EASTERN
WASHINGTON UNIVERSITY

Chemical Safety Manual

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Contact Information

Emergency

EWU Police Department	**509-359-7676**
Cheney Fire Department	**509-498-9291**
After-hours or weekends	**911**

Medical

Cheney Medical Center	509-235-6151
Sacred Heart Medical Center	509-455-3131
Deaconess Medical Center	509-458-5800

Environmental Health and Safety (EH&S Website)

Chad Johnson, Manager, Radiation Safety	509-359-6455 Cell 509-359-5768
Kathy Kees, Safety Officer III	509-359-2788 Cell 509-220-7049
John Shields, Safety Officer III	509-359-6697 Cell 509-220-7085

Electrical Shop Supervisor

Jeff Chandler	509-359-6452

Work Order Desk	**509-359-2245**
Hazardous Material Incident	**509-359-6496**
Poison Center	**800-732-6985**
National Emergency Response	**800-424-8802**
Washington Department of Ecology	**509-456-2926**

Departmental Contact Information

(Enter your department's contact information)

Department: _____

Departmental Chemical Hygiene Officer (CHO): _____

CHO Phone Number: _____

1. Introduction

1.1 Chemical Safety Manual

Washington Administrative Code (WAC) 296-828 requires that chemical users document their safety procedures in a Chemical Hygiene Plan (CHP). For Eastern Washington University (EWU) laboratories and shops using chemicals, the CHP is created by combining information specific to individual laboratories/shops with the information provided in this Chemical Safety Manual (CSM). The lab/shop CHP must be accessible at all times to all personnel who work in areas containing hazardous chemicals.

1.2 Purpose

This manual provides laboratory work practices and procedures which are necessary to ensure that EWU students and employees are protected from hazards associated with chemicals used in laboratories. This manual is meant to be incorporated as one part of a CHP. It is not intended to stand alone. This document will not provide all safety requirements for highly specialized tasks, projects, or locations at EWU. Individuals may perform tasks that require more stringent precautions than the general principles covered in this manual and it is the responsibility of Principal Investigators (PIs) and supervisors to evaluate such procedures and develop specific health and safety protocols to meet those requirements.

1.3 Scope

Chemical laboratories are defined as spaces where relatively small amounts of hazardous substances are used on a nonproduction basis. In addition to traditional science laboratories, this definition includes some areas not usually considered a “laboratory”. Examples of the types of rooms may be included in the chemical laboratory definition are art studios, theater workshops, engineering workshops, and archeology classrooms.

Throughout this document, the word “**laboratory**” or “**lab**” will be used to refer to any space that meets the definition of a “chemical laboratory”.

All laboratories must complete a Chemical Hygiene Plan by adding information specific to the lab/shop/studio/room to this manual.

Laboratories that do not meet the definition of a chemical laboratory may use this manual for general safety. Those laboratories are still required to comply with all relevant labeling requirements found in Chemical Safety Section. The non-chemical laboratories must still maintain a chemical inventory and have **5.1** (Section 5.1) for any chemical in the lab.

1.3.1 Hazardous Chemicals

Hazardous chemicals are those that either present a health hazard or could cause physical harm from a chemical action.

1.3.1.1 Health Hazard

The health hazard level for a chemical is determined when 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. Chemicals covered by this definition include carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents that act on the hematopoietic system, and agents that damage the lungs, skin, eyes, or mucous membranes.

1.3.1.2 Physical Hazard

The physical hazard level for a chemical is determined when 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.

2. Chemical Hygiene Plan

A Chemical Hygiene Plan is a written program, required by Washington State Law, which defines the chemical hazards present in the workplace and specifies the ways those hazards will be reduced or removed to protect workers health and safety. There are several legally required parts to a Chemical Hygiene Plan which will be discussed in this section. A checklist for the information necessary to complete the laboratory CHP can be found in ***Appendix A: Laboratory Specific Information for Chemical Hygiene Plan.***

2.1 Required CHP Elements

1. The name of the Chemical Hygiene Officer (CHO), the person responsible for implementing the CHP within the laboratory. This is typically the Principle Investigator (PI) or laboratory manager. The role of the CHO is explained in Roles and Responsibilities Section ***3.2.1 Laboratory Chemical Hygiene Officer***.
    - The laboratory CHO is separate from the Departmental Chemical Hygiene Officer. Each department must also choose a CHO who is responsible for ensuring chemicals are purchased, stored, and used appropriately throughout the department. The role of the departmental CHO is explained in Roles and Responsibilities Section ***3.2.2 Departmental Chemical Hygiene Officer***.
2. A chemical inventory of every chemical present in the lab and a corresponding Safety Data Sheets or SDS (formerly Material Safety Data Sheets or MSDS).
3. Standard operating procedures (SOPs) for lab protocols or hazards found in the lab, such as specific chemicals or equipment. SOPs must clearly identify the potential hazards, outline safe work practices to reduce the risk of injury, state the required protective equipment to be used while working, and outline the proper response to an injury or spill.
4. Control measures that will be implemented to reduce the risk of exposure to lab members. This should include:
    - Engineering controls (physical alterations made to separate a worker from a hazard).
    - Administrative controls (safety policies, training, and procedure changes that alter the way work is performed to reduce the risk of injury).
    - Personal Protective Equipment (worn equipment to reduce contact between a worker and a hazard).
5. Any additional protections for chemicals that are extremely acutely toxic, carcinogenic, or reproductive toxins. This should include:
    - Identifying areas where the chemicals will be used (this can be the entire lab, or a specific place within the lab).
    - Containment devices that will be used (such as a fume hood or glove box).
    - Practices for safe storage and removal of contaminated waste.
    - Procedures for decontamination in the event of a spill or exposure.
6. Methods that will be used to ensure that laboratory safety equipment is operational to manufacture specifications and protective equipment is appropriate to hazards present.

7. Instances when prior authorization is required before laboratory activities or procedures can be carried out.
8. Descriptions for how laboratory members will be trained.
9. Information about medical consultations and surveillance available to workers.

Elements six through nine, and parts of element four are covered in this manual. Elements one through three, five, and parts of four must be addressed by the PI or laboratory supervisor.

3. Roles and Responsibilities

Keeping the laboratory safe requires participation from everyone. This section outlines the important people and organizations, and outlines their role in laboratory safety.

3.1 Principle Investigator

The PI is ultimately responsible for everything that happens within their laboratory space. The PI must:

- Take the position of Laboratory Chemical Hygiene Officer, or designating that role to a responsible and knowledgeable laboratory employee. The CHO cannot be an unpaid student.
- Know the hazards present in their laboratory and ensuring appropriate controls and equipment are present to minimize the likelihood of laboratory injuries or chemical release.
- Ensure appropriate PPE is present in the laboratory for all hazards and that all laboratory members know what PPE goes with each experiment or hazard type.
- Review the CHP and SOPs to make sure they adequately address the needs of, and hazards in, their laboratory.
- Give laboratory specific training to everyone in the lab, or designating that responsibility to a laboratory member who they are sure has the knowledge and capability to carry out training.
- Take Hazardous Waste Procedures training from Environmental Health & Safety, and ensuring that laboratory generated waste is disposed of according to Washington state laws.
- Maintain documentation for laboratory trainings.
- Submit training documentation to departmental CHO annually.

3.2 Chemical Hygiene Officer

3.2.1 Laboratory Chemical Hygiene Officer

At a minimum, the laboratory CHO has the following specific responsibilities:

- Ensure that a CHP is completed for the laboratory and review it annually so it remains up to date.
- Examine the procedures used in the laboratory, determine the potential hazards, and identify ways to minimize potential accidents and exposures.
- Create SOPs to cover the potential hazards identified, or locate general use SOPs that will cover the hazards and are relevant to the laboratory research.
- Submit SOPs involving highly reactive or toxic materials to the Chemical Safety Committee for review and approval.

- Submit all laboratory specific SOPs to EH&S for emergency planning and response.
- Review all SOPs annually to ensure they are still addressing the potential laboratory hazards.
- Ensure that a chemical inventory and a chemical map are available in the lab. They must inspect all chemicals at least annually to ensure the inventory is accurate, the labels remain on all containers, and that no containers have been compromised.
- Submit laboratory chemical inventory and chemical map to the department CHO annually.
- Ensure that employees and students follow the CHP guidelines; including wearing proper protective equipment, following safety protocols, and attending required trainings.
- Ensure that regular laboratory inspections are conducted, and that hazardous conditions or behaviors are corrected.
- Ensure that good housekeeping practices are in effect and that emergency equipment, such as showers and eye washes, are in working order.
- Identify all unattended, overnight laboratory operations, and review failsafe devices or procedures designed to prevent an accident in the event of a component failure.
- Review all laboratory accidents and recommend steps to prevent recurrence or similar problems.

3.2.2 Departmental Chemical Hygiene Officer

The departmental CHO is responsible for advising the laboratory CHOs and overseeing departmental compliance with laboratory standards. The departmental CHO has the following specific responsibilities:

- Review chemical purchases to ensure they are approved for use and stored appropriately.
- Maintain departmental chemical inventory and chemical maps and ensure they are updated annually.
    - This includes the general department chemical inventory and chemical maps as well as the individual PI laboratory's chemical inventories and chemical maps.
- Submit a department-wide chemical inventory and chemical maps to EH&S annually.
- Maintain departmental training records, for department-wide trainings and individual laboratory trainings.
- Annually submit training records annually to EH&S for retention.

3.3 Laboratory Employees and Students

Employees and students are responsible for working safely in the laboratory, their responsibilities include:

- Planning and conducting all laboratory operations in accordance with the Chemical Hygiene Plan
- Using best practices when working with hazardous chemicals, wearing required personal protective equipment and following safe practices
- Reporting any hazards or unsafe practices to the CHO or the PI.
- Asking questions when unsure of safety protocols and halting projects until answers have been obtained.

3.4 Chemical Safety Committee

The Chemical Safety Committee will oversee chemical use at EWU. The committee will be responsible for:

- Working with Departmental CHOs on chemical safety compliance.
- Reviewing SOPs involving work with highly reactive or toxic substances, giving recommendations for improving the safety of the SOP and approving or rejecting work.
- Submitting reviewed SOPs and recommendations to EH&S for emergency planning and response.

3.5 Environmental Health & Safety

Environmental Health & Safety (EH&S) works to make EWU a safe and healthy environment for employees, students, and visitors. EH&S is responsible, or available for:

- General safety trainings, this includes:
  - General Lab Safety Training
  - Hazard Communication
  - Hazardous Waste Procedures
  - Bloodborne Pathogen Awareness
  - Fire Extinguisher Training
- EH&S can advise, help develop, and/or deliver more specific lab safety trainings as requested by PIs.
- Removal of hazardous waste and bio-waste.
- Disposal of old or unwanted chemicals.
- Assisting with chemical spill clean-up.
- Annual laboratory inspections.
- Fume hood testing.
- Document retention according to WA state record retention guidelines.
- Tracking incident reports.

4. General Laboratory Safety

The following are the most basic laboratory rules:

- Never work alone in potentially dangerous situations.
- Read the labels carefully and know where the SDS are.
- Know where the emergency equipment is stored, how to use it, and what the emergency procedures are.
- Don’t use any equipment, or handle any chemicals, you are unfamiliar with.
- Wear gloves when handling any hazardous or toxic agents.
- Wash your hands when you take off your gloves, when you leave the lab, and before eating.
- Never pipet anything by mouth.
- Store chemicals in tightly closed containers with accurate and legible labels.
- Open containers with the tops pointed away from you to avoid splashing your face.

- Never eat, drink, smoke, or apply make-up while working in the laboratory.
- No shorts or sandals in the lab; wear appropriate clothes to protect yourself.
- Clean up after yourself.

4.1 Housekeeping

Laboratories must be maintained in an organized manner. They must be clean enough that hazards can be located and avoided and that exiting, for laboratory personnel, and entry, for emergency responders, is possible in the event of an emergency (WAC 296-800-310).

- Floors must be kept free of chemicals and equipment to ensure safe entry and exit in the event of an emergency. Floors must also be kept dry to avoid slipping hazards.
- Benchtops and fume hoods should not be used for chemical storage, and should be kept reasonably clear to ensure a safe working environment. Benchtops should be cleaned and decontaminated at the end of the day.
- All containers must be clearly labeled with the contents and associated hazards. Labels must include the full chemical names and concentrations. Refer to Chemical Safety Section ***5.2.2 Labeling Containers*.**
- Fume cabinets, under-sink cabinets, and refrigerators should be periodically inspected for out of date reagents, spilled substances, and leaking containers.
- Chemical inventories should be limited to those which are used on a regular basis, and chemicals must be segregated and stored appropriately. Refer to Chemical Safety Section *Error! Reference source not found.*.

4.2 Standard Operating Procedures

Standard Operating Procedures are clear, written, instructions for safely conducting potentially hazardous activities within the laboratory. They can be generated for procedures as a whole, such as *Acid Washing* or *Isolating Proteins from Cells*, or for specific hazards, such as ***Appendix E: SOP for Hydrofluoric Acid*** or *SOP for Circular Saws.*

SOPs for work with hazardous chemicals are a required portion of the CHP under WAC 296-828-20005. SOPs (or another form of safety documentation) are required for machine operation under WAC 296-800-14020.

Information about SOP generation can be found in ***Appendix D: Generating Standard Operating Procedures.*** Alternatively, general use SOPs can be followed in the laboratory. There are several general use SOPs available on the EHS Website and many more can be located online. EH&S can assist in developing SOPs if requested.

4.3. Laboratory Equipment

4.3.1 Fume Hoods

All laboratory areas where hazardous chemicals are handled must have a properly functioning fume hood. The hood must be on whenever work with volatile chemicals is being performed. Fume hoods must be kept in an organized and uncluttered condition and should not be used as a chemical storage area unless it is used expressly for that purpose. All fume hoods will be checked on a regular basis to ensure these conditions are met.

When working in a fume hood:

- Make sure the hood is on (use the high setting for hoods that have two airflow speeds) and air is being drawn in before starting work.
- Keep materials at least six inches inside the hood to maintain proper airflow.
- Keep the sash as low as possible, and never above the 18-inch limit, while working.
- Make sure the exhaust port in the back of the hood is not blocked.
- Never put your head inside the fume hood.

For more information about working with fume hoods see the Fume Hood SOP on the EHS Website.

4.3.2 Safety Equipment

Areas where hazardous chemicals are handled will also be equipped with a safety shower and/or eyewash station. The eyewash must be run for 5 minutes every week to ensure it is free of build-up; this weekly test must be recorded on the inspection tag attached to the eyewash handle or the pipes under the sink. If the eyewash is not functioning properly, a work order should be submitted with the Facilities Work Order Desk (x2245) to have it repaired.

The emergency shower will be inspected by the Plumbing Department on a regular basis to ensure it is functioning properly.

A spill kit is required for labs with hazardous chemicals. A fire blanket and first aid kit are recommended. All safety equipment should be easily located and accessible.

4.4 Personal Hygiene

Use common sense while working in the laboratory. Most especially, be conscious of where your hands have been and what you have touched and always keep your hands (and pens) out of your mouth.

- Avoid skin contact with chemicals; wash promptly if contact occurs. • Avoid inhalation of chemical; do not smell or taste chemicals.
- Never pipette by mouth or use your mouth to start a siphon.
- Never bring food, drinks, chewing gum, cigarettes, or food containers into the laboratory.
    - Never eat, drink, or smoke in the laboratory.
    - Never store foods or drinks in a refrigerator that is used to store chemicals or laboratory materials.
- Never bite fingernails or pens in the laboratory.
- Never apply cosmetics or handle contact lenses in the laboratory.
- Wash your hands frequently.
- Wash areas of exposed skin, like your forearms, after chemical use.
- Never use laboratory ice for food storage or consumption.

4.5 Personal Protective Equipment

Personal Protective Equipment (PPE) should be worn anytime there is a possibility for contact with chemicals.

Remember: Different types of PPE may be required for different types of hazards. Always refer to the SDS before working with new chemicals/materials to make sure the PPE you have is going to provide protection for the hazards present.

4.5.1 Eyes

Protection shall be worn if there is a possibility that projectiles, hazardous liquids, or other foreign matter can enter the eye.

It is important that the type of eye protection chosen matches the hazard being used.

- Hardened, shatter proof lenses shall be worn when there is a chance that projectiles could enter the eye. Side shields shall also be worn under these circumstances.
- Splash goggles shall be worn when working with hazardous liquid materials. If an explosion or sudden release of energy is possible, then shatter-proof lenses shall be part of the protection.
    - If there is a possibility that hazardous chemicals can be splashed into the eyes or hazardous fumes can be released, contact lenses shall not be worn.
- When working with equipment that produces ultraviolet radiation (UV), eyewear that filters out the UV light must be worn
- Welder's glasses with tinting appropriate for the type of hazard shall be worn during welding operations.

4.5.2 Face

Full face protection shall be provided when hazardous liquid chemicals are used, especially when there is a risk of explosion or high energy chemical reactions. Protection shall extend to cover the neck when projectiles or explosions could occur. Where explosions are possible, shatter-proof eyewear shall be worn in addition to the full-face protection.

Facial hair which will interfere with masks or other protective devices is strongly discouraged. Long hair should be tied back to keep it out of hazardous materials, out of moving equipment parts, and away from flames.

4.5.3 Body

When working with chemicals, legs should be completely covered. Shorts, capris, and skirts should not be worn in chemical labs.

Chemically resistant coveralls or laboratory coats shall be worn when working with hazardous materials.

Laboratory coats or coveralls exposed to chemicals should not be washed with general laundry. Do not take them home.

4.5.4 Hands

Gloves shall be worn anytime there is a possibility of contact with hazardous materials. There are many different types of glove materials for use with different hazardous chemicals. The type of glove that is selected must match the hazard being used. ***Appendix B: Glove Selection*** has links to help with glove selection.

Gloves shall be removed before touching clean objects, like door handles and faucet pulls, and before leaving the laboratory.

4.5.5 Feet

Open-toed shoes or sandals shall not be worn when chemicals are being used, or if there is a possibility of objects falling to the floor.

Steel (or equivalent) toe guards shall be worn during activities where energies of greater than 20 foot-pounds (e.g. 5 pounds falling from a height of 4 feet) are being generated on a routine basis.

4.5.6 Respiratory Protection

Anyone requiring respiratory protection must be medically cleared and have their mask(s) fitted annually by EH&S. If required for employees, respirators are supplied by EWU.

Half-face or full-face mask respirators, with appropriate cartridges, will be worn as required. Requirement will be based on SDS recommendations and exposure levels.

The Medical Monitoring Section *Error! Reference source not found.* has information about the medical portion of the Respiratory Protection Program.

4.6 Working Alone

A person is considered to be working alone if they are out of audio or visual range of another individual for more than a few minutes at a time and no other person is aware of the work being performed.

All attempts shall be made to avoid working alone in the laboratory. An individual shall not work alone when using extremely toxic or highly flammable chemicals. Experiments known to be hazardous shall NOT be undertaken when a worker is alone in the laboratory.

Prudent steps should be taken to avoid working alone.

- Arrangements can be made between individuals working in separate laboratories to check on each other periodically.
- Scheduled calls can be placed to, or from, the worker to ensure they are safe.
    - The contact person must be familiar with the laboratory and the experiment in progress.

The PI or supervisor has the responsibility for determining whether procedures are safe to be completed alone and what safety procedures should be put into place.

4.7 Unattended Operations

An experiment is considered unattended if no one is immediately present who fully understands the operation and how to terminate the procedure in the event of an emergency.

ANY REACTION THAT IS NOT WELL UNDERSTOOD SHALL NOT BE LEFT UNATTENDED.

- Unattended operations shall be clearly labeled. The contact person's name and phone number must be present. The date and time that the operation was started, and the anticipated stop date and time shall be on the label. Information regarding any hazards associated with the experiment must be on the label and also posted on the exterior of the laboratory door.
- Laboratory lights shall be left on when experiments are in progress.
- Plans shall be made for interruptions in utility services such as electricity, water, or gas.
- Unattended operations that could result in a fire or explosion shall be equipped with the necessary automatic shutdown controls.
- Appropriate shields or barriers shall be placed to contain splashes, explosions, or other releases.

4.8 Operations Requiring Prior Approval

There are several laboratory activities that require approval from a person or organization prior to beginning. The approval can be as simple as asking the PI or supervisor before starting potentially hazardous experiments. Sometimes the approval process can be more complicated and involve paperwork and weeks or months of advanced planning. Below are the types of operations that require advanced approval and who to seek that approval from.

Disposing of chemical waste and equipment containing hazardous materials requires prior approval of EH&S.

Experiments involving Drug Enforcement Agency (DEA) listed substances requires prior approval from the Dean of Sciences, with consultation by EH&S. See the Department of Justice Lists of Scheduling Actions, Controlled Substances, and Regulated Chemicals for a list of the substances in question.

When working with highly reactive (pyrophoric, water-reactive, etc.) or highly toxic chemicals, SOPs must be submitted for review by the Chemical Safety Committee. After review, EH&S shall be notified and the SOP shall be submitted to EH&S for emergency planning and response.

Any radioactive substance use must be approved by the Radiation Safety Committee and the Radiation Safety Officer.

The PI, or Supervisor, and the CHO must approve activities that involve:

- Handling chemicals known to pose extreme risks to personnel, such as:
  - Extremely toxic reagents
  - Very unstable reagents
  - Known carcinogens
  - Reagents that can be absorbed through the skin
- Unknown substances
- Equipment that poses considerable risk to personnel, such as lasers, and x-rays
- Working when the science building is normally locked.

5. Chemical Safety

Chemicals can pose a wide variety of hazards, from explosions to cancer. The risks associated with chemical work can be greatly reduced by preplanning and carefully following laboratory protocols.

Before starting a project make sure you:

- Have a copy of the SDS(s) and know the hazards associated with the chemical(s) to be used.
- Know the location of any safety equipment (eyewash, safety shower, fire extinguisher, etc.) that may be needed.
- Review the protocol or SOP and think through the steps involved.
- Have a clean space to work.

When you start your project, remember to handle chemicals intelligently:

- Always wear appropriate PPE.
- Never taste or smell chemicals.
    - This is true of all chemicals, even baking soda or table salt, present in the lab; they could be contaminated with another chemical.
- Keep hands away from eyes and mouth while chemicals are out.
- Wash hands frequently.

5.1 Globally Harmonized System

The Globally Harmonized System (GHS) is a system for the classification and labeling of chemicals. It includes criteria for the classification of health, physical, and environmental hazards, as well as specifying what information must be included on labels and safety data sheets for hazardous chemicals. It was designed to ensure that the identification of hazards was standardized across countries, and was adopted by the United Nations in 2003. The United States has been implementing regulatory changes to align with the GHS since 2009.

The GHS regulations work to standardize the safety information found in safety data sheets and chemical labels.

5.1.1 GHS Required Information

5.1.1.1 Signal Words

There are two signal words used in the GHS, they are “Danger” and “Warning”. Based on the hazards a chemical or product may be assigned one of the signal words. “Danger” is more hazardous than “Warning”. Relatively unhazardous substances will not have a signal word.

5.1.1.2 Hazard Statements

Hazard statements are a set of standardized phrases about the hazards of a chemical or product. All applicable hazard statements are required on chemical labels and safety data sheets.

Each hazard statement has an assigned code; the codes all start with the letter H followed by three digits. There are 36 H200 statements for physical hazards, 36 H300 statements for health hazards, and 8 H400 statements for environmental hazards.

Examples of the hazard statements include:

- H220 Extremely flammable gas
- H250 Catches fire spontaneously if exposed to air

- H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled
- H410 Very toxic to aquatic life with long-lasting effects.

5.1.1.3 Precautionary Statements

The precautionary statements describe recommended safety measures. There are four types of precautionary statements: prevention statements have steps to minimize exposure; response statements describe what to do in the event of a spill or exposure event; storage statements; and disposal statements.

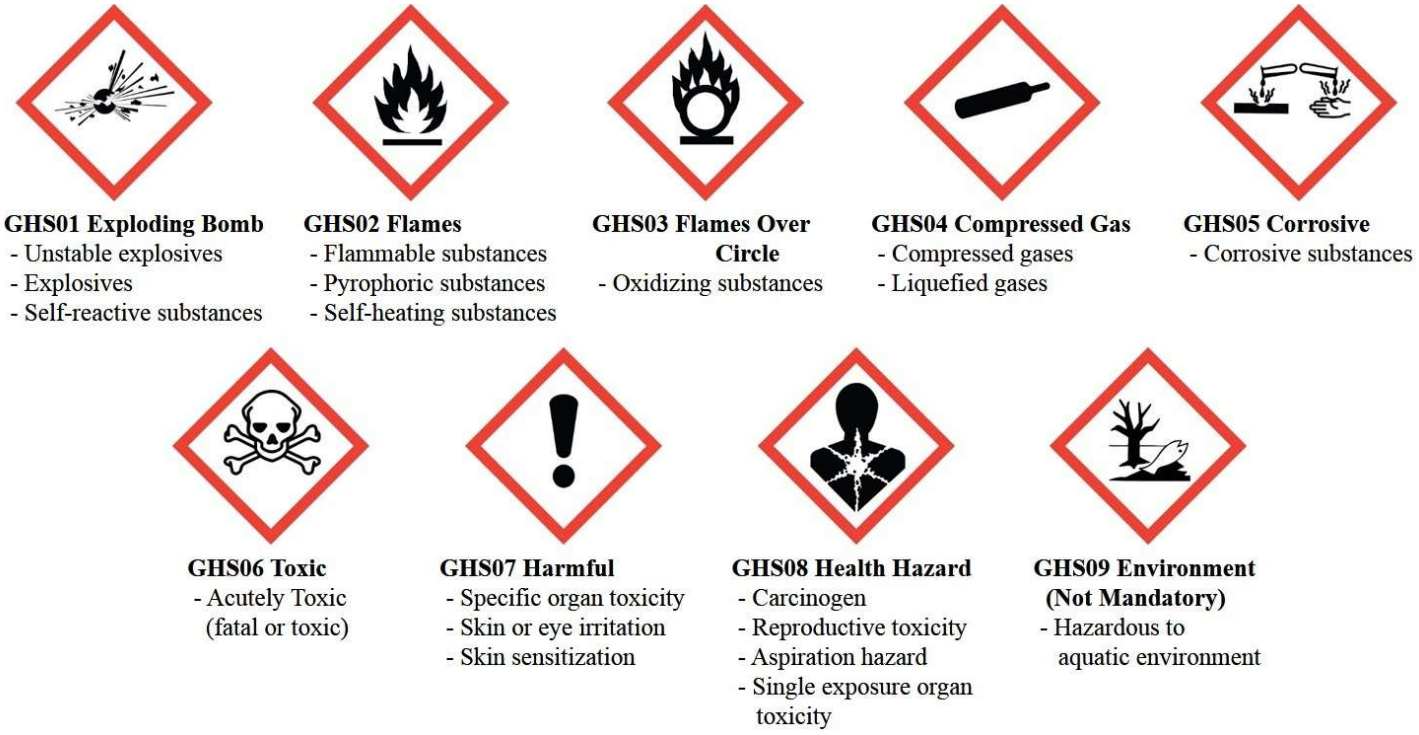
Examples of precautionary statements include:

- Keep away from heat and open flames
- Wash hands after handling
- Do not breathe vapors or spray
- If swallowed: Rinse mouth. Call a doctor if you feel unwell
- Dispose of contents/container in accordance with local, state, and federal regulations

5.1.1.4 GHS Pictograms

The GHS has nine hazard pictograms that appear in in section 2 (Hazard Identification) of the SDS and on chemical labels. They are pictures that appear inside a red diamond. These pictograms allow users to quickly identify the main hazard(s) of a chemical or product.

Figure 1 GHS Pictograms



5.1.2 Safety Data Sheets

Part of the GHS regulations was to change Material Safety Data Sheet (MSDS) to Safety Data Sheet (SDS). These documents both contain the information necessary to work safely with a chemical. The difference between the new SDS and the old MSDS is that the SDS have the information divided into 16 sections that must always be presented in the same order. The SDS and MSDS usually have the same information[1] , it is just easier to locate in the SDS.

Laboratories are required to maintain a copy of the SDS/MSDS for each chemical they possess. The SDS/MSDS must be in an easily identifiable and continuously accessible location. If they are stored on a computer, the computer must be accessible at all times by anyone in the lab and a sign should be posted indicating that the SDS/MSDS are on the computer and where the files can be located.

Before beginning work with a new chemical, take time to review the information found in the SDS/MSDS.

5.1.2.1 SDS Sections

The 16 sections in the SDS are:

1. **Identification** – Product and supplier information is provided here
2. **Hazard Identification** – Pictograms, signal words, hazard statements, and precautionary statements
3. **Composition** – Chemical name(s) and identifiers for the product
4. **First-Aid Measures** – Symptoms of exposure and treatment information
5. **Fire-Fighting Measures** – Suitable extinguishing techniques and equipment, chemical hazards from fire
6. **Accidental Release Measures** – Emergency procedures, protective equipment, methods for containment and cleanup
7. **Handling and Storage** – Precautions for handling and storage including chemical incompatibilities
8. **Exposure Controls/Personal Protection** – Exposure limits, safe engineering controls and PPE
9. **Physical & Chemical Properties** – Characteristics of the product or chemical (smell, density, pH…)
10. **Stability and Reactivity** – Chemical stability and possible hazardous reactions
11. **Toxicology Information** – Routes and effects of exposure, numerical measures of toxicity
12. **Ecological Information** – Ecotoxicity, degradability, mobility in soil
13. **Disposal Considerations** – Information on safe disposal
14. **Transportation Information** – UN number and shipping name, transport hazard class(es)
15. **Regulatory Information** – Safety, health, and environmental regulation specific to product or chemical
16. **Other Information** – Date of last SDS revision, sometimes NFPA or HMIS classification information

[1] When the SDS rule went into effect, several manufacturers rushed to get their SDS out and there is occasionally incorrect information found in them. Read the SDS carefully but if something looks strange, make sure you get more information before proceeding.

When planning to work with new chemical, start by reading SDS sections two, and seven through ten.

If something about an SDS seems strange, check section nine. Make sure the physical characteristics in the SDS match the physical characteristics of the chemical. If the color, physical state, or other characteristics are not correct, look for a different SDS or contact EH&S for assistance.

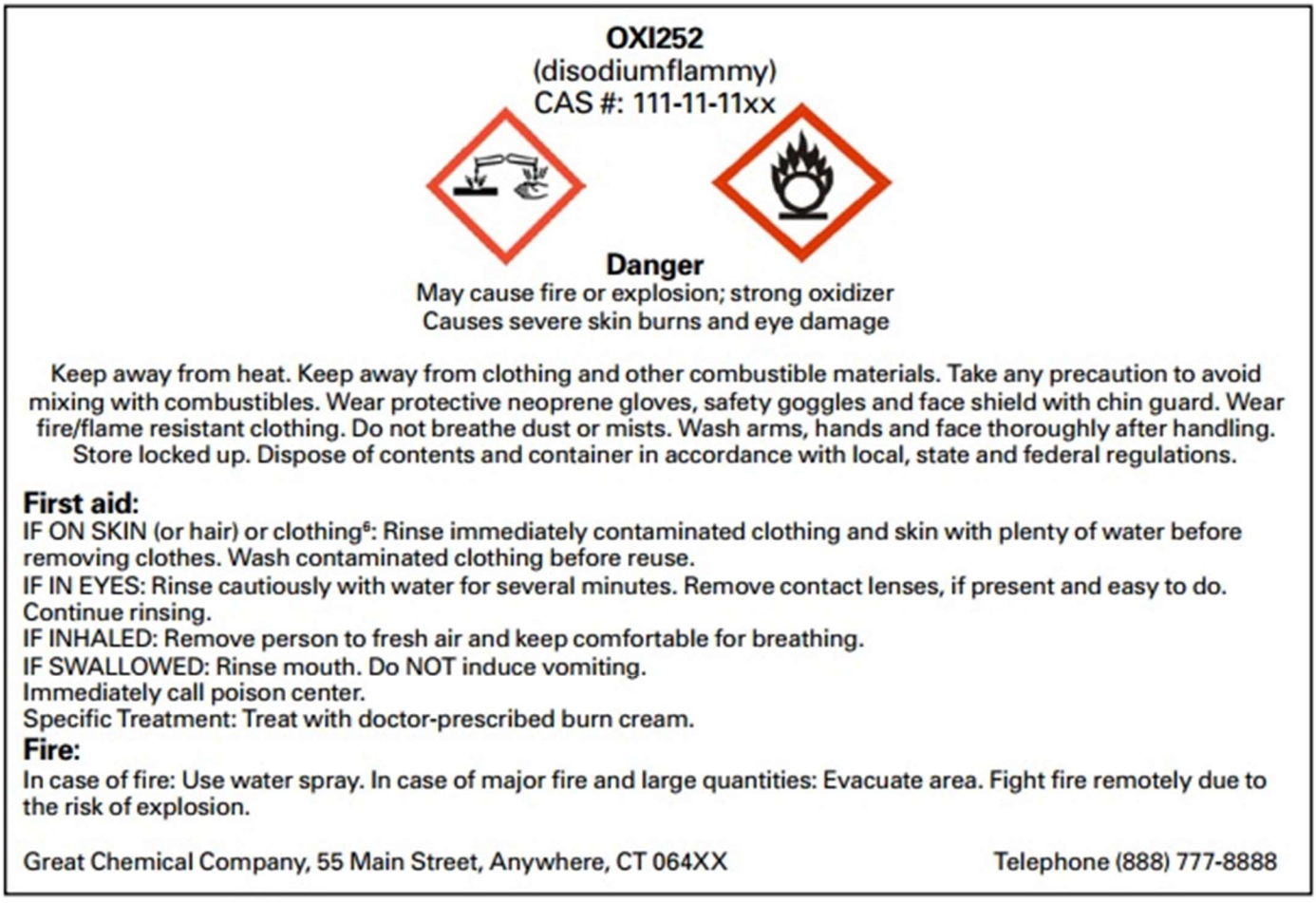
5.1.3 GHS Labels

The GHS regulations have also standardized the labeling information. The new labels on chemicals are required to provide:

- Product identifier
- Name, address, and telephone number of the manufacturer or supplier
- Signal word
- Hazard statement(s)
- Precautionary statement(s)
- Pictogram(s)

Unlike the SDS, the label information does not have to be presented in any specific order but all the required information must be present on the label.

Figure 2 Example of a GHS Chemical Label



Purchased chemicals and products arrive with appropriate labels. PIs and supervisors should inspect chemicals to ensure that labels are legible. Any label that is coming off or becoming hard to read should be replaced.

5.2 Signs and Labels

There are many signs and labels required in and around laboratories and storage areas. They are designed to ensure anyone can identify hazards that are present in the area. They help not only laboratory members, but also custodial staff, maintenance staff, visitors, and emergency responders.

5.2.1 Signs

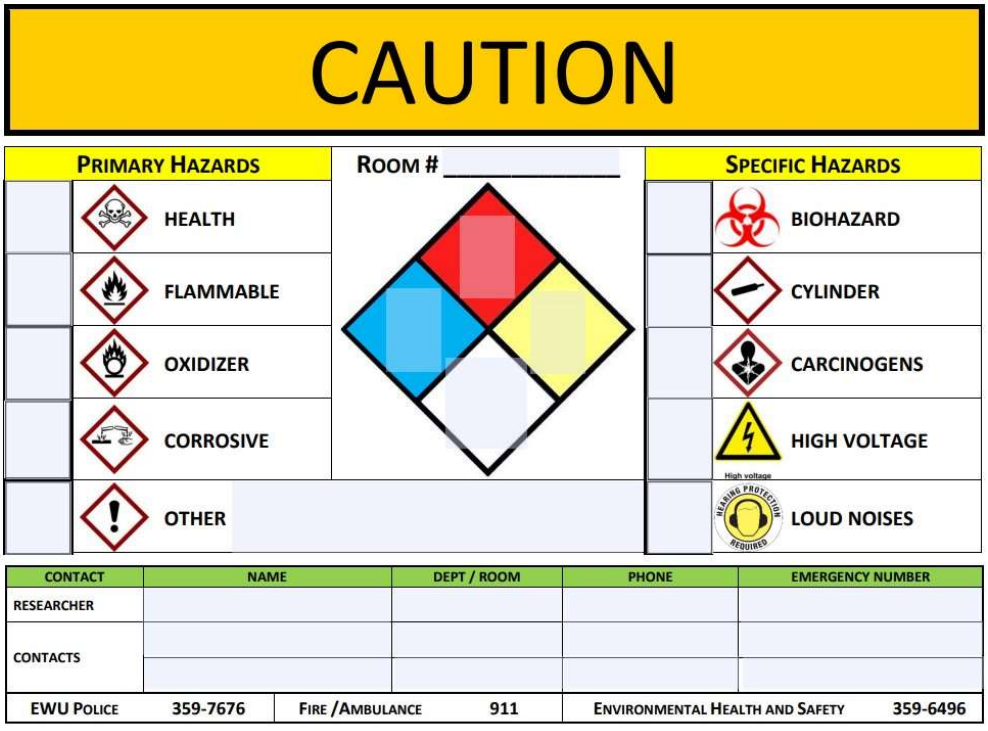
Signs are designed to alert people to hazards that they may not be aware of. There are signs that are posted outside the lab, or storage area, to warn about the hazards within, and signs that are posted within the lab, or storage area, to alert personnel to specific areas where hazards are located.

5.2.1.1 Exterior Laboratory Signs

Signs are posted outside the laboratory, or storage area, to alert people who are passing by, or entering, that there are hazards present.

Laboratories and storage areas shall post a Primary Hazards Door Sign on the exterior of the door indicating the types of hazards inside the room. The Primary Hazard Door Sign contains an NFPA diamond and checklists for hazards inside the room. It also contains the contact information for the room; the emergency number should not be added unless it is a number everyone can have access to. The sign should be reviewed annually to ensure it is accurate.

Figure 3 Hazard Door Sign



Additional warning signs are required for special hazards, these include:

- Lasers
- Radioactive materials
- High voltage equipment
- Strong magnetic fields
- Special protections required for entry (e.g. labs where hearing or eye protection is required)
- Environmental hazards (e.g. low light areas or areas where respiratory hazards are present)
- During work with highly hazardous chemicals or biohazards, signs should be posted to alert people to potential hazards.
    - These signs should be temporary, put up when work is being started and removed when work is finished.

5.2.1.2 Interior Laboratory Signs

If any students are allowed to work in the lab after hours or on weekends, the PI must post an emergency contact number. It is recommended that the emergency number be posted with the emergency call sheets, by the exit, or by the phone.

Inside the lab, or storage area, signs should be posted in areas where hazards are being stored, especially if they may be hidden from sight.

Signs should be posted:

- In areas where hazardous waste is being accumulated.
- On all cabinets containing chemicals.
    - Warning signs for hazards associated with the chemicals, such as “flammable,” “corrosive,” or “toxic,” should be placed on cabinets.
- On refrigerators, freezers, and microwaves.
    - These items must have a sign indicating if they are for food or for laboratory materials, they must be for one or the other. These items cannot be used for both food and laboratory materials.
    - Refrigerators and/or freezers for laboratory materials should be signed like cabinets, with warning information about any hazards associated with the contents.
- In areas where hazards requiring exterior signs are located (e.g. areas where radioactive materials are stored or worked with, or areas where lasers are located, need to have signs).

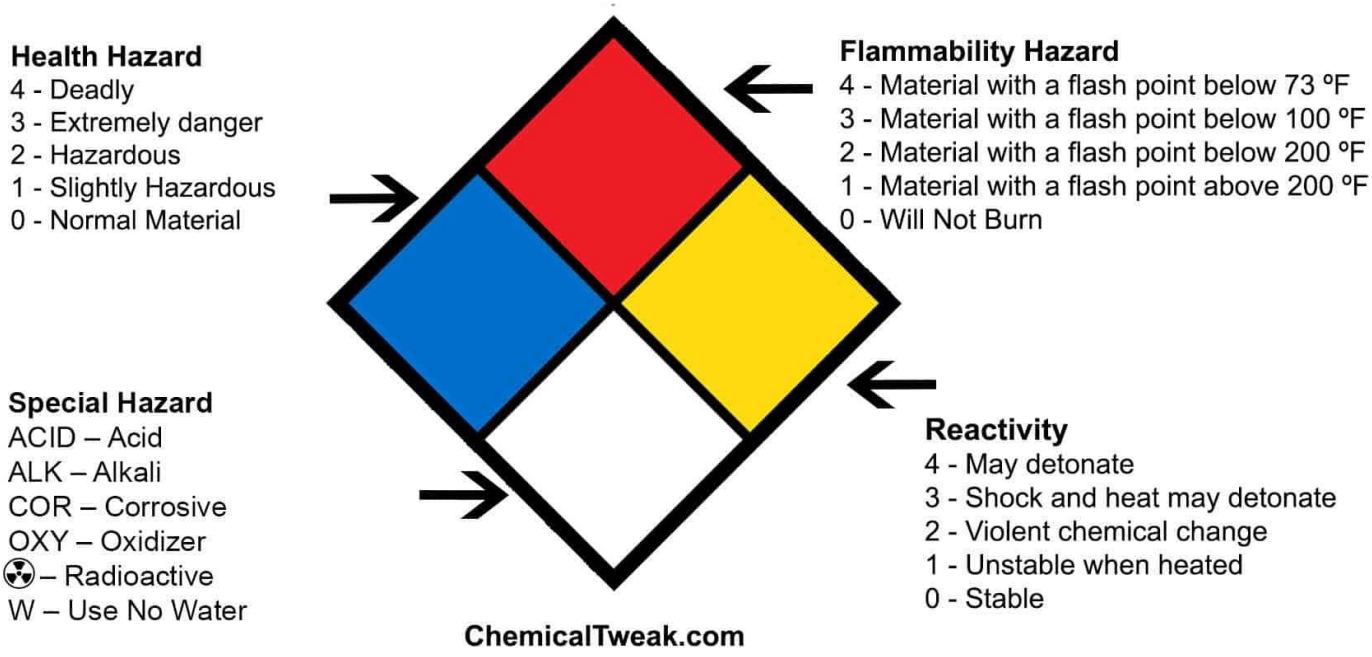
5.2.1.3 NFPA Diamonds

The National Fire Protection Agency (NFPA) designed a hazard identification diamond that is required on the exterior of buildings and rooms that contain chemicals. The NFPA diamond is made up of four smaller diamonds, each representing a different type of hazard. The four diamonds are, blue for health, red for flammability, and yellow for reactivity, and white for special hazards. The diamonds are laid out with blue on the left, red on the top, yellow on the right, and white on the bottom.

The blue, red, and yellow diamonds have a number in them from zero to four. A zero in any hazard category indicates that the hazard is not present; a four indicates that the hazard is extremely dangerous. So a NFPA diamond with a zero in blue, a 4 in red, and a zero in yellow would indicate that something very flammable is inside the room, but nothing in the room was very hazardous to health and it would not react violently. The white diamond has three symbols that can be present:

- W – water reactive chemicals
- OX – oxidizing chemicals
- SA – simple asphyxiants (compressed gases that can displace air; argon, nitrogen, xenon…)

Figure 4 The NFPA Diamond



The figure above is an example of the NFPA diamond with the various potential hazard ratings listed. Chemicals are sometimes shipped with NFPA diamonds on the label or as part of the packing material. For information about how to choose the designations for each section of the NFPA diamond, refer to the NFPA Diamonds section of the EH&S website.

5.2.2 Labeling Containers

The rules and regulations for container labeling all come down to two simple points:

1. It has to be obvious exactly what is inside a container.
2. Any hazards associated with the contents must be easily to identify.

For contents:

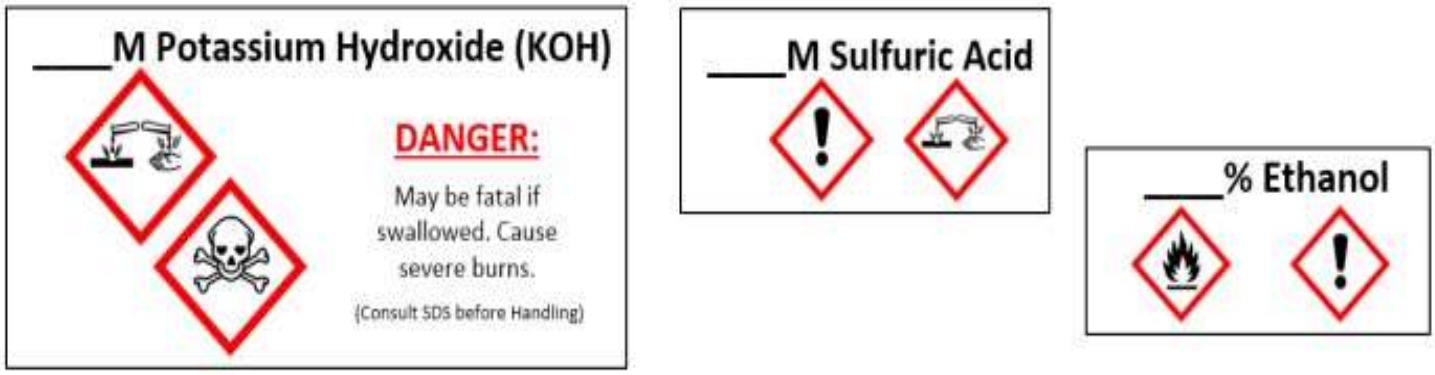
- Any chemical in a container must have its full chemical name on the label.
  - Hydrochloric acid, not HCl.
  - If six chemicals are added to a container, six chemical names need to be on the label.
  - Contents of compressed gas cylinders need to be visible without moving the cylinder.
- The amount of that chemical must be present.
  - 5g, 2M, 16%; however, you want to indicate the amount is fine, the amount just needs to be there.

- If a container is empty or contains a chemical that is not the one it originally held, the original information needs to be removed.
    - This includes any mention of the chemical name and any hazard information.

For hazard identification:

- It does not matter how big, or small, a container is, the hazard information must be present. Hazards should be presented using the GHS pictograms.
- Make sure that hazard identification stickers do not obscure the chemical name(s) or concentration(s).

Figure 5 - Examples of Chemical Labels



Most chemical solutions are indistinguishable from water, so proper labeling is important to prevent unfortunate accidents. Remember, container labeling would have helped Johnny:

Johnny was a scientist but Johnny is no more
For what he thought was H_2O was H_2SO_4 [2]

5.2.2.1 Laboratory Experiment Unknowns

For academic laboratory experiments where unknowns are necessary, all containers must be labeled with a code that will allow the contents to be identified in the event of an emergency.

The code should be stored with the professor or laboratory instructor, AND a copy should be maintained with the department for quick reference.

5.2.2.2 Labeling Groups of Containers

In instances where a cabinet or box is full of multiple containers of the same substance (e.g. cabinets containing many specimen samples) the exterior of the cabinet/box can be labeled instead of the individual containers.

The labels need to include the full chemical name(s), percentage(s) and hazard warnings.

[2] This is also an example of why:
- Chemicals must NEVER be stored in containers that previously held foods or drinks.
- Foods and drinks need to be stored away from laboratory reagents.

If a container is going to be removed from the labeled cabinet/box for more than a few hours, it should have a temporary label affixed to it while it is out.

5.3 Chemical Procurement

5.3.1 Purchasing Chemicals

The Departmental Chemical Hygiene Officer must approve the purchase of all new hazardous chemicals. Prior to purchase the following must be considered:

- Proper storage, handling, and disposal procedures
- Facility requirements for safe handling of the material
- Personnel training or proficiency necessary for safe handling of the material

Before a chemical is received, the department and laboratory must have a plan for proper handling, storage and disposal of the chemical.

5.3.2 Receiving Chemicals

Incoming chemicals should be delivered to a single location so the department inventory can be updated, containers can be examined for leakage or damage, and the chemicals can be stored under appropriate conditions (desiccator, refrigerator, flammables storage cabinet, etc.…).

Safety Data Sheets (SDSs) received with shipments should have three copies made:

- One copy to be kept in the laboratory.
- One copy to be kept on file in the department.
- One copy sent to the Environmental Health & Safety office in MAR 002.[3]

Newly arrived chemicals shall be marked with the date received.

5.4 Chemical Storage

Secondary containment is a term used frequently when talking about safe chemical storage and transport. The primary container or containers are placed into a second container to ensure that all hazardous materials are contained if there is a problem with the primary container. The secondary container must be non-reactive with the chemical and large enough to hold the contents of the initial container(s) plus 10%.

Chemicals must be stored safely:

- Chemicals must always be stored off the floor.
- Secondary containment is required when chemicals are stored near a drain, or when incompatible chemicals are stored in close proximity.
- No food or beverage containers are to be used to store food.
- All chemicals shall be stored according to manufacturer recommendations.
- Whenever possible, store chemicals so that their label is visible without needing to touch the container.

[3] Once a chemical comes on campus, the university is required to keep a copy of the SDS/MSDS for 30 years after we stop using the chemical.

5.4.1 Container Reuse

There is a list of chemicals, from the Environmental Protection Agency (EPA), that are considered hazardous enough that the containers they come in must be disposed of as hazardous waste. The list can be found in ***Appendix F: EPA P-Listed Chemicals:***

Containers that held chemicals NOT found on the EPA list can be reused.

When reusing containers:

- The new contents of the container must be compatible with the original contents or the container must be triple rinsed before new contents are added.
    - When triple rinsing, the rinseate is considered hazardous waste and must be treated as such.
- When a different chemical is added to a container any information about previous contents must be completely defaced, covered over, or removed.
- Any "Empty" labels, if present, must be removed when contents are added to a container.
- Information about the new chemical(s) must be added.

5.4.1.1 Removing Old Labels

When a container is reused, any information about previous contents must be removed. Chemical names and hazards must be illegible. Inspect containers carefully when defacing, some containers have a chemical name or hazard in several places.

Figure 6 Defacing Labels

Examples of appropriately defaced labels:

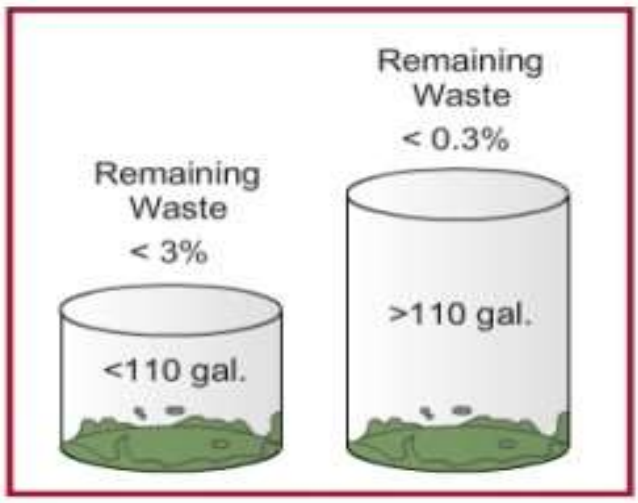
There are three options for defacing a label:

- Cover all the chemical and warning information, like in the left photo.
- Attach a new label, like in the right photo
- Remove all of the original label

Figure 7 Poorly Defaced Label

5.4.1.2 RCRA Empty Containers

The Resource Conservation and Recovery Act (RCRA) is a federal solid and hazardous waste management program. Containers that have been contaminated with hazardous waste are exempted if they are empty. There are two measures to determine if a container is ***empty:***



According to federal regulations, a container is considered empty when all wastes are removed using common practices and:

- There must be no more than 2.5 cm (1 inch) remaining in the container (>110 gal), -- or –
- Containers less than 110 gallons must have no more than 3% remaining, -- or –
- Containers over 110 gallons must have no more than 0.3% remaining in the container
- Compressed gas cylinders are considered empty when the pressure in the container approaches atmospheric pressure
- Containers holding acutely hazardous chemicals must be handled as a dangerous waste. These containers should not be cleaned or treated in any way.
    - A list of acutely hazardous chemicals is found on pages 5-10 of the Acutely Toxic Chemicals document on the EH&S website.

If a container meets the RCRA Empty standard, the "empty" container may be managed as follows:

- ✓ All indications of the contents and any associated hazards must be completely defaced, covered, or removed.
- ✓ A container of 5 gallons or smaller may be disposed in a non-hazardous landfill or recycled for scrap.
- ✓ A container larger than 5 gallons must be reclaimed for scrap value, reconditioned, remanufactured or refilled.
- ✓ Containers holding flammable aerosols must be completely discharged of contents and propellant before disposed in a non-hazardous waste landfill.

RCRA Empty containers can be stored for later reuse. When they are stored, an "Empty" or "RCRA Empty" label should be added to them. These labels are available from EH&S.

Figure 8: RCRA Empty Labels

Note: any empty container must be protected from the outside elements. If rain water or snow melt enters the container and fills the container above the 3 percent level it is no longer considered RCRA Empty. The contents will then need to be profiled and designated for disposal by EH&S at a considerable cost.

5.4.2 Incompatible Chemicals

Chemical storage shall be provided so that incompatible chemicals are separated from each other.

- Secondary containment shall be used when incompatible chemicals must be stored near each other.

Figure 8 Chemical Segregation

5.4.3 Flammable Chemicals

No more than 10 gallons of flammable liquid may be stored outside of a flammable liquid storage cabinet or flammable liquid safety cans. This quantity includes flammable chemicals and flammable waste.

- Storage of flammable materials in refrigerators is not allowed unless the refrigerator is specially designed, wired, and labeled as being safe for flammable material storage.
- Storage cabinets and cans shall bear approved labels from UL (Underwriters Laboratories) or FM (Factory Mutual).

All flammable and combustible liquids that are not in use shall be stored in an approved storage cabinet, flameproof refrigerator/freezer, or storage room.

- Special storage facilities must be provided for materials having uniquely hazardous properties such as:
  - Temperature-sensitive
  - Water-reactive
  - Explosive

5.5 Spill Prevention

Appropriate spill control, containment, and cleanup is essential to reducing the hazards when working with chemicals. Ideally, spill prevention procedures in place will prevent spills from occurring.

The following practices shall be employed to reduce the likelihood of chemical spills:

- Workspace
  - Reagent preparation areas and work areas must be maintained in an organized and uncluttered fashion.
  - Reagent bottles must have their lids tightly secured when not in use, and reagent flasks must be stoppered.
  - All chemicals and reagents not immediately in use should be returned to their storage locations.
- Chemical Storage
  - Cabinets, refrigerators, and other areas where chemicals are stored, must be kept organized and uncluttered.
  - Extremely toxic or otherwise dangerous chemicals should be kept in secondary containers to minimize the effects of a spill.
  - Infrequently used chemicals should be stored in centralized storage areas; keep only frequently used materials inside the lab/shop/studio.
  - Chemicals must not be stored on the floor.
  - Fume hoods shall not be used for permanent chemical storage, and shall be kept in an organized and uncluttered condition.
- Transport of Chemicals
  - Chemicals being carried by hand shall be placed in secondary containment to protect against breakage and spills.
  - Caustic, corrosive, and toxic chemicals shall always be transported in containment buckets. o
  - Carts with side rails shall be employed when transporting bulky or numerous chemical items.
  - Chemical transport between rooms should be restricted to periods during the day when hallway traffic is minimal; do not transport chemicals during class breaks.
  - Compressed gas cylinders shall be transported in a suitable handcart and shall be strapped in place during transport.

- Entrances/exits and walkways must be kept clear at all times. Information about what to do in the event of a spill is located in ***Emergencies Section 9.2 Spills***.

5.6 Special Considerations

5.6.1 Gas Cylinders

Gas cylinders present several unique safety concerns that must be addressed when they are used

If the cylinder leaks, even non-hazardous chemicals may become dangerous as they can displace the oxygen in the air and cause asphyxiation. Always inspect hoses and valves before using a cylinder to make sure that no gas will be able to leak out. Make sure cylinders are tightly closed when finished using them.

Gas cylinders have a lot of potential energy from the compressed gases stored inside them. If a cylinder is damaged it can become a rocket. Damaged cylinders have shot through cinderblock walls and launched themselves through roofs. To ensure everyone's safety, gas cylinders must be secured during storage, transport, and use

Gas cylinders are usually heavy. If they fall over, they can break toes or equipment. People trying to catch a tipping cylinder may strain muscles in their arms, shoulders, and/or back. When moving a gas cylinder, steel toed shoes should be worn to protect the feet

For storage and use:

- Gas cylinders must be stored upright and secured to a wall or lab bench
- Cylinders over 26" must be secured with at least one, and preferably two, chains or straps.
    - One chain/strap at 2/3 the height of the cylinder.
    - If two chains/straps are used the second will be at 1/3 the height of the cylinder
- Cylinders under 26" must be secured with one chain or strap at 2/3 the height of the container.
- No more than two cylinders can be secured using the same chain(s) or strap(s).
- Cylinders must have their valves closed and valve caps in place when not in use.
- Cylinders should be stored in well-ventilated areas and away from heat sources.
- The contents of the cylinder must be visible, if the cylinder is stored so that the label is not visible contact EH&S to obtain magnetic cylinder labels.

During transport, cylinders must be chained into a cylinder handcart. They should be transported when the hallways are not being heavily used. Upon arrival at their destination, cylinders must be immediately transferred from the handcart to an appropriately secured location.

5.6.2 Peroxidizable Chemicals

Some chemicals can form potentially explosive peroxides upon exposure to air. When formed, the peroxides are sensitive to thermal or mechanical shock and can be violently explosive when concentrated. Before purchasing any peroxidizable chemicals, SOPs must be in place for their safe storage and use

Peroxidizable chemicals pose some special storage considerations. Two important points to remember are:

- They should be stored away from heat, light, and ignition sources and protected from physical damage.
- They have a limited shelf life because of their reactivity.
    - Check the SDS and manufacturer recommendations for how long the chemical can be safely stored.
    - Date the container when it is opened to ensure shelf life is not exceeded.

6. Methods to Reduce Chemical Exposure

The most effective way to reduce chemical risk is to reduce the potential for exposure to harmful chemicals. Measures will be enacted to reduce the number of people who are exposed to hazardous chemicals and to reduce the quantity of hazardous chemicals stored in any space. These measures will include

6.1 Access Restriction

- Chemical storeroom access is restricted to authorized personnel only.
- Rooms containing hazardous chemicals shall be locked at all times and remain closed unless an authorized person is present.
- The volume of hazardous chemicals maintained outside a chemical storeroom shall be as low as possible while allowing for continued work

6.2 Engineering Controls.

- Whenever possible, work with hazardous chemicals shall be carried out in a fume hood.
- Fume hoods will be inspected annually to ensure they are operating according to manufacturer recommendations.
- Shields are needed when there is a possibility of violent reactions or explosions.

6.3 Administrative Controls

- Employees and students needing access to chemical supplies shall receive safety training before becoming authorized personnel.
- Employees and students shall not be allowed in research labs until the PI or supervisor has authorized them and shall not work in research labs until they receive laboratory specific safety training.
- SOPs and housekeeping outlined in this document, and presented in safety trainings, shall be followed at all times in the laboratory.

6.4 Personal Protective Equipment

- Appropriate PPE, as identified by the PI or supervisor, shall be worn while working in the laboratory.

7. Hazardous Chemical Waste

This section does not apply to asbestos waste, radioactive waste, or infectious/biological waste. For information on these waste types contact EH&S or consult the EH&S website.

Washington State Law defines hazardous waste as any solid, liquid, or contained gas material which is no longer useful, and which may cause injury to humans or the environment if released in an uncontrolled manner. A material is determined to be hazardous, according to the regulations, either by the specific chemical(s) present, or by physical characteristics and other criteria as defined by state and federal regulations. Mixtures of chemicals may or may not be hazardous, depending on concentrations.

EWU is required to dispose of all waste in accordance with: the Solid Waste Disposal Act, the Resource Conservation and Recovery Act (RCRA), the Environmental Protection Agency (EPA) federal regulations, and the Washington Administrative Codes (WACs) 296-843 (Hazardous Waste Operations) and 173-303 (Dangerous Waste Regulations). EH&S provides a required annual training for hazardous waste generators. This training is to ensure everyone who generates hazardous waste knows how to operate within these laws.

Important points to remember:

1. All waste must be labeled with contents and hazards
2. Waste must be appropriately containerized and segregated
3. Waste containers should never be filled to the top. Stop adding to the container when it is 90% full.
4. If volume limits[4] are reached:
    - All waste[5] in your laboratory will have to be removed within three days and transported to the 90-day Storage Facility.
    - The waste has 90 days to be removed from campus.

NOTE: NO CHEMICAL MIXTURES MAY BE POURED DOWN THE SINK, PLACED INTO THE GENERAL TRASH, OR OTHERWISE DISCARDED WITHOUT PRIOR EH&S APPROVAL.

7.1 Unlabeled Containers

If unlabeled containers of chemicals or solutions are found:

- Place them in a basin or other suitable container with the label "Contents Unknown."
- Indicate where the container(s) were found.
- Contact EH&S for a pickup.
- Notify the department's Chemical Hygiene Officer.

Analysis of unknown chemicals can be very expensive; always label your containers.

7.2 Hazardous Waste Labels

The generator of the waste is legally responsible for proper labeling of all waste containers. Every effort must be made, by the waste generator, to provide an accurate description of all chemical constituents within a waste container. EH&S may refuse to collect waste that is improperly labeled.

Hazardous waste labels are required to contain the follow information:

- The words "hazardous waste" or "dangerous waste"
- The components in the waste
    - Full chemical names for each chemical inside the waste
    - Amount of each chemical listed, preferably in percent
- Hazards associated with the waste

EH&S has waste label stickers available. Email EH&S at envhea@ewu.edu to request labels.

[4] See Section 7.3 Hazardous Waste Accumulation for volume limit information.
[5] In order to keep waste containers in the lab, request waste pickups more frequently so neither volume limit is reached.

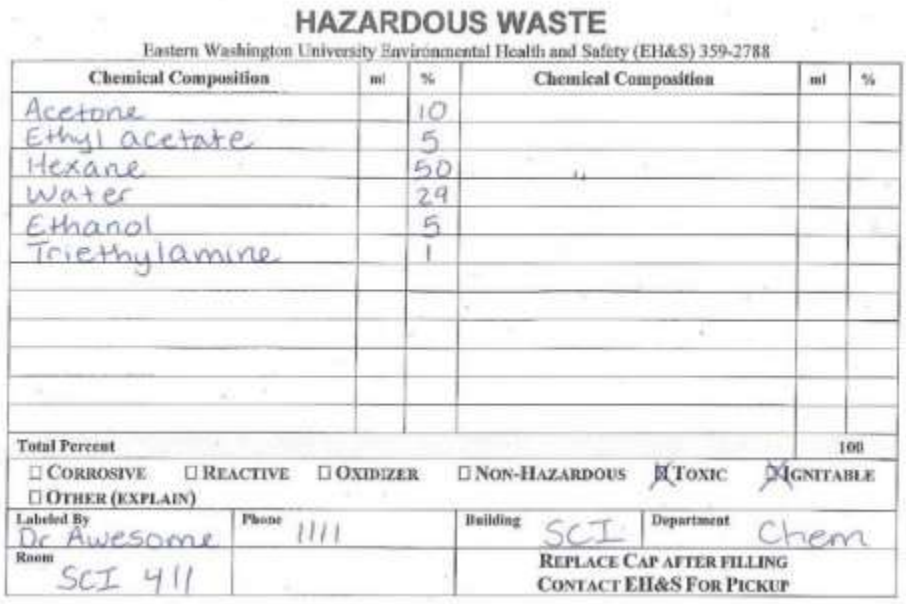
Figure 9 Waste Label Examples

HAZARDOUS WASTE
Eastern Washington University
Environmental Health and Safety (EH&S) 509-359-2788

Chemical Composition	ml	%
isopropyl alcohol		70%
glycerol		15%
Water		10%
Trace Fat / Phenol		5%
	Total	100

CORROSIVE REACTIVE NON-HAZARDOUS
✓ TOXIC ✓ IGNITABLE OXIDIZER
_ OTHER (EXPLAIN)

Labeled By Awesome
Department BIOLOGY Phone 1111
Building SCIENCE Room 411
REPLACE CAP AFTER FILLING | CALL EH&S FOR PICKUP



HAZARDOUS WASTE
Eastern Washington University Environmental Health and Safety (EH&S) 359-2788

Chemical Composition	ml	%	Chemical Composition	ml	%
Acetone		10			
Ethyl acetate		5			
Hexane		50			
Water		29			
Ethanol		5			
Triethylamine		1			
Total Percent					100

☐ CORROSIVE ☐ REACTIVE ☐ OXIDIZER ☐ NON-HAZARDOUS ☒ TOXIC ☒ IGNITABLE
☐ OTHER (EXPLAIN)

Labeled By Dr Awesome | Phone 1111 | Building SCI | Department Chem
Room SCI 411
REPLACE CAP AFTER FILLING
CONTACT EH&S FOR PICKUP

7.3 Hazardous Waste Accumulation

State and federal regulations set limits on the amount of waste that can be accumulated, and the length of time that waste is allowed to remain on Eastern's campus.

The laboratory limits are:

- 55 gallons of waste.
- 1 quart of Extremely Hazardous Waste (as defined by Washington State).
- No more than one container per waste stream

When either of these limits is reached, you must contact EH&S for waste removal and **all waste** in your lab must be removed. To maintain unfilled waste containers, request waste pick-up for individual containers frequently so that the laboratory limits are never reached.

7.3.1 Extremely Hazardous Waste

Washington State has two criteria for waste that may be Extremely Hazardous Waste (EHW). EHW is designated either from the toxic criteria or from the persistent criteria. Waste that is designated as EHW can only be accumulated up to one quart.

Remember: PIs and supervisors are ultimately responsible for making sure waste regulations are followed in their labs. If you need assistance determining if your waste classifies as extremely hazardous, contact EH&S.

7.3.1.1 Toxic Criteria

For the toxic criteria, all constituents of a waste are given a Toxic Category (X or A through D) and the percentages for each category are run through a formula that gives the waste an Equivalent Concentration (EC) value. ECs above 1% are considered EHW.

LC50s and LD50s are determined using SDS/MSDS for the chemical components as well as available data from resources such as the Registry for Toxic Effects of Chemical Substances (RTECS), Hazardous Substances Data Bank (HSDB), and Ecotoxicology database (ECOTOX). Toxic Categories are then determined using the Toxic Category Table below. For chemical components that have multiple values for one category (such as multiple Oral Rat LD50s), or values for multiple categories (such as a Fish LC50 and an Oral Rat LD50), the most toxic result is used for the toxic category determination.

If available resources have no toxicological data for a component, that component can be ignored from the EC calculation

Toxic Category Table

Toxic Category	Fish LC_{50} (mg/L)	Oral (Rat) LD_{50} (mg/kg)	Inhalation (Rat) LC_{50} (mg/L)	Dermal (Rabbit) LD_{50} (mg/kg)
X	<0.01	<0.5	<0.02	<2
A	0.01 - <0.1	0.5 - <5	0.02 - <0.2	2 - <20
B	0.1 - <1	5 - <50	0.2 - <2	20 - <200
C	1 - <10	50 - <500	2 - <20	200 - <2000
D	10 - 100	500-5000	20 - 200	2000 - 20000

Equivalent Concentration formula

The Equivalent Concentration (EC in %) =

$$\frac{\Sigma X\%}{1} + \frac{\Sigma A\%}{10} + \frac{\Sigma B\%}{100} + \frac{\Sigma C\%}{1000} + \frac{\Sigma D\%}{10000}$$

As an example: if a waste contains 20% Ethanol, 5% Hydrochloric Acid, and 75% water EC determination is as follows:

Ethanol's toxic information includes: Fish LC50 of 11200 mg/L, Oral Rat LD50 of 7060 mg/kg, Inhalation Rat LC50 of 38 mg/L and Dermal Rabbit LD50 of 15800 mg/kg. The Inhalation Rat LC50 of 38 mg/L puts Ethanol' into the "D" Toxic Category, the other toxicities are all over the regulated limits. Ethanol receives the most stringent toxic category based on the available information and is put into the "D" category.

Hydrochloric Acid's toxic information includes: Fish LC50 of 282 mg/L, Oral Rat LD50 of 238 mg/kg, Inhalation Rat LC50 of 1.68 mg/L and Dermal Rabbit LD50 of 5010 mg/kg. The Fish value is over the regulated limit, the Oral Rat value would be a "C" toxic category, the Inhalation Rat value is a "B" toxic category, and the Dermal Rabbit value is a "D" toxic category. Hydrochloric acid receives the most stringent toxic category based on the available information and is put into the "B" category.

Using the formula the EC for this waste is the sum of the B percentage divided by 100 plus the sum of the D percentage divided by 10000. So the EC = (5/100) + (20/10000) = 0.051%. This waste does not designate as Extremely Hazardous because the EC is less than 1%. This waste does designate as hazardous and will still need to be disposed of as such, but more than 1 quart may be accumulated.

7.3.1.2 Persistent Criteria

Persistent constituents are chemical compounds which are either halogenated organic compounds (HOC) or polycyclic aromatic hydrocarbons (PAH) as defined under WAC 173-303-040 (chemicals and definitions in section ***7.3.1.3 Extremely Hazardous Waste Chemicals***).

When a waste contains one or more HOC or PAH the percentages for the type (either HOC or PAH) are summed to determine the waste's final concentration of that compound type.

For both HOC or PAH, final concentrations over 1% are considered EHW and are subject to the one quart restriction.

7.3.1.3 Extremely Hazardous Waste Chemicals

The following tables have chemicals that have a toxic category of "X", are HOCs or PAHs. The list for toxic category "X" is not exhaustive. If these chemicals are present in your waste and the total concentration is 1% or more, your waste will designate as EHW and you must not have more than 1 quart.

Chemicals with "X" designations	
CAS Number	**Chemical Name**
7440-43-9	Cadmium
7440-22-4	Silver
128-04-1	Sodium dimethyldithiocarbamate (DMDK)
1313-84-4	sodium sulfide, nonahydrate

Halogenated organic compounds (HOC)

Any chemical with one or more fluorine, chlorine, bromine, or iodine atoms bonded directly to a carbon atom.

Polycyclic Aromatic Hydrocarbons (PAH)			
CAS Number	**Chemical Name**	**CAS Number**	**Chemical Name**
83-32-9	Acenaphthene	192-65-4	diBenzo(a,e)pyrene
208-96-8	Acenaphthylene	189-64-0	diBenzo(a,h)pyrene
120-12-7	Anthracene	189-55-9	diBenzo(a,i)pyrene
56-55-3	Benzo(a)anthracene	224-42-0	diBenzo(a,j)acridene
50-32-8	Benzo(a)pyrene	191-30-0	diBenzo(a,l)pyrene
205-99-2	Benzo(b)fluoranthene	206-44-0	Fluoranthene
191-24-2	Benzo(g,h,i)perylene	86-73-7	Fluorene
207-08-9	Benzo(k)fluoranthene	193-39-5	Indeno(1,2,3-c,d)pyrene
218-01-9	Chrysene	85-01-8	Phenanthrene
53-70-3	diBenz(a,h)anthracene	129-00-0	Pyrene

The following table has chemicals that have a toxic category of "A". This list is not exhaustive. If these chemicals are present in your waste and the total concentration is 10% or more, your waste will designate as EHW and you must not have more than 1 quart.

Chemicals with "A" designations			
CAS Number	**Chemical Name**	**CAS Number**	**Chemical Name**
110-80-5	2-Ethoxyethanol	55406-53-6	Iodopropynyl butylcarbamate (IPBC)
26530-20-1	2-Octyl-4-isothiazolin-3-one	4098-71-9	Isophorone diisocyanate
101-68-8	4,4'-Diphenylmethane diisocyanate	7439-97-6	Mercury
7783-20-2	Ammonium sulfate	7487-94-7	Mercury(II) Chloride
584-84-9	Benzene, 2,4-diisocyanato-1-methyl-	2155-70-6	Methacryloxytri-n-butyltin
65-85-0	Benzoic Acid	7440-02-0	Nickel
80-05-7	Bisphenol A	7697-37-2	Nitric acid
141-32-2	Butyl Acrylate	87-86-5	Pentachlorophenol (PCP)
64743-05-1	Coke (petroleum), calcined	131-52-2	Pentachlorophenol sodium salt
64741-79-3	Coke (petroleum), green	79-94-7	Tetrabromobisphenol A
7440-50-8	Copper	7664-38-2	Phosphoric acid
7758-98-7	Copper (II) Sulfate	7723-14-0	Phosphorus
5538-94-3	Dioctyl dimethyl ammonium chloride	151-50-8	Potassium Cyanide
1239-45-8	Ethidium Bromide	26628-22-8	Sodium azide
822-06-0	Hexamethylene Diisocyanate (HDI)	7632-00-0	Sodium Nitrate
123-31-9	Hydroquinone	87-90-1	Trichloroisocyanuric acid
27668-52-6	Dimethyloctadecyl[3-(trimethoxysilyl)propyl]ammonium chloride		

7.4 Hazardous Waste Storage

Hazardous waste must be handled and segregated in the same ways that general chemicals are.

- Incompatible materials must not be stored together (e.g., acidic waste must be separated from basic waste).
- Store all waste containers away from heat sources, open flames, and active workstations.
- Secondary containment is required when waste is stored near drains or when incompatible chemical wastes must be stored close together.
- All containers must be under the control of the PI or laboratory manager.
- All containers must be securely closed when not being filled, funnels must not be left in containers unless they screw on and have a latching lid.
- When not in use, such as filling during a lab, the containers must be secured in a locked room.
- Waste should be stored near the area where it is generated.

7.4.1 Satellite Accumulation Areas

Locations that generate and temporarily store hazardous waste are defined as Satellite Accumulation Areas (SAAs). There are several legal requirements for SAAs that must be followed by waste generators (or waste managers for class related wastes).

- Signs should be present indicating the location of a SAA within a room.
- Waste in SAAs must be appropriately labeled and stored.
- SAAs must be inspected at least every 7 days by the waste generator or manager.
    - All waste containers must be checked to ensure they are in good condition, closed, and labeled.
    - The area(s) where waste is stored must be inspected for evidence of leaks or spills.
    - The inspection date must be recorded on the record log along with the initials of the inspector.

7.4.2 Containers

All hazardous waste containers must be in good shape and compatible with the type of chemical waste.

- For example, hydrofluoric acid will etch glass and metal so the acid, and any waste containing it, should be stored in plastic containers.

No food or drink containers shall be used to store hazardous waste.

Chemical product containers can be used for waste storage provided they are used for the same product or they have been properly cleaned to accommodate the new waste product.

- If containers are not properly cleaned, a reaction can occur between the added waste and the residual chemical product.

Containers must be triple rinsed before reuse.

- The rinseate is considered hazardous waste and must be containerized, properly labeled, and disposed of through EH&S.

Waste containers must be properly labeled, refer to Section ***7.2 Hazardous Waste Labels***.

7.5 Waste Mixing

Different waste streams should not be mixed in the same containers.

Incompatible materials should not be mixed together:

- Acids must not be mixed with bases.
- Corrosives must not be mixed with flammables.
- Reactive wastes should not be mixed with anything.
- Avoid pouring a weaker corrosive into a concentrated corrosive liquid, even if they are the same chemical waste.

If waste is improperly mixed and there is a reaction:

- Move away from the container.
- Evacuate and cordon off the area.
- Contact EH&S.

All efforts will be made to determine the final hazard(s) of the reacted chemical.

- PIs and/or supervisors must know the chemicals that are being wasted in their lab and therefore should be able to identify the sort of reaction that is happening.
- Depending on the reaction, it could take some time before anyone can safely approach the container.

Once the reaction is complete, the container will be removed for disposal, if it is safe to do so. If the container explodes, a contractor may need to be brought in to handle cleanup.

7.6 Recyclable Waste

There are several chemical wastes that can be recycled.

Recyclable wastes must still be labeled as hazardous waste until they are shipped to the recycler.

Examples of recyclable waste include:

- Mercury
- Amalgam capsules and clean amalgam
- Photographic fixer

If you have unwanted, unused chemicals contact EH&S before labeling as waste

EH&S will attempt to find a lab or shop who can use the chemical. If unsuccessful, EH&S will designate the chemical as waste at that time.

8. Employee Training

All persons working in laboratories shall receive training prior to beginning work. At a minimum, training shall cover:

- Laboratory specific and general hazards
- Use of PPE
- Safety procedures, including general laboratory safety and SOPs
- How to read a SDS/MSDS and where they are located in the laboratory
- Emergency procedures, and the locations of emergency equipment
- Incident reporting

Trainings shall be documented with the date, the names of the trainer and trainee(s), and brief description of subject covered.

Copies of training records shall be sent annually to EH&S. According to the State Record Retention Schedule, all training records must be maintained for at least three years after the training. However, in the event of an investigation from the Department of Labor and Industries or the Department of Ecology, all training records will be requested so it is advised to maintain training records for the duration of employment or enrollment. EH&S will retain training records for the duration of employment/enrollment plus three years.

8.1 Hazardous Waste Training

All persons who generate hazardous waste are required to take annual Hazardous Waste Management training. Training will be offered to departments and PIs through EH&S. PIs can decide if they want their students to receive training from EH&S or if they will train their students.

At a minimum, training shall cover:

- How to label hazardous waste
- How to store hazardous waste
- Any issues with hazardous waste management discovered by laboratory inspections
- Updates to hazardous waste regulations and/or procedures

9. Emergencies

In the event of any emergency, it is important to remember not to endanger yourself trying to help others. If you can safely help others, do so, if not, move to a safe location and **call 911**.

If the fire alarm sounds:

- Shut off all open flames.
- Close the fume hood sash all the way. (If left open the hood will draw smoke into the lab).
- Evacuate using the nearest exit.

Don't take chances with your life. **NEVER ASSUME THE FIRE ALARM IS A DRILL.**

Anytime a laboratory emergency occurs it is important to inform the laboratory CHO, departmental CHO, and EH&S. Incident reports should be submitted as soon as possible after a laboratory emergency. Incident reports must be submitted for all incidents in the laboratory, even small things like chemical spills that can easily be cleaned by laboratory personnel should be recorded on an incident report. More detailed information regarding incident reports can be found in ***Appendix G: Incident Reports.***

9.1 Fires

DO NOT attempt to fight any fire involving hazardous materials. If such a fire occurs, immediately exit the building and **call 911**.

DO NOT attempt to operate a fire extinguisher unless you have been trained and know that the type of extinguisher is appropriate for the material(s) on fire.

Fire extinguishers shall be used only if:

- You know what is burning.
- There is a fire extinguisher very close to the fire appropriate for the burning substance.
    - Never leave a room to retrieve an extinguisher from somewhere else, by the time you get back the fire will likely be too big to fight.
- The fire is small.
- Building evacuation has been started and emergency services have been called.
- There is a safe evacuation route if the fire does not extinguish completely.

If there are any questions about your safety, do not attempt to fight the fire.

9.1.1 Building Fires

If you see smoke or a fire:

1. Evacuate your area and shut the door behind you.
    a. If you have time; turn off open flames and completely close the sash on the fume hood.
2. Pull the nearest emergency fire alarm.
3. Evacuate the building, warn everyone on your way out.
4. **Call 911** and provide information to the dispatcher.
5. Proceed to a safe evacuation area away from the building.

9.1.2 Clothing Fires

Clothing fires can be especially dangerous because often the first response is to run. This response does not put out the fire and results in painful, often fatal, burn injuries.

If your clothing (or someone else's) catches on fire:

- Immediately STOP, DROP, and ROLL!
    - If someone else is on fire, instruct them to drop to the ground and roll back and forth.
- If you are not wearing gloves, cover your face with your hands.
- Use a fire blanket, only if immediately available, to help smother the flames.
- Use an emergency shower, only if immediately available, to douse the flames.
- **Call 911**.

9.2 Spills

Remember, personal safety is the priority in any situation. If there are any questions regarding proper cleanup for the chemical or the spill situation, contact EH&S at 359-6496. After hours, contact EH&S manager Chad Johnson at (509) 359-5768; if no response, call 911.

In the event of a chemical spill:

- Alert people in the area that a spill has occurred.
- Isolate the area around the spill.
- Obtain a copy of the SDS/MSDS for the chemical(s) involved.

9.2.1 Spills involving injuries

If anyone is injured during a chemical spill:

- Refer to Section ***9.3.1 Chemical Exposure*** for initial emergency response.
- Call 911.
- Evacuate the spill area and secure it to make sure no one enters the area.
- DO NOT attempt to clean any spill that involves an injury.

9.2.2 Spills without injury

For spills that do not involve an injured person:

- If the windows are capable of opening AND you can reach them without exposing yourself to fumes, open the windows to ventilate the area.
- Follow spill procedures listed below.

9.2.2.1 Spill Evaluation

If no one is injured, evaluate the spill to determine if evacuation or additional assistance is needed.

Determine the answers to the questions below:

- □ Have personnel been trained for spill cleanup?
- □ Is the spilled material known?
- □ Is the chemical a low hazard? Check the SDS.
  - □ Not flammable, or explosive?
  - □ Not reactive with water or air?
  - □ Does not produce toxic vapors or dust?
  - □ Not highly corrosive?
- □ Is the volume of the spilled material less than one gallon?
  - □ For any amount of highly reactive or toxic material contact EH&S for assistance.
- □ Is the spill easily contained?
  - □ If the spill is spreading and can come into contact with materials (like incompatible chemicals or ignition sources) that would increase the hazards in the situation, evacuate the area and call for help.
- □ Are appropriate PPE and spill cleanup materials available?

If the answer to the questions above are all "yes" proceed with Section **9.2.3 Spill Cleanup Procedure**, otherwise contact EH&S or **911** for help:

Do not attempt to clean up a spill if you have any doubts about your ability or safety.

If working alone when a small spill occurs:

- Notify laboratory emergency contact that a spill has happened and cleanup will be attempted.
- Attempt spill cleanup.
- Contact person to let them know cleanup was successful, or that assistance is required.

9.2.2.2 Spills That Require Special Handling

A. Acid Chlorides

- Use Oil-Dri, Zorb-all, dry sand, etc.
- Avoid water and sodium bicarbonate

B. Alkali Metals

- Smother in dry sand
- Collect materials and place them in a fume hood until they can be collected for disposal

C. Hydrofluoric Acid

Hydrofluoric acid (HF) requires a special spill kit because of its unique hazards. Do not attempt to clean hydrofluoric acid spills with a regular chemical spill kit.

Some information about response to hydrofluoric acid spills is included here but the complete standard operating procedure for working with hydrofluoric acid is in Appendix E: ***SOP for Hydrofluoric Acid.***

- Use calcium carbonate, or calcium hydroxide to neutralize.
- Do NOT use vermiculite or silica-based absorbents

D. Mercury

Mercury spills require special spill kits. Do not attempt to clean mercury spills with a regular chemical spill kit.

The following precautions shall be taken if a small (amount of mercury in a thermometer) mercury spill occurs:

- Evacuate the area of people not involved in cleanup.
- Have anyone leaving remove any contaminated shoes and clothes.
    - If clothes or shoes are contaminated place them in a sealed plastic bag and contact EH&S for proper disposal.
- Do NOT use a vacuum cleaner. It will spread the mercury vapors and tiny droplets will spread throughout the area, increasing the spread of contamination and the chance of exposure.
- Windows and doors in the area should be opened to increase ventilation.
- Small amounts of mercury can be collected with adhesive tape or an eye dropper and stored in a sealed plastic container until disposal.
- After all visible mercury has been collected, use a mercury cleanup kit to clean the spill area.
    - Work amalgamation powder into cracks with a broom or brush.
    - Do not add water. o Sweep up powder with broom and dustpan.
    - Wash the area with trisodium phosphate detergent solution and rinse with water.\
- Contaminated carpet must be removed and discarded.
- All contaminated materials and any collected mercury must be discarded as hazardous waste.
    - Place items in a sealable container and label appropriately.
- Contact EH&S to remove waste.

Call EH&S for large mercury spills.

E. Organic Peroxides

Organic peroxide spills should be cleaned immediately to avoid the risks of chemical reactions that could result in fire or explosion.

Be sure to consult the SDS/MSDS for the specific compound to make sure any safety issues are addressed.

1. Spread an inert absorbent material (e.g. sodium bicarbonate, or sand) directly on the spill.
2. Wet the spill mixture with water.
3. Using non-sparking tools, sweep the mixture into a polyethylene bag
4. Add additional water to the mixture once inside the bag
5. Call for immediate disposal
    a. If the material must be stored for any length of time; place the bag in a fume hood, out of direct sunlight.
6. Wash down spill area

F. White (Yellow) Phosphorus

- Blanket with wet sand or wet absorbent

9.2.3 Spill Cleanup Procedure

1. Notify anyone nearby that a chemical has been spilled and cleanup is underway.
2. Locate spill kit.
3. Choose appropriate PPE.
    - Always wear protective gloves and goggles
    - If there is a chance of body contact, wear an apron or coveralls
    - If the spill is on the floor, wear protective boots or shoe covers
    - If there are inhalation hazards, wear a respirator.
        - If there are inhalation hazards and you haven't been fitted with a respirator, do not attempt to clean up the spill!
4. Remove ignition Sources.
    - Turn off hot plates, stirring motors, and flame sources.
    - Shut down all other equipment.
    - If unable to shut off sources of ignition, notify emergency responders.
5. Confine or contain the spill.
6. If spilled material is an acid or base, add neutralizing agent.
7. Cover with an appropriate absorbent material, such as:
    - Paper towels.
    - Vermiculite.
    - Sand.
    - Floor-Dri

8. Remove absorbent material with a broom and dustpan and place in a sealable container or appropriate waste bag.
    - If the spilled material was a volatile substance, put container/bag in fume hood for storage.
9. Dispose of PPE in same container/bag.
10. Wash hands and arms thoroughly.
11. Contact EH&S to pick up chemical waste.

9.3 Laboratory Injuries

In the event of a laboratory injury, initiate the emergency procedures listed below.

All injuries must have incident reports submitted as soon as possible, depending on the type of injury EWU may need to report to the state within 8 hours of the incident. See ***Appendix G: Incident Reports*** for more information.

Note: Hydrofluoric acid (HF) requires special precautions because of its unique hazards. Some information about response to hydrofluoric acid is included here but the complete standard operating procedure for working with hydrofluoric acid is in ***Appendix E: SOP for Hydrofluoric Acid.***

9.3.1 Chemical Exposure

There are minor chemical exposures which can be resolved with adequate hand washing or removing a lab coat, however most exposures to chemicals will be more involved. For injuries resulting from chemical exposure:

- **Make sure a copy of the SDS/MSDS is on hand to refer to during the 911 call and to send with the victim in the event they need to be transported to the hospital.** The SDS will provide information about delayed effects of chemical exposure.
- **Provide any emergency responders with information about decontamination done before they arrived** (e.g. flushing with water for 15 minutes).
- **Make sure that emergency room personnel are told exactly what the victim was exposed to so that appropriate treatment protocols can be used.**

9.3.1.1 Chemicals in the Eyes

If a chemical gets into the eyes:

1. Immediately move to an eye wash or emergency shower.
2. Flush eyes with water for at least 15 minutes.*
    - Hold eyelids open if necessary to keep water in contact with eyes.
3. **Call 911** .

*If hydrofluoric acid (HF) is splashed into the eyes: flush for 5 minutes with water, then flush the eye with a 1% solution prepared from the calcium gluconate antidote gel. Get medical attention immediately.

9.3.1.2 Chemicals on the Skin

For chemical burns or skin absorption:

1. Immediately move to the emergency shower (or sink for hand/arm exposure) and start the water.
2. Remove all contaminated clothing and shoes to prevent further contact with chemicals.
3. Flush the area with water for at least 15 minutes*.
4. **Call 911**.

*If hydrofluoric acid (HF) is spilled onto skin: flush the area for 5 minutes with water, then apply calcium gluconate gel. Get immediate medical attention. If no calcium gluconate gel is available, flush for 15 minutes with water **after** contacting **911** for immediate transport to the emergency room.

9.3.1.3 Chemical Inhalation

In the event of chemical inhalation:

1. Move the person to an area with fresh air
2. Call 911
3. If practical, eliminate the source of the problem:
   - Turn off gas lines
   - Close fume hood
   - Replace top on bottle

4. If necessary, keep others out of the affected area

9.3.1.4 Chemical Ingestion

If chemicals are ingested:

1. **Call 911** and tell the operator exactly what chemical(s) were ingested
2. Look at the SDS for information on treatment

9.3.2 Cuts

Call 911 if:

- A cut is bleeding severely
- Blood is spurting out
- Bleeding can't be stopped after 10 minutes of firm and steady pressure

For smaller cuts:

1. Apply pressure with a clean cloth or bandage, and elevate the wound, to stop the bleeding
2. Clean the wound with water and clean around the wound with water and soap
3. Apply antibiotic ointment
4. Cover the wound with a bandage
5. Get stitches for deep wounds

9.3.3 Electrical Shock

Don't touch the injured person if they are still in contact with the electrical current

- Attempt to disconnect the power if safe to do so.
  - Unplug equipment or power strips from the wall.
  - Use circuit breaker to cut power if available.
- Use a dry, non-conducting object (such as plastic, cardboard, or wood) to move the electric source away from the injured person.

Once the injured person is free of the electrical current:

- Don't move the injured person unless they are in immediate danger.
- **Call 911**.
- If person is not breathing and has no pulse, begin CPR.
- Try to prevent injured person from becoming chilled.

10. Occupational Medical Monitoring

An Occupational Medical Monitoring Program is required by law at any workplace that has job assignments that involve working in potentially hazardous conditions. It is implemented for job assignments that include work with specific chemicals, substances, or hazardous materials. An Occupational Medical Monitoring Program involves medical monitoring and testing that is generally used to determine and track the health of employees working with specific chemicals, substances, or physical hazards and to evaluate and monitor potential exposure to employees who perform work in hazardous conditions.

Employers are required to offer medical examinations and testing to identify health effects or exposures that require further follow-up. Improvements to work practices, engineering controls, or personal protective equipment may be necessary to limit exposures. The type of occupational medical monitoring depends on a number of factors including, but not limited to, the chemical, substances, or physical hazards the employee is working with, the number of days per year the employee works with or is exposed to the materials, and the types of functions performed by the employee.

Any employee who needs medical monitoring for their position will have all exams conducted by EWU's authorized Licensed Health Care Provider(s) (LHCP) at no cost to the employee. Medical examinations will be performed during working hours. Physician recommendations, based on exams, will be kept in a secure facility by EH&S.

The Programs and Procedures Document Occupational Medical Monitoring Program, available on the EH&S website contains all the information about the program.

10.1 Regulated Chemicals and Hazardous Materials

Any position that has duties which create exposure to the chemicals and materials listed below will be subject to occupational medical monitoring as required by law. In order to determine the potential for exposure to regulated chemicals and materials, the EH&S *Regulated Chemical Usage Questionnaire* will be sent to employees who may use these items in the workplace. The forms must be completed/updated every year, or anytime regulated chemicals or materials are added to a laboratory.

Initial occupational medical monitoring may be required before any work with regulated chemicals or materials begins.

10.1.1 Regulated Chemicals, Carcinogens, and Materials:

- 1,2-Dibromo-3-chloropropane (WAC 296-62-07342(14) & 07346)
- Acrylonitrile (WAC 296-62-07336(14) & 07339)
- Arsenic (WAC 296-848-30010)
- Asbestos (WAC 296-62-07725)
- Benzene (WAC 296-849-120 through 12080)
- Butadiene (WAC 296-62-07460(11))
- Cadmium (WAC 296-62-07423)
- Carcinogens (WAC 296-62-07314)
    - 2-Acetylaminofluorene
    - Alpha-Naphthylamine
    - 4-Aminodiphenyl
    - Beta-Naphthylamine Benzidine
    - Beta-Propiolactone
    - Bis-Chloromethyl ether
    - 3,3'-Dichlorobenzidine (and its salts)
    - 4-Dimethylaminoazobenzene
    - Ethyleneimine
    - Methyl chloromethyl ether
    - Methylenedianiline
    - 4,4' Methylene bis (2 - chloroaniline)
    - 4-Nitrobiphenyl
    - N-Nitrosodimethylamine
- Coke Ovens (WAC 296-62-20017)
- Cotton Dust (WAC 296-62-14533(8))
- Emergency Response, (WAC 296-824-400 through 4005)
- Ethylene Oxide (WAC 296-855-30030 and WAC 296-62-07387)
- Formaldehyde (WAC 296-856-300)
- Hazardous Waste, (WAC 296-843-210 through 21005)
- Lead (WAC 296-62-07521 occupational exposure except construction or agriculture)
- Methylene Chloride, (WAC 296-62-07470(10))
- Vinyl Chloride (WAC 296-62-07329(10))

10.1.2 Occupational Medical Monitoring Requirements for Regulated Chemicals and Materials

Occupational medical monitoring for regulated chemicals and materials involves:

- An initial medical examination
- Subsequent medical evaluations, which shall occur:
    - At least once every 12 months after initial assignment (unless the physician recommends a shorter or longer interval which may not exceed 24 months);
    - As soon as possible after an employee reports:
        - Signs or symptoms of possible overexposure to a hazardous substance or health hazard

- Injury and/or
- Exposure over the permissible exposure limits or published exposure levels

- At the termination of employment, unless employee was examined within the past six months
- When the physician determines follow-up is medically necessary

All hazardous waste workers will be required to fill out the EH&S form *Periodic Medical Questionnaire* yearly.

10.2 Respiratory Protection Program

Anyone who needs to use a respirator for his or her job will be enrolled in the Respiratory Protection Program, as required by WAC 296-842. Employees participating in the Respiratory Protection Program do so at no cost to them, EWU covers all expenses associated with the program.

This section covers only the medical portion of the Respiratory Protection Program. For full information about the contents of this program see the Procedures & Guidance Document *Respiratory Protection Program* on the *EH&S website*. Employees using respirators must be physically able to perform the work while wearing the respiratory. EWU has the responsibility of ensuring that employees are physically fit and able to tolerate the physical and psychological stress imposed by respirator use. Employees will not be allowed to wear a respirator until a physician or other licensed health care professional (PLHCP) has determined they are medically able to do so. Any employee refusing the medical evaluation cannot work in an area requiring a respirator.

10.2.1 Medical Questionnaire

Employees assigned to tasks requiring the use of respirators will be required to complete the "WISHA Respirator Medical Evaluation Questionnaire" (Ref.: WAC 296-62-07255, Appendix C). The Program Administrator will make available a copy of the questionnaire to all employees requiring medical evaluations. The medical evaluation will be administered confidentially and during working hours, at a place on-site that is convenient to employees.

Completed questionnaires are confidential and should be sealed in an envelope with the employee's name written on the outside of the envelope. They should then be forwarded to EH&S where they will be sent to the medical provider without review by management or EH&S. All records from medical evaluations, including completed questionnaires, will remain confidential between the employee and the PLCHP.

10.2.2 Medical Examination

If the medical questionnaire indicates to the medical provider that a more comprehensive medical exam is required, it will be provided at no cost to the employee. The medical provider will make a determination on whether or not the employee is medically able to wear a respirator. The medical provider will also determine when the employee needs to return for additional exams.

Medical exams will also occur when:

- The employee reports medical signs or symptoms that are related to the employee's ability to wear a respirator.
- A PLCHP, supervisor, or the respirator program administrator observes that the employee is having a medical problem during fit testing or workplace respirator use.
- Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee re-evaluation.
- A change occurs in workplace conditions that may result in a substantial increase in the physiological burden placed on an employee.

The content of additional medical evaluations will be determined by the PLCHP.

EWU will obtain a written recommendation from the PLCHP on whether or not the employee is medically able to wear a respirator. The recommendation must identify any limitations on the employee's use of the respirator, as well as the need for periodic or future medical evaluations.
The employee will receive a copy of the PLHCP's recommendations directly from the PLCHP. Information regarding diagnosis, test results, or other confidential medical information will not be disclosed to EWU by the PLHCP.

10.3 Other Medical Exams

EWU provides medical consultations and examinations to employees after exposure to any hazardous chemicals or materials. If injured or exposed to chemicals while working, tell the medical professional (or receptionist) that you are being seen for an on-the-job injury so that payment will be covered by Washington State Industrial Insurance. Notify EWU as soon as possible if injured on the job or diagnosed with an occupational disease. See Section ***9. Emergencies*** for more information about emergency procedures.

Anytime emergency medical consultations or exams are necessary, provide the physician with specific information about the identity of the chemical, conditions under which the exposure occurred, and a description of the signs and symptoms of exposure. Provide the SDS to the physician whenever possible.

If emergency medical attention is received in Washington State, ask the attending physician for a completed APF (Activity Prescription Form). If medical attention is received elsewhere, the employee should request the following documentation:

- Exams performed.
- Initial diagnosis.
- Follow-up exams and/or other medical treatments recommended.
- Recommendations for returning to work.
    - Time that should be taken off, based on observations.
    - Restrictions for workday length upon return.
    - Restrictions on activities upon return.
        - E.g. No lifting, no bending, standing less than 40 minutes, etc.
- Statement that employee was informed of results.

Appendix A: Laboratory Specific Information for Chemical Hygiene Plan

This appendix is also available on the EH&S website in a form fillable PDF.

This Laboratory Chemical Safety Manual (LCSM)/Chemical Hygiene Plan (CHP) Belongs To:

Laboratory Principle Investigator:	
Chemical Hygiene Officer*:	
Department:	
Phone:	
Date:	

*The Chemical Hygiene Officer is the Principal Investigator, Faculty Member, or Supervisor who is responsible for the Chemical Hygiene Plan in the laboratory.

This LCSM/CHP covers the following laboratory spaces: (list rooms or portions of rooms):

This LCSM/CHP was reviewed and updated:

Date	Print Name and Sign

The items listed below identify the laboratory-specific or shop-specific information for this laboratory/shop. Check marks indicate that the material is available on the following sheets or at a noted location:

✓	Laboratory-specific information cover sheet (*i.e.*, these pages)
	Hazard Identification Form
	Chemical Inventory
	Chemical Safety Manual
	Standard Operating Procedures (SOPs)
	SDSs (MSDSs), other reference materials, equipment maintenance manuals and other documents
	Special instructions for receiving and storing hazardous materials*
	Contents of chemical spill kit(s)
	Special instructions for labeling containers*
	Training records
	Building evacuation plan, departmental health and safety plan, and any other pertinent documents

*If necessary

Identify items from above list and locations for anything filed separately from this CSM/CHP:

Item	Location

Appendix B: Glove Selection

There are many different types of gloves available on the market. Different types of gloves will have different resistances to different chemical types. It is important to match the gloves to the type of chemical and hazard being used. The SDS will often give information about specific gloves, if needed for a chemical.

Nitrile gloves are the most common type found in laboratories today. They are good for many things but do not protect well against several chemicals, including:

- Acetic, Hydrofluoric, Nitric, and Sulfuric Acids
- Benzene, Toluene and Xylene
- Methylene Chloride
- Methyl Mercury
- Trichloroethylene UC Berkeley has a great Glove Selection Guide which goes through the steps for locating the proper glove. Some other useful links for glove selection are:

http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf

http://www.allsafetyproducts.com/asp-glove-selection-chart-chemical-break-through-times.html

Appendix C: Safe Glove Removal

When removing gloves, it is important to take them off slowly and carefully. The outsides of the gloves should always be considered contaminated and the insides should be considered clean.

Remove gloves so that contaminated areas only touch other contaminated areas and clean areas only touch other clean areas. Always wash hands after removing gloves. Wash with soap for 20 seconds. A demonstration video can be found here: https://www.youtube.com/watch?v=kesQF_G3pQ8. Contact supervisor or EH&S (x6496) if you need help with this.

Appendix D: Generating Standard Operating Procedures

Standard Operating Procedures (SOPs) are required for either laboratory projects involving hazardous materials or for hazardous materials on their own. SOPs are also necessary for operating potentially hazardous machinery. This document is designed to serve as a guide for researchers who want to create their own SOPs without using a template.

There are three project specific templates on the *Environmental Health & Safety (EH&S) website*; one for work with chemicals, one for work with biological materials, and one for combined projects. If you choose to generate your own SOP, a copy must be submitted to EH&S for emergency planning and response.

There are a number of commonly used SOPs available on the EH&S website. EH&S will continually update the selection of SOPs available. If there is a specific SOP that would be useful to you, please contact EH&S for assistance. There are many general SOPs available in other locations online as well. The University of Nebraska-Lincoln's Environmental Health & Safety department has a great resource page for SOPs (which they call Safe Operating Procedures).

Using general use SOPs is an easy way of ensuring the proper safety documents are on hand for laboratory procedures/materials. However, general use SOPs should be read carefully before putting them into use to make sure they adequately address the conditions present in your laboratory.

A laboratory specific SOP should address:

- □ Emergency contact information for the lab
- □ The hazardous materials and type(s) of hazard(s) they present ≤ How the hazard is being used ≤ Methods to minimize exposure to the hazard
- □ Any special equipment used to protect workers
- □ Any Personal Protective Equipment (PPE) necessary for the work
- □ Special handling procedures ≤ Any special labeling, signs or storage for materials
- □ Precautions for dealing with waste and waste disposal
- □ If special disinfecting/cleaning needs to happen, and how often
- □ Response procedures for accidents and spills
- □ If any medical monitoring is needed

An example of a general use SOP is found in ***Appendix E: SOP for Hydrofluoric Acid***.

General use SOPs do not have the laboratory specific information about emergency contacts and procedures. If you are only using general use SOPs please make a list of emergency information for your laboratory and store that information along with the SOPs.

Appendix E: SOP for Hydrofluoric Acid

Introduction

Extreme care must be used when working with hydrofluoric acid (HF). It has a number of chemical, physical, and toxicological properties, which make handling this material especially hazardous. HF is highly corrosive and a contact poison. Anhydrous HF is a clear, colorless, fuming, corrosive liquid. HF is also available in the gaseous state. All forms including the solution or the vapor can cause severe burns to tissue.

Uses

Concentrated hydrofluoric acid is used in the fabrication of electronic components, to etch glass, and in the manufacture of semiconductors. Hydrofluoric acid gel is commonly used to etch all ceramic dental restorations to improve bonding. Because of its ability to dissolve oxides, HF is useful for dissolving rock samples prior to analysis. Dilute hydrofluoric acid solutions are used in some biological staining procedures.

Chemical Properties

Hydrofluoric acid solutions are clear and colorless with a density similar to that of water. The most widely known property of HF is its ability to dissolve glass. It will also attack glazes, enamels, pottery, concrete, rubber, leather, many metals (especially cast iron) and organic compounds. Upon reaction with metals, explosive hydrogen gas may be formed. Use and store HF in polyethylene, polypropylene, Teflon, wax, lead or platinum containers.

Toxicological Properties

Fluoride ions are both acutely and chronically toxic. Acute effects of HF exposure include extreme respiratory irritation, immediate and severe eye damage and pulmonary edema. Skin, eye, or lung exposure to concentrated (>50%) HF solutions will cause immediate, severe, penetrating burns. Exposure to less concentrated solutions may have equally serious effects, but the appearance of symptoms can be delayed for up to 24 hours.

HF penetrates skin quickly and then corrodes soft tissue and bones. The fluoride ions bind to calcium in the body causing calcium deficiency. The calcium deficiency interferes with nerve function, so chemical burns may not be painful initially.

If you are exposed to hydrofluoric acid seek medical attention immediately, even if you do not feel pain.

Working with HF

Engineering Controls

- HF should be used in a fume hood with the sash as low as possible to prevent vapor escape and to provide a physical barrier.
- Local ventilation should always be used when working with HF. The ACGIH ceiling limit and OSHA TWA for HF is 3 PPM.

Work Practices

- Never work alone with HF, there must always be an additional person present with training in HF emergency procedures.
- Before beginning work ensure that access to the safety shower and emergency eyewash are not blocked and that they have been tested recently.
- A phone must be present in any lab where HF is being used.
- In order to warn and protect others from the hazard of HF, a warning sign indicating the use of HF should be posted.

- When diluting solutions ALWAYS add the acid to the water, NEVER add water to acid.
- A small amount of calcium carbonate or calcium hydroxide should be kept near the fume hood for use in the event of a HF spill.
- Containers of HF must not be left open in the fume hood, the vapors will etch the glass.

PPE

The purpose for personal protective equipment (PPE) is to shield the individual in the event of a release of vapor, a spill or other incident. PPE is not a substitute for safe work practices.

- Eye protection in the form of safety glasses or goggles and a face shield should be used.
- Stanzoil Neoprene or Stanzoil Nitrile (22mil) gloves or other HF resistant gloves should be worn.
    - Inspect gloves prior to each use.
    - Remove immediately if contact with HF occurs.
    - Use proper glove removal technique (keep bare hands away from the outer surface of the gloves).
    - Dispose of gloves as hazardous waste.
    - Wash hands thoroughly with warm water and soap immediately after glove removal.
- It is also recommended that an acid resistant suit or apron be used.
    - Some clothing is able to absorb HF and will keep it close to the skin.
- Long pants and rubber or leather closed-toe shoes should be worn.

Avoid contact with skin, eyes, and clothes. Wash hands thoroughly after handling HF and before leaving the lab.

HF Storage and Transport

- Store HF in original container or plastic bottles (polypropylene or polyethylene), NEVER IN GLASS.
- Store in a corrosive/acid storage cabinet within secondary containment (Nalgene/polypropylene tray or tub).
- Store on a shelf below eye level.
- Ensure the lid is tightly closed at all times.
- Do not store with oxides, organic chemicals, bases, or metals.
- Anytime the bottle is being moved it must be in a plastic secondary container.

HF Waste

Any waste that involves HF must be placed in a chemically compatible container that is clearly labeled with a Hydrofluoric Acid warning sign, in addition to all other required waste labels.

Gloves that come into contact with HF must be disposed of along with other HF waste and must not be placed into normal laboratory garbage.

HF Exposure Kit

Before beginning work involving HF, an exposure kit must be available and located in the laboratory area. The exposure kit must contain:

- Container of calcium gluconate gel
    - This gel must be inspected before each use of HF, or at least monthly, to ensure the gel has not been removed or reached the expiration date. If a tube of the gel has been opened, a new container must be purchased and the old container discarded. No work with HF can be done with an expired tube of calcium gluconate gel.

- Two pairs of Stanzoil Neoprene or Stanzoil Nitrile (22mil) gloves.
- Heavy-duty polyethylene bag to be used for HF contaminated items.
- "HF Contaminated Waste" label.
- Copy of these procedures and the SDS to take to the emergency room.
- Calcium Carbonate (antacid tablets).

Emergency Response Procedures

HF is very toxic and exposure can be fatal if not treated immediately. HF is absorbed quickly into the skin but damage and symptoms can occur up to days later.

Any person exposed to HF must have immediate first aid followed by immediate medical treatment.

Bring a copy of the SDS to the emergency room when going for treatment.

Anyone aiding someone who has come into contact with HF needs to be careful not to contaminate themselves.

Make sure to fill out an Incident Report with EH&S as soon as possible after the emergency.

Skin Contact

Use the following instructions with the HF Exposure Kit:

1. Immediately flush affected area with water for 5 minutes.
    - While in the water, remove all clothing, shoes, jewelry.
    - Remove goggles: close eyes, face water flow, pull goggles over head.
2. Have someone call **911**, tell them:
    - There is a person who was exposed to Hydrofluoric Acid.
    - The victim is in location: _____.
    - Please send paramedics and an ambulance.
3. Using a gloved hand, apply calcium gluconate gel to affected area.
    - Note the time that the gel was first applied so that information can be given to the paramedics.
4. Continue to reapply gel every 15 minutes until paramedics arrive.
5. When paramedics arrive tell them what decontamination steps have been taken:
    - How long the person was in the water.
    - When the gel was administered.
6. When paramedics arrive they should contact the Emergency Room for instructions and approval to administer the calcium carbonate tablets (antacid tablets) found in the HF Exposure Kit.
7. The responding person or assisting lab personnel must escort the victim to the hospital.
    - Bring a copy of the SDS and these emergency procedures to the hospital.

If HF Exposure Kit is not available:

1. Contact **911** for immediate transport to emergency room, tell them:
    a. There is a person who was exposed to Hydrofluoric Acid.
    b. The victim is in location: _____.
    c. Please send paramedics and an ambulance.
2. Flush area with water for at least 15 minutes or until emergency personnel arrive.
    a. Remove all clothing, shoes, and jewelry while in the water.
    b. Remove goggles: close eyes, face water flow, pull goggles over head.
3. When paramedics arrive tell them what decontamination steps have been taken:
    a. How long the person was in the water.
4. Inform paramedics that no HF Exposure Kit was available so no calcium gluconate gel has been applied.
5. The responding person or assisting lab personnel must escort the victim to the hospital.
    a. Bring a copy of the SDS and these emergency procedures to the hospital.

Eye Contact

If only one eye is affected, take care not to flush HF from the contaminate eye into the other eye.

1. Immediately flush eyes with water for 5 minutes.
    a. If a sterile 1% calcium gluconate solution is available, flush eyes with the solution after 5 minutes of water.
    b. If no solution is available continue flushing eyes with water until paramedics have arrived.
2. **Call 911** for immediate transport to the emergency room, tell them:
    a. There is a person whose eyes were exposed to Hydrofluoric Acid.
    b. The victim is in location: _____.
    c. Please send paramedics and an ambulance.
3. When paramedics arrive tell them what decontamination steps have been taken:
    a. How long eyes were flushed with water for.
    b. If calcium gluconate solution was used to flush eyes.
4. When paramedics arrive they should contact the Emergency Room for instructions and approval to administer the calcium carbonate tablets (antacid tablets) found in the HF Exposure Kit.
5. The responding person or assisting lab personnel must escort the victim to the hospital.
    a. Bring a copy of the SDS and these emergency procedures to the hospital.
6. If possible, provide continuous irrigation to the eye(s) during emergency transport.

Inhalation

Inhalation of HF fumes may cause swelling in the respiratory tract up to 24 hours after exposure. Persons who have inhaled HF vapors may need prophylactic oxygen treatment and must be seen by a physician as soon as possible.

In the event of inhalation:

1. Immediately move victim to fresh air.
2. **Call 911**, tell them:
    a. There is a person who inhaled Hydrofluoric Acid.
    b. The victim is in location: _____.
    c. Please send paramedics and an ambulance.
3. Cordon off the area, if HF vapors are still present.

4. When paramedics arrive they should contact the Emergency Room for instructions and approval to administer the calcium carbonate tablets (antacid tablets) found in the HF Exposure Kit.
5. The responding person or assisting lab member must escort the victim to the hospital.
    a. Bring a copy of the SDS and these emergency procedures to the hospital.

Ingestion

Do not induce vomiting.

- Rinse mouth with cold water.
- If victim is conscious, have them drink lots of water to dilute the acid.
    a. Note the time that water is ingested.
- **Call 911**, tell them:
    a. There is a person who ingested Hydrofluoric Acid.
    b. The victim is in location: _____.
    c. Please send paramedics and an ambulance.
- When paramedics arrive they should contact the Emergency Room for instructions and approval to administer the calcium carbonate tablets (antacid tablets) found in the HF Exposure Kit.
- Inform the paramedics of any decontamination steps performed (e.g. rinsed mouth, gave __ amount of water to drink).

Spills

Immediately call EH&S (6496 or 6455) to report any HF spill that is:

- Life threatening.
- Greater than 30mLs.
- Will take longer than 15 minutes to clean up.

Normal laboratory spill kits cannot be used for HF clean-up. Many typical neutralization agents produce hazardous gas or otherwise react with HF.

If a small quantity (less than 30mL) of dilute (<1%) hydrofluoric acid solution is spilled:

1. Apply powdered calcium carbonate or calcium hydroxide to neutralize the spill.
    a. Or use a commercial Hydrofluoric Acid spill kit.
2. Carefully collect the powder/acid mixture with a disposable scoop and place in appropriate container for disposal.
3. Dispose of contaminated PPE in the same container.
4. Close container, with clean gloves on, and label with HF warning signs.
5. Wash the spill site with a sodium bicarbonate solution.
6. Contact EH&S for removal of waste.

If a large volume, or concentrated, hydrofluoric acid is spilled:

- DO NOT attempt to clean up the spill.
- Isolate the area to prevent spread of contamination.
    - Close doors and post warning signs and/or personnel to prevent entry.
- Alert personnel in the immediate area to evacuate.
- Attend to any injuries.
- Contact EH&S and **911**.

Remember: ANY exposure to Hydrofluoric acid must be medically evaluated.

Appendix F: EPA P-Listed Chemicals

The EPA P-Listed Chemicals are acutely toxic. Chemicals found on this list should be handled with extreme care.

Empty containers that held P-Listed chemicals must be disposed of as hazardous waste. These containers must not be rinsed or cleaned, when empty contact EH&S for disposal.

Chemical name	CAS #	P code
Acetaldehyde, chloro-	107-20-0	P023
Acetamide, N-(aminothioxomethyl)-	591-08-2	P002
Acetamide, 2-fluoro-	640-19-7	P057
Acetic acid, fluoro-, sodium salt	62-74-8	P058
1-Acetyl-2-thiourea	591-08-2	P002
Acrolein	107-02-8	P003
Aldicarb	116-06-3	P070
Aldicarb sulfone.	1646-88-4	P203
Aldrin	309-00-2	P004
Allyl alcohol	107-18-6	P005
Aluminum phosphide (R,T)	20859-73-8	P006
5-(Aminomethyl)-3-isoxazolol	2763-96-4	P007
4-Aminopyridine	504-24-5	P008
Ammonium picrate (R)	131-74-8	P009
Ammonium vanadate	7803-55-6	P119
Argentate(1-), bis(cyano-C)-, potassium	506-61-6	P099
Arsenic acid H_3 AsO_4	7778-39-4	P010
Arsenic oxide As_2 O_3	1327-53-3	P012
Arsenic oxide As_2 O_5	1303-28-2	P011
Arsenic pentoxide	1303-28-2	P011
Arsenic trioxide	1327-53-3	P012
Arsine, diethyl-	692-42-2	P038
Arsonous dichloride, phenyl-	696-28-6	P036
Aziridine	151-56-4	P054
Aziridine, 2-methyl-	75-55-8	P067
Barium cyanide	542-62-1	P013
Benzenamine, 4-chloro-	106-47-8	P024
Benzenamine, 4-nitro-	100-01-6	P077
Benzene, (chloromethyl)-	100-44-7	P028
1,2-Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]-, (R)-	51-43-4	P042
Benzeneethanamine, alpha,alpha-dimethyl-	122-09-8	P046
Benzenethiol	108-98-5	P014
7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-, methylcarbamate.	1563-66-2	P127

Chemical name	CAS #	P code
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).	57-64-7	P188
2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-, & salts, when present at concentrations greater than 0.3%	[1]81-81-2	P001
Benzyl chloride	100-44-7	P028
Beryllium powder	7440-41-7	P015
Bromoacetone	598-31-2	P017
Brucine	357-57-3	P018
2-Butanone, 3,3-dimethyl-1-(methylthio)-, O-[(methylamino)carbonyl] oxime	39196-18-4	P045
Calcium cyanide	592-01-8	P021
Calcium cyanide $Ca(CN)_2$	592-01-8	P021
Carbamic acid, [(dibutylamino)- thio]methyl-, 2,3-dihydro-2,2-dimethyl- 7-benzofuranyl ester.	55285-14-8	P189
Carbamic acid, dimethyl-, 1-[(dimethyl-amino)carbonyl]- 5-methyl-1H- pyrazol-3-yl ester.	644-64-4	P191
Carbamic acid, dimethyl-, 3-methyl-1- (1-methylethyl)-1H- pyrazol-5-yl ester.	119-38-0	P192
Carbamic acid, methyl-, 3-methylphenyl ester.	1129-41-5	P190
Carbofuran.	1563-66-2	P127
Carbon disulfide	75-15-0	P022
Carbonic dichloride	75-44-5	P095
Carbosulfan.	55285-14-8	P189
Chloroacetaldehyde	107-20-0	P023
p-Chloroaniline	106-47-8	P024
1-(o-Chlorophenyl)thiourea	5344-82-1	P026
3-Chloropropionitrile	542-76-7	P027
Copper cyanide	544-92-3	P029
Copper cyanide Cu(CN)	544-92-3	P029
m-Cumenyl methylcarbamate.	64-00-6	P202
Cyanides (soluble cyanide salts), not otherwise specified		P030
Cyanogen	460-19-5	P031
Cyanogen chloride	506-77-4	P033
Cyanogen chloride (CN)Cl	506-77-4	P033
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	P034
Dichloromethyl ether	542-88-1	P016
Dichlorophenylarsine	696-28-6	P036
Dieldrin	60-57-1	P037
Diethylarsine	692-42-2	P038
Diethyl-p-nitrophenyl phosphate	311-45-5	P041
O,O-Diethyl O-pyrazinyl phosphorothioate	297-97-2	P040
Diisopropylfluorophosphate (DFP)	55-91-4	P043

Chemical name	CAS #	P code
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)-	309-00-2	P004
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)-	465-73-6	P060
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)-	60-57-1	P037
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	[1]72-20-8	P051
Dimethoate	60-51-5	P044
alpha,alpha-Dimethylphenethylamine	122-09-8	P046
Dimetilan.	644-64-4	P191
4,6-Dinitro-o-cresol, & salts	[1]534-52-1	P047
2,4-Dinitrophenol	51-28-5	P048
Dinoseb	88-85-7	P020
Diphosphoramide, octamethyl-	152-16-9	P085
Diphosphoric acid, tetraethyl ester	107-49-3	P111
Disulfoton	298-04-4	P039
Dithiobiuret	541-53-7	P049
1,3-Dithiolane-2-carboxaldehyde, 2,4-dimethyl-, O- [(methylamino)-carbonyl]oxime.	26419-73-8	P185
Endosulfan	115-29-7	P050
Endothall	145-73-3	P088
Endrin	72-20-8	P051
Endrin, & metabolites	72-20-8	P051
Epinephrine	51-43-4	P042
Ethanedinitrile	460-19-5	P031
Ethanimidothioic acid, 2-(dimethylamino)-N-[[(methylamino) carbonyl]oxy]-2-oxo-, methyl ester.	23135-22-0	P194
Ethanimidothioic acid, N-[[(methylamino)carbonyl]oxy]-, methyl ester	16752-77-5	P066
Ethyl cyanide	107-12-0	P101
Ethyleneimine	151-56-4	P054
Famphur	52-85-7	P097
Fluorine	7782-41-4	P056
Fluoroacetamide	640-19-7	P057
Fluoroacetic acid, sodium salt	62-74-8	P058
Formetanate hydrochloride.	23422-53-9	P198
Formparanate.	17702-57-7	P197
Fulminic acid, mercury(2 +) salt (R,T)	628-86-4	P065
Heptachlor	76-44-8	P059
Hexaethyl tetraphosphate	757-58-4	P062

Chemical name	CAS #	P code
Hydrazinecarbothioamide	79-19-6	P116
Hydrazine, methyl-	60-34-4	P068
Hydrocyanic acid	74-90-8	P063
Hydrogen cyanide	74-90-8	P063
Hydrogen phosphide	7803-51-2	P096
Isodrin	465-73-6	P060
Isolan.	119-38-0	P192
3-Isopropylphenyl N-methylcarbamate.	64-00-6	P202
3(2H)-Isoxazolone, 5-(aminomethyl)-	2763-96-4	P007
Manganese, bis(dimethylcarbamodithioato-S,S′)-,	15339-36-3	P196
Manganese dimethyldithiocarbamate.	15339-36-3	P196
Mercury, (acetato-O)phenyl-	62-38-4	P092
Mercury fulminate (R,T)	628-86-4	P065
Methanamine, N-methyl-N-nitroso-	62-75-9	P082
Methane, isocyanato-	624-83-9	P064
Methane, oxybis[chloro-	542-88-1	P016
Methane, tetranitro- (R)	509-14-8	P112
Methanethiol, trichloro-	75-70-7	P118
Methanimidamide, N,N-dimethyl-N′-[3-[[(methylamino)-carbonyl]oxy]phenyl]-, monohydrochloride.	23422-53-9	P198
Methanimidamide, N,N-dimethyl-N′-[2-methyl-4-[[(methylamino)carbonyl]oxy]phenyl]-	17702-57-7	P197
6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide	115-29-7	P050
4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro- 3a,4,7,7a-tetrahydro-	76-44-8	P059
Methiocarb.	2032-65-7	P199
Methomyl	16752-77-5	P066
Methyl hydrazine	60-34-4	P068
Methyl isocyanate	624-83-9	P064
2-Methyllactonitrile	75-86-5	P069
Methyl parathion	298-00-0	P071
Metolcarb.	1129-41-5	P190
Mexacarbate.	315-8-4	P128
alpha-Naphthylthiourea	86-88-4	P072
Nickel carbonyl	13463-39-3	P073
Nickel carbonyl $Ni(CO)_4$, (T-4)-	13463-39-3	P073
Nickel cyanide	557-19-7	P074
Nickel cyanide $Ni(CN)_2$	557-19-7	P074
Nicotine, & salts	[1]54-11-5	P075
Nitric oxide	10102-43-9	P076

Chemical name	CAS #	P code
p-Nitroaniline	100-01-6	P077
Nitrogen dioxide	10102-44-0	P078
Nitrogen oxide NO	10102-43-9	P076
Nitrogen oxide NO_2	10102-44-0	P078
Nitroglycerine (R)	55-63-0	P081
N-Nitrosodimethylamine	62-75-9	P082
N-Nitrosomethylvinylamine	4549-40-0	P084
Octamethylpyrophosphoramide	152-16-9	P085
Osmium oxide OsO_4, (T-4)-	20816-12-0	P087
Osmium tetroxide	20816-12-0	P087
7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid	145-73-3	P088
Oxamyl.	23135-22-0	P194
Parathion	56-38-2	P089
Phenol, 2-cyclohexyl-4,6-dinitro-	131-89-5	P034
Phenol, 2,4-dinitro-	51-28-5	P048
Phenol, 2-methyl-4,6-dinitro-, & salts	[1]534-52-1	P047
Phenol, 2-(1-methylpropyl)-4,6-dinitro-	88-85-7	P020
Phenol, 2,4,6-trinitro-, ammonium salt (R)	131-74-8	P009
Phenol, 4-(dimethylamino)-3,5-dimethyl-, methylcarbamate (ester).	315-18-4	P128
Phenol, (3,5-dimethyl-4-(methylthio)-, methylcarbamate	2032-65-7	P199
Phenol, 3-(1-methylethyl)-, methyl carbamate.	64-00-6	P202
Phenol, 3-methyl-5-(1-methylethyl)-, methyl carbamate.	2631-37-0	P201
Phenylmercury acetate	62-38-4	P092
Phenylthiourea	103-85-5	P093
Phorate	298-02-2	P094
Phosgene	75-44-5	P095
Phosphine	7803-51-2	P096
Phosphoric acid, diethyl 4-nitrophenyl ester	311-45-5	P041
Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester	298-04-4	P039
Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester	298-02-2	P094
Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester	60-51-5	P044
Phosphorofluoridic acid, bis(1-methylethyl) ester	55-91-4	P043
Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester	56-38-2	P089
Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester	297-97-2	P040
Phosphorothioic acid, O-[4-[(dimethylamino)sulfonyl]phenyl] O,O-dimethyl ester	52-85-7	P097
Phosphorothioic acid, O,O,-dimethyl O-(4-nitrophenyl) ester	298-00-0	P071
Physostigmine.	57-47-6	P204
Physostigmine salicylate.	57-64-7	P188
Plumbane, tetraethyl-	78-00-2	P110
Potassium cyanide	151-50-8	P098

Chemical name	CAS #	P code
Potassium cyanide K(CN)	151-50-8	P098
Potassium silver cyanide	506-61-6	P099
Promecarb	2631-37-0	P201
Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl]oxime	116-06-3	P070
Propanal, 2-methyl-2-(methyl-sulfonyl)-, O-[(methylamino)carbonyl] oxime.	1646-88-4	P203
Propanenitrile	107-12-0	P101
Propanenitrile, 3-chloro-	542-76-7	P027
Propanenitrile, 2-hydroxy-2-methyl-	75-86-5	P069
1,2,3-Propanetriol, trinitrate (R)	55-63-0	P081
2-Propanone, 1-bromo-	598-31-2	P017
Propargyl alcohol	107-19-7	P102
2-Propenal	107-02-8	P003
2-Propen-1-ol	107-18-6	P005
1,2-Propylenimine	75-55-8	P067
2-Propyn-1-ol	107-19-7	P102
4-Pyridinamine	504-24-5	P008
Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-, & salts	[T]54-11-5	P075
Pyrrolo[2,3-b]indol-5-ol, 1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethyl-, methylcarbamate (ester), (3aS-cis)-.	57-47-6	P204
Selenious acid, dithallium(1 +) salt	12039-52-0	P114
Selenourea	630-10-4	P103
Silver cyanide	506-64-9	P104
Silver cyanide Ag(CN)	506-64-9	P104
Sodium azide	26628-22-8	P105
Sodium cyanide	143-33-9	P106
Sodium cyanide Na(CN)	143-33-9	P106
Strychnidin-10-one, & salts	[T]57-24-9	P108
Strychnidin-10-one, 2,3-dimethoxy-	357-57-3	P018
Strychnine, & salts	[T]57-24-9	P108
Sulfuric acid, dithallium(1 +) salt	7446-18-6	P115
Tetraethyldithiopyrophosphate	3689-24-5	P109
Tetraethyl lead	78-00-2	P110
Tetraethyl pyrophosphate	107-49-3	P111
Tetranitromethane (R)	509-14-8	P112
Tetraphosphoric acid, hexaethyl ester	757-58-4	P062
Thallic oxide	1314-32-5	P113
Thallium oxide Tl_2O_3	1314-32-5	P113
Thallium(I) selenite	12039-52-0	P114
Thallium(I) sulfate	7446-18-6	P115
Thiodiphosphoric acid, tetraethyl ester	3689-24-5	P109

Chemical name	CAS #	P code
Thiofanox	39196-18-4	P045
Thioimidodicarbonic diamide [$(H_2N)C(S)]_2NH$	541-53-7	P049
Thiophenol	108-98-5	P014
Thiosemicarbazide	79-19-6	P116
Thiourea, (2-chlorophenyl)-	5344-82-1	P026
Thiourea, 1-naphthalenyl-	86-88-4	P072
Thiourea, phenyl-	103-85-5	P093
Tirpate.	26419-73-8	P185
Toxaphene	8001-35-2	P123
Trichloromethanethiol	75-70-7	P118
Vanadic acid, ammonium salt	7803-55-6	P119
Vanadium oxide V_2O_5	1314-62-1	P120
Vanadium pentoxide	1314-62-1	P120
Vinylamine, N-methyl-N-nitroso-	4549-40-0	P084
Warfarin, & salts, when present at concentrations greater than 0.3%	[1]81-81-2	P001
Zinc, bis(dimethylcarbamodithioato-S,S')-,	137-30-4	P205
Zinc cyanide	557-21-1	P121
Zinc cyanide $Zn(CN)_2$	557-21-1	P121
Zinc phosphide Zn_3P_2, when present at concentrations greater than 10% (R,T)	1314-84-7	P122
Ziram.	137-30-4	P205

[1]CAS Number given for parent compound only.

Appendix G: Incident Reports

Incidents that occur must be reported. Any incidents in the laboratory, or on lab trips, shall be reported promptly to Environmental Health & Safety (MAR 002).

Incident reports are for incidents:

- On any EWU campus or facility.
- That occur to any EWU employee while at work, wherever work is happening.
- That occur to any EWU student, on campus, during field trips, or during organized activities.

Incident reports can be submitted by filling out the Incident Report Form on the EH&S website (https://sites.ewu.edu/ehs/incident-reporting/).

Make sure the report is filled out as completely as possible and as soon after the incident as is reasonable.

When To Report

Incident reports shall be submitted anytime:

- An incident occurs that results in injury or illness, even minor injuries should be reported.
  - WA law requires that any injury is reported within 24 hours.
- An incident occurs that results in property damage.
- A spill occurs that is large enough to necessitate the use of the spill kit.
- Chemicals are released down the drain.
- Something explodes or catches fire (even if it was dealt with by an individual).
- An incident occurs that requires Emergency Services to be contacted (this includes break-ins, theft, or suspicious person(s) in or around the laboratory).

Reporting incidents helps EWU to identify locations on campus, or activities, which may have previously unrecognized hazards associated with them. Some types of incidents must be reported to state and federal agencies, and the submitted incident report forms are how those incidents are tracked.

What To Report

Incident reports need to include:

- The date of the incident.
- The name of any person affected by the incident.
  - The EWU ID # if the affected person was an EWU student or staff.
- The name of the Instructor or Supervisor, and their phone number.
- What the incident was, if the incident was an injury include:
  - What part of the body was injured.
  - What type of medical attention the injury required.
  - Any witnesses to the incident.
- What was happening right before the incident.
- What caused the incident.
- Any other information you think is useful for EH&S to know.