UNIVERSITY of WASHINGTON

Laboratory Safety Manual

September 2009

Including Change 1 – July 2010

Environmental Health and Safety
UNIVERSITY of WASHINGTON

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Change 1 (July 2010) to the September 2009 UW Laboratory Safety Manual:
Identified with columnar lines at locations changed

Major Paragraph/Page Changes, Corrections and Additions:

- Preface: Inserted Change Record as page 3 with blank page 4; other preface pages moved back.
- Section 2.B Chemical Inventory and Material Safety Data Sheets, and 2.B.1 Access to Mychem: Reworded to improve clarity and internet links. (Page 2-5)
- Section 2.C Chemical Management: Chemical Procurement: Completely updated paragraphs 2 Pharmaceuticals and 3 DEA Controlled Substances, and reworded paragraphs 4 and 7 to fit revised paragraphs 2 and 3 on the page. (Page 2-7)
- Section 2.D.3 Chemical Management: Chemical Storage: Chemical Storage Quantity Limits: Updated information about control zone limits decreasing on upper floors, and corrected the table showing allowable container sizes (and its reference), such that metal containers could be used for quantities greater than 5 liters for some flammable and combustible liquids. (Pages 2-10 and 2-11, including Tables 2-2 and 2-3)
- Section 2.G Chemical Management: Special Chemical Hazards: Added new sub-section 10. Process Safety for Highly Hazardous Chemicals. Previous editions of the Laboratory Safety Manual did not address this requirement. (Table of Contents and Page 2-29)
- Section 3.B.7 Chemical Waste Management: What Qualifies as Hazardous Waste: Trash Rules: (Title Change) Completely changed due to new rules from King County no longer using an approved trash disposal listing. Waste chemicals potentially disposable into the trash must be checked for carcinogen, sensitizer and irritant hazards in addition to “previous” hazardous waste definitions. (Table of Contents and Page 3-6)
- Section 3.E.1 Trash Disposal of Chemicals: Updated instructions in accordance with the changes in Section 3.B.7. (Page 3-10)
- Section 3.E.2 Trash Disposal: Trash Disposal of Empty Chemical Containers: added sentence referring to the EH&S web page. (Page 3-11)
- Section 3.F.3 Chemical Waste Management: Sewer Disposal: Chemical Treatment Log: (Title Change) The Sewer Discharge Log is no longer required for disposal of chemicals. However, a Chemical Treatment Log is still required for those who treat chemicals to reduce their hazards and then discharge them to the sink. (Table of Contents, Page 3-12, and Table 4-1 on Page 4-4)

Minor (Short Phrase or Single Word) Changes:

- Preface: Cover Page: Identified as Change 1 – July 2010 (Page 1)
- Preface: October 7, 2009 Letter from the Director: Minor typographical and telephone number corrections (Now pages 5, 6)
- Preface: Acknowledgements: Office name change correction (Now page 7)
- Section 2: Changed wording (Page 2-13) and corrected phone numbers from 206-685-5835 or 206-685-2848 to 206-616-5835 in several places (Pages 2-19, 2-20)
- Section 3: Updated name of Chemical Waste Collection Request throughout and made other updates and typographical corrections such as phone numbers. Added additional details to Section 3.D.5 What Happens to Hazardous Waste? And Section 3.E.2 Trash Disposal of Empty Chemical Containers. (Pages 3-5, 3-6, 3-8, 3-9, 3-10, 3-13, 3-14, 3-15)
- Section 4: Corrected telephone numbers from 206-543-9510 to 206-543-0465 in several places. (Pages 4-8, 4-9, 4-18)
- Appendix A: Cover Page and Scope were updated to September 2010 to correct the content for formaldehyde and permissible exposure limit regulations (Cover and Page 100-2)
- Appendix B: Corrected phone number to 206-616-5835 (Page B-1) and added information about water concentration. (Page B-9)
- Appendix E, Checklist F: Corrected telephone number to 206-543-0465 and deleted reference to University Stores (Page E-19), and Checklist G. SOP Required Elements Checklist: Added additional explanatory material concerning particularly hazardous substances and revised the instructions section. (Page E-23)

UNIVERSITY of WASHINGTON

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October 7, 2009

TO: Principal Investigators and Laboratory Supervisors

FROM: Jude Van Buren Dr.PH, MPH, RN
Director

SUBJECT: UPDATED LABORATORY SAFETY MANUAL

I am delighted to provide for you this revision of the University of Washington's *Laboratory Safety Manual.* This manual was developed in a collaborative effort between the members of the Chemical Hazards Advisory Committee (CHAC), the Environmental Health and Safety Department, and UW researchers.

I would like to thank all who contributed to this revision and in particular, I want to acknowledge and thank the CHAC chair, Elaine Faustman, Professor, Environmental and Occupational Health Sciences, and the following CHAC members:

Paul Hopkins, Professor and Chair, Chemistry
Gary Pedersen, Director, Chemistry
Lia Wetzstein, Environmental Science Lab Coordinator and Lecturer, Interdisciplinary Arts and Sciences, Tacoma Campus
Tony Miller, Buyer, Purchasing
Sam Tillery, Manager, Facilities Services' Health Science Maintenance Zone

Major efforts have been made to make this revision more "user friendly" and I believe that you will find it current, addressing the latest worker safety and environmental regulations as well as more concise and easier to understand.

You are encouraged to frequently review this manual with your employees to assure they understand the key University policies and local, state and federal regulatory requirements under which you are expected to operate your laboratories. New regulatory oversight and guidelines have been given to laboratories in institutions of higher education by agencies such as the Department of Homeland Security, the Environmental Protection Agency, the National Institutes of Health, and our state Occupational Health and Safety program. Maintaining your commitment and oversight in addressing the on-going and new requirements that address the safe handling, processing and disposal of chemicals will continue to be essential.

Prior to recycling your older manual, remember to update and transfer your own “laboratory-specific” information from your old manual to the new manual (see the Quick Start Guide at the front of the manual). If you have questions or need a new binder, please call the Department at 206-543-7388, email Occupational Health and Safety at uwcho@uw.edu or visit our website at http://www.ehs.washington.edu/.

A very sincere thank you in your various roles to keep the University of Washington, an exemplary institution where promoting and practicing environmental, health and safety principles are part of the “University way” of pursuing our educational, research, and service missions.

cc: Denis Sapiro – Manager – Occupational Health and Safety Office

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Environmental Health and Safety
UNIVERSITY of WASHINGTON

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A. BASIC LABORATORY SAFETY PRACTICES

1. Working Alone

Do not work alone in the laboratory if the procedures being conducted involve highly hazardous substances or processes (such as are described in section G later in this section). If you are working alone with lesser hazard chemicals, let personnel in other laboratories know of your presence or develop an accountability system with your supervisor or co-workers.

2. Prevent Chemical Exposure

Prevent skin contact with chemicals. For example, use appropriate personal protective equipment (PPE) (goggles, gloves, lab coat, etc. per Lab Safety Manual Section 5.B) but consider it as “the last line of defense” and use other precautions such as using appropriate containment equipment and regularly checking that connections are tight. Clean up spills as soon as possible and minimize clutter to avoid inadvertent spills.

Prevent inhalation of chemicals. For example, use a fume hood whenever handling volatile or aerosolized chemicals, even if they are of relatively low toxicity. Cap chemicals as soon as is convenient. Limit the smelling of chemicals to the minimum amount necessary and only if no other method of identifying a chemical is available.

Prevent ingestion of chemicals. For example, do not taste chemicals. Mouth suction must not be used to pipet chemicals or to start a siphon; instead, a pipet bulb or an aspirator must be used to provide a vacuum.

Prevent injection of chemicals. For example, cap needles as soon as the injection is complete. Use needles with inherent safety devices that prevent inadvertent needle sticks. Dispose of sharps into appropriate waste containers. If operating a high pressure system, never check for a pressure leak using your hands.

3. Washing Hands

Wash hands well with soap and water after removing gloves and before leaving the laboratory area. Never wash with organic solvents. (See Section 5.B Personal Protective Equipment and Appendix G Gloves for more information.)

4. Food and Drink

Food and drink increase the chance of exposure to chemicals and are prohibited from being prepared or consumed in laboratories using chemicals. Smoking is prohibited inside all University owned or occupied facilities and vehicles (see http://www.ehs.washington.edu/psosmoking/index.shtm).

a. Glassware/Utensils

Glassware or utensils that have been used for laboratory operations must never be used to prepare or consume food or beverages.

b. Storage of Food/Beverages

Laboratory refrigerators, ice chests, and cold rooms must not be used for food or beverage storage.

5. Vacuum

Use extra care when evacuating air from glassware. Shield or wrap the glassware to contain chemicals and glass fragments should implosion occur. When possible use thick wall vacuum glassware.

6. Access to Emergency Exits and Equipment

Storage, even temporary storage, and equipment must not block doorways, corridors, aisles, stairways, and laboratory emergency kickout panels to assure unobstructed access to exits in the event of an emergency. Likewise, emergency equipment, such as eyewashes, deluge showers, fire extinguishers, and fire alarm pull stations, must be directly accessible.

7. Laboratory Signs

Laboratory signs must be posted as described in Section 4.C. These signs may provide information (*e.g.*, emergency numbers), prohibit unsafe behavior or require protective measures, or designate locations of various supplies and equipment.

Magnetic or framed signs that can be easily moved may be used to designate a temporary hazard. Warning signs must be removed when the hazard no longer exists, such as a sign indicating the presence of a chemical that is no longer kept in a laboratory.

B. CHEMICAL INVENTORY AND MATERIAL SAFETY DATA SHEETS

Laboratories must maintain chemical inventories in MyChem, the University of Washington's campus-wide chemical tracking system. MyChem is designed for emergency planning efforts and helps laboratories comply with federal, state, and local regulations. Chemical inventories, location contacts, and Material Safety Data Sheets (MSDSs) are provided to emergency personnel so they know what chemicals may be involved in an accident and who to contact in the event of an emergency. Laboratories use chemical inventories to keep track of chemicals and to avoid unnecessary purchases.

Laboratory staff are required to maintain their chemical inventories in MyChem to facilitate compliance with Bothell, Seattle or Tacoma Fire Department Hazardous Material Storage and Use Permits (occupancy permits), EPA Community Right-To-Know reporting, and Department of Homeland Security chemical security requirements.

MyChem also stores more than 425,000 MSDSs. MSDSs provide an overview of the hazards of products used in the laboratories. All employees should be able to readily access an MSDS for any chemical they are using.

1. Access to MyChem

For access to MSDSs, go to http://mychem.ehs.washington.edu and login using your UWNetID and password.

To request access to site-specific chemical inventories and the Chemical Exchange, register your name and your specific inventory locations at https://www.ehs.washington.edu/pubcookie/epo/mychemcomboform.php or send an email to mychem@uw.edu.

MyChem is easy to use, but if you have questions or desire additional information, a MyChem User's Manual is available on the MyChem web site (http://mychem.ehs.washington.edu). You may also phone EH&S at 206-616-4046.

Hands-on computer training is available for groups upon request. Register at http://www.ehs.washington.edu/psotrain/corsdesc.shtm#mychem .

2. Conducting your Chemical Inventory

Personnel must inventory all chemicals found in the laboratory and specify the maximum amount normally found at this location. Dilutions and reagents prepared in the lab for further work do not need to be added to the inventory, but must have a container label applied unless the preparation will be all used or disposed that day. Review and update inventories annually and whenever there are significant changes in your chemical inventory, such as when you are moving a laboratory or starting a new project.

A worksheet that helps you inventory prior to entry into MyChem is available at http://www.ehs.washington.edu/epomychem/mychemworksheet.pdf.

While conducting your inventory, examine containers for deterioration and integrity. Chemicals that are expired, in bad shape or no longer needed must be managed as hazardous chemical waste. For more information about chemical waste management, see Section 3 of this manual.

After completing the inventory, the Chemical Hygiene Officer should print two copies of the inventory from MyChem: one copy for the lab and one for home in case of an after-hours emergency in the laboratory.

3. Material Safety Data Sheets (MSDSs)

Material Safety Data Sheets (MSDSs) are documents that describe the physical and health hazards of chemicals. Manufacturers of chemicals must provide MSDSs for chemicals that they sell. Although many MSDSs have limited application in laboratories due to their orientation towards industrial use of large quantities of a chemical, they provide basic information that all persons using that chemical need to know.

MyChem is the University of Washington's centralized MSDS database for chemicals used by University personnel (see Section B.1, above). EH&S maintains the MyChem MSDS database.

Laboratory staff and students must have ready access to MSDSs for all chemicals used in the laboratory. The department or laboratory may choose whether to maintain the MSDSs in either electronic or paper format. The source of the MSDS is less important than the requirement that all personnel using chemicals or working around the chemicals must be able to demonstrate that they can retrieve the MSDS for a chemical within a short period (such as within five minutes). MyChem allows researchers to link to electronic and updated MSDSs directly, so is a suitable tool for fulfilling this requirement.

EH&S recommends laboratories maintain paper copies of MSDSs for the hazardous chemicals most likely to spill and/or cause injury to someone. Having an MSDS immediately available when someone has been exposed to a hazardous chemical helps emergency personnel decide how to respond and treat that person.

Call EH&S at 206-616-3441 to request assistance locating or accessing MSDSs during business hours. For MSDSs which are in the MyChem system, EH&S will obtain the MSDS for you and fax a copy within a work shift. Chemicals that do not have an MSDS in the system will take longer to research and obtain. After business hours, contact the UWPD at 206-685-8973; UWPD will contact an EH&S representative.

A Safety Data Sheet (SDS) generated in accordance with the Globally Harmonized System of Classification and Labeling of Chemicals provides similar information to an MSDS and is an acceptable alternative to an MSDS.

If an MSDS or SDS is received with a chemical shipment please maintain a copy in the lab, and send the original MSDS or SDS to EH&S (Box 354110, c/o MSDS Coordinator) for addition to the MyChem database.

C. CHEMICAL PROCUREMENT

Most chemical products can be purchased without restriction from suppliers through eProcurement (on-line ordering system) or through UW Purchasing Services. However, the following rules and guidelines apply to some chemicals.

1. Hazardous Chemicals

Order only the amount of chemicals needed. Many manufacturers will supply smaller quantities or containers if requested by the purchaser. Do not stockpile chemicals. Chemicals that are expired and/or appear to be no longer useful are considered hazardous waste.

Purchase hazardous chemicals in plastic coated bottles (when available) instead of uncoated glass bottles.

If possible, hazardous chemicals should be received directly by the laboratory. If it is received in an office, there should be a safe location such as a designated table with adequate open space reserved for temporary storage of the package.

When you open a shipment, you should verify that the proper chemical was sent, that the container is intact, and that the label is legible. The date of receipt should be written on the container's label.

2. Pharmaceuticals

Pharmaceuticals not regulated by the Drug Enforcement Administration (DEA), *e.g.* antibiotics, heparin, sterile water, and over the counter drugs, can be purchased through UWMC Drug Services. Some restrictions may apply. For more information and to see the pharmacy formulary list, go to https://eres.lib.washington.edu/coursepage.asp?cid=1805&page=01. If you do not know exactly what is needed, email questions to drugsvcs@uw.edu.

3. DEA Controlled Substances

DEA registrants can obtain controlled substances from a drug company, wholesaler or UWMC Drug Services. If you wish to order a controlled substance through Drug Services, a current Controlled Substances Registration Certificate must be faxed or mailed to Drug Services before an order can be filled. Controlled substances must be stored in a locked cabinet with limited access. A perpetual inventory must be maintained and the inventory forms used must meet DEA and State regulations. Expired or waste (undesired) drug must be kept secure in a locked cabinet in a separate container properly labeled for content, and inventoried until disposal. Drug Services or EH&S will provide the contact information of DEA-licensed reverse distributors who must be used for disposal. For more information, contact Drug Services (drugsvcs@uw.edu) or EH&S (ehsdept@uw.edu or 206-616-5835).

4. Non-Denatured Ethyl Alcohol

Instructions for obtaining approval and purchasing non-denatured ethyl alcohol are detailed on the UW eProcurement web site at http://www.washington.edu/admin/stores/eprocurement/ . Instructions for maintaining accountability for tax-free ethyl alcohol are in Administrative Policy Statement (APS) 15.1 at http://www.washington.edu/admin/rules/APS/15.01.html.

5. Radioactive Materials

The State of Washington Department of Health, Division of Radiation Protection, licenses radioactive materials use. Using radioactive materials requires the prior approval of the EH&S Radiation Safety Office. Orders for radioactive materials must be placed through the UW Purchasing Department.

6. Highly Dangerous Materials

Materials that are extremely hazardous to property, health or the environment (explosives, pyrophoric materials, highly water reactive chemicals, and highly toxic gases, for examples) must not be procured until the necessary permits and administrative, engineering and environmental controls are in place. Hazardous materials must be stored and used in accordance with numerous regulations including, but not limited to, the International Fire Code and local amendments. See Section G: Special Chemical Hazards, below, for examples. Contact the EH&S Building and Fire Safety Office at 206-543-0465 for more information.

7. Compressed Gas Cylinder Procurement

Whenever possible gas cylinders should be purchased through the preferred supplier, Praxair, to ensure that the supplier has a cylinder return authorization program. Please refer to the UW eProcurement web site http://www.washington.edu/admin/stores/eprocurement . Contact information concerning Praxair is also available on the EH&S web page http://www.ehs.washington.edu/fsohazmat/gascylinders.shtm .

If a different vendor must be used to provide a specialty gas, the purchaser must get a written return agreement from the distributor or manufacturer prior to purchasing the gas. It is

important that the return agreement include a statement requiring the manufacturer to take back both the cylinder and any unused gas. The purchaser should retain this agreement until the manufacturer has accepted the returned cylinder.

8. Chemical Exchange

The UW Chemical Exchange program facilitates the free exchange of chemicals campus-wide via MyChem, the online chemical inventory system. Consider checking the online Chemical Exchange (accessible only to UW employees) for chemicals before you buy new chemicals. For more information about this program, see the MyChem website at http://www.ehs.washington.edu/epomychem/index.shtm.

D. CHEMICAL STORAGE

1. Segregate Incompatibles

To avoid dangerous interactions among incompatible chemicals, chemicals should be physically segregated by observing the general classes listed in Table 2-1 and by checking the MSDS. Incompatible chemicals within these classes should also be segregated. You can contact EH&S at 206-543-7388 for additional information about chemical hazard classes and compatible storage.

Table 2-1 Chemical Use Category Segregation Table

Acids	Segregate acids from active metals such as sodium, potassium, magnesium, etc.
	Segregate oxidizing acids from organic acids such as glacial acetic acid and from flammable and combustible materials, such as cardboard boxes.
	Segregate acids from chemicals which could generate toxic or flammable gases upon contact, such as sodium cyanide, iron sulfide, calcium carbide, etc.
	Segregate acids from bases.
Bases	Segregate bases from acids, metals, explosives, organic peroxides and easily ignitable materials.
Flammables.	Store in approved safety cans or cabinets. Segregate from oxidizing acids and oxidizers. Keep away from any source of ignition: heat, sparks, or open flames. Also see section D.3 below.
Oxidizers	Store in a cool dry place. Keep away from combustible and flammable materials. Keep away from reducing agents such as zinc, alkali metals, and formic acid.
Cyanides	Segregate from acids and oxidizers.
Water Reactive Chemicals	Store in a cool dry place away from any water source. Have a Class D fire extinguisher available in case of fire. Also see section G.1.e below.
Pyrophoric Substances	(Materials that will react with the air to ignite when exposed, e.g., tert-butyl lithium.) Store in a cool dry place, making provisions for an airtight seal. Also see section G.1.d below.
Light Sensitive Chemicals	Store in amber bottles in a cool, dry, dark place.

Peroxidizable Chemicals	Store in airtight containers in a dark and cool place. Most peroxidizable compounds are flammable and should be stored in a flammable liquid storage cabinet or room. Label containers with receiving, and opening dates. Periodically test for the presence of peroxides. Discard before exceeding expiration date. Also see section G.2.b below.
Toxic Chemicals	Store according to the nature of the chemical, using appropriate security where necessary. Also see section G.1.a below.
Nitrated compounds	Nitrated compounds can be considered explosive; special care and handling may be required. Also see section G.2.a below.

2. General Chemical Storage Guidelines

Follow good storage practices no matter wherever the chemicals are stored (i.e. cabinets, refrigerators, or shelves).

a. Good Storage Practices

1) Cabinets - Whenever practical, chemicals should be stored in approved cabinets.

2) Shelves - All shelves should be securely anchored to walls and fitted with 2-inch lipped edges or enclosed in cabinets with latched doors.

3) Heavy Objects - Heavy objects should be stored on lower shelves.

4) Corrosives – Corrosives should be stored only below eye level.

5) Secondary Containment - When practical, chemicals in the same hazard class that are compatible should be stored in secondary containment tubs that are chemically resistant and unbreakable.

6) Consistent Chemical Storage Locations - Particularly hazardous substances (highly dangerous or toxic chemicals, select carcinogens, mutagens, and teratogens) should be stored together if compatible. Signs should be posted indicating their location and unique hazards.

7) High Degree of Toxicity - Chemicals with a high degree of toxicity (*e.g.* venoms, mycotoxins, and select agents) should be doubly contained and stored in a locked area accessible only by authorized personnel. Use containers that are chemically resistant and non-breakable.

8) Chemical Waste - Store chemical wastes following the same guidelines as above. Original container labels must be obliterated and the containers must be labeled with a completed University of Washington hazardous waste label. Secondary containment is required if chemical waste is stored near a floor drain or other drain to sanitary sewer. Avoid mixing incompatible waste materials. Serious laboratory accidents, such as a death at the University of Washington in the early 1970's, have occurred when people have mixed incompatible waste materials. For more information about chemical waste, see Section 3 of this manual.

b. Incorrect Storage Practices

1) Acids - Do not store inorganic acids with flammable solvents, flammable acids or combustibles (such as cardboard). Contact of a concentrated oxidizing acid with a flammable solvent may result in a fire or an explosion. Other incompatible chemical storage practices are shown above in section D.1.

2) Heat/Direct Sunlight - Exposure of chemicals to heat or direct sunlight should be avoided. Even if the chemical is stable, plastic containers have degraded from sunlight.

3) Storage on Floors, on Bench Tops or in Fume Hoods - Chemicals should not be stored on the floor or be so numerous as to clutter bench top work areas. Storing more than a few chemicals in a fume hood will compromise the effectiveness of the hood unless they are stored on a shelf a few inches above the work surface of the fume hood (so that air can enter the slot at the back of the work surface).

4) Storage Height – Do not store heavy containers on the floor or above waist level. Do not store corrosives above eye level. Do not store items closer than 18 inches from the ceiling if the area has fire sprinklers.

5) Hallway Storage – Do not store chemicals in hallways, corridors and exit ways.

3. Chemical Storage Quantity Limits

a. Control Zones

Chemical quantities in most University buildings are limited by the local fire code, which is based on the most recent International Fire Code (IFC) adopted by the local jurisdictions. (Note: Local amendments to IFC have been made by Bothell, Seattle, and Tacoma Fire Departments.) Limits by hazardous material classification apply to a control zone that may include up to an entire floor of a building. Quantity limits may be increased if fire sprinklers protect the building or, in some cases, if hazardous materials are in approved cabinets. Limits in control zones above the second floor are reduced by the fire code and the higher the floor the greater the reduction. Researchers and other building occupants must cooperate with each other to make sure that hazardous material quantities do not exceed code limits. This can be aided by maintaining an accurate chemical inventory in MyChem.

Some specific quantity limits per control zone are listed in the following table (Table 2-2, Example Hazardous Material Quantity Limits). This table is not complete and there are also many additional criteria in the implementation of the limits. To assure compliance with the IFC, contact the EH&S Building and Fire Safety Office at 206-543-0465.

Table 2-2 Example Hazardous Material Quantity Limits

Material	Quantity Limits per Control Zone	IFC Citation	Comments
Class I-A Flammable Liquids	30 gallons	2703.1.1	Limits increased if stored in approved cabinets, or the zone is sprinklered.
Combination Class I-B/ I-C Flammable Liquids	120 gallons	2703.1.1	Limits increased if stored in approved cabinets, or the zone is sprinklered.
Flammable Gas	1000 cubic feet	2703.1.1	Limits increased if stored in approved cabinets, or the zone is sprinklered.
Organic Peroxide Class I to V	5 pounds or more	2703.1.1	Limit depends on class.
Pyrophoric	4 pounds	2703.1.1	Only allowed in sprinklered buildings.
Water Reactives, Class 1 to 3	5 pounds or more	2703.1.1	Limit depends on class.
Highly Toxic Materials	10 pounds or	2703.1.1	Gas may only be used and stored in

Material	Quantity Limits per Control Zone	IFC Citation	Comments
	20 cubic feet (gas)		approved ventilated cabinets or exhausted enclosures.
Corrosives	810 cubic feet	2703.1.1	Limits increased if stored in approved cabinets, or the zone is sprinklered.
Liquid Corrosives	500 gallons	2703.1.1	Same as Corrosives.
Toxics	500 pounds	2703.1.1	Same as Corrosives.

b. Flammable Liquids in Basements

In Seattle, flammable liquids are prohibited in basement laboratories except for laboratories conforming to Seattle Fire Department Administrative Rule 34.03.04. The rule is online at http://www.seattle.gov/fire/FMO/firecode/adrules/AdRule34.03.04.pdf. For assistance in determining local requirements, contact EH&S at 206-543-0465.

c. Additional Requirements

In a laboratory, a maximum of 10 gallons of flammable liquids, in approved containers, may be stored outside of a flammable liquid cabinet. See the following table, Table 2-3, Approved Flammable Liquid Storage Containers, for container types and limits (Reference: NFPA 30, Table 9.4.3). Flammable liquid containers larger than 5 gallons are not permitted in laboratories without specific approval.

Table 2-3 Approved Flammable Liquid Storage Containers

Container Type	Flammable Liquids			Combustible Liquids	
	Class I-A	Class I-B	Class I-C	Class II	Class III
	Flash Point < 73 °F Boiling Point < 100 °F (Ethyl ether)	Flash Point < 73 °F Boiling Point ≥ 100 °F (Hexane)	Flash Point ≥73 °F and < 100 °F (Diesel fuel)	Flash Point ≥ 100 °F and < 140 °F (Mineral spirits)	Flash Point ≥ 140 °F (Kerosene)
Glass	0.5 L (1.05 pt) *	1 L (1.05 qt) *	5 L (1.3 gal)	5 L (1.3 gal)	20 L (5.3 gal)
Metal	5 L (1.3 gal)	20 L (5.3 gal)	20 L (5.3 gal)	20 L (5.3 gal)	20 L (5.3 gal)
Rigid Plastic IBCs (UN 31H or 31H2)	0	0	0	3000 L	3000 L
Composite IBCs w/flexible inner receptable (UN31HZ2)	0	0	0	0	0
Polyethylene UN 1H1	5 L (1.3 gal)	20 L (5.3 gal)	20 L (5.3 gal)	450 L	450 L
Safety Can	10 L (2.6 gal)	20 L (5.3 gal)	20 L (5.3 gal)	20 L (5.3 gal)	20 L (5.3 gal)
* Containers may be up to 5 Liters for reagents of Analytical Purity Grade or High Grade.					

E. CHEMICAL LABELING

1. Original Container

The label on an original container must be legible, be written in English and include the chemical name, the hazard warnings and the manufacturer's name and address. If a container label becomes illegible during use, you must affix an extra copy of the original container label or a completed generic label.

2. Transfer to Additional Containers

Chemicals are often transferred from the original container to another container. This second container must be labeled with the chemical name (which must be the same name as on the original container's label and the MSDS) and hazard warnings. Examples of the second container's label are shown below in Figures 2-1 and 2-2. The label should also include the initials of the person who made the transfer and the date of the transfer.

3. Labeling Instructions

Your department may require a specific type of label. Describe any departmental or laboratory-specific requirements for labels in the laboratory-specific information section of your CHP. Types of labels routinely used on containers are shown below. The method of affixing the label to the container (i.e., glue, tape or wire) is also at the discretion of the department/laboratory.

Preparations, sample aliquots, etc. do not need to be labeled if the container will be under the control of a person who knows what is in the container and it will be emptied before the end of the work shift. If a preparation or working solution will be kept for a longer period, the container must be labeled with the content identity and hazards, and should be labeled with date of preparation and preparer's initials or name.

A container that is too small for labels, installed into a process, or would become unusable for its intended purpose if labeled must still have its contents identified in some way. Use any labeling method that enables employees and visitors from other agencies such as the fire department to identify the chemicals and their hazards. Examples include a sign identifying the materials and their hazards, or color or numeric codes cross-referenced on a chart, or room diagrams identifying locations of the chemicals and hazards.

Label chemicals that form peroxides or other hazardous products when exposed to air with the date the container was first opened, using the form (UoW 1716) shown in Section G.2.b below.

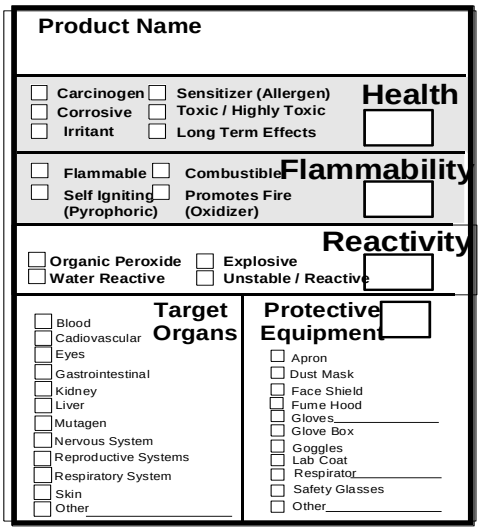
Label chemicals listed in the Chemical Facility Anti-Terrorism Standards (CFATS) with warning labels as described in Section G.9.b below to remind workers that the substances are regulated and cannot be shipped off campus without prior EH&S notification.

Waste containers must be labeled following guidelines in this manual in Section 3 for hazardous chemical waste. For radioactive waste, see Section 14 of the UW Radiation Safety Manual. For biological waste, see page IV-42 of the UW Biohazard Manual. If re-using a container to hold waste, the container must be compatible and appropriate for the waste. Completely deface all old labels.

a. UW Hazard Label

The UW Hazard Label (Figure 2-1) is no longer available from University Stores, but previous stocks can continue to be used. Various suppliers have similar labels.

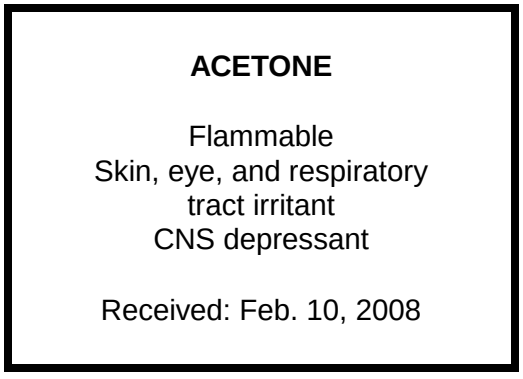
Figure 2-1 UW Hazard Label



b. Handwritten Label

Handwritten labels as shown in Figure 2-2 may be used to label additional containers. The container's contents must be identified and the chemical's hazards must be described. EH&S recommends that you also add the name and date associated with the container to help with chemical management.

Figure 2-2 Handwritten Label



c. HMIS® Label

HMIS® is a commercially available rating and labeling system as shown in Figure 2-3. Developed by the National Paint and Coatings Association, it is a complete hazard communication program in which the hazard ratings are related to personal protective equipment. More information is available at http://www.paint.org/hmis/index.cfm. These labels may be used for your containers. The chemical's name and hazard ratings must be written on the label and the chemical's hazards must be described.

Figure 2-3 HMIS® Label

d. Globally Harmonized System (GHS) Labels

The Globally Harmonized System for Classifying and Labeling Chemicals is a system coordinated internationally which uses standardized hazard terms, warning statements, and pictograms or icons on product labels. (The label format is also standardized.) If you are making an additional container label for a product labeled in accordance with the GHS, you must include the product name and hazards, but you do not need to include all the warning statements and pictograms or icons. (Information about the GHS labeling system is available at http://www.unece.org/trans/danger/publi/ghs/ghs_rev01/01files_e.html and http://www.osha.gov//dsg/hazcom/ghs.html,)

F. TRANSPORTING CHEMICALS

Avoid transporting chemical containers which may have contamination on the outside (*i.e.*, avoid the need to wear gloves or other PPE while transporting chemicals). If gloves must be worn, either be escorted by another person to open and close doors and press elevator buttons or remove the glove from one hand and use it to open doors while holding the chemical in the other hand.

1. Transporting between Floors and Buildings on Campus

This section applies to transportation by hand or by cart. In general, when possible, use freight-only elevators when moving chemicals between floors.

a. Moving a Single Chemical

1) The person doing the moving must be trained in the hazards of the chemical and know what to do in the event of a spill of that chemical.

2) The exterior of the container should be clean enough that it could be handled without the need for protective gloves.

3) Chemical bottles must be labeled and should be securely capped and placed in a bottle carrier.

4) Chemical containers that are glass and do not have closing caps or handles should be placed in bottle carriers or larger containers and surrounded by vermiculite or other absorbent material.

a. Nitrated Compounds

Nitrated organics and inorganics constitute the largest class of compounds that are explosive when dehydrated.

Purchase nitrated compounds in small quantities. Do not break the seal on the cap until the chemical is needed.

When you purchase a nitrated compound, weigh the container and note the weight on the bottle. Prior to subsequent use, weigh the container again. If the container weighs less, add an appropriate solvent to replace the weight lost. After the reagent is opened and an aliquot is taken, again note the weight of the container. Visually inspect the container for problems prior to each use and wipe down the bottleneck, cap, and threads with a wet cloth before resealing.

Additional factors need to be addressed in your SOPs are described in the opening paragraph of Section G above.Examples of nitrated compounds are shown in Table 2-9.

Table 2-9 Nitrated Compounds

Diphenyl hydrazine	3-Nitrotoluene	Trinitrophenol (Picric acid)
Nitrocellulose	Trinitrobenzene	Trinitrotoluene

Picric acid is a nitrated compound usually purchased as a solid wet with 10% water. Extreme heat, blasting cap, or electric charge can detonate picric acid. It becomes highly unstable if allowed to dehydrate. When wet, picric acid is an orange colored, compact crystalline solid with the consistency of lumpy sand. When dry, picric acid is a crystalline solid with visible air pockets below the surface.

Picric acid will readily form explosive metal picrates. These metal picrates are extremely shock sensitive and will detonate with the slightest movement or vibration. Do not allow picric acid to contact metal that is readily oxidized or be stored in a container with a metal cap. Lead, iron and copper metals are particularly dangerous, due to metallic picrate formation.

b. Organic Peroxide-Forming Solvents

Organic peroxide-forming solvents become shock sensitive when allowed to oxidize and form appreciable quantities of explosive peroxides. Most of these solvents are also flammable. Most peroxide forming solvents are colorless, mobile liquids. Oxidation can occur when the solvent is exposed to atmospheric oxygen. This reaction is catalyzed by light as well as by temperature and pressure changes.

The additional precautions you take to control peroxide-forming hazards (described in the opening paragraph of Section G above and in this section) need to be documented in your SOPs. Below is a list of good laboratory practices. For more information, see the Peroxide Forming Chemicals Management and Assessment Guidelines online at http://www.ehs.washington.edu/forms/epo/peroxideguidelines.pdf.

1) Highly Concentrated Peroxides - Over a period of time, peroxide concentrations can increase to hazardous levels. Solvents with high concentrations of peroxides will appear viscous or contain needle-like crystals. If peroxides are visible, no further handling is recommended. Contact EH&S at 206-616-5835 for assistance with professional testing and stabilization.

2) Explosive Capability - Peroxides formed in organic solvents have caused some laboratory accidents, including unexpected explosions during distillation and use.

Such formulations are considered low powered explosives in that they will detonate in moderate concentrations by modest shock, friction, or when heated. The biggest dangers of organic peroxides in these solutions are opening the container and distilling. Do **NOT** open or move the container if you see crystals on or around the container cap. Call for assistance if you are concerned about opening the container (EH&S, 206-616-5835).

3) Required Procedures - Purchase peroxide forming solvents in small quantities that contain an inhibitor, such as butylated hydroxytoluene (BHT), which will delay the formation of peroxides until the inhibitor is used up. Label the container with the date received and opened. Label the container with the standard peroxide label (UoW 1716) (see Figure 2-4 below). Do not break the seal on the container until the solvent is needed. Once opened, store solvent in an airtight amber glass bottle or metal container, with an inert gas, such as nitrogen, in the headspace.

Figure 2-4 Peroxide Label (UoW 1716)

4) Testing Peroxides - It is a good laboratory practice to use test strips to test the solvent for peroxides prior to each use. After each use, wipe down the bottleneck, cap and threads with a cloth before resealing. Reduce formed peroxides and add an inhibitor as necessary to keep the concentration of peroxides below 10 ppm. Test and treatment methods can be obtained by calling EH&S at 206-616-5835. Extreme caution should be exercised if concentrations of peroxides exceed 30 ppm.

5) Distillation and Evaporation Precautions - Always test for peroxides before distillation or evaporation because these procedures will increase the concentration of any peroxides present. Do not distill or evaporate solvents containing any amount of peroxides. Use a water bath over a hermetically sealed electrical mantle to safely heat the solvent. Use any distilled solvent immediately, or add an inhibitor.

6) Use of Inhibitors – Inhibitors slow the formation of peroxides in the future. They do not reduce or remove peroxides. Organic peroxides should be reduced safely.

7) Monitoring Expiration Date - Use the solvent before the manufacturer's expiration date. Peroxide-forming solvents exceeding their expiration date cannot be discarded through EH&S until the contents have been tested for peroxides. Examples of peroxide formers are shown in Table 2-10 below.

Acetone cyanohydrins (stabilized), aluminum phosphide, and phosphorus pentasulfide must be treated before collection. Contact EH&S for details before filling out the collection request if you wish to dispose of one of these three chemicals.

10. Process Safety for Highly Hazardous Chemicals

If there is any chance that the quantities of hazardous chemicals handled at one time may exceed the quantity limits of WAC 296-67, Process Safety Management of Highly Hazardous Chemicals, additional safety precautions must be taken. The basic regulation is viewable at http://www.lni.wa.gov/wisha/rules/hazardouschemicals/default.htm and a table listing chemical limits in pounds that require implementation of this process is at http://www.lni.wa.gov/wisha/rules/hazardouschemicals/PDFs/Chemchart.pdf .

Among the requirements is a formal, documented failure analysis using techniques such as

- What-If,
- Checklist,
- Fault Tree Analysis,
- Hazard and Operability Study (HAZOP),
- Failure Mode and Effects Analysis (FMEA), or
- Other equivalent methodology for assessing hazards.

Assistance on these techniques is available from EH&S (206-543-7388). Other requirements, such as storing highly toxic gases in a gas storage cabinet may be required as described in earlier paragraphs in this section.

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Section 3 - Chemical Waste Management

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For mixtures such as diluted wastes and wastes containing more than one constituent, an Equivalent Concentration (EC) for the mixture must be calculated to determine the toxicity level of the mixture. If the EC is greater than or equal to 0.001%, the waste is toxic. The formula for the EC is:

$$EC(\%) = \Sigma X\% + \frac{\Sigma A\%}{10} + \frac{\Sigma B\%}{100} + \frac{\Sigma C\%}{1{,}000} + \frac{\Sigma D\%}{10{,}000}$$

For example, a mixture of 0.01% aldrin (toxic category A), 1.0% endrin (toxic category A), 4.0% benzene (toxic category D), 2.0% phenol (toxic category C) and 5% dinoseb (toxic category B) in water (nontoxic) exceeds the toxicity:

$$EC(\%) = 0\% + \frac{(1.0\% + 0.01\%)}{10} + \frac{5.0\%}{100} + \frac{2.0\%}{1{,}000} + \frac{4.0\%}{10{,}000} = 0.153\%$$

If you are not confident enough or willing to use the above equation to determine whether your chemical mixture is toxic, please fill out and submit a Waste Evaluation Request, online at http://www.ehs.washington.edu/forms/epo/1957.pdf. EH&S staff will then evaluate your waste and advise you on proper disposal of your chemical.

5. Persistent

Persistent chemicals do not biodegrade quickly in the environment. There are two main categories of persistent chemicals, described below.

a. Halogenated Organic Compounds

A halogenated organic compound (HOC) is a molecule that includes one or more atoms of fluorine, chlorine, bromine, or iodine. When a waste mixture contains one or more halogenated organic compounds, the total halogenated organic compound concentration is determined by summing the concentration percentages of each halogenated organic compound. If a waste mixture contains more than 0.01% HOC, the waste is persistent and therefore hazardous. For example, a waste contains 0.009% carbon tetrachloride, 0.012% DDT, and 0.020% 1,1,1-trichloroethylene. The total halogenated organic compounds concentration calculation indicates the mixture is persistent, as follows:

Total HOC Concentration = 0.009% + 0.012% + 0.020% = 0.041%

b. Polycyclic Aromatic Hydrocarbons

The following polycyclic aromatic hydrocarbons (PAHs) are regulated: acenapthylene, acenapthene, anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(q,h,i)perylene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, fluoranthene, fluorene, naphthalene, phenanthrene and pyrene. When a waste contains one or more of these PAHs, determine the total concentration by summing the concentration percentages of each regulated polycyclic aromatic hydrocarbons. If the waste contains more than 1% PAHs, the waste is persistent and therefore hazardous. For example, a waste contains 0.08% chrysene and 1.22% 3,4-benzo[a]pyrene. The total polycyclic aromatic hydrocarbon concentration calculation demonstrates the mixture is persistent as follows:

Total PAH Concentration = 0.08% + 1.22% = 1.30%

6. Carcinogenic

The Washington Department of Ecology briefly regulated chemical wastes that are suspected or known to be carcinogenic. However, these rules were challenged and the Department of

Ecology retracted the rules. EH&S nevertheless strongly encourages you to manage chemical waste that is carcinogenic or mutagenic as if it were hazardous waste, even if it is not toxic according to the definition above, which accounts for acute and immediate toxicity.

7. Trash Rules

Non-hazardous solid chemicals can go in the trash. Known, probable or suspected carcinogens, irritants and sensitizers cannot go in the trash

Deface labels. Bag and label chemicals as “non-hazardous.” Liquids and pressurized containers like aerosol cans can never go in the trash.

Uncontaminated or slightly contaminated items such as gloves, paper towels and empty containers can go in the trash. EH&S recommends double-bagging and labeling these items as “non-hazardous” if there is evidence of contamination. Manage very contaminated items, such as spill cleanup materials, as hazardous waste. Also, empty containers for extremely toxic chemicals are hazardous waste unless you triple rinse them and dispose of the rinseate as hazardous waste.

8. Local Sewer Limits

These rules determine what can be poured down the sink and sometimes supersede Hazardous Waste rules. Please also refer to the local sewer limits rules in Section F below.

9. Waste Evaluation Request

If you are unsure whether your waste is hazardous, please submit an online Waste Evaluation Request . Fill out all information completely, and attach the MSDS(s) for the chemical(s) to it. EH&S staff will evaluate your waste stream for you and advise you on proper disposal.

C. HAZARDOUS WASTE ACCUMULATION RULES

Follow the below rules for hazardous chemical waste accumulation.

1. Appropriate Containers

Accumulate waste in an appropriate container compatible with the waste. You may reuse containers, even containers that were used for other chemicals, if they have been rinsed and the original labels have been defaced (note that the rinseate may be hazardous waste according to the definitions in Section B, above.) Containers that were designed for solid chemicals should not be used for liquids. Use only containers that show no sign of damage or deterioration.

You must use containers with screw top closures. The lids of waste containers should be removed only when waste is being added to the container. Use spring loaded funnels for adding waste frequently to waste containers.

Finally, do not fill the containers completely. Each container must have at least a one inch of headspace above the waste when it is collected. Request collection of your waste ahead of time to avoid overfilling your containers.

2. Hazardous Waste Labels

Label the container using the Hazardous Waste Label, Figure 3-1, below.

Figure 3-1 Hazardous Waste Label

Fill out the label completely, including percentages of constituents, the hazards of the waste, and contact name. If you do not know the hazards of your chemical, use the MSDS of the chemical to determine what they are. Do not date the container or label. Deface or remove any original labels remaining on the container to avoid confusion about the identity of the waste.

Booklets of twenty adhesive hazardous waste labels are available free at the following locations:

Biochemistry Stores

Location: J-014 Health Sciences Building

Hours: Monday – Friday 8:15-12:00, 1:00-4:45

Last day of the month 8:15-12:00, 1:00-3:30

Chemistry Department Research Stockroom (Chemstore)

Location: 036 Bagley Hall

Hours: Monday – Friday 8:30-12:00, 1:00-4:30

Closed on UW employee holidays

Hazardous waste labels may also be printed out online at http://www.ehs.washington.edu/epowaste/hazwastelabel.shtm .

Or, email chmwaste@u.washington.edu to request that labels be mailed to you.

3. Location

Waste must be under the control of the individual(s) generating the waste. The waste should be in a physically safe area (*e.g.*, not on a windowsill.) Waste chemicals may be stored with unused chemicals as long as the containers are properly labeled and your laboratory personnel know the storage location.

Do not accumulate large amounts of waste in the fume hood.

Use flammable liquid storage cabinets for flammable waste over ten gallons in volume.

Store the waste away from emergency equipment such as safety showers and emergency access panels. Do not block exits.

Do not store the waste near or in sinks. If the waste is stored in an area that drains to a floor drain, the waste must be in secondary containment.

4. Segregation

Segregate regulated chemical waste by chemical compatibility. Refer to the segregation guidelines in Section 2 of this manual. Use secondary containment (tubs, basins or buckets) for segregation of incompatible wastes accumulated in the same area.

5. Accumulation Volume Limits

Accumulate no more than 200 liters (55 gallons) of chemical waste per waste stream or one liter (one quart) of extremely hazardous waste per waste stream. Extremely hazardous waste is waste that is highly toxic, and the one liter limit is designed to limit risk, especially in the event of a spill. See http://www.ehs.washington.edu/epowaste/ehw.shtm for how to determine whether your waste is extremely hazardous waste.

Also, any one type of flammable chemical waste plus chemicals cannot exceed the limits specified by the controlling fire department. For example, in Seattle for class IA flammables (which include ethers and other very flammable solvents,) the total volume of allowed flammables is limited to 60 gallons per control area in a sprinklered building and 30 gallons in a nonsprinklered building. Contact EH&S Building & Fire Safety Office at 206-543-0465 with questions about control areas and volume limits if you accumulate large amounts of flammable hazardous waste, or arrange for more frequent collection of this waste.

Leave some headspace (at least one inch) in each container to allow for pressure changes due to changes in temperature.

Chemical waste must not be accumulated (*i.e.* stored) for more than one year.

6. Large Containers (Drums)

If you are accumulating wastes in containers greater than five gallons in volume, make sure that drums used to accumulate regulated wastes are in good condition and are approved by Department of Transportation (DOT) for highway mode transportation. If the drums were shipped to you in the first place, they are very likely DOT-approved.

Drums containing liquids must have ten centimeters of air space between the liquid surface and the lid.

Collection must be requested before the drum is full, especially in the case of 55 gallon drums.

7. Inherently Waste-like Chemicals

"Inherently waste-like chemicals" include expired chemicals, chemicals in deteriorating containers and chemicals that appear to be or are unusable. State inspectors may issue fines or infractions for inherently waste-like chemicals in your laboratory. Do not keep chemicals past their expiration date, and conduct cleanouts when you do your annual chemical inventory update.

Please also see the section on "legacy chemicals" in Section G.3, below. Legacy chemicals are those that are left behind by laboratory staff when they leave the university or move laboratories. They become the responsibility of the new space occupants.

D. HAZARDOUS WASTE COLLECTION REQUESTS

1. Hazardous Waste Collection Overview

EH&S collects hazardous chemical waste from all UW campuses and UW owned and operated facilities. There are about 3500 laboratories on and near the Seattle campus. Therefore EH&S

may only be near your area once every week or every other week. Therefore, you may have to wait one to several weeks after you send your collection request before EH&S collects your waste. To avoid problems, plan ahead and request collection before your containers are full.

2. Collection Requests – One-Time

Request collection of your waste by submitting a Chemical Waste Collection Request found online at http://www.ehs.washington.edu/forms/epo/1470.pdf . Fill out all information completely and fax or mail the form (information is on the form).

3. Routines and Routine Collection Requests

Wastes that are generated on a regular basis may be set up as routine collections. For routine collections, EH&S assigns your chemical waste a routine number. To request pickup, you then simply enter your routine number and waste volume in an online form. EH&S tracks what your waste is and where you are located. If you have a routine waste number and want to request a pickup, fill out and send the Routine Chemical Waste Collection Request at http://www.ehs.washington.edu/forms/epo/routinepickup.php .

To set up a new routine, fill out and send a New Routine Chemical Waste Collection Request at http://www.ehs.washington.edu/forms/epo/1471.pdf . If you have any questions about whether your waste is routine, email chmwaste@u.washington.edu or call 206-616-5835.

4. Waste Cleanouts

If you are moving or cleaning out your workplace and will need EH&S to collect a large volume of chemical waste, here are some guidelines.

If you think you have more than 100 containers of waste, call 206-616-0595 to arrange a cleanout appointment. Call at least a month before your deadline.

For fewer than 100 containers, fill out and send the copies of the Chemical Waste Collection Request (http://www.ehs.washington.edu/forms/epo/1470.pdf) to EH&S, making sure to put your name on each of the pages. Place completed UW Hazardous Waste Labels on each waste container (not needed for containers with an original label and original contents).

Consider the MyChem Chemical Exchange for your unwanted but useable chemicals. “Useable” chemicals are unexpired and preferably unopened.

Finally, remember to update your chemical inventory in MyChem.

5. What Happens to Hazardous Waste?

EH&S has a Waste Minimization Program that reuses, recycles and treats more than 50% of the total waste generated at the University of Washington. Reuse, recycling and treatment takes place both in laboratories and at the EH&S hazardous waste facility. Some waste streams, like batteries, paint and oil, are sent offsite for recycling by contractors. For more information, see the Waste Minimization subsection below or visit http://www.ehs.washington.edu/epohazreduce/index.shtm.

All hazardous waste at the University of Washington that is not reused, recycled or treated is sent to permitted hazardous waste recycling and disposal facilities. Flammable waste is used as an alternative fuel to incinerate hazardous waste. Most of the other waste streams are incinerated at high temperature. A few waste streams are placed in permitted hazardous waste landfills.

E. TRASH DISPOSAL

1. Trash Disposal of Chemicals

The following are prohibited in the trash because of their chemical or physical hazards:

- Hazardous chemical waste as defined earlier in this section
- Known, probable or suspected carcinogens, irritants and sensitizers (see a current MSDS for the chemical to determine if the chemical is any of these)
- Free liquids of any type
- Pressurized vessels, including aerosol cans
- Laboratory glass and sharps
- Radioactive waste
- Batteries
- Mercury, including broken empty thermometers
- Biohazardous waste

To throw away chemicals that are not prohibited in the trash, deface any labels, securely double-bag it and label it “non-hazardous” so that custodial staff know it is safe for them to handle the trash.

2. Trash Disposal of Empty Chemical Containers

"Empty" chemical containers may still contain enough chemicals in them to present a hazard to custodial staff. On the other hand, it can be difficult to completely empty a container.

The legal interpretation of the word "empty" acknowledges this difficulty. A container is legally empty when both of the following are true:

- Contents have been removed by "normal, no-nonsense means, such as inverting and draining, shaking, scraping, or scooping", and
- No more than 3% of the contents remain.

If the chemical is "extremely hazardous waste" or a pesticide marked with danger or warning labels, then the container must be triple rinsed before it is legally empty. The rinseate from this process is also considered hazardous waste by law. The definition for extremely hazardous wastes is on the EH&S website at http://www.ehs.washington.edu/epowaste/ehw.shtm. Also, if your chemical is a known or suspected carcinogen, such as those listed in Appendix H of this manual, EH&S strongly recommends that you triple rinse the container.

If you choose to dispose of the empty container, do the following:

- Dry the empty container, preferably in a fume hood. Ensure that there are no sources of heat or open flame in the fume hood when drying containers that contained flammable chemicals.
- With a pen or marker, cross out or black out the labels on the container.
- Leave the container uncapped. Throw the cap away separately.
- If the container fits in the trashcan, place it there. If it does not fit in the trashcan, place it next to the trash.

- Do not leave empty containers in public areas, such as hallways or loading docks, unless you have made an agreement with Custodial Services or EH&S for pickup services.

Consider reusing the empty container for accumulation of waste for that same chemical or other compatible chemicals. If you do reuse a container, deface or remove the label on the container and then fill out and affix a hazardous waste label to the container. Defacing and labeling are required by law and also help others in your workplace know that the container contains hazardous waste, not the original chemical.

Do not recycle glass or plastic containers that contained chemicals unless approved by EH&S. Recycled glass and plastic is used for beverage and food containers, so the recycling industry does not accept chemical containers. However, EH&S does recycle large plastic and metal drums; see http://www.ehs.washington.edu/eporecycle/drums.shtm for more details.

It is illegal to "dispose" of hazardous waste by leaving non-empty containers of chemicals in the fume hood or elsewhere to evaporate the chemical.

See also the empty container recycling guidelines on the EH&S website at http://www.ehs.washington.edu/epowaste/trashcontainer.shtm.

3. Trash Disposal of Contaminated Items

Used gloves and other commonly used items (besides empty containers) can be placed in the trash if they are not “grossly contaminated” with hazardous chemicals. If you have an item that is “grossly contaminated”, dispose of it as hazardous chemical waste.

Examples of "grossly contaminated" items include used spill clean-up materials, items such as gloves and equipment contaminated from a spill and used equipment that contains hazardous chemical residue.

Finally, EH&S encourages you to collect items that look like they might be contaminated by chemicals, such as weighing papers and gloves, in bags and then label the bags “non-hazardous waste” before you place them in the trash. Custodial staff members are sometimes understandably nervous when handling laboratory trash; a white residue or a few drops of water in the trash could be a dangerous chemical. Taking an extra step to bag these items can be a nice gesture.

Custodians may refuse to collect trash that appears to contain hazardous items. If they refuse to collect trash, they will leave a *Notice of Improper Waste Disposal Practices* form (UoW 1970). Once corrections are made, they will collect the trash.

F. SEWER DISPOSAL

All wastewater discharged to the sanitary sewer system must be under the local Sewer Discharge Limits designed to protect surface waters and maintain the quality of biosolids from wastewater treatment plants.

1. King County Local Sewer Discharge Limits

In King County, you may dispose of some chemicals down the sanitary sewer drain in some circumstances. This method of disposal is also known as "sewering". Records of this disposal must be kept as described in Section F.3 below. If your waste qualifies as hazardous waste (according to the criteria in Section B above) then you may not sewer the waste.

King County has also published local discharge limits for commonly used chemicals. These limits are on the EH&S website at http://www.ehs.washington.edu/epowaste/sink.shtm. They apply only to UW Seattle, UW Bothell, and other sites within King County.

2. Outside King County

If you are outside King County (UW Tacoma, Pack Forest, and Friday Harbor), local sewer limits have not been formally adopted in these areas. In addition, operators of some very small waste treatment plants allow chemical disposal to sanitary sewer only on a case-by-case basis in order to protect the treatment plant. You are therefore not allowed to pour any chemicals down the drain without explicit permission at this time.

For more information and for assistance with obtaining permission to dispose of non-hazardous chemicals to sanitary sewer, call EH&S at 206-685-3759 or email chmwaste@u.washington.edu.

3. Chemical Treatment Log

All discharges must be recorded in a Chemical Treatment Log if you are treating waste. Detergents, bleach and other "household" cleaning chemicals are the only exceptions to this rule and do not need to be recorded. Keep the log posted near the sink or point of discharge; the emergency phone number on the Chemical Treatment Log form must be posted in the event of an accidental release of chemicals to the sewer. Keep these logs for three years. County inspectors can ask to see them. EH&S will also contact you annually for the total waste you treated each year. UW is required to report waste treatment totals to state agencies. See http://www.ehs.washington.edu/epohazreduce/index.shtm for treating specific wastes.

Blank logs are available at http://www.ehs.washington.edu/forms/epo/chemlog.pdf.

4. Soaps, Bleach and Acetone

When you are washing glassware or equipment, you will likely use chemicals such as detergents and bleach. Standard household bleach and other cleansers may go down the drain.

Acetone may not go down the sink at any concentration. If you use acetone to rinse off items, you must collect any excess acetone in a securely capped, properly labeled waste container and dispose of it as hazardous waste (see the hazardous chemical waste page for more information.) You may not store acetone squeeze bottles near the sink.

Do not use chromate based cleansers. There are many less toxic and non-carcinogenic alternative cleansers that work just as well.

5. Scintillation Fluids

There are only three liquid scintillation cocktail products currently approved by the State of Washington Department of Ecology for disposal down the sanitary sewer. They are soluble (or readily dispersible) in water and contain less than 10% non-ionic surfactants. Other scintillation fluids may claim to be safer, but because they contain high concentrations of flammable surfactants, they are not approved for sewer disposal.

6. Dilution Prohibition

It is illegal to dilute your chemical waste solely to meet sewer discharge limits. However, you may sewer wastes such as equipment rinse water or any chemical treatment that you do as a normal part of cleaning up after an experiment, as long as it meets sewer disposal limits.

There are two reasons why you may not dilute to meet the limits. First, if everyone were allowed to do it, the practice would use a lot of water. Secondly, many toxic chemicals, such as metals and organic compounds, partition into organic matter. At the wastewater treatment plant, these chemicals would end up in the biosolids, no matter how dilute they are. The biosolids can be re-introduced into the general environment, such as in King County where it is

sold as fertilizer for tree crops and for landscaping. Therefore, it is environmentally preferable to manage concentrated wastes as hazardous waste rather than dilute to meet the discharge limit. For more information, see the EH&S website on sewer disposal at http://www.ehs.washington.edu/epowaste/sink.shtm.

G. CHEMICAL WASTES OF PARTICULAR CONCERN

1. Unknown Chemicals

Without an accurate chemical name and concentration range, unknown or unidentified chemicals cannot be safely handled or disposed of. The best way to prevent unknowns is to label all chemical containers and make sure that the labels stay in good condition over time.

If you have an unknown chemical, keep it where it is or store it temporarily in the fume hood, whichever you believe to be safer. Find out as much information as you can about the chemical by examining the container and interviewing anyone you think might know something about the chemical. If that fails, complete and mail or fax to EH&S a Chemical Waste Collection Request, online at http://www.ehs.washington.edu/forms/epo/1470.pdf. Provide as much information about the waste as possible, such as the history, physical properties and the results of any analysis performed on the unknown.

Identification analysis performed by the approved waste disposal contractor will cost the chemical user roughly $80 per unknown. Analysis performed by the contractor is conducted in the area where the unknown is stored. After analysis, EH&S can collect the unknown for hazardous waste disposal.

2. Potentially Explosive Wastes

Some common chemicals can become highly unstable explosives over time when stored improperly and cannot be collected as hazardous waste unless they have been deactivated and stabilized. The following segments highlight the most common of these troublesome chemicals.

a. Peroxide-Forming Chemicals

Peroxide-forming chemicals such as p-dioxane, diethyl ether, tetrahydrofuran and acetaldehyde that have exceeded the manufacturer's expiration date will not be collected for disposal until they have been tested for peroxides. These chemicals must be managed correctly. For more information, see section 2.G.2.b earlier in this manual and the *EH&S Peroxide Forming Chemicals Management and Assessment Guidelines* online at http://www.ehs.washington.edu/forms/epo/peroxideguidelines.pdf.

Chemicals containing more than 10 parts per million (ppm) peroxides must be deactivated before they will be collected by EH&S. Treatment methods are available through EH&S; email chmwaste@u.washington.edu to obtain more information about them. If the chemical is expired, very old, or otherwise poses great risk to laboratory workers, an outside contractor will perform deactivation and stabilization services at the expense of the laboratory.

b. Picric Acid and Other Polynitroaromatic Compounds

Polynitroaromatic compounds are commonly used in laboratories and are safe in the form in which they are sold. They are ordinarily sold with 3 to 10% water added to stabilize them. However, they will become explosive if allowed to dry out. Dry polynitroaromatic compounds must be wet with 10% water before they can be collected by EH&S.

c. Sodium Azide

Sodium azide, although not inherently unstable, can form highly explosive heavy metal azides if contaminated or used improperly. Do not pour sodium azide into the sanitary sewer. Disposal of sodium azide solutions to the sewer can cause the formation of lead or copper azides in plumbing. Routine sewer disposal of sodium azide has caused several serious explosions.

d. Nitrocellulose

Several nitrocellulose products, primarily paper and tubes, are used in some laboratories. Nitrocellulose burns vigorously in ambient conditions and may explode when heated under confinement. When completely dehydrated, it is considered a low level explosive. As a result, these products should never be autoclaved for decontamination. Nitrocellulose products must be soaked in water before disposal through EH&S.

3. Legacy Chemicals

Principal investigators are required to completely clean out laboratories before they leave, including all hazardous chemicals and waste (see Section 10, Moving In/Moving Out.) However, sometimes people leave without disposing of chemicals properly.

Legacy chemicals are unwanted chemicals that are sometimes left behind after a move. If you move into a laboratory that has legacy chemicals in it, you should tell your department administrator immediately. If your department cannot, for whatever reason, solve the problem, then these legacy chemicals are “yours” to manage. Unless you think that you will use them, arrange to request their collection as hazardous waste and follow all waste accumulation rules, including hazard identification, labeling and segregation.

H. HAZARDOUS WASTE MINIMIZATION

On average, EH&S collects and processes about 200,000 kg of hazardous chemical waste a year. Since 1985, EH&S has developed several programs to reduce the amount of hazardous waste that must be incinerated or landfilled. For the last five years, the UW reused, recycled, or treated about 40% of our hazardous chemical waste. This section outlines some of the basic elements of this effort and how you can participate.

More information is at http://www.ehs.washington.edu/epohazreduce/index.shtm. There you will find an extensive and detailed list of services and resources.

1. Chemical Procurement and Chemical Exchange

Purchase only what you'll use, especially if you're purchasing a hazardous chemical. One recent study suggested that up to 40% of the hazardous waste produced by laboratories is actually unused and expired chemicals.

Shop for free chemicals in the MyChem Chemical Exchange. Or, if you have chemicals in good condition that you do not need, consider listing them in the MyChem Chemical Exchange. For more information, see the EH&S website at http://www.ehs.washington.edu/eporecycle/chemex.shtm.

2. Treatment and Recycling in the Laboratory

You are encouraged to treat or recycle your own waste. EH&S staff are available to help you get started, and in some cases offer free materials for recycling and treatment. Please see http://www.ehs.washington.edu/epohazreduce/index.shtm for more details.

3. Hazardous Materials Recycling

Both EH&S and UW Recycling (Property Transport and Services) manage the recycling of materials that would otherwise be disposed of as hazardous waste. See http://www.ehs.washington.edu/eporecycle/index.shtm for all the common (and sometimes uncommon) items recycled at the UW, from batteries to computer monitors to elemental mercury to scrap metal.

I. SOLID WASTE AND RECYCLING

Below are guidelines for recycling a number of common non-chemical items in laboratories.

1. Paper and Cardboard

EH&S encourages you to recycle boxes and packaging as soon as possible unless you have sufficient storage space for them. Storing boxes in aisles or in front of emergency equipment or exits, or necessary fire panels, is illegal and dangerous. Paper, cardboard and other common recyclables are managed by UW Recycling. For more information, see UW Recycling's procedures webpage at http://www.washington.edu/facilities/transportation/recyclingandsolidwaste/.

2. Plastic and Glass

Plastic and glass chemical containers are not recyclable at this time. The glass and plastic recycling industry uses recycled material to make food and beverage containers and bans chemical containers, even if rinsed clean, from their recycling streams. UW Recycling and the EH&S Environmental Programs Office are currently pursuing limited recycling for some laboratory plastics.

3. Packaging Materials

UW Recycling also coordinates the recycling of wooden pallets, packaging "peanuts", plastic wrap and other packaging materials. Styrofoam packaging is handled on a case-by-case basis. For more information on all these items, see http://www.washington.edu/facilities/transportation/recyclingandsolidwaste/.

4. Media and Printer Cartridges

Electronic media, including CDs, tapes, cell phones and LaserJet cartridges, and small amounts of "household" batteries are recycled in E.MEDiA bins throughout campus. This is a joint effort of UW Recycling and EH&S Environmental Programs Office. See the UW Recycling website for more information.

5. Batteries

Small amounts of batteries can be recycled through the E.MEDiA system (see above.) Large, heavy, and/or unusual research or clinical batteries, as well as large volumes of batteries, are handled two ways.

a. One-Time Battery Collection

To request a large one-time collection of batteries, fill out and send a Battery Collection Request at http://www.ehs.washington.edu/forms/epo/1943.pdf.

b. Routine Battery Collection

Routine collection for batteries uses a process similar to that of hazardous chemical waste. To set up a new routine, fill out a New Routine Collection Request at http://www.ehs.washington.edu/forms/epo/1471.pdf. If you have a routine number, request a pickup with the online Routine Collection Request at http://www.ehs.washington.edu/forms/epo/routinepickup.php.

J. SHARPS AND "LAB GLASS"

The following are guidelines for the disposal of sharps and "lab glass" (or broken glass) that is not contaminated with infectious, radioactive or chemical materials.

1. Sharps

Sharps are a restricted waste according to state and local regulators and must not be disposed of as special waste. The term "sharps" is a regulatory waste classification associated with those instruments used to puncture, cut, or scrape body parts and that, as waste, can cause punctures or cuts to solid waste handlers or the public. This is interpreted to mean that any instrument that looks like it is meant to be used in this manner must be disposed of as sharps waste. The sharps definition includes, but is not limited to, hypodermic needles, syringes, IV tubing with needles attached, lancets, scalpel blades, glass Pasteur pipettes, microtome blades, dental scalers and razor blades.

Such items must be disposed of in an authorized sharps container which is leak proof, rigid, puncture-resistant, and durable plastic. It is red in color and equipped with a tight-fitting lid for use during handling and transport. Various sizes of sharps containers are available from different vendors. Sharps containers should be labeled with the Principal Investigator's name and the room number and disposed of when full.

Sharps disposal, like all biological waste at the University of Washington, is dependent upon the location of generation. Please refer to the location-specific Biological Waste Flow Charts, which are located online at http://www.ehs.washington.edu/rbsresplan/sharp.shtm#flowcharts.

2. "Lab Glass" (Broken Glass)

"Laboratory glass" (including plasticware) is any item that could puncture regular waste bags and therefore endanger waste handlers. "Laboratory glass" must be placed in a sturdy cardboard box lined with plastic for safety during transport through the building. Any cardboard box may be used, provided it is sturdy, does not have holes in the bottom or sides, and of a size that will not weight more than 40 pounds when full.

Boxes must be labeled with the room number and principal investigator's name and should be sealed with tape identifying the box as containing "laboratory glass." Boxes and tape are available in the Chemistry stockroom and from suppliers, and tape is also available from Biochemistry stores. If the printed tape is not available, the box can be sealed with other packaging tape as long as the box is well marked as containing "laboratory glass."

The sealed box is placed alongside the regular waste container for collection by Custodial Services.

Never use these boxes for the disposal of sharps, biohazardous materials that have not been autoclaved, liquid wastes, chemically contaminated laboratory glassware/plasticware or chemical containers that cannot be disposed of as regular solid waste.

Laboratory glass that is disposed of in cardboard boxes must be clean or appropriately decontaminated prior to disposal.

protect the contents from extreme temperatures for a limited time. Contact EH&S at 206-543-0465 for further information on flammable liquid storage cabinets.

a. UL or FM Approval

Flammable liquids should be stored in an Underwriter's Laboratory (UL) listed or Factory Mutual (FM) approved flammable liquid storage cabinet outfitted with approved automatic or self-closing doors. All new cabinets must have UL or FM approval. (Note: Some existing wooden cabinets that are not labeled with UL or FM approval are still in service and approved for use.)

b. Label

Cabinets must be labeled "Flammable - Keep Fire Away".

c. Capacity

Do not over fill cabinets. Check manufacturer's recommendations for storage limits.

d. Bottles

All bottles should be placed on the shelves, never stacked. Keep all containers tightly closed.

e. Incompatible Chemicals

Do not store incompatible chemicals in these cabinets.

f. Cabinet Doors

Cabinet doors should never be propped open unless the mechanism is a designed part of an approved cabinet.

g. Secondary Containment

There should be a secondary containment on each shelf and at the bottom of the unit. These plastic or rubber trays retain spills.

h. Unapproved Storage

Tops of cabinets are not storage shelves. Do not store combustible materials on or beside these cabinets.

2. Flammable Storage Refrigerators

Flammable chemicals or chemical mixtures that need to be stored below room temperature must be stored in U.L. listed Flammable Material Storage Refrigerators or Freezers. These refrigerators and freezers are specifically designed by the manufacturer to have non-sparking interiors. All laboratory refrigerators and freezers must be prominently labeled with a warning sign indicating whether it can be used for flammable or non-flammable storage. For these warning signs or information regarding a Flammable Storage Refrigerator purchase, contact EH&S at 206-543-0465. For more information on flammable storage refrigerators, see http://www.ehs.washington.edu/fsofire/flamfrig.shtm.

C. LABORATORY SIGNS

Laboratory signs may be either permanently mounted or mounted temporarily as described in Section 2.A.7. A synopsis of mandatory and desirable signs is provided in the following table and explanatory material is described in the following paragraphs.

Table 4-1 Safety-Related Signs

Description of Sign	Mandatory?	For more information, see
Emergency contacts / phone numbers	Mandatory	Section 4.C.1
Laboratory floor plan	See Section 4.C.2	Section 4.C.2
Emergency / safety equipment location signs	Mandatory	Section 4.C.3
Food and drink prohibitions	Mandatory if present	Section 4.C.4
Area and equipment warnings	Mandatory if present	Section 4.C.5
"NFPA 704"	See Section 4.C.6	Section 4.C.6
"Chemical Treatment Log" for waste disposal sink	Mandatory if present	Section 3.F.3
"Natural gas emergency shut off valve"	Mandatory if present	-
"Laboratory water – do not drink"	Mandatory if present	-
Lab-specific procedural / operational signs	Optional / Desirable	Section 4.C.7

1. Emergency Numbers

Post a list of telephone numbers to be called in case of fire, accident, hazardous chemical spill or other emergency. The list should be posted prominently in each laboratory next to a telephone.

2. Laboratory Floor Plan

A plan showing evacuation route(s), as well as emergency and safety equipment locations should be posted prominently in each laboratory. See Appendix C for an example laboratory floor plan. If particularly hazardous substances are used in a designated area, the floor plan is mandatory.

3. Emergency/Safety Equipment Location Signs

Signs must be posted identifying the location of exits, safety showers, eyewash stations, fire extinguishers, first aid equipment, flammable storage cabinets, and other safety equipment. Contact Facilities Services to post these signs.

4. Food and Drink Prohibitions

Label areas, refrigerators, freezers and other locations where food and beverages are not to be consumed or stored. Food prohibition stickers can be obtained from EH&S.

5. Area and Equipment Warnings

Operation and warning signs and labels must be posted on such things as alarm systems, biosafety cabinets, fume hoods (sash opening height). Warnings may also need to be posted in areas or on equipment where special or unusual hazards exist, such as biohazards, lasers, magnetic fields, radioactive materials, high voltage, restricted access, or particularly hazardous substance control areas. These signs may be mandatory depending on the degree of hazard and possibly local codes.

b. Vents

Do not block or cover supply and exhaust vents. Occupant changes to lab ventilation may compromise the safety features of the laboratory and local exhaust systems such as fume hoods, biosafety cabinets, etc.

2. Fume Hoods

A fume hood is ventilation equipment that vents separately from the building's heating, ventilation and air conditioning (HVAC) system. The primary means of controlling airborne chemical exposure is a fume hood. Fume hoods should be used when working with toxic compounds or compounds with a boiling point below 120°C. (However, some aqueous solutions may be an exception to this rule.) It may be necessary to use a closed system such as a glove box or bag for highly hazardous chemical materials.

EH&S maintains a roster of fume hood designs which have been approved for purchase, on the EH&S web site at http://www.ehs.washington.edu/fsofumehoods/approvedfumehoods.shtm.

Additional information about fume hoods and access to an on-line training class in fume hood operation is available at http://www.ehs.washington.edu/fsofumehoods/index.shtm

a. Fume Hood Use

1) Training – Personnel using fume hoods should take the on-line training class (at http://www.ehs.washington.edu/fsofumehoods/index.shtm) or equivalent.

2) Verify Operation – Make sure the fume hood is operating before starting work. Some new fume hoods have monitoring devices that indicate acceptable working conditions. Otherwise, a strip of Kimwipe taped to the underside of the sash can be used as an indicator of air flow. (Since this strip may flutter even when the air flow is inadequate, the strip should be placed and its movement observed when you know that the air flow is proper – such as at the same time that EH&S measures the air velocity.)

3) Exhaust Fan Speed – Laboratory fume hoods in recently remodeled and newer buildings have two speed exhaust fans with local control at the hood. The low exhaust setting is only appropriate for storage -- not for working with chemicals outside of their original containers. The high setting provides protection for working with chemicals.

4) Minimize Cross Drafts and Eddy Currents – Air flow into the fume hood is adversely affected by cross drafts and eddy currents. Cross-drafts occur when people walk in front of a fume hood or when nearby windows or doors are open. Eddy currents occur around the person using the fume hood and around objects inside it. To limit these effects, fume hoods should not contain unnecessary objects and the slots within the fume hood which direct air flow must not be blocked. The slot at the rear of the work surface is essential for proper air movement. If large pieces of equipment or large numbers of bottles are placed in front of the slot, they should be raised up on blocks or placed on a shelf to allow air to flow into the slot. Equipment should be placed as far to the back of the fume hood as practical. Work should be performed at least six inches inside the fume hood opening to prevent cross drafts and eddy currents from pulling contaminated air out of the fume hood and into the room.

5) Sliding Sashes – The sash should be kept as low as possible to improve overall performance of the hood. The more closed the sash is, the better protection from an unexpected chemical reaction. Procedures should be done with the sash at the level

of the maximum approved sash height marking, or lower. Use a separate safety shield, such as a face shield, when working with an open sash.

6) Chemical Evaporation – It is illegal to evaporate chemicals in the hood to "dispose" of them. Any open apparatus used in hoods which emit large volumes of volatile chemicals should be fitted with condensers, traps, or scrubbers to contain and collect hazardous vapors or dusts.

7) Storage – Do not store chemicals or supplies in the fume hood. Chemicals and supplies should be stored in approved cabinets.

8) Flammable Liquid Vapor – Laboratory fume hoods are designed to reduce flammable vapors below lower explosive limits when properly operated and maintained. As an added precaution, use only non-sparking and explosion proof electrical equipment (hot plates, stirring plates, and centrifuges) in fume hoods where a large volume of flammable liquid vapor may be generated. Take care with flammable liquids and heat sources.

9) Containers – All containers of chemicals must be securely capped when not in use. A rule of thumb is that containers should be open for minutes at the most – which is the maximum time it normally takes to pour a small amount of chemical into another container and cap them. All containers must be labeled with the chemical identity and appropriate hazard warnings (or the material must be used up during the work period and it is under continuous control of the researcher using it).

b. Fume Hood Prep for Maintenance

1) Prior to any maintenance of fume hoods the entire interior surfaces must be decontaminated and/or cleaned as described below in Section G.2 Decontamination of Equipment for Service, by the researchers using the hood.

2) Maintenance may require access to the storage cabinets below the hood or to the sides of the hood. If this access is required, the entire cabinet and adjacent area also needs to be emptied, decontaminated, cleaned, and rinsed. Lab staff need to identify a contact for coordinating with Facilities Services as to the work to be done.

3) See Section G.2 below for details and the required form.

c. Fume Hood Testing

1) EH&S performs a functional performance test annually to assure hoods are performing as designed. If a hood fails, it may need to be taken out of service until repaired. EH&S will notify the researchers and post a "do not use" sign if repair is required.

2) If you are having problems with your fume hood, contact EH&S at 206-543-0465. EH&S will troubleshoot the problem and may refer it to Facilities Services for repair.

3. Perchloric Fume Hoods

Procedures using concentrated perchloric acid (>70%) or which heat any amount or concentration of perchloric acid must be performed in a closed system or within a specially designed perchloric acid fume hood with wash down systems to prevent the accumulation of explosive perchlorates in the hood and ducting. For assistance in locating a perchloric acid fume hood, call EH&S at 206-543-0465.

4. Glove Boxes

Glove boxes generally operate under either positive or negative pressure to the lab, depending on the process or material used. Positive pressure glove boxes are used when you are trying to protect your material from contamination. Negative pressure glove boxes are used to provide increased operator protection. Glove boxes should be thoroughly tested before each use and there should be a method of monitoring the integrity of the system (such as a pressure gauge).

5. Biological Safety Cabinets

Biological Safety Cabinets (BSCs) are laboratory hoods designed to protect the worker and laboratory from the biohazards (infectious agents) of the experiment by drawing air across the samples and away from the worker and into a HEPA filter.

There are two types of BSCs. The Class II type A and Class II type B1 units recirculate filtered air into the laboratory and are not designed for chemical use for this reason. The Class II type B2 unit is designed for use of some chemicals but is not a substitute for a fume hood. The use of chemicals in this type of hood needs to be carefully evaluated so that the protective barrier (HEPA filters) is not destroyed by the chemicals.

Biological Safety Cabinets are certified annually by EH&S. If a BSC fails the certification, it may not be used until repaired, unless specifically authorized by the Institutional Biosafety Officer.

BSCs may not be repaired or moved until decontaminated by EH&S.

For additional information on the proper use of BSCs, Class II type B2 design, cabinet certification, troubleshooting problems, or decontamination, please contact EH&S at 206-543-0465.

6. Laminar Flow Hoods

Laminar flow hoods are designed to protect the work surface from contaminants, and blow out into the face of the person using the hood. Therefore, any chemical use will cause the person to be exposed to the chemical. Toxic, volatile chemicals may not be used in a laminar flow hood.

7. Ductless Laboratory Hoods

In some cases, installation of a ducted fume hood may be impossible, and installation of a “ductless hood” is requested for approval by EH&S. This type device uses special filters or absorbents to clean the contaminated air in the hood prior to recirculating the air back into the room. Recirculation of potentially contaminated air into the room presents special dangers and special requirements must be met. The requesting department must demonstrate that the following concerns are addressed as long as the hood is in use:

a. Chemical Characterization

Each of the chemicals to be used in the ductless hood must be completely characterized as to the quantity which may be released within the hood at one time and the frequency of use. The hood manufacturer will need this information for the design of the hood. Once designed, use of other chemicals in the hood must be forbidden unless the hood manufacturer approves the alternate chemical. Records as to the design of the hood and the design chemical usage must be maintained in the laboratory.

b. Hood Approval

The Principal Investigator must verify that the size, shape and layout of the proposed hood as offered by the hood manufacturer is appropriate for the intended use. The PI must also develop a management plan for the hood, which addresses staff training, procedures for using the hood including emergency procedures, ongoing maintenance and certifications for the hood, and recordkeeping. This plan needs to assure continuity if management of the hood is taken over by another individual. A description of the items required in the management plan is available from EH&S (206-543-7388). Hood approval by EH&S is contingent on submittal of the hood design information from the proposed manufacturer and submittal of the management plan.

c. Laboratory Staff Information and Training

All personnel in the laboratory must be trained as to the fact that the ductless hood re-circulates air back into the room, that only certain, designated chemicals may be used within the hood, and that failure to properly operate and maintain the hood may result in personnel exposures.

Also, a sign must be placed on the hood identifying what chemicals may be used and warning that the air is re-circulated back into the room from the hood.

8. Cold Rooms, Warm Rooms and Environmental Chambers

a. Room Design

Controlled environment rooms generally are completely enclosed with no fresh air and heating/cooling and other environmental systems independent from the building. Rooms large enough to enter should be designed or retrofitted with doors that allow anyone trapped inside to get out easily. The electrical system within environmental rooms should be independent of the main power supply so that people are never left in these areas without light.

b. Chemical Use

Controlled environment rooms usually re-circulate the air using a closed air-circulation system. Hazardous chemicals must not be stored in these rooms because ambient concentrations of volatile chemicals can accumulate to dangerous levels.

Flammable solvents should not be used in controlled environment rooms. Ignition sources in these rooms could ignite vapors.

Avoid using volatile acids in cold rooms because vapors can corrode the cooling coils, leading to possible refrigerant leaks.

If solid carbon dioxide (dry ice) is placed into a cold room, its sublimation will raise the carbon dioxide levels within the room, possibly to dangerous levels. Use extra precautions if you must use or store dry ice in these spaces.

9. Other Ventilation Systems

A ventilation engineer must design all other local exhaust systems used in the laboratory. Do not attach canopy hoods or snorkel systems to existing fume hood exhaust ducts without consulting a ventilation engineer at the Seattle campus Facilities Services Campus Engineering, 206-543-7372 or your local campus engineering design services (if available). All local exhaust systems should have a visual indicator that the system is functioning properly at all times, even if the indicator is just a Kimwipe.

1. Custodial Services

UW Custodial Services will clean floors in laboratories only if requested. Contact Custodial Services at 206-685-1500 on the Seattle campus and refer to Appendix F for contact numbers for Facilities Services at other locations. Custodial floor care equipment should not be used to clean-up spills or chemicals.

2. Servicing of Lab Area or Equipment

To protect maintenance and facility workers, any laboratory area or equipment needing servicing is required to be unobstructed, emptied of chemicals, decontaminated with a decontaminating chemical as needed, washed with warm, soapy water, and rinsed. The area or equipment must have a signed *Notice of Laboratory Equipment Decontamination (UoW 1803)* attached before service will be provided. This form is available online at http://www.ehs.washington.edu/forms/fso/lab_equip.pdf.

Facilities Services and maintenance personnel are trained to reject servicing the requested area or equipment if it has not been decontaminated and/or cleaned. Conditions which can lead to service rejection include such things as visible debris from absorbents or glassware, “diapers” or papers taped to surfaces which were supposedly decontaminated and cleaned, and visible or sticky spilled materials.

If the laboratory is expected to be unattended when service personnel arrive, an informal note should be left stating a contact name and phone number in case there are questions about the work area, or if equipment needs to be moved.

H. DECONTAMINATION OF EQUIPMENT FOR DISPOSAL

Laboratory equipment is often contaminated with hazardous materials and/or may be inherently unsafe. UW Surplus Property cannot accept some types of laboratory equipment and cannot accept laboratory equipment containing hazardous materials.

To surplus contaminated or potentially contaminated laboratory equipment, you must first make sure that the equipment is safe for handling and resale by following the directions on the Notice of Laboratory Equipment Decontamination (UoW 1803 at http://www.ehs.washington.edu/forms/fso/lab_equip.pdf). The Chemical Hygiene Officer (Laboratory Supervisor or Principal Investigator) must sign this notice to certify that all of the applicable instructions on this form have been followed. Affix this notice to the equipment. Surplus Property will not pick up equipment that does not have this notice attached or does not appear to be clean and empty.

Examples of equipment that must be decontaminated include centrifuges, incubators, fume hoods, cryostats, ovens, biosafety cabinets, refrigerators, freezers, sinks, storage cabinets, lockers, bins, and tanks. (Tanks have the potential to be a confined space hazard and thus require special procedures, call 206-543-7388.)

Any equipment capable of generating dangerous radiation or containing radioactive sources must be checked by the EH&S Radiation Safety Office prior to public sale. Please contact the Radiation Safety Office 206-543-6328. These items include:

- Gas chromatographs
- Germicidal UV lamps
- Lasers
- Scintillation counters
- X-ray equipment

- Any item with a radioactive sticker

The following items CANNOT be accepted by Surplus Property. Contact the EH&S Environmental Programs Office at 206-616-5835 for information on how to dispose of these items.

- Capacitors, transformers (note: some equipment may contain transformers, such as x-ray equipment and electron microscopes. These transformers may be accepted but must be drained of oil and the oil must have been tested and certified by EH&S as being non-PCB oil.)
- Gas cylinders and other pressurized containers/vessels
- Instruments containing mercury
- Equipment containing asbestos, including but not limited to: autoclaves, laboratory ovens, fireproof file cabinets, anything that produces high heat.

The type of decontamination will vary depending on the hazardous material and the type of equipment. Note that personal protective equipment should be used when decontaminating equipment. Below are some requirements and guidelines for decontamination, as well as contact information for questions.

1. Equipment Used to Process/Store Chemicals

Safely remove or drain chemicals from the equipment, including any oil or coolant. Collect the chemical(s) for reuse or dispose of as hazardous waste. If applicable, use an inert gas or liquid to purge or rinse out chemical residues. In some cases, rinseate will need to be disposed of as hazardous waste as well. See our website at www.ehs.washington.edu/epowaste or call the EH&S Environmental Programs Office at 206-616-5835 for questions regarding hazardous waste disposal of chemicals and/or rinseate.

Decontaminate the equipment as necessary. For example, use solvents to remove viscous or non-water soluble contaminants. Then scrub decontaminated equipment thoroughly with warm soapy water. Rinse and dry. Wash and/or rinse water and solvents may need to be managed as hazardous waste. Contact the EH&S Occupational Health & Safety Office at 206-543-7388 for more specific information about decontamination.

2. Equipment Used to Process/Store Radionuclides

Conduct a thorough radiation survey of all accessible surfaces of the equipment with an appropriate instrument. If you detect radioactive contamination, you must clean the equipment with small amounts of warm detergent water. Avoid splash. Blot dry with paper towels. Commercial radiation decontamination solutions containing chelating agents may be helpful. Resurvey to assure that contamination is less than 100 counts per minute per 100 square centimeters of surface. If contamination persists or you have other questions, contact the EH&S Radiation Safety Office at 206-543-6328.

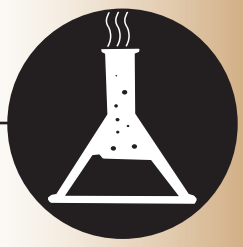
3. Equipment Used to Process/Store Biological Material

Remove all biological material from the equipment. Decontaminate with a 1:10 bleach solution. After 30 minutes of contact time, rinse metal surfaces. If you have specific biosafety questions, contact the EH&S Research and Biological Safety Office at 206-221-7770.

Before repair or relocation, biological safety cabinets must be decontaminated by EH&S or by a contractor approved by EH&S. For this service, contact EH&S at 206-543-0465.

WISHA Department of Labor & Industries

Hazardous Chemicals in Laboratories



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Department of LABOR AND INDUSTRIES

Hazardous Chemicals in Laboratories

WAC 296-828-100

Scope

This Chapter applies to the laboratory use of hazardous chemicals. To determine if this Chapter applies to your workplace, use Table 1.

Table 1

Chapter Application

Are "Hazardous Chemicals" used?

Definition:
Hazardous chemicals are any chemicals that have been shown (in at least one scientific study) to cause acute or chronic health effects in exposed employees. 296-839 WAC contains information that can be used to determine if a chemical is considered hazardous for this rule

YES → NO

Are the hazardous chemicals used in "laboratory scale operations"?

Note:
Laboratory scale operations use containers that have been designed to be easily and safely handled by one person for reactions, transfers and other handling of the hazardous chemicals.

Laboratory scale operations **are not:**

- Capable of producing commercial quantities of materials
- Part of a production process or simulate a production process
- Part of a quality control process that directs how a process operates.
- A simulation of a production process such as a pilot plant

YES → NO

*If any one of your answers brought you here, the Laboratory Standard **does not apply**, but other WISHA rules still apply.*

Are multiple chemicals or multiple procedures used?

YES → NO

Are protective practices or protective equipment generally available for employee protection?

Note:
Protective practices and equipment are those procedures, practices, or equipment accepted by laboratory health and safety experts as effective at controlling employee exposures to hazardous chemicals. For example laboratory fume hoods, chemical splash goggles, protective gloves, etc.
or
Those practices, procedures or equipment the employer can show are effective at controlling employee exposures to hazardous chemicals.

YES → NO

If your answers brought you here, the Laboratory Standard **applies** to your workplace.

– Continued–

Hazardous Chemicals in Laboratories

WAC 296-828-100

Scope

WAC 296-828-100

Scope (Continued)

IMPORTANT:

- When your laboratory operation is covered by this Chapter, and you use any of the substances in Table 2, the following applies with the exception of formaldehyde use in histology, pathology, and anatomy laboratories. In histology, pathology, and anatomy laboratories you must follow the requirements in chapter 296-856 WAC, Formaldehyde. This chapter applies to all other formaldehyde laboratory uses as defined in Table 1:
  - The exposure limits and any requirement protecting employees from skin and eye contact in the rules listed in Table 2 will still apply.
  - Where the action level (or where no action level exists, the permissible exposure limit) is exceeded for a substance listed in Table 2, the exposure evaluation and medical surveillance requirements in the substance rule will still apply.
  - You aren't required to meet other requirements of the substance rule.
- To get the permissible exposure limits (PELs) for hazardous chemicals used in your laboratory, see Chapter 296-841 WAC, Airborne contaminants.

– Continued–

Environmental Health and Safety
UNIVERSITY of WASHINGTON

Appendix B - Glossary

This glossary contains common terms found in the Laboratory Safety Manual and on Material Safety Data Sheets. Another valuable source for information about MSDS entries can be found at the web site http://www.ilpi.com/msds/ref/index.html.

absolute	A chemical substance that is not mixed; pure. For example Absolute Alcohol, ethyl alcohol, containing not more than one percent by weight of water.
ACGIH	American Conference of Governmental Industrial Hygienists, Incorporated. An organization of professional personnel in governmental agencies or educational institutions engaged in occupational safety and health programs. ACGIH develops and publishes recommended occupational exposure limits (see "TLV") for hundreds of chemical substances and physical agents annually. (ACGIH, 1330 Kemper Meadow Drive, Cincinnati, OH 45240-1634; 513-742-2020, http://www.acgih.org/home.htm)
acids	Any chemical which undergoes dissociation in water with the formation of hydrogen ions. Acids have a sour taste and may cause severe skin burns. Acids turn litmus paper red and have pH values of 0 to 6.
action level	An exposure limit designated in a WAC, generally derived as an 8-hour time-weighted average, which requires the employer to initiate certain required activities such as exposure monitoring and medical surveillance.
acute health effect	An adverse effect on a human or animal body, with severe symptoms developing rapidly and coming quickly to a crisis. Also, see "chronic health effect."
acute toxicity	The adverse (acute) effects resulting from a single dose of, or exposure to, a substance. Ordinarily used to denote effects in experimental animals.
acutely hazardous waste	A dangerous material as identified with a dangerous waste number beginning with "P" in WAC 173-303-9903. Contact EH&S at 206-616-5835 for current information.
alkali	Any chemical substances which forms soluble soaps with fatty acids. Alkalis are also referred to as bases. They may cause severe burns to skin. Alkalis turn litmus paper blue and pH values range from 8 to 14.
alopecia	Loss of hair.
analgesia	Loss of sensitivity to pain.
anesthesia	Loss of sensation or feeling.
anhydride	An oxide or compound that when combined with water gives an acid or base.
anhydrous	Free of water.
anorexia	Loss of appetite.
anosmia	Loss of the sense of smell.
anoxia	A lack of oxygen from inspired air (literally without oxygen). Also, see "hypoxia."

ANSI	American National Standards Institute. A privately funded, voluntary membership organization that identifies industrial and public needs for national consensus standards and coordinates development of such standards. Many ANSI standards relate to safe design/performance of equipment such as safety shoes, eyeglasses, smoke detectors, fire pumps, and household appliances; and safe practices of procedures such as noise measurement, testing of fire extinguishers and flame arresters, industrial lighting practices, use of abrasive wheels, etc. (ANSI, 1819 L Street NW, Suite 600, Washington DC 20036, 202-293-8020, http://www.ansi.org)
aqueous	A water-based solution.
aquatic toxicity	The adverse effects to marine life that result from being exposed to a toxic substance.
argyria	Local or generalized impregnation (gray-blue color) of the body tissues with silver.
asphyxia	Lack of oxygen and thus interference with the oxygenation of the blood. Can lead to unconsciousness.
asphyxiant	A vapor or gas that can cause unconsciousness or death by suffocation (lack of oxygen). Most simple asphyxiants are harmful to the body only when they become so concentrated that they reduce oxygen in the air (normally about 21%) to dangerous levels (18% or lower). Asphyxiation is one of the principal potential hazards of working in confined spaces.
asthma	A disease characterized by recurrent attacks of dyspnea, wheezing, and perhaps coughing due to spasmodic contraction of the bronchioles.
ASTM	American Society for Testing and Materials. A voluntary membership organization whose members devise consensus standards for materials characterization and use. (ASTM, 1916 Race Street, Philadelphia, PA 19103, 215-299-5400.)
asymptomatic	Neither causing nor exhibiting symptoms.
ataxia	A loss of muscular coordination.
atrophy	A wasting or diminution in the size of tissues, organs, or the entire body.
autoignition temperature	The minimum temperature to which a substance must be heated without application of a flame or spark in order to cause that substance to ignite.
bases	See “alkali.”
boiling point	The temperature at which a liquid changes to a vapor state, at a given pressure. Flammable materials with low boiling points (below 100 °F) generally present special fire hazards.
bradycardia	A slow heartbeat. Pulse rate below 60 beats per minute.
bronchitis	Inflammation of the bronchial tubes in the lungs.
buffer	A substance capable in solution of neutralizing both acids and bases.
CAA	Clean Air Act. The federal law enacted to regulate/reduce air pollution. Administered by the EPA.
C *or* **ceiling**	The maximum allowable human exposure limit for an airborne substance; not to be exceeded even momentarily. Also, see “STEL” and “TWA.”
carcinogen	A substance that causes cancer. Also, see “select carcinogen.”
CAS number	An assigned number that identifies the material. CAS stands for Chemical Abstracts Service, a Columbus, Ohio, organization that indexes information published in Chemical Abstracts by the American Chemical Society and provides

jaundice Yellowish discoloration of the skin, whites of eyes, and bodily fluids with bile pigment (bilirubin) caused by any of several pathological conditions that interrupt liver function.

L&I Department of Labor and Industries. The State of Washington agency that is responsible for administering worker safety and health regulations in Washington (*www.wa.gov/lni*).

laboratory An area where chemical manipulations are done for either research, educational, or clinical purposes.

Laboratory Safety System The precursor to MyChem. No longer in use. See "MyChem."

lacrimation Secretion and discharge of tears.

lavage A washing of a hollow organ, such as the stomach.

LC_{50} (lethal concentration 50) The concentration of a material that on the basis of laboratory tests has been shown to kill 50% of a group of test animals when administered as a single exposure (usually 1 or 4 hours). The LC_{50} is expressed as parts of material per million parts of air by volume (ppm) for gases and vapors, or as micrograms per liter of air (ug/l) or milligrams per cubic meter of air (mg/m^3) for dusts, mists, gases or vapors, or as ppm or mg/l by mass of material in water.

LD_{50} (lethal dose 50) A single dose of a material that on the basis of laboratory tests is expected to kill 50% of a group of test animals. The LD_{50} dose is usually expressed as milligrams or grams of material per kilogram of animal weight (mg/kg or g/kg).

LEL *or* **LFL** Lower Explosive Limit or Lower Limit. For a vapor or gas; the lowest concentration (lowest percentage of the substance in air) that will produce a flash of fire when an ignition source (heat, arc, or flame) is present. At concentrations lower than the LEL, the mixture is too "lean" to burn. Also, see "UEL or UFL."

lesion Abnormal change, injury, or damage to tissue or to an organ.

leukemia A progressive, malignant disease of the blood-forming organs.

LFL Lower Flammable Limit. See "LEL or LFL."

light sensitive chemicals Chemicals that may react violently or degrade in the presence of light. Store in amber bottles in a cool, dry, dark place.

local exhaust A mechanical ventilation system for capturing and exhausting contaminants from the air at the point where the contaminants are produced (welding, grinding, sanding, other processes or operations), as opposed to "general exhaust." The work area is often partially enclosed to improve the capture of the contaminants.

LSS Laboratory Safety System. The name of the computer network database which has been upgraded and is now the MyChem system. See "MyChem."

malaise A feeling of general discomfort, distress, or uneasiness; an out-of-sorts feeling.

mechanical exhaust A powered device, such as a motor-driven fan or air/stream venturi tube, for exhausting contaminants from a workplace, vessel, or enclosure.

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

melting point The temperature at which a solid substance changes to a liquid state. For mixtures, the melting range may be given.

mil Generally, one one-thousandth of something. With respect to protective gloves, a unit of thickness equal to one thousandth of an inch. Thin, surgical gloves may be five to seven mils thick. Many industrial gloves are 20 to 35 mils thick.

MSDS Material Safety Data Sheet. A document describing a chemical's known hazards, which is produced by the chemical manufacturer and provided to the chemical user as required by OSHA.

mutagen A substance or agent capable of altering the genetic material in a living cell.

MyChem A computer network database established to give access to MSDSs, to surplus chemical exchange, and to site-specific chemical information including chemical inventories.

nanoparticle A particle having at least one dimension on the scale of 100 nanometers or smaller, where chemical and physical properties may differ from bulk material properties. Typically the term applies to deliberately human-designed particles and not those which may occur in nature such as proteins or as a byproduct of other processes, such as the release of nanoparticle-sized combustion products.

narcosis Stupor or unconsciousness produced by some narcotic drug.

nausea Tendency to vomit, feeling of sickness at the stomach.

necrosis Local death of tissue.

neoplasm A new or abnormal growth of tissue in which the growth is uncontrollable and progressive.

negative pressure The environmental condition when the air pressure inside a room or containment device is less than the air pressure outside the area of interest. When a fume hood is running, it should be at "negative pressure" to the rest of the room. This is desirable because hazardous chemicals inside the area of interest will be less likely to escape, because air leaks will be into the area. Also, see "positive pressure."

neutralization A method of chemically treating corrosive hazardous waste by the addition of an acid or base to make the waste neutral.

NFPA National Fire Protection Association. An international voluntary membership organization to promote/improve fire protection and prevention and establish safeguards against loss of life and property by fire. Best known on the industrial scene for the National Fire Codes, 16 volumes of codes, standards, recommended practices, and manuals developed (and periodically updated) by NFPA technical committees. Among these is NFPA 704. It contains the code for showing hazards of materials using the familiar diamond-shaped label or placard with appropriate numbers or symbols.

NIOSH National Institute for Occupational Safety and Health. A research agency within the Public Health Service, U.S. Department of Health and Human Services (DHHS) which--among other activities--tests and certifies respiratory protective devices, recommends occupational exposure limits for various substances, and assists OSHA in occupational safety and health investigations and research. (http://www.cdc.gov/Niosh/homepage.html)

NTP National Toxicology Program. A group within the U.S. Department of Health and Human Services which produces the Annual Report on Carcinogens.

nystagmus Spastic, involuntary motion of the eyeballs in a horizontal, rotary, or vertical direction.

olfactory Relating to the sense of smell.

F. LABORATORY MOVING OUT CHECKLIST

Use this checklist as a tool to help you relocate or shut down your laboratory, or to temporarily relocate for remodels and renovations. Refer to the Laboratory Safety Manual Section 10 - Moving In/Moving Out for more details, including your responsibilities.

Laboratory Decontamination and Cleanout

- ❑ If you are partially or completely vacating your laboratory for remodeling, relocation or closure, you must leave it clean, empty and safe for Facilities Services staff or the next occupants. Follow all applicable instructions on the *Notice of Laboratory Moveout* (UoW 1800) online at http://www.ehs.washington.edu/forms/fso/1800.pdf. The Principal Investigator or laboratory manager/Chemical Hygiene Officer must sign the checklist to verify that all instructions were followed. **A copy of the *Notice for Laboratory Moveout* must be posted inside the door near one or more exits of your laboratory for Facilities Services or the next occupants.**

Chemical Safety

- ❑ Arrange for disposal of all hazardous waste and unwanted chemicals. (Attach a completed UW Hazardous Waste Label to any waste not in its original manufacturer's container, and complete and send a Chemical Collection Request form (UoW 1470) at least one month before you vacate.)
- ❑ Properly manage unwanted gas cylinders. (Return gas cylinders to the supplier or to whom you are leasing them from if at all possible. If you cannot do either, email chmwaste@u.washington.edu for assistance.)

  For questions or assistance call the EH&S Environmental Programs Office at 206-616-5835.

Biological Safety

- ❑ If your laboratory is relocating or shutting down, contact the EH&S Research and Biological Safety Office (RBSO) at 206-221-7770 to update your Research Project Hazard Assessment (RPHA) Form and/or laboratory spaces.
- ❑ If you are relocating or ending research involving select agents, contact the EH&S RBSO at 206-221-7770 for instructions.
- ❑ If you intend to relocate a biological safety cabinet, call 206-543-0465 or complete and submit a "Request to Purchase or Relocate a Biological Safety Cabinet" at http://www.ehs.washington.edu/fsobiocab/approvedlist2.shtm .
- ❑ If applicable, submit written plans for the decommissioning of a Biosafety Level 3 (BSL-3) area to the EH&S Research & Biological Safety Office Manager (Box 357165).

  For questions or assistance call EH&S Research & Biological Safety Office at 206-221-7770.

Radiation Safety

- ❑ Notify the EH&S Radiation Safety Office in writing as soon as the intent to vacate is known. Mail correspondence to EH&S Radiation Safety, Box 354400 or e-mail radsaf@u.washington.edu. Inform Radiation Safety of your new laboratory location if known.
- ❑ Discuss arrangements with Radiation Safety to assure removal of all radioactive waste and to coordinate relocation or transfer of ownership for remaining radioactive materials (206-543-0463).

If the Principal Investigator is leaving the University of Washington, these additional steps must be followed with the Radiation Safety Office:

- ❑ Usage records, including Radiation Survey Records, must be updated, finalized and submitted to Radiation Safety.
- ❑ Waste disposal records must be finalized and turned in to the Radiation Safety Office.
- ❑ All radioactive material waste containers must be picked up by the Radiation Safety Office.
- ❑ Personnel dosimeters must be returned to Radiation Safety.
- ❑ Termination bioassays must be performed if necessary.

For questions or assistance call the EH&S Radiation Safety Office at 206-543-0463.

Transportation

- ❑ Biological Materials: follow the instructions in Appendix B of the UW Biosafety Manual, online at http://www.ehs.washington.edu/rbsbiosafe/appendixb.pdf.
- ❑ Chemicals: follow the instructions in Section 10 Moving In/Moving Out and in Section 2 Chemical Management in your UW Laboratory Safety Manual. Under certain conditions, you can transport the chemicals yourself on campus. You can also arrange for a hazardous material contractor to pack and/or transport your chemicals for you.
- ❑ Radioactive Materials: For short moves of radioactive materials between locations on the contiguous UW Seattle campus, “hand carrying” is an option. For transport of radioactive materials over public roads, call the Radiation Safety Office.
- ❑ Equipment and Non-Hazardous Items: you may choose to hire an outside moving company or UW Property & Transport Services to move equipment. Either way, do these two items first:
  - ❑ Schedule with your local Facilities Services to remove materials or equipment that are attached to the building or would impact building materials. Refer to the Laboratory Safety Manual, Appendix F, for contact means.
  - ❑ Decontaminate your laboratory equipment if it has or may have come into contact with hazardous materials. Follow the instructions and fill out Form UoW 1803 Notice of Laboratory Equipment Decontamination and attach it to the equipment. For more details, see the form at http://www.ehs.washington.edu/forms/fso/lab_equip.pdf. To schedule pickup or drop off of surplus equipment, see http://www.washington.edu/facilities/transportation/movingandsurplus .
- ❑ Freezers: special arrangement must be made with EH&S to move freezers and Dewar flasks that contain infectious materials. Specialized moving companies can move other materials. See Section 10 of this manual for more details.

General

- ❑ Inform vendors and on-campus suppliers of your new box number and physical delivery address. Update your own information on www.myuw.washington.edu. Follow guidelines on records retention in Section 7 of this manual and also on the Records Management website at http://www.washington.edu/admin/recmgt/index.php. Box and label sensitive files (data, patent files, *etc*.) for personal transport.

G. SOP REQUIRED ELEMENTS CHECKLIST

Instructions: Use this SOP checklist to ensure that all required safety elements are present in an existing SOP. There may be an instance where a required element is not applicable under certain specific circumstances, such as when no animals are involved. Mark those elements with an NA. Add any missing elements to your existing SOP and add the completed checklist to your laboratory-specific information section in your Chemical Hygiene Plan.

SOP Title, Date	
PI or Lab Name	
Department	

Element Present	General Required Elements
☐	**Process or Experiment Description** Are the chemicals, process or equipment identified well enough there will be no confusion as to what the SOP pertains to – and doesn't pertain to?
☐	**Hazardous Chemicals/Class of Hazardous Chemicals** Are all hazardous chemicals/chemical classes involved in the procedure addressed – raw stocks, intermediates, final products, and wastes?
☐	**PPE – Personal Protective Equipment** Is the personal protective equipment to be used described well enough that there will be no confusion as to what is required at what stages of the procedure?
☐	**Engineering/Ventilation Controls** Are the environmental controls and ventilation systems needed to safely use the chemicals identified? This may include hoods, environmental rooms, aerosol suppression devices, filtering or absorption devices, etc. Does the SOP note that the equipment must be checked for proper operation before use?
☐	**Special Handling Procedures and Storage Requirements** Are any special storage requirements for the chemicals noted?. This may include restricted access areas, special containment devices, and safe methods of transportation.
☐	**Spill and Accident Procedures** Are spill or accidental release procedures identified? Are there any specifications as to how big a spill could be safely handled, who might be designated to clean up the spill, and if any special spill clean-up materials are needed?
☐	**Waste Disposal** Are waste disposal procedures identified? (For more information refer to Section 3 of this manual.) If particularly hazardous substances are involved, this is especially important.
☐	**Special Precautions if Using Animals** Are procedures for safely handling the animal described?
If particularly hazardous substances are used in the process, the following should also be present. (Definitions and partial listings of these acute toxicants, carcinogens, reproductive hazards, highly dangerous chemicals, and select toxins are in Appendix H of the laboratory safety manual.)	
☐	**Approvals** Are training and approval requirements before someone can perform the procedure noted?
☐	**Decontamination Procedures** Are special precautions identified for handling the especially hazardous materials?
☐	**Designated Area/Equipment** Is a specific area and specific equipment for safe use of the hazardous material identified?

Name:	Title:
Signature:	Date:

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