

Chemical Hygiene Plan

The George Washington University



Table of Contents

Table of Contents	2
INTRODUCTION	4
Foreword	4
Scope	4
1 Chemical Hygiene Overview.....	5
A. Regulatory Guidance	5
B. Roles and Responsibilities	5
C. Training Requirements	7
D. Recordkeeping.....	8
E. Resources	9
F. Prior Approval.....	10
2. Chemical/Physical Hazards & Controls	11
A. Procurement, Distribution, and Storage	11
B. SDS and Chemical Inventory.....	13
C. Chemical Waste	13
D. Higher Hazard Chemicals.....	13
E. Compressed Gas Cylinders	14
F. Laboratory Equipment.....	14
G. Engineering Controls	15
H. Administrative Controls.....	15
I. PPE.....	15
J. Physical Hazards	16
K. Radiation and Lasers.....	16
L. Infectious Agents and Biological Toxins	16
3. Emergency Preparedness and Response	18
A. Incident Reporting.....	18
B. Accidental Spills/Releases	18
C. General Safety	19
D. First Aid, Eyewash, and Showers	20
E. Medical Surveillance.....	20
F. Environmental/Exposure Monitoring.....	21
Appendix 1: Definitions	22



Appendix 2: Laboratory Best Practices 25

Appendix 3: Laboratory Weekly Checklist 27

Appendix 4: Standard Operating Procedure Template 30

Appendix 5: Chemical Inventory Template..... 36

Appendix 6: Packaging Biohazardous Waste 39



INTRODUCTION

Foreword

This Chemical Hygiene Plan (CHP) has been developed to protect the safety and health of students, faculty, staff, and visitors of The George Washington University (GW). This program implements requirements set forth in 29 CFR 1910.1450 by the Occupational Safety and Health Administration (OSHA).

Scope

This CHP applies to activities on the Foggy Bottom, Mount Vernon, and Virginia Science and Technology Campuses that involve the handling, storage, or other manipulation of hazardous chemicals. Settings in which the CHP applies include but are not limited to:

- a. Laboratory-type operations in which chemicals are manipulated or otherwise experimented with. This includes teaching and research laboratories
 - b. Anywhere multiple chemicals are combined
 - c. Hazardous chemical storage facilities
 - d. Anywhere engineering controls exist to protect personnel from hazardous chemical exposure
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1 Chemical Hygiene Overview

A. Regulatory Guidance

Various agencies provide regulatory oversight for laboratory operations. Laboratory personnel should be aware of these regulations and understand the need to follow these regulations. Anyone requiring assistance on regulatory guidance should contact their supervisors and/or Environmental Health and Safety (EHS). Provided below are links for various regulatory agencies that laboratory personnel should be aware of:

- [OSHA.gov](https://www.osha.gov)
- [NFPA.gov](https://www.nfpa.gov)
- [EPA.gov](https://www.epa.gov)
- [DOEE.DG.gov](https://www.doe.gov)
- [NRC.gov](https://www.nrc.gov)

A CHP is a written program which identifies procedures for protecting laboratory personnel from health hazards created by potentially hazardous chemicals, equipment, or other agents used in the laboratory. The CHP shall include:

- Standard Operating Procedures (SOP) created and followed, for laboratory work that includes the use of hazardous chemicals and other agents, or equipment.
- Criteria used to determine and implement control measures to reduce exposure to hazardous chemicals including engineering controls, the use of personal protective equipment (PPE), and hygiene practices.
- Requirements that fume hoods and other protective equipment are functioning properly and for maintaining adequate performance of equipment.
- Provisions for training personnel on hazard recognition, control measures, and this CHP.
- Circumstances under which a particular laboratory operation, procedure, or activity would require special approval.
- Provisions for medical consultation and medical examinations.
- Determination and implementation of control measures to reduce exposures to hazardous chemicals.
- Provisions for additional protection for work involving particularly hazardous substances and conditions.
- Availability of Safety Data Sheets (SDS).

B. Roles and Responsibilities

GW's faculty, staff, students, and visitors have the right to expect a safe and healthy work environment. They are also responsible for creating and maintaining a safe and healthy environment for themselves and others. Everyone at GW is required to be informed of the known hazards and risks present in their working and learning spaces, and be properly trained to interact safely with those materials. The following parties have specific roles and responsibilities for effective implementation of the CHP:

1. Environmental Health and Safety (EHS) shall:
 - a. Prepare the institutional Chemical Hygiene Plan and review annually to monitor regulatory requirements and update accordingly
 - b. Designate a Chemical Hygiene Officer (CHO) to oversee CHP implementation



- c. Provide institutional awareness training on the CHP, chemical hazards, and mitigation techniques available to minimize exposure
 - d. Provide consultation, exposure monitoring where appropriate, and recommendations for the safe handling, use, and storage of hazardous chemicals and hazardous waste
 - e. Provide advisory assistance with experimental design, and review of SOP to control risk in workspaces
 - f. Conduct biannual safety inspections of laboratories that use chemicals and provide findings and corrective action recommendations to the principal investigator (PI) or laboratory supervisor
 - g. Coordinate and oversee annual inspections of ducted chemical fume hoods
 - h. Manage the university online SDS system (Currently in final development stages)
 - i. Collect and coordinate disposal of hazardous and other regulated laboratory waste
 - j. Assist in responding to and cleaning up chemical-related incidents including spills
 - k. Oversee and participate in incident investigations
 - l. Act as the liaison with federal, state, and local regulatory agencies with respect to inspections, audits, or investigations involving areas or issues covered by the CHP
 - m. Manage personal exposure assessment recordkeeping and training records
2. GW University Chemical Hygiene Officer shall:
- a. Serve as a point of contact/liaison with the laboratory Chemical Hygiene Officers and the departments regarding the CHP and its application.
 - b. Evaluate training needs and organize relevant trainings for laboratory CHOs, PIs and Lab Manager
 - c. Oversee Chemical Hygiene Committee and encourage laboratory CHO attendance and participation
 - d. Disseminate chemical safety information throughout the university via email, EHS website updates, and other forms of communications.
 - e. Provide general chemical safety guidance to department staff, students and faculty.
3. Facilities Planning Construction and Management (FPCM) shall:
- a. Provide routine maintenance for ducted chemical fume hoods and other laboratory local exhaust systems
 - b. Provide annual inspection and routine maintenance for emergency shower and eyewash facilities
 - c. Evaluate all requests for modification to laboratory equipment or building structure in conjunction with EHS
 - d. Maintain the utilities and infrastructure of buildings that house laboratories
4. Principal Investigators (PI) shall:
- a. Designate a laboratory CHO to maintain overall responsibility for chemical hygiene in their laboratory spaces
 - b. Complete all actions as indicated by the CHP
 - c. Identify and implement institutional training requirements, provide laboratory specific training for all laboratory personnel, and maintain all training documentation
 - d. Maintain a current inventory of all chemicals in laboratory spaces



- e. Provide access to (SDS), in physical form, of all chemicals used or stored within the laboratory
 - f. Confirm that PPE and other risk reducing controls are identified, available, maintained, and properly used
 - g. Confirm that hazardous chemicals within the laboratory are stored according to SDS and other reference material recommendations, and are separated from incompatible materials and conditions following best storage practices
 - h. Confirm that written SOP are developed and available to laboratory personnel for all hazardous laboratory activities
 - i. Identify laboratory operations that require [prior approval](#) and coordinate with appropriate university departments (e.g. higher hazard processes, animal research, laboratory closeout)
 - j. Report circumstances necessitating exposure monitoring (refer to [section 3F](#)), near misses, and chemical spills to EHS, and any other injuries, exposures, or laboratory incidents resulting in personal harm to Risk Management (<https://risk.gwu.edu/forms>)
 - k. Provide current laboratory hazard warning signage. Information can be found on the [EHS website](#)
 - l. Participate with laboratory inspection process and address findings within the required timeframe
5. Laboratory Personnel shall:
- a. Complete all [training](#) requirements set by EHS, Office of Research Safety, and the PI
 - b. Work in accordance with laboratory safety rules and SOPs
 - c. Report any unsafe conditions, chemical exposures, or injuries to [EHS, Office of Risk Management](#), and the PI
 - d. o Notify EHS and/or emergency responders in the event of any imminent serious safety threat that develops
6. Department Chairs and College Deans shall:
- a. Require implementation of the CHP for affected laboratories under their management
 - b. Provide necessary assistance to principal investigators to correct deficiencies identified during laboratory safety inspections
 - c. Work with FPCM and EHS to confirm that laboratory space made available to each PI meet appropriate safety standards
7. Student Health Center shall:
- a. Coordinate and direct all medical surveillance programs for students
 - b. Provide medical consultations and examinations for student laboratory personnel who have been exposed, or may have been exposed, to hazardous chemicals
 - c. Maintain medical records relating to consultations, examinations, and medical surveillance as required

C. Training Requirements

Laboratory PI or designated staff must provide safety information and training to laboratory personnel initially, upon assignment to a laboratory where hazardous chemicals are present, and also prior to assignments involving new hazardous chemicals and/or new laboratory work procedures.



All laboratory personnel are required to annually complete [University Laboratory Safety Training](#) offered by EHS.

Laboratories coordinate with the Office of Research Safety (ORS) to complete trainings covering the following topics:

1. Bloodborne Pathogens
2. Radiation Safety
3. Laser Safety

For more information, visit the [ORS website](#).

Laboratory-specific safety training will be provided by or its delivery overseen by the laboratory's CHO.

To view and register for training conducted by EHS, visit the [EHS website](#).

D. Recordkeeping

The following records must be retained in each laboratory by the designated individual(s):

1. *Training Records*: must be maintained for all laboratory personnel for their entire time spent working in the laboratory. These records include attendance verification and dates completed for laboratory-specific training/orientation, Laboratory Safety Training, and any other training the PI requires based on hazards present in the laboratory.
2. *Chemical Hygiene Plan*: The University's CHP must be readily available in physical form in each laboratory for use and review. Any SOP created by the laboratory must be included with the CHP.
3. *Chemical Inventory*: Must be kept up-to-date and submitted through [email to EHS](#) annually and whenever any chemicals are added or removed. See [Appendix 5](#) for an example checklist that includes all required component, or visit the EHS website to download the full Excel [Chemical Inventory Template](#). (Update to electronic system coming in 2025)
4. *Safety Data Sheets*: Must be readily available in physical form. Confirm SDS is present for each chemical used in the laboratory and is the most updated version from the manufacturer. SDS must be maintained for 30 years after last use. (Update to electronic system coming in 2025)
5. *Weekly Laboratory Inspections*: Authorized laboratory personnel must perform a weekly inspection that identifies any safety discrepancies that need remediation. See [Appendix 3](#) for an example checklist that includes all required components. Inspections must be maintained until the laboratory is decommissioned.
6. *Hazardous Waste Management Plan*: Required in physical form for each laboratory that generates hazardous waste. See <https://safety.gwu.edu/laboratory-safety> for more information.
7. *Animal Research Information*: For specific record retention about training, inspections or other animal research information, please refer to the [Office of Animal Research](#) and/or the [Institutional Animal Care and Use Committee](#).

GW will maintain records concerning the following:

1. Exposure assessments
2. Occupational medicine consultations and examinations
3. Inspection reports



4. Fume hood evaluations
5. Trainings conducted by GW

For information on requesting records, [contact EHS](#).

E. Resources

Emergency Phone Numbers:

FOR ALL MEDICAL EMERGENCIES CALL 202-994-6111 or 911
GW Emergency Services (GWPD and EMERG) 202-994-6111
GW Emergency Services (non-emergency) 202-994-6110
Environmental Health and Safety 202-994-4347
(after normal business hours, call GW Emergency Services)

Health, safety, and environmental resources are available to the GW research community through EHS and OVPR. These resources include: technical assistance in evaluating risk of processes and materials, risk controls, training requirements, equipment specifications, hazardous waste disposal, chemical storage, and compliance requirements. Initial inquiries into these resources can be made through the GW [EHS website](#). EHS personnel are available by phone and email to provide personalized service for specific needs.

The Chemical Hygiene Committee is being formed as a sub-committee of the university's Campus Safety Committee. The Chemical Hygiene Committee will meet to manage and oversee implementation of the CHP and provide a valuable resource to all laboratory CHOs in achieving reduced risk in the university's laboratory space. To request guidance or information from the Chemical Hygiene Committee, contact your laboratory CHO.

Other resources can be found throughout this CHP, and in the appendices. Provided below are links to general resources providing health and safety guidance:

1. [OSHA \(29 CFR 1910.1450\)](#)
2. [NIOSH Pocket Guide](#)
3. [2020 DOT Emergency Response Guidebook](#)
4. [Laboratory Best Practices Guide](#)
5. [SOP Template \(Appendix 4\)](#)
6. [OSHA Hazard Identification/Recognition Guide](#)
7. [ACS Hazard Assessment Guide](#)
8. [PPE Selection Guide](#)
9. [Prudent Practices in the Laboratory](#)
10. [ACS Guidelines for Chemical Safety](#)



F. Prior Approval

It is the responsibility of the laboratory CHO to identify laboratory processes that require prior approval from ORS or EHS programs. Department heads or CHOs may require their own prior approval for specific laboratory processes that must be documented and trained to all laboratory staff. Below are links to sources that will help identify the need for prior approval from GW programs:

1. [Animal Research Guidance](#)
2. [Biosafety Guidance](#)
3. [Radiation Safety](#)
4. [Laser Safety](#)
5. [Laboratory Close-out Guidelines](#)



2. Chemical/Physical Hazards & Controls

A. Procurement, Distribution, and Storage

1. Procurement

Obtain chemicals and other laboratory materials from vendors that comply with EPA and DOT regulations.

Order the smallest quantity necessary for the work being performed in the laboratory. Avoid storage of excess quantities of chemicals.

Confirm the laboratory representative designated to receive chemicals has been trained in handling the specific hazards and can locate the appropriate SDS.

2. Labeling

Original containers must retain the manufacturer's original label. Labels on all chemical containers may not be removed or defaced until the container is empty. All labels must bear the chemical name and any applicable hazard warnings/pictograms. OSHA pictograms detailing [29 CFR 1910.1200 Hazard Communication Standard](#) are below.

HCS Pictograms and Hazards

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



3. *Distribution and Transportation*

When transferring chemicals from bulk storage into working containers, label the containers with the information described in the above “Labeling” section if the contents are not immediately used by the same individual who performed the transfer. When performing transfers of hazardous chemicals, use secondary containment measures and any applicable equipment to prevent spills.

Laboratory personnel may transport chemicals within the same building, from room to room. During transportation, chemicals must be kept in a secondary container and on a cart with applicable spill cleanup measures available. If moving chemicals between floors, use a freight elevator whenever available.

If there is a need to move chemicals between buildings, EHS will perform the transfer. [Submit requests through Fixit](#) as a Chemical Waste Pickup, stating that the request is for relocation of chemicals.

4. *Storage*

Chemicals shall be stored according to hazard classes listed below:

- a. Explosives
- b. Gasses
- c. Flammable and Combustible Liquid
- d. Flammable Solid, Spontaneously Combustible, and Dangerous when Wet
- e. Oxidizer and Organic Peroxide
- f. Poison (Toxic)
- g. Radioactive
- h. Corrosive
- i. Miscellaneous

In addition to storing chemicals according to their hazard class, adhere to the following storage practices:

- a. Flammable materials shall be stored in an approved flammable storage cabinet.
- b. Store volatile or odiferous chemicals in ventilated cabinets.
- c. Chemicals not requiring specific cabinet storage shall be stored in another closed cabinet or on shelves that have a lip around the edge to prevent containers from falling.
- d. Store chemicals in secondary containers when possible to prevent spills.
- e. Store heavy containers on lower shelves.
- f. Never store chemicals on the floor.
- g. Store liquid hazardous chemicals (corrosive, flammable, and toxic liquids) at or below eye level.
- h. If cold storage is required, the refrigeration unit must not be used for any other purpose and have a sign reading “NO FOOD - LAB CHEMICAL STORAGE ONLY”.
- i. Only substances used for household cleaning purposes (Windex, household multi-purpose cleaners) may be stored under sinks.



B. SDS and Chemical Inventory

1. Safety Data Sheets

Hazard information of specific chemicals can be found in SDS provided by all manufacturers and vendors of hazardous chemicals. SDS must be available for every chemical stored or used in the laboratory. All personnel working with, or near, hazardous chemicals, must be trained on the location of SDS, and the information they provide. This training must be documented with all other laboratory-specific safety training. SDS should be reviewed and updated annually.

2. Chemical Inventory

All areas storing hazardous chemicals must have an inventory of all chemicals (including gas cylinders) on site. This inventory must be updated routinely to effectively demonstrate a current list of hazardous chemicals available. Below is a link to a chemical inventory template, with fields for all required information:

[Chemical Inventory Template](#)

C. Chemical Waste

EHS at GW provides oversight for compliance with regulations pertaining to the collection, packaging, and disposal of regulated waste, as well as providing the services of collecting and disposing of all regulated waste generated by the laboratories. Additionally, EHS, through [FixIt](#), provides all laboratories with approved waste labels and containers.

1. Labeling

Submit a [FixIt](#) request to acquire approved labels for regulated waste. Labels must be affixed to all containers of regulated waste, with all the necessary information and chemical contents properly identified.

Disclaimer: For waste to be collected, the entire label must be completed properly, with all provided fields complete.

2. Storage

All hazardous/regulated waste must be stored in approved accumulation areas inside the laboratories. These areas must be identified using the provided ["Chemical Waste Accumulation Area"](#) signage. All waste stored in these areas *must* be kept inside secondary containment and removed from the laboratory within 60 days of the waste container's start date. Reference the [Chemical Compatibility Guide](#) when combining chemicals in the waste stream to avoid potential reactions. Waste accumulation areas must be inspected weekly to identify and remediate discrepancies.

3. Disposal

All hazardous waste must be disposed of by contacting EHS when it is ready to be removed from the laboratory, with all necessary information labeled on the container. Requests for waste pickups, or waste supplies, can be made through [FixIt](#). Please allow 2 business days for requests to be completed.

D. Higher Hazard Chemicals

There are special provisions for additional protections of laboratory personnel who work with particularly hazardous substances. Per OSHA, prior to procurement, the laboratory CHO must identify any highly



hazardous substances with high degrees of acute toxicity, select carcinogens, and reproductive toxins, and provide additional guidance to include the following: (Process must be documented in writing, and trained on with all applicable laboratory staff)

1. Establish a designated area for use
2. Use of a fume hood or other containment device
3. Procedures for safe removal of hazardous waste
4. Decontamination procedures

E. Compressed Gas Cylinders

Compressed gasses serve as both chemical and physical hazards in the lab. Under-pressure vessels containing gasses must be carefully handled to prevent their rupture or leaking of potentially dangerous chemicals.

All compressed gas cylinders shall be clearly labeled with the chemical name and primary hazard. During storage, properly secure cylinders with a strong chain or strap so they cannot fall or be knocked over, and secure the safety cap tightly when not in use. Segregate compressed gasses and other chemicals according to hazards; for example, store flammable gasses away from oxidizers. When transporting gas cylinders, secure them on a cylinder cart and use as designed.

Regularly inspect the condition of compressed gas cylinders. Monitor pressure readings and appropriately affix safety caps when not in use.

Once cylinders are empty, clearly mark them as “empty,” Continue to store them upright and secured until they are removed from the laboratory. In the event cylinders are not able to be returned to the supplier, submit a [FixIt request](#) for EHS disposal.

F. Laboratory Equipment

Before ordering equipment for your laboratory, research the dimensions of the equipment, and where it will be placed/operated, to identify if there are any needs prior to receiving the equipment. Before operating any equipment, personnel should review the equipment operating manual, and receive any necessary training to properly use the equipment safely. No piece of equipment should be powered long-term by an extension cord.

Properly dispose of non-contaminated broken glassware in appropriate containers (e.g., broken glass box, plastic waste container). Contaminated glassware shall be disposed of as hazardous waste.

If you are acquiring a 3D printer for a laboratory, please review the [3D Printer Guidelines](#) to plan and get approval for its use.

Any laboratory equipment that needs to be serviced or removed from the laboratory must be decontaminated. Information regarding equipment decontamination can be found here: <https://researchsafety.gwu.edu/i-need>.



G. Engineering Controls

Engineering controls are mechanisms that reduce or potentially eliminate individuals' exposures to hazards. To reduce risk, engineering controls should always be considered before [administrative controls](#) or [personal protective equipment](#).

Some engineering controls at GW encompass specific laboratory and laboratory-related spaces. These include seismically protected rooms and clean rooms.

Fume hoods and biosafety cabinets are two common engineering controls designed to reduce exposure while working with chemicals and biological materials. These pieces of equipment must operate at the flow rates required by the manufacturer. These rates shall be easily accessible and are usually posted on the exterior of the hoods or cabinets. Fume hoods and biosafety cabinets are certified upon initial installation and annually thereafter; fume hood certifications are coordinated by EHS, and biosafety cabinet certifications by ORS. In the event that a hood or cabinet alarms, cease use of the device. Submit a [FixIt request](#), and do not use the device until it has passed re-certification.

H. Administrative Controls

Administrative controls are manifested in laboratory operating procedures, training regimens, and supervision by management. When properly implemented, administrative controls will reduce risk presented by hazardous chemicals by lessening the duration, severity, and frequency of exposure.

One University-wide administrative control that helps protect campus personnel and first responders is the presence of [Laboratory and Studio Hazard Information Sheets](#) that are posted outside of each laboratory and studio. These must be updated within the first week of each new semester as identified by the university academic calendar.

Commonly employed administrative controls include:

1. Never working with hazardous substances alone in the lab
2. Ordering the least hazardous chemical necessary (instead of more hazardous versions or options)
3. Performing certain tasks in shifts with breaks in between
4. Quarterly safety meetings to review safe laboratory practices
5. Implementing personal hygiene and decontamination standards after working with chemicals

I. PPE

1. PPE

If engineering and administrative controls cannot reduce hazards to safe levels, Personal Protective Equipment (PPE) is the remaining control measure that can be used to reduce exposure to hazardous chemicals. However, even if engineering and administrative controls are in place, PPE is to be utilized according to the chemical's SDS.

Examples of PPE and the parts of the body they protect are listed below:

- a. Respiratory system: respirators including N95, half-face respirator, powered air-purifying respirators (PAPR), and self-contained breathing apparatus (SCBA)
- b. Face and eyes: safety goggles, safety glasses, face shield



- c. Hands: gloves that are selected based on present hazards
- d. Body: lab coat, apron, boot covers, chemical coveralls

2. *Respiratory Protection*

Some chemicals require the use of a respirator when handled. All laboratory personnel who are required to use a respirator as part of their job duties must be fit tested. Register for and learn more about fit testing at GW [here](#). More details on requirements can be found in GW's [Respiratory Protection Program](#).

Respirator selection, and a cartridge change schedule, must be documented for respiratory protection use. For help identifying needs for respiratory protection, or for selecting a respirator for use, [contact EHS](#) or visit [OSHA's Respirator Selection page](#).

J. **Physical Hazards**

Physical hazards are any hazards that can harm personnel through contact, striking, being caught between, and falling. These hazards should be identified with applicable control measures to reduce the risk of injury. If you require assistance identifying hazards, or need control recommendations, [contact EHS](#).

All reasonable accommodation should be made to keep pathways and entryways clear of obstructions maintaining a minimum of 36 inches of clearance. Any cords required to extend through a path of travel, should utilize concealment methods to reduce the potential to trip and fall.

Any stools or ladders used to reach objects higher up should only be used following manufacturer specifications.

When handling objects or materials greater than 40 pounds, use equipment designed for the task, or use the buddy system to perform the lift.

K. **Radiation and Lasers**

The Office of Research Safety (ORS) oversees the Radiation Safety Program at GW. This program covers all radioactive material compounds, radiation-producing devices, and any radioactive sealed or plated sources. Utilizing any of these materials requires approval from ORS. For more information, refer to the [Radiation Safety Policies Manual](#) or contact ORS at (202)994-2630.

ORS also oversees the Laser Safety Program. Any laboratory using lasers as part of its research is subject to this program. Visit the [ORS webpage](#) or call (202)994-2407 for more information.

L. **Infectious Agents and Biological Toxins**

Persons working with infectious agents or materials must be trained in the proper procedures required for safe handling of these materials. Laboratory personnel must be informed of any special hazards and signs that are present in the work area.

Biosafety is managed by the [Office of Research Safety](#). Refer to the [Biosafety Manual](#) for greater detail on this program.



1. Waste

All biological waste must be disposed of in a biological waste box, lined with a red biological waste bag. Any sharps containers shall be disposed of in biological waste boxes. Any waste with known pathogenic material that can be transmitted by the contact or aerosol route must be autoclaved immediately and then put in regulated biological waste boxes. When packing these boxes, seal each seam completely with clear packing tape on the top and bottom of the box. The red bag shall be twisted closed at the top and taped completely closed to prevent any spills within the box. To request boxes, red bags, and pick-up of packed biological waste boxes, submit a [FixIt request](#).

[Biological Waste Packing Instructions](#)



3. Emergency Preparedness and Response

A. Incident Reporting

Report all injuries that occur in the laboratory and related spaces to the Office of Risk Management at <https://rmaprdgeorgewashingtonuniversity.dcx-ins.com/GWU%20Shell%20WebForm/Webform/Pagebuilder.aspx>. Reportable incidents include bodily injuries such as slips and needlesticks as well as symptoms of chemical exposure. Symptoms of exposure vary based on what the individual is exposed to in addition to individual susceptibleness and allergies. Laboratory personnel are responsible for familiarizing themselves with each chemical in the laboratory and its signs and symptoms of exposure.

Below is a list of routes and symptoms of exposure. This is not an all-inclusive list, but it does cover many common symptoms.

Skin absorption	Ingestion	Inhalation	Eye Contact
<ul style="list-style-type: none"> • Itching • Redness • Burns • Blisters • Rash/hives 	<ul style="list-style-type: none"> • Abdominal pain • Nausea • Vomiting • Diarrhea • A warm sensation in the stomach (halogenated hydrocarbons) • Dark-colored (black) urine (arsenic) • Dehydration 	<ul style="list-style-type: none"> • Drowsiness • Dizziness/vertigo • Headache • Confusion/lethargy • Clear drainage from nose • Cough • Dry/scratching/burning throat • Blurred vision • Shortness of breath • Rapid breathing (tachypnea) • Rapid heart rate (tachycardia) 	<ul style="list-style-type: none"> • Redness of the eyes • Burning sensation • Constant tear production • Mucous discharge from tear ducts • Blurred vision/blindness (partial or complete)

Source: University of Illinois Urbana-Champaign Division of Research Safety

B. Accidental Spills/Releases

1. Chemical Spills

Trained laboratory personnel are authorized to clean up spills of less than 7 fluid ounces (30 mL) on their own while wearing appropriate PPE. EHS is required to clean spills greater than 7 fluid ounces (30 mL).

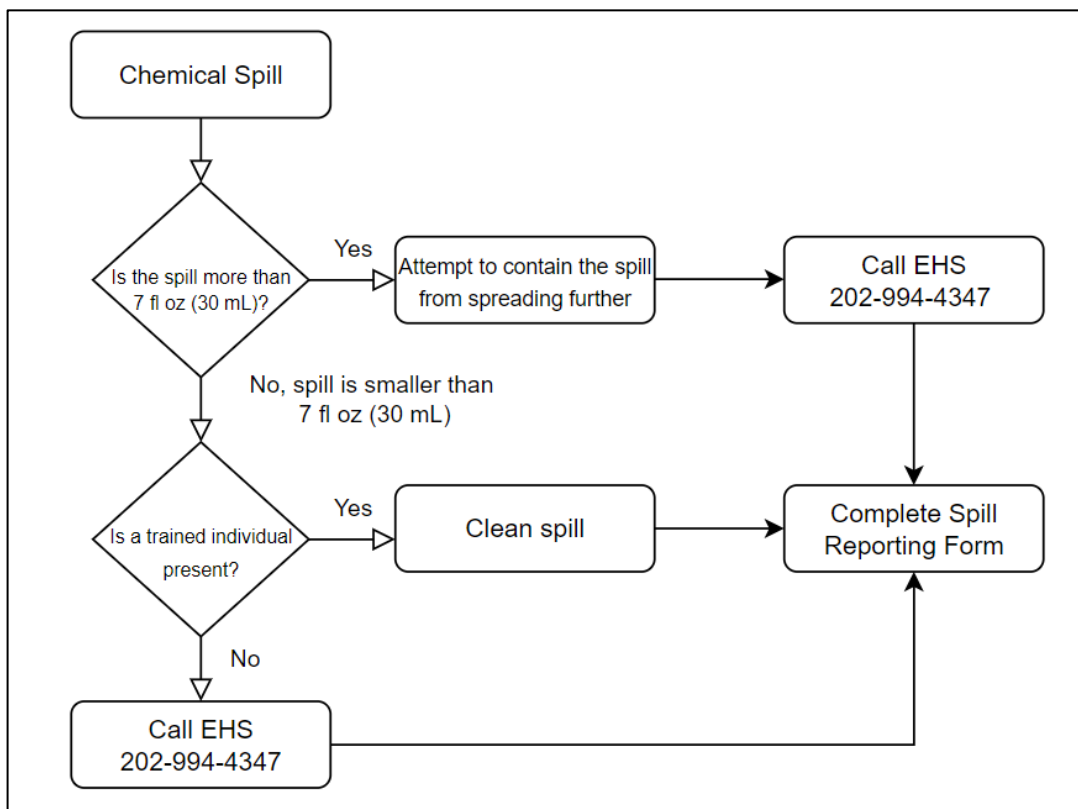
Every laboratory is required to maintain a spill kit for cleaning up chemical spills. The name "Spill Kit" shall be posted on the exterior of the kit and visible from across the room. A table of contents for the spill kit shall be labeled on the clearly on the exterior of the kit, and all supplies listed must be accounted for within the kit. Items present within the spill kit must be suitable for the chemicals present in the laboratory. Common spill kit items include:



- a. Absorbent materials, such as pads or powders
- b. Neutralizing agents, such as citric acid and sodium bicarbonate
- c. Personal protective equipment, such as gloves, goggles, and lab coat
- d. Dustpan and broom

Report all chemical spills using the [Spill Reporting Form](#). Spills are required to be reported to communicate relevant information to building officials. Information that may be disseminated to building occupants might include odors present in shared spaces or extra personnel present during spill response.

Follow the below guide when cleaning up chemical spills:



2. Gas Leaks and Alarms

Some laboratories and storage rooms on campus are equipped with gas monitoring systems. All personnel should familiarize themselves with the operating manual for these systems to understand how they function and alert occupants of an emergency. Identify who is responsible for maintaining and servicing the equipment. Be familiar with the sounds that indicate the monitoring system has detected a leak. Follow your established evacuation procedures to safely leave the laboratory. Call GWPD at 202-994-6111 or 911 to report the emergency. For general support with gas monitoring systems, [contact EHS](#).

C. General Safety

Every room designed for human occupancy shall have emergency egress routes posted near the door. Laboratory supervisors will review the emergency evacuation route with all laboratory personnel along with the laboratory's individual emergency evacuation plan. The plan must include designated meeting locations



and communication procedures. Refer to the [GW Fire Prevention Plan](#), located on the EHS website, for more information.

D. First Aid, Eyewash, and Showers

1. General Requirements

Laboratory supervisors will provide and document training for all laboratory personnel on the location, and uses of first aid kits, emergency eyewash stations, and emergency showers. These locations must be easily identifiable in the laboratory and remain clear of all obstacles/obstructions, including temporary storage of supplies.

2. First Aid

First aid kits must have a documented inspection once a month performed by laboratory personnel. This can be documented on a checklist or directly on the first aid kit in relevant areas. Inspections should identify any materials that need to be resupplied and expiration dates of existing content. Remove expired supplies and replace them with new materials.

3. Emergency Eyewash and Showers

Emergency eyewash and shower stations must have a documented inspection once a week. This can be documented on a weekly checklist, or on an inspection tag affixed to the equipment. Weekly inspections should observe the flow, color, and temperature of the water, and make sure all parts are functioning properly. EHS coordinates annual inspections of this equipment.

E. Medical Surveillance

OSHA sets forth medical surveillance requirements to safeguard workers' health and well-being in various workplaces. These standards necessitate employers to provide their employees with medical exams and services when they might be exposed to specific workplace hazards. Here are the key points regarding OSHA medical surveillance:

1. **Exams and Services:** Employers must offer medical exams and services performed by a physician or other licensed healthcare professional to employees who may encounter hazardous conditions. These exams are typically related to occupational exposures, such as exposure to toxic substances, noise, or radiation.
2. **Cost:** Employers are required to make these exams available at no cost to the employees.
3. **Records:** Employers must maintain accurate medical and exposure records for each employee. These records help track health trends, identify potential risks, and maintain compliance with regulations.
4. **Employee Rights:** Employers must inform employees of their rights related to medical surveillance. Employees should be aware of the risks associated with their work environment and understand the purpose of the medical exams. However, employees are not obligated to undergo these exams if they choose not to.

OSHA's goal is to promote a safe and healthy work environment, and medical surveillance plays a crucial role in achieving this objective. If there are any specific concerns or need further details, [contact EHS](#).



F. Environmental/Exposure Monitoring

OSHA publishes a list of regulated substances and their permissible exposure limits (PELs) in [29 Code of Federal Regulations part 1910 subpart Z](#). For laboratory uses of OSHA regulated substances the laboratory CHO will assure that the laboratory employees' exposures do not exceed the PELs specified by OSHA or limits defined by other sources for chemicals which are not identified by OSHA. As provided for in 29 CFR 1910.1450, a laboratory employee may request exposure monitoring and must be notified of the results, in writing, within 15 days of the receipt of the results.

Laboratory personnel may request exposure monitoring for any reason, including believed chemical exposure above PELs and signs and symptoms associated with a chemical exposure. To file a formal request for monitoring, [contact EHS](#). Monitoring will be conducted and any relevant recommendations for additional engineering controls, administrative controls, or personal protective equipment will be recommended. Records of environmental monitoring will be kept on file by EHS for the required retention period.



Appendix 1: Definitions



These definitions have been adopted by GW from [OSHA 29 CFR 1910.1450 "Occupational exposure to hazardous chemicals in laboratories."](#)

Chemical Hygiene Officer: an employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the GW University Chemical Hygiene Plan. This definition is not intended to place limitations on the position description or job classification that the designated individual shall hold within the employer's organizational structure.

Chemical Hygiene Plan: a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace and meets the requirements set forth in 29 CFR 1910.1450

Compressed Gas: A gas which when under pressure is entirely gaseous at -50°C (-8°F), including all gasses with a critical temperature $\leq 50^{\circ}\text{C}$ (-58°F).

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

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

Hazardous chemical: any chemical which is classified as a health hazard or simple asphyxiant in accordance with the [Hazard Communication Standard \(§ 1910.1200\)](#).

Health hazard: a chemical that is classified as posing one of the following hazardous effects: Acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); aspiration hazard. The criteria for determining whether a chemical is classified as a health hazard are detailed in appendix A of the Hazard Communication Standard (§ 1910.1200) and § 1910.1200(c) (definition of "simple asphyxiant").

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

Permissible exposure limits: the maximum amount of a substance, as defined by OSHA, to which an individual can be exposed without experiencing adverse health effects. For laboratory uses of OSHA regulated substances, the employer shall assure that laboratory employees' exposures to such substances do not exceed the permissible exposure limits specified in 29 CFR part 1910, subpart Z.

Reproductive toxins: chemicals that affect the reproductive capabilities including adverse effects on sexual function and fertility in adult males and females, as well as adverse effects on the development of the offspring. Chemicals classified as reproductive toxins in accordance with the Hazard Communication Standard (§ 1910.1200) shall be considered reproductive toxins for purposes of this section.

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

- (i) It is regulated by OSHA as a carcinogen; or
- (ii) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or
- (iii) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (latest editions); or

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

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

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

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



Appendix 2: Laboratory Best Practices



Laboratory Best Practices

Note: This guide is not all-inclusive and should be used in conjunction with the GWU Chemical Hygiene Plan

Chemical Handling

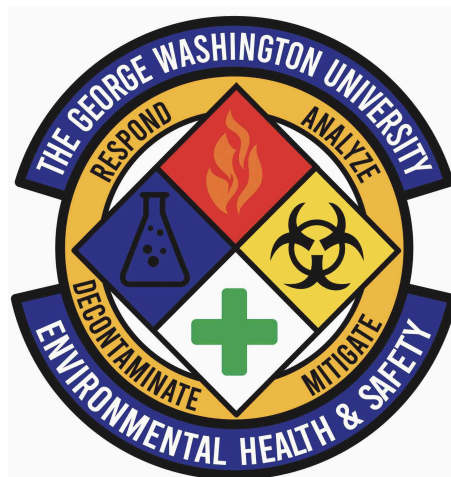
- All chemicals brought into the department are to be entered on the annual inventory list.
- Smoking, drinking, and eating are prohibited in the laboratory
- Treat all chemicals in the laboratory as toxic substances. Minimize your exposure to all chemicals.
- Do not taste anything in the laboratory. This applies to food as well as to chemicals. Do not place your mouth on any chemical equipment.
- Avoid inhalation of vapors of any kind. Exhaust vapors through a hood. To test an odor, fill your lungs with air and cautiously sniff the vapors as you waft (fan) them from the source. Never inhale vapors directly from chemical substances.
- Always wash before eating, drinking, smoking, or applying makeup.
- Wash thoroughly before leaving the lab. Set a designated area for "selected carcinogens", reproductive toxins, and high degree of acute toxicity. Use containment devices such as fume hoods or glove boxes and set up a procedure for the waste and decontamination.

General Work Practice

- Avoid working alone.
- Prohibit horseplay.
- Tie back long hair, jewelry, and any other items that may dangle and become contaminated or entangled.
- Avoid wearing headphones in order to hear what is going on around you.
- Be aware of all personnel coming in and out of the lab.

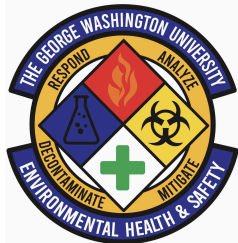
Housekeeping

- Keep benchtops clear of any devices or materials not directly involved in the experiment in progress.
- All work surfaces should be cleared and wiped down with a damp paper towel immediately following use. This includes benchtops, fume hood work surfaces, sink drainboards, sinks, balance pans and scales. Leave the area cleaner than you found it.
- Immediately rinse glassware after use to prevent others from coming in contact with residues left in or on the glassware.
- All lab users are responsible for prompt and proper cleaning, drying and storage of glassware.
- Secure all chemical containers immediately after use to prevent evaporation or accidental spills.



Appendix 3: Laboratory Weekly Checklist





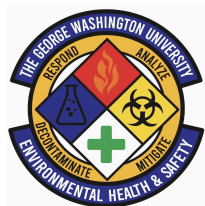
Appendix 3 Daily Laboratory Safety Checklist

Name: _____

Date: _____ Time: _____

Yes	No	N/A	Item	Corrective Action	Comments
General Safety					
			Are entry/exit doors locked?		
			Are restricted access chemicals and cabinets locked?		
			Are aisles and exits easily accessible/free of clutter?		
			Are fire extinguishers present?		
			Is the lab free of slip, trip, and fall hazards?		
			Is there no open food or drink in the lab?		
Administrative Materials					
			Is a designated person in charge present?		
			Are safety data sheets (SDS) available?		
			Is the Lab Hazard Information Sheet posted outside of the entry door?		
			Have all present lab personnel completed required trainings?		
Personal Protective Equipment (PPE)					
			Is PPE being worn where required?		
			Is PPE being properly worn?		
			Is there extra PPE available for the extent of the day's activities?		
Laboratory Equipment and Materials					
			Is a fully stocked spill kit available?		
			Is a fully stocked First Aid kit available?		
			Are fume hoods, biosafety cabinets, and ventilation systems working as required?		
			Are emergency eyewash and showers easily accessible for use?		

Yes	No	N/A	Item	Corrective Action	Comments
Chemical Hygiene					
			Are chemicals stored appropriately (with compatibles, closed caps, location, etc)?		
			Are only in-use chemicals out of storage?		
			Are compressed gas cylinders secured?		
Hazardous Waste					
			Are hazardous waste accumulation areas labeled?		
			Does a FixIt ticket for hazardous waste pickup need to be submitted for <u>chemical waste</u> ?		
			Does a FixIt ticket for hazardous waste pickup need to be submitted for <u>biological waste</u> ?		
Laboratory-Specific Items					
			<i>Example: Are freezers operating at required temperatures?</i>		
Any additional comments:					



Signature: _____ Date: _____

Appendix 4: Standard Operating Procedure Template



Appendix 4: Standard Operating Procedures (SOP) Template

Chemical name/procedure

Standard Operating Procedure

Revision Date: **Insert Date**

Description [Provide additional information as it pertains to your research protocol]

Describe the process, hazardous chemicals, concentration, quantity required, and approximate frequency of use.

Process [Write the steps to perform an activity, or for using a chemical in your research protocol]

Potential Hazards [Provide additional information as it pertains to your research protocol]

State route of exposure (skin, inhalation, ingestion, injection) when/how exposure might occur (inhalation of gases/vapors, inhalation during weighing and mixing, splashes, cleaning up spills, etc.). Be sure to indicate if material is a gas, liquid, powder, pellet, etc. Hazards will be found in the SDS. Look for information on whether the chemical is flammable, corrosive, toxic, carcinogenic, pyrophoric, an irritant, etc.

Permissible Exposure Limits (PELs):

Provide PEL's for chemicals.

Contact EHS for assistance in performing an exposure assessment.

Engineering Controls [Provide additional information as it pertains to your research protocol]

State the safety equipment that must be used (ex. chemical fume hood, Biological Safety Cabinet (BSC), vented ovens, furnaces, glove boxes, etc.). If this is a new process and the appropriate engineering controls do not seem to be available in the lab, discuss with lab staff whether the process can be done and how to obtain what is needed. If no engineering controls are needed please cite this fact. Consider if liquid form would be less hazardous than powder and, if so, purchase in liquid form.

Work Practice Controls [Provide additional information as it pertains to your research protocol]

Describe work practices to be used that reduce exposure to hazardous chemicals. Describe required hand washing and the frequency for changing PPE. Describe additional safe work practices, such as keeping containers closed, working away from open flames, etc.

Personal Protective Equipment [Provide additional information as it pertains to your research protocol]

Describe PPE requirements for each task involving the chemical. (Examples: gloves, lab coat/gown, safety glasses/goggles, face shield, respirator, closed-toe shoes, and splash apron).

Note: Respirators are designed to protect the wearer from specific airborne hazards and are different from surgical masks, which protect the wearer only from splashes and are primarily intended to protect others from infectious aerosols exhaled by the wearer. Respirator use requires employee participation in the Respiratory Protection Program, which involves medical clearance and annual fit testing and training. Please be clear about use of surgical masks versus respirators. (Do NOT use the vague term “masks”.)

Contact EHS for assistance in performing an exposure assessment.

Transportation and Storage [Provide additional information as it pertains to your research protocol]

Describe where will you store hazardous materials in the lab, e.g., solvent, acid, or base cabinet, refrigerator, etc. Be aware of incompatibility with other chemicals already in use in the lab. Chemical containers must be labeled with chemical name (& concentration, if diluted) and hazard warnings at a minimum. Describe transportation strategy (use of secondary containers, travel through low-traffic hallways). State chemical segregation strategies (list incompatibles).

Waste Disposal [Provide additional information as it pertains to your research protocol]

Provide guidance on how waste products are disposed. Be specific and describe the specific disposal procedure to be used, i.e., do not write “Dispose of in accordance with applicable regulations”.

Exposures/Unintended Contact [Provide additional information as it pertains to your research protocol]

Describe what actions to take in an exposure incident i.e. leaving the area for inhalation hazards, removing contaminated clothing and/or PPE, flushing eyes and skin. Describe procedures to contact Risk Management to report exposures, or seeking any medical consultation.

If anyone is in need of emergency medical attention, call 202-994-6111 or 911 immediately.

INJURY TYPE	ACTION	NOTES
Exposure- Eyes	<ol style="list-style-type: none">1. Flush with water for at least 15 minutes2. Seek medical attention.	Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Exposure- Skin	<ol style="list-style-type: none">1. Remove contaminated clothing and footwear.2. Flush with water for at least 15 minutes.3. Remove contaminated clothing.4. Seek medical attention.	Indicate if contaminated clothing can be laundered for reuse or must be discarded as hazardous waste.
Inhalation (including from spills outside the fume hood)	<ol style="list-style-type: none">1. Remove patient from the contaminated area.2. Encourage patient to blow nose to ensure clear breathing passages.3. Ask patient to rinse mouth with water but to not drink the water.4. Seek medical attention.	
Ingestion	<ol style="list-style-type: none">1. If swallowed, refer for medical attention, where possible, immediately.	Urgent hospital treatment is likely to be needed.
NOTE: If an ambulance is needed, call George Washington University Emergency Services at 202-994-6111 or dial 911.		

Emergency Procedures [Provide additional information as it pertains to your research protocol]

Describe how employees should handle spills. Are there specific absorbents that should be used? If it's a gas leak, what do you do when the detectors go off? Be specific. Are there specific concerns to be considered in the event of a fire? For example, some chemicals are water reactive, and using water on a fire where these chemicals are involved will make the problem worse.

Training of Personnel

All personnel shall read and fully adhere to this SOP when performing this process, or handling this chemical.

Certification

I have read and understand the above SOP. I agree to contact my Lab Director if I plan to modify this procedure.

NAME	SIGNATURE	UMID #	DATE

Chemical Hygiene Officer

Revision Date

Major Revisions (Tracking purposes only -- Do not print as part of SOP)

DATE	REVISION

Appendix 5: Chemical Inventory Template



Environmental Health and Safety
Hazardous Material Inventory Control Form

PI/Laboratory Name CHEMICAL INVENTORY									
			Building and Room #						
			Person Completing Inventory, and Title						
			Date Inventory Completed/Reviewed						
Chemical Name	CAS #	Quantity	Hazard Class	Expiration Date	Manufacturer	List of Hazard Classes			
Hydrochloric Acid (40%)	7647-01-0	2 (gal/L/mL)	8	1/1/2024	J.T. Baker	Class 1	Explosive		
						Class 2	Flammable Gas		
						Class 2	Nonflammable Gas		
						Class 3	Flammable Liquid		
						Class 4	Flammable Solid, Pyrophoric, Water Reactive		
						Class 5	Oxidizer, Organic Peroxide		
						Class 6	Poison / Toxic		
						Class 7	Radioactive		
						Class 8	Corrosive		
						Class 9	Miscellaneous (Environmental Hazard, Marine Pollutant, etc.)		
						Health (Other)	Harmful, Irritant, Carcinogen		
						Nonhazardous			
						Cannot Be Determined	- must submit SDS to Safety		

Appendix 6: Packaging Biohazardous Waste



Packing Biohazardous Waste

1.



Flip and fold the bio-box. Then, tape the seams on the bottom of the box with clear packing tape (down the middle and across the sides).

2.



Open the bio-bag and line the bio-box to leave the bio-box open for continuous use.

3.



Tie-off the bio-bag in a knot or twist the top of the bag multiple times and fold the twist down on to the bag.

4.



Tape around the knot or twist, and tape the knot/twist down onto the rest of the bag so it is completely sealed.

5.



Tape the top of the bio-box down the middle and along the seams using the clear packing tape. Label the bio-box with the lab name, building and room number, and packing date.

6.

DONE!