

HAZARD COMMUNICATION

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PROCEDURES AND TRAINING

The University of Maryland at the Horn Point Laboratory recognizes that certain job activities require employees to risk contact with hazardous substances as a result of assigned duties. It is the intent of the HPL to eliminate or minimize the risk of occupational exposure to potentially hazardous substances by utilizing a combination of engineering controls, employee training/education, personal protective equipment, vaccinations, and implementation of recommended safe work practices.

Potentially hazardous materials are defined as having one or more of the following characteristics or effects: asphyxiate, carcinogen, corrosive, explosive, oxidant, radioactive, reactive, toxic, or poisonous..

THE COMPLIANCE PROGRAM

In 1984 the Maryland General Assembly enacted legislation designed to give employees information about hazardous substances in their workplaces. This law is sometimes called the "Right-to Know" law or "Hazard Communication Standard". In 1990, the Maryland Right-to-Know law was amended to include the provisions of the federal standard, *29 CFR 1910.1200*. This law requires employers to obtain, maintain and submit certain information about hazardous substances.

Written Hazard	Employers must have a Written Program describing all steps of regulatory compliance
Labels and Other Forms of Warning	(1) CM&I labels must have (i) chemical identity, (ii) hazard warning, and (iii) responsible company name and address (2) Labels must not conflict with DOT regulations (49CRF) (3) OSHA standard labels must be used if applicable (4) Employers must ensure labels have (i) chemical identity and (ii) appropriate hazard warning (5) Other forms of identification may be used for stationary process containers
Material Safety Data Sheets (MSDS)/Safety Data Sheets (SDS)	(1) CM&I are responsible to develop MSDS; employers are responsible to obtain them (2) Content requirements for MSDS (3) No blank spaces are allowed (4) Mixtures of varying concentrations can have 1 MSDS (5) New information must be added within 3 months (6) MSDS are to be provided prior to first shipment of chemical (7) Distributors must pass along MSDS to the

Training includes:

- chemical detection methods,
- chemical hazards,
- protective measures and
- details on labeling and how to read an MSDS

Employee Information & Training

All employees will receive “Right to Know” training regarding materials present at HPL. All employees are expected to familiarize themselves with all relevant MSDS/SDS prior to working with hazardous chemicals (Section 5.0).

Material Safety Data Sheets (MSDS) / Safety Data Sheets (SDS)

The Environmental Safety Compliance Officer (ESCO) is responsible for establishing and maintaining SDS on all chemical substances in the facility. No delivery of chemicals will be accepted unless a SDS is already on file or is provided prior to the shipment. While respecting a company’s legal right to

protect secret formulations, alternate sources of supply will be sought if the supplier refuses to provide required health and hazard information (which is not part of the formula). A SDS file is maintained in the library for easy access at all hours of the day.

Labeling

HPL will use and preserve the labels already on containers as provided by the chemical manufacturers or suppliers. Whenever substances are transferred, the new container will be labeled immediately with the chemical name (or product name) as it appears on the manufacturer's label. The new container label will also include the appropriate hazard warnings.

Inventory

An annual inventory of chemical stocks in each laboratory will be kept current and maintained for each laboratory by the Principal Investigator of that lab. This is an example of a laboratory chemical inventory listing the name, size, supplier and current quantity of each chemical.

Table 2. Chemical Inventory for Room _in Building ____.			
Chemical Name	Size	Supplier	Quantity
Sulfuric acid	1000 ml	Baker	4 liters
Acetone	5000 ml	Baker	12 liters
etc			

Flammable Chemicals

All flammable chemicals will be stored in flammable storage cabinets and used away from ignition sources such as open flames, cigarettes, and sparking tools.

Corrosive Chemicals

All corrosive chemicals will be managed to prevent spills. Personnel using corrosive materials must wear appropriate personal protective equipment (PPE) (gloves, goggles, lab coats, etc.) as prescribed in the MSDS/SDS for that chemical. Store corrosives together, according to the colored storage codes.

Toxic Chemicals

All toxic chemicals will be managed according to OSHA's guidelines. Workers will wear appropriate protective equipment when handling of toxic chemicals. Any

toxic materials capable of becoming airborne must be used with respiratory protection. Anyone needing to wear a respirator must adhere to the Respiratory Protection Program of HPL.

Reactive Hazards

Chemicals which are incompatible with other chemicals or substances will be segregated to avoid accidental chemical reactions. Chemicals must not be mixed without first checking the container's labels to confirm that it is the proper chemical to use, and without checking the MSDS/SDS to note special mixing hazards. Reactive chemicals will be stored separately so as not to interact with other chemicals.

Oxidizers

Oxidizers are chemicals which create a persistent fire when mixed with a flammable or combustible material. All oxidizer chemicals will be segregated from all flammable and combustible materials including solvents, cleaners, paint, rags, paper and wood. Personnel handling oxidizers will wear proper personal protective equipment.

Radioactive Materials

The University of Maryland College Park Campus has been issued a license to possess, use, and store radioactive materials by the State of Maryland. This license limits the amount of radioactive material which may be possessed, used and stored on campus. Personnel may be authorized by the Radiation Safety Officer (RSO) and the Radiation Safety Committee (RSC) to possess, use and store radioactive materials. The total activity of these authorizations including radioactive waste on hand shall not exceed the University's licensed authorization per isotope. The University license is subject to annual audit by the State of Maryland, Department of the Environment, and UMCP to ensure compliance with the requirements of the Radiation Safety Manual and the conditions of our radioactive material licenses. CES laboratories operate under UMCP's license. Failure to comply with the requirements of the Radiation Safety Manual may result in suspension of the users authorization and could lead to the loss of the University license.

The duties of the Environmental Safety Compliance Officer (ESCO) are primarily associated with the management of RAM within CES. The ESCO is the Assistant Radiation Safety Office(ARSO) and works closely with the UMCP RSO to adhere to the requirements of the UMCP license for the use of radioactive isotopes in research activities at CES laboratories.

Paint & Cleaning Supplies

Paint, painting supplies, epoxy resins, aerosols, and cleaning agents often contain corrosive, toxic, flammable, and inflammatory chemicals and must be used accordingly. Respiratory protection and/or adequate ventilation must be used when working with paints and other products that contain volatile chemicals. Anyone needing to wear a respirator must adhere to the Respiratory Protection Program of HPL.

Compressed Gases

Compressed gases must be managed to prevent accidental damage to the cylinder and uncontrolled discharge. Damaged cylinders become "unguided missiles." Uncontrolled releases of compressed gases can lead to asphyxiation. Cylinders will be secured to walls or stationary benches and will not be moved without a valve protector cap in place.

Emergency Procedures

Each employee should be aware of the location of equipment to be used in the event of an emergency. They are responsible for cleaning up small spills and responding in an appropriate manner to small fires, minor injuries, and chemical splashes requiring eye wash or emergency shower procedures.

Employees are to respond to emergencies only if they are trained and feel competent to manage the accident. At no time should an employee jeopardize their own safety or that of a fellow colleague. If unsure of the correct response it is best to call for help at 9-911 or the Environmental Safety Compliance Officer (ESCO). Emergency phone numbers can be found on all laboratory doors and other areas of potential danger.

All accidents, no matter how small, are to be reported to the ESCO; near misses or close calls are also reported so that the ESCO can then eliminate a potential accident from happening. All injuries are to be reported to your immediate supervisor, regardless of the treatment or non-treatment of any injury.

Spills

Spill clean-up kits, buckets and absorbent material are stored at strategic locations in all buildings where hazardous chemicals are in use. Users of hazardous chemicals and individuals working in these spaces must be familiar with procedures for cleaning up and reporting spills. Caution is to be used to prevent contamination of the environment.

Employees are requested to respond to small spill; less than or equal to one liter of material. If the employees is unsure of the danger caused by the spill they will vacate the area and contact the Environmental Safety Compliance

Officer (ESCO).

Large spills are to be reported to the ESCO immediately; all personnel in danger from the spill are to evacuate the area. If the spill is determined to be immediately dangerous to life and/or property, 911 will be activated

Fire

After implementing evacuation procedures and contacting the fire company via 9-911, personnel may attempt to put out or contain the fire using fire extinguishers located in strategic locations throughout each building. Fire blankets are also available to smother clothing fires. Never put yourself in danger when responding to an emergency; if the task looks too dangerous or you are unsure of the correct procedures please leave the job for someone trained for the task.

First-aid

Comprehensive first-aid kits are available in lab buildings, research vessels, and the maintenance complex. Portable field kits for first aid are also available from Facilities Management Office. Safety showers and eyewash stations are available throughout the campus.

INVENTORY CONTROL PROGRAM

Inventory control consists of tracking orders and deliveries, maintaining accurate records of current stocks, limiting the amount of each chemical in stock, and ensuring the timely and safe disposal of chemicals.

Purchasing, Storage, and Disposal

HPL employees responsible for purchasing and receiving chemicals are ultimately responsible for their safe storage. There is a place on all requisition purchase orders to indicate if the item ordered is hazardous material; please use this indicator when appropriate. Contact the ESCO for disposal of all chemicals and chemical waste.

Inventory Frequency

The inventory of all chemicals on campus is up-dated annually by each laboratory and more frequently as hazardous materials are added throughout the year. This yearly list is to be maintained in the HPL archives for 40 years. A copy of the inventory list is to be given to the Environmental Safety Compliance Officer (ESCO).

Labeling Requirements

All chemical containers will have labels that give the name of the chemical and the appropriate hazard warning. Original containers will have labels provided by the chemical manufacturer and/or supplier. Containers into which chemicals are transferred must also be so labeled.

MATERIAL SAFETY DATA SHEETS/ Safety Data Sheets

Material Safety Data Sheets (MSDS)/SDS are required, from the supplier, prior to each shipment of a hazardous chemical. These MSDS are maintained in the HPL library and are accessible to all employees 24 hours a day.

Hazard Determination

The manufacturer or importer of a chemical must determine if the chemical product is hazardous under OSHA's Hazardous Chemicals Standard (HCS). Although HPL is not responsible for determining hazard properties, personnel are expected to be aware of minimal hazard determination procedures as follows:

- The DOT hazard class labels on each container must be consistent with the hazards described on the MSDS/SDS. If this is not the case, e.g., the chemical is listed on an MSDS/SDS as non-hazardous but the DOT shipping label indicates "poison", the supplier must be contacted to clear the discrepancy.
- If experience has shown the material to have a different hazard than stated on the MSDS/SDS, the supplier must be contacted to resolve the issue.
- If the MSDS states that ingredients are a "trade secret" and gives no hazard warnings or first-aid information, the supplier must provide this information in an up-dated MSDS.

Chemical Inventory, Purchasing, and MSDS/SDS

All hazardous chemicals in stock, regardless of when purchased, must have an MSDS/SDS on record in HPL's files. No new chemical may be purchased without the supplier sending an MSDS beforehand so the appropriate safety personnel may note the laboratory's ability to handle the chemical before receipt of shipment. No "free" samples from a supplier's sales staff will be accepted without an MSDS/SDS.

MSDS Inventory

The Environmental Safety Compliance Officer (ESCO) is responsible for maintaining an MSDS for all chemicals in use at HPL. All employees who use or may be exposed to hazardous chemicals are expected to be familiar with the content, purpose, and location of the MSDS.

EMPLOYEE INFORMATION AND TRAINING

Employer Responsibility

HPL is responsible under the Hazard Communication Standard for employee training in handling hazardous materials. The following sections outline procedures that have been implemented for training.

Employee Information & Summary of Responsibilities

HPL employees must be informed about:

- (1) The regulatory requirements of the Hazard Communication Standard;
- (2) The presence, identity and location of hazardous chemicals in the workplace; and
- (3) The location and availability of this Written Hazard Communication Program and the MSDS files.

This information may be presented during training sessions, in bulletin board and safety station notices, in the HPL Newsletter, or over the Internet.

Individual responsibilities of the employee include the following:

- Become familiar with safety procedures by attending the “Right to Know” training, and reading the MSDS for each chemical you use.
- Think ahead before conducting hazardous experiments, e.g., What are the potential hazards? What’s the worst that could happen? How would I handle such a problem? What are the practices and equipment needed to minimize the risk of exposure? What procedures should be followed in the case of a spill?
- Use your personal protective equipment (PPE).
- Know the location of the nearest fire extinguishers, emergency shower, eyewash station, first-aid kit, bloodborne pathogen kit, fire blanket, burn kit and hazardous spill kit.
- Learn basic first-aid techniques.
- Never perform hazardous experiments alone (if possible). If you do work alone, make sure someone knows where you are and how long you expect to be working so that they can check on you if you do not return or contact them within that time frame.
- Label all chemicals to indicate hazards and expiration dates if any. Be sure the nature of the chemical has not changed (formation of crystals, becoming a liquid or solid, etc).
- Read all labels before and after lifting containers and before removing chemicals from their containers.
- Pour chemicals slowly.
- Treat chemicals or mixtures of unknown composition as hazardous.
- Report all accidents to the Environmental Safety Compliance

Officer (ESCO), whether or not you were involved.

- After using hazardous chemicals, wash exposed parts of your body with soap and water before leaving the lab.

Employee Training

All employees who use or have the potential of being exposed to hazardous chemicals are required to receive training on:

- (1) Chemical detection methods;
- (2) Physical and health hazards of the respective chemical(s);
- (3) Appropriate protective measures including ventilation, fume hoods and personal protective clothing;
- (4) Labeling procedures;
- (5) The content and interpretation of MSDS and label warnings; and
- (6) Clean-up procedures for small chemical spills.

Training will be conducted by the Environmental Safety Compliance Officer (ESCO). Individuals using radioactive materials must have taken and passed a radiation safety course approved by the Radiation Safety Committee at College Park.

New employees and students are required to receive training prior to their initial assignment in work areas where hazardous materials are present. Outside contractors must receive "Right to Know" training by the ESCO prior to performing work on the HPL campus. It is the responsibility of each HPL employee who arranges for outside personnel to be on campus to inform the ESCO and arrange a date for the contractor's training.

Retraining is required whenever new hazards are introduced into the workplace. Employees are expected to contact the Environmental Safety Compliance Officer (ESCO) before using new chemicals or procedures for which they have not been trained. Appropriate instruction will be provided by their supervisor or the ESCO.

The HPL training course consists of the following:

1. Introduction
2. Explain the Hazard
3. Communication Standard
4. Laboratory Policies & Practices,
5. Toxic Chemical Hazards. Explain toxicity and proper hygiene in the workplace
6. Flammable Hazards. The fire triangle (fuel, oxygen, heat) and how to prevent fires
7. Corrosive Hazards. What corrosives are and what to do if splashed with corrosive chemicals

8. Reactive chemical compatibility and importance of separating chemicals
9. Safety Equipment, location of clean-up materials, fire extinguishers, fire blankets and first- aid kits.
10. Conclusion & Summary.

HAZARD DEFINITIONS

1. FLAMMABLE - ignites easily and burns quickly.

- liquid having a flashpoint below 100°F.
- solid, liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing and when ignited burns vigorously and persistently, (gasoline, hydrogen, xylene, ethyl alcohol).

2. EXPLOSIVE - a chemical that causes a sudden, almost instantaneous release of pressure, gas and heat when subjected to sudden shock, pressure or high temperature, (dynamite, nitroglycerine).

3. COMPRESSED GAS - a gas or mixture of gases having an absolute pressure or exceeding 40 psi at 70 degrees F or exceeding 104 psi at 130 degrees F or a liquid having a vapor pressure exceeding 40 psi at 100 degrees F, (oxygen, nitrogen, acetylene, nitrous oxide).

4. OXIDIZER - a chemical other than a blasting agent or explosive that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases, (perchloric acid, bromate, hydrogen peroxide).

5. PYROPHORIC - a chemical that will ignite spontaneously in air at 130 degrees F or below, (titanium, dichloride, phosphorous, lithium hydride in moist air).

6. UNSTABLE - a chemical which in the pure state will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

7. ORGANIC PEROXIDE - organic compound that contains the bivalent -O-O- 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, (ether, aldehydes, THF are known to form

dangerously explosive peroxides on exposure to air and light).

8. CORROSIVES - any solid, liquid or gaseous substance that attacks building materials, metals, burns, irritates or destructively attacks organic tissue such as skin, (sulfuric acid, nitric acid, sodium hydroxide, hydrofluoric acid, chlorine, bromine, glacial acetic acid).

9. POSIONS -,any substance that is harmful to living tissues when applied in relatively small doses, (mercury, arsenic, cyanide, phenol).

HAZARD DETERMINATION

Although safety hazards related to the physical characteristics of a chemical can be

objectively defined in terms of testing requirements (e.g. flammability), health hazard definitions are less precise and more subjective. Health hazards may cause measurable changes in the body-such as decreased pulmonary function. These changes are generally indicated by the occurrence of signs and symptoms in the exposed employee-such as shortness of breath, a non-measurable, subjective feeling. Employees exposed to such hazards must be apprised of both the signs and symptoms that may occur to signal that change.

"**Acute**" effects usually occur rapidly as a result of short-term exposures, and are of short duration. The acute effects referred to most frequently are:

- irritant - A substance that causes slight inflammation or other discomfort to the body.
- corrosive - Gradually destructive; steadily harmful,
- sensitizer - a chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical. and
- lethal dose (LD50). - the toxicity of a material that will kill half of the sample population of a specific testanimal in a specified period through exposure by ingestion, skin contact, or injection.

"**Chronic**" effects generally occur as a result of long-term exposure, and are of long duration. The term chronic effect is often used to cover:

- carcinogen - any substance or agent that tends to produce a cancer
- teratogen - a drug or other substance capable of interfering with the development of a fetus, causing birth defects. and
- mutagen - physical or chemical agent that changes the genetic material, usually DNA, of an organism and thus increases the

frequency of mutations above the natural background level

Target organ effects:

The following is a target organ categorization of effects which may occur, including examples of signs and symptoms and chemicals which have been found to cause such effects. These examples are presented to illustrate the range and diversity of effects and hazards found in the workplace, and the broad scope employers must consider in this area, but are not intended to be all-inclusive.

1. **Hepatotoxin:** Chemicals which produce liver damage. Signs and symptoms are jaundice and liver enlargement. . Chemicals: Carbon tetrachloride; nitrosamine
2. **Nephrotoxins:** Chemicals which produce kidney damage a. Signs and symptoms are Edema; proteinuria. Chemicals: Halogenated hydrocarbons; uranium
3. **Neurotoxins:** Chemicals which produce their primary toxic effects on the nervous system Signs and symptoms are narcosis; behavioral changes; and decrease in motor functions. Chemicals: Mercury; carbon disulfide
4. **Agents which act on the blood or hematopoietic system:** Decrease hemoglobin function; deprive the body tissue of oxygen. Signs and symptoms are: cyanosis and loss of consciousness. Chemicals: Carbon monoxide; cyanides
5. **Agents which damage the lung:** Chemicals which irritate or damage the pulmonary tissue. Signs and symptoms are: cough; tightness in chest; and shortness of breath. Chemicals: Silica; asbestos
6. **Reproductive toxins:** Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis). Signs and symptoms are: birth defects and sterility. Chemicals: Lead; DBCP
7. **Cutaneous hazards:** Chemicals which affect the dermal layer of the body Signs and symptoms are: defatting of the skin; rashes; and irritation. Chemicals: Ketones; chlorinated compounds
8. **Eye hazards:** Chemicals which affect the eye or visual capacity. Signs and symptoms are: conjunctivitis and corneal damage. Chemicals: Organic solvents; acid

The HPL Safety Board is requesting that you complete the exposure history form, which will become part of your permanent personnel file. This form can be obtained from the Environmental Safety Compliance Officer (ESCO). Your record of exposure to hazardous materials could save you time and money should you develop an illness related to a hazardous material. Failure to complete this form will make it difficult to

document your exposure history if you should file a request for compensation in the future.

Should you have any unusually high exposure to a hazardous material it would be wise to inform the Environmental Safety Compliance Officer (ESCO) in writing, so that we can make the incident a part of your permanent record.

Alcohol Thermometers

Alcohol thermometers are not quite as accurate as mercury thermometers.. The expansion of alcohol is not linear, and therefore alcohol thermometers become less accurate as the temperature of the measured material increases. This means that they have a lower usable range than do mercury thermometers, typically being accurate below 300 °C.

In general, wastes from a small alcohol thermometer breakage may be disposed in the normal trash, with the glass shards being contained in a rigid-sided, labeled box. In contrast, materials from a broken mercury thermometer must be disposed of as hazardous waste, and the costs for disposing of waste mercury are significant.

Please consider using alcohol thermometers wherever they are appropriate.