

Laboratory Safety Manual

Section 1 General Safety

INTRODUCTION

PURPOSE

This section has been prepared to provide Duke University laboratory personnel with information about general requirements related to safety and prevention of injuries in laboratories. Laboratory personnel are reminded that the policies in the [University Safety Manual](#) apply in the lab environment.

HAZARDS ADDRESSED

This section primarily addresses equipment and hazards that may cause physical injury such as cuts, burns, slips/trips/falls, traumatic injury, or electrical shock. Subsequent chapters address exposure to hazardous biological materials and chemicals. Radioactive materials and lasers are covered in the [Radiation Safety Manual](#) and the [Laser Safety Policy](#).

DEFINITIONS

High Risk Procedures – Lab procedures which pose significant risk of serious injury or major property damage if an unexpected event were to occur (such as a utility outage or equipment failure/misuse) and/or which

- May expose research personnel to hazardous energy (e.g., electricity or high pressures).
- Require specialized training not covered by another Duke Safety policy.
- Require specialized personal protective equipment in addition to gloves, lab coats, eye/face protection and/or thermal protective aprons or sleeves (for example, fall protection).

Laboratory - A facility for scientific experiments, research, or teaching where equipment and/or materials are designed to be easily and safely manipulated by one person. Laboratory work may involve relatively small quantities of hazardous materials used on a non-production basis, or experimental equipment generating hazardous energy (such as pressure, microwaves, or heat) on a small scale. The equipment and/or materials used in a laboratory are not part of a production process, nor in any way simulate a production process. In a laboratory, “protective laboratory practices and equipment” are available and in common use to minimize the potential for employee exposure to hazardous materials or energy.

Protective laboratory practices and equipment – Those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous materials or hazardous energy.

RESPONSIBILITIES

It is the responsibility of the Principal Investigator to ensure the safety of persons working or volunteering in his/her laboratories.

Department Heads shall:

- Ensure compliance with all safety requirements within their departments.
- Establish criteria and processes for Departmental review of hazard assessments/lab-specific Standard Operating Procedures for High Risk Procedures.

Principal Investigators (Research Labs)/Directors (Clinical Labs) shall:

- Ensure compliance with all safety requirements within the laboratory or laboratories.
- Provide direction and support to the Laboratory Safety Coordinator, if one is designated, or undertake the responsibilities of the Laboratory Safety Coordinator if no one is designated for that role.
- Perform a hazard assessment and develop/approve lab-specific Standard Operating Procedures for all high-risk procedures.
- When it is required by the department, submit High Risk Procedure hazard assessments for departmental review and maintain documentation that this review was completed.
- Before allowing minors or non-Duke employees to volunteer or work in the laboratory, submit and receive approval using the "[Workplace Safety Statement for Minors and Non-Employees at Duke](#)". The PI must ensure compliance with the policy on [Minors/Non-Employees in Work Areas](#).

Laboratory Safety Coordinators shall:

- Work with the Principal Investigator to develop and document necessary laboratory-specific standard operating procedures.
- Read and be familiar with this section of the Laboratory Safety Manual.
- Train laboratory employees and students when there is new laboratory-specific safety information or when a new employee or student is assigned to the laboratory. Document training as described under Laboratory-specific Training. Training must be documented for all paid employees (graduate students, post-docs, paid work study, or other wage or salaried personnel) in the laboratory; it is recommended that training be documented for non-paid students as well. *Examples of topics to be included in the training are detailed under Laboratory-specific Training.*
- Coordinate interaction with the Occupational and Environmental Safety Office, Employee Occupational Health and Wellness, and other Duke departments or outside agencies as needed for laboratory audits, incident/accident investigation, medical care, and emergency response.
- Post the Emergency Response and Incident Reporting Guide (available from OESO – 919-684-2794) in the lab near the door or main laboratory telephone.

Laboratory Employees and Students shall:

- Plan and conduct laboratory operations in accordance with federal regulation and applicable University safety policies (in this manual, the [University Safety Manual](#), the [Radiation Safety Manual](#), and the [Laser Safety Policy](#)).
- Abide by all policies and procedures described in any department or laboratory-specific policies.

- Report all injuries, other incidents, and unsafe conditions to their supervisor and PI, and to the appropriate university support groups as described in the Laboratory Emergency Response and Incident Reporting Guide.

The Occupational and Environmental Safety Office (OESO) shall:

- Develop and provide general laboratory safety training.
- Conduct periodic safety audits of laboratories.
- Investigate laboratory accidents and injuries.
- Review and provide input on safety measures for High Risk Procedures when requested by the PI or Department.

Employee Occupational Health and Wellness shall:

- Provide medical care for employees who have been injured.

GENERAL HAZARD INFORMATION AND TRAINING

Required Hazard Awareness Training

General Lab Safety Training:

Each laboratory employee (including P.I.s) and student shall be required to take a general laboratory safety course online before beginning work in the lab and annually thereafter.

Other General Training:

Laboratory employees or students exposed to general hazards that are not covered in the general laboratory safety training may be required to take other applicable safety trainings offered by the Occupational and Environmental Safety Office. Examples include:

- [Vehicle Safety Policy](#) training and Defensive Driver training for laboratory personnel who operate Duke Vehicles.
- Lockout-Tagout training for laboratory personnel who may perform service or maintenance on equipment where the unexpected start-up, energization, or release of stored energy could occur and cause injury. (See the [Hazardous Energy Control Policy](#) for more information.)
- Hearing Protection or Hearing Conservation training for employees exposed to hazardous noise. (See OESO Online Training Page for links to these courses.)
- Ladder Safety training where step ladders or extension ladders are used. (See OESO Online Training Page for a link to this course.)

Laboratory-specific Training:

The Principal Investigator or Laboratory Safety Coordinator shall conduct laboratory-specific hazard awareness training for each laboratory employee or student before that person begins working in the lab. This hazard awareness training shall be reviewed as necessary and any time a new hazard is introduced. Records shall be kept to indicate topics covered, name of person providing training, persons in attendance, and the date.

Examples of information to be covered (when applicable) in laboratory-specific training are listed below:

- The location and contents of the Laboratory Emergency Response and Incident Reporting Guide.
- Departmental or lab-specific incident reporting requirements.
- Location of emergency equipment such as fire extinguishers and fire alarm pull stations.
- Location of the lab's emergency assembly point (EAP). (See the [site-specific fire plans](#) online for EAPs for campus buildings.)
- Proper use and disposal of razor blades or other sharps (including broken glass disposal boxes).
- Safe use and storage of stepladders or stools.
- Equipment or areas requiring hearing protection.
- Safe use of laboratory equipment.
 - For any laboratory equipment, refer to the equipment manual for safety instructions.

- For electrical equipment, including extension cords, see the [Electrical Safety Policy](#).
- For machine tools, see the [Academic Shop Policy](#).
- Safety procedures for [Fieldwork](#).
- Appropriate methods for disposing of various types of waste generated in the lab.
- Laboratory standard operating procedures for any High Risk Procedures.

Required Sources of General Hazard Information

Equipment Hazard Labels:

When there are hazard labels on purchased equipment (such as labels indicating possible electrical shock, sharp edges, or pinch points), laboratories shall not remove or deface these labels.

If laboratories produce or assemble equipment that could cause injury, warning labels are recommended.

Equipment Manuals:

If laboratory equipment is provided with a manual that includes safety warnings, the manual (or at least the safety warnings) must be accessible to laboratory personnel. Laboratories are encouraged to maintain a list of equipment manuals that contain safety information and to require staff to sign indicating that they have read the applicable safety information for the equipment they will use.

GENERAL SAFETY PROCEDURES FOR THE LABORATORY

Introduction

This section covers common safety concerns noted in laboratories. Where applicable, policies in the [University Safety Manual](#) are referenced for detailed requirements.

Consideration of Safety during Procurement

When purchasing laboratory equipment, consider the safety of laboratory personnel. Considerations include:

- Presence of engineered safeguards – When possible, choose equipment that isolates users from heat, sharp edges, pinch points, hazardous energy (such as ultraviolet light, microwaves, or other energy sources), and hazardous materials. If laboratory personnel will maintain equipment, consider their safety during maintenance activities as well as normal operations.
- Noise – When possible, choose equipment that generates less noise. If equipment produces noise levels over 85 dBA, see the [Occupational Noise Exposure Policy](#) for requirements.
- Ergonomics – When possible, choose equipment that:
 - Allows users to maintain neutral postures,
 - Adjusts for multiple users,
 - Minimizes repetitive activities, and
 - Runs automatically instead of requiring manual operation.

Safe Work Practices

General Housekeeping, Storage and Use of Equipment, and Maintenance

Keeping the laboratory clean, organized, and functioning properly can help to prevent incidents and injuries. General housekeeping, storage, and maintenance practices are described below.

- Never obstruct access to exits and emergency equipment such as eyewashes, drench hoses, and safety showers.
- Keep the work area clean and uncluttered, with equipment and hazardous materials properly stored.
- Secure or position benchtop equipment so that it will not be knocked over.
- Keep drawers and cabinets closed and cords and cables off the floor to avoid tripping hazards. Use cable management devices to bundle cords and cables together under desks and lab benches.
- Keep items off the floor to allow your housekeeping service to clean effectively, and to reduce the risk of trips and falls.
- Keep aisles clear of stored materials.
- Arrange workspace efficiently to allow personnel to maintain neutral postures, minimize repetitive activities, and minimize forces required while working.
- Promptly clean up spills and dropped materials/equipment to avoid slip hazards. (For chemical spills, see the Chemical Safety Chapter).

- Keep sink traps and floor drain traps filled with water at all times to prevent the escape of sewer gas into the laboratory. Alternately, contact your maintenance provider to fill infrequently-used traps with linseed or other oil that is safe for sewer disposal (since the oil will evaporate less rapidly than water).
- Keep sharp or pointed tools properly sheathed or otherwise stored safely when not in use.
- Hang clothing in proper locations; it should not be draped over equipment or benches.
- Do not store excess cardboard boxes, equipment boxes, Styrofoam, or lab equipment under lab benches or above shelves/cabinets throughout the lab. This can be a safety as well as a fire hazard.
- Promptly notify the laboratory safety coordinator or PI and contact your maintenance or equipment service provider when lighting, vacuum lines, or other laboratory equipment is not functioning properly. Until the repair is completed, tag the affected equipment as “out of service”. Advise maintenance/service personnel of hazards they may encounter during repair.

Working alone –

Prior approval of the Principal Investigator is required for working alone after hours.

Generally, it is prudent to avoid working alone in a laboratory. Individuals working alone should make arrangements with other lab personnel to check on them periodically, or ask security guards to check on them. High Risk Procedures must not be performed by personnel working alone.

Unattended experiments –

High Risk Procedures should not be left unattended, but if circumstances require that the experiment run when the lab is not occupied, seek the approval of the Principal Investigator or laboratory safety coordinator in advance.

Water taps should not be left open and unattended because of the potential for flooding. This includes running tap water for cooling, or filling tanks or other containers with water.

Safe use and disposal of sharps –

Handle and store laboratory glassware with care to avoid damage; do not use damaged glassware. Dispose of broken glassware using broken glass disposal boxes.

Choose safe cutting devices – use of straight razors should be avoided in favor of safety scalpels or other alternatives. Straight razors should not be used when a safer cutting device (e.g., scissors, box cutter) is more appropriate.

Uncontaminated razor blades and needles must be disposed of in puncture-resistant hard-sided sharps disposal boxes. If red sharps boxes are used, mark out any biohazard warnings and write “not a biohazard” on the box. For safe disposal of contaminated sharps, see the Biological Safety or Chemical Safety Sections, or the Radiation Safety Manual, as appropriate.

Safe use of laboratory equipment –

In general:

- Use equipment only for its designated purpose.
- Be familiar with the manufacturer’s instructions before using.

- Inspect equipment for damage; do not use damaged equipment.

Use of laboratory equipment requiring highly specialized training shall be considered a high risk procedure if accidental misuse of the equipment could cause injury or damage to the building. Lab-specific standard operating procedures, including training for operators, must be developed and approved by the PI.

Electrical safety –

Included below are requirements from the Electrical Safety Policy that are commonly applicable to laboratories. See the [Electrical Safety Policy](#) for further details and additional requirements.

- Extension cords
 - Extension cords shall not be used as substitutes for permanent wiring. Extension cords may remain in place for no more than 30 days if they are in continuous use and otherwise comply with requirements for extension cords. Contact the appropriate maintenance department to install permanent wiring where needed.
 - Extension cords shall not be plugged into one another so as to increase the overall reach.
 - All extension cords purchased or in use shall be the three wire type and have a minimum wire size of 14 AWG.
- Power strips
 - Power strips may be used to supply office equipment.
 - Power strips shall not be plugged into one another so as to increase the overall reach or number of available outlets.
 - All power strips purchased or in use shall have a cord 6 feet or less in length, a 15 amp circuit breaker/fuse, and a surge protector.
- Extension cords and equipment cords shall not be run through doorways or in any other manner that may result in damage to the cord unless cord protectors are in place.
- The purchase or use of cube taps to expand the capacity of an outlet is prohibited.

Some laboratories may have other electrical hazards present and may therefore require additional electrical safety precautions. Specifically:

- Use of high voltage power supplies shall be considered high risk procedures requiring PI approval.
 - Written lab-specific safety procedures, approved by the PI, shall be developed. These may reference the manufacturer's instruction manual, but must include specific instructions for the experiment being conducted.
 - Any personnel working with high voltage power supplies shall be trained on the hazards and shall be familiar with manufacturer-supplied safety information and lab-specific procedures.
 - Warning signs shall be in place when high voltage power supplies are in use.

- Where laboratory personnel maintain or service hard-wired electrically-powered laboratory equipment, the [Hazardous Energy Control Policy](#) applies. For more information and to arrange required training, see the [OESO webpage on Lockout/Tagout](#) and contact OESO – Occupational Hygiene and Safety at 919-684-5996.
- Labs are reminded that the [Electrical Safety Policy](#) requires that electrical installations, modifications, and repairs are to be made only by Duke-employed electricians and other trades performing electrical work within the scope of their trade, or authorized contractors.
- If the lab will create or modify electrically-powered equipment, see paragraph below on “Controlling exposure to hazardous energy”.

Safety during field research–

Refer to the [Fieldwork Safety Policy](#) and [Fieldwork Safety Plan Template](#) for requirements and guidelines related to fieldwork. The [Safety Guidelines for Fieldwork](#) provides reference information that may be useful for researchers conducting field research.

Safe use of machine tools and portable power tools –

Refer to the [Academic Shop Policy](#) for requirements and guidelines related to use of machine tools and portable power tools in the laboratory environment.

Safe use of vehicles–

Refer to the [Vehicle Safety Policy](#) for requirements and guidelines related to driving Duke-owned or leased vehicles and for the Corporate Risk policy on use of personal vehicles for Duke business.

Controlling exposure to hazardous energy –

Where laboratory personnel maintain laboratory equipment connected to compressed air, steam, electricity or other hazardous energy sources, the [Hazardous Energy Control Policy](#) may apply. For more information and to arrange required training, see the [OESO webpage on Lockout/Tagout](#) and contact OESO – Occupational Hygiene and Safety at 919-684-5996.

Procedures that could expose personnel to hazardous energy (in the case of equipment failure or misuse) will be considered high risk procedures requiring a hazard assessment and/or written standard operating procedure. The hazard assessment/written SOP will require the approval of the PI and, in many cases, the department.

Where labs create or modify equipment that uses hazardous energy (including electricity, compressed air, steam, vacuum, etc.), the creation or modification of the equipment and its initial testing will be considered a High Risk Procedure requiring the review of the PI. The lab planning to create or modify such equipment will seek guidance from the department to determine if departmental review and approval will be necessary. A hazard assessment shall be performed, and the review and approval thereof shall be documented in writing and kept with the hazard assessment.

Personal Protective Equipment (PPE)

This section covers personal protective equipment for general physical hazards commonly present in laboratories. For PPE requirements and recommendations for hazardous materials and lasers, see the Biological Safety or Chemical Safety Sections of this Manual, or the Radiation or Laser Safety Manuals, as appropriate.

Laboratory procedures that require specialized personal protective equipment, such as personal fall arrest systems or arc-flash clothing, are considered high-risk procedures. A hazard assessment, written laboratory-specific procedures, and PI approval are required. In some cases, Departmental approval may also be required. OESO may be consulted for advice on specialized PPE and/or review of procedures.

Gloves –

- Thermal gloves should be worn for contact with hot surfaces such as (dry) equipment being removed from ovens or autoclaves, or the inside of a hot oven or autoclave.
- Heat-resistant impermeable gloves must be worn for handling hot liquids. Standard autoclave gloves are not appropriate.
- Cryo-gloves must be worn when retrieving materials from cryogenic freezers.
- Leather or cloth work gloves should be worn to protect the hands from scrapes, scratches, or splinters during materials-handling activities.
- Cut-or puncture-resistant gloves should be worn when working with sharps. If these gloves reduce dexterity, consider wearing a cut-or puncture-resistant glove only on the non-dominant hand. If working with chemicals or infectious materials and sharps, wear the cut- or puncture-resistant glove under the disposable glove. If the outer glove is damaged, remove both pairs of gloves and wash hands thoroughly before continuing.
- Gloves should be worn when working around UV light sources to prevent skin exposure.

Eye/face Protection –

Safety goggles should be worn when working with glassware under reduced or elevated pressures and when handling glassware or liquids at high temperatures. If the risk of splash is high, a face shield should also be worn. Safety glasses should be worn when there is a risk of eye injury from projectiles.

Skin protection –

If work in the laboratory may expose the skin to cuts, scratches, or burns, laboratory workers should minimize exposed skin through their choice of personal clothing and/or use of a lab coat.

If there is a risk of splash with hot water, wear a standard lab coat, rubberized apron and heat-resistant impermeable gloves.

Foot protection –

Closed-toed shoes should be considered standard attire for laboratory work, especially if there is a risk of dropping hot liquids or laboratory materials, or if materials-handling carts are used.

Hazard Assessment & Documentation of Approval for High-Risk Procedures:

When planning research involving High Risk Procedures (see definitions), the PI (or designee) must perform a hazard assessment and/or develop a laboratory-specific Standard Operating Procedure, which must be approved by the PI, and in some cases by the Department, before beginning work. Documentation of approval must be kept with the hazard assessment/lab-specific SOP. For Chemical High Risk Procedures, see the Chemical Safety Chapter.

PREPARING FOR AND RESPONDING TO EMERGENCIES

Preparedness

Types of incidents

Each lab should consider the types of incidents that could have an adverse effect on people, research efforts, property, and/or the environment and engage in planning efforts aimed at mitigating the impact of the emergency (for example, arranging for critical laboratory equipment to be maintained on emergency power) and on the necessary response for each situation.

Response actions

For possible incidents, the lab should consider and prepare for the response actions that will be needed. Evacuation of the lab may be necessary in some emergency situations. Therefore, lab personnel need to be familiar with how to get out of the building in the event of an emergency, and the location of the lab's designated Emergency Assembly Point. Emergency Assembly Points in "The Site-Specific Fire Plans" for campus buildings can be found on Fire Safety's website at <http://www.safety.duke.edu/laboratory-safety/fire-safety>.

Written plan

Where a response will be needed at the time of an emergency, a written plan should be prepared by the lab, describing the actions that will need to be taken.

Resources and Equipment

Each lab should make sure that it has the equipment and other resources available to implement its emergency plans. The following resources will be necessary for all research and clinical labs; if additional resources are needed, the Laboratory Safety Coordinator and PI should identify those resources in the written emergency plan, and make sure that they are available.

Emergency Response & Incident Reporting Guide –

Each lab should post an up-to-date copy of the Duke Laboratory Emergency Response and Emergency Reporting Guide near the exit and/or primary telephone for the lab. This guide lists emergency contacts and procedures for various types of incidents.

Emergency Contact Information –

Each laboratory unit or department should keep emergency contact information for laboratory personnel, especially the Principal Investigator and Laboratory Safety Coordinator. The purpose of this information is twofold:

- In the event of a fire, flood, or other emergency affecting the lab, to allow emergency response personnel to reach someone in the lab; and
- In the event of a lab-related or other incident requiring a member of the lab to seek medical attention, to allow the Lab Safety Coordinator, PI, or department representative to reach a family member or friend of the affected personnel.

To facilitate contact with the lab in case of emergency (such as fire or flooding in the lab), labs should also post contact information (including after-hours phone numbers) for key laboratory personnel on or near the door to the lab. OESO has a [laboratory door sign template](#) that may be used.

Fire extinguishers –

See the [Fire Safety Section of the Laboratory Safety Manual](#) for information on the types of fires and appropriate fire extinguishers.

Emergency Response

Most of the following information is also found in the Duke Laboratory Emergency Response and Incident Reporting Guide, which should be posted near the main exit and/or mail telephone for each lab. Contact OESO Laboratory Safety at 919-684-8822 if you need a copy of this Guide.

Personal Injury

- All work-related injuries and illnesses (including chemical spills onto the body), regardless of the severity, must be reported to the supervisor.
- If needed, obtain medical care from the nearest Employee Occupational Health and Wellness location (call 919-684-3136 for more information (after hours, call 919-684-8115)), or through one of the other providers listed at
- Complete a [Report of Work-related Accident, Injury or Illness](#).
- See the [Workers' Compensation website](#) for additional information, or call Workers' Compensation at 919-684-6693.

Fire

See your building's [site-specific fire plan](#) (available on the OESO website) for emergency procedures related to a fire.

Other incidents affecting property or the environment

For EMERGENCIES that may impact building integrity and/or harm people:

- Evacuate the immediate area. If the entire building needs to be evacuated, follow the procedures in your Site-Specific Fire Plan.
- On campus: Call 911 from a campus phone or 919-684-2444 from any phone. Off campus: Call 911.

For other incidents/accidents that do not pose immediate danger to people or the environment, call 919-684-2794 to report the incident. If maintenance support is needed, contact your maintenance provider.

LABORATORY START-UP, AUDITING AND CLOSEOUT

This section has been included to provide guidance to all principal investigators (PIs) and laboratory managers on appropriate start-up, auditing, and close-out procedures. It is imperative that these procedures be followed to ensure compliance with all applicable federal, state and local requirements.

Instructions for Principal Investigators (PIs)

Background

It is the responsibility of each Principal Investigator (PI) to be aware of all applicable safety requirements. Failure to follow safety requirements may lead to an unsafe occupational setting. Such non-compliance may also result in fines from external regulatory agencies such as the Occupational Safety and Health Administration (OSHA).

Laboratory Start-up Procedures

New PIs must complete the “[Notice of Laboratory Occupancy](#)” Qualtrics form (prior to arrival if possible). Once notice is received, an OESO representative will contact the PI to schedule a visit to the laboratory, at which time all applicable safety policies and procedures will be discussed. Every effort will be made to schedule the on-site visit within the first week of occupancy. Thereafter, [laboratory safety audits](#) will be conducted on a periodic basis.

- **Laboratory Door Signs with Emergency Contact Information**

Each laboratory room should have emergency contact information posted at the door. In the event of an emergency, such as a fire or hazardous spill, response personnel will need to contact those responsible for the laboratory. The sign should include the names of the principal investigator (PI), the lab manager, and a department contact. Office and after-hour phone numbers and/or other contact information should be provided on the sign. Also, any special instructions the PI would like emergency personnel to be aware of can be listed on the sign. **An example of an emergency contact information sign can be found at <http://www.safety.duke.edu/ergonomics/computer-ergonomics/laboratory-door-signs-emergency-contact>.**

The following special requirements may be applicable to your laboratory operations. See the links for more information and/or call OESO-Laboratory Safety Program 919-684-8822 for guidance.

- **Lab-specific Chemical Hygiene Plan** (*required of all labs that use chemicals*): Each laboratory must have a [Laboratory-Specific Chemical Hygiene Plan](#), list of [Particularly Hazardous Substances \(PHSs\)](#) used in the lab, and lab-specific [Standard Operating Procedures \(SOPs\)](#) for any PHSs and nanomaterials used in the lab.

- **Chemical Reporting and Toxic Substance Control Act:** The Department of Homeland Security (DHS) promulgated the Chemical Facility Anti-Terrorism Standards (CFATS) in 2007. This program was designed to secure the nation's chemical infrastructure by identifying high risk chemical facilities and requiring them to implement risk-based performance standards and other requirements. Facilities that manufacture, use, store or distribute certain “chemicals of interest” are covered by these requirements.

Because of the way DHS defined chemical facilities, colleges and universities such as Duke have to comply with this regulation. To determine if we must institute additional security measures, OESO must determine Duke’s aggregate quantities of these chemicals. For most of the chemicals on the list, we have determined that our aggregate quantities are well below the DHS thresholds. However, the list includes some chemicals that Duke has or could have in quantities close to the thresholds. These chemicals, along with other chemicals that are tightly regulated by the Environmental Protection Agency, are on Duke’s [“Targeted Chemical Reporting List”](#).

The Toxic Substance Control Act (TSCA), administered by the Environmental Protection Agency (EPA), was established to ensure that the human health and environmental effects of chemical substances are identified and properly controlled prior to placing these materials into commerce ([Fact Sheet](#)). Although research laboratories such as those found at Duke University are exempted from many of the requirements of this act, certain provisions still apply.

For compliance with Chemical Reporting and TSCA, complete the annual report found on the Laboratory Safety and Waste Management System found by going to www.safety.duke.edu, selecting “Laboratory Safety”, then “Lab Safety and Waste Management”.

- **Chemical Waste Disposal:** All new PIs must carefully review the [Duke Chemical Waste Policy](#). If any chemical waste will be produced, information on proper disposal can be found at: <http://www.safety.duke.edu/environmental-programs/hazardous-waste>.
- **Application for Possession of Radioactive Materials:** An application must be submitted to the Radiation Safety Officer (RSO) for the use of all radioactive materials. Only after the application has been reviewed and approved by the RSO, shall the laboratory be allowed to purchase or use radioactive materials. Information on how to become an “authorized user” can be found at: https://lsw.duhs.duke.edu/radsafety/new_au/main_menu.asp. Contact Radiation Safety Division 919-684-2194 for more information.
- **Registration for Work with Recombinant DNA:** Experiments involving the utilization of rDNA may require approval by the Duke University Institutional Biosafety Committee (IBC) prior to submission to outside agencies and the initiation of experimentation. PIs should refer to the [rDNA chapter](#) of the Biological Safety Section of this manual and/or contact OESO - Biological Safety Division 919-684-8822 for more information. To go directly to the rDNA project registration form click [here](#).

- **Written standard operating procedures (SOP) for work with biohazards and/or hazardous chemicals:**
 - [Biosafety Level 2 \(BSL2\) SOP:](#)
 - [Hazardous Chemical SOPs](#)
- **Personal Protective Equipment Hazard Assessment:** The [PPE Hazard Assessment form](#) must be completed for any required PPE that is not covered in the Lab Safety Manual and lab-specific SOPs.

Laboratory Closeout and Relocation Procedures

All laboratory closeouts and relocations must be conducted in accordance with standard procedures for the removal of hazardous materials. The OESO Laboratory Safety Division (919-684-8822 or labsafety@dm.duke.edu) should be notified as soon as the laboratory closeout/relocation is anticipated (preferably 3-4 months), no less than 30 days prior to the departure date. Notice is given by completing the [Laboratory Closeout/Relocation Notice](#). Upon receipt, the OESO will provide specific instructions for proper shut-down to the laboratory's assigned safety contact. The departing/relocating principal investigator shall be held fully responsible for all Institutional requirements. The laboratory will be cleared for new occupancy only after all requirements are met.

If proper notification is not given, the principal investigator and/or the department will be held responsible for all cost incurred for safe disposal of remaining hazardous material wastes.

The following is a list of requirements which must be met for each class of hazardous agents used before a laboratory is released by the OESO.

Biological Hazards

1. All biological materials (e.g. blood, fresh tissue, bacterial cultures) must be removed from the laboratory by disposing according to Institutional policy, by shipping to another facility while conforming to the approved shipping regulations, or by transferring to another PI. This includes those materials stored in refrigerators, freezers, incubators and cold rooms.
2. All equipment which has come in contact with potentially infectious materials must be properly decontaminated and labeled with the "[Laboratory Equipment Statement of Hazard Assessment](#)".
3. All biological waste must be properly decontaminated and disposed of appropriately (autoclave, etc.).
4. All benchtops or other work surfaces on which biological materials were manipulated must be wiped down with an approved disinfectant.
5. The OESO shall determine the appropriate decontamination method for all biological safety cabinets. If formaldehyde gas decontamination is deemed necessary, the departing PI will be financially responsible.

Chemical Hazards

1. All chemical containers must be labeled with the chemical name or a best description of the compound and hazard warning.
2. All chemicals not transferred to another Duke laboratory will be considered chemical waste. Contact OESO-Environmental Programs (919-684-2794) to discuss disposal options.
3. Chemicals being shipped or transferred to another facility must be packaged and labeled according to approved regulations.
4. All benchtops and equipment (including fume hoods) must be cleaned of visible contamination using a compatible cleaning method (e.g. detergent/water solution, ethanol, etc.).
5. All equipment which has come in contact with hazardous chemicals must be properly decontaminated and labeled with the "[Laboratory Equipment Statement of Hazard Assessment](#)".
6. Compressed gas cylinders must be returned to their supplier (e.g. National Welders). Cylinders owned by the PI (e.g. lecture cylinders) may be submitted to the OESO-Environmental Programs for proper disposal.

Radiation Hazards

1. Notify the Radiation Safety Officer, at 919-684-2194, of intention to terminate authorization.
2. Dispose of all radioactive materials by one of the following methods:
 - Materials can be transferred to another authorized user while complying with all license restrictions of that user. Approval from the Radiation Safety Officer is required prior to radioactive material transfer.
 - Materials can be disposed of through the OESO-Environmental Programs Division.
 - Materials can be shipped to a non-Duke licensee while conforming to all applicable shipping regulations. Radioactive materials will be prepared for shipment by the Radiation Safety Division. *Note: There will be notification/acceptance requirements at the new facility.*
3. Perform a thorough radiation contamination survey of the laboratory, including equipment, to determine if allowable contamination levels are achieved. Those areas found to exceed the allowable limits must be decontaminated and resurveyed until within allowable limits. Once this is complete, any equipment must then be labeled with the "[Laboratory Equipment Statement of Hazard Assessment](#)".
4. Notify the X-ray Program lead at 919-684-2194, of intention to terminate use of X-ray producing devices.
5. All X-ray producing devices have to be made inactive before sending to surplus.

Laser Hazards

Notify the Laser Safety Manager (LSM), at 919-684-2194, of intention to terminate use of lasers. The LSM will provide information or assistance with proper disposal of lasers.

APPENDICES

[Laboratory Startup/Closeout/Relocation Notices](#)