

# **Chemical Hygiene Plan**

**For**

**UNCW Laboratories**

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# Chemical Hygiene Plan for UNCW Laboratories

This program is required by OSHA and is based on the standard, Occupational Exposure to Hazardous Chemicals in Laboratories (29 CFR 1910.1450). It applies to all University of North Carolina Wilmington employees who work in laboratory settings. Employees who work with hazardous materials in non-laboratory settings must comply with the UNCW Hazard Communication Program based on the OSHA Hazard Communication Standard (29 CFR 1910.1200). It is good practice that the same levels of safety and precautions that are afforded to employees be implemented for students; however, the mechanisms for supplying personal protective equipment, medical evaluations, and for reporting accidents may differ.

The Chemical Hygiene Plan (CHP) serves to communicate the hazards of chemicals used in laboratories at the University of North Carolina Wilmington (UNCW) to personnel and affiliates and to convey safety precautions necessary to minimize exposure to hazardous chemicals and to protect employees from health hazards associated with the use of hazardous chemicals.

The requirements of a chemical hygiene plan are:

- It shall be site specific.
- It shall contain written Standard Operating Procedures (SOPs) that address the safe usage of hazardous chemicals in the laboratory.
- It shall be immediately available to staff, Environmental Health & Safety (EH&S) and to regulatory officials.
- It shall be reviewed annually and updated as necessary.

## **RESPONSIBILITIES:**

### Environmental Health & Safety Department (EH&S):

Environmental Health & Safety is responsible for the implementation and monitoring of safety and environmental programs and operates under authority of the Chancellor as described in UNCW Policy 05.600. The Chemical Hygiene Plan is administered by EH&S who will assist departments in their implementation and compliance with the CHP. EH&S will review the CHP annually, update if necessary, and notify departments of any changes. In addition, EH&S will inspect fume hoods, drench showers and eyewashes, perform exposure and hazard assessments, provide general laboratory training and chemical-specific user awareness training.

### Chemical Hygiene Officer (CHO):

A Chemical Hygiene Officer is required under this program. The CHO is an individual who can provide technical guidance in the implementation of the CHP. The CHO for the UNCW Campus and Center for Marine Science (CMS) is appointed within EH&S by the EH&S Director and will provide general laboratory training and chemical-specific user awareness training as needed.

### Department Chairs:

Department Chairs are responsible for supporting the Principal Investigators and laboratory staff with the resources necessary to ensure compliance with this program. This includes providing training, time away from work to attend training sessions, safety equipment, and the appropriate personal protective equipment (PPE).

### Principal Investigators/Lab Supervisors:

Each Principal Investigator or Lab Supervisor is responsible for implementing the CHP in their laboratory. The Principal Investigator is responsible for providing lab-specific training for their employees and students to include safety procedures and hazard awareness training for the chemicals used within the lab. Each Principal Investigator or Lab Supervisor shall provide Standard Operating Procedures (SOPs) for the activities where hazardous chemicals are used. The SOP must incorporate general safety practices to protect lab workers. See attachments for basic chemical handling procedures (Attachment F) and a template for creating SOPs for the lab (Attachment G).

Each Principal Investigator or Laboratory Supervisor is responsible for providing training, ensuring that personal protective equipment is obtained and worn, maintaining a chemical inventory, and ensuring that all aspects of the CHP are complete for their area. In addition, each Principal Investigator is responsible for conducting an annual review of the laboratory's CHP and revising it as necessary.

### Individuals:

Individual laboratory workers are responsible for wearing the appropriate personal protective equipment, ensuring that hazards are minimized and controlled, adhering to prescribed safety rules and regulations, and following the Standard Operating Procedures.

### Visiting Scientists:

Visiting Scientists are expected to adhere to the rules and expectations of the Chemical Hygiene Plan in the same manner as UNCW employees.

## **DEFINITIONS**

(29 CFR 1910.1450 (b))

**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.

*For purposes of this plan, hazardous chemicals also include those that present a physical hazard.*

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

## **HAZARD IDENTIFICATION**

Chemical Hazards within the laboratory will be identified by the use of hazard communication signs, chemical labels, a chemical inventory, and safety data sheets (SDSs).

### Hazard Communication Signs:

Laboratory and other potentially hazardous work areas will have a hazard communication sign at the door leading into the workspace. These hazard communication signs will identify the categories of potentially hazardous materials within the lab and the names of individuals who would know the hazards that may result from an emergency in the laboratory. EH&S will maintain emergency contact information for each laboratory.

EH&S will provide the hazard communication signs for each laboratory after receiving a completed Laboratory Safety Data Sheet for the facility (Attachment B). The Laboratory Safety Data Sheet and the hazard communication signs will be reviewed annually and revised, if necessary, by the CHO and Principal Investigator.

Chemical Labels:

All chemical containers must be labeled. The manufacturer's labels will provide the initial information on the handling of any substance. Directions found on the label must be followed.

Where substances are transferred from an original container, the new container must be labeled with the full trade or chemical name of the product and concentration of the chemical. If abbreviations or codes of the chemical name are used, a key for identifying the code or symbol must be available in the lab.

Chemical Inventory:

An inventory of hazardous chemicals found in the laboratory is required to be maintained at all times. This must be updated annually and available for staff, EH&S or CHO review. This inventory should include the top 20 chemicals used in the lab (based on quantity) and chemicals that are carcinogenic, reproductive toxins, or acutely toxic. This inventory must be included on the Laboratory Safety Data Sheet (Attachment B).

Safety Data Sheets (SDS):

SDSs for all chemicals used in the laboratory shall be readily available (by paper or electronic means) to all personnel during their work shift. EH&S highly recommends that each laboratory maintain a paper copy of the SDS for their top 20 chemicals and supervisors are responsible for obtaining the sheets. SDSs may be supplied through electronic means if each employee is capable of retrieving the information at any time. When personnel travel between different workstations, SDSs may be kept at the primary location.

SDSs are often available electronically. Check the manufacturer's website for the most recent version. EH&S also maintains a subscription service to MSDSONline which is accessible to employees and students through mySeaport. Please note that SDSs and chemical inventories are considered to be part of an exposure record and, where required, shall be kept for 30 years after an individual leaves the work setting.

**STANDARD OPERATING PROCEDURES:**

Each Principal Investigator or Lab Supervisor must complete Standard Operating Procedures for laboratory work involving the use of hazardous chemicals. (See Attachment G for a template.) SOPs may be prepared to address a process, such as distillation; a specific hazardous material, such as arsenic; or a class or family of chemicals, such as inorganic acids.

Details of the Standard Operating Procedures include:

- a. The location of the laboratory.
- b. The individual responsible for laboratory safety programs, e.g., PI, lab manager.
- c. The storage of chemicals, e.g., chemical storage cabinet, under the fume hood.
- d. The requirements for chemical transport.
- e. The emergency procedures and equipment.
- f. The spill control and decontamination procedures.
- g. The waste disposal procedures.

- h. For procedures using hazardous chemicals, e.g., distillations, reactions, syntheses:
  - The chemicals used in the process, e.g, formaldehyde, acetone
  - The hazard class of each chemical, e.g, poison, corrosive, flammable
  - The human health hazard of each chemical, e.g., nephrotoxin, teratogen
  - The personal protective equipment that must be worn during the activity, e.g., gloves, lab coat, goggles
  - The engineering controls that must be used during the activity, e.g., fume hood, glove box

Special considerations shall be provided for particularly hazardous substances. OSHA defines these as select carcinogens, reproductive toxins, and substances with a high degree of acute toxicity. See Attachment E for a list that includes many particularly hazardous substances by these criteria:

- a. Select carcinogens that are regulated by OSHA as a carcinogen, are listed by the National Toxicology Program (NTP) as a carcinogen, or are listed under Group 1, Group 2A, or Group 2B by the International Agency for Research on Cancer (IARC) monographs.
- b. Reproductive toxins.
- c. Acutely toxic materials (LD50 is less than or equal to 100 mg/kg).

For these particularly hazardous compounds, the following are also required:

- a. Establishment of a dedicated work area.
- b. Use of a containment device such as a fume hood or glove box.
- c. Specific waste removal procedures.
- d. Specific decontamination procedures.

If the use of select carcinogens, reproductive hazards, and/or acute toxins takes place in the laboratory, please ensure that all of the information listed above (dedicated work area, the use of the fume hood or glove box, a specific waste removal procedure, and a specific decontamination procedure) is included in the SOP. If you are not sure whether a chemical meets the criteria, please check with EH&S at 962-7017.

### **TRAINING:**

The Principal Investigator shall train all employees who work in laboratories in the following areas:

- a. The physical and health hazards of the chemicals used in the laboratory.
- b. The SOPs to be used in the laboratory.
- c. The location of SDSs and how to use them.
- d. The location of the chemical inventory.
- e. The appropriate handling of laboratory wastes.

EH&S will train employees who work in laboratories in the following areas:

- a. The contents of the CHP.
- b. The methods for detecting chemicals in laboratories.
- c. The measures employees can take to protect themselves from exposure to chemicals, e.g., engineering controls, personal protective equipment.
- d. The general procedures for managing laboratory wastes.

Training shall be made available upon initial assignment and prior to work with any new hazardous chemical or new activity using chemicals. EH&S offers General Lab Safety Training and Chemical Specific User Training to employees and provides a checklist for employees to use

to ensure they are sufficiently trained (see Employee Review in Attachment D). Training must be documented and records retained for 5 years.

Students who are enrolled in laboratory courses or are participating in laboratory research where hazardous chemicals are used must receive instruction on safe handling of the materials, prevention of exposure, and recognition of and response to incidents.

Online training is available for all employees through mySeaport at UNCW EH&S Vivid Learning Access. Students may also be enrolled by request to the EH&S Department. Recommended courses are the University Laboratory Safety Series: Working Safely, Analyzing Hazards, and Developing and Using Controls.

### **USING CHEMICALS SAFELY:**

#### Prior to Beginning Work with Chemicals:

Prior to purchasing chemicals for lab use, survey the work areas and ensure that there is adequate storage and equipment necessary to work safely. Complete the SOP (Attachment G) or create your own and conduct any training necessary. **Note that processes where perchloric acid is heated require availability of a perchloric acid fume hood unless otherwise approved by EH&S. Cold storage of flammable liquids requires an approved flammable storage refrigerator or freezer. Household units and cold rooms are not suitable.**

#### Obtaining Chemicals for Laboratory Use:

Most chemicals may be ordered directly by the department. EH&S must approve work with radioactive materials and be notified of work with select carcinogens, acute toxins, and controlled substances. (Attachment E)

Ensure that an SDS is delivered along with the chemical that is ordered. Of you need an SDS for a chemical already on hand, contact the supplier or use available electronic sites.

#### Engineering Controls:

Fume hoods shall be used when handling hazardous chemicals in a way that might result in an over exposure or a hazardous condition. Ensure containment by performing work at a minimum of four inches back from the front edge of the hood and by minimizing the sash opening. During hood use, the sash should be positioned at or below the stops (or prescribed height as designated by EH&S) and laboratory workers should note airflow conditions as shown by hood monitors. If the hood is equipped with a combination sash, sliding panel openings should be minimized to a single panel width. Larger sash openings are only appropriate during equipment/apparatus loading and set-up. When work concludes, *Shut the Sash* to provide a barrier between the hood and the room and to conserve energy by minimizing loss of conditioned air.

If the hood is not working correctly, all hazardous work in the hood must cease until the hood has been repaired. To have a hood repaired or serviced, log on to AiM via mySeaport and complete an electronic work request. Emergency work requests can be phoned in to Physical Plant's work order desk at 962-3101. Contact EH&S at 962-3057 with any questions about fume hoods.

Other protective devices such as glove boxes, shields, increased ventilation, point source vapor collection, and others may be necessary, depending on the activity.

### Personal Protective Equipment (PPE):

Laboratory workers shall use personal protective equipment (PPE) as necessary. The PPE must fit the individual, be specific for the hazard, and training in the proper use is necessary. PPE may include gloves, safety glasses, safety goggles, face shields, lab coats, aprons, gowns, and other protective devices. In special conditions, respirators may be appropriate.

- Gloves:  
One type of glove is not appropriate for all uses. Determine which glove is appropriate for your use by reviewing MSDSs and glove compatibility guidelines.
- Respirators:  
Respirators may not be worn without EH&S approval. Respirator use should be the last line of defense against chemical hazards and only considered if engineering controls are not adequate. EH&S manages a Respiratory Protection Program that includes initial training, fit-testing, and medical monitoring. Employees are not allowed to use a respirator at UNCW without being on this program. Voluntary use of filtering face pieces and other respirators requires compliance with 29 CFR 1910.134 Appendix D.

### Chemical Waste and Disposal:

EH&S will dispose of all regulated chemical waste; hazardous materials may not be discharged to the sewer or thrown away as regular trash. Laboratory personnel are responsible for proper packaging and labeling, safely storing the waste during accumulation in the lab, and for ensuring that containers are closed except when waste is being added to them. To request waste disposal, complete and submit a [Laboratory Waste Form](#) or phone: 962-7258.

### Waste Containers:

EH&S supplies containers for disposal of broken glassware and organic solvent waste. Please call 962-7258 to request a waste container. Full broken glassware containers can be sealed and disposed of directly into the dumpster by lab personnel. No liquids are permitted in broken glass boxes. Hazardous chemical waste is managed by and disposed of by EH&S.

### Chemical Spills:

Laboratory staff are responsible for cleaning up chemical spills and contaminated areas that are bench scale and for which they have adequate materials and training to respond. If the spill is large or there are concerns about the safety of laboratory individuals, call University Police at 962-2222 or EH&S at 962-3057 for assistance.

### Spill Kits:

EH&S recommends that each laboratory have a spill kit. Suggested contents are listed in Attachment H. Since each laboratory uses different chemicals, the kit should be specific to the hazards present in that laboratory. For assistance in creating an appropriate spill kit, please contact EH&S at 962-7017.

### Sharps:

Laboratories are responsible for purchase of sharps boxes. EH&S will dispose of full boxes; contact 962-7892 for collection. No hazardous chemicals are permitted.

### **EXPOSURE MONITORING:**

Monitoring is appropriate when there is reason to believe that the exposure level of any chemical approaches or exceeds the action level or Permissible Exposure Limit (PEL) for that substance. Monitoring will be performed by EH&S staff and results will be provided to laboratory



employee(s). If you have concerns about exposures to specific chemicals, contact EH&S at 962-7017 for an assessment.

### **MEDICAL CONSULTATION AND EXAMINATIONS:**

The opportunity to receive medical attention is available to all employees who work with hazardous chemicals in the laboratory, under the following circumstances:

- When an employee develops signs or symptoms associated with exposure to a hazardous substance.
- When exposure monitoring reveals an exposure level routinely above the action level for an OSHA-regulated substance for which there are exposure monitoring and medical surveillance requirements.
- When an event, such as a chemical spill, leak, explosion or other occurrence, takes place resulting in the likelihood of a hazardous exposure.

The medical consultations and examinations will be provided at no charge to the employee, without loss of pay, and at a reasonable time and place. Please contact EH&S at 962-7017 to arrange a medical consultation and examination. For an incident or exposure requiring immediate medical attention, please call 911. Any UNCW staff member working at an off-campus facility who needs immediate medical attention should contact the nearest emergency health care provider.

### **ACCIDENT REPORTING:**

All work-related accidents and injuries, regardless of severity, and work-related illnesses involving employees must be reported to Human Resources' Workers' Compensation Administrator and to EH&S at 962-3057. If these forms are not completed within the required time schedule, the employee's medical benefits may be affected and the department may be held responsible for treatment costs and penalties.

### **RECORDKEEPING:**

The accident report form will be retained by the Workers' Compensation Administrator. The medical records will be retained by the health care provider. Training records will be kept by the department or facility for a period of five years and monitored by EH&S.

### **SURPLUS EQUIPMENT:**

Laboratory equipment for surplus or disposal must be decontaminated by the user, then evaluated and tagged by EH&S before it can be released.

### **LABORATORY MOVES AND CLOSURES:**

Prior to planning the movement or closure of a laboratory, please contact EH&S at 962-7017. EH&S will ensure safe handling of hazardous materials and give guidance on how to safely accomplish the move. When closing laboratories, EH&S will work with laboratory personnel to ensure that materials and equipment are handled and disposed of properly.

**OSHA RULE:**

The NC-OSHA rule regarding this program is available electronically at  
[http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=STANDARDS&p\\_id=10106](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10106)

**ATTACHMENTS:**

- A. UNCW EH&S Contact Information
- B. Laboratory Safety Data Sheet
- C. Flammable Material Storage Information
- D. Laboratory Self-Inspection Checklist
- E. Particularly Hazardous Substances
- F. Basic Laboratory Safety Guidelines
- G. Standard Operating Procedures (SOP) Template
- H. Suggested Spill Kit Contents
- I. Suggested References
- J. Hazard Communication Standard Pictograms

## UNCW EH&S CONTACT INFORMATION

<b>During Business Hours:</b> EH&S Main Office	Spills Emergency Notification	962-3057 if no answer, call University Police
<i>Assistant Director, Industrial Hygiene and Laboratory Programs</i>	Chemical Hygiene Industrial Hygiene Environmental Health Regulated Waste Programs	962-7017
<i>Radiation and Biological Safety Officer</i>	Radiation Safety Biological Safety Bloodborne Pathogen Program Regulated Materials Shipping Controlled Substances	962-7892
<i>Sr.EH&amp;S Technician</i>	Regulated Waste Services Fume Hood Testing & Operation General Laboratory Safety Indoor Environmental Quality	962-7258
<i>EH&amp;S Technician</i>	General Laboratory Safety Services	962-7892
<i>OSHA/ADA Specialist</i>	General Industry & Construction Safety Americans with Disabilities Act	962-4287
<i>Fire and Life Safety Officer</i>	Fire & Life Safety Special Events Construction Safety OSHA Programs	962-7258
<i>Assistant Director, Emergency Management</i>	Emergency Management Program Disaster Planning & Exercises	962-7874
<i>Emergency Management Technician</i>	Emergency Management & Business Continuity Support	962-7697
<i>Loss Control and Insurance Analyst</i>	Insurance Programs Accident Investigation	962-2950
<i>Compliance Coordinator</i>	Administration	962-3057
<i>EH&amp;S Director</i>	Management and Policies	962-3108
<i>University Police</i>	<b>After Hours Emergencies</b>	962-2222

## OTHER IMPORTANT TELEPHONE NUMBERS

<b>Fire &amp; Medical Emergencies</b>	<b>911</b>
<b>University Police Department</b>	<b>962-2222</b>
<b>Carolinas Poison Center</b> <a href="http://www.ncpoisoncenter.org/">http://www.ncpoisoncenter.org/</a>	<b>800-222-1222</b>
<b>New Hanover Regional Medical Center</b> Non-emergency	<b>343-7000</b>
<b>Vitaline</b> NHRMC Nurse Help Line	<b>815-5188</b>
<b>Workers' Compensation Administrator</b> UNCW Human Resources	<b>962-3006</b>

## Laboratory Safety Data Sheet

The Laboratory Safety Data Sheet should be completed for each Principal Investigator. This information will be maintained by Environmental Health & Safety for emergency use and will be reviewed during Lab Safety Audits. Labs should update this information during their self-audits. Emergency contact numbers will be posted.

Principal Investigator:	Office Phone:
Department:	Building & Room:
Emergency Contact 1:	Home Phone:
	Other Phone:
Emergency Contact 2:	Home Phone:
	Other Phone:

### Lab Environment

Nature of work performed in the laboratory:	
Mark the classes of materials that are used in your lab:	
<input type="checkbox"/> Flammable Liquids	<input type="checkbox"/> Poisons
<input type="checkbox"/> Flammable Solids	<input type="checkbox"/> Carcinogens/Particularly Hazardous Substances
<input type="checkbox"/> Oxidizers	<input type="checkbox"/> Corrosives
<input type="checkbox"/> Organic Peroxides	<input type="checkbox"/> Compressed Gases
<input type="checkbox"/> Biohazards	<input type="checkbox"/> Cryogenics
<input type="checkbox"/> Radioactive Materials	<input type="checkbox"/> Lasers
<input type="checkbox"/> Non-ionizing Radiation	<input type="checkbox"/> Other: _____
If you work with radioactive materials in your lab, please complete:	
Radiation source:	
In case of radiological emergency, call:	
Number of lab workers who work with radioactive materials:	

### Employees

List all persons working in your lab:

Name	Status <small>(Student: G/UG, Staff, Faculty)</small>	Banner ID#	Email	Radiation User?

### Safety Supplies

Does your lab have an eyewash station?	<input type="checkbox"/> yes	<input type="checkbox"/> no
Does your lab have a drench shower?	<input type="checkbox"/> yes	<input type="checkbox"/> no
Does your lab have a first aid kit?	<input type="checkbox"/> yes	<input type="checkbox"/> no
Does your lab have a spill kit?	<input type="checkbox"/> yes	<input type="checkbox"/> no
Does your lab have a fire extinguisher?	<input type="checkbox"/> yes	<input type="checkbox"/> no

### Chemical Inventory

Of the hazardous chemicals in your lab, list the twenty items that you have in greatest quantity, the manufacturer, and the average amount kept in inventory.

<b>Chemical</b>	<b>Manufacturer</b>	<b>Amount</b>

List particularly hazardous chemicals (acutely toxic, carcinogenic, reproductive toxins) in the lab. See Attachment E for examples and include any others that are considered to be especially hazardous.

<b>Chemical</b>	<b>Manufacturer</b>	<b>Amount</b>

List chemicals in the lab that could form peroxides.

<b>Chemical</b>	<b>Manufacturer</b>	<b>Amount</b>

Does your laboratory use formaldehyde?       yes     no

Do you have any other special concerns, such as items that become unstable if electrical power is lost, biological hazards or research animals?

Please send completed forms to [tewdg@uncw.edu](mailto:tewdg@uncw.edu) or to EH&S, Box 5974. Questions? 962-7017.

## **Flammable Material Storage Information**

Building and fire protection codes limit the amount of flammable materials that may be stored in laboratories and the size of the containers. Flammable liquids should be stored in approved safety cans or in fire-rated flammable storage cabinets wherever possible.

### **Flammable Liquids – Maximum Size of Containers**

<b><u>Container Type</u></b>	<b><u>Class 1A</u></b>	<b><u>Class 1B</u></b>	<b><u>Class 1C</u></b>	<b><u>Class II</u></b>
Glass	1 pint	1 quart	1 gallon	1 gallon
Metal or approved plastic	1 gallon	5 gallon	5 gallon	5 gallon
Safety cans	2 gallon	2 gallon	2 gallon	5 gallon
Metal drums	Contact EH&S for storage requirements			

*Class 1A - Flash point <73°F (23°C), boiling point <100°F (38°C)*

*Class 1B - Flash point <73°F (23°C), boiling point >=100°F (38°C)*

*Class 1C - Flash point 73 - 100°F (24 - 38°C)*

*Class II - Flash point 101 - 140°F (39 – 60°C)*

Safety cans are the safest way to store flammable liquids. They have spring loaded lids and an internal screen which prevents combustion of the contents. Large polypropylene (Nalgene) containers with stopcocks or valves at the bottom should never be used to store flammable liquids. These valves frequently leak and are unsafe in a fire.

### **Flammable Liquids – Maximum Quantities**

<b><u>Location</u></b>	<b><u>Max. Amount</u></b>
Open laboratory or shop (including safety cans)	10 gallons
Fire rated storage cabinets	60 gallons

### **Storage of Flammable Liquids in Refrigerators and Environmental Rooms**

Never store flammable liquids in a standard or domestic refrigerator. If flammable liquids must be refrigerated or cooled, they must be kept in an approved “flammable storage” refrigerator or freezer. These units are available from many vendors. (Consider sharing storage with a nearby lab if purchasing a unit is not within your budget.)

Domestic refrigerators have a variety of ignition sources inside the cabinet, such as lights, switches, defrost coils, etc. that could ignite vapors. Flammable storage refrigerators have no ignition sources inside the cabinet. In extremely rare occasions, it may be necessary to use an “explosion proof” refrigerator or freezer, i.e., one with no interior or exterior ignition sources.

#### **Labeling**

- Domestic refrigerators should be labeled “No Flammable Storage”
- Refrigerators used for chemicals should be labeled “Laboratory Use Only” or “No Food”
- Refrigerators used for food storage should be labeled “Food Only”

Environmental rooms (warm/cold rooms) have many ignition sources and little or no air circulation from outside. They should never be used for storage of flammable or other hazardous materials, Small quantities of hazardous materials, e.g., 500 ml, may be used in these spaces but they should not be stored there.

## Laboratory Self-Inspection Checklist

This purpose of this form is to assist UNCW laboratories in complying with the OSHA Laboratory Safety Standard. Principal Investigators or Lab Supervisors should conduct self-inspections and Environmental Health & Safety (EH&S) will conduct periodic formal inspections. If you have questions or concerns regarding chemical safety in the laboratory, please contact EH&S at 962-3057.

**Building:** \_\_\_\_\_ **Department:** \_\_\_\_\_  
**Room number:** \_\_\_\_\_ **Contact:** \_\_\_\_\_ **Date:** \_\_\_\_\_

### LAB INSPECTION:

- \_\_\_\_\_ Exits are lighted and clear of obstruction
- \_\_\_\_\_ Work area is free of debris and in good condition
- \_\_\_\_\_ Hand washing facilities are provided inside the lab
- \_\_\_\_\_ Food is stored and consumed away from the work area
- \_\_\_\_\_ Refrigerators are properly labeled
- \_\_\_\_\_ Emergency contact numbers and procedures are posted in conspicuous locations in the lab
- \_\_\_\_\_ A written Chemical Hygiene Plan is in the lab and available for inspection
- \_\_\_\_\_ Inventory of chemicals is maintained, updated annually, and available for review
- \_\_\_\_\_ Material Safety Data Sheets are readily available
- \_\_\_\_\_ Labels on chemical containers are legible, firmly secured, and identify the degree of hazard
- \_\_\_\_\_ Chemicals are stored according to compatibility
- \_\_\_\_\_ Corrosive and high hazard chemicals are stored below eye level
- \_\_\_\_\_ A flammable storage cabinet is available for flammable liquids where needed
- \_\_\_\_\_ Explosion-proof or flammable storage refrigerators are available where needed
- \_\_\_\_\_ Chemical waste containers are closed and labeled "WASTE *chemical name*"
- \_\_\_\_\_ Appropriate containers are used for broken glassware and regulated sharps
- \_\_\_\_\_ Gas cylinders are properly secured
- \_\_\_\_\_ UL listed/FM approved electrical equipment is provided
- \_\_\_\_\_ Electrical cords are in good condition
- \_\_\_\_\_ Electrical cords and equipment are protected from chemicals and temperature extremes
- \_\_\_\_\_ Extension cords are not used in place of permanent wiring
- \_\_\_\_\_ Fume hoods are not used for storage

\_\_\_\_\_ Personal protective equipment is provided and in use

\_\_\_\_\_ A spill kit appropriate to the hazards of the lab is available

\_\_\_\_\_ A Laboratory Safety Data Sheet has been submitted to EH&S

**EMPLOYEE REVIEW** (All lab personnel must be able to answer the following questions.)

- Do you know what the Chemical Hygiene Plan is and where it is located?
- Do you know the location of the chemical inventory in your lab?
- Do you know what Material Safety Data Sheets are and where they are located?
- Do you know the health hazards associated with the chemicals that you use?
- Do you know where the Standard Operating Procedures for the lab are located?
- Do you know how to recognize the presence or release of the chemicals used in your area?
- Do you know what to do if there is a chemical spill?
- Do you know the location of and how to use the emergency eyewash and shower?
- Do you know what Permissible Exposure Limits are and where to locate them for the chemicals that you use?
  
- Do you know what measures you can take (work practices, emergency procedures, Personal Protective Equipment, etc.) to protect yourself from the hazards associated with the chemicals used in your lab?



# Particularly Hazardous Substances

The OSHA Laboratory Standard requires that certain chemicals be identified as “particularly hazardous substances” and handled using special additional procedures. Particularly hazardous substances include chemicals that are “select” carcinogens (those strongly implicated as a potential cause of cancer in humans), reproductive toxins, and compounds with a high degree of acute toxicity. The following tables list chemicals that are considered by OSHA to be “particularly hazardous substances.”

## WORKING WITH SUBSTANCES OF HIGH TOXICITY

Preparations for handling highly toxic substances (including, but not limited to those listed below) must include a risk assessment. This enables sound and thorough planning of the experiment, understanding the intrinsic hazards of the substances and the risks of exposure inherent in the planned processes. The risk assessment will identify precautions, equipment, disposal, and emergency response procedures required for handling the highly toxic substances in a way that minimizes the potential for exposure. Once the risk assessment is complete, any deficiencies should be corrected before conducting the work according to the Standard Operating Procedure (SOP) for that hazardous or toxic chemical. Each experiment type must be evaluated individually because assessment of the level of risk for work with any substance depends on how the substance will be used, and, under certain conditions, even chemicals not on these lists may become highly toxic.

When highly toxic materials are being handled, it is essential that an adequate number of people are working in the area and that they are familiar with the hazards of the experiments being conducted and with the appropriate emergency response procedures. Personal protective equipment (PPE) to safeguard the hands, forearms, and face from exposure to chemicals, while desirable in most circumstances, is essential in handling highly toxic materials. Good housekeeping fosters a safer work environment and should be maintained scrupulously in areas where highly toxic substances are handled. Source reduction is always a prudent practice, but in the case of highly toxic chemicals it may mean the difference between working with toxicologically dangerous amounts of materials and working with quantities that can be handled safely with routine practice. Similarly, emergency response planning and training become very important when working with highly toxic compounds. Additional hazards from these materials (e.g., flammability and high vapor pressures) can complicate the situation, making operational safety all the more important. The following tables list chemicals that are considered to be “Particularly Hazardous Substances” by OSHA, as referenced in *Prudent Practices in the Laboratory*.

### Examples of Compounds with a High Level of Acute Toxicity

Acrolein	Nickel carbonyl
Arsine	Nitrogen dioxide
Chlorine	Osmium tetroxide
Diazomethane	Ozone
Diborane (gas)	Phosgene
Hydrogen cyanide	Sodium azide
Hydrogen fluoride	Sodium cyanide
Methyl fluorosulfonate	

### Examples of Select Carcinogens

2-Acetylaminofluorene	Dimethyl sulfate
Acrylamide	Ethylene dibromide
Acrylonitrile	Ethylene oxide

Aflatoxins	Ethylenimine
4-Aminobiphenyl	Formaldehyde
Arsenic/Arsenic compounds	Hexamethylphosphoramide
Asbestos	Hydrazine
Barium chromate	Melphalan
Benzene	4,4'-Methylene-bis(2-chloroaniline)
Benzidine	Mustard gas (bis(2-chloroethyl)sulfide)
Bis(chloromethyl)ether	N,N-Bis(2-chloroethyl)-2-naphthylamine
1,4-Butanediol dimethylsulfonate	Naphthylamine
Chlorambucil	Nickel carbonyl
Chloromethyl methyl ether	4-Nitrobephenyl
Chromium and certain chromium compounds	N,N-Nitrosodimethylamine
Cyclophosphamide	B-Propiolactone
1,2-Dibromo-3-chloropropane	Thorium dioxide
3,3-Dichlorobenzidine (and its salts)	Treosulfan
Diethylstilbestrol	Vinyl chloride
4-Dimethylaminoazobenzene	

#### Examples of Reproductive Toxins

Arsenic and certain arsenic compounds	Lead compounds
Benzene	Mercury compounds
Cadmium/certain cadmium compounds	Toluene
Carbon disulfide	Vinyl chloride
Ethylene glycol monomethyl and ethyl ethers	Xylene
Ethylene oxide	

OSHA Carcinogens page:

<http://www.osha.gov/SLTC/carcinogens/index.html>

National Toxicology Program Report on Carcinogens:

<http://ntp.niehs.nih.gov/index.cfm?objectid=72016262-BDB7-CEBA-FA60E922B18C2540>

International Agency for Research on Cancer monographs:

<http://monographs.iarc.fr/>

California Proposition 65 List (*Chemicals Known to the State to Cause Cancer or Reproductive Toxicity*)

[http://oehha.ca.gov/prop65/prop65\\_list/files/P65single091009.pdf](http://oehha.ca.gov/prop65/prop65_list/files/P65single091009.pdf)

Drug Enforcement Agency Controlled Substances Schedules

<http://www.deadiversion.usdoj.gov/schedules/schedules.htm>

National Research Council. *Prudent Practices in the Laboratory: Handling and Disposal of Chemicals*. Washington, D.C.: National Academy Press, 1995.

# UNCW LABORATORY SAFETY GUIDELINES

## Basic Chemical Handling Procedures

All laboratories at UNCW should develop Standard Operating Procedures (SOPs) that incorporate safety practices to protect lab workers. At a minimum, labs should follow these general safety practices:

### GENERAL SAFETY PRACTICES

- **Keep the work area clean and uncluttered**
- **Do not leave exposed sharps (needles, razor blades, etc.) unattended.**
- **Label all containers and keep containers closed except when in use.**
- **Know the locations of fire extinguishers, eye washes, and drench showers.**
- **Wash hands frequently and before eating.**
- **Do not eat, drink, smoke or apply cosmetics in the work area.**
- **Clean up spills promptly.**
- **Wear shoes that completely cover the feet.**
- **Avoid exposure to hazardous materials – wear proper personal protective equipment.**
- **Horseplay, practical jokes, or other acts of carelessness are prohibited.**

### GENERAL PRACTICES FOR HANDLING & STORING CHEMICALS

- **Minimize all chemical exposures. Approach all chemicals as hazardous and use common sense – do not taste chemicals, avoid smelling chemicals and do not mouth pipette.**
- **Do not work alone when handling hazardous materials and do not leave on-going reactions unattended without adequate safety measures.**
- **Restrict the amount of chemicals ordered, kept on hand, and used; substitute less hazardous chemicals when possible.**
- **Avoid underestimating the risk. One should assume that any mixture will be more toxic than its most toxic component and that all substances of unknown toxicity are highly toxic.**
- **Protective glasses or goggles should be worn in the laboratory. Non-vented goggles should be worn when working with acids, caustics, explosives, or hot molten materials.**
- **Wear proper gloves when working with any hazardous or potentially hazardous materials.**
- **Warning signs should be posted near any dangerous equipment, reaction, or condition.**
- **Use fume hoods and other ventilation devices to control exposure to airborne substances.**
- **All containers must be labeled with chemical name, concentration, and hazard warning.**
- **Store chemicals by hazard classification, not alphabetical order. Do not store materials in the fume hood or on the floor.**

**Flammable materials should be stored in approved containers**

## Standard Operating Procedures for Chemicals in the Laboratory

Chemical Name: \_\_\_\_\_ CAS#: \_\_\_\_\_

Building: \_\_\_\_\_ Room: \_\_\_\_\_

Principal Investigator or Lab Manager: \_\_\_\_\_

This substance should be considered particularly hazardous if any boxes at the right are marked.	<input type="checkbox"/> Carcinogen <input type="checkbox"/> Embryotoxin/Mutagen/Teratogen <input type="checkbox"/> Highly/Acutely Toxic
<b>Personal Protective Equipment (PPE)</b>	<input type="checkbox"/> Gloves, list type: _____ <input type="checkbox"/> Lab coat <input type="checkbox"/> Safety glasses with side shields <input type="checkbox"/> Respirator: type _____ <input type="checkbox"/> Closed-toe shoes only
<b>Engineering and Ventilation Controls</b>	<input type="checkbox"/> Chemical fume hood <input type="checkbox"/> Glove box <input type="checkbox"/> Canopy or snorkel hood <input type="checkbox"/> Other ventilation
<b>Transport/Storage Requirements</b> Chemical container labeling strategy: containers must be labeled with chemical name and hazard warnings	Chemical is transported from one location to another: <input type="checkbox"/> Using secondary container <input type="checkbox"/> Traveling least trafficked areas Chemical Segregation guidelines: <input type="checkbox"/> Avoid storing near: _____ Other handling precautions: _____
<b>Exposures/Accidental Contact</b>	<input type="checkbox"/> Flush eyes for 15 min. in emergency eyewash <input type="checkbox"/> Utilize drench shower for exposures to body <input type="checkbox"/> Change gloves once contact is noted
<b>Method for Handling a Small Spill</b>	<input type="checkbox"/> Neutralize and dilute the spill <input type="checkbox"/> Ventilate the area <input type="checkbox"/> Use absorbent material for clean-up <input type="checkbox"/> Containerize and dispose of properly
<b>Method for Handling a Large Spill</b>	<input type="checkbox"/> Remove all persons from the area <input type="checkbox"/> Close doors to affected area <input type="checkbox"/> Call 22222 or EH&S (962-3057) <input type="checkbox"/> Other comments: _____ _____
<b>Waste Disposal</b>	<input type="checkbox"/> Material must be disposed of as hazardous waste through EH&S <input type="checkbox"/> Other: _____
<b>Designated Area</b> List area(s) of the lab where this chemical is used and how the area is demarcated	<input type="checkbox"/> Chemical fume hood <input type="checkbox"/> Lab bench top <input type="checkbox"/> Radioactive work area <input type="checkbox"/> Other (specify): _____
<b>Special Requirements</b>	<input type="checkbox"/> More than one person must be present

## Suggested Spill Kit Contents

- 5-gallon plastic bucket with lid
- Nitrile gloves, 4 pairs (or other appropriate glove material)
- Goggles, 2 pairs
- Lab coats or Tyvek suits, 2
- Inert absorbent, e.g., clay cat litter, vermiculite, sand, Oil-Dri
  - 4 1-gallon bags (or enough to absorb the volume of the largest container of liquid in the lab),
  - A good universal absorbent - 1:1:1 clay litter, sodium bicarbonate, sand, or
  - Commercially available pads or pillows
- Specialty absorbent where larger volumes of acids or bases are kept. Check compatibility with unique materials, such as hydrofluoric acid.
  - Acid Gator to absorb, but not neutralize, acids
  - Neutracit
  - Base Eater
  - Pads, pillows, booms
- Mercury spill kit, if elemental mercury present, including thermometers
- Tape
- Tongs or long forceps
- Small broom and dustpan
- Paper towels
- Plastic trash can liners, 1.6 mil or thicker, 24" X 32" – 4
- Resealable plastic bags, 4 1-gallon

### Examples of Commercially Available Products

#### Universal sorbent products

- 3-M High Capacity Chemical Sorbent Pads, e.g., Lab Safety Supply #26577
- Spilfyter Sorbent Pillows, e.g., Lab Safety Supply #153808
- Chemsorb universal sorbents, e.g., Lab Safety Supply #123159

#### For solvent adsorption and vapor suppression

- [J.T. Baker Solusorb](#), e.g., Lab Safety Supply #4420
- Spill-X-S, e.g., Lab Safety Supply #11679

#### Acid and base neutralizer kits and products

- Spilfyter Neutralizer, e.g., Lab Safety Supply #66877
- Acid Encapsulation Neutralizer Sorbents, e.g., Lab Safety Supply #144468

#### For mercury clean-up

- Hg Absorb sponges and powder, e.g., Lab Safety Supply #20760, 26395

#### Supplies and Commercially Prepared Kits Available From:

[www.labsafetysupply.com](http://www.labsafetysupply.com)

[www.fishersci.com](http://www.fishersci.com)

[www.vwrsp.com](http://www.vwrsp.com)

[www.spill911.com](http://www.spill911.com)

[www.newpig.com](http://www.newpig.com)

[www.gatorinternational.com](http://www.gatorinternational.com)

## SUGGESTED REFERENCES

American Chemical Society, Safety in Academic Chemistry Laboratories, 7<sup>th</sup> edition, 2003.

[http://membership.acs.org/C/CCS/pubs/SACL\\_faculty.pdf](http://membership.acs.org/C/CCS/pubs/SACL_faculty.pdf)

[http://membership.acs.org/C/CCS/pubs/SACL\\_Students.pdf](http://membership.acs.org/C/CCS/pubs/SACL_Students.pdf)

American Chemical Society, Guide for Chemical Spill Response Planning in Laboratories, Washington, DC, 1995

[http://membership.acs.org/C/CCS/pubs/spill\\_guide\\_online.htm](http://membership.acs.org/C/CCS/pubs/spill_guide_online.htm)

Hall, Stephen K, Chemical Safety in the Laboratory, Lewis Publishers, Boca Raton, 1994.

National Research Council, Prudent Practices in the Laboratory: Handling and Disposal of Chemicals, National Academy Press, Washington, DC, 2011.

[http://www.nap.edu/catalog.php?record\\_id=12654](http://www.nap.edu/catalog.php?record_id=12654)







“Occupational Exposure to Hazardous Chemicals in Laboratories.” Title 29 *Code of Federal Regulations*, Pt. 1910.1450

<http://frwebgate.access.gpo.gov/cgi-bin/get-cfr.cgi>

# Hazard Communication Standard Pictograms

As of June 1, 2015, the Hazard Communication Standard (HCS) will require pictograms on labels to alert users of the chemical hazards to which they may be exposed. Each pictogram consists of a symbol on a white background framed within a red border and represents a distinct hazard(s). The pictogram on the label is determined by the chemical hazard classification.

## HCS Pictograms and Hazards

<p><b>Health Hazard</b></p>  <ul style="list-style-type: none"> <li>▪ Carcinogen</li> <li>▪ Mutagenicity</li> <li>▪ Reproductive Toxicity</li> <li>▪ Respiratory Sensitizer</li> <li>▪ Target Organ Toxicity</li> <li>▪ Aspiration Toxicity</li> </ul>	<p><b>Flame</b></p>  <ul style="list-style-type: none"> <li>▪ Flammables</li> <li>▪ Pyrophorics</li> <li>▪ Self-Heating</li> <li>▪ Emits Flammable Gas</li> <li>▪ Self-Reactives</li> <li>▪ Organic Peroxides</li> </ul>	<p><b>Exclamation Mark</b></p>  <ul style="list-style-type: none"> <li>▪ Irritant (skin and eye)</li> <li>▪ Skin Sensitizer</li> <li>▪ Acute Toxicity</li> <li>▪ Narcotic Effects</li> <li>▪ Respiratory Tract Irritant</li> <li>▪ Hazardous to Ozone Layer (Non-Mandatory)</li> </ul>
<p><b>Gas Cylinder</b></p>  <ul style="list-style-type: none"> <li>▪ Gases Under Pressure</li> </ul>	<p><b>Corrosion</b></p>  <ul style="list-style-type: none"> <li>▪ Skin Corrosion/Burns</li> <li>▪ Eye Damage</li> <li>▪ Corrosive to Metals</li> </ul>	<p><b>Exploding Bomb</b></p>  <ul style="list-style-type: none"> <li>▪ Explosives</li> <li>▪ Self-Reactives</li> <li>▪ Organic Peroxides</li> </ul>
<p><b>Flame Over Circle</b></p>  <ul style="list-style-type: none"> <li>▪ Oxidizers</li> </ul>	<p><b>Environment</b> (Non-Mandatory)</p>  <ul style="list-style-type: none"> <li>▪ Aquatic Toxicity</li> </ul>	<p><b>Skull and Crossbones</b></p>  <ul style="list-style-type: none"> <li>▪ Acute Toxicity (fatal or toxic)</li> </ul>