substances which are volatile; i.e., evaporate at normal temperature and pressure, or
 - b) There is a possibility the [action level](#) or [PEL](#) will be exceeded.
2. The protection provided by laboratory fume hoods is dependent upon two important factors:
 - a) proper use of the hood, and
 - b) maintenance of adequate airflow through the hood.
3. The way the hood is used will determine the degree of protection it will provide. Each employee is responsible for implementing the following work practices when using a hood.
 - a) Continually monitor air being drawn into the hood. This can be done by attaching a lightweight strip of paper to the bottom of the sash.
 - b) Operate the hood at a sash position that will provide splash protection for the user; e.g. 10-12 inch opening for hoods with vertical sliding (up and down) sashes and the sashes closed as much as possible for continuous air flow hoods with horizontal sliding (left and right) sashes. This helps to ensure optimum protection when conducting operations in the hood.
 - c) ***Avoid using the hood for storage of bottles and equipment***, especially along the back wall. Any apparatus that must be housed within the hood should fit completely inside the hood. Elevate the apparatus on blocks (at least 2 inches off the bench top) to allow air to flow freely around and beneath.
 - d) Manipulations within the hood should be performed at least 6 inches inside the face of the hood or as far towards the back of the hood as possible. This minimizes the possibility of contaminants escaping from the hood.
 - e) Avoid things which cause air turbulence across the face of the hood such as fans, window air conditioning units, or excessive movement.
 - f) Exhaust hoods do not provide adequate protection for all operations involving toxic materials. A higher level of containment should be used for procedures where minor contamination can be serious. If you are in doubt about the level of containment needed for your operation, ask your Department CHO.
4. Facilities Operations will conduct semiannual surveys of fume hoods to ensure adequate airflow is maintained through the hood face. Contact Facilities Ops at XT 2507 if you suspect the hood is not working properly.

B. SPILL CLEAN-UP PROCEDURES

1. Attend to anyone who may have been contaminated.
2. Notify occupants in the immediate area about the spill.
3. Evacuate all nonessential personnel from the spill area.

4. If the spilled material is flammable, turn off all ignition and heat sources; including magnetic stirrers.
5. Avoid breathing vapors of the spilled material.
6. Ensure that the fume hood(s) is on. Open windows where possible to increase exhaust ventilation.
7. Secure cleanup supplies. Ensure protective apparel is resistant to the spill material.
8. Confine or contain the spill to a small area.

VI. EXPOSURE MONITORING

Exposure monitoring shall be performed when there is reason to believe that exposures are in excess of the action-level or the PEL. Materials which require monitoring under these conditions are listed in [OSHA Regulations](#). If an employee would like to have an exposure assessment conducted, the CHO should be contacted. Exposure assessments and monitoring may be conducted by the CHO. Documentation of exposure monitoring shall be kept and maintained as part of each employee's personnel record.

VII. MEDICAL CONSULTATIONS AND EXAMINATIONS

Employees shall be provided an opportunity to receive medical attention, including any related follow-up examinations, at the College's expense, under the following circumstances:

- A. An individual develops signs or symptoms associated with exposure to hazardous chemicals in the laboratory.
- B. Exposure monitoring reveals an exposure level routinely above the action level or PEL for a UOSH regulated substance for which there are exposure monitoring and medical surveillance requirements.
- C. An accident such as a spill, leak, equipment failure, or explosion results in possible overexposure to hazardous chemicals.
- D. The faculty in charge of the lab is responsible for establishing and maintaining an accurate record of any medical consultations and examinations provided to an employee.

VIII. SELECT CARCINOGENS, REPRODUCTIVE TOXINS, HIGHLY ACUTE TOXINS

The procedures described in this section are mandatory when performing laboratory work with greater than 10 mg or 100 mL of any carcinogen, reproductive toxin, or substance that has a high degree of acute toxicity.

A. Definitions

1. Select carcinogens: any substance defined as such by UOSH.
2. Reproductive toxins: chemicals which affect reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogens).
3. A Highly Acute Toxin is any substance for which:
 - a) The median oral LD50 is less than or equal to 50 mg/kg when administered orally to albino rats, or
 - b) the median inhalation lethal concentration, LC50, value is less than or equal to 200 ppm by volume of gas or vapor, or 2 mg/liter or less of dust, mist, or fume when administered continuously for one hour or less to albino rats, or

c) the median LD50 is less than or equal to 200 mg/kg when administered by continuous contact for 24 hours or less with the bare skin of albino rabbits.

4. Designated area: a hood, glove box, portion of a laboratory, or an entire laboratory room, designated as the only area where work shall be conducted with quantities of select carcinogens, reproductive toxins, or highly acute toxins in excess of the limits specified above.

B. Designated Area

1. Access to designated areas shall be restricted. Only trained employees will be allowed to work with chemicals in the designated area. All such persons will:

- a) Use the smallest amount of chemical that is consistent with the requirement of the work to be done.
- b) Always use these chemicals in a hood with adequate air flow (face velocity between 80 and 120 feet per minute) or other containment device for procedures which may result in the generation of aerosols or vapors containing the substance.
- c) Use high-efficiency particulate air (HEPA) filters or high-efficiency scrubber systems to protect vacuum lines and pumps.
- d) Decontaminate designated areas before normal work is resumed there. This includes contaminated equipment.
- e) Remove any protective apparel, place it in an appropriately labeled container, and thoroughly wash hands, forearms, face, and neck on leaving a designated area.
- f) Prepare wastes for proper disposal
- g) Do not wear jewelry when working in designated areas since decontamination of jewelry may be difficult or impossible.