CHEMICAL

HYGIENE

PLAN

UNIVERSITY of HAWAI'I®
COMMUNITY COLLEGES

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Revised June 2025

CONTENTS

PREFACE

The University of Hawaii, Community Colleges has a fundamental obligation to safeguard the health, safety, and welfare of its students, personnel, and the visiting public whenever they participate in an official University activity. It is the policy of the University to provide for and maintain, through implementation of safety and health programs, conditions and practices that provide safe and healthful campus environments. In keeping with this commitment, this Chemical Hygiene Plan was developed as part of the UHCC Laboratory Safety Program.

The Chemical Hygiene Plan (CHP) is designed to protect laboratory personnel from potential hazards associated with the use of chemicals. It is for your reference while working with or around chemicals in laboratories at the University of Hawaii. Compliance is mandatory for all employees working in campus laboratories due to requirements of the Hawaii Occupational Safety and Health (HIOSH) division of the Department of Labor and Industrial Relations' standard on "Hazardous Chemicals In Laboratories". While these regulations pertain specifically to employees, provisions of the CHP apply to students and visitors depending on their activities when specified by supervisors.

UHCC Environmental Health and Safety Office
University of Hawaii, Community Colleges
Reviewed and revised: June 2025

INTRODUCTION

The objective of this CHP is to provide uniform requirements for safe use and disposal of potentially hazardous substances in campus laboratories. 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. General standard operating procedures are outlined, including work with select carcinogens, reproductive toxins, and substances with a high degree of acute toxicity. **Specific standard operating procedures must be developed by each lab for operations posing a special hazard**, for example, heating phosphoric acid, working with pyrophores, conducting electrophoresis, distillations, extractions, etc.

Maintaining a safe and healthy environment in the laboratory is ultimately the responsibility of the unit level administrator, employee supervisor, lab instructor, and/or Principal Investigator. However, each individual is expected to conduct all operations and procedures involving chemicals in a safe and prudent manner.

I. **PROGRAM ADMINISTRATION**

A. SAFETY COMMITTEE

1. A campus Safety Committee (SC) will establish policies that will provide guidance that the campus is in compliance with all federal, state, and local regulations, statutes, procedures, and principles relating to environmental and occupational safety, including in particular (1) the fire code, (2) the electrical code, and (3) the regulations relating to the purchase, storage, use, and disposal of hazardous chemicals. This task includes the review and maintenance of a campus-specific Chemical Hygiene Plan (CHP).

2. Establish close-out procedures for hazardous chemical users that will minimize the hazardous waste burden to the campus.

3. Appoint a campus Chemical Hygiene Officer (CHO). The CHO shall be responsible for maintaining all laboratory safety training records for their area of responsibility.

4. Review laboratory safety audit reports. In cases where problems have been noted by the UHCC Environmental Health and Safety Office (UHCC EHSO) and the responsible parties have been notified by the UHCC EHSO, initiate corrective actions if the problems have not been resolved within a reasonable amount of time.

5. Evaluate and approve the use of particularly hazardous substances such as select carcinogens, reproductive toxins, and highly acute toxins. Prepare a list of such substances to facilitate oversight and control/regulation of their use.

6. The UHCC EHSO will evaluate laboratory accidents and chemical spills and will ask the or campus administrator to initiate corrective action if needed to prevent the recurrence of such incidents.

7. Where necessary, participate in UHCC EHSO inspection and enforcement actions (see Appendix XIII).

B. DEAN/DIRECTOR/DEPARTMENT CHAIR

1. Have the primary responsibility of establishing and maintaining a safe and healthy environment for their employees, students and visitors.

2. Ensure that laboratories and other chemical storage sites within the department comply with all CHP requirements.

3. Take corrective action in cases where an inspection by the UHCC EHSO has indicated that a hazard exists in the workplace that has not been corrected in a timely manner, including (but not limited to) electrical hazards, fire safety hazards and chemical hazards. The hazardous condition will be judged to have been corrected only when an inspection by the UHCC EHSO indicates that the condition

has been corrected.

4. Ensure all Principal Investigators follow closeout procedures (see Appendix XII); and take measures to enforce them when necessary.

5. Assign responsibility for shared labs/facilities to one person

C. UHCC ENVIRONMENTAL HEALTH AND SAFETY OFFICE

1. Provide technical assistance to the campus administration, SC, principal investigators, supervisors, and employees.

2. Conduct laboratory surveys, including air monitoring if required. The CHO must inform the SC about any deficiencies that are not corrected in a timely manner.

3. Maintain all relevant records of air monitoring results and laboratory surveys.

4. Assist principal investigators and supervisors in complying with the CHP.

5. Provide chemical safety training for all UH employees as required by the CHP.

D. LAB INSTRUCTOR/PRINCIPAL INVESTIGATOR/SUPERVISOR

1. Have direct and overall responsibility for safety and chemical hygiene in the laboratory/workplace. This includes following the policies and procedures of the CHP and correcting deficiencies found during UHCC EHSO audits in a timely manner.

2. Ensure that employees are informed of and follow the rules and procedures of the CHP.

3. Inform employees and students about workplace hazards. This information must include written Standard Operating Procedures (SOP's) that detail operations the employees will conduct. These SOP's should include safety precautions that employees (and students) must follow.

4. Provide personal protective equipment (PPE), (gloves, lab coats, goggles, etc.) for employees and ensure that they are used.

5. Conduct and document the appropriate chemical hygiene training, including emergency procedures, for all employees.

6. Periodically survey the workplace to ensure safe working conditions. These surveys should include inspection of all emergency equipment such as eyewashes, safety showers and spill kits. All defective equipment must be immediately reported to the appropriate department

7. Review SDS and other sources for information about special first aid requirements for chemicals, e.g., hydrogen fluoride and cyanogen bromide, and prepare accordingly.

8. Restrict access to areas where an inspection by the UHCC EHSO indicates that a

hazardous condition exists.

9. Follow the closeout procedures when departing from the University (see Appendix XII).

10. Keep lab equipment and chemicals secure against theft or tampering. Keep the laboratory doors closed and locked when no one is present.

E. LABORATORY WORKERS

1. Know the hazardous properties of the chemicals they use so that proper safety precautions can be determined and followed.

2. Plan and conduct each operation in accordance with the general safety procedures specified in the CHP, as well as whatever additional specific procedures are required by the principal investigator/supervisor.

3. Develop and maintain good personal chemical hygiene practices.

4. Properly implement all safety precautions, engineering control, administrative control and personal protective equipment based upon task.

5. Immediately report improperly functioning safety equipment such as fume hoods directly to the principal investigator/supervisor.

6. Promptly complete required safety training sessions.

7. Immediately report any occupational injury or illness to your principal investigator/supervisor.

8. Know the location and operation of emergency equipment such as eyewashes, safety showers, etc.

9. Be aware of emergency reporting and evacuation procedures.

10. Immediately inform the principal investigator/supervisor about any unsafe workplace conditions.

II. EMPLOYEE INFORMATION AND TRAINING

All lab personnel need to take appropriate training before conducting any work in the lab. All PI's and lab instructors shall complete initial lab safety training prior to setting up their lab. PI's and lab instructors shall ensure that information and training are 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. PI's and lab instructors may contact the CHO for assistance in providing training. Refresher training (Lab personnel safety checklist, attachment XIV) shall be conducted and documented at least annually by the PI or lab instructor (for students).

A. INFORMATION

All laboratory personnel (entering or working) shall be informed of:

1. requirement of the HIOSH Standard, "Hazardous Chemicals in Laboratories" (Appendix III);

2. the contents and availability of this Chemical Hygiene Plan;

3. permissible exposure limits (PELs) for HIOSH regulated substances (Appendix IV) or recommended exposure limits where there is no applicable HIOSH standard;

4. signs and symptoms associated with exposures to hazardous chemicals used in their laboratory;

5. the location of reference materials (including electronic versions) on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Safety Data Sheets (SDS's).

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, 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 CHO when:

A. Radioactive materials will be used. Contact the UH Radiation Safety Program for training and assistance with additional safety precautions.

B. Recombinant DNA or any biological commodities will be used. Contact the UH Biological Safety Program.

C. It is likely that exposure limit concentrations could be exceeded or that other harm could occur. Contact the CHO.

D. Certain hazardous chemicals will be used which require prior approval from the UHCC EHSO before purchase. Refer to Appendix V for a list of these chemicals.

E. Shipping hazardous material(s) air or ground.

Employees must stop working and contact their immediate supervisor to gain approval for continuing to work when:

A. There is failure or suspected failure of any equipment used in the process, especially of safeguards such as chemical fume hoods.

B. A member of the laboratory staff becomes ill and you know or suspect the illness is related to the work environment in the laboratory.

C. If there is a large release of a hazardous material to the laboratory.

UHCC EHSO should be contacted by the campus administration to conduct a thorough review of the work area prior to allowing employees/students to continue to work in the area.

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 a SDS 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 (Appendix V);

   e. proper personal hygiene practices;

   f. proper methods of transporting chemicals outside the laboratory;

   g. appropriate procedures for emergencies, including first aid, evacuation routes, and spill cleanup procedures.

2. **Employees should not work alone**. Arrangements should be made between individuals working in separate laboratories outside of regular working hours to crosscheck each other periodically. Alternatively, and in rare circumstances, Campus Security may be asked to check on the employee. Experiments known to be hazardous should not be undertaken by an employee who is alone in the laboratory.

3. In the event of a power outage, the procedures listed in Appendix VI should be followed.

4. Individuals who are not properly trained in laboratory safety and the CHP (e.g. employees' children, guests, etc.) shall not be allowed in University laboratories unless closely supervised and monitored.

5. No animals, other than those approved for laboratory experimentation or as an ADA accommodation by the UH Institutional Animal Care and Use Committee (IACUC), shall be allowed in laboratories.

6. The use of open flames in UH laboratories are strongly discouraged. Every effort must be made to find alternatives to using open flames (electric sterilizers, disposable supplies, etc.)

B. PERSONAL HYGIENE

1. Wash promptly whenever a chemical has contacted your skin.

2. Avoid inhalation of chemicals. Do not "sniff" to test chemicals.

3. Do not use mouth suction to pipet. 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 chemical use areas. Eating, drinking, and applying cosmetics is allowed in designated areas only. Smoking is prohibited in all University 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. PROTECTIVE CLOTHING AND EQUIPMENT

1. Carefully inspect all protective equipment prior to use. Do not use defective equipment.

2. When the potential for a splash hazard is present (e.g. chemistry laboratories), eye protection in the form of chemical-resistant goggles shall be worn at all times in the laboratory. Ordinary prescription glasses and/or standard safety glasses are not considered effective eye protection since they lack necessary shielding from vapors and splash. Chemical-resistant goggles should be worn over the glasses for employees who wear corrective lenses.

3. Consult with an optometrist prior to wearing contacts in the laboratory. Chemical-resistant goggles must 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 protective for the hazard shall be worn.

   No one glove can protect against all hazards. Cloth gloves, while not appropriate for use around liquids, can protect against light abrasive materials and moderate temperature changes. Synthetic or rubber gloves protect against corrosives, solvents, and poisons. Leather gloves, often used for tasks like welding, protect against sparks, heat, & rough abrasives.

   Consult the manufacturer's performance chart or contact the CHO to determine the proper choice of glove material. Appendix X has a glove selection chart that can be used to determine glove choices.

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 garments with lab coats with long sleeves must be worn when working with or around chemicals.

7. Long hair should be secured behind the head, to prevent it from being pulled into machinery or catch fire.

8. Caution should be taken when wearing loose clothing not to inadvertently allow cuffs, sleeves, or other materials to knock over or absorb chemicals.

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.

10. A proper respirator must be worn whenever exposure by inhalation is likely to exceed the action level (AL) or permissible exposure limits (PEL) and a fume hood is not accessible. Procedures specified in the UH Respiratory Protection Program must be followed. Employees must be medically qualified, trained, and fit-tested prior to using a respirator. Contact the CHO before doing any work requiring a respirator.

11. Remove all PPE before leaving the laboratory.

D. 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. All work areas, especially laboratory bench tops, should be kept clear of clutter.

2. Access to emergency equipment, showers, eyewashes, fire extinguisher, exits and circuit breakers shall never be blocked or obstructed.

3. All aisles, corridors, stairs, and stairwells shall be kept clear of chemicals, equipment, supplies, boxes, and debris.

4. Each laboratory must have a puncture resistant container (e.g., cardboard box) lined with plastic specifically designated for glassware disposal.

5. Food and drink for human consumption shall not be allowed in the laboratory. Food 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.

E. CHEMICAL MANAGEMENT

1. Chemical containers should be regularly monitored for proper labeling and container integrity. Labels which are fading, falling off, or deteriorating must be promptly replaced. Improperly or unlabeled chemicals make hazard identification and disposal difficult, and may create a health hazard. Abbreviations or other acronyms may be only used to label containers of chemicals generated in the laboratory as long as all personnel working in the laboratory understand the meaning of the label, or know the location of information, such as a laboratory notebook or log sheet that contains the code associated with content information. In addition, small containers, such as vials and test tubes, can be labeled as a group by labeling the outer container (e.g., rack or box). Alternatively, a placard can be used to label the storage location for small containers (e.g., shelf, refrigerator, etc.).

2. Segregate all chemicals in storage according to hazard class. The main hazard classes are flammable/combustible, oxidizer, acid, and base. See Appendix XI for more detailed chemical storage guidelines.

3. 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, or in aisles.

4. Secondary containers (flasks, beakers, reaction vessels, etc.) should be labeled unless they are under the immediate control of the user. At the end of each workday, all unlabeled containers are to be labeled as to their contents or the contents must be disposed of as waste.

5. Chemical wastes must be clearly labeled with hazardous waste label and stored according to hazard class. Refer to the Hazardous Material Management Plan in Appendix V for requirements.

11. Maintain an inventory of all chemicals in the laboratory, including all containers of chemicals in use or in storage, but excluding working solutions, synthetic intermediates, biological samples, chemical extracts, and waste. The chemical inventory should be kept in the laboratory's Chemical Hygiene Plan binder and updated annually. The inventory should include, at a minimum, the chemical name, the amount, the storage location, and the hazard class (see Appendix XI for guidelines). Appendix XIV contains a sample inventory form that may be used.

12. Hazardous materials should not be stacked or laid on their side. Stacking bottles can cause pressure and lead to bottles cracking or breaking. Laying a bottle on its side can lead to the bottle leaking.

F. FLAMMABLE MATERIALS

Precautions for safe handling of flammable materials include the following:

1. Storage and handling of flammable and combustible substances shall be conducted in accordance with the requirements in Appendix VII.

2. Flammable substances shall be handled in areas free of ignition sources.

3. Flammable substances should be heated cautiously when using an open flame. Preferred heat sources include steam baths, water baths, oil baths, heating mantles, and hot air baths.

4. Class I liquids (see Appendix VII) shall not be transferred from one vessel to another in any exit passage way.

5. Transfer of flammable liquids shall be conducted in a laboratory fume hood or an approved flammable liquid storage room.

6. Empty containers (no pourable liquid remaining) shall be treated in the following manner:

    a. For water soluble solvents: triple rinse, deface the label, and dispose empty container appropriately.

b. For non-water-soluble solvents: allow to evaporate to dryness in a hood, deface the label, and dispose empty container appropriately.

G. REACTIVE CHEMICALS

A reactive chemical is one that:

1. Fits the HIOSH definition of "unstable" in 12-204-2 (Appendix III):

   "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, or

2. Is ranked by the National Fire Protection Association (NFPA) as 3 or 4 for reactivity, or

3. Is identified by the Department of Transportation (DOT) as:

   a. an oxidizer, or
   b. an organic peroxide, or
   c. a class A, B, or C explosive

4. Violently reacts with exposure to water or air.

Handle reactive chemicals with all proper safety precautions. This includes designating a separate storage area, monitoring periodically for degradation, and using appropriate personal protection.

H. 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 are:

glacial acetic acid	hydrofluoric acid	hydrochloric acid
fluorine	nitric acid	bromine
sulfuric acid	chlorine	sodium hydroxide

Safe handling procedures will vary with each operation and the type and concentration of the corrosive chemical. Refer to the SDS for specific safe handling procedures.

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. Suitable facilities, such as a safety shower and eyewash, shall be located

within 50 feet or 10 seconds of the work area for quick drenching or flushing of the eyes and body. PI's shall ensure eyewash stations are flushed once every quarter.

d. Procedures requiring the use of concentrated acids and bases should be conducted in a fume hood.

e. Never mix acid wastes with other materials such as solvents, metal-contaminated solutions, etc. Non-contaminated acid wastes can be easily disposed by neutralization. Never dispose of acids or bases in the sanitary sewer system (i.e., down the drain) until neutralized (pH 5.5-8.5). Neutralization should be conducted in a fume hood, than the solution poured slowly down the drain with copious amounts of water, i.e., leave the water running for approximately 5 minutes.

f. When disposable containers are completely emptied of their contents, flush them thoroughly with water before throwing them away.

g. Contact UHCC EHSO Hazardous Material Management Program (see Appendix V) for assistance with disposal of large quantities (more than 2 gallons or 1 pound) of acids and bases.

I. COMPRESSED GAS CYLINDERS

Use of compressed gases in the laboratory requires anticipating chemical, physical, and health hazards. Cylinders that are knocked over or dropped can be very dangerous. If a valve is knocked off, the cylinder can become a lethal projectile. Accidental releases may result in an oxygen deficient atmosphere or adverse health effects. In short, improper handling and use can cause structural damage, severe injury, and possibly death.

The following guidelines will help ensure safe handling, use, and storage of compressed gas cylinders

1. RECEIVING AND STORAGE

a. Be sure to arrange a return agreement with suppliers prior to purchase since disposal of compressed gas cylinders is difficult and very expensive. Retain all documentation such as purchase orders to facilitate return of cylinders to the manufacturer.

b. Cylinders should not be accepted unless the cylinder contents are clearly labeled. Color code only should not be accepted, since it does not constitute adequate labeling.

c. Do not accept cylinders which are damaged or do not have a valve protection cap.

d. All gas cylinders in use shall be secured in an upright position in racks, holders, or clamping devices. When cylinders are grouped together, they should be individually secured and conspicuously labeled on the neck area.

e. Oxygen cylinders shall be separate from combustible materials (e.g. oils, greases, fuels, acetylene, etc.) a minimum distance of 20 ft or by a noncombustible barrier at least five feet high having a fire-resistant rating of at least 1/2 hour. Systems and components used for other gases and must never be used for oxygen or interconnected with oxygen.

f. Cylinders should have current hydrostatic test date (normally less than 5 years old for steel and 3 years old for aluminum) engraved on the cylinder.

Cylinders should be returned to the supplier for servicing prior to the expiration date.

g. Do not place cylinders near heat, sparks, or flames or where they might become part of an electrical circuit.
h. Do not store cylinders in exit corridors or hallways.

2. HANDLING AND USE

a. Only Compressed Gas Association 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. Never lubricate any fitting or component of a gas cylinder.
b. Before opening the cylinder valve, be sure that the T-valve is backed out and turns loosely. Open cylinder valves slowly and be sure that the T-valve is not facing anyone, 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
c. 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.
d. All cylinders are to be considered full unless properly identified as empty by the user. Empty cylinders must be returned to the supplier and not accumulated.
e. Compressed gases must not be used to clean your skin or clothing.
f. Never heat cylinders to raise internal pressure.
g. Do not use copper (>65%) connectors or tubing with acetylene. Acetylene can form explosive compounds with copper, silver, and mercury.
h. Always leave at least 30 psig minimum pressure in all "empty" cylinders. Do not leave an empty cylinder attached to a pressurized system.

V. CONTROL MEASURES

A. VENTILATION

1. Laboratory ventilation is normally designed to provide approximately 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 (see Appendix III) will be exceeded.

2. The protection provided by the 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 by attaching a kimwipe or similar light-weight strip of paper to the bottom of the sash.
   b. Operate the hood at the lowest working sash height; i.e., recommended maximum 18-inch sash height for hoods with vertical sliding (up and down) sashes and the sashes closed as much as possible for hoods with horizontal sliding (left and right) sashes. This helps to ensure optimum protection when conducting operations in the hood. The lowest working sash height opening maximizes air velocity through the hood face and may provide additional protection from unexpected splashes or chemical reactions.
   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 benchtop) 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. Fully close the hood sash and turn off the fan (if possible) when the hood is not in use. The fan should remain on if volatile materials are being temporarily (i.e., for the duration of a current project) stored in the hood.
   f. Things which cause air turbulence across the face of the hood such as fans, window air conditioning units, or excessive movement should be avoided.
   g. 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 PI or contact the CHO.

4. UHCC EHSO conducts annual surveys of fume hoods to ensure adequate airflow is maintained through the hood face. Face velocities should be between 80 and 120 feet per minute (fpm) with the sash lowered to within 18 inches of the bottom of the hood. Hoods that do not meet these minimum standards are considered "inadequate" and should not be used for protection from toxic or volatile materials. Contact your supervisor and/or CHO if you suspect the hood is not working properly.

5. At no time shall laboratory fume hood alarms be tampered with or disabled. Upon activation of the alarm, work within the hood should cease and facilities and/or the CHO must be notified.

B. SPILL CLEAN-UP PROCEDURES

The range and quantity of hazardous substances used in laboratories requires preplanning to respond safely to chemical spills. The cleanup of a chemical spill should only be done by knowledgeable and experienced personnel. Spill kits with instructions, adsorbents, reactants, and protective equipment should be available to clean up minor spills. A minor spill is one that does not spread rapidly, does not endanger people or property except by direct contact, does not endanger the environment, and the laboratory staff is capable of handling safely without the assistance of safety and emergency personnel. All other chemical spills are considered major.

In the event of a major spill the following procedures shall be carried out:

1. Attend to anyone who may be hurt or contaminated if it can be accomplished without endangering yourself.

2. If flammable materials are spilled, de-energize electrical devices if can be done without endangering yourself.

3. Call 911 if the person is unconscious. Call Campus Security for first aid assistance.

In the event of a minor spill the following procedures shall be carried out:

1. Attend to anyone who may have been contaminated or hurt.

2. Ensure that the fume hood(s) is on. Open windows where possible to increase exhaust ventilation and if the spilled material is flammable, turn off all ignition and heat sources.

3. Secure cleanup supplies. Neutralize acids and bases, if possible. Ensure protective apparel is resistant to the spill material.

4. Control the spread of the liquid by containing the spill.

5. Absorb the liquid by adding appropriate absorbent materials from the spill's outer

edges toward the center.

6. Collect and contain the cleanup residues by scooping it into a plastic bucket or other appropriate container.

7. Properly dispose of the waste as hazardous waste.

8. Decontaminate the area and affected equipment. Ventilating the spill area may be necessary.

9. Document what happened, why, what was done, and what was learned. Such documentation can be used to avoid similar instances in the future. Major incidents are almost always preceded by numerous near misses.

In any event, there should be supplies and equipment on hand to deal with the spill, consistent with the hazards and quantities of the spilled substance. These cleanup supplies should include neutralizing agents (such as sodium carbonate or sodium bisulfate) and absorbents (such as vermiculite and sand). Paper towels and sponges may also be used as absorbent-type cleanup aids, although this should be done cautiously. For example, paper towels used to clean up a spilled oxidizer may later ignite, and appropriate gloves should be worn when wiping up highly toxic material with paper towels. Also, when a spilled flammable solvent is absorbed in vermiculite or sand, the resultant solid is highly flammable and gives off flammable vapors and, thus, must be properly contained or removed to a safe place. If you have questions regarding spill clean-up requirements please contact UHCC EHSO.

VI. EXPOSURE MONITORING

Exposure monitoring shall be performed when there is reason to believe that exposures are in excess of the AL or the PEL. Materials which require monitoring under these conditions are listed in Appendix III. If an employee would like to have an exposure assessment conducted, the CHO should be contacted.

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 University's expense, under the following circumstances:

1. An individual develops signs or symptoms associated with exposure to hazardous chemicals in the laboratory.

2. Exposure monitoring reveals an exposure level routinely above the AL or PEL for a HIOSH regulated substance for which there are exposure monitoring and medical surveillance requirements.

3. An accident such as a spill, leak, equipment failure, or explosion results in possible over-exposure to hazardous chemicals.

The PI or direct supervisor, and campus Human Resources Office, are 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 in Title 12 Chapter 204-2
(refer to Appendix III page 204-2-4, and Appendix VIII)

2. Reproductive toxin: chemicals which affect reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogens).

3. Highly Acute Toxin is any substance for which:

   a. the median oral LD_{50} is less than or equal to 50 mg/kg when administered orally to albino rats, or
   b. the median inhalation lethal concentration, LC_{50}, 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 LD_{50} 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

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:

1. Use the smallest amount of chemical that is consistent with the requirement of the work to be done.

2. Always use these chemicals in a hood with adequate air flow (face velocity between 80 and 120 feet per minute with the sash 18 inches t from the floor of the hood) or other containment device for procedures which may result in the generation of aerosols or vapors containing the substance.

3. Use high-efficiency particulate air (HEPA) filters or high-efficiency scrubber systems to protect vacuum lines and pumps.

4. Contact the UHCC EHSO for more information about reproductive toxins. A partial list of reproductive toxins is listed in Appendix IX.

5. Decontaminate designated areas before normal work is resumed there. This includes contaminated equipment.

6. Remove any protective apparel, place it in an appropriately labeled container, thoroughly wash hands, forearms, face, and neck on leaving a designated area.

7. Prepare wastes for disposal in accordance with the UHCC Hazardous Material Management Program (Appendix V).

8. Do not wear jewelry when working in designated areas since decontamination of jewelry may be difficult or impossible.

APPENDIX I

EMERGENCY TELEPHONE NUMBERS
and
WORK COORDINATION

EMERGENCY TELEPHONE NUMBERS

CAMPUS EMERGENCY (24 Hours) varies by campus

POISON CENTER
941-4411

ENVIRONMENTAL HEALTH & SAFETY OFFICE (UHCC EHSO) RESOURCES

UH Community Colleges
956-5155
Environmental Health Safety Office

UH Manoa
Laboratory Safety
956-5097

Radiation Safety
956-6475

Occupational Health and Safety
956-3204

Hazardous Material Management
966-3198

Diving Safety
956-6420

Fire Safety
956-4953

Environmental Compliance
956-9173

OFFICE OF FACILITIES AND GROUNDS

Work Coordination varies by campus

OFFICE OF RESEARCH COMPLIANCE, BIOSAFETY PROGRAM

BIOSAFETY COMPLIANCE PROGRAM
966-0347

APPENDIX II

LABORATORY INSPECTION CHECKLIST

An electronic laboratory self-inspection tool is available to UH laboratory workers with access to the UH Safety Solutions web application. To begin a self-inspection follow these instructions:

1. Login to https://hawaii.risksafety.solutions/ , found at https://www.hawaii.edu/ehso/lab-safety/uh-safety-solutions/ , and complete authentication.
2. Select the Inspect Application.
3. Select Start Inspection.
4. Select “Campus Facilities and Lab Safety-Self Inspection".
5. Enter a party to inspect (if prompted) and select “Let’s go!”

Contact labsafe@hawaii.edu with questions or to request in person training. Questions from UH Safety Solutions - Campus Facilities and Lab Safety-Self Inspection are attached below.

DOCUMENTATION

1. Is the laboratory or facility entrance signage adequate and current? Are emergency notification procedures, contacts with current phone numbers, and hazard warning signs posted at the entrance?
2. Is a current Chemical Hygiene Plan (CHP) and a current Hazardous Materials Management Program Manual (HMMP) available (electronic or hard copy) in the laboratory?
3. Does the facility (non-laboratory) have a Hazard Communication Program Plan and Hazardous Waste Management Program Manual (HMMP) on file?
4. Are Standard Operating Procedures (electronic or hard copy) available for chemicals, experiments, or equipment that pose an increased hazard?
5. Does the laboratory have a written (annually updated) chemical inventory?
6. Are Safety Data Sheets (SDS) available for all chemicals in the laboratory (hard copy or accessible online by all laboratory members)?
7. Have personnel received appropriate initial and annual safety training (where required)? Are the training document records on file?
8. DOCUMENTATION-OTHER?

GENERAL SAFETY

1. Is the laboratory locked when not in use?
2. Are emergency eyewashes and showers available and unobstructed (required if corrosive materials are present)?
3. Are disposable containers for broken glass provided and specifically labeled for glass disposal (“Broken Glass”)?
4. Are laboratory coats, goggles, face shields, gloves, closed-toe shoes and other PPE available and used?
5. Are protective goggles or face shields provided and worn where there is any danger of flying particles or corrosive materials?
6. Have all chemical fume hoods passed inspection within the past 12 months?
7. Are chemical fume hood sashes closed when not in use?
8. Are chemical fume hoods free from excessive storage?
9. Is good housekeeping maintained?
10. Are all floors kept clean and dry and in good repair?
11. Are food and beverages prepared and consumed in areas separate from chemicals?
12. Are glass containers not stored on the floor?

13. Are exits free of any trip hazards or obstruction (minimum 28 inches clearance in any exit access such as hallways and aisles)?
14. Do refrigerators, freezers, microwaves, and ice machines designated for laboratory use have proper “No Food/Drink” signage?
15. Are safety guards in place for equipment with moving parts (belts, blades, fans, etc.)?
16. Is there a first aid kit in the laboratory and is it adequately stocked with items within expiration dates?
17. Employer has a written Respiratory Protection Program?
18. Employees are fit tested to their respirators annually and are current in their medical clearance? Respirators are clean and maintained?
19. Users are annually trained in the proper use of respirators and their limitations?
20. GENERAL SAFETY-OTHER?

CHEMICAL SAFETY

1. Are all highly flammable and toxic procedures performed in a fume hood?
2. Are approved spark-proof refrigerators used for cold storage of flammable liquids?
3. Are flammable chemicals stored in a safe manner (more than 10 gallons stored in an approved flammable storage cabinet)?
4. Are incompatible chemicals segregated in storage (flammables and oxidizers; nitric acid/acids; acids and bases)?
5. Are all chemicals properly labeled, including hazard identification, and percentages of mixtures?
6. Are chemical containers kept closed and in good condition?
7. Are air and water reactive chemicals properly stored?
8. Does the laboratory test peroxide-forming chemicals?
9. Are chemical storage areas identified with signs (e.g., flammables, corrosives, carcinogens,poisons, etc.)?
10. Is a chemical spill kit available (with posted procedures)?
11. Is metallic mercury used in the laboratory? If yes, is a Hg spill kit available?
12. Are only cleaning agents stored under sinks (No hazardous chemicals allowed)?
13. CHEMICAL SAFETY-OTHER?

HAZARDOUS WASTE AUDIT CHECKLIST

1. Is hazardous waste generated and properly managed in the facility or laboratory?

2. Is non-hazardous chemical waste disposed of properly from the facility or laboratory?
3. Does the satellite accumulation area store less than 55 gallons of all hazardous waste and less that one quart of P waste?
4. Is the satellite accumulation area in the same laboratory where the waste is generated?
5. Is the satellite accumulation area kept in good housekeeping condition?
6. Are waste containers separated by hazard class to avoid incompatible storage?
7. Are all the waste containers in good condition (e.g.,not corroded or leaking, and properly sealed or closed)?
8. Are all waste containers properly labeled as to their contents (correct chemicals names, readable labels, and percentages of individual components for mixtures)?
9. Are secondary containers used when required?
10. Can the facility document the proper disposal of all hazardous waste?
11. Is there at least one person in the facility who has attended the EHSO training forHazardous Waste Generators?
12. Is the "Emergency Plans for Spills" document posted at Satellite Accumulation Area?
13. HAZARDOUS WASTE AUDIT CHECKLIST-OTHER?

COMPRESSED GAS CYLINDERS

1. Are cylinders legibly marked to clearly identify the gas contained?
2. Are incompatible gases properly segregated when not in use (e.g. oxygen and flammable gases must be separated by minimum 20 feet)?
3. Are cylinders secured properly (recommend chains) and protective caps in place when not in use?
4. Are cylinders located or stored in areas where they will not be damaged by passing or falling objects or subject to tampering by unauthorized persons?
5. Are oxygen cylinders stored 20 feet apart from combustible material or acetylene cylinders, or separated by an approved fire wall (at least 5 feet high) having a fire resistant rating of at least ½ hour?
6. Are multiple gas cylinders securely stored in a cylinder rack and not by strap?
7. Are cylinders of different heights/sizes chained or strapped appropriately?.
8. Cylinders have been hydrotested within the last 5 years to determine their integrity for current and further use?

9. Are cylinders in good condition (no rusting, sidewall indentations, bulging, crack and fissures)?
10. Gas tubing (used for gas cylinders) is in good condition; show no leaks and are not pinched?
11. Is appropriate tubing used (Tygon tubing is not to be used for flammable gases, e.g. hydrogen since it can cause static electricity)?
12. COMPRESSED GAS CYLINDERS-OTHER?

FIRE SAFETY / ELECTRICAL SAFETY

1. Are the cords of all electrical equipment in good condition?
2. Are cords used properly (e.g., no piggy-backing of surge protectors; clear of burners, sinks, aisles; no use of extension cords)?
3. Are electrical panels readily accessible and not blocked (3 foot clearance in front & 30 inch working width clearance)?
4. Gasoline portable containers are approved metal safety cans with a spring-closing lid and spout cover?
5. Are fire extinguishers and fire pull stations readily accessible? Is the building fire alarm system tested annually?
6. Are fire-rated doors not propped open?
7. Are exits visibly marked and illuminated?
8. Is storage at least 18 inches below the ceiling/sprinkler heads (24 inches for rooms without sprinklers)?
9. Are equipment that draw large amounts of power (e.g. refrigerators, microwaves) plugged directly into an outlet?
10. Equipment with exposed heating elements are unplugged when not in use (hot plates, coffee makers, toasters)?
11. Does each electrical outlet, plug box, junction box, and cabinet have a faceplate, cover or canopy cover and are unused openings in cabinets and boxes effectively closed?
12. When electrical equipment or lines are to be serviced, maintained or adjusted, are necessary switches opened, locked-out and tagged whenever possible?
13. Combustible material is not stored in boiler, mechanical or electrical rooms.
14. Does the facility have a written fire emergency plan? Have fire drills been conducted?
15. FIRE SAFETY / ELECTRICAL SAFETY-OTHER

RADIATION SAFETY

1. RADIATION SAFETY - OTHER?

http://www.hawaii.edu/ehso/ .

APPENDIX III

"HAZARDOUS CHEMICALS IN LABORATORIES"
STATE OF HAWAII OCCUPATIONAL SAFETY & HEALTH STANDARDS

The “limits for air contaminants” can be found at HAR 12-60-50, exhibit A and B, at the
following link:
https://labor.hawaii.gov/hiosh/standards/standards-admin-rules-part-2/

12-60 Exhibit A (Effective 10/27/18; Enforcement Date 2/1/19)
https://labor.hawaii.gov/hiosh/files/2018/12/Appendix-A.xlsx

12-60 Exhibit B (Effective 10/27/18; Enforcement Date 2/1/19)
https://labor.hawaii.gov/hiosh/files/2018/12/Exhibit-B-12142018.pdf

HAWAII ADMINISTRATIVE RULES

TITLE 12 DEPARTMENT OF LABOR AND INDUSTRIAL RELATIONS

SUBTITLE 8

DIVISION OF OCCUPATIONAL SAFETY AND HEALTH
CHAPTER 204

HAZARDOUS CHEMICALS IN LABORATORIES

§12-204-1 Purpose. (a) The purpose of this chapter is to prescribe minimum performance standards for the maintenance of employee health and safety that reflect the unique workplace circumstances of laboratories and the risks associated with the use of multiple hazardous substances in these environments.

(b) Scope and application.

(1) This chapter shall apply to all employers engaged in the laboratory use of hazardous chemicals as defined below.

(2) Where this chapter applies, it shall supersede, for laboratories, the requirements of all other DOSH health
standards in chapter 12-202, except as follows:

(A) For any DOSH health standard, only the requirement to limit employee exposure to the specific permissible exposure limit shall apply for laboratories, unless that

particular standard states otherwise or unless the conditions of subparagraph (C) below apply.

(B) Prohibition of eye and skin contact where specified by any DOSH health standard shall be observed.

(C) Where the action level (or in the absence of an action level, the permissible exposure limit) is routinely exceeded for a DOSH regulated substance with exposure monitoring and medical surveillance requirements, sections 12-204-4 and 12-204-8 shall apply.

(3) This chapter shall not apply to:

(A) Uses of hazardous chemicals which do not meet the definition of laboratory use, and in such cases, the employer shall comply with the relevant standard in chapters 12-202 and 12-203, even if such use occurs in a laboratory.

(B) Laboratory uses of hazardous chemicals which provide no potential for employee exposure. Examples of such conditions might include:

(i) Procedures using chemically-impregnated test media such as Dip-and-Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip; and

(ii) Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit. [Eff. 3/22/91; am 6/8/92] (Auth: HRS §396-4) (Imp: HRS§396-4)

§12-204-2 Definitions. As used in this chapter: "Action level" means a concentration for a specific substance, calculated as an 8-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.
"Carcinogen" (see "select carcinogen").
"Chemical Hygiene Officer" means an employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. This definition is not intended to place limitations on the position description or job classification that the designated individual shall hold within the employer's organizational structure.
"Chemical Hygiene Plan" means a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that:

(1) Are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace; and

(2) Meets the requirements of section 12-204-5.

"Combustible liquid" means any liquid having a flashpoint at or above 100° F (37.8° C), but below 200° F (93.3° C), except any mixture having components with flashpoints of 200° F (93.3° C), or higher, the total volume of which make up 99 per cent or more of the total volume of the mixture.

"Compressed gas" means:

(1) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70° F (21.1° C); or

(2) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130° F (54.4° C) regardless of the pressure at 70° F (21.1° C); or

(3) A liquid having a vapor pressure exceeding 40 psi at 100° F (37.8° C) as determined by ASTM D-323-72.

"Designated area" means an area which may be used for work with "select carcinogens," reproductive toxins or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood.

"Emergency" means any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the workplace.

"Employee" means an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

"Explosive" means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

"Flammable" means a chemical that falls into one of the following categories:

(1) "Aerosol, flammable" means an aerosol that yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

(2) "Gas, flammable" means:

(A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 per cent by volume or less; or

(B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 per cent by volume, regardless of the lower limit;

(3) "Liquid, flammable" means any liquid having a flashpoint below 100° F (37.8° C), except any mixture having components with flashpoints of 100° F (37.8° C) or higher, the total of which make up 99 per cent or more of the total volume of the mixture.

(4) "Solid, flammable" means a solid, other than a blasting agent or explosive as defined in section 12-98-1, that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing; or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if it ignites and burns with a self-sustained flame at a rate greater than 1/10 of an inch per second along its major axis.

"Flashpoint" means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

(1) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24-1979 (ASTM D 56-79))--for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100° F (37.8° C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or

(2) Pensky-Martens Closed Tester (see American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D 93-79))--for liquids with a viscosity equal to or greater than 45 SUS at 100° F (37.8° C), or that contain suspended solids, or that have a tendency to form a surface film under test; or

(3) Setaflash Closed Tester (see American National Standard Method of Test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)). Organic peroxides, which undergo auto accelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

"Hazardous chemical" means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic
or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes. (Appendices A and B of the Hazard Communication Standard chapter 12-203 provide further guidance in defining the scope of health hazards and determining whether or not a chemical is to be considered hazardous for purposes of this standard.)

"Laboratory" means a facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

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

"Laboratory-type hood" means a device located in a laboratory, enclosed on five sides with a moveable sash or fixed partial enclosure on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations
to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms. Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees
do not work inside the enclosure during the release of airborne hazardous chemicals.

"Laboratory use of hazardous chemicals" means handling or use of such chemicals in which all of the following conditions are met:

(1) Chemical manipulations are carried out on a "laboratory scale";

(2) Multiple chemical procedures or chemicals are used;

(3) The procedures involved are not part of a production process, nor in any way simulate a production process; and

(4) "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

"Medical consultation" means a consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to hazardous chemical may have taken place.

"Organic peroxide" means an organic compound that contains the bivalent -0-0-structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

"Oxidizer" means a chemical other than blasting agent or explosive as defined in section 12-98-1, that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

"Physical hazard" means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, or organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

"Protective laboratory practices and equipment" means those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

"Reproductive toxins" means chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

"Select carcinogen" means any substance which meets one of the following criteria:

(1) It is regulated by DOSH as a carcinogen; or

(2) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or

(3) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (latest editions); or

(4) It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

(A) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m3;

(B) After repeated skin application of less than 300 mg/kg of body weight per week; or

(C) After oral dosages of less than 50 mg/kg of body weight per day.

"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.
"Water-reactive" means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard. [Eff. 3/22/91] (Auth: HRS §396-4) (Imp: HRS §396-4)

§12-204-3 Permissible exposure limits. For laboratory uses of DOSH regulated substances, the employer shall ensure that laboratory employees' exposures to such substances do not exceed the permissible
exposure limits specified in chapter 12-202. The permissible exposure limit for this standard refers to any DOSH exposure limit whether it be a TWA (time weighted average), STEL (short term exposure limit), or ceiling. [Eff. 3/22/91] (Auth: HRS §396-4 (Imp: HRS §396-4)

§12-204-4 Employee exposure determination. (a) Initial monitoring. The employer shall measure the employee's exposure to any substance regulated by a standard in chapter 12-202 which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL).

(b) Periodic monitoring. If the initial monitoring discloses employee exposure over the action level (or in the absence of an action level, the PEL), the employer shall immediately comply with the exposure monitoring provisions of the relevant standard in chapter 12-202.

(c) Termination of monitoring. Monitoring may be terminated in accordance with the relevant standard in chapter 12-202.

(d) Employee notification of monitoring results. The employer shall, within 15 working days after the receipt of any monitoring results, notify the employee of these results in writing either individually or by posting results in an appropriate location that is accessible to employees. [Eff. 3/22/91] (Auth: HRS §396-4) (Imp: HRS §396-4)

§12-204-5 Chemical hygiene plan. (a) Where hazardous chemicals as defined by this standard are used in the workplace, the employer shall develop and carry out the provisions of a written Chemical Hygiene Plan which is:

(1) Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory; and

(2) Capable of keeping exposures below the limits specified in section 12-204-3.

(b) The Chemical Hygiene Plan shall be readily available to employees, employee representatives and, upon request, to the director, and director's representative.

(c) The Chemical Hygiene Plan shall include each of the following elements and shall indicate specific measures that the employer will take to ensure laboratory employee protection:

(1) Standard operating procedures to be followed when laboratory work involves the use of hazardous chemicals;
(2) Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices; particular attention shall be given to the selection of control measures for chemicals that are known to be extremely hazardous;
(3) A requirement that fume hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment;

(4) Provisions for employee information and training as prescribed in section 12-204-7;
(5) The circumstances under which a particular laboratory operation, procedure, or activity shall require prior approval from the employer or the employer's designee before implementation;

(6) Provisions for medical consultation and medical examinations in accordance with section 12-204-8;
(7) Designation of personnel responsible for implementation of the Chemical Hygiene Plan including the assignment of a Chemical Hygiene Officer and, if appropriate, establishment of a Chemical Hygiene Committee; and
(8) Provisions for additional employee protection for work with particularly hazardous substances. These include "select carcinogens," reproductive toxins, and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate:
(A) Establishment of a designated area;
(B) Use of containment devices such as fume hoods or glove boxes;
(C) Procedures for safe removal of contaminated waste; and
(D) Decontamination procedures. (d) The employer shall review and evaluate the effectiveness
of the Chemical Hygiene Plan at least annually and update it as necessary.
(Appendix A is non-mandatory but provides guidance to assist employers in the development of the Chemical Hygiene Plan.)
[Eff. 3/22/91] (Auth: HRS §396-4) (Imp: HRS §396-4)

§12-204-6 Hazard identification. (a) With respect to labels and material safety data sheets:

(1) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.
(2) Employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees.

(b) The following provisions shall apply to chemical substances developed in the laboratory:

(1) If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the employer shall determine if it is a hazardous chemical as defined in section 12-204-2. If the chemical is determined to be hazardous, the employer shall provide appropriate training as required under section 12-204-7;
(2) If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and shall follow the procedures in section 12-204-5; and
(3) If the chemical substance is produced for another user outside of the laboratory, the employer shall comply with chapter 12-203 including the requirements for preparation of material safety data sheets and labeling. [Eff. 3/22/91] (Auth: HRS §396-4) (Imp: HRS §396-4)

§12-204-7 Employee information and training. (a) The employer shall provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area.
(b) Such information shall 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. The frequency of refresher information and training shall be determined by the employer.
(c) Information. Employees shall be informed of:
(1) The contents of this standard and its appendices which shall be made available to employees;
(2) The location and availability of the employer's Chemical Hygiene Plan;
(3) The permissible exposure limits for DOSH regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable DOSH standard;
(4) Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and
(5) The location and availability of known reference materialon the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, material safety data sheets received from the chemical supplier.
(d) Training.
(1) Employee training shall include:
(A) Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the employer or chemical hygiene officer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
(B) The physical and health hazards of chemicals in the work area; and
(C) The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

(2) The employee shall be trained on the applicable details of the employer's written Chemical Hygiene Plan.
[Eff. 3/22/91] (Auth: HRS §396-4) (Imp: HRS §396-4)

§12-204-8 Medical consultation and medical examinations. (a) The employer shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

(1) Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination.

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

(3) Whenever an accident takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee shall be provided an opportunity for a medical consultation. Such consultation shall be for the purpose of determining the need for a medical examination.

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

(c) Information provided to the physician. The employer shall provide the following information to the physician:

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

(2) A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and

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

(d) Physician's written opinion.

(1) For each examination or consultation required under this standard, the employer shall obtain a written opinion from the examining physician which shall include the following:

(A) Any recommendation for further medical follow-up;

(B) The results of the medical examination and any associated tests;

(C) Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace; and

(D) A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

(2) The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure. [Eff. 3/22/91] (Auth: HRS §396-4) (Imp: HRS §396-4)

§12-204-9 Use of Respirators. Where the use of respirators is necessary to maintain exposure below permissible exposure limits, the employer shall provide, at no cost to the employee, the proper respiratory equipment. Respirators shall be selected and used in accordance with the requirements of section 12-64-6. [Eff. 3/22/91]
(Auth: HRS §396-4) (Imp: HRS §396-4)

§12-204-10 Recordkeeping. (a) The employer shall establish and maintain for each employee an accurate record of any measurements taken to monitor employee exposures and any medical consultations and examinations, including tests or written opinions required by this chapter.
(b) The employer shall assure that such records are kept, transferred, and made available in accordance with section 12-202-3. [Eff. 3/22/91] (Auth: HRS §396-4) (Imp: HRS §396-4)

§12-204-11 Appendix. The information contained in the appendices is not intended, by itself, to create any additional obligations not otherwise imposed or to detract from any existing obligation.

APPENDIX IV

"LIMITS FOR AIR CONTAMINANTS"
STATE OF HAWAII OCCUPATIONAL SAFETY & HEALTH STANDARDS

§12-60-50

HAWAII ADMINISTRATIVE RULES

TITLE 12
DEPARTMENT OF LABOR AND INDUSTRIAL RELATIONS

SUBTITLE 8
HAWAII OCCUPATIONAL SAFETY AND HEALTH DIVISION

PART 2
GENERAL LEGAL AND ADMINISTRATIVE PROVISIONS
FOR OCCUPATIONAL SAFETY AND HEALTH

CHAPTER 60

GENERAL SAFETY AND HEALTH REQUIREMENTS

Historical Note: Chapter 60 of title 12 is based upon chapter 201 of the Hawaii Occupational Safety and Health Standards, Rules and Regulations. [Eff 7/11/74; am 6/7/76; am 12/30/76; am 8/22/77; R 12/6/82; am 10/27/18]

§12-60-1 Application. The general provisions of the standards in this chapter shall not apply when there are more specific provisions in other sections of the standards in parts 3 – 11 of title 12, subtitle 8. [Eff 12/6/82; am 8/16/84; am and comp 10/27/18] (Auth: HRS §396-4) (Imp: HRS §396-4)

§12-60-2 Safety and health programs. (a) Scope and application. This section shall apply to all employers with employees doing business in the State.

(1) Every employer shall comply with the state laws, standards, and rules regarding a safe place of employment and safe practices, and shall do everything reasonable and necessary to protect the life, safety, and health of the employees.

(2) Employers involved with construction or related activities shall provide safe and healthful work places and practices that protect the employees and the affected general public as well.

(3) Every employer shall provide safe work places and practices by elimination or reduction of existing or potential hazards. Elimination of existing or potential hazards by design, process substitution, or other appropriate methods is preferred because it eliminates the need for further employee protection. When elimination is not feasible, reduction of existing or potential hazards to acceptable levels, using methods such as engineering or administrative controls, isolation, or guarding, shall be promptly used. When these methods are inadequate to reach acceptable levels, personal protective equipment shall be provided and used.

Exception: Employers with less than ten (10) employees need not comply with subsection (b)(1).

(b) Employer duties and responsibilities. An employer subject to this standard shall meet the following requirements:

(1) Written safety and health program.

(A) The employer shall institute and maintain an effective safety and health program to identify, evaluate, and control workplace hazards. Employer safety and health programs which were developed prior to the promulgation of this section may be used to satisfy this requirement so long as they meet the criteria for an acceptable program set forth in subparagraph (B).

(B) The program shall at a minimum:

(i) Set forth policies, procedures, and practices that recognize and protect employees from occupational safety and health hazards.

(ii) Establish and communicate a clear goal for the safety and health program and the mechanisms that will be utilized in meeting this goal.

(iii) Provide for visible top management leadership in implementing the program and ensure that all workers at the site, including contract

workers, are provided equally high quality safety and health protection, so that all workers will understand that management's commitment is serious.

(iv) Provide for and encourage employee involvement in the structure and operation of the program and in decisions that affect their safety and health, so that they will commit their insight and energy to achieving the safety and health program's goal and objectives. Involvement shall be accomplished through employee collective bargaining units, where appropriate.

(v) Assign and communicate responsibilities for all aspects of the safety and loss prevention program to managers, supervisors, and employees so that they all know and understand what is expected of them in the implementation of the program.

(vi) Provide a system to hold managers, supervisors, and employees accountable for their responsibilities under the safety and health program.

(vii) Provide a reliable system for employees to notify management personnel or safety and health committee members of conditions that appear hazardous or of noncompliance with the terms of the safety and health program without fear of reprisal and provide a mechanism to ensure timely and appropriate responses to correct these conditions.

(viii) Provide a mechanism to investigate accidents and "near miss" incidents, so that the root cause and means for preventing a recurrence are identified. For the purposes of this section, the term "accident" means any unexpected happening that interrupts the work sequence or process and that may result in injury, illness, or property damage.

(ix) Provide a means to review injury and illness trends over time, so that patterns with common causes are identified and eliminated.

(x) Establish a mechanism for the employer to conduct ongoing, periodic in-house safety and health inspections so that new or previously missed hazards or failures in controls are identified. Inspections shall be conducted with a frequency necessary to be effective.

(xi) Address the impact of emergency situations and develop written plans and procedures to insure employee safety during emergencies. For the purpose of this section, the term "emergency situation" means an unforeseen single event or combination of events that calls for immediate action to prevent, control or contain injury or illness to person or damage to property.

(xii) Establish procedures for transmitting and enforcing safe work practices in the workplace through training, positive reinforcement, as a reward system, public recognition, etc., correction of unsafe performance, and, if necessary, reinforcement of work practices through a clearly defined and communicated disciplinary system.

(C) The program shall be made available to the employees or their collective bargaining agent or both, upon request.

(2) Safe work practices.

(A) The employer shall eliminate or control all existing and potential hazards

within the workplace in a timely manner, using one or more of the following:

(i) Engineering and work practice controls designed to control employee exposures to safety and health hazards by modifying the source to reduce exposure.

(ii) Administrative controls designed to control employee exposure to safety and health hazards.

(iii) Requirements for the distribution and proper use of personal protective equipment.

(iv) A program of medical examinations or evaluations conducted by a qualified physician or health practitioner when required by a standard.

(B) The employer shall ensure that practices are understood by all employees and are underscored through training, positive reinforcement, correction of unsafe performance, and, if necessary, through a clearly defined and communicated disciplinary system.

(3) Periodic inspections. The employer shall conduct periodic in-house safety and health inspections so that new or previously missed hazards or failures in engineering, work practice, and administrative controls are identified. The in-house inspections will be conducted by individuals who are trained to recognize hazardous conditions, as members of the safety and health committee or a person designated and trained by the employer for the facility's safety and health program.

(4) Safety and health training.

(A) The employer shall develop and institute a safety and health training program for all employees so they have an understanding of the hazards to which they may be exposed, and the procedures or practices needed to protect them from these hazards.

(B) In addition, supervisors and managers shall be trained in the elements of the employer's safety and health program and in the specific responsibilities assigned to them under the program.

(C) The employer shall ensure that the supervisors and managers understand their responsibilities under the safety and health program and their importance to the safety and health of the workplace. In particular, the training for managers and supervisors shall enable them to:

(i) Recognize potential hazards;

(ii) Maintain safety and health protection in the work area; and

(iii) Reinforce employee training on the nature of the potential hazards and required protective measures.

(c) The use of any machinery, tool, material, or equipment which is not in compliance with any applicable requirement of these standards is prohibited. The machine, tool, material, or equipment shall either be identified as unsafe by tagging or locking the controls to render them inoperable or shall be physically removed from its place of operation.

(d) The employer shall permit only those employees qualified by training

or experience to operate equipment and machinery.

(e) For procedures in reporting accidents, consult chapter 12-52.1.

(f) All safety devices and safeguards in use shall be kept sound and operable.

(g) Any employee having knowledge of the existence of any unsafe device, practice, operation, safeguard, equipment, or condition shall promptly inform the supervisor or person in charge. A supervisor or person in charge to whose attention the existence of any unsafe device, practice, operation, safeguard, equipment, or condition is called shall take immediate steps to correct the unsafe condition or practice. [Eff 12/6/82; am 8/16/84; am 9/21/96; am and comp 10/27/18] (Auth: HRS §396-4) (Imp: HRS §396-4)

§12-60-3 Employee responsibilities. The employee shall not knowingly perform work in an unsafe manner or in an unsafe environment without the safeguards provided for in these standards. The employee shall not tamper with or render ineffective any safety device or safeguard and shall use the safety devices provided for personal protection. [Eff 12/6/82; comp 10/27/18] (Auth: HRS §396-4) (Imp: HRS §396-4)

§12-60-4 Removal of safety devices. No person shall remove, displace, damage, destroy, or carry off any safety device, safeguard, notice, or warning furnished for use in any employment or place of employment. [Eff 12/6/82; comp 10/27/18] (Auth: HRS §396-4) (Imp: HRS §396-4)

§12-60-5 Use of intoxicants or drugs. The use of intoxicants or harmful drugs while on duty is prohibited. No person shall be permitted to work under the influence of liquor or drugs and shall be removed from the work premises if found under the influence of liquor or drugs. [Eff 12/6/82; comp 10/27/18] (Auth: HRS §396-4) (Imp: HRS §396-4)

§12-60-6 Requirements of competence. When work is to be performed by or under the supervision of a designated person, that person shall have the degree of competence necessary to perform or direct the work in a safe manner. [Eff 12/6/82; comp 10/27/18] (Auth: HRS §396-4) (Imp: HRS §396-4)

§12-60-7 Requirement of quality. Materials, devices, structures, and methods and procedures of operation which are required by these standards, and which are described by general descriptive terms such as adequate, proper, sufficient, and the like, shall be of such kind and quality as a reasonable and prudent person experienced in the work would require in order to effect a safe operation. [Eff 12/6/82; am and comp

10/27/18] (Auth: HRS §396-4) (Imp: HRS §396-4)

§§12-60-8 to 12-60-49 RESERVED.

§12-60-50 Standards. (a) Incorporation of federal standard. Title 29, Part 1910 of the Code of Federal Regulations, 2017 Edition published as of July 1, 2017, by the U.S. Government Printing Office, U.S. Superintendent of Documents, Washington, DC 20402-0001, is made a part of this chapter except as provided in subsections (b) through (d).

(b) State specific definitions. The following definitions are in addition to those found in section 12-50-2 and subsection (a). Where a definition exists in both subsection (a) and this subsection, the definition contained in this subsection supersedes the definition in subsection (a). This State's adoption of 29 C.F.R. §1910.2, Definitions, is amended by adding the following definitions:

"Access" means the right and opportunity to examine and copy.

"Analysis using exposure or medical records" means any compilation of data, or any research, or statistical or other studies based at least in part on information collected from individual employee exposure or medical records or information collected from health insurance claims records, if either the analysis has been reported to the employer or no further work is currently being done by the person responsible for preparing the analysis.

"ANSI Z9.2" means ANSI Z9.2-1979, Fundamentals Governing the Design and Operation of Local Exhaust Systems.

"ANSI Z88.2" means ANSI Z88.2-1984, Practices for Respiratory Protection.

"Coal tar pitch volatiles" means, as used in Exhibit A, entitled "Limits for Air Contaminants", and dated July 1, 2017, which is made part of this chapter and located at the end of this chapter, the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt, CAS 8052-42-4 and CAS 64742-93-4), wood, and other organic matter.

"Designated representative" means any individual or organization to whom an employee gives writtenauthorization to exercise a right of access. For access to employee exposure records and analyses using exposure or medical records, a recognized or certified collective-bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization.

"Employee exposure record" means a record containing any of the following kinds of information:

(1) Environmental (workplace) monitoring or measuring of a toxic substance or a harmful physical agent, including personal, area, grab, or wipe sampling, or any other form of sampling, as well as related collection and analytical methodologies, calculations, and other background data relevant to interpretation of the results obtained;

(2) Biological monitoring results which directly assess the absorption of a

substance or agent by body systems (e.g., the level of a chemical in the blood, urine, breath, hair, fingernails, etc.) but not including results which assess the biological effect of a substance or agent or which assess an employee's use of alcohol or drugs;

(3) Material safety-data sheets; and

(4) A chemical inventory or any other record which reveals where and when used and the identity (e.g., chemical, common, or trade name) of a toxic substance or harmful physical agent.

"Employee medical record" means a record concerning the health status of an employee, which is made or maintained by a physician or nurse, or any other health care personnel or technician, including:

(1) Medical and employment questionnaires or histories (including job description and occupational exposures);

(2) The results of medical examinations (pre-employment, pre-assignment, periodic, or episodic) and laboratory tests (including chest and other X-ray examinations taken for the purposes of establishing a baseline or detecting occupational illness, and all biological monitoring not defined as an "employee exposure record");

(3) Medical opinions, diagnoses, progress notes, and recommendations;

(4) Descriptions of treatments and prescriptions;

(5) First-aid records; and

(6) Employee medical complaints; but does not include medical information in the form of:

(A) Physical specimens (e.g., blood or urine samples) that are routinely discarded as a part of normal medical practice;

(B) Records concerning health insurance claims if maintained separately from the employer's medical program and its records, and not accessible to the employer by employee name or other direct personal identifier (e.g., social security number, payroll number, etc.); [or]

(C) Records created solely in preparation for litigation which are privileged from discovery under the applicable rules of procedure or evidence; or

(D) Records concerning voluntary employee assistance programs (alcohol, drug abuse, or personal counseling programs) if maintained separately from the employer's medical program and its records.

"Excursion factor" means the magnitude of the permissible excursion above the PEL-TWA for those substances not preceded by a "C" in Exhibit A entitled

"Limits for Air Contaminants", and dated July 1, 2017, which is made part of this chapter and located at the end of this chapter, and not found in Exhibit B entitled "More Limits for Air Contaminants", and dated July 1, 2017, which is made part of this chapter and located at the end of this chapter.

"Exposure" or "exposed" means that an employee is subjected to a toxic material or harmful physical agent during employment through any route of entry, such as inhalation, ingestion, skin contact, or absorption, and

includes past exposure and potential exposure.

"Health professional" means a physician, occupational health nurse, industrial hygienist, toxicologist, or epidemiologist, providing medical or other occupational health services to exposed employees.

"Permissible Exposure Limit (PEL)" means the airborne concentrations of substances to which it is believed that nearly all workers may be exposed with no adverse effect.

"Permissible Exposure Limit-Ceiling (PEL-C)" means the concentration that shall not be exceeded even instantaneously. The PEL-C is the employee's exposure, which shall not be exceeded during any part of the workday. If instantaneous monitoring is not feasible, then the ceiling shall be assessed as a 15-minute time weighted average exposure, which shall not be exceeded at any time over a working day.

"Permissible Exposure Limit-Short Term Exposure Level (PEL-STEL)" means the employee's fifteen (15) minute time weighted average exposure, which shall not be exceeded at any time during a workday unless another time limit is specified in a parenthetical notation below the limit. If another [time] period is specified, the time weighted average exposure over that time limit shall not be exceeded at any time during the workday.

"Permissible Exposure Limit-Time Weighted Average (PEL-TWA)" means the employee's average airborne exposure, which shall not be exceeded in any

seven (7) to eight (8) hour work shift of a forty (40) hour workweek.

"Record" means any item, collection, or grouping of information regardless of the form or process by which it is maintained (e.g., paper document, microfiche, microfilm, X-ray film, or automated data processing).

"Specific chemical identity" means the chemical name, Chemical Abstracts Service (CAS) Registry Number, or any other information that reveals the precise chemical designation of the substance.

"Specific written consent" means a written authorization containing:

(1) The name and signature of the employee authorizing the release of medical information;
(2) The date of the written authorization;
(3) The name of the individual or organization that is authorized to release the medical information;
(4) The name of the designated representative (individual or organization) that is authorized to receive the released information;
(5) A general description of the medical information that is authorized to be released;
(6) A general description of the purpose for the release of the medical information; and
(7) A date or condition upon which the written authorization will expire (if less than one year); but a written authorization does not authorize the release of medical information not in existence on the date of written authorization, unless the release of future information is expressly authorized, and does

not operate for more than one year from the date of written authorization. A written authorization may be revoked in writing prospectively at any time.

"Toxic material or harmful physical agent" means any chemical substance, biological agent (bacteria, virus, fungus, etc.), or physical stress (noise, heat, cold, vibration, repetitive motion, ionizing and non-ionizing radiation, hypo- or hyperbaric pressure, etc.) which:

(1) Is listed in the latest printed edition of the National Institute for Occupational Safety and Health (NIOSH) Registry of Toxic Effects of Chemical Substances (RTECS);

(2) Has yielded positive evidence of an acute or chronic health hazard in testing conducted by, or known to, the employer; or

(3) Is the subject of a material safety-data sheet kept by or known to the employer indicating that the material may pose a hazard to human health.

"Trade secret" means any confidential formula, pattern, process, device, or information or compilation of information that is used in an employer's business and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it.

(c) State specific standards for Occupational Noise Exposure. The following standards are in effect in addition to those adopted in subsection (a). Where standards on an item exist in both subsection (a) and this subsection, the standards contained in this subsection supersede the standards in subsection (a).

(1) 29 C.F.R. §1910.95 Table G-16 is amended to read as follows:

(2)

[“]TABLE G-16–PERMISSIBLE NOISE EXPOSURES1

Duration per day, hours	Sound level dBA slow response
8	90
	92
6	95
	97
4	100
	102
3	105
	110
2	115
1-1/2	
1	
1/2	
1/4 or	

less.....
.

When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect shall be considered, rather than the individual effect of
each. If the sum of the following fractions: C1/T1+C2/T2Cn/Tn exceeds unity, then[,] the mixed exposure shall be considered to exceed the limit value. Cn indicates the total time of exposure at a specific noise level, a Tn indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise shall not exceed 140 dB peak sound pressure level.[”]

(3) 29 C.F.R. §1910.95(c)(1) is amended to read as follows:

The employer shall administer a continuing, effective hearing conservation program, as described in paragraphs (c) through (o) of this section, whenever employee noise exposures equal or exceed an eight (8) hour time-weighted average sound level (TWA) of eighty-five (85) decibels measured on the A scale (slow response) or a dose of 50 percent. For purposes of the hearing conservation program, employee noise exposures shall be computed in accordance with appendix (a) and table G-16a, and without regard to any attenuation provided by using personal protective equipment.

(d) State specific standards for Toxic and Hazardous Substances. The following standards are in effect in addition to those adopted in subsection (a). Where standards on an item exist in both subsection (a) and this subsection, the standards contained in this subsection supersede the standards in subsection (a).

(1) 29 C.F.R. §1910.1000 is amended by adding the following:

(A) All employers shall measure, monitor, and record employee exposure to toxic materials or harmful physical agents. The measurement shall determine if any employee may be exposed to concentrations of the toxic materials or harmful physical agents at or above the permissible exposure limit. The determination shall be made each time there is a change in production, process, or control measures which could result in an increase in concentrations of these materials or agents. A written record of the determination shall be made and shall contain at least:

(i) Any information, observations, or calculations that may indicate employee exposure to toxic or potentially toxic materials or harmful physical agents;

(ii) Any measurements taken;

(iii) Any employee complaints of symptoms that may be attributable to exposure to toxic or potentially toxic materials or harmful physical agents;

(iv) Date of determination, work being performed at the time, location within work site, name, and social security number of each employee considered; and

(v) Any other information that may be relevant to employee exposure.

(B) When medical examinations are appropriate for adequate

employee protection, the employer shall, at the employer's cost, provide examinations to best determine the effect of toxic material or harmful physical agents on the health of employees.

(2) 29 C.F.R. §1910.1000(a) is amended to read as follows:

(A) Air Contaminants Limits Column. An employee's exposure to any substance listed in Exhibit A, entitled "Limits for Air Contaminants", and dated July 1, 2017, which is made part of this chapter and located at the end of this chapter, shall not exceed the PEL-TWA, PEL-STEL and PEL-Ceiling specified for that substance shown in Exhibit A.

(i) Because many industrial exposures are not continuous, but instead are short-term, or intermittent, to which the PEL-TWAs cannot be applied, PEL-STELs for selected air contaminants are listed in Exhibit A, entitled "Limits for Air Contaminants", and dated July 1, 2017, which is made part of this chapter and located at the end of this chapter.

(ii) The PEL-STELs listed in Exhibit A, entitled "Limits for Air Contaminants", and dated July 1, 2017, which is made part of this chapter and located at the end of this chapter, are fifteen (15) minute time-weighted average (TWA) exposures that shall not be exceeded at any time during a workday.

(iii) Exposures at the PEL-STEL shall not be longer than fifteen (15) minutes and shall not be repeated more than four times per day. There shall be at least sixty (60) minutes between successive exposures at the PEL-STEL.

(B) Skin Designation. To prevent or reduce skin absorption, an employee's skin exposure to substances listed in Exhibit A, entitled "Limits for Air Contaminants", and dated July 1, 2017, which is made part of this chapter and located at the end of this chapter, with an "X" in the Skin Designation columns shall be prevented or reduced to the extent necessary in the circumstances through the use of gloves, coveralls, goggles, or other appropriate personal protective equipment, engineering controls, or work practices.

(3) 29 C.F.R. §1910.1000(b) is amended to read as follows:

(A) PEL-TWA. An employee's exposure to any material listed in Exhibit A, entitled "Limits for Air Contaminants", and dated July 1, 2017, which is made part of this chapter and located at the end of this chapter, in any seven (7) to eight (8) hour work shift of a forty (40) hour workweek, shall not exceed the PEL-TWA given for that material in Exhibit B, Exhibit B entitled "More Limits for Air Contaminants", and dated July 1, 2017, which is made part of this chapter and located at the end of this chapter.

(B) Acceptable ceiling concentration. An employee's exposure to a material listed in Exhibit B, entitled "More Limits for Air Contaminants", and dated July 1, 2017, which is made part of this chapter and located at the end of this chapter, shall not exceed at any time during a seven (7) to eight (8) hour work shift the acceptable ceiling concentration given for that material in the table.

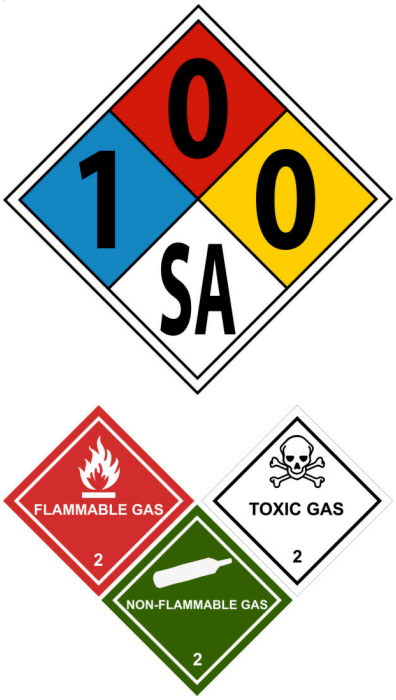
[Eff 2/13/12; am 11/2/12; am and comp 10/27/18] (Auth: HRS: §396-4) (Imp: HRS §396-4)

Historical Note: §12-60-50 is based substantially upon Part 2. [Eff 6/8/82; 7/24/94; am 9/30/94; am 8/10/95; am 1/16/96; am 2/8/97; am 10/23/97; am 7/6/98; am 3/29/99; am 7/6/99; am 2/14/00; am12/29/00; am 12/29/01; am 5/21/04; am 5/5/05; am 9/1/05; am 3/31/06; am 12/21/06; am 4/19/07; am 8/29/07; am 5/2/08; am 7/27/09; R 2/13/12 and Part 8 [Eff 7/12/82; am 5/28/83; am 6/16/84; am 8/5/88; am 3/22/91; am 6/8/92; am 2/26/93; am 7/25/94; am 8/10/95; am 1/26/96; am9/21/96; am 11/16/96; am 2/8/97; am 5/2/97; am 7/10/97; am 4/11/98; am 7/6/98; am 3/29/99; am 12/29/00; am 8/9/01; am 12/29/01; am 5/21/04; am 3/31/06; am 12/21/06; 4/19/07; am 7/27/09; R 2/13/12; am 10/27/18]

APPENDIX V

HAZARDOUS MATERIAL MANAGEMENT PROGRAM

University of Hawai‘i - Community College



Hazardous Material Management Program (HMMP)

Revised March 2025

Dear Colleagues,

In alignment with the University's commitment to promoting a safe and healthy study and work environment, this Hazardous Materials Management Plan (HMMP) was created as a vital component in ensuring the well-being of students, faculty, staff, and the surrounding community.

Each campus is responsible for maintaining a safe environment through the enforcement of environmental health and safety programs. The HMMP serves as a crucial guide for the management of hazardous materials and waste, ensuring compliance with federal, state, and local regulations. It also outlines procedures that safeguard our campus personnel from the risks associated with hazardous substances, thus reducing the likelihood of accidents, spills, and environmental contamination.

This revised version of the HMMP, which incorporates updates and revisions since its original issuance in September 2000, reflects the ongoing commitment of the University to ensure that all hazardous materials are handled in a safe, efficient, and compliant manner. It serves not only as a regulatory tool but also as a roadmap for emergency preparedness and response, providing clear instructions on how to minimize the impact of hazardous materials incidents.

Hazardous materials are present across our campuses in laboratories, maintenance areas, and various other facilities. From chemicals used in research and classroom settings to cleaning agents and fuels required for campus operations, the potential risks associated with mishandling these substances can have devastating impacts on both human health and the environment. Without an organized and well-executed Hazardous Materials Management Plan, there is an increased risk of spills, accidents, and long-term environmental damage.

A comprehensive HMMP is not just a regulatory requirement; it is an essential framework for maintaining the safety and sustainability of our community college campuses. It helps us meet our environmental stewardship goals while promoting a culture of safety and responsibility within the University community. The importance of this program cannot be overstated, as it directly impacts the health and safety of those who work and study on campus.

By adhering to the guidelines set forth in the plan, we can collectively contribute to a safer, healthier, and more environmentally conscious campus environment.

Office of the Vice President for Community College – Environmental Health & Safety

List of Abbreviations

CESQG – Conditionally Exempt Small Quantity Generator

CFR – Code of Federal Regulations

CTAHR – College of Tropical Agriculture and Human Resources

DOH-SHWB – State of Hawaii Department of Health Solid and Hazardous Waste Branch

EHSO – University of Hawaii at Manoa Environmental Health and Safety Office

EPA – Environmental Protection Agency

HawCC – Hawaii Community College

HMMP – Hazardous Materials and Hazardous Waste Management Plan

Kg – Kilogram

LQG – Large Quantity Generator

MSDS – Material Safety Data Sheets

OSHA – Occupational Safety and Health Administration

PI – Principal Investigator

ppm – Parts per million

RCRA – Resource Conservation and Recovery Act

SQG – Small Quantity Generator

UHCC – University of Hawai‘i Community Colleges

UHCC-EHSS – UHCC Environmental Health and Safety Specialist within the Office of the Vice President for Community Colleges.

UHH – University of Hawaii at Hilo

UHH-ESS – University of Hawaii at Hilo Environmental Safety Specialist

VCAS – The Vice Chancellor for Administrative Services (Affairs)

Contents

Hazardous Material Management Program

Introduction

This HMMP outlines requirements for the management of hazardous materials and the disposal of hazardous waste at University of Hawai‘i community college campuses and facilities. These requirements are based on federal, state and county regulations. Adherence to this program will ensure the proper management of hazardous materials and hazardous wastes, reduce overall costs (by reducing disposal cost and minimizing the use of hazardous materials), and avoid potential civil and/or criminal liabilities. This plan is applicable to all University of Hawai‘i community college campuses and facilities . Failure to comply with these requirements may subject University and/or individuals to fines and civil or criminal prosecution.

The Environmental Protection Agency (EPA) is charged with the enforcement of hazardous waste regulations under the Resource Conservation and Recovery Act (RCRA). Locally, the State of Hawaii Department of Health – Solid and Hazardous Waste Branch (DOH-SHWB) enforces RCRA regulations. Under RCRA, facilities that generate hazardous waste are categorized according to the amount and type of waste they generate and/or accumulate. Facilities that generate less than 100 Kg (220 pounds) a month of hazardous waste or 1 Kg of acutely hazardous waste (as defined in 40 CFR 261.33e) are categorized as **Conditionally Exempt Small Quantity Generators (CESQG)**.

Facilities that generate between 100 Kg and 1000 Kg/mon. of hazardous waste and less than 1 Kg of acutely hazardous waste are categorized as Small Quantity Generators (SQG). Facilities that generate more than 1000 Kg/ mon. of hazardous waste or accumulate more than 1 Kg of hazardous waste at any time are categorized as Large Quantity Generators (LQG). Regulatory requirements vary according to a facility’s generator status.

It is the intent of the University to operate all community college campuses and related facilities as separate CESQG by campus. This will minimize the requirements and burden upon campus administrators, faculty and staff. As stated above, a CESQG is allowed to generate up to 100 Kg (220 pounds) of hazardous waste or 1 Kg of acutely hazardous waste per calendar month. Additionally, a CESQG is allowed to accumulate up to 1000 Kg of hazardous waste and up to 1 Kg of acutely hazardous waste at any time. The following program outlines the requirements for operating as a CESQG.

APPLICABILITY

This program applies to all personnel that purchase, store, transport, manage, use, and dispose of hazardous materials and/or hazardous wastes. This plan applies to waste generated on the main campus of any community college, as well as any attached facilities and/or properties used or controlled by the individual campus units.

RESPONSIBILITY

All applicable personnel must become familiar with the hazardous materials in their areas of responsibility and with the UHCC Hazardous Materials and Hazardous Waste Management Program. Applicable personnel shall contact the UHCC Environmental Safety Specialist, Ph: 808-956-XXXX, if in doubt about the requirements of this program or about how to properly dispose of waste.
Individual investigators, supervisors, workers, students, laboratory staff, contractors, etc. are considered the actual originators (generators) of these regulated materials. Therefore, it is the responsibility of each generator to identify all hazardous wastes that they might be producing, and to assure the waste is handled in a manner consistent with the requirements listed in this document.

DESIGNATED PROGRAM COORDINATORS

The University of Hawai‘i Community Colleges – Environmental Health and Safety Specialist (UHCC-EHSS) within the Office of the Vice President for Community Colleges shall have responsibility for the oversight and overall coordination of the HMMP for all community college campuses. Their role is to ensure campuses have and maintain a sufficient number of personnel at each campus are trained in the proper handling and disposal of hazardous materials and waste, as well as to provide subject matter expertise to campuses in the identification and safe disposal of hazardous waste. The Chancellor (or their assigned designee) shall be responsible for coordinating the implementation of the HMMP for their campus and related facilities under their control.

The Chancellor (or their assigned designee) shall be responsible for properly identifying, in writing, all faculty and staff in each Division/Department who shall implement the HMMP for their area, a list of which shall be kept current and updated annually (at a minimum). Designated program coordinators shall be responsible for the submission of a monthly hazardous materials report and a cumulative annual inventory report of hazardous waste to their campus Vice Chancellor for Administrative Services.

All hazardous waste generators are required to attend initial and annual hazardous waste generator training and refresher course. The purpose of the training is to familiarize waste generators with EPA requirements for the safe handling, purchase, and disposal of hazardous chemicals and hazardous waste. The EHSS within the Office of Vice President for Community Colleges shall also conduct training on the University’s requirements contained in this HMMP for the safe handling, purchase, and disposal of hazard chemicals and hazardous waste.

All designated personnel must:

- Become familiar with the hazardous materials in their area and with this UHCC hazardous material and hazardous waste management program (HMMP).
- Use authorization to purchase form (Attachment 1) to obtain approval for the purchase of hazardous material.
- Submit an authorization to use hazardous material form (Attachment 2) for grant approval

- Provide a beginning of the semester/end of the semester inventory of hazardous materials (Attachment 3) and an annual inventory of hazardous wastes (Attachment 4).
- Store and label waste properly.
- Properly identify and make waste determination according to federal and state regulations.

Training Certificates

Designated program coordinators are required to retain a copy of their training certificates as proof of training and annual refresher completion on how to properly handle, purchase or dispose of hazardous chemicals/waste. Designated program coordinators shall submit copies of their training certificates to their campus Vice Chancellor for Administrative Services (VCAS) prior to being allowed to purchase or dispose of hazardous chemicals, materials, and/or waste. The VCAS shall maintain an updated record of all designated program coordinators authorized to purchase and dispose of hazard chemicals and waste for their campus.

Authorization to Purchase Hazardous Materials

VCAS approval is required for the purchase or requisition of all hazardous materials. The Authorization to Purchase Hazardous Materials Form (Attachment 1), must be complete and submitted to VCAS at the time any purchase order for hazardous materials is initiated. If approved, a copy of the form will be provided to you for attachment to your purchase order or requisition. The purpose of the VCAS approval is to ensure campus oversight of the safe storage, handling and eventual disposal of the material while minimizing the cost to UHCC. All requests should be submitted for approval for purchase at least two weeks prior to initiating any purchase of chemicals.

Approval to Use Extremely Hazardous Materials

As part of the grant approval process (ORS Form 5, item 4 under PI certification) a specific form for the use of certain hazardous materials has been developed (Attachment 2). This form is similar to those already in place for the use of radioactive and biohazard materials. Principal Investigators (PI) are required to complete Attachment 2 prior submitting their grant proposals for approval.

Inventory Control Procedures

Semester Inventory of Hazardous Materials

Programs that use and store hazardous materials are required to submit an inventory of all hazardous materials to the VCAS at the beginning and ending of each school semester. Attachment 3 shall be utilized to help manage existing hazardous materials, monitor on-going usage, and prevent unnecessary accumulation. Inventories are due prior to the beginning of each semester or Summer school term, and at the end of each semester or Summer school term. As part of the inventory process, programs are required to inspect the condition of all hazardous material containers to ensure that hazardous materials are stored in containers which are in good condition and properly labeled.

Monthly Inventory of Hazardous Wastes

UHCC programs that generate hazardous wastes are required to submit monthly waste inventories to their VCAS. Waste inventory forms (Attachment 4) shall be submitted to the VCAS on or before the first Friday of every month. The waste inventories help your campus administration to ensure that it does not exceed its accumulation limits that could possibly subject your campus to more stringent regulations. As part of the inventory procedure, designated program coordinators are required to inspect the condition of all hazardous waste material containers to ensure that hazardous wastes are stored in containers which are in good condition and which are properly labeled.

Hazardous Waste Disposal

The VCAS shall coordinate with campus programs to consolidate hazardous waste inventories to prepare a Request for Quotation (RFQ) from a licensed EPA vendor for the packaging, transportation, and disposal of the hazardous waste. This may need to be done on an annual basis or more frequently depending on the amount of hazardous waste accumulated to maintain EPA status as a **Conditionally Exempt Small Quantity Generator (CESQG)**. VCAS is encouraged to contact the UHCC Environmental Safety Specialist for technical advice and assistance in developing the RFQ and preparing the campus generated hazardous waste for removal.

Inventory of Special Wastes

While certain wastes are not hazardous, they also cannot be disposed of in a sanitary landfill or down the sewer drain and may necessitate special disposal procedures. These non-hazardous wastes should be included in Waste Inventory Form for proper disposal.

Audit Program

The audit program will assist in maintaining a safe working and academic environment. The UHCC Environmental Health and Safety Specialist will conduct periodic audits of each community college campus to review the safe handling, inventory, and storage of all hazardous materials and hazardous waste. The EHSS shall review the following:

- Hazardous material storage
- Personal protective equipment is being adequately used
- Emergency eyewash and showers are operational/present
- Laboratory chemical hoods are operating properly
- Hazardous and acutely hazardous waste accumulation containment
- Safety Data Sheet availability
- Hazardous waste accumulation areas and related emergency plans

A report indicating any corrective actions that are necessary and recommendations for safe handling and storage improvement will be provided to the campus Chancellor.

Storage of Safety Data Sheets

All chemical manufacturers and suppliers of hazardous chemicals must furnish an SDS with each initial shipment and furnish new SDS information upon request. SDSs generally contain information such as the following:

- Chemical composition
- Physical characteristics and chemical properties
- Fire, explosion and reactivity hazards

- Health hazard information and symptoms of overexposure
- Protective equipment recommendations
- Handling and storage precautions
- Cleanup and disposal procedures
- Emergency first aid procedures

Federal and state law requires that written SDSs must be kept in proximity to the area where products are stored and must be **readily available** to all employees at any time. SDSs must also be available for emergency personnel or any state or federal agency that requests them. It is the responsibility of the designated program coordinator in each area to ensure that all SDSs are kept in an accessible storage area and are updated. If an SDS is missing or incomplete, it is likely that you can obtain a copy from the Internet or from the manufacturer. Requests for missing SDSs should be made in writing and a copy of the request should be kept in your file.

Safety In Use

Certain hazardous materials require Standard Operating Procedures (SOPs) to ensure their safe use and storage. The UHCC Chemical Hygiene Plan (CHP) provides SOP requirements and describes the specific types of materials covered.

Inventory of Hazardous Materials

The requirement for a total chemical inventory has been incorporated into the UHCC Chemical Hygiene Plan (CHP). A copy of the inventory must be available at the laboratory/facility for review at all times.

Hazardous Waste Management

Waste Identification and Classification

All waste must be identified and then classified as a hazardous or non-hazardous waste according to specific federal and state definitions summarized in Attachment 5. The UHCC EHSS is available to assist you in deciding whether a waste is hazardous or not. A waste determination must be done as soon as waste is collected into a waste container. The waste determination will be documented on the Hazardous Waste Tag. Most facilities produce wastes consistent in character. Therefore, what is often the most confusing aspect of the regulations – characterization and classification – becomes a periodic verification function.

What is a waste? A waste is:

- A useless by-product of an operation
- A material which is to be disposed
- Any material which can no longer be used
- A manufacturing or process by-product

How do I determine if a waste is hazardous?

Review the Safety Data Sheets:
SDSs may provide information that will assist you and the EHSO Office in making a proper

hazardous waste determination.
Contact the Environmental Health and Safety Specialist:
The Environmental Health and Safety Specialist for the Community Colleges (808-956-XXXX) will assist you in making the determination of whether a waste is hazardous or is non-hazardous.

Accumulation of Waste

Limits on Waste Generation
To maintain the status of a Conditionally Exempt Small Quantity Generator, each campus **may not** generate more than 100 kilograms (approximately one half of a 55-gallon drum, 27 gallons, or 220 pounds) of hazardous waste per month. Each campus also may not generate more than 1 kilogram (2.2 pounds) of acute hazardous waste in one month.

Limits on Waste Accumulation
To maintain the status of Conditionally Exempt Small Quantity Generator, each campus **may not** have more than 1000 kilograms (approximately five 55-gallon drums, or 275 gallons, or 2200 pounds) of total accumulated hazardous waste and no more than 1 kilogram (2.2 pounds) of accumulated acute hazardous waste at any time.

Designation of Waste Management Area
Campus programs generating hazardous waste should establish a safe area near the point of generation for the temporary storage of that waste before disposal by a licensed contractor. The area should be neat and orderly, containers should not be stacked upon one another, and containers of liquid should not be stored on their side. **The VCAS will hire a licensed hazardous waste contractor to transport the waste to an EPA permitted hazardous waste treatment, storage and disposal facility.**

Storage of Hazardous Waste

Labeling Waste Containers
All hazardous waste containers must be labeled with the following:

- The words "WASTE_____." (example: WASTE Methanol, WASTE Hydrochloric Acid, etc.)
- An accurate description of the contents of the container. The manufacturer's label or a label giving the chemical name and specific hazards (e.g., flammable, corrosive or poison) is acceptable.
- Generic names can be used if a separate list is maintained to indicate the chemical names and the approximate amounts (e.g., "WASTE chlorinated solvent bottle no.1" with a separate list "Bottle no. 1 Chloroform 50%, Methyl Chloroform 40%, Methylene Chloride 10%).
- The accumulation start date.
- Provide pH for all liquids.

Closed Waste Containers

All hazardous waste containers must remain closed except when waste is being added to them.

Waste Containers Kept In Good Condition

Containers used for wastes must be in good condition (i.e., no rusting, cracks or structural defects). If a container is broken or begins to leak, the materials must be transferred to a container in good condition. The material composition must be compatible with the material to be stored, and incompatible materials must not be stored in proximity to one another. Package materials in sturdy cardboard boxes or plastic waste containers. Cushion the material in the containers to prevent breakage. If cardboard boxes, which originally held other chemicals are used, the of the chemical and any inappropriate hazard markings must be covered over or defaced. Failure to do so constitutes improper marking as to content and is an EPA and OSHA violation.

Containment

Secondary Containment

Secondary containment is not mandatory for containers of liquid waste that is less than 55 gallons. However, a plan for handling spills must be in place. Consult with the UHCC EHSS regarding appropriate containment when a 55-gallon drum is used to collect waste.

Separate Incompatible Materials/Wastes

Incompatible materials shall be segregated by HAZARD CLASS, i.e., Toxic-Reactive-Ignitable-Corrosive-Oxidizers. Examples of incompatible materials are acids/bases, organics/oxidizers, and flammable liquids/oxidizers. Unknowns and high hazard materials such as cyanides, organic peroxides, pyrophoric, water reactive and explosives shall be packaged separately regardless of quantity. Training will be provided to assist in segregation of incompatible materials. If there are any questions, please contact the UHCC Environmental Health Safety Specialist (808-956-XXXX) for assistance.

Hazardous Waste Disposal

The disposal of hazardous waste requires that a licensed hazardous waste contractor be hired to dispose of the waste.

Drain Disposal Prohibited

- **No hazardous materials/waste may be disposed of down the drain.** All liquid prior to drain disposal (except known clean water) shall be reviewed prior to any drain disposal. In addition, City and County Ordinances prohibit disposal of the following additional items down the drain:
- Fats and greases, if their concentration and physical dispersion results in separation and adherence to sewer structures.
- Storm water, surface water, groundwater, roof runoff, subsurface drainage, cooling water, swimming pool water or other unpolluted drainage.
- Liquid or vapor having a temperature of >150 degrees Fahrenheit.
- Any water or waste containing >100 ppm, by weight, of fat, oil or grease.
- Gasoline, benzene, naphtha, fuel oil, or other flammable or explosive liquid, solid or gas.

- Garbage that has not been properly shredded. Garbage from commercial food establishments is prohibited.
- Ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, paunch manure or any other solid or viscous substance capable of causing obstruction to the flower in sewers.
- Water or wastes having a pH lower than 5.5 or higher than 9.5 having any other corrosive property capable of causing damage to the sewage works or its personnel.
- Water or wastes containing a toxic or poisonous substance of sufficient quantity to injure or interfere with any sewage treatment process or cause a hazard to humans or animals.
- Noxious or malodorous gas or explosive liquids or substance capable of endangering public property and safety or creating a public nuisance.

Emergency Spill Procedures

You must have a specific spill emergency plan and provide information and training to individuals working in your area regarding the plan. It is a good idea to post the emergency procedures and emergency phone numbers in the work area. Personnel working with hazardous chemicals should be able to answer the question: "What would I do if this material spilled?"

Spill kits with instructions, absorbents, reactants, and protective equipment should be available to clean up minor spills. A **minor spill** is one that does not spread rapidly, does not endanger people or property except by direct contact, does not endanger the environment, and the workers in the area are capable of handling safely without the assistance of safety and emergency personnel. **All other chemical spills are considered major.**
The following are general procedures for the handling of spills.

1. In the event of a spill, attend to anyone who may have been contaminated or hurt, if it can be done without endangering yourself.
2. Turn on the fume hood(s) and open windows where this can be done without endangering yourself.
3. If flammable materials are spilled, de-energize electrical devices if it can be done without endangering yourself.

Minor Spills

- If you have any questions regarding spill clean-up requirements, please contact your campus Vice Chancellor of Administrative Service or UHCC Environmental Health Safety Specialist (808-956-XXXX).
- Ensure protective apparel is resistant to the spilled material. Neutralize acids and bases, if possible, using neutralizing agents such as sodium carbonate or sodium bisulfate.
- Control the spread of liquids by containing the spill. Absorb liquids by adding appropriate absorbent materials, such as vermiculite or sand, from the spill's outer edges toward the center. Paper towels and sponges may also be used as absorbent material, but this should be done cautiously considering the character of the spilled material.

- Collect and contain the cleanup residue and any materials used to clean up the spill by scooping them into a plastic bucket or other appropriate container and properly disposing of the waste as hazardous waste.
- Decontaminate the area and affected equipment. Ventilating the spill area may be necessary.
- Document what happened, why, what was done, and what was learned. Such documentation can be used to avoid similar instances in the future. Major incidents are almost always preceded by numerous near misses.

Major Spills

- If the spill is major, evacuate and secure the area from all personnel.
- If flammable liquid is spilled, secure all ignition sources.
- If the spill is major contact the Fire Department (911) and Campus Public Safety for immediate assist. You should also contact your campus Vice Chancellor of Administrative Service and the UHCC Environmental Health Safety Specialist (808-956-XXXX) for assistance in containing the spill and to determine other precautions that need to be taken depending on the type and size of the spill.

Spill Reporting Requirements

After the initial spill response, contact the Vice Chancellor of Administrative Service and UHCC Environmental Health Safety Specialist (808-956-XXXX) to determine whether there are any federal or state reporting requirements. Some reporting obligations are immediate and must be made within 24 hours.

How to Dispose of Various Materials/Waste

The individual possessing or generating the material/waste retains the primary responsibility for the material/waste. The Vice Chancellor of Administrative Service, UHCC Environmental Health and Safety Specialist at (808-956-XXXX) provides information on requirements and assistance in handling the materials. Specific information on various types of materials is given below.

Batteries

Lithium, nickel/cadmium or mercury batteries shall be stored at the hazardous waste accumulation site for contract disposal. Vehicle batteries are recyclable and arrangements with local vendors can be made. Operations and Maintenance handle disposal of batteries from State vehicles.

Biological Materials

For biohazardous wastes, refer to the published University biohazardous waste disposal guidelines or contact the UHCC Environmental Health and Safety Specialist (808-956- XXXX) for information concerning the handling and disposal of biological materials. Remains from dissections shall be properly disposed of.

Compressed Gases

Compressed gas cylinders should be returned to the vendor. A return agreement with the vendor should be included in the contract. Without such an agreement the return or disposal of the cylinders

is difficult and very costly, contact the UHCC Environmental Health Safety Specialist (808-956-XXXX) for assistance.

Controlled Substances

The handling and disposal of controlled substances (i.e., drugs and other substances listed in 21 CFR 1308) are the responsibility of the permit holder.

Fluorescent Light Ballasts

Your campus facilities and maintenance department removes non-leaking ballast and removes/disposes of fluorescent light tubes.

Hazardous Chemicals and Hazardous Waste

The “College” will hire a contractor to dispose of hazardous wastes. Efforts should be made to determine if other campus departments could use excess hazardous chemicals prior to submitting for contract disposal. Chemicals considered non-hazardous waste (see "Non-hazardous Waste" below) could be disposed of in the municipal sanitary landfill or sanitary sewer.

Mercury

Items containing functional mercury (e.g., light switches, barometers and thermometers) shall be stored at a hazardous waste accumulation site for contract disposal.

Mixed Waste

Mixed waste is defined as materials that possess a radioactive or biological hazard as well as an unrelated chemical hazard (e.g., potassium dichromate solution contaminated with Carbon-14). Contact the UHCC Environmental Health and Safety Specialist for assistance in coordinating with the Environmental Health and Safety Office at the UH Manoa campus Radiation Safety Office for assistance in the proper disposal of these materials.

Non-Hazardous Waste

Listed below in Table 1 are typical laboratory chemicals that are not considered hazardous wastes by the U.S. Environmental Protection Agency. Chemicals with an LD(50) (oral rat) greater than 500mg/kg are considered non-hazardous unless they are suspect carcinogens, mutagens, or teratogens (the LD (50) can be found in the MSDS). Non-hazardous waste can be disposed of in the municipal sanitary landfill if solid and down the drain if liquid, provided it is allowed by the local regulations or policies, if the requirements of the applicable county ordinances or the facility industrial wastewater discharge permit are met. Alternatively, the materials can be collected for disposal as non-hazardous waste in the periodic waste disposal shipments. Contact the UHCC Environmental Health Safety Specialist if you are unsure and need assistance.

Table 1: Non-Hazardous Waste

Sugars (e.g., sucrose, glucose, mannose)	Silica Gel
Starch	Alumina (aluminum oxide)
Naturally occurring Amino Acids	Calcium Fluoride

Citric Acid and its Sodium, Potassium, Magnesium, Calcium and Ammonium Salts.	Lactic Acid and its Sodium, Potassium, Magnesium, Calcium and Ammonium, Salts
Sodium, Potassium, Calcium, Strontium, and Ammonium Sulfates	Sodium, Potassium, Calcium, Magnesium, Strontium and Ammonium Phosphates
Sodium, Potassium, Magnesium and Ammonium Chlorides	Sodium, Potassium, Magnesium, and Calcium Borates
Silicon Dioxide	Sodium, Potassium, Ammonium Acetates
Boron, Magnesium, Copper Oxides	Sodium, Potassium, Magnesium, Calcium, and Ammonium Carbonates

Oils and Transformer Fluid

The VCAS may assist programs with disposal of used pump oil. Used motor oil is recyclable through local vendors and campus departments should consolidate their disposal of used motor oil to reduce costs.

Transformer fluid will be handled on a case-by-case basis, contact the UHCC Environmental Health and Safety Specialist for assistance. The following requirements apply to used oil:

- Used oil may only be stored in containers that are in good condition and not leaking.
- Containers, aboveground storage tanks, and fill pipes must be labeled or marked clearly with the words **"Used Oil."**
- Upon detection of a release of used oil, a generator must stop the release, contain the used oil, clean up and manage properly the used oil and other materials, and if necessary, repair or replace any leaking used oil storage containers. If a release of used oil occurs, contact your campus VCAS immediately. Contact the UHCC Environmental Health Safety Specialist (808-956-XXXX) for information regarding cleanup, and special regulatory reporting requirements which may apply.

Paint Waste (Auto body)

Excess paint or waste paint containing cadmium, chromium, lead or mercury will not be recycled but will be disposed of as hazardous waste. Other paint waste generated by an auto body program will be stored in a marked container labeled, "Paint Waste for Recycling". On a regular basis, the paint waste will be processed through the paint solvent recycler. After recycling, the remaining sludge should be checked for ignitibility. If the sludge is ignitable, it will be disposed of as hazardous waste. If it is not ignitable, it will be disposed in the municipal sanitary landfill. Thinner solvent extract can be used as product.

Photographic Chemicals

Photographic fixer will must be stored in capped container and labeled, "Fixer for Recycling". Photographic fixer solution may contain silver salts after use. Silver is an EPA toxic characteristic waste and must be recycled or disposed of as a hazardous waste. If your facility has a silver recovery unit, it should be used to process the used fixer in accordance with the manufacturing instructions. This would include ensuring that the effluent from the unit meets the requirements for safe drain disposal and that the unit filter, when full, is sent for recycling. If your facility does not

have a silver recovery unit, there are contractors who will furnish one for a fee or for the value of the silver recovered. Alternatively, the used fixer solution can be handled and disposed of as a hazardous waste.

Radioactive Materials

Contact the UHCC Environmental Health and Safety Specialist (808-956-XXXX) for assistance. Refer to the University Radiation Safety Manual or contact the UH Manoa campus (808-956-8660) for information concerning the proper handling and disposal of radioactive material.

Sharps and Glassware

Glassware not contaminated with radiological, biological or hazardous chemical material shall be placed in a puncture resistant container labeled "glass" or "broken glass" and disposed of safely by your campus operations and maintenance staff utilizing appropriate PPE. Refer to published biohazardous waste disposal guidelines or contact the Environmental Health and Safety Specialist (808-956-XXXX) for information on the handling and disposal of sharps or glassware contaminated with biological or infectious material. Glassware or sharps contaminated with hazardous chemicals should be rinsed to decontaminate them and then disposed of as non-contaminated glassware or sharps (i.e., placed in a sharps container). Broken glassware contaminated with hazardous chemicals should be placed in a puncture resistant container (e.g., bottle, plastic container or can over-pack), labeled with the name of the chemical and disposed of as hazardous chemical waste.

Hazardous Waste Minimization

Buying Chemicals in Smaller Amounts

The "large economy size" may cost less to buy, but disposal costs, in most cases, are several times the initial cost of the material. Many of the bottles of excess or waste chemicals sent for disposal are full or 3/4 full. Everyone needs to try to accurately estimate the amount of a chemical they expect to use.

Recycling and Redistribution

Efforts should be made to find someone in the laboratory or department who can use the hazardous material before it is submitted to the VCAS as waste for contract disposal.

Use of Less Hazardous or Non-Hazardous Materials

The following provides some examples of the use of less hazardous or non-hazardous materials; everyone is encouraged to think of some others that may be applicable to their research or instructional materials.

Cleaning Solutions

Chromerge, chromic acid and dichromate cleaning solutions are not desirable from a waste disposal prospective, as they cannot be made non-hazardous and are expensive to dispose of. There are many non-toxic biodegradable cleaning solutions that can be used instead of chromic acid. For extremely dirty glassware a product called Nochromix, which uses sulfuric acid and an organic oxidizer in place of chromium can be used. While this requires neutralization of the acid for ordinary disposal, it is far less costly to dispose of than chromium solutions. A number of alternative cleaning

solutions are listed below. These are all available from Fisher Scientific, who has the University contract for laboratory supplies. NoChromix, Alconox, Liquinox liquid detergent, Citranox, Fisherbrand sparkleen, and FL-70 Concentrate.

Drying Agents

The safest common drying agents are calcium chloride, silica gel, molecular sieves and calcium sulfate (Drierite). These are recommended because of their low toxicity and stability. Drying agents that pose varying degrees of hazard and disposal problems include:

- Phosphorus pentoxide which generates highly corrosive phosphoric acid and heat on contact with water. This material also has to be disposed of as a hazardous.
- Magnesium perchlorate (Dehydrite) which is a strong oxidizer and may cause fires or explosions on contact with organic materials. This material has to be disposed of as a hazardous waste.

Thermometers

Mercury thermometers should be replaced with non-mercury thermometers whenever possible. Broken mercury thermometers create spills that are a potential health hazard, time consuming to clean up, and are one of the most expensive hazardous wastes to dispose of. Non-mercury thermometers with equivalent accuracy are available for temperature ranges of –20 to 250 degrees Centigrade. Check your laboratory supply catalog for more information. If mercury containing equipment is used, then mercury spill kit and personnel knowledgeable in its use is required in the laboratory or facility.

Attachment 1 – University of Hawaii Community College Procurement Authorization for hazardous materials

UNIVERSITY OF HAWAII COMMUNITY COLLEGE PROCUREMENT AUTHORIZATION FOR HAZARDOUS MATERIALS

An approved (signed) copy of this form must accompany any *request*, purchase order or requisition for the procurement of all hazardous materials.

NAME _____
(Instructor/Program Coordinator)

DEPARTMENT: _____ PHONE NO., EXT.: _____ LOCATION: _____ PO NO.: _____

Chemical Name	Solid/Liquid/Gas	Amount (Gallon, lbs)	Usage Plan	Estimated Usage Period

Instructor/Program Coordinator _____DATE:
(Signature)

Dean/Vice Chancellor _____ DATE:
(Signature)

SEND COMPLETED FORM TO: Vice Chancellor for Administrative Services (VCAS).
FOR VCAS USE ONLY

VCAS APPROVAL: _____ DATE: _____

APPROVAL NO.: _____

Attachment 2 - University of Hawaii at Manoa Environmental Health And Safety Office Hazardous Material Management Program Approval For The Use of Hazardous Waste

For Research Grants

1. Principal Investigator:__
2. Project Title:____
3. If your project will involve any of the types of hazardous materials listed below, please provide a list of the chemical name(s) and approximate amounts of the materials to be used, information on how the material will be used and stored, also information on any special safety measures that will be taken. The information is needed to ensure the materials are stored, used and disposed of in accordance with the applicable Federal and State regulations.

a) Explosive materials (e.g., ammonium perchlorate, picric acid or picrates, azides, acetylides or fulminates of heavy metals, aromatic di or tri nitro compounds such as dinitrophenol or trinitrotoluene, nitroglycerine, RDX and tetrazene).
b) Water reactive chemicals (e.g., alkali metals such as sodium, potassium or lithium; metal hydrides such as lithium aluminum hydride, sodium borohydride or lithium hydride; calcium carbide, ethyldichlorosilane and phosphides).
c) Flammable or poison gases (e.g., methane, ethylene, chlorine, phosgene and hydrogen sulfide).
d) Organic peroxides (e.g., methyl ethyl ketone peroxide or peracetic acid).
e) Highly toxic materials (e.g., cyanides, osmium tetroxide, phosphorus, strychnine, pentaborane, or any material with a LD50 [oral rat] of 50mg/kg or less).
f) Flammable liquids (i.e., materials with a flash point of 140 degrees Fahrenheit or less) in quantities of 60 gallons or more at any one time.

If your project will involve the use of controlled substances (i.e., materials listed in 21 CFR 1308 by the U.S. Drug Enforcement Agency such as cocaine, chloral hydrate, morphine, and sodium barbital), provide the number of the required Federal or State permit for possession and use of these materials.

4. I agree to: (1) comply with the University of Hawaii at Manoa Hazardous Material Management Program (HMMP) requirements and any additional requirements provided by the Environmental Health and Safety Office that are necessary to ensure compliance with Federal and State regulations, (2) inform the Environmental Health and Safety Office if there are any amendments to the project which affect the types of hazardous material listed above, and (3) transfer or properly dispose of all my hazardous material as specified in the HMMP prior to leaving the University or transferring to a different laboratory. I believe the above information is accurate and complete.

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PRINCIPAL INVESTIGATOR DATE

DEAN/VICE CHANCELLOR DATE

SEND COMPLETED FORM TO: HSO 2040 East-West Road Attention: Hazardous Material Management Officer. The Hazardous Material Management Officer may be contacted at 956-3198 or Fax 956-3205, if you have questions.

The use of the hazardous materials listed above is approved subject to the special requirements listed below.

HAZARDOUS MATERIAL MANAGEMENT OFFICER DATE

SPECIAL REQUIREMENTS:

Attachment 3 - UNIVERSITY OF HAWAI'I COMMUNITY COLLEGE
HAZARDOUS CHEMICAL INVENTORY FORM (SEMESTER)

CAMPUS:

This form assists University of Hawaii with proper management of our hazardous material and hazardous waste and to ensure that materials are safely stored and handled. You should provide a complete inventory of all stored hazardous materials. If additional space is needed, you may use an attached sheet using the same format. If at a later date you obtain materials not previously listed, please submit an amended form.

I.PRODUCT NAME	II. CHEMICAL NAME	Primary Hazard Warning	Physical State (solid, liquid or solution)	Container Size	Amount (Gal, lb)s	Qty

INSTRUCTOR/PROGRAM COORDINATOR:

_____ PHONE NO.: LOCATION:
(Printed Name)

_____ DATE: _____
(Signature)

SEND COMPLETED FORM TO: Vice Chancellor for Administrative Services.

Attachment 3 (cont.) sample

This form assists University of Hawaii with proper management of our hazardous material and hazardous waste and to ensure that materials are safely stored and handled. You should provide a complete inventory of all stored hazardous materials. If additional space is needed, you may use an attached sheet using the same format. If at a later date you obtain materials not previously listed, please submit an amended form.

III. PRODUCT NAME	IV. CHEMICAL NAME	Primary Hazard Warning	Physical State (solid, liquid or solution)	Container Size	Amount (Gal, lb)s	Qty
Acetic Acid, Glacial		Flammable	Liquid	1 gal	1 gal	5
Enamel Paint	Naphtha ether, mineral spirit	Flammable	Liquid	1 gal	1 gal	10
Carter's Rubber Cement	Naphtha, Hexane, Propyl alcohol	Flammable	Liquid	4 oz	4 oz	48

INSTRUCTOR/PROGRAM COORDINATOR:

Dr. George Bush PHONE NO.: x7777 LOCATION: Science Bldg, Rm 205
(Printed Name)

DATE:
(Signature)

SEND COMPLETED FORM TO: Vice Chancellor for Administrative Services.

Attachment 4 - UNIVERSITY OF HAWAI'I COMMUNITY COLLEGE
HAZARDOUS WASTE INVENTORY FORM (MONTHLY)

CAMPUS:

This form assists University of Hawaii of Hawaii Community College with proper management of our hazardous waste. If you have any hazardous or non-hazardous waste being stored for disposal, please provide the information requested. If additional space is needed, you may use an attached sheet using the same format. If at a later date you generate wastes not previously listed, please submit an amended form.

DOT Class and EPA Waste Codes are available on the Products Safety Data Sheet

Chemical Name/Product (Chemical constituents)	Physical State (solid, liquid or solution)	Amount (Gal, lbs)	Container Size	Container Type	Hazard Category	pH)	DOT Class	EPA Waste

INSTRUCTOR/PROGRAM COORDINATOR:

_____ PHONE NO.: _____ LOCATION: _

(Printed Name)

_____ DATE: _____

(Signature)

SEND COMPLETED FORM TO: Vice Chancellor for Administrative Services.

ATTACHMENT 4 (CONT.) SAMPLE

This form assists University of Hawaii of Hawaii Community College with proper management of our hazardous waste. If you have any hazardous or non-hazardous waste being stored for disposal, please provide the information requested. If additional space is needed, you may use an attached sheet using the same format. If at a later date you generate wastes not previously listed, please submit an amended form. EHSO will complete columns 8 and 9, DOT Class and EPA Waste Code.

Chemical Name/Product (Chemical constituents)	Physical State (solid, liquid or solution)	Amount (Gal, lbs)	Container Size	Container Type	Hazard Category	pH)	DOT Class (EHSO only)	EPA Waste Code (EHSO only)
Solvent waste—Acetone 5%, methanol 20%, mineral spirits50%, water 20%	Liquid	55 gal	55 gal	Drum metal	flam	N/A		
Spray paint—mineral spirit	Liquid under pressure	8 oz	16 oz	Metal	Flam	N/A		
Acid solution—hydrochloric acid 45%, sulfuric acid	Liquid	4 liters	4 liters	Glass	corr	1		

INSTUCTOR/PROGRAM COORDINATOR:

Dr. George Bush (Printed Name) PHONE NO.: x7555 LOCATION: Science bldg rm 205

(Signature) DATE:

SEND THE COMPLETED FORM TO: Vice Chancellor for Administrative Services.

ATTACHMENT 5 PROCEDURE FOR MAKING HAZARDOUS WASTE DETERMINATION

All wastes must be screened to determine whether they are hazardous, whether it is a RCRA regulated or a non-RCRA regulated hazardous waste. A hazardous waste is one which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed. The EPA has determined that the following meet the definition of a hazardous waste:

a) A waste which is listed as hazardous in the regulations (40 CFR 261)*
b) A mixture that includes a listed hazardous waste; or
c) A waste which exhibits any of the four following characteristics; ignitability, corrosivity, reactivity, or toxicity.

*Note: The complete text of the hazardous waste regulations is available online at www.epa.gov/epahome/cfr40.htm.
The following procedures must be used to determine if a waste is hazardous. If it is, the procedures will identify the appropriate EPA hazardous waste number for each waste, which will in turn determine disposal requirements:

1) Determine the proper name of the waste and its specific source.
2) Check the EPA's hazardous waste lists in the following order:
    a) "U" list of toxic wastes (40 CFR 261.33f).
    b) "P" List of acutely hazardous waste (40 CFR 261.33e). See Attachment 6.
    c) "K" List of hazardous wastes from specific sources (40 CFR 261.32).
    d) "F" List (40 CFR 261.31) for a non-specific source of waste.
3) If the waste is not one the "U" List, the "P" List, the "K" List or the "F" List, you must determine whether the waste exhibits any of following four characteristics:
    a) Ignitability. A waste that exhibits the characteristic of ignitability has the EPA hazardous waste number of D001. See 40 CFR §261.20.
    b) Corrosivity. A waste that exhibits the characteristic of corrosivity has the EPA hazardous waste number of D002. See 40 CFR §261.22.
    c) Reactivity. A waste that exhibits the characteristic of reactivity has the EPA hazardous waste number of D003. See 40 CFR §261.23.
    d) Toxicity. A waste that exhibits the characteristic of reactivity will have and the EPA hazardous waste number of D004 through D043. See 40 CFR §261.24.

ATTACHMENT 6 LIST OF ACUTELY HAZARDOUS WASTE (P-CODED WASTE)

The following materials are hazardous wastes if and when they are intended to be discarded (40 CFR 261.33):

1. Any commercial chemical products or manufacturing chemical intermediate having the generic name listed below.
2. Any specification commercial chemical or product or chemical intermediate having the generic name listed below.
3. Any residue remaining in a container that is not empty. P-coded containers must have their contents removed and be triple rinsed with an appropriate solvent before they are legally empty and no longer regulated.
4. Any residue resulting from the clean-up of a spill of a P-coded waste.
5. The phrase “commercial chemical product or manufacturing chemical intermediate having a generic name listed below” refers to a chemical substance which is manufactured or formulated for commercial or manufacturing use which consists of the commercially pure grade of the chemical, any technical grades of the chemical that are produced or marketed, and all formulations in which the chemical is the sole active ingredient.

Hazardous Waste No.	Chemical Abstracts No.	Chemical Name
P023	107-20-0	Acetaldehyde, chloro-
P002	591-08-2	Acetamide, N-(aminothioxomethyl)-
P057	640-19-7	Acetamide, 2-fluoro-
P058	62-74-8	Acetic acid, fluoro-, sodium salt
P002	591-08-2	1-Acetyl-2-thiourea
P003	107-02-8	Acrolein
P070	116-06-3	Aldicarb
P203	1646-88-4	Aldicarb sulfone
P004	309-00-2	Aldrin
P005	107-18-6	Allyl alcohol
P006	20859-73-8	Aluminum phosphide
P007	2763-96-4	5-(Aminomethyl)-3-isoxazolol
P008	504-24-5	4-Aminopyridine
P009	131-74-8	Ammonium Picrate
P119	7803-55-6	Ammonium Vanadate
P099	506-61-6	Argintate (1-), bis(cyano-C-), potassium

P010	7778-39-4	Arsenic acid (H3AsO4)
P012	1327-53-3	Arsenic oxide (As2O3)
P011	1303-28-2	Arsenic oxide (As2O5)
P011	1303-28-2	Arsenic pentoxide
P012	1327-53-3	Arsenic trioxide
P038	692-42-2	Arsine, diethyl-
P036	696-28-8	Arsenous dichloride, phenyl-
P054	151-56-4	Aziridine
P067	75-55-8	Aziridine, 2-methyl-
P013	542-62-1	Barium cyanide
P024	106-47-8	Benzenamine, 4-chloro-
P077	100-01-6	Benzenamine, 4-nitro
P028	100-44-7	Benzene (chloromethyl)-
P042	51-43-4	1,2-Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]-
P046	122-09-8	Benzeneethanamine, alpha,alpha-dimethyl-
P014	108-98-5	Benzenethiol
P127	1563-66-2	7-Benzofuranol, 2,3-dihydro-2-2-dimethyl-, methylcarbamate
P188	57-64-7	Benzoic acid, 2-hydroxy, compd, with (3aS-cis)-1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethylpyrrolo [2,3-b]indol-5-yl methylcarbamate ester (1:1)
P001	81-81-2	2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1- phenylbutyl)-, & salts, when present at concentrations greater than 0.3%.
P028	100-44-7	Benzyl chloride
P015	7740-47-7	Beryllium powder
P017	598-31-2	Bromoacetone
P018	357-57-3	Brucine
P045	39196-18-4	2-Butanone, 3,3-dimethyl-1-(methylthio)-, o- [methylamino, carbonyl] oxime
P021	592-01-8	Calcium cyanide
P189	55285-14-8	Carbamic acid, [(dibutylamino)-thio] methyl-,2,3-dihydro-2,2-dimethyl-7-benzofuranyl ester
P191	644-64-4	Carbamic acid, dimethyl-, 1-[(diemthylamino) carbonyl]-5-methyl-1H-pyrazol-3-yl ester
P192	119-38-0	Carbamic acid, dimethyl-, 3-methyl-1-(1-methylethyl)-1H-pyrazol-5-yl ester
P190	1129-41-5	Carbamic acid, methyl-, 3-methylphenyl ester
P127	1563-66-2	Carbofuran
P022	75-15-0	Carbon disulfide
P095	75-44-5	Carbonic dichloride
P189	55285-14-8	Carbosulfan
P023	107-20-0	Chloroacetaldehyde

P024	106-47-8	p-Chloroaniline
P026	5344-82-1	1-(o-Chlorophenyl) thiourea
P027	542-76-7	3-Chloropropionitrile
P029	544-92-3	Copper cyanide (202CuCN)
P202	64-00-6	m-Cumenyl methylcarbamate
P030	----------	Cyanides (soluble cyanide salts) not otherwise specified
P031	460-19-5	Cyanogen
P033	506-77-4	Cyanogen chloride (CNCl)
P034	131-89-5	2-Cyclohexyl-4,6-dinitrophenol
P016	542-88-1	Dichloromethyl ether
P036	696-28-6	Dichlorophenylarsine
P037	60-57-1	Dieldrin
P038	692-42-2	Diethylarsine
P041	311-45-5	Diethyl-p-nitrophenyl phosphate
P040	297-97-2	O,O-Diethyl O-pyrazinyl phosphorothioate
P043	55-91-4	Diisopropylfluorophosphate (DFP)
P004	309-00-2	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexa-chloro-1,4,4a,5,8,8a,-hexahydro-(1alpha,4alpha,4abeta,5alpha,8alpha,8abeta)-
P060	465-73-6	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexa-chloro-1,4,4a,5,8,8a-hexahydro-, (1alpha,4alpha,4abeta,5beta,8beta,8abeta)-
P037	60-57-1	2,7:3,6-Dimethanonaphth [2,3-b] oxirene,3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-(1aalpha,2beta,2aalpha,3beta,6beta,6aalpha, 7beta,7aalpha)-
P051	72-20-8	2,7:3,6-Dimethanonaphth [2,3,-b] oxirene,3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-,(1aalpha,2beta,2abeta,3alpha,6alpha,6abeta,7beta,7aalpha)-, & metabolites
P044	60-51-5	Dimethoate
P046	122-09-8	alpha,alpha-Dimethylphenethylamine
P191	644-64-4	Dimetilan
P047	534-52-1	4,6,Dinitro-o-cresol, & salts
P048	51-28-5	2,4,-Dinitrophenol
P020	88-85-7	Dinoseb
P085	152-16-9	Diphosphoramide, octamethyl-
P111	107-49-3	Diphosphoric acid, tetraethyl ester
P039	298-0404	Disulfoton
P049	541-53-7	Dithiobiuret
P185	26419-73-8	1,3-Dithiolane-2-carboxaldehyde, 2,4-dimethyl-,O-[(methylamino)-carbonyl] oxime

	P050	115-29-7	Endosulfan
	P088	145-73-3	Endothall
	P051	72-20-8	Endrin, & metabolites
	P042	51-43-4	Epinephrine
	P031	460-19-5	Ethanedinitrile
	P194	23135-22-0	Ethanimidothioc acid, 2-(dimethylamino)-N-{[(methylamino) carbonyl] oxy}-2-oxo-, methyl ester
	P066	16752-77-5	Ethanimidothioic acid, N-{[(methylamino) carbonyl]oxy}-, methyl ester
	P101	107-12-0	Ethyl cyanide
	P054	151-56-4	Ethyleneimine
	P097	52-85-7	Famphur
	P056	7782-41-4	Fluorine
	P057	640-19-7	Fluoroacetamide
	P058	62-74-8	Fluoroacetic acid, sodium salt
	P198	23422-53-9	Formetanate hydrochloride
	P197	17702-57-7	Formparanate
	P065	628-86-4	Fulminic acid, mercuric salt
	P059	76-44-8	Heptachlor
	P062	757-58-4	Hexaethyl tetraphosphate
	P116	79-19-6	Hydrazinecarbothioamide
	P068	60-34-4	Hydrazine, methyl-
	P063	74-90-8	Hydrocyanic acid
	P063	74-90-8	Hydrogen cyanide
	P096	7803-51-2	Hydrogen phosphide
	P060	465-73-6	Isodrin
	P192	119-38-0	Isolan
	P202	64-00-6	3-Isopropylphenyl N-methylcarbamate
	P007	2763-96-4	3(2H)-Isoxazolone, 5-(aminomethyl)-
	P196	15339-36-3	Manganese, bis(dimethylcarbamodithioato-S,S')-
	P196	15339-36-3	Manganese dimethyldithiocarbamate
	P092	62-38-4	Mercury, (acetato-O) phenyl-
	P065	628-86-4	Mercury fulminate
	P082	62-75-9	Methanamine, N-methyl-N-nitroso-
	P064	624-83-9	Methane, isocyanato-
	P016	542-88-1	Methane, oxybis(chloro-
	P112	509-14-8	Methane, tetranitro-
	P118	75-70-7	Methanethiol, trichloro-
	P198	23422-53-9	Methanimidamide, N,N-diemthyl-N'-{3-[[(methylamino)-carbonyl]oxy]-phenyl}-, monohydrochloride
	P197	17702-57-7	Methanimidamide, N,N-dimethyl-N'-{2-methyl-4-[[(methylamino) carbonyl]oxy]phenyl}-

	P050	115-29-7	6,9,-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide
	P059	76-44-8	4,7,-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-
	P199	2032-65-7	Methiocarb
	P066	16752-77-5	Methomyl
	P068	60-34-4	Methyl hydrazine
	P064	624-83-9	Methyl isocyanate
	P069	75-86-5	2-Methyllactonitrile
	P071	298-00-0	Methyl parathion
	P190	1129-41-5	Metolcarb
	P128	315-08-4	Mexacarbate
	P072	86-88-4	alpha-Naphthylthiourea
	P073	13463-39-3	Nickel carbonyl (NiCO)
	P074	557-19-7	Nickel cyanide (NiCN)
	P075	54-11-5	Nicotine & salts
	P076	10102-43-9	Nitric oxide
	P077	100-01-6	p-Nitroaniline
	P078	10102-44-0	Nitrogen dioxide
	P076	10102-43-9	Nitrogen oxide (NO)
	P078	10102-44-0	Nitrogen oxide (NO2)
	P081	55-63-0	Nitroglycerine
	P082	62-75-9	N-Nitrosodimethylamine
	P084	4549-40-0	N-Nitrosomethylvinylamine
	P085	152-16-9	Octamethylpyrophosphoramide
	P087	20816-12-0	Osmium Tetroxide (OsO4)
	P088	145-73-3	7-Oxabicyclo (2.2.1) heptane-2,3-dicarboxylic acid
	P194	23135-22-0	Oxamyl
	P089	56-38-2	Parathion
	P034	131-89-5	Phenol, 2-cyclohexyl-4,6-dinitro-
	P048	51-28-5	Phenol, 2,4-dinitro
	P047	534-52-1	Phenol, 2-methyl-4,6-dinitro- & salts
	P020	88-85-7	Phenol, 2-(1-methylpropyl)-4,6-dinitro-
	P009	131-74-8	Phenol, 2,4,6-trinitro-, ammonium salt
	P128	315-18-4	Phenol, 4-(dimethylamino)-3,5-dimethyl-, methylcarbamate (ester)
	P199	2032-65-7	Phenol, (3,5-dimethyl-4-(methylthio)-, methylcarbamate
	P202	64-00-6	Phenol, 3-(1-methylethyl)-, methylcarbamate
	P201	2631-37-0	Phenol, 3-methyl-5-(1-methylethyl)-, methylcarbamate
	P092	62-38-4	Phenylmercury acetate
	P093	103-85-5	Phenylthiourea

	P094	298-02-2	Phorate
	P095	75-44-5	Phosgene
	P096	7803-51-2	Phosphine
	P041	311-45-5	Phosphoric acid, diethyl 4-nitrophenyl ester
	P039	298-04-4	Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester
	P094	298-02-2	Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester
	P044	60-51-5	Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester
	P043	55-91-4	Phosphorofluoridic acid, bis(1-methylethyl) ester
	P089	56-38-2	Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester
	P040	297-97-2	Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester
	P097	52-85-7	Phosphorothioic acid, O-{4-[(dimethylamino)sulfonyl] phenyl} O,O-dimethyl ester
	P071	298-00-0	Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester
	P204	57-47-6	Physostigmine
	P188	57-64-7	Physostigmine salicylate
	P110	78-00-2	Plumbane, tetraethyl-
	P098	151-50-8	Potassium cyanide (KCN)
	P099	506-61-6	Potassium silver cyanide
	P201	2631-37-0	Promecarb
	P070	116-06-3	Propanal, 2-methyl-2-(methylthio)-, O- [(methylamino)carbonyl] oxime
	P203	1646-88-4	Propanal, 2-methyl-2-(methyl-sulfonyl)-, O- [(methylamino) carbonyl] oxime
	P101	107-12-0	Propanenitrile
	P027	542-76-7	Propanenitrile, 3-chloro-
	P069	75-86-5	Propanenitrile, 2-hydroxy-2-methyl-
	P081	55-63-0	1,2,3,-Propanetriol, trinitrate
	P017	598-31-2	2-Propanone, 1-bromo-
	P102	107-19-7	Propargyl alcohol
	P003	107-02-8	2-Propenal
	P005	107-18-6	2-Propen-1-ol
	P067	75-55-8	1,2-Propylenimine
	P102	107-19-7	2-Propyn-1-ol
	P008	504-24-5	4-Pyridinamine
	P075	54-11-5	Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-, & salts
	P204	57-47-6	Pyrrolo[2,3-b]indol-5-ol, 1,2,3,3a,8,8a-hexahydro-1,3a,8- trimethyl-, methylcarbamate (ester, (3aS-cis)-
	P114	12039-52-0	Selenious acid, dithallium (thallous) salt

	P103	630-10-4	Selenourea
	P104	506-64-9	Silver cyanide (AgCN)
	P105	26628-22-8	Sodium azide
	P106	143-33-9	Sodium cyanide (NaCN)
	P108	57-24-9	Strychnidin-10-one, & salts
	P018	357-57-3	Strychnidin-10-one, 2,3-dimethoxy-
	P108	57-24-5	Strychnine & salts
	P115	7446-18-6	Sulfuric acid, dithallium (thallous) salt
	P109	3689-24-5	Tetraethyldithiopyrophosphate
	P110	78-00-2	Tetraethyl lead
	P111	107-49-3	Tetraethyl pyrophosphate
	P112	509-14-8	Tetranitromethane
	P062	757-58-4	Tetraphosphoric acid, hexaethyl ester
	P113	1314-32-5	Thallic oxide
	P113	1314-32-5	Thallium oxide (Tl2O3)
	P114	12039-52-0	Thallium (I) selenite (thallous selenite)
	P115	7446-18-6	Thallium (I) sulfate (thallous sulfate)
	P109	3689-24-5	Thiodiphosphoric acid, tetraethyl ester
	P045	39196-18-4	Thiofanox
	P049	541-53-7	Thioimidodicarbonic diamide (H2NCS)2NH
	P014	108-98-5	Thiophenol
	P116	79-19-6	Thiosemicarbazide
	P026	5344-82-1	Thiourea, (2-chlorophenyl)-
	P072	86-88-4	Thiourea, 1-naphthalenyl-
	P093	103-85-5	Thiourea, phenyl-
	P185	26419-73-8	Tirpate
	P123	8001-35-2	Toxaphene
	P118	75-70-7	Trichloromethanethiol
	P119	7803-55-6	Vanadic acid, ammonium salt
	P120	1314-62-1	Vanadium Oxide (V2O5) vanadium pentoxide
	P084	4549-40-0	Vinylamine, N-methyl-N-nitroso-
	P001	81-81-2	Warfarin, & salts, when present at concentrations greater than 0.3%
	P205	137-30-4	Zinc, bis(dimethylcarbamodithioato-S,S')-,
	P121	557-21-1	Zinc cyanide [Zn (CN)2]
	P122	1314-84-7	Zinc phosphide (Zn3P2) when in concentrations greater than 10%
	P205	137-30-4	Ziram

APPENDIX VI

EMERGENCY PROCEDURES DURING POWER OUTAGES

EMERGENCY PROCEDURES FOR LABORATORIES DURING POWER OUTAGES

It is important to remember that some equipment cannot be turned off and certain other pieces of equipment do not shut themselves off when there is a power outage. Pre-plan specific procedures for your laboratory while adhering to the following:

1. Close chemical fume hood sashes. No work is allowed in fume hoods during a power outage.

2. Ensure that all chemical containers are secured with caps, parafilm, etc.,

3. All non-essential electrical devices should be turned off. Keep the doors of refrigerators and freezers closed. Check to ensure large lasers, radio frequency generators, etc. have been turned off.

4. Turn off all gas cylinders at the tank valves. If a low flow of an inert gas is being used to "blanket" a reactive compound or mixture, it may be appropriate to leave the flow of gas on. The decision to do this should be part of the written SOP specific for each lab and included in this CHP.

5. Check all cryogenic vacuum traps (N_2, CO_2 + solvent). The evaporation of trapped materials may cause dangerous conditions.

6. Check all pressure, temperature, air, or moisture sensitive materials and equipment. This includes vacuum work, distillations, glove boxes used for airless/moisture-less reactions, etc.

APPENDIX VII

UH REQUIREMENTS FOR STORAGE AND HANDLING OF FLAMMABLE AND COMBUSTIBLE LIQUIDS

UNIVERSITY OF HAWAII AT MANOA

REQUIREMENTS FOR STORAGE AND HANDLING OF FLAMMABLE LIQUIDS

STORAGE REQUIREMENTS

1 Flammable liquids stored in the open in a laboratory work area or inside any building shall be kept to the minimum necessary for the work being done.

2 Maximum quantity permitted in labs and other areas of use is limited to a total of 10 gallons, all classifications combined, outside of a flammable storage cabinet or approved flammable storage room. Please refer to Table 1.

3 Quantities stored in flammable storage cabinets shall be limited to 60 gallons of category 1 and 2 or 3 and 4 liquids and the total of all liquids shall not exceed 120 gallons. Please refer to Table 1 for maximum allowable container size for each class. Not more than three cabinets shall be located in the same fire area.

4 Quantities exceeding the above must be stored in an approved flammable storage room meeting the requirements of the Uniform Building and Fire Codes.

5 Flammables shall not be stored near exit doorways, stairways, in exit corridors, or in a location that would impede egress from the building.

6 Materials which will react with water or other liquids to produce a hazard shall be segregated from flammable liquids.

7 Refrigerators, freezers, and other cooling equipment used for storing flammable liquids must be rated for storing such items and prominently labeled as such. Equipment that is IM or UL listed as “flammable storage” or “explosion proof” must be used for flammable or volatile liquid storage. “Flammable storage” indicates that flammable materials are isolated from sparks. “Explosion proof” indicates that the entire unit is sealed and can

be used in explosive atmospheres.

HANDLING AND DISPENSING

1 Category 1 and 2 liquids shall not be transferred from one vessel to another in any exit passageway.

2 Transfer of flammable liquids from 5 gallon containers (or less) to smaller containers shall be done in a laboratory fume hood or in an approved flammable liquid storage room.

3 Empty containers shall be treated in the following manner:

a) For water soluble solvents ☾ rinse, deface label, and dispose with normal trash.

b) For non-water soluble solvents ☾ allow to evaporate to dryness in a hood, rinse, deface label, and dispose with normal trash.

TABLE 1

(Categories are per new Globally Harmonized System)

CATEGORY	**1**	**2**	**3**	**4**
Flash point	less than 73.4 F	less than 73.4 F	between 73.4 F and 140 F	between 140 F and 199.4 F
Boiling point	less than or equal to 95 F	greater than 95 F		
Flammability Potential	Extremely High	Very High	High	Moderate
EXAMPLES OF COMMONLY USED MATERIALS	acetaldehyde benzoyl peroxide ethyl ether pentane methyl formate	acetone ethanol butylamine gasoline methanol isopropanol	amyl acetate butanol chlorobenzene turpentine xylene	formaldehyde hydrazine kerosene

MAXIMUM CONTAINER SIZE Glass	1 pint (500 ml)	1 quart (1 liter)	1 gallon (4 liter)	1 gallon (4 liter)
Metal or approved plastic	1 gallon	5 gallon	5 gallon	5 gallon
Safety cans	2 gallon	5 gallon	5 gallon	5 gallon
Metal drums (DOT)	N/A	5 gallon	5 gallon	5 gallon

APPENDIX VIII

SELECT CARCINOGENS

The OSHA Laboratory Standard 29 CFR 1910.1450 defines select carcinogens as any substance which meets one of the following criteria:

1. It is regulated by OSHA as a carcinogen; or

2. It is listed under the category "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or

3. It is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (latest editions); or

4. It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

    a. After inhalation exposure of 6 - 7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m3;

    b. After repeated skin application of less than 300 (mg/kg of body weight) per week; or

    c. After oral dosages of less than 50 mg/kg of body weight per day.

The following websites maintain comprehensive lists of select carcinogens:

https://www.osha.gov/SLTC/carcinogens/standards.html
https://ntp.niehs.nih.gov/pubhealth/roc/index.html
http://monographs.iarc.fr/ENG/Classification/index.php

The following is a combined list of chemicals carcinogens from OSHA, NTP, and IARC. The combined list is provided as a guide and is not comprehensive. Please refer to SDSs for specific chemical information.

- Acetaldehyde
- Acetamide
- Acetylaminofluorene, 2-
- Acrylamide
- Acrylonitrile
- Adriamycin (doxorubicin hydrochloride) Aflatoxins
- Aflatoxin M1
- Alcoholic beverages (consumption)
- Alpha-Chlorinated toluenes
- Aluminium production
- Amino-2,4-dibromoanthraquinone, 1-

- Amino-2-methylanthraquinone, 1-
- Amino-5-(5-nitro-2-furyl)-1,3,4-thiadiazole, 2-
- Amino-9H-pyrido[2,3-beta]indole), A-alpha-C(2-
- Aminoanthraquinone, 2-
- Aminoazobenzene, para-
- Aminoazotoluene, ortho-
- Aminobiphenyl, 4- Amitrole
- Amsacrine
- Analgesic mixtures containing phenacetin
- Androgenic (anabolic) steroids
- Anisidine, ortho-
- Antimony trioxide
- Aramite
- Areca nut
- Aristolochia genus herbal remedies
- Arsenic and arsenic compounds
- Asbestos
- Attapulgite (palygorskite), long fibers >5mm
- Auramine, technical-grade
- Azacitidine
- Azaserine
- Azathioprine
- Aziridine
- Benz(a)anthracene
- Benzene
- Benzidine
- Benzidine-based dyes (technical grade) (Direct Black 38, Direct Blue 6, Direct Brown 95)
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(j)fluoranthene
- Benzo(k)fluoranthene
- Benzofuran
- Benzotrichloride
- Benzyl violet 4B
- Beryllium and beryllium compounds
- Betel quid with tobacco
- Betel quid without tobacco
- Bis(2-chloroethyl)-2-naphthylamine(Chlornaphazine), N,N- Bis(chloromethyl)ether
- Bis(bromomethyl)propane-1,3-diol, 2,2-
- Bischloroethyl nitrosourea (BCNU)
- Bis(chloromethyl) ether
- Bitumens, extracts of steam-refined and air-refined
- Bleomycins
- Bracken fern
- Bromodichloromethane
- Butadiene, 1,3-
- Butanediol dimethanesulphonate (myleran), 1,4-
- Butanediol dimethylsulfonate (myleran), 1,4-
- Butylated hydroxyanisole (BHA)
- Butyrolactone, beta-
- C.I. Basic Red 9 monohydrochloride

- Cadmium and certain cadmium compounds
- Caffeic acid
- Captafol
- Carbon black extract
- Carbon tetrachloride
- Carrageenan, degraded
- Catechol
- Ceramic fibers (respirable size)
- Chlorambucil
- Chloramphenicol
- Chlordane
- Chlordecone (kepone)
- Chlorendic acid
- Chloro-4-(dichloromethyl)5-hydroxy-2(5H)-furanone, 3-
- Chloroaniline, para-
- Chloroethyl)-3-cyclohexyl-1-nitrosourea (CCNU), 1-(2-
- Chloroethyl)-3-4-methylcyclohexyl-1 nitrosourea, 1-(2-
- Chlorinated paraffins (C12, 60% Chlorine)
- Chlorinated toluenes, alpha- (not necessarily all in group)
- Chlornaphazine
- Chloro-2-methylpropene, 1-
- Chloro-2-methylpropene, 3-
- Chloro-o-phenylenediamine, 4-
- Chloro-ortho-toluidine, para-
- Chloroform
- Chloromethyl ether
- Chloromethyl methyl ether (technical grade)
- Chlorophenols and their sodium salts
- Chlorophenoxy herbicides
- Chloroprene
- Chlorothalonil
- Chlorozotocin
- Chromium compounds, hexavalent
- CI Acid Red 114
- CI Basic Red 9
- CI Direct Blue 15
- Cisplatin
- Citrus Red No. 2
- Clonorchis sinensis (Oriental liver fluke)
- Coal tar pitches
- Coal tars
- Cobalt and cobalt compounds
- Cobalt metal with tungsten carbide
- Cobalt metal without tungsten carbide
- Cobalt(II) sulfate and other soluble cobalt(II) salts
- Coffee (bladder)
- Conjugated estrogens
- Creosotes
- Cresidine, para-
- Cupferron
- Cycasin

- Cyclophosphamide
- Cyclosporin A
- Dacarbazine
- Danthron (1,8-dihydroxyanthraquinone)
- Daunomycin
- DDT
- Diacetylbenzidine, N,N'-
- Diaminoanisole, 2,4-
- Diaminoanisole sulfate, 2,4-
- Diaminodiphenyl ether, 4,4'
- Diaminotoluene, 2,4-
- Diazoaminobenzene
- Dibenz(a,h)acridine
- Dibenz(a,h)anthracene
- Dibenz(a,j)acridine
- Dibenzo(a,e)pyrene
- Dibenzo(a,h)pyrene
- Dibenzo(a,i)pyrene
- Dibenzo(a,l)pyrene
- Dibenzo(c,g)carbazole, 7H-
- Dibromo-3-chloropropane, 1,2-
- Dibromoethane (EDB), 1,2-
- Dibromopropan-1-ol, 2,3-
- Dichloroacetic acid
- Dichlorobenzene, para-
- Dichlorobenzene, 1,4-
- Dichlorobenzidine, 3,3'-
- Dichloro-4,4'-diaminodiphenyl ether, 3,3'-
- Dichloroethane, 1,2-
- Dichloromethane (methylene chloride)
- Dichloropropene (technical grade), 1,3-
- Dichlorvos
- Diepoxybutane
- Diesel engine exhaust
- Diesel fuel (marine)
- Di (2-ethylhexyl) phthalate
- Diethyl sulphate
- Diethylhydrazine, 1,2-
- Diethylstilbestrol
- Diglycidyl resorcinol ether
- Dihydrosafrole
- Diisopropyl sulfate
- Dimethoxybenzidine, 3,3'-
- Dimethoxybenzidine (ortho-dianisidine), 3,3'
- Dimethyl sulphate
- Dimethylaminoazobenzene, para
- [(Dimethylamino) methylamino]-5-[2-(5-nitro-2-, trans-2-
- Dimethylaniline, 2,6- (2,6-xylidene)
- Dimethylbenzidine, 3,3'-
- Dimethylbenzidine (ortho-toluidine), 3,3'-
- Dimethylcarbamoyl chloride

- Dimethylhydrazine, 1,1-
- Dimethylhydrazine, 1,2-
- Dimethylvinyl chloride
- Dinitrofluoroanthrene, 3,7-
- Dinitrofluoroanthrene, 3,9-
- Dinitropyrene, 1,6-
- Dinitropyrene, 1,8-
- Dinitrotoluene, 2,4-
- Dinitrotoluene, 2,6-
- Dioctyl phthalate [Di(2-ethylhexyl)phthalate]
- Dioxane, 1,4-
- Direct Black 38
- Direct Blue 6
- Direct Brown 95
- Disperse Blue 1
- Epichlorohydrin
- Epoxybutane, 1,2-
- Epstein-Barr virus
- ErioniteEstrogens (not conjugated): estradiol-17
- Estrogens (not conjugated): estrone
- Estrogens (not conjugated): mestranol
- Estrogens (not conjugated): ethinylestradiol
- Ethylbenzene
- Ethyl acrylate
- Ethyl methanesulphonate
- Ethyl-N-nitrosourea, N-
- Ethylene oxide
- Ethylene thiourea
- Ethylene dibromide
- Ethyleneimine
- Etoposide
- Etoposide in combination with cisplatin and bleomycin
- Formaldehyde
- Formylhydrazino)-4-(5-nitro-2-furyl)thiazole, 2-(2-
- Fuel oils (residual, heavy)
- Furan
- Furyl)-3-(5-nitro-2-furyl)acrylamide], AF-2[2-
- Fusarium moniliform (toxins derived from) (Fumonisin B1, Fumonisin B2, Fusarin C)
- Gallium arsenide
- Gamma radiation (ionizing radiation)
- Gasoline
- Gasoline engine exhausts
- Glasswool (respirable size)
- Glu-P-1 (2-amino-6-methyldipyrido[1,2-a:3',2'-d]imidazole)
- Glu-P-2(2-aminodipyrido[1,2-a:3',2'-d]imidazole)
- Glycidaldehyde
- Glycidol
- Griseofulvin
- HC Blue No 1
- Helicobacter pylori (infection with)
- Hepatitis B virus (chronic infection with)

● Hepatitis C virus (chronic infection with)
● Heptachlor
● Hexachlorobenzene
● Hexachlorocyclohexanes
● Hexachloroethane
● Hexamethylphosphoramide
● Human immunodeficiency virus type 1 (infection with)
● Human immunodeficiency virus type 2 (infection with)
● Human papilloma virus type 16
● Human papilloma virus type 18
● Human papilloma virus type 31
● Human papilloma virus type 33
● Human papilloma virus: some types other than 16, 18, 31, and 33
● Human T-cell lymphotropic virus type I
● Hydrazine and hydrazine sulfate
● Hydrazobenzene
● Hydroxyanthroquinone, 1-
● Indeno(1,2,3-cd)pyrene
● Indium phosphide
● Involuntary smoking
● IQ (2-amino-3-methylimidazo[4,5-f]quinoline)
● Iron-dextran complex
● Isoprene
● Kaposi's sarcoma herpesvirus/human herpesvirus 8
● Kepone (chlordecone)
● Lasiocarpine
● Lead
● Lead acetate and lead phosphate
● Lead compounds, inorganic
● Lindane and other hexachlorocyclohexane isomers
● Magenta (containing CI Basic Red 9)
● Magnetic fields (extremely low frequency)
● Man-made mineral fibers (glasswool, rockwool, slagwool, and ceramic fibers), respirable size
● Mate drinking (hot)
● MeA-alpha-C(2-amino-3-methyl-9H-pyrido[2,3-b]indole)
● MeIQ (2-amino-3,4-dimethylimidazo[4,5-f]-quinolone)
● MeIQx (2-amino-3,8-dimethylamidazo[4,5-f] quinoxaline)
● Medroxyprogesterone acetate
● Melphalan Merphalan
● Methoxsalen with ultraviolet A therapy (PUVA)
● Methoxypsoralen, 8- plus ultraviolet radiation
● Methoxypsoralen, 5-
● Methyl mercury compounds (methylmercuric chloride)
● Methyl methanesulphonate
● Methyl chloromethyl ether
● Methyl-1-nitroanthraquinone (uncertain purity), 2-
● Methyl-N'-nitro-N-nitrosoguanidine, N- (MNNG)
● Methyl-N-nitrosourethane, N-
● Methyl-N-nitrosourea, N-
● Methylaziridine (propyleneimine), 2-

- Methylazoxymethanol and its acetate
- Methylchrysene, 5-
- Methylene bis(2-methylaniline), 4,4'-
- Methylenebis (N,N-dimethyl)benzenamine, 4,4'-
- Methylenebis(2-chloroaniline) (MBOCA), 4,4'-
- Methylene chloride (dichloromethane)
- Methylenedianiline, 4,4'- and its dihydrochloride
- Methyleugenol
- Methylthiouracil
- Metronidazole
- Michler's Ketone
- Mineral oils - untreated and mildly treated oils
- Mirex
- Mitoxantrone
- Mitomycin C
- Monocrotaline
- MOPP and other combined chemotherapy for cancer
- Morpholinomethyl)-3-[(5-nitrofurfurylidene)amino]-2- oxazolidinone, 5-(
- Mustard gas (sulphur mustard)
- Nafenopin
- Naphthalene
- Naphthalamine, alpha-
- Naphthylamine, beta-
- Neutrons (ionizing radiation)
- Nickel and certain nickel compounds
- Niridazole
- Nitrilotriacetic acid and its salts
- Nitro-2-furyl)-2-thiazolyl]acetamide, N-[4-(5-
- Nitroacenaphthene, 5-
- Nitroanisole, 2-
- Nitrobenzene
- Nitrobiphenyl, 4-
- Nitrochrysene, 6-
- Nitrofen
- Nitrofluorene, 2-
- Nitrofurfurylidene)amino]-2-imidazolidinone, 1-[(5-
- Nitro-2-furyl)-2-thiazolyl] acetamide, N-[4-(5-
- Nitrogen mustard N-oxide
- Nitrogen mustard hydrochloride
- Nitrogen mustard
- Nitrolotriacetic acid and its salts
- Nitromethane
- Nitropropane, 2-
- Nitropyrene, 1-
- Nitropyrene, 4-
- Nitroso-N-ethylurea, N-
- Nitroso-N-methylurea, N-
- Nitrosodi-n-butylamine, N-
- Nitrosodi-n-propylamine, N-
- Nitrosodiethanolamine, N-
- Nitrosodiethylamine, N-

- Nitrosodimethylamine, N-
- Nitrosomethylamino)propionitrile, 3-(N-
- Nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK), 4-(N-
- Nitrosomethylethylamine, N-
- Nitrosomethylvinylamine, N-
- Nitrosomorpholine, N-
- Nitrosonornicotine, N- (NNN)
- Nitrosopiperidine, N-
- Nitrosopyrrolidine, N-
- Nitrososarcosine, N-
- Norethisterone
- Ocratoxin A
- Oestrogen-progestogen therapy, postmenopausal
- Oestrogens, nonsteroidal*
- Oestrogens, steroidal*
- Oil Orange SS
- Opisthorchis viverrini (infection with)
- Oral contraceptives, sequential or combined
- Oxazepam
- Oxydianiline, 4,4'-
- Oxymetholone
- Panfuran S (containing dihydroxymethylfuratrizine)
- Phenacetin
- Phenazopyridine hydrochloride
- Phenobarbital
- Phenolphthalein
- Phenoxybenzamine hydrochloride
- Phenyl glycidyl ether
- Phenytoin
- PhIP (2-amino-1-methyl-6-phenylimidazo [4,5-b] pyridine)
- Phosphorus-32 (32P), as phosphate
- Pickled vegetables, traditional Asian
- Plutonium-239 (239Pu) and its decay products, as aerosols
- Polybrominated biphenyls (PBBs)
- Polychlorinated biphenyls (PCBs)
- Polycyclic aromatic hydrocarbons (PAHs)
- Ponceau MX
- Ponceau 3R
- Potassium bromate
- Procarbazine hydrochloride
- Progesterone
- Progestins
- Propane sultone -propiolactone, 1,3-
- Propane sultone, 1,3-
- Propiolactone, beta-
- Propylene oxide
- Propylthiouracil
- Radionuclides,and particle emitting, internally deposited
- Radium-224 (224Ra) and its decay products
- Radium-226 (226Ra) and its decay products
- Radium-228 (228Ra) and its decay products

- Radon-222 (222Rn) and its decay products
- Refractory ceramic fibers
- Reserpine Riddelliine Safrole
- Salted fish, Chinese style
- Schistosoma haematobium (infection with)
- Schistosoma japonicum (infection with)
- Selenium sulfide
- Shale oils
- Silica (crystalline)
- Sodium ortho-phenylphenate
- Solar radiation
- Soots
- Sterigmatocystin
- Streptozotocin
- Styrene
- Styrene oxide (styrene-7,8-oxide)
- Sulfallate
- Sulphuric acid (occupational exposures to strong inorganic acid mists)
- Sunlamps and sunbeds (use of)
- Talc containing asbestiform fibers
- Tamoxifen
- Tenopiside
- Tetrachlorodibenzo-p-dioxin (TCDD), 2,3,7,8-
- Tetrachloroethylene (perchloroethylene)
- Tetrafluoroethylene
- Tetranitromethane
- Thioacetamide
- Thiodianiline, 4,4'-
- Thiotepa [tris(1-aziridinyl)phosphine sulfide]
- Thiouracil
- Thiourea
- Thorium dioxide
- Thorium-232 (232Th) and its decay products
- Tobacco products (smokeless)
- Tobacco smoke
- Toluene diisocyanates
- Toluidine, ortho- (3,3-Dimethylbenzidine)
- Toluidine hydrochloride, ortho-
- Toxaphene (polychlorinated camphenes)
- trans-2[(Dimethylamino)methylimino]-5-[2-(5-nitro-2-furyl)vinyl]- Treosulphan
- Treosulphan
- Trichloroethylene
- Trichlormethine (trimustine hydrochloride)
- Trichlorophenol, 2,4,6-
- Trichloropropane, 1,2,3-
- Tris(2,3-dibromopropyl)phosphate
- Trp-P-1 (3-Amino-1,4-dimethyl-5H-pyrido[4,3-b]indole)
- Trp-P-2(3-Amino-1-methyl-5H-pyrido[4,3-b]indole)
- Trypan blue
- Ultraviolet radiation: A, B, and C including sunlamps and sunbeds
- Uracil mustard

- Urethane
- Vanadium pentoxide
- Vinyl acetate
- Vinyl bromide
- Vinyl chloride
- Vinyl fluoride
- Vinylcyclohexene, 4-
- Vinylcyclohexene diepoxide, 4-
- Welding fumes
- Wood dust
- X-radiation (ionizing radiation)
- Zalcitabine
- Zidovudine (AZT, retrovir)

Occupational exposures associated with a technological process known to be carcinogenic:

- Boot and shoe manufacture and repair
- Carpentry and joinery
- Coal gasification
- Coke oven emissions
- Coke production
- Dry cleaning
- Furniture and cabinet making
- Glass manufacturing industry (occupational exposure)
- Art glass, glass containers and pressed ware
- Hairdresser or barber (occupational exposure to dyes)
- Insecticide use (occupational)
- Iron and steel founding
- Isopropyl alcohol manufacture (strong-acid process)
- Magenta manufacture
- Painter (occupational exposures)
- Printing processes (occupational exposures)
- Petroleum refining (occupational refining exposures)
- Rubber industry
- Soots, tars, and mineral oils
- Textile manufacturing (occupational exposures)
- Wood industries

APPENDIX IX

REPRODUCTIVE TOXICANTS

Reproductive Toxins – Reproductive toxins are substances that have adverse effects on various aspects of reproduction, including fertility, gestation, lactation, and general reproductive performance. When a pregnant woman is exposed to a chemical, the fetus may
be exposed as well because the placenta is an extremely poor barrier to chemicals.

Reproductive toxins can affect both men and women. Male reproductive toxins can in some
cases lead to sterility.

Substances with a High Acute Toxicity – High acute toxicity includes any chemical that falls
within any of the following OSHA-defined categories:

- A chemical with a median lethal dose (LD_{50}) of 50 mg or less per kg of body weight when administered orally to certain test populations.

- A chemical with an LD_{50} of 200 mg less per kg of body weight when administered by continuous contact for 24 hours to certain test populations.

- A chemical with a median lethal concentration (LC_{50}) in air of 200 parts per million (ppm) by volume or less of gas or vapor, or 2 mg per liter or less of mist, fume, or dust, when administered to certain test populations by continuous inhalation for one hour, provided such concentration and/or condition are likely to be encountered by humans when the chemical is used in any reasonably foreseeable manner.

The State of California Office of Environmental Health Hazard Assessment (OEHHA) maintains a list of known carcinogens and reproductive toxins. Proposition 65 requires the state to maintain and update a list of chemicals known to the state to cause cancer or reproductive toxicity. The Prop 65 list can be found in the following links:

https://oehha.ca.gov/media/downloads/proposition-65//p65list030819.pdf

https://oehha.ca.gov/proposition-65/proposition-65-list

APPENDIX X

GLOVE SELECTION GUIDE

Resistance to Chemicals of Common Glove Materials (E=Excellent, G=Good, F=Fair, P=Poor)

Chemical	Natural Rubber	Neoprene	Nitrile	Vinyl	Chemical	Natural Rubber	Neoprene	Nitrile	Vinyl
Acetaldehyde	G	G	E	G	Formic Acid	G	E	E	E
Acetic Acid	E	E	E	E	Glycerol	G	G	E	E
Acetone	G	G	G	F	Hexane	P	E	-	P
Acrylonitrile	P	G	-	F	Hydrobromic acid (40%)	G	E	-	E
Ammonium Hydroxide	G	E	E	E	Hydrochloric acid (conc)	G	G	G	E
Aniline	F	G	E	G	Hydrofluoric acid (30%)	G	G	G	E
Benzaldehyde	F	F	E	G	Hydrogen Peroxide	G	G	G	E
Benzene	P	F	G	F	Iodine	G	G	-	G
Benzyl Chloride	F	P	G	P	Methylamine	G	G	E	E
Bromine	G	G	-	G	Methyl Cellosolve	F	E	-	P
Butane	P	E	-	P	Methyl Chloride	P	E	-	P
Calcium Hypochlorite	P	G	G	G	Methyl Ethyl Ketone	F	G	G	P
Carbon Disulfide	P	P	G	F	Methylene Chloride	F	F	G	F
Carbon Tetrachloride	P	F	G	F	Monoethanolamine	F	E	-	E
Chlorine	G	G	-	G	Morpholine	F	E	-	E
Chlorocetone	F	E	-	P	Naphthalene	G	G	E	G
Chloroform	P	F	G	P	Nitric Acid (conc)	P	P	P	G
Chromic Acid	P	F	F	E	Perchloric Acid	F	G	F	E
Cyclohexane	F	E	-	P	Phenol	G	E	-	E
Dibenzylether	F	G	-	P	Phosphoric Acid	G	E	-	E
Dibutyl Phthalate	F	G	-	P	Potassium Hydroxide (sat)	G	G	G	E
Diethanolamine	F	E	-	E	Propylene Dichloride	P	F	-	P
Diethyl Ether	F	G	E	P	Sodium Hydroxide	G	G	G	E
Dimethyl Sulfoxide	-	-	-	-	Sodium Hypochlorite	G	P	F	G
Ethyl Acetate	F	G	G	F	Sulfuric Acid (conc)	G	G	F	G
Ethylene Dichloride	P	F	G	P	Toluene	P	F	G	F
Ethylene Glycol	G	G	E	E	Trichloroethylene	P	F	G	F
Ethylene Trichloride	P	P	-	P	Tricresyl Phosphate	P	F	-	F
Fluorine	G	G	-	G	Triethanolamine	F	E	E	E
Formaldehyde	G	E	E	E	Trinitrotoluene	P	E	-	P

Aromatic and halogenated hydrocarbons will attack all types of natural and synthetic glove materials.

The Internet resources provided will help you select the best glove and provide the most protection. For chemical mixtures or multiple hazards, pick the glove with the highest

resistance to the most toxic substance or consider a double-glove protocol. If you are in doubt,
do not hesitate to call the manufacturer's representative for technical assistance or EHSO.

Choosing the right protective glove for the job is critical to safe handling of animals as well as hazardous and toxic chemicals and other laboratory tasks. Match the individual glove
by manufacturer and style to the required task and exposure particulars. No single glove will
protect against all harmful substances. Nor will one glove suit all applications. No matter which
glove is used, they all can potentially leak or become punctured or torn. No glove can offer
100% protection either, as permeation and degradation take their toll during use. To ensure
the highest level of protection train employees to know the hazards of the substances they
handle and the estimated breakthrough times for the gloves selected. Always handle toxic and
hazardous chemicals with utmost care.

Resources:
- Ansell - https://www.ansellguardianpartner.com/chemical/home#hp
- Showa-Best - https://www.showagroup.com/us/en
- HexAmour - https://www.hexarmor.com/learning-center
- Microflex - https://www.ansell.com/us/en/industrial/brands/microflex/

Adapted from " All Hands on Deck: a primer on protective gloves " by Vince McLeod, CIH; ALN;
2010-06-24

APPENDIX XI

INVENTORY AND
CHEMICAL STORAGE GUIDELINES

http://www.hawaii.edu/ehso/wp-content/uploads/2016/07/Chemstorage.pdf

Effective segregation in chemical storage reduces the risk of dangerous chemical reactions.
This guide must be used in conjunction with information from the manufacturer's safety data sheets and chemical-specific expert knowledge.
This storage group system is intended to be used in research settings to store laboratory-scale quantities of chemicals.

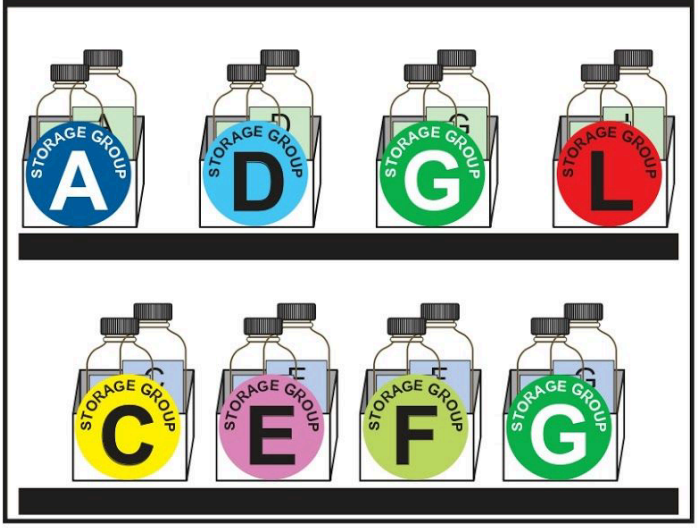
STORAGE GROUPS

Store chemicals in separate secondary containment and cabinets

A	Compatible Organic Bases
B	Combatible Pyrophoric & Water Reactive Materials *
C	Compatible Inorganic Bases
D	Compatible Organic Acids
E	Compatible Oxidizers & Peroxides (not including Strong, Oxidizing Acids)*
F	Compatible Inorganic Acids (not including Oxidizers or Combustibes)
G	Not Intrinsically Reactive, Flammable, or Combustible
I	Compatible Strong, Oxidizing Acids
J	Poison Compressed Gases*
K	Compatible Stable Explosives* (not including Oxidizing Explosives)
L	Flammables, Combustibles, & Organic Solvents
X	Incompatible with ALL Other Chemicals* (including other Chemicals within X)

* Contact UH EHSO @ 808-956-5097 or email at labsafe@hawaii.edu
* Special handling and storage requirements - Consult manufacturer's SDS

If space does not allow Storage Groups to be kept in separate cabinets the following scheme can be used with extra care taken to provide stable, uncrowded, and carefully monitored conditions.



NOTE: Different chemicals within Storage Group X must be segregated from each other.

Storage Group X must be segregated from all other chemicals.

Storage Group B is not compatible with any other storage group.

Last updated 03/19/19

Storage Group Classification System created by Stanford University

March 19, 2019

Recommended Storage Groups for Common Chemicals

CHEMICAL	Group
1-Butanol or 2-butanol	L
1-Propanol	L
2-Mercaptoethanol	L
Acetic acid, glacial (flammable)	D
Acetic anhydride (in THF or acetone: L)	X
Acetone	L
Acetonitrile	L
Acetaldehyde	L
Acrolein	X
Acrylamide	G
Agarose	G
Ammonium acetate	G
Ammonium chloride	G
Ammonium formate	G
Ammonium hydroxide	C
Ammonium nitrate	E
Ammonium persulfate	E
Ammonium sulfate	G
Ammonium sulfide	L
Benzene	L
Benzyl chloride	B
Benzoic acid	D
BIS/Bis-acrylamide	G
BIS-TRIS	A
BIS-TRIS-HCl	G
Borax	G
Boric acid	G
Calcium chloride	G
Chloroform	G
Chromic acid	I
Citric acid	D
Coomassie Blue	G
Dextrose	G
Dichloromethane	L
Diethylamine (flammable)	A
Diethyl pyrocarbonate (DEPC)	L
Dimethyl sulfoxide (DMSO)	L
Drierite	G
Econo-Safe, UniverSOL, BetaMax, CytoScint, Scintisafe, EcoLume, Ecoscint, Opti-fluor	L
EDTA (in solution: G)	D
Ethanol	L
Ethanolamine	A
Ethers	L
Ethidium bromide	G
Ethyl acetate	L
Ethylene glycol	L
Ficoll	G
Formaldehyde	L
Formamide	L
Formic Acid (≥85%)	D
Glutaraldehyde	G
Glycerol	L
Glycine	G
Guanidine hydrochloride	G
Guanidinium thiocyanate	C
Halothane, isoflurane	G
HEPES	G
Hexanes	L
Hydrochloric acid	F
Hydrogen peroxide, > 5%	E
Hydrogen peroxide, < 5%	G
Imidazole	A
Isobutyl alcohol	L
Isopentane	L
Isopropanol	L
Lithium hydroxide	C
Magnesium chloride	G
Magnesium sulfate	G
Maleic acid	D
Methanol	L
N-Methyl-2-pyrrolidone	L
N,*N*-Dimethylformamide	L
Nitric acid	I
p-Dioxane	L
Paraformaldehyde	L
Perchloric acid	I
Periodic acid	I
Permount	L
Phenol (solid)	G
Phenol (liquid, ≤ 89% phenol)	L
Phosphoric acid	F
Picric acid (any concentration)	X
Piperidine	A
PIPES, free acid	G
Potassium acetate	G
Potassium chloride	G
Potassium cyanide	C
Potassium hydroxide (KOH)	C
Potassium phosphate (K_3PO_4)	G
Propionic acid	D
Propylene oxide	L
Pump oil	L
Pyridine	A
SDS (Sodium dodecyl sulfate) (in solution: G)	L
Sigmacote	L
Sodium acetate	G
Sodium azide	X
Sodium bicarbonate	G
Sodium bisulfate	G
Sodium bisulfite	G
Sodium borate	G
Sodium borohydride	B
Sodium carbonate	G
Sodium chlorate	E
Sodium chloride (NaCl)	G
Sodium citrate dihydrate	G
Sodium dichromate dihydrate	E
Sodium hydroxide (NaOH)	C
Sodium hypochlorite	E
Sodium hypochlorite solution (i.e. bleach)	E
Sodium phosphate	G
Sodium sulfide, anhydrous	B
Succinic acid	D
Sucrose	G
Sulfuric acid	I
Tannic acid	G
TEMED	A
TES free acid	G
Tetracycline	G
Tetrahydrofuran	L
Trichloroacetic acid	D
Trifluoroacetic acid	D
Toluene	L
Triethanolamine	A
TRIS	A
Triton X-100	G
Trizol	L
TWEEN 20	G
Urea	G
WD-40	L
Xylenes	L
Zinc chloride	G

This Storage Group System was created by Stanford University.
See other side for information about the (Stanford) Storage Group System. Storage Groups are continuously reviewed and updated as needed. If you have any questions or suggested changes, please contact the University of Hawaii EHSO at 808-956-5097.

Chemical Inventory

Principal Investigator:

Department:

Laboratory room #s:

Updated/revised:

Chemical Name	Amount	Physical state	Location	Hazard Class

SUGGESTED SHELF STORAGE PATTERN - ORGANIC

Organic #2 Alcohols, Glycols, Amines, Amides, Imines, Imides (Store flammables in a dedicated cabinet.)		**Organic #8** Phenol, Cresols
Organic #3 Hydrocarbons, Esters, Aldehydes (Store flammables in a dedicated cabinet.)		**Organic #6** Peroxides, Azides, Hydroperoxides
Organic #4 Ethers, Ketones, Ketenes, Halogenated Hydrocarbons, Ethylene Oxide (Store flammables in a dedicated cabinet.)		**Organic #1** Acids, Anhydrides, Peracids (Store certain organic acids in acid cabinet.)
Organic #5 Epoxy Compounds, Isocyanates		**Organic #9** Dyes, Stains, Indicators (Store alcohol-based solutions in flammables cabinet.)
Organic #7 Sulfides, Polysulfides, etc.		**MISCELLANEOUS**

SUGGESTED SHELF STORAGE PATTERN - INORGANIC

Inorganic #10 Sulfur, Phosphorus, Arsenic, Phosphorus Pentoxide		**Inorganic #7** Arsenates, Cyanides, Cyanates (Store away from water)
Inorganic #2 Halides, Sulfates, Sulfites, Thiosulfates, Phosphates, Halogens, Acetates		**Inorganic #5** Sulfides, Selenides, Phosphides, Carbides, Nitrides
Inorganic #3 Amides, Nitrates (not Ammonium Nitrate), Nitrites, Azides (Store Ammonium nitrate away from all other substances-ISOLATE IT!)		**Inorganic #8** Borates, Chromates, Manganates, Permanganates
Inorganic #1 Metals & Hydrides (Store away from any water.) (Store flammable solids in flammables cabinet.		**Inorganic #9** Acids, except Nitric (Acids are best stored in dedicated cabinets.) **(**Store Nitric Acid away from other acids unless your acid cabinet provides a separate compartment for Nitric Acid.)
Inorganic #4 Hydroxides, Oxides, Silicates, Carbonates, Carbon		**Inorganic #6** Chlorates, Bromates, Iodates, Chlorites, Hypochlorites, Perchlorates, Perchloric Acid, Peroxides, Hydrogen Peroxide

COMMON LABORATORY CORROSIVES

ORGANIC ACIDS	**ORGANIC BASES**
Acetic Acid (Glacial)	Ethylenediamine
Acetic Anhydride	Ethylimine
Acetyl Bromide	Hexamethylenediamine
Acetyl Chloride	Hydroxylamine
Benzoyl Bromide	Phenylhydrazine
Benzoyl Chloride	Piperazine
Benzyl Bromide	Tetramethylammonium Hydroxide
Benzyl Chloride	Tetramethylethylenediamine
Butyric Acid	Triethylamine
Chloroacetic Acid	Trimethylamine (aqueous solution)
Chloroacetyl Chloride	
Chlorotrimethylsilane	**INORGANIC BASES**
Dichlorodimethylsilane	Ammonium Hydroxide
Dimethyl Sulfate	Ammonium Sulfide
Formic Acid	Calcium Hydride
Methyl Chloroformate	Calcium Hydroxide
Oxalic Acid	Calcium Oxide
Phenol	Hydrazine
Propionic Acid	Potassium Hydroxide
Propionyl Bromide	Sodium Hydride
Propionyl Chloride	Sodium Hydroxide
Salicylic Acid	
Trichloroacetic Acid	**OTHERS**
	Aluminum Trichloride
INORGANIC ACIDS	Ammonium Bifluoride
Bromine Pentafluoride	Antimony Trichloride
Chlorosulfonic Acid	Bromine (liquid)
Hydriodic Acid	Calcium Fluoride
Hydrobromic Acid	Chlorine (gas)
Hydrochloric Acid	Ferric Chloride
Hydrofluoric Acid	Fluorine (gas)
Nitric Acid	Iodine
Perchloric Acid	Phosphorus
Phosphoric Acid	Sodium Bisulfate
Phosphorus Pentachloride	Sodium Fluoride
Phosphorus Pentoxide	
Phosphorus Tribromide	
Phosphorus Trichloride	
Sulfuric Acid	
Sulfuryl Chloride	
Thionyl Chloride	
Tin Chloride	
Titanium Tetrachloride	

COMMON LABORATORY OXIDIZERS

Oxidizers react with other chemicals by giving off electrons and undergoing reduction. Uncontrolled reactions of oxidizers may result in a fire or an explosion, causing severe property damage or personal injury. Use oxidizers with extreme care and caution and follow all safe handling guidelines specified in the MSDS.

Bleach

Bromate

Bromine

Butadiene

Chlorates

Chloric Acid

Chlorine

Chlorite

Chromates

Chromic Acid

Dichromates

Fluorine

Haloate

Halogens

Hydrogen Peroxide

Hypochlorites

Iodates

Mineral Acids

Nitrates

Nitric Acid

Nitrites

Nitrous oxide

Ozanates

Oxides

Oxygen

Oxygen Difluoride

Ozone

Peracetic Acid

Perhaloate

Perborates

Percarbonates

Perchlorates

Perchloric Acid

Permanganates

Peroxides

Persulfate

Sodium Borate Perhydrate

Sulfuric Acid

APPENDIX XII

CLOSEOUT PROCEDURES AND CHECKLIST

CLOSE-OUT PROCEDURES FOR DEPARTING/RETIRING FACULTY AND STAFF

Proper disposal of all hazardous materials used in the workplace is the responsibility of the chemical user or supervisor/Principal Investigator (PI) to whom a chemical use room/laboratory is assigned. Enforcement of this policy is the responsibility of the supervisor/PI. Proper disposition of hazardous materials is required whenever a chemical user leaves the University or transfers to a different laboratory/chemical use room. This process should be started at least a month before departure from the chemical use room/laboratory to allow ample time to properly dispose all materials. Hazardous waste pickup should be completed before the chemical use room/laboratory is vacated. The disposal must be in compliance with the University's Hazardous Materials Management Plan. The following checklist should be completed prior to the chemical user's departure. Once completed, the checklist should be signed and submitted to the user's Dean or Director and to the Environmental Health and Safety Office (EHSO).

If periodic inspections by the EHSO reveal that proper close-out procedures have not been followed, the EHSO will oversee correction/remediation of any problems created by failure to follow those procedures, and the cost of correcting those problems will be charged to the budget of the level V unit within which the problems were identified by the EHSO.

Prepared by: Environmental Health and Safety Office
Date: March 18, 2011

UNIVERSITY OF HAWAI‘I

M2.400 LABORATORY DECOMMISSIONING POLICY

I. POLICY STATEMENT:

Prior to laboratories being vacated, all equipment, furniture, chemicals, radioactive and biological materials must be properly transferred, removed, or disposed.

II. PURPOSE:

This policy is to prevent and minimize risk to the campus community, including cleaning and maintenance staff, contractors, and new occupants who may enter vacated laboratories containing abandoned hazardous material.

III. APPLICABILITY/SCOPE:

This policy applies to all laboratories and auxiliary spaces serving laboratories and provides for the removal of potentially hazardous material from these spaces when the user is planning to vacate the space. This includes terminating affiliation with the University, relocating to another laboratory space, major laboratory renovation requiring relocation of hazardous materials, and retirement from research activities. This policy applies to all Mānoa units regardless of location on or off campus.

This policy does not apply to facilities such as computer labs and music labs.

IV. DEFINITIONS:

A. Decommissioning – the formal deactivation of a laboratory.
B. Laboratory – a facility where quantities of hazardous chemicals, biological, and radiological materials are used in a non-production basis, including research labs, student teaching labs, and clinical labs.
C. Principal Investigator (PI) – faculty, staff, or researcher responsible for supervising activities within a laboratory.

V. RESPONSIBILITIES:

A. Deans/Directors are responsible for ensuring that departments and units are

aware of and follow the procedures contained in this policy.

B. Department Chairs/Unit Heads are responsible for the following:
   1. Verify that PIs in their department/unit have notified the appropriate campus units, such as Radiation Safety and Facilities Management, when vacating or relocating a laboratory.
   2. Inform EHSO's various departments of new laboratory assignments.
   3. Accountable for costs, deficiencies, or regulatory actions or fines resulting from improper management or disposal of regulated materials from laboratories that have not been properly decommissioned.

C. Principal Investigators (PIs) are responsible for the following:
   1. Ensure enough lead time (at least one month) is given for proper management of materials. Required disposal time will vary depending on amount and type of materials involved.
   2. Notify the appropriate departments (i.e., Radiation Safety, Hazardous Materials Management, Laboratory Safety, and Biosafety) when vacating or relocating a laboratory.
   3. Complete the Laboratory Decommissioning Checklist (Attachment 1) and submit to the Environmental Health and Safety Office (EHSO) Laboratory Safety Program.
   4. Take specific measures to transfer or dispose of hazardous, radioactive, and/or biological materials before vacating or relocating.
   5. Ensure all equipment, such as fume hoods, biological safety cabinets, flammable or corrosive storage cabinets, freezers, incubators, scintillation counters, autoclaves, and centrifuges are emptied and decontaminated.
   6. All research specific apparatus shall be dismantled, packaged, and removed.
   7. All compressed gas cylinders shall be removed prior to closing of the laboratory.
   8. All papers, books, rags, empty containers, boxes, bottles, glassware, plastic ware, etc., shall be properly disposed of prior to vacating the laboratory.
   9. If a vacated laboratory does not undergo decommissioning and becomes occupied by a new PI, all materials found within the laboratory become the responsibility of the new PI.

VI. **PROCEDURES:** Refer to section **V. RESPONSIBILITIES** above.

VII. **REFERENCES:**
   A. Laboratory Decommissioning Checklist – Attachment 1
   B. General Waste Disposal Procedures (Equipment, Furniture, etc.) – Attachment 2
   C. Hazardous Materials Disposal/Laboratory Close-out Procedures - Attachment 3
   D. Biosafety Laboratories Close-Out Guidance Document- Attachment 4
   E. Radioisotope Laboratories Close-out Procedures - Attachment 5

VIII. **HISTORY:** Guidelines and procedures on hazardous waste handling have been in existence as listed above in REFERENCES (see B, C, D, and E). However, an official policy is warranted to ensure the health and safety of the campus

community.

Attachment 1

University of Hawai‘i at Mānoa
Laboratory Decommissioning Checklist

Principal Investigator:	Department:
Department Head/Chair:	Building:
Room Number:	Laboratory Closeout Date:

The purpose of this checklist is to assist Principal Investigators in safely removing hazardous materials from a laboratory and confirming that the area is free from contamination.

Chemicals	**Yes**	**No**	**N/A**
Refrigerators, areas under sinks, fume hoods, cabinets and shelves, and bench tops have been checked for storage of hazardous materials (including shared spaces).			
All chemical containers have been labeled and ready for disposal, transfer, or recycling in accordance with the University of Hawai‘i Hazardous Materials Management & Disposal Guidelines.			
Refrigerators have been emptied, defrosted, and cleaned.			
Storage areas have been cleaned: chemical residues, drips, and spills are appropriately decontaminated and cleaned up.			
All bench tops have had disposable liners/covers removed from the work surface and surfaces have been cleaned.			
All keys to lockable chemical storage cabinets have been returned to the department.			
Controlled Substances	**Yes**	**No**	**N/A**
All storage areas are free of controlled substances.			
All controlled substances have been disposed of or transferred according to U.S. Drug Enforcement Agency regulations and requirements.			

Compressed Gas Cylinders	**Yes**	**No**	**N/A**
Cylinders have been properly labeled and secured.			
Cylinders not in use have been disconnected and capped**.**			
Arrangements have been made for returning empty cylinders to vendors.			
All cylinders have been labeled and ready for disposal, transfer, or recycling in accordance with the University of Hawaii Hazardous Materials Management and Disposal Guidelines.			
Radioactive Materials	**Yes**	**No**	**N/A**
Radioactive waste materials have been handled in accordance with the University of Hawaii Radioactive Waste Disposal Procedures.			
The removal of radioactive materials and termination surveys has been coordinated with the Radiation Safety Officer in accordance with the guidelines in the University of Hawaii Radiation Safety Manual.			
Biological Materials	**Yes**	**No**	**N/A**
All work surfaces and storage areas, including walk-in coolers, freezers, refrigerators and incubators, have been decontaminated.			
All inside working surfaces of the biological safety cabinets have been decontaminated.			
Certification of the biological safety cabinet is current.			
Arrangements have been made for the decontamination and replacement of the HEPA filter in the biological safety cabinet, if required.			
All sharps have been properly disinfected and placed in puncture resistant containers for disposal.			
All biological waste has been autoclaved and properly disposed of.			
Are there biological materials that need to be transferred to another location? If yes, contact Environmental Health and Safety Office for transport information.			
Has the Responsible Official (Research Office) been contacted to advise that experiments using a Select Agents and/or Toxins will be terminated and the Select Agents and/or Toxins will be destroyed?			
Equipment	**Yes**	**No**	**N/A**
All equipment has been disinfected and decontaminated.			
Is any equipment going to be transferred to surplus? If yes, then equipment must be inspected by EHSO prior to transfer to surplus.			
Is any equipment connected to permanent building systems being removed for transfer with the exiting investigator? If yes, contact Facilities Management.			
Has all broken glass been placed in a rigid, puncture resistant container and sealed in preparation for disposal by Buildings and Grounds Services?			

Records	Yes	No	N/A
Has a copy of the last current lab/chemical inventory been provided to the department head?			

I have, to the best of my knowledge, complied with the requirements of the University of Hawai‘i at Mānoa Laboratory Decommissioning Checklist and am not aware of any other items or special circumstances that are not listed on this form.

Principal Investigator: _____ Date: _____

Department Chair: _____ Date: _____

Final Inspection Sign-Off

Laboratory Safety Officer: _____ Date: _____

Biological Safety Officer: _____ Date: _____

Radiation Safety Officer: _____ Date: _____

CLOSE-OUT PROCEDURES FOR DEPARTING/RETIRING FACULTY AND STAFF

Proper disposition of all hazardous materials used in the workplace is the responsibility of the chemical user or supervisor/Principal Investigator (Pl) to whom a chemical use room/laboratory is assigned. Enforcement of this policy is the responsibility of the supervisor/Pl. Proper disposition of hazardous materials is required whenever a chemical user leaves the University or transfers to a different laboratory/chemical use room. This process should be started at least a month before departure from the chemical use room/laboratory to allow ample time to properly dispose all materials.

Hazardous waste pickup should be completed before the chemical use room/laboratory is vacated. The disposal must be in compliance with the University's Hazardous Materials Management Plan. The following checklist should be completed prior to the chemical user's departure. Once completed, the checklist should be signed and submitted to the user's Dean or Director and to the Environmental Health and Safety Office (EHSO).

If periodic inspections by the EHSO reveal that proper close-out procedures have not been followed, the EHSO wilt oversee correction/remediation of any problems created by failure to follow those procedures, and the cost of correcting *those* problems will be charged to the budget of the level V unit within which the problems were identified by the EHSO.

CHEMICAL USER CLOSE-OUT CHECKLIST

DATE:_____

BLDG:_____

ROOM(S):_____ _

SUPV/PI:_____

DEPT:_____ _

REQUIREMENT	YES	NO	COMMENTS
1. Have shared storage units such as refrigerators, freezers, cold rooms, stock rooms, etc. been properly surveyed in order to locate and appropriately dispose/designate remaining chemicals?			
2. Are all chemical containers labeled and/or listed in a logbook or inventory with the name and hazard?			
3. Are all containers securely closed and in good condition?			
4. Have beakers, flasks, vials, evaporating dishes, etc. been emptied and the contents properly disposed? Remember to check refrigerators, freezers, cold rooms, fume hoods, biological safety cabinets, bench tops, storage cabinets, stock rooms, etc.			
5. Have you determined which chemicals and compressed gas cylinders are usable and transferred responsibility for those materials to another party who is willing to take charge of them? If a new user cannot be foood, the materials must be disposed.			
6. Were controlled substances disposed of as specified by the Drug Enforcement Agency (DEA) permit under which they were held? Abandonment of a controlled substance is a violation of the DEA requirements.			
7. Was permission received from the DEA to transfer ownership of a controlled substance to another individual?			
8. Were non-transferable compressed gas cylinder connections removed, cylinder caps replaced, and cylinders returned to suppliers? If cylinders are non-returnable, contact the Hazardous Material Management Program at x6398.			

9. Has all laboratory equipment been cleaned or decontaminated? Were fume hood surfaces and bench tops washed?			

I 0. If laboratory equipment will be discarded, have the following items been removed prior to disposal: capacitors? transformers? mercury switches and thermometers? refugerant fluids containing chlorofluorocarbons? radioactive sources and chemicals? Contact the Environmental Health and Safecy office (EHSO) for assistance.	- - - - -	- - - - -	
11. Were chemicals targeted for hazardous waste disposal prepared by following procedures in the Haz.ardous Materials Management Program?			
12. Did you leave a copy of your lab notebook in the lab? Its care has been transferred to			
13. Have you submitted the completed checklist to your Dean or Director and the EHSO? **EHSO Fax:** 63205 **Email:** labsafeJi),hawaii.edu			

NOTE: If any radioactive mate1ial or biological commodities were used in **the lab, please contact the Radiation Safety Officer (66475) and/or the Biological Safety Officer (63197) at the EHSO.**

REQUIRED SIGNATURES:

Chemical User	Supervisor!Pl	Department Head*

*By signing this checklist, you as Department Head are declaring that items I through 13 have been addressed. No signature would mean that the lab has not been closed-out properly. Therefore, the transfer oflab equipment to departing staff will be delayed.

Guidance Document: Biosafety Facilities Close-Out

A. Documentation (Close-Out/Moving}

1. Provide a complete inventory of all biological commodities.

2. Submit inventory with a completed and signed BSP-2 form.

3. Attached copies personal acquired federal and state permits and authorizations. (All federal and state agencies must be notified prior to move).

4. Follow close-out procedures.

5. May require current Biological Shipping and Receiving training.

Assess all biological materials (recombinant DNA materials, microorganisms, cells and cell lines, tissues, organs, body fluids, and biologically-derived or -contaminated media) and determine which materials will be moved to your new laboratory, transferred to another investigator or disposed.

Dispose of the remaining materials as you would have during the course of experimentation. For example, solid materials (including Petri dishes and microfuge tubes) should be autoclaved and disposed as biological contaminated waste.

B. Moving Biological Commodities from Lab

Many laboratory materials, including biological commodities are regulated. Regulated biological commodities include all microorganisms: bacteria, fungi, virus, animals (vertebrate and invertebrate), plants plant parts and seeds, human tissue, blood or body fluids, biological derived toxins and drugs, etc. Federal permits from USDA, CDC, DEA EPA, Commerce, Customs and DOT, as well as, State HDOA and HDOH permits may be required prior to transport, transfer or destruction.

1. Cultures and Stocks of microorganisms

Microorganisms are subject to the requirements of the U.S. DOT when being moved or shipped (Risk Group 2 or greater). HDOA must be notified if the microorganisms have an import or possession permit.
Federal agencies may require notification.

2. Human and Animal Materials (Blood, body fluids, cell line, organs)

We strongly encourage all laboratories working with human or animal materials (blood, sera, cell, tissue) to plan for the movement of these materials, whether at ambient temperatures or frozen. This will allow appropriate time to clean incubators and other equipment, and go through the other requisite steps for the

move.

3. Preserved Tissue and Specimens

Any tissue or biological specimen preserved in formaldehyde, mercuric chloride, 70% ethanol, glutaraldehyde, DMSO, or other preservatives should be included in your chemical inventory, using the preservative name and volume. These containers MUST be shipped as hazardous materials. All containers MUST be PROPERLY SEALED (so they cannot leak) and labeled with the full chemical name to be lab-packed and moved. Check directly with EHSO Hazardous Materials Management Program, if disposing.

3. Biological Contaminated Wastes

Decontaminate **all** wastes. Biological waste must not be transported. All sharps containers in use, whether or not they are full, must be disposed of as biological waste prior to the move. See biological wastes procedures.

4. Select Agents and Toxins

Any Select Agents or toxins must not be moved by any outside contractors. All necessary federal requirements must be adhered with including notification to USDA and proper forms completed. Call for OVCRGE Compliance for further information.

5. Biological Derived Toxins and Drugs

If they are controlled under Federal/State Drug Enforcement Agencies, prior to movement or disposal they must be notified.

Disposal of biological toxins and drugs must be through an approved disposal method either autoclaving or neutralization.

6. Animals

The transport of any live vertebrate animals used in teaching or research must be approved by and coordinated through the Laboratory Animal Services (LAS) and IACUC

Invertebrates under permits from the NFWS or DLNR must be notified.

C. Moving Equipment

All equipment, apparatus, and fixed structure must be cleaned and decontaminated as necessary. Once decontamination is done, any work that can re-contaminate the premises must be prohibited.

Decontaminate all surfaces (interior and exterior), first with soapy water and then secondly with an appropriate working dilution of an appropriate disinfectant. Remember: Contact time of at least 10-15 minutes. Rinse with fresh water as some disinfectants are corrosive.

Tag equipment, instruments, apparatus as cleaned and decontaminated (see attached "Equipment Owner Declaration tag). Tag must be secured to the face of the equipment. Remove any universal biohazard symbol.

1. **Equipment Needing Repair:** Contact the service company to determine if they require written verification of decontamination before they will service equipment. Certifying that equipment has been properly decontaminated is the responsibility of the lab. Consult the equipment manual for cleaning/decontamination procedures, policies, and chemical compatibility. If it is not possible to decontaminate the equipment, it must be properly packaged to prevent exposure and labeled to inform non laboratory staff of the potential hazards present. When a service person (University or outside contractor) needs to work on equipment in the laboratory:

    - Prepare a working area which is clean and free of hazards,
    - Clear enough space for easy access around the equipment,
    - Remove any hazardous items stored near, on, or under the equipment,
    - Inform the individual of potential hazards in the laboratory (training),
    - Provide personal protective equipment if necessary.

2. **Centrifuge:** clean and decontaminate chamber, cups, and rotors or other parts as instructed by manufacturer (consult manual)

3. **Water baths, bio-fermenters, aquariums, reactors, and incubators.** Flush out all drains. Water jackets must be drained and emptied. Prior to water disposal, the water should be decontaminated before disposal down the sanitary drain.

4. **Biosafety Cabinets** All biological safety cabinets require a Biological Safety Program evaluation to determine required decontamination, even if they are not moved. If being moved, the equipment must be certified again after the move to ensure filter integrity. Make arrangements for this work in advance to allow contractors to meet your schedule.

All interior and exterior surfaces must be disinfected prior to moving them. This including under the work bench/grille and top of the BSC.

5. **Refrigerators:** Empty all refrigerators; clean and decontaminate inside and outside surfaces. Drain drip pans. Vacuum motor and grills.

6. **Freezers** containing biological commodities may be moved without emptying them if no infectious substances. If moving, complete inventory must be attached to the outside of the freezer. .

Laboratory personnel are responsible for preparing freezers for the move, ensuring that all loose vials and containers are properly packaged using unbreakable containers (plastic, metal, or cardboard).

All spaces within the freezer must be filled with packing material to prevent the contents from shifting during transit.

Once the freezer is prepared to move, decontaminate the exterior of the freezer. Secure and lock down. The movers will secure the freezer lid with plastic straps before moving the freezer.

If freezer will be defrosted prior to move, water must be sterilized prior to draining.

Liquid nitrogen freezers, cryostats, Dewar flasks, etc. Call vendor for proper instructions.

E. Decommissioning a Lab

All horizontal surfaces, including bench tops, floors, shelves, fire extinguishers, waste cans, electrical conduits, etc. should have been cleaned and decontaminated with appropriate disinfectant with appropriate contact time.

Sanitary drains must be flushed with bleach.

All universal biohazard symbols should be removed (entry doorway, wastes trash cans, bench tops).

F. New Location

No manipulation without proper federal, state and UH authorization. A new floor plan should have been submitted to Biosafety Program. When the materials arrive at the new locations, lab personnel will need to check contents for breakage/damage. Open all parcel in a biosafety cabinet. All biosafety cabinets must be certified prior to use.

G. Post-Close-out/Move

If inspections by the BSP reveal that proper close-out procedures have not been followed. BSO will oversee correction/remediation of any problems created by failure to follow those procedures, and the cost of correcting those problems will be charged to the budget of the Level V unit within which the problems were identified by the BSP.

H. Equipment Owner Declaration Tag (Example)

Tag equipment, instruments, and apparatus as cleaned and decontaminated. Tags should be printed on light Green Qfil2fil and secured to the face of the equipment being moved or relocated. Printable "Equipment Owners Declaration tags" in a PDF format (2 tags/page, form fillable).

CLOSEOUT PROCEDURES FOR RADIOISOTOPE LABORATORIES

MOVING TO ANOTHER LABORATORY

1. Submit an Amendment Application to Authorization Form, RSP-3a, to add new laboratory location to your current authorization.

    a. Include floor plan of new lab space with areas marked for restricted area. Show where radioisotopes and radioactive waste will be stored on the floorplan.

    b. Show which sink will be the hot sink, if any.

2. Once new lab space is approved by the Radiation Safety Committee, do the following:

    a. Dispose of any radioactive waste by calling RSP for a waste pickup.

    b. if you need to move any radioisotopes to the new lab, call RSP to make arrangements to move your material.

    c. Clear out all big equipment not being kept at old lab. Clear all lab benches of materials, supplies, chemicals, etc.

        1) Move refrigerators, freezers, LSCs, gamma counters, and glassware from lab benches.

        2) Do a wipe test survey to ensure no contamination is left. Mark any fixed contamination that is present.

3. Call RSP to perform a final close out survey. If any contamination is found, you will have to decontaminate it and have RSP resurvey the area.

4. If you fail to clean up contaminated areas found, RSP will charge your department for its time used in cleaning up the laboratory.

LEAVING THE UNIVERSITY OR STOPPING RADIOISOTOPE USE

1. Submit a memorandum to the RSO stating that you will close out your authorization.

2. Arrange to have radioisotopes transferred to another Pl or university, or dispose of your radioisotopes and arrange for a waste pick up. The RSP will assist you with the paperwork to transfer your radioisotopes to another university.

3. Clean your lab equipment of any contamination and transfer equipment to another Pl or have them disposed. Notify RSP if giving fixed equipment to another Pl.

4. Clear lab benches as much as possible of all lab supplies which were used with radioisotopes.

5. Call RSP for a close out survey or decommissioning survey. If any contamination is found, you must decontaminate the areas and have RSP resurvey your lab. If you do not decontaminate the area, RSP will charge your department for the time spent in the cleanup.

APPENDIX XIII

WORKPLACE SAFETY COMMITTEE
INSPECTION AND ENFORCEMENT PROCEDURES

WORKPLACE SAFETY COMMITTEE

INSPECTION AND ENFORCEMENT

PROCEDURES

In order to ensure that University facilities are operating in as safe a manner as possible, the University's Environmental Health and Safety Office (EHSO) under the auspices of the Workplace Safety Committee (WSC) will conduct periodic inspections of work sites. The procedures that will be followed are described below and on the attached flowchart.

Initially, the supervisor in charge of the work area will be given prior notice that an inspection will be conducted. On the appointed day, a member of the EHSO will conduct an inspection of the facility. The supervisor is strongly encouraged to accompany the EHSO representative. A report will be issued to the PI and/or the supervisor. If deficiencies were observed during the inspection, the report will list a response date by which the supervisor must reply to the EHSO indicating when and how all the deficiencies will be corrected.

Once the response from the supervisor has been received and reviewed by the EHSO, a compliance date will be established. If the supervisor does not respond to the report, the EHSO will establish the compliance date. In either case, the supervisor will be informed about the compliance date. Once the compliance date has been reached, the EHSO will conduct a follow-up inspection to ensure the deficiencies have been corrected. If all the deficiencies have been corrected, then no further action will be taken and the PI and/or supervisor will be informed. If only minor deficiencies (as defined by the EHSO) remain after the follow-up inspection, then the EHSO and the supervisor will establish a new compliance date.

If major deficiencies (as defined by the EHSO) remain, a second report will be generated and sent to the original report's recipients and the President's office. A meeting will be scheduled between the supervisor, the EHSO and a member of the WSC. The participants at this meeting will discuss how the deficiencies can be corrected. A new compliance date will be scheduled at this meeting.

The EHSO will conduct the second follow-up inspection on the new compliance date. If all deficiencies are corrected, then no further action will occur and the supervisor, Department Chairperson, the Dean/Director and the President's office will be informed. However, if any deficiencies still remain, then the WSC will formally send the matter to the appropriate Dean/Director for further action. The Dean/Director may take appropriate action including disciplinary action in accordance with applicable collective bargaining agreements. The Dean/Director will inform the WSC of all activities taken to correct the situation in a timely manner.

WORKPLACE SAFETY COMMITTEE

INSPECTION AND ENFORCEMENT PROCEDURES

In order to ensure that University facilities are operating in as safe a manner as possible, the University's Environmental Health and Safety Office (UHCC EHSO) will conduct periodic inspections of work sites. The procedures that will be followed are described below and on the attached flowchart.

Initially, the supervisor in charge of the work area will be given prior notice that an inspection will be conducted. On the appointed day, a member of the UHCC EHSO will conduct an inspection of the facility. The supervisor is strongly encouraged to accompany the UHCC EHSO representative. At the conclusion of the inspection, a report will be issued to the supervisor, and copies will be sent to the Department Chairperson and the appropriate VC/Dean/Director. If deficiencies were observed during the inspection, the report will list a response date by which the supervisor must reply to the UHCC EHSO indicating when and how all the deficiencies will be corrected.

Once the response from the supervisor has been received and reviewed by the UHCC EHSO, a compliance date will be established. If the supervisor does not respond to the report, the UHCC EHSO will establish the compliance date. In either case, the supervisor will be informed about the compliance date. Once the compliance date has been reached, the UHCC EHSO will conduct a follow-up inspection to ensure the deficiencies have been corrected. If all the deficiencies have been corrected, then no further action will be taken and the supervisor, Department Chairperson and the Dean/Director will be informed. If only minor deficiencies (as defined by the UHCC EHSO) remain after the follow-up inspection, then the UHCC EHSO and the supervisor will establish a new compliance date.

If major deficiencies (as defined by the UHCC EHSO) remain, a second report will be generated and sent to the original report's recipients and the Chancellor's office. A meeting will be scheduled between the supervisor, the UHCC EHSO and a member of the SC. The participants at this meeting will discuss how the deficiencies can be corrected. A new compliance date will be scheduled at this meeting.

The UHCC EHSO will conduct the second follow-up inspection on the new compliance date. If all deficiencies are corrected, then no further action will occur and the supervisor, Department Chairperson, the VC/Dean/Director and the Chancellor's office will be informed. However, if any deficiencies remain, then the SC will formally send the matter to the appropriate VC/Dean/Director for further action. The VC/Dean/Director will take appropriate action. The VC/Dean/Director

will inform the SC of all activities taken to correct the situation in a timely manner.

APPENDIX XIV

LABORATORY PERSONNEL SAFETY CHECKLIST

Laboratory Personnel Safety Check List

Employee/Student Name_____ Date _____

Department _____ Bldg._____Rm.# _____

Principal Investigator _____OR
Print

Lab Supervisor_____
Print

The following procedures have been reviewed with this employee/student.

1. _____ Has the PI/Lab Supervisor discussed the nature of the research being conducted in the laboratory?

2. _____ Has the PI/Lab Supervisor discussed all hazardous components of the research?

a._____ chemical
b._____ biological
c._____ physical
d._____ radioactive

3. _____ Has the employee/student received instruction on known symptoms associated with exposure to highly toxic chemicals or biological commodities used in the laboratory?

4. _____ Has the PI/Lab Supervisor discussed the need for the employee/student to inform health care providers of the hazardous substances (chemical, biological, radioactive) used in the laboratory during each medical visit?

5. _____ Has the PI/Lab Supervisor reviewed the laboratory Chemical Hygiene Plan and all Standard Operating Procedures with the employee/student?

6. ___ Has the PI/Lab Supervisor identified the location of Material Safety Data Sheets to the employee/student and demonstrated methods of access? (e.g., EHSO website, hardcopy, etc.).

7. ___ Has hazard assessment information concerning Personal Protective Equipment required in laboratory been reviewed, and has the supervisor and employee signed off?

8. ___ Does the employee/student need a respirator? If yes, arrange for exposure evaluation, training and fit testing through the Environmental Health & Safety Office at x6-3204.

9. ___ Have the Emergency Response Procedures been identified to the employee/student and pertinent procedures reviewed for:

a. _____ spills
b. _____ fire
c. _____ personal injury
d. _____ meeting location upon evacuation _____

10. ___ Have all Emergency Equipment locations/procedures been identified to the employee/student?

a. _____ Emergency Shower
b. _____ Emergency Eyewash
c. _____ Fire Alarm Pull Station
d. _____ Spill Kit (posted chemical spill procedures)
e. . Emergency action plan (DPS website: http://manoa.hawaii.edu/dps/emergency.html)
f. _____ Telephone (x6-6911)

11. ___ Have the locations of the Satellite Accumulation Area and Hazardous Material Management Plan been identified to the employee/student and waste procedures explained for:

a. _____ solvents?
b. _____ acids/bases?
c. _____ radioactive material?
d. _____ sharps/broken glass?
e. _____ biological material?

12. ___ Has the PI/Lab Supervisor reviewed with the employee/student, the laboratory signage system as indicated on the door?

13. _____ Have basic laboratory safety requirements been explained & reinforced?

14. _____ Training (refer to website www.hawaii.edu/ehso for schedule):

_____ a. If new employee/student, has the employee student signed up for Chemical Hygiene/Laboratory Safety training at x6-5180.

_____ b. If biological commodity user, has the employee/student signed up for training with the Biological Safety Office at x6-3197.

_____ c. If radioactive material user, has the employee/student signed up for training with the Radiation Safety Office at x6-6475.

All laboratory personnel must: **know** the hazards
understand the hazards
have **skills** to execute safe practices

Employee/Student Name_____ _____
Signature Date

Principle Investigator/Lab Supervisor _____ _____
Signature Date

Keep the completed form with employee records

APPENDIX XV

SAFE HANDLING PRACTICES FOR MOVING CHEMICALS

Moving chemicals from one laboratory or area to another can be a very dangerous activity when safe handling precautions are not practiced. This fact sheet will explain the basic chemical handling and storage precautions to practice when moving chemicals between labs and buildings.

1. First, perform a pre-move visual inspection and inventory of the chemicals that will be moved.

    - Make a list of the chemicals and note of the type (e.g. Acid, Base, Reactive, Toxic), and amounts of the chemicals to be moved.

    - Make sure that each container is correctly labeled as to its contents.

    - Observe the general condition of each chemical container.

    - Observe each containers cap or closure seal for the formation of crystals. CAUTION DO NOT TIGHTEN, OPEN OR MOVE CONTAINERS THAT HAVE CRYSTALS FORMING ON THE CAPS AND SEALS.

    - Observe whether crystals, which could be the signs of decomposition, have formed INSIDE the container. Ethers and other classes of organic peroxides can decompose and produce potentially dangerous and explosive crystals.

2. Locate the Safety Data Sheet (SDS) for each chemical to be moved. Each SDS has chemical specific handling and safety information that must be properly followed in order to move the chemical safely.

3. Plan the move. Choose the best route to take from point A to point B. Do not to take containers up and down stairs if possible.

4. Prepare the chemicals for the move.

    - Remember to use the proper goggles, gloves and other personal protective equipment before handling any chemicals.

- Group the containers for the move by Hazard Class. Do not move acids with toxics, or oxidizers with organic solvents. Make a separate move for each Hazard Class.

- Transfer salvageable chemicals from deteriorating or contaminated containers to new containers with new labels. Properly dispose of unsalvageable and excess chemicals as Hazardous Waste.

- Box chemical containers if possible, using the correct packing materials (e.g. Vermiculite, original packaging boxes).

- If you use a cart to move containers make sure it has rails so the containers don't slip off. Place heavy containers on the bottom rack of the cart. Do not over load the cart, make several trips if necessary.

- Take a chemical spill kit with you in the event you have a spill along the move. This can be a coffee can filled with Vermiculite or the Acid/Base neutralizer kits found in many labs.

5. Compressed cylinder handling.

   - Always remove regulators from the cylinders before moving.

   - Always replace the metal valve cover on the cylinder before moving.

   - Move the cylinder with a cylinder dolly made especially for moving cylinders. Make sure the cylinder is securely chained or strapped to the dolly.

   - DO NOT lay cylinders on their sides. Laying a cylinder on its side can cause condensed liquids in the cylinder to enter the valve. When the valve is opened the liquid can rapidly volatilize and expand. This can produce potentially explosive conditions.

6. Before the move, rethink the storage system where you're moving to. The best way to store reactive chemicals is by family groups, making sure that you don't put certain groups right next to each other. For example, store phenols and amines well away from acid chlorides. Inorganics should be separated from organics. The inert or low-reactive materials can still stored in alphabetical order. This "mixed" system can work well and will help you comply with chemical storage requirements.

7. During the move. Be prepared for unexpected events during the move.

   - Stay with the containers. Do not let them out of you sight while you are moving them between points "A" and "B."

   - Be aware of the surroundings. Watch for doors opening in your way. Warn people of the hazard before they get close to you.

- If it begins to rain while you are outside of a building you will need to find safe cover for the containers.

- Have your spill kit available as well as the phone numbers to call in the event you have a spill along the move. Familiarize yourself with the UH chemical hygiene plan “Spill Clean-Up Procedures.”

  The emergency contact numbers are;

  Campus Security

By following these basic chemical handling practices during your move, you can ensure your safety, as well as the safety of other people around you.