

# UNIVERSITY OF DELAWARE

## Research Faculty Guide to Environmental Health and Safety Laboratory Services

**MSDS**

**FLAMMABLE**

4 Extremely flammable  
3 Ignites at normal temperatures  
2 Ignites when moderately heated  
1 Must be preheated to burn  
0 Will not burn

**HEALTH**

4 Too dangerous to enter vapor or liquid  
3 Extremely dangerous use full protective clothing  
2 Hazardous - Use breathing apparatus  
1 Slightly hazardous  
0 Like ordinary material

**REACTIVITY**

4 May detonate - Vacate area if materials are exposed to fire  
3 Strong shock or heat may detonate - Use monitors from behind explosive-resistant barriers  
2 Violent chemical change possible - Use hose streams from distance  
1 Unstable if heated - Use normal precautions  
0 Normally stable

**HAZARDOUS MATERIALS IDENTIFICATION SYSTEM**

HAZARD INDEX		PERSONAL PROTECTION INDEX	
4 = SEVERE HAZARD	A	G	☑️ + 🧤 + 🦺 + 🦠
3 = SERIOUS HAZARD	B	H	☑️ + 🧤 + 🦺 + 🦠
2 = MODERATE HAZARD	C	I	☑️ + 🧤 + 🦺 + 🦠
1 = SLIGHT HAZARD	D	J	☑️ + 🧤 + 🦺 + 🦠
0 = MINIMAL HAZARD	E	K	☑️ + 🧤 + 🦺 + 🦠
	F	X	☑️ + 🧤 + 🦺 + 🦠
	A	n	☑️ + 🧤 + 🦺 + 🦠
	O	P	☑️ + 🧤 + 🦺 + 🦠
	t	U	☑️ + 🧤 + 🦺 + 🦠
	W	y	☑️ + 🧤 + 🦺 + 🦠
		Z	☑️ + 🧤 + 🦺 + 🦠

HEALTH  
FLAMMABILITY  
PHYSICAL HAZARD  
PERSONAL PROTECTION

Consult your supervisor or S.O.P. for "SPECIAL" handling directions

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Department of Environmental Health & Safety  
(302) 831-8475 <http://www.udel.edu/ehs>

Created: August 2004

Revision dates: February 2005  
April 2008  
September 2009

# Research Faculty Guide to Environmental Health and Safety Laboratory Services

## Purpose:

The purpose of this Guide is to assist faculty members and others responsible for coordinating laboratory research activities with the process of obtaining the necessary authorizations to conduct scientific research in a laboratory setting at the University of Delaware. The Guide will help determine the appropriate contact persons, University policies, training requirements, and sources of information. A checklist is used to help identify the sections of the Guide that are pertinent to the research work that will be conducted.

## Department of Environmental Health and Safety:

This Guide was developed and provided to you by the Department of Environmental Health and Safety (EHS) which is nationally recognized for excellence in the management of its occupational and environmental safety programs. The mission of the department is to-

- Maintain safe and healthful working conditions,
- Contribute to general educational development related to safety, health and the environment,
- Provide safety-related support to the University community, and
- Ensure compliance with federal, state and local regulations.

The EHS operates with a team- and service-oriented approach. One role of the department is to facilitate the safe conduct of scientific research on campus. EHS members will assist you with the development of a safety program for your laboratory and will guide you through the administrative process to obtain the necessary authorizations from federal, state, and/or local agencies that regulate laboratory processes. Use of this Guide is the first step to obtaining approval to conduct research in your lab.

## Safety and Compliance Checklist

This checklist will assist you in finding the appropriate sections of this Guide that apply to the research activities that you plan to conduct. It will also assist the Department of Environmental Health and Safety in determining the proper level of support that the Department needs to provide to you.

Please complete the checklist and fax or mail a copy to Environmental Health and Safety (FAX number: 302- 831-1528).

Name:	Phone Number:
Department:	Email Address:

Please check one box for each question below	YES	NO	NO - but possible in the future
Will you work in a laboratory with potentially hazardous materials? (Section 1)			
Will your work involve the use of chemicals? (Section 2.1)			
Will you use acutely toxic gases/materials? "Acutely" means life-threatening even in very small quantities, e.g. dimethyl mercury, silane (Section 2.2)			
Will you use chemicals or materials that are known or anticipated to be human carcinogens? (Section 2.2)			
Will you use carbon nanotubes or nano-materials? (Section 2.2)			
Will you use highly reactive gases/materials? (Section 2.3)			
Will you use hydrofluoric acid? (Section 2.4)			
Will you purchase, or have in your laboratory, any of following pieces of equipment (fume hood, microwave oven, refrigerator, freezer, flammable storage cabinet, acid storage cabinet)? (Section 2.5)			
Will you use "controlled" substances or DEA scheduled materials (e.g. narcotics)? (Section 2.6)			
Will your work involve the use of biological materials? (Section 3.1)			
Will your work involve the use of human blood, tissues or body fluids, or human cell lines? (Section 3.2)			
Will your work involve the use of recombinant DNA? (Section 3.3)			
Will you purchase, or have in your laboratory, a biological safety cabinet, laminar flow bench, or autoclave? (Section 3.4)			
Will your work require a permit from the USDA or CDC or an Import/Export license ? (Section 3.5)			
Do you wish to work with material classified as a "select agent"? (Section 3.6)			

Will your work involve the use of radioactive materials in sealed or unsealed form? (Section 4.1)			
Will your work involve the use of x-ray producing devices? (Section 4.2)			
Will your work involve the use of Class 3b or Class 4 lasers? (Section 4.3)			
Will your work involve the use of devices that emit radiation in the radio-frequency or microwave range or devices that generate strong magnetic fields (e.g. NMR units)? (Section 4.4)			
Will your work generate chemical, biological/infectious, or radioactive waste? (Section 5)			
Will your work require that you ship samples or materials off campus? (Section 6)			

## Section 1: General Laboratory Safety Issues

Use of hazardous materials may be regulated by one or more of the following federal, state, or local government agencies: Occupational Safety and Health Administration, Environmental Protection Agency, Nuclear Regulatory Commission, Delaware Department of Natural Resources and Environmental Control, Centers for Disease Control and Prevention, etc. In addition, the University has established policies related to the use of hazardous materials. These policies can be found at <http://www.udel.edu/ExecVP/polprod/>.

The Department of Environmental Health and Safety (EHS) acts as the liaison with all the controlling agencies and works with faculty members to ensure that laboratories are safe work environments and that applicable regulations are followed. EHS also assists researchers that must obtain a safety/compliance certification from a funding agency (e.g. DOD, DOE). Visit <http://www.udel.edu/ehs/grantcertreq.html> to learn about the process to gain these certifications.

This section covers safety issues applicable to all laboratories. Other sections cover specific lab safety issues.

### **Department of Environmental Health and Safety Staff**

All of the staff members of EHS, their areas of responsibility, and their contact information are provided in the *EHS Reference Guide* or at [www.udel.edu/ehs/staff.html](http://www.udel.edu/ehs/staff.html). Please do not hesitate to contact any member of EHS for assistance when developing the safety program for your laboratory.

### **Signage**

Complete and submit a *Laboratory Sign Request Form* (found at <http://www.udel.edu/ehs/labsign.html>) for each of your laboratory rooms. A sign will be printed and sent to you by campus mail. Insert the sign in the sign holder. If there is no sign holder, contact the Chemical Hygiene Officer (CHO) at 831-8475 to arrange installation of the holder. Complete an Emergency Information Insert Card, available from EHS, and tuck in the sign holder behind the laboratory sign.

### **Laboratory Posters and Charts**

The following guides, safety posters and charts that have general applicability to all laboratory research settings are available, namely-

- Laboratory Emergency Procedure Cards
- Glove Selection Guide
- Waste Disposal Guide
- Solid Waste Disposal Procedures and Set-Up
- Gel Waste Disposal Guidelines

The posters and charts can be used as a convenient reference source for your laboratory personnel. Please post them in your laboratory.

### **Departmental Safety Committees**

Each department that conducts laboratory research has established a Safety Committee comprised of departmental faculty, staff and students. In addition to other work, the Committee oversees the periodic safety audit of each laboratory within its department. Visit this page (<http://www.udel.edu/ehs/safetycomm.html>) to find out the name of your department's Safety Committee Chair and to see if your Committee maintains a webpage. Introduce yourself to your Committee Chair.

### **Safety Training**

You and your laboratory staff must receive training in the topics of hazard recognition, hazard protection, and regulatory compliance. The specific training that workers must receive depends on the hazards present in the laboratory. Training requirements will be discussed in Sections 2 through 5. The Department of Environmental Health and Safety can assist you by providing some of the necessary training. The EHS training schedule can be found at <http://www.udel.edu/ehs/safetyedu.html>.

### **Personal Protective Equipment (PPE)**

You must provide workers with the equipment needed to work safely and enforce the use of such equipment. Sections 2 through 5 will identify PPE needed for some specific tasks, however, one item of PPE is required in any laboratory setting. UD Policy 7-23 (<http://www.udel.edu/ExecVP/polprod/7-23.html>) requires workers to wear ANSI approved safety eyewear whenever they are present in the laboratory. Purchase at least one pair of safety glasses for each worker in your lab. The mounting of a safety glasses rack at the entrance of each of your laboratory rooms is recommended. Local opticians may provide special pricing to UD employees that wish to obtain prescription safety glasses. Further information on the eyewear policy and suppliers of eyewear can be found at (<http://www.udel.edu/ehs/safetyglasses.html>).

### **Laboratory Design and Construction**

If you will be moving into new or renovated laboratory facilities, confirm that Department of Environmental Health and Safety is involved as early as possible in the design and construction process. EHS will ensure that the facility-related equipment and utilities you need to work safely are in place when you move into your laboratory.

### **Laboratory Safety Equipment**

It is highly recommended (and in some cases required) that you consult with the Department of Environmental Health and Safety prior to the purchase of any safety equipment, e.g. biological safety cabinets, radiation shielding, personal protective clothing, respirators, etc. EHS can evaluate your proposed purchase to determine if it will provide the appropriate level of safety.

### **Sharps and Piercing Objects**

Most laboratories will generate "sharps" waste. Sharps are any item that presents a laceration or puncture hazard to lab workers or waste collection staff (e.g. broken glass, scalpels, needles, glass slides, pipette tips). Follow the guidelines described at this website-- <http://www.udel.edu/ehs/sharpsdisp.html>. Sharps containers of various capacities are available free of charge either from your departmental storeroom or the Department of Environmental Health and Safety.

## Section 2: Use of Chemically Hazardous Materials

The use of hazardous chemicals is regulated by many federal and state agencies, including: Occupational Safety and Health Administration, Environmental Protection Agency, and the Delaware Department of Natural Resources and Environmental Control. In addition, the University has established policies related to the use of laboratory chemicals. These policies can be found at <http://www.udel.edu/ExecVP/polprod/>.

### 2.1. Hazard Communication and General Training Requirements

#### Right-to-Know Training

All laboratory workers are required to receive training with regard to their exposure to hazardous materials in the workplace under the State of Delaware's Hazardous Chemical Information Act and University Policy 7-27. This training must be completed by the individual's supervisor prior to the individual working with or in a location where hazardous materials are used. Documentation of the training must be submitted to EHS within 5 days of the training. Options for training can be found at <http://www.udel.edu/ehs/safetyedu.html>.

#### Instruction in the Chemical Hygiene Plan

In addition to Right-to-Know training, laboratory workers are subject to OSHA's Laboratory Standard. This standard incorporates requirements for employee training and information, medical consultation and examination, hazard identification, respirator use and recordkeeping. Chemical Hygiene Plan training must also be completed prior to the start of work in a lab and is the responsibility of the supervisor. Options for training can be found at <http://www.udel.edu/ehs/chptraining.html>.

#### Job Hazard Analysis and Standard Operating Procedures

The Chemical Hygiene Plan and University Policy 7-40 requires that a Job Hazard Analysis (JHA) be performed for all operations that pose a health risk to workers. During the course of this activity Personal Protective Equipment (PPE) will be designated. Some activities lend themselves to the development of a Standard Operating Procedure in lieu of a JHA. These can be done in conjunction with your departmental Chemical Hygiene Officer or the University Chemical Hygiene Officer. More information on this program can be found at <http://www.udel.edu/ehs/jha.html>. This site also lists some JHAs and SOPs that have already been approved for campus-wide use.

#### Material Safety Data Sheets (MSDS)

MSDSs must be readily available for all workers in the lab. EHS purchases a subscription to MSDS databases through [CHEMWATCH](#) and the [Canadian Center for Occupational Health and Safety](#). The Department of Environmental Health and Safety strongly encourages laboratories to keep hard copies of the MSDSs for all of the chemicals present in the lab in a yellow MSDS binder. These forms are needed to accompany any lab workers who have been exposed and are being transported to medical facilities for treatment. MSDSs are also to be consulted when determining how to use the materials in the lab as well as how to dispose of them.

## 2.2 Acutely Toxic or Carcinogenic Gases and Materials

University Policy 7-24 stipulates that cylinders of all gases having a health hazard rating of 3 or 4 and cylinders of gases having a health hazard rating of 2 with no physiological warning properties shall be stored in a continuously mechanically ventilated enclosure if inside a building.

Anyone working with acutely toxic materials, carcinogens, reproductive toxins or carbon nanotubes and nano-materials must be provided information and training under OSHA 29 CFR 1910.1200 and 29 CFR 1910.1400. There is limited evidence that carbon nanotubes and nano-materials have carcinogenic effects. Carcinogenic material precautions should be taken when working with these materials, until further research and studies prove otherwise. This information shall be covered under the Chemical Hygiene Training and the Right-to-Know annual training and is the responsibility of the Supervisor. For more information on acutely toxic materials or training options please go to <http://www.udel.edu/ehs/toxiccarcinogenicprogram.html>.

## 2.3 Highly Reactive Gases

Highly reactive gases should be housed in a vented gas cabinet according to National Fire Protection Association (NFPA) codes. The requirements and limitations will depend on the type of gas. Please contact the Chemical Hygiene Officer (831-8475) for more information.

## 2.4 Special Procedures/Training when Using Hydrofluoric Acid

The use of hydrofluoric acid requires very specific training to outline the UD program prior to working with or around this acid. The initial training needs to be arranged through the Chemical Hygiene Officer and the annual refresher training thereafter is available on the EHS Assistant Online Training Program. Please contact the Chemical Hygiene Officer for information and training (831-8475).

## 2.5 Laboratory Equipment for Use/Storage of Chemicals

University Policy 7-29 states that each laboratory must be provided with a flammable liquids storage cabinet and fume hood for the use and storage of hazardous materials. Additional safety equipment, such as an acid cabinet or lab safe refrigerator, may be necessary for proper chemical storage. Chemicals must be stored according to the requirements stated on the label or MSDS. If you do not have adequate storage locations for the chemicals you will use, contact your departmental Chemical Hygiene Officer or the EHS at 831-8475.

## 2.6 "Controlled" Substances or DEA Scheduled Material

Use of these materials requires special permits, security measures, and waste management procedures. Please contact the Chemical Hygiene Officer if you anticipate their use.

## Section 3: Infectious and Biological Materials

The University's biosafety program is established to protect individuals from exposure to biohazards through the application of administrative and engineering controls. The program is managed by the Biosafety Officer and has oversight by the University Biosafety Committee.

The Biosafety Manual outlines the entire biosafety program for the University. A hard copy of the manual is available through the Department of Environmental Health and Safety, and it is available online at <http://www.udel.edu/ehs/biosafetymanual/biosafetymanual.pdf>.

### 3.1 General Biological Work

Anyone working with biological materials must complete a *Biological Registration Form* and a *Biological Inventory Form* or maintain their inventory in the EHS Assistant Online. These are available on the web at <http://www.udel.edu/ehs/ubc.html>. When completed, the forms must be submitted to the Biosafety Officer.

Anyone working with biological materials must take training based on the hazard level of the work. This is determined through the *Biological Registration Form*. Anyone working at with biologicals must take Biosafety Training. Anyone working at Biosafety Level 3 will take additional specific training through that facility.

Depending on the work, the research may need to be included in specific biological programs in addition to these procedures. These programs are outlined in further sections of this document.

Further information on the biosafety program is available at <http://www.udel.edu/ehs/biosafety.html> . There are also additional resources available on this page which may be useful to you in your research.

### 3.2 Bloodborne Pathogens Program

The University of Delaware's Bloodborne Pathogens (BBP) Program was established in 1993 to protect workers who are exposed to blood or other potentially infectious materials in the workplace. It is designed to provide compliance with the Occupational Safety and Health Administration's Bloodborne Pathogens Standard. The University has an Exposure Control Plan which outlines the program.

Anyone who may be exposed to human blood, body fluids, tissues, or human cell lines must be included in the program. A permit is written with the Biosafety Specialist for the research group or lab. Everyone who works with these materials must take BBP training prior to starting work with them. The University provides the hepatitis B vaccination series for employees included in the program, and performs a follow-up if someone is exposed to these infectious materials.

To have your lab included in the program, contact the Biosafety Specialist. Further information on the program, including the Exposure Control Plan, is available at <http://www.udel.edu/ehs/bloodborne.html> .

### 3.3 Recombinant DNA Research

The University of Delaware complies with the NIH *Guidelines for Research Involving Recombinant DNA Molecules*. A copy of the *Guidelines* is available on the Department of Environmental Health and Safety (EHS) web page.

Any research involving recombinant DNA must be registered with the University Biosafety Committee (UBC). The *Registration Form for Recombinant DNA Research* must be completed and signed by a UBC

member and the Biosafety Officer. These forms are available on the web page or through EHS, as are the procedures to have a protocol reviewed and approved.

Further information on the recombinant DNA program is available at <http://www.udel.edu/ehs/dnaregister.html> . The form and the *Guidelines* are available on this page as well.

### 3.4 Laminar Flow Equipment and Autoclaves

Biological safety cabinets and laminar flow clean benches are used to protect personnel, their work, and the environment from microorganisms and experimental biological materials. Different cabinets perform different functions. It is crucial that the correct cabinet be selected for each application. The Department of Environmental Health and Safety maintains a list of cabinets at the University.

The purchase of any laminar flow equipment must first be approved by the Biosafety Specialist. New equipment or equipment that is to be moved must be certified prior to its use. All equipment is certified on an annual basis as well. This is coordinated through the Specialist Officer.

Further information on the cabinets, their purchase and certification is available at <http://www.udel.edu/ehs/biosafetycabinet.html> .

Autoclaves, in some cases, must be inspected and licensed by the State. If you wish to purchase one or bring one to campus, please contact the Biosafety Specialist.

### 3.5 Permits

Certain research may require a permit from either the Centers for Disease Control and Prevention (CDC) or the United States Department of Agriculture (USDA). These permits may be required for either importation of the materials, or for the actual work with them.

Any faculty who must apply for a permit or must transfer one from a previous location to the University should contact the Biosafety Officer. The Biosafety Officer should be included in any necessary inspections as the permit process is completed.

### 3.6 Select Agents

On June 12, 2002 the "Public Health Security and Bioterrorism Preparedness Response Act of 2002" was signed. This regulation requires that all persons possessing certain biological agents or toxins register with either the Centers for Disease Control and Prevention or the United States Department of Agriculture.

If anyone at the University of Delaware wishes to work with any select agent, they must first contact the Biosafety Officer regarding registration requirements. Further information on select agents is available at <http://www.udel.edu/ehs/selectagents.html>

## Section 4: Radiation and Radioactivity

### 4.1 Use of Radioactive Materials

The use of radioactive materials is regulated by the Nuclear Regulatory Commission and the State of Delaware Office of Radiation Control. The University maintains licenses from both the NRC and ORC that authorize the handling of such material by UD staff. The licenses require the appointment of a Radiation Safety Officer and establishment of a Radiation Safety Committee. The RSC is composed primarily of UD research faculty and issues internal authorizations to UD faculty that wish to conduct research with radioactive material.

To obtain authorization to use radioactive materials-

- a. Contact the Radiation Safety Officer (831-8475) to schedule a meeting to complete an application. The *Application for Radionuclide Utilization* form and a *Statement of Training and Experience for Radioactive Material Users* form may be completed and submitted prior to the meeting if you wish. Find forms at <http://www.udel.edu/ehs/formindex.html>.
- b. The *UD Radiation Safety Manual* and other radiation related information can be found at <http://www.udel.edu/ehs/radiation/radmat.html>.
- c. All those handling radioactive materials need to attend an Initial Radiation Safety Training session. Refresher training is then required each year after initial training. The training schedule for both initial and refresher training sessions can be found on-line at <http://www.udel.edu/ehs/ehstrainsched99.html>.
- d. Complete a *Permit Supervisor Training Certification for Radioactive Material Users* form for each individual who will work with, or near, radioactive materials. The form can be found at <http://www.udel.edu/ehs/formindex.html>.
- e. Purchase appropriate radiation safety supplies. If you will work with high energy beta emitters (such as P-32) or gamma emitters, a radiation survey meter will be required. Use of P-32 requires Plexiglass shielding (whole body shield, benchtop waste shields, storage boxes, Eppendorf tube finger shield, etc.). Plastic-backed bench paper and *Caution Radioactive Material* warning tape are needed when working with all radionuclides. Links to radiation safety suppliers can be found at <http://www.udel.edu/ehs/radiation/radsupply.html>.
- f. Confirm with your department that you will have convenient access to a liquid scintillation counter or make arrangements to obtain one.

### 4.2 Use of X-ray Producing Devices

The use of x-ray producing devices is regulated by the State of Delaware Office of Radiation Control. The University must register every device with the ORC. The University has established a Radiation Safety Committee composed primarily of UD research faculty to govern the use of x-ray devices. The RSC issues internal authorizations to UD faculty that wish to operate or supervise the use of x-ray devices.

To obtain authorization to use x-ray producing devices-

- a. Contact the Radiation Safety Officer (831-8475) to schedule a meeting to complete an application. The *Application for Analytical X-ray Equipment Utilization* form and a *Statement of Training and Experience for X-ray Workers* form may be completed and submitted prior to the meeting if you wish. Find forms at <http://www.udel.edu/ehs/formindex.html>.
- b. The *UD X-ray Safety Manual* and other x-ray related information can be found at <http://www.udel.edu/ehs/radiation/radproducing.html>.

- c. All those operating x-ray equipment need to attend an X-ray Safety Training session. The training is scheduled by contacting the Radiation Safety Officer (831-8475).
- d. Complete a *Permit Supervisor Training Certification for X-ray Workers* form for each individual who will work with x-ray producing devices. The form can be found at <http://www.udel.edu/ehs/formindex.html>.

#### 4.3 Use of Class 3b and Class 4 Lasers

The University uses *American National Standard for Safe Use of Lasers (ANSI Z136.1)* as a model for its laser safety program. The Laser Safety Committee (LSC), composed primarily of UD research faculty, oversees the Laser Safety Program. The Laser Safety Officer (LSO) manages the program and reports to the LSC. Prior to using Class 3b and Class 4 lasers-

- a. Submit a Laser Registration form for each Class 3b or Class 4 laser to the LSO. Find form at <http://www.udel.edu/ehs/formindex.html>.
- b. Review the *UD Laser Safety Manual* for requirements of the Laser Safety Program. The manual is found at <http://www.udel.edu/ehs/radiation/lasersafety.html>.
- c. All those who will operate Class 3b and 4 lasers need to attend a Laser Safety Training session. The training schedule can be found on-line at <http://www.udel.edu/ehs/ehstrainsched99.html>
- d. Obtain suitable laser safety eyewear for each worker who will be present in the room when the laser is operating. The RSO can help with proper selection. Links to suppliers of laser safety equipment can be found at <http://www.udel.edu/ehs/radiation/laserequip.html>.
- e. Depending on the planned laser operation, one or more of the following control systems may need to be in place to comply with the UD Laser Safety Program: illuminated warning sign, curtains, emergency shut-off switch, laser enclosures, interlocked entranceway, window covers, beam stops, deadbolt lock, etc. Review the Laser Safety Manual and consult with the LSO to determine needs. Discuss planned purchases and installations with the LSO. The manual is found at <http://www.udel.edu/ehs/radiation/lasersafety.html>.

#### 4.4 Using Devices that emit RF Radiation, Microwave Radiation, or Strong Magnetic Fields

The University must ensure that no worker exceeds the occupational limits on exposure to electromagnetic fields and static magnetic fields. There are also limits on exposure to the general public that need to be considered.

- a. Consult with the Radiation Safety Officer during the design stage of the facility especially if radiation fields are expected to extend into public or uncontrolled areas.
- b. Inform the Radiation Safety Officer whenever you acquire these devices so a campus-wide inventory can be maintained, the facility can be properly posted with a warning sign (if appropriate), and periodic measurements by the RSO of the field strength in your facility can be conducted.
- c. Install an alarming oxygen sensor in NMR facilities in the case of a quench event. Consult with the Industrial Hygienist (302-831-8475) prior to purchase or installation of an oxygen sensor.

## Section 5: Hazardous Waste Management

Proper management of hazardous waste is a critical component of the safety programs at the University of Delaware. Improper disposal jeopardizes the safety of laboratory workers, waste collection and management staff, and the environment. Compliance with the many waste disposal regulations can be challenging but the staff at the Department of Environmental Health and Safety (EHS) is committed to assisting you with developing an effective waste management program in your lab and providing the necessary training to you and your laboratory staff.

The Waste Disposal Guide and other posters, available through EHS, provided to you in this packet provide an excellent resource for laboratory workers. They are not, however, a substitute for training in proper waste disposal practices. The sections below provide information on the materials you will need to obtain for waste management and the training opportunities available to you through the EHS.

### Laboratory Chemical Waste

The University of Delaware has developed a Chemical Waste Management Program to assure that proper handling and disposal procedures are used to protect the health and safety of the University community and to comply with federal and state regulations governing hazardous and solid waste management. Improper chemical waste management may result in injury to University personnel, damage to University facilities and/or fines and enforcement actions from Federal, State or Local Regulatory Agencies.

Laboratories generate the largest amount of chemical waste at the University of Delaware. The majority of these wastes consist of spent organic solvents, solid chemically contaminated debris, inorganic acids and out-of-date or unwanted reagent chemicals.

- **Supplies and Equipment:** Below are the minimal supplies typically needed for managing chemical laboratory waste. Contact the Environmental Health Specialist if you require assistance with procuring the supplies. The last four items on the list are provided to you by the EHS.
  - 2½ gallon Low Density Polyethylene Nalgene Carboys with a 53B screw cap. Order 4 to 6 per flammable and aqueous waste stream.
  - 2 gallon “Justrite” Safety Containers. All bulk liquid corrosive waste must be stored in these containers. Order 4 to 6 per corrosive waste stream.
  - 4” ECO-Funnels with or without HPLC inputs to fit the 53B screw cap. Order 2 to 3 per waste stream.
  - Plastic bins for secondary containment. All liquid waste containers must be stored in secondary containment.
  - Containers for Solid Waste
    - Purchase Glass Only Boxes
    - Obtain other cardboard boxes and line with trash bags
    - Purchase 5-gallon pails (or larger) and line with trash bags
    - Purchase smaller plastic containers to have a receptacle at the generation site (128oz, 93mm cap)
  - Sharps Containers
  - EHS Orange Chemical Waste Labels

- Training: All workers in the lab must attend chemical waste management training, even the Principal Investigator. Contact the Environmental Health Specialist to discuss training options and to schedule an initial meeting.
  - Meet to discuss setting up a chemical waste disposal program.
  - Complete the online Chemical Waste Training class (<http://ehs.facil.udel.edu:1569/>), attend monthly Chemical Waste Disposal Training (<http://www.udel.edu/ehs/ehstrainsched99.html>), or schedule an on-site training session with the Environmental Health Specialist.
- Chemical Spill Kits: Assemble or purchase a chemical spill kit so materials are immediately at-hand in the case of a spill. Visit the following webpage to find the materials that should be included in the kit or to purchase a pre-assembled kit.
  - <http://www.udel.edu/ehs/chemspillkit/chemspillkit.html> .
- Online Chemical Waste Information

University of Delaware Policy 7-18 Hazardous Waste Disposal	<a href="http://www.udel.edu/ExecVP/polprod/7-18.html">http://www.udel.edu/ExecVP/polprod/7-18.html</a>
Laboratory Chemical Waste Management Procedures	<a href="http://www.udel.edu/ehs/chemwstmanage.html">http://www.udel.edu/ehs/chemwstmanage.html</a>
Chemical Waste Disposal Guidance Documentation	<a href="http://www.udel.edu/ehs/wasteguidance.html">http://www.udel.edu/ehs/wasteguidance.html</a>

**Other Chemical Wastes (batteries, recyclables, office waste, etc.)**

Laboratories generate other forms of chemical waste similar to that generated by administrative offices and groups like Custodial Services and Facilities. The types of waste include, but are not limited to computer and electronic equipment, industrial cleaners, used oil, recyclable metals, and batteries.

The *Waste Disposal Guide* flipchart available through EHS, provides information on the proper disposal of such waste. Information can also be found online at-

Office and Facility Chemical Waste Management Procedures	<a href="http://www.udel.edu/ehs/chemwstmanageoffice.html">http://www.udel.edu/ehs/chemwstmanageoffice.html</a>
Recycling and Waste Minimization Resources	<a href="http://www.udel.edu/ehs/ehsrecycles.html">http://www.udel.edu/ehs/ehsrecycles.html</a>

## Infectious/Biological Waste

The University of Delaware has developed an Infectious Waste Management program to assure that proper handling and disposal procedures are used to protect the health and safety of the University community and to be in compliance with the State of Delaware Department of Natural Resources and Environmental Control 7 Delaware Code, Chapter 60, Section 11. Types of infectious waste generated at the University of Delaware include, but are not limited to, blood and blood products; pathological wastes; cultures and stocks of etiologic agents; laboratory wastes which have come in contact with pathogenic organisms, blood or body fluids; and contaminated needles and syringes.

- **Supplies and Equipment:** All waste boxes, bags, tape, and sharps containers are provided by the Department of Environmental Health and Safety (EHS). In some locations on campus the supplies are available at a central location. These locations typically also serve as a storage location for full boxes awaiting pick-up. You should check with your department to see if this is available at your building.

If you do not have a central storage location, supplies will be delivered to your lab and your waste will be picked up there. To request a pick-up, either call EHS at x8475 or submit a request at <http://www.udel.edu/ehs/waste/biowstindex.html> .

- **Training and Procedures:** Contact the Biosafety Specialist to set up the waste program for your lab. All waste disposal procedures are available at <http://www.udel.edu/ehs/infectious.html> . The *Waste Disposal Guide* flipchart, available through EHS, provides information on the proper disposal of biological waste. Training in proper waste practices will be provided when you and your staff attend biological safety training.

## Radioactive Waste

The University of Delaware has developed a Radioactive Waste Management program to assure that proper handling and disposal procedures are used to protect the health and safety of the University community and to be in compliance with the US Nuclear Regulatory Commission regulations. Types of radioactive waste generated at the University of Delaware generally include: contaminated solid material (such as gloves, tubes, bench paper, etc.), vials containing radioactive liquid scintillation cocktail, and radioactive liquids.

- **Supplies and Equipment:** Radioactive waste containers are provided by the Department of Environmental Health and Safety. Nalgene carboys (8 or 10L capacity) are provided for liquid waste. Five gallon plastic or metal pails are provided for vials and solid waste. If you wish to use other waste containers, contact the Radiation Safety Officer. Shielding (e.g. lead, plexiglass) for waste containers is not provided by EHS and should be purchased if necessary for the radioactive work planned. To request a waste pick-up, either call EHS at x8475 or submit a request at [https://udapps.nss.udel.edu/webforms/embtform?wf\\_id=317&wf\\_ty=blank](https://udapps.nss.udel.edu/webforms/embtform?wf_id=317&wf_ty=blank) .
- **Training and Procedures:** Radioactive waste disposal procedures are available at <http://www.udel.edu/ehs/radiation/radwstguide.html>. The *Waste Disposal Guide* flipchart included in your packet provides information on the proper disposal of radioactive waste. Training in proper waste practices will be provided when you and your staff attend radiation safety training.

## Section 6: Shipping Laboratory Materials

The University of Delaware has developed procedures to follow for the shipment of laboratory materials. This includes biological, chemicals and radioactive materials. Some of these materials may be considered hazardous for shipping purposes. If you will be shipping any laboratory samples or materials,

complete a shipping request form available at [www.udel.edu/ehs/dotshippingrequest.pdf](http://www.udel.edu/ehs/dotshippingrequest.pdf) and send to EHS for determination of hazard and further guidance in performing the shipment. If the material is hazardous, EHS will perform the shipment for you. In addition, you may need a Material Transfer Agreement (MTA) from the Research Office. The form available on their web site at [www.udel.edu/research/researchers/policies-forms.html](http://www.udel.edu/research/researchers/policies-forms.html). Contact the Research Office at x2828 with any questions. Further guidance on chemical shipments is available at <http://www.udel.edu/ehs/shippingchemicals.html>. Further guidance for biological shipments is available at <http://www.udel.edu/ehs/bioshipmentguide.html>. Contact the Radiation Safety Officer at x8475 for information on shipping radioactive materials.

# We need your help.....

The development and distribution of this Guide is to assist those initiating research activities in University laboratories to establish a safety program and to obtain the necessary authorizations to conduct work.

Your comments on the usefulness of this Guide will be very helpful as we further revise and refine it. Please take a few minutes to complete the survey below and mail or fax it to Environmental Health and Safety at 831-1528.

Thank You.

Name (optional):	
May we contact you to discuss your comments?	
Did you find this Guide useful?	
What did you like about the Guide?	
What would you change about the Guide?	
What information was missing in the Guide that should be included?	
Did you find that the Checklist helped you find the sections relevant to your research?	
Have you encountered a similar Guide elsewhere during your research career? If yes, where?	
Any other comments you have:	