LABORATORY SAFETY PLAN

Northeastern University

Department of Bioengineering

REVISION 2: AUGUST 21, 2018
# Table 1: University and Departmental Emergency Contacts*

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# ABBREVIATIONS

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<th>Description</th>
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<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
</tr>
<tr>
<td>BioE</td>
<td>Northeastern University Department of Bioengineering</td>
</tr>
<tr>
<td>BSL (BL)</td>
<td>Biological safety level</td>
</tr>
<tr>
<td>CHP</td>
<td>Chemical Hygiene Plan</td>
</tr>
<tr>
<td>DLAM</td>
<td>Northeastern University Division of Laboratory Animal Medicine</td>
</tr>
<tr>
<td>DSO</td>
<td>Department Safety Officer</td>
</tr>
<tr>
<td>EHS</td>
<td>Northeastern University Office of Environmental Health and Safety</td>
</tr>
<tr>
<td>FT</td>
<td>Fulltime (full-time)</td>
</tr>
<tr>
<td>GHS</td>
<td>United Nations’ Globally Harmonized System of Classification and Labeling of Chemicals</td>
</tr>
<tr>
<td>HF</td>
<td>Hydrofluoric acid</td>
</tr>
<tr>
<td>IRB</td>
<td>Institutional Review Board</td>
</tr>
<tr>
<td>IACUC</td>
<td>Institutional Animal Care and Use Committee</td>
</tr>
<tr>
<td>LSO</td>
<td>Laboratory Safety Officer</td>
</tr>
<tr>
<td>LSP</td>
<td>Laboratory Safety Plan</td>
</tr>
<tr>
<td>NEU</td>
<td>Northeastern University</td>
</tr>
<tr>
<td>NFPA</td>
<td>National Fire Protection Association</td>
</tr>
<tr>
<td>NUID</td>
<td>Northeastern University identification number</td>
</tr>
<tr>
<td>OSHA</td>
<td>US Occupational Health and Safety Administration</td>
</tr>
<tr>
<td>PI</td>
<td>Principal investigator (usually a NEU faculty member)</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal protective equipment</td>
</tr>
<tr>
<td>PT</td>
<td>Part-time</td>
</tr>
<tr>
<td>RAM</td>
<td>Radioactive material</td>
</tr>
<tr>
<td>REU</td>
<td>Research Experience for Undergraduates (a program of the National Science Foundation)</td>
</tr>
<tr>
<td>SDS</td>
<td>Safety Data Sheet (formerly known as Material Safety Data Sheet or MSDS)</td>
</tr>
<tr>
<td>TA</td>
<td>Teaching Assistant</td>
</tr>
</tbody>
</table>
OVERVIEW

The LSP presented herein is intended to present authorized personnel (laboratory user and workers) within the BioE policies and procedures for the safe use of BioE laboratory facilities. Analytical methods and experimental activities conducted within laboratories vary among research groups and classes. It is not possible to review all methods and activities that are or may be performed in BioE laboratory facilities in this manual. Policies and procedures presented in this manual should serve as minimum requirements for all BioE laboratory user and workers. Laboratory users and workers must receive training specific to each activity and method from their PI, course instructor, course TA, or supervisor, as appropriate.

Many parties work collaboratively to ensure the safe operation of BioE laboratories, including: Department Chair, PIs, Faculty, and the DSO. Primary responsibility for laboratory safety rests with the laboratory user and worker.

Before beginning work in any BioE laboratory facility or office/writing area directly connected to a laboratory, the laboratory user and worker must:

- Read this LSP in full
- Review the EHS website
- Review the CHP, including the NEU plan for laboratory safety management (Appendix G of CHP)
- Complete all required safety trainings
- Complete the BioE Facility Access Request Form

After beginning work in BioE laboratory facilities, the laboratory user and worker must:

- Develop good personal laboratory safety habits
- Wear all required PPE
- Inform appropriate personnel of any laboratory deficiency that may pose a safety hazard
- Plan and conduct each analytical method and experiment in accordance with proper laboratory safety procedures and this LSP
- Ensure that their work area is decontaminated, clean, and tidy, and that all chemicals, biologicals, and laboratory equipment are properly stored at the end each experiment or the end of each work day, whichever is sooner.
- Complete all required refresher safety trainings
- Complete required safety training(s) before using new methods, procedures, or materials used in experiments
EMERGENCY CONTACT INFORMATION

IN THE EVENT OF FIRE:

1. CALL 911 TO REPORT THE FIRE
2. THEN CALL NEU PUBLIC SAFETY AT 617-373-3333 TO REPORT THE FIRE
3. THEN REACH OUT TO BioE EMERGENCY CONTACTS
   (see laboratory door signage and Table 1)

IN THE EVENT OF A CHEMICAL OR BIOLOGICAL EXPOSURE, OR ANY OTHER EMERGENCY:

1. CALL NEU PUBLIC SAFETY AT 617-373-3333
2. THEN REACH OUT TO BioE EMERGENCY CONTACTS
   (see laboratory door signage and Table 1)

Know your location and be specific about the nature of the emergency.

Laboratory information and emergency contact numbers, including home and mobile numbers, are posted on laboratory doors. Table 1 provides additional emergency contacts at the university and department level. Only office telephone numbers are provided. For home and mobile numbers, consult the laboratory door signage or call NEU Public Safety at 617-373-3333.
# TABLE 1: UNIVERSITY AND DEPARTMENTAL EMERGENCY CONTACTS*

## For chemical spills, exposures, and other emergencies

<table>
<thead>
<tr>
<th>NAME</th>
<th>TITLE</th>
<th>CONTACT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elham Ghabbour</td>
<td>Laboratory Safety Program Manager, EHS</td>
<td><a href="mailto:e.ghabbour@northeastern.edu">e.ghabbour@northeastern.edu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>617.373.2769</td>
</tr>
<tr>
<td>Lee Makowski</td>
<td>Department Chair, BioE</td>
<td><a href="mailto:l.makowski@northeastern.edu">l.makowski@northeastern.edu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>617.373.3006</td>
</tr>
<tr>
<td>Helen Markewich</td>
<td>Departmental Safety Officer, BioE</td>
<td><a href="mailto:h.markewich@northeastern.edu">h.markewich@northeastern.edu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>617.373.8591</td>
</tr>
<tr>
<td>Evan Saravo</td>
<td>Environmental Health and Safety Specialist</td>
<td><a href="mailto:e.saravo@northeastern.edu">e.saravo@northeastern.edu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>617.373.4015</td>
</tr>
<tr>
<td>Andrew Sullivan</td>
<td>Hazardous Material Program Manager</td>
<td><a href="mailto:a.sullivan@northeastern.edu">a.sullivan@northeastern.edu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>617.373.6030</td>
</tr>
<tr>
<td>Susan Wilcox</td>
<td>Business Manager, BioE</td>
<td><a href="mailto:s.wilcox@northeastern.edu">s.wilcox@northeastern.edu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>617.373.6405</td>
</tr>
</tbody>
</table>

## For biological spills, exposures, and emergencies

<table>
<thead>
<tr>
<th>NAME</th>
<th>TITLE</th>
<th>CONTACT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elisabeth Clark</td>
<td>Biosafety Program Manager, EHS</td>
<td><a href="mailto:e.clark@northeastern.edu">e.clark@northeastern.edu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>617.373.2769</td>
</tr>
<tr>
<td>Elham Ghabbour</td>
<td>Laboratory Safety Program Manager, EHS</td>
<td><a href="mailto:e.ghabbour@northeastern.edu">e.ghabbour@northeastern.edu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>617.373.2769</td>
</tr>
<tr>
<td>Getzabel Guevara</td>
<td>Biosafety Specialist, EHS</td>
<td><a href="mailto:g.guevara@northeastern.edu">g.guevara@northeastern.edu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>617.373.2432</td>
</tr>
<tr>
<td>Elham Ghabbour</td>
<td>Laboratory Safety Program Manager, EHS</td>
<td><a href="mailto:e.ghabbour@northeastern.edu">e.ghabbour@northeastern.edu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>617.373.2769</td>
</tr>
<tr>
<td>Lee Makowski</td>
<td>Department Chair, BioE</td>
<td><a href="mailto:l.makowski@northeastern.edu">l.makowski@northeastern.edu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>617.373.3006</td>
</tr>
</tbody>
</table>
### For spills of radioactive material (RAM) and RAM exposures

<table>
<thead>
<tr>
<th>NAME</th>
<th>TITLE</th>
<th>CONTACT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Christopher S. Bingel</td>
<td>Radiation Safety Manager, Laser Safety Officer EHS</td>
<td><a href="mailto:c.bingel@northeastern.edu">c.bingel@northeastern.edu</a> 617.373.2769</td>
</tr>
<tr>
<td>Lee Makowski</td>
<td>Department Chair, BioE</td>
<td><a href="mailto:l.makowski@northeastern.edu">l.makowski@northeastern.edu</a> 617.373.3006</td>
</tr>
<tr>
<td>Helen Markewich</td>
<td>Departmental Safety Officer, BioE</td>
<td><a href="mailto:h.markewich@northeastern.edu">h.markewich@northeastern.edu</a> 617.373.8591</td>
</tr>
<tr>
<td>Susan Wilcox</td>
<td>Business Manager, BioE</td>
<td><a href="mailto:s.wilcox@northeastern.edu">s.wilcox@northeastern.edu</a> 617.373.6405</td>
</tr>
</tbody>
</table>

### For laser exposures and related emergencies

<table>
<thead>
<tr>
<th>NAME</th>
<th>TITLE</th>
<th>CONTACT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Christopher S. Bingel</td>
<td>Radiation Safety Manager, Laser Safety Officer EHS</td>
<td><a href="mailto:c.bingel@northeastern.edu">c.bingel@northeastern.edu</a> 617.373.2769</td>
</tr>
<tr>
<td>Lee Makowski</td>
<td>Department Chair, BioE</td>
<td><a href="mailto:l.makowski@northeastern.edu">l.makowski@northeastern.edu</a> 617.373.3006</td>
</tr>
<tr>
<td>Helen Markewich</td>
<td>Department Safety Officer, BioE</td>
<td><a href="mailto:h.markewich@northeastern.edu">h.markewich@northeastern.edu</a> 617.373.8591</td>
</tr>
<tr>
<td>Susan Wilcox</td>
<td>Business Manager, BioE</td>
<td><a href="mailto:s.wilcox@northeastern.edu">s.wilcox@northeastern.edu</a> 617.373.6405</td>
</tr>
</tbody>
</table>
For any injury or hazardous material exposure in a BioE facility

<table>
<thead>
<tr>
<th>NAME</th>
<th>TITLE</th>
<th>CONTACT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Health and Safety</td>
<td>Incident Reporting</td>
<td><a href="mailto:ehs@northeastern.edu">ehs@northeastern.edu</a> 617-373-2769</td>
</tr>
<tr>
<td>Helen Markewich</td>
<td>Departmental Safety Officer, BioE</td>
<td><a href="mailto:h.markewich@northeastern.edu">h.markewich@northeastern.edu</a> 617.373.8591</td>
</tr>
<tr>
<td>Lee Makowski</td>
<td>Department Chair, BioE</td>
<td><a href="mailto:l.makowski@northeastern.edu">l.makowski@northeastern.edu</a> 617.373.3006</td>
</tr>
<tr>
<td>Susan Wilcox</td>
<td>Business Manager, BioE</td>
<td><a href="mailto:s.wilcox@northeastern.edu">s.wilcox@northeastern.edu</a> 617.373.6405</td>
</tr>
</tbody>
</table>

For veterinary or laboratory animal-related emergencies

<table>
<thead>
<tr>
<th>Division</th>
<th>Time of day</th>
<th>CONTACT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Division of Laboratory Animal Medicine-Institutional Animal Care and Use Committee (DLAM-IACUC)</td>
<td>Mon-Fri 8:00 AM – 4:00 PM</td>
<td><a href="mailto:DLAM@northeastern.edu">DLAM@northeastern.edu</a> (617) 373-3958</td>
</tr>
<tr>
<td></td>
<td>o After working hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Weekends (Saturday, Sunday)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Holidays</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Call the Work Order, Facilities Customer Service: (617) 373-2754</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Request that the DLAM or Animal Care “On Call Person” contact you.</td>
<td></td>
</tr>
</tbody>
</table>

* Only office telephone numbers are provided. For home and mobile numbers, consult the laboratory door signage or call NEU Public Safety at 617-373-3333.
FIRE & FIRE-RELATED EMERGENCIES

If the fire alarm is activated in any building:

- Proceed to the nearest exit in a quick and orderly manner.
- Close all doors as you exit.
- Alert others as they leave.
- Once outside, move away from the building to a safe area.
- If you have knowledge as to the nature of the event or the location of anyone needing rescue assistance, identify yourself to the emergency responders.

In the event of a fire or fire-related emergency such as abnormal heating of material, a flammable gas leak, a flammable liquid spill, smoke, or odor of burning:

- Activate the building alarm (fire pull station).
- Call 911 to notify emergency responders of the fire. Then call 617-373-3333 to notify NEU Public Safety of the fire.
- Shut down experimental equipment in the immediate area, if possible.
- Isolate the area by closing windows and doors and evacuate the building.
- Use a portable fire extinguisher to:
  - assist oneself to evacuate;
  - assist another to evacuate; and
  - to control a small fire, if possible.

There are fire extinguishers located in every BioE laboratory. All fire extinguishers are maintained and inspected by the university’s fire safety program. If a fire extinguisher is used, or discharges accidentally, notify the DSO immediately.

Provide the fire/police teams with the details of the problem upon their arrival. Special hazard information is essential for the safety of the emergency responders.

EXPOSURES AND SPILL EMERGENCIES

For details on emergency response to chemical exposures, biological exposures, and spills, consult the Exposures and Spills sections of this document.
STUDENT, STAFF, AND FACULTY EMERGENCY CONTACTS

Each NEU student, staff, and faculty member is required to list an emergency contact with the university. BioE also maintains a list of emergency contacts for its personnel. If a BioE student, staff, or faculty member is incapacitated in an emergency, asks for their emergency contact to be notified, or it is otherwise judged that their emergency contact should be notified, contact:

1. NEU Public Safety at 617-373-3333 and request that officers reach out the emergency contact of the affected individual(s). Be sure to have the individual’s full name and, if possible, NUID.

2. Lee Makowski, Susan Wilcox, or Helen Markewich at the details listed in Table 1 to request that they reach out to the emergency contact of the affected individual(s).

LABORATORY TRAINING & ACCESS

Each laboratory user and worker is required to receive the appropriate training from NEU EHS before accessing any BioE laboratory facility or office/writing area directly connected to a laboratory. Each laboratory user and worker is required to submit verification of his/her training to the DSO. Prior to assignments involving new laboratory methods or techniques that may result in new exposure situations; the laboratory user and worker must obtain the appropriate training as determined by the PI and/or the DSO.

All laboratory users and workers must have a status with the university as an active student, staff member, or faculty member. Unpaid positions or positions established without the participation of NEU Human Resource Management are not permitted. For details and guidance, contact the BioE Business Manager.

LABORATORY SAFETY TRAINING – EHS

- EHS training requirements for BioE students, staff, and faculty are available on the BioE website available here.
- Each laboratory user and worker must have an active NUnet student, faculty/staff, or sponsored account to register for EHS training.
- Access online trainings three ways:
  - Navigate to https://ehsa.nunet.neu.edu/ehstrn/EHStrainwebisapi.dll/EXEC
  - Navigate to https://www.northeastern.edu/ehs/training/online-training/ and click here:

    ![Online Training](https://www.northeastern.edu/ehs/training/online-training/)

    To go directly to our on-line training click here.

  - Or, access online trainings via myNortheastern
- Important: laboratory users and workers may be required to take additional training depending on the type of experimental methods, equipment, and materials with which they work.
ACCESS

Once the laboratory user and worker has read the LSP, fulfilled his/her training responsibilities and submits the signed BioE Facility Access Form to the DSO, access will be granted and his/her laboratory work may begin.

Beginning in July 2018, keycard access to office/desk, laboratory, and other BioE facilities facilities is granted with the following term limits:

- **Faculty**: indefinite access
- **Permanent staff**: indefinite access
- **Temporary staff, Co-ops**: access expires at the end of the term of employment/co-op agreement
- **PhD students**: access expires after six years
- **MS students**: access expires after three years
- **BS, BS/MS students**: access expires after at 5pm on the last day of each semester
- **Summer REU, other high school, undergraduate, and graduate summer research programs**: access expires after at 5pm on the last day of the program

If any BioE student, Co-op, temporary staff, or summer program member requires access beyond the terms listed above, contact the DSO to extend the access.

Note that if the individual loses status with NEU due to resignation, withdrawal or removal from academic program, nonpayment of tuition, or other causes, their keycard access will be automatically revoked by NEU.

BioE student, Co-ops, and temporary staff who started work prior to July 2018 may have their access expiration updated retroactively, according to the terms listed above, at any time by the DSO.

**No student, staff member, or faculty may work alone in a BioE laboratory facility.**

When working outside of normal business hours, BioE students, staff and faculty are encouraged to use the SafeZone app to notify NEU Public Safety of their whereabouts, as well as to notify their faculty advisor/PI and colleagues of their work schedule.

UNDERGRADUATES

Undergraduates must be supervised when working in BioE laboratory facilities according to the NEU Policy on Laboratory Supervision.

Undergraduates attending a BioE class in a laboratory facility may not be left unattended. A TA or faculty member must be present at all times.

Per ISEC building policy, undergraduates may not receive Husky card access to ISEC building main doors.

**Undergraduates may not use an autoclave without direct supervision by a graduate**
VISITING RESEARCHERS & SCHOLARS

Periodically, visiting researchers, undergraduate students, and high school students become involved in research activities requiring access to BioE laboratories. BioE encourages external collaboration and the participation of qualified researchers at all levels. As with BioE students, faculty, and staff, visiting researchers accessing BioE laboratories must complete appropriate training. **Visiting researchers attached to or sponsored by departments other than BioE must also notify the BioE Business Manager of:**

- The start date and end date of their work in BioE facilities
- The name and contact information of their sponsoring faculty member or faculty advisor
- The name of their home department

All laboratory workers must have a status with the university as a student, fulltime (FT) staff, part-time (PT) staff, faculty, or visiting scholar. All laboratory workers must have a NEU email account and Husky card.

**Note that for high school students and other minors, additional approvals and paperwork are required.** Refer to the [High School Students & Other Minors](#) section for details.

HIGH SCHOOL STUDENTS AND OTHER MINORS

Any visit, course, program, or research/work employment of high school students or other minors in any BioE facility must be reviewed and approved by:

- NEU Office of Risk Services
  - **Paperwork is required**
- NEU EHS
  - Email details to the [ehs@northeastern.edu](mailto:ehs@northeastern.edu) and [biosafety@northeastern.edu](mailto:biosafety@northeastern.edu)
  - Paperwork is required, generated automatically by the EHS online training system
- BioE Department Chair
- BioE Business Manager
- BioE DSO
High school students and other minors visiting, working in, or participating in a program or course in any BioE facility may not be granted keycard access to any BioE facility.

High school students and other minors may not work or be present in any BioE facility without direct supervision by a graduate student, postdoctoral researcher, or faculty member.

SHORT-TERM VISITORS

Short-term visitors include vendor technical sales representatives, service and installation representatives, potential research collaborators, potential students, faculty, and staff during an interview, and other visitors who will spend one day or less in a BioE laboratory facility and who will perform no work. These visitors may enter and walk through BioE laboratory spaces without donning PPE and without completing safety trainings if:

1. They remain clear of all chemical, biological, radiological, laser, and other hazards.
2. They are escorted at all times by a BioE faculty member, staff member, or graduate student designated by a PI.
3. They wear closed-toed shoes.
4. They comply with the no food or drink rule.
5. They comply with laboratory rules concerning personal electronics and other items.

Short-term visitors who will spend less than one day in a BioE laboratory space may work in laboratory spaces without completing safety trainings if:

1. They remain clear of all chemical, biological, radiological, laser, and other hazards not associated with the work they are performing.
2. They are escorted at all times by a BioE faculty member, staff member, or graduate student designated by a PI.
3. They wear closed-toed shoes.
4. They wear the appropriate PPE for their work.
5. They comply with the no food or drink rule.
6. They comply with laboratory rules concerning personal electronics and other items.

BioE students, including Capstone students, who will spend less than one day in a BioE laboratory space may work in laboratory spaces if:

1. They complete the required safety trainings.
2. They remain clear of all chemical, biological, radiological, laser, and other hazards not associated
with the work they are performing.

3. They are escorted at all times by a BioE faculty member, staff member, or graduate student designated by a PI.

4. They wear closed-toed shoes.

5. They wear the appropriate PPE for the work.

6. They comply with the no food or drink rule.

7. They comply with laboratory rules concerning personal electronics and other items.

WINTER HOLIDAYS

From December 25 through January 1 of each year, BioE is closed for business. Department business and research support services are not available during this time period, including but not limited to:

- Procurement
- Package/mail receiving and distribution
- Hazardous waste collection and supplies delivery
- Biohazardous waste collection and supplies delivery
- Transportation and moving
- Laboratory operations and moving support
- Changes or updates to facility cardkey access

Researchers are discouraged from working in department facilities, especially in laboratory facilities, during the winter holidays. If researchers must work in these facilities during the winter holidays, they are encouraged to use the SafeZone app to notify NEU Public Safety of their whereabouts, as well as to notify their faculty advisor/PI and colleagues of their work schedule.

No student, staff member, or faculty may work alone in a BioE laboratory facility.

FACULTY TRAVEL, LEAVE & SABBATICALS

Per NEU Policy (NEU CHP Appendix G), if faculty will be traveling away from the university (personal travel, business travel, or sabbatical), or if they will have limited telephone, mobile phone, and internet access for any length of time, they must designate another full-time NEU faculty member or postdoctoral researcher who is familiar with their laboratory research to supervise the laboratory. This individual must:

1. Be familiar with the traveling faculty member’s research and laboratory methods;
2. Be in close physical proximity to the traveling faculty member’s laboratory;
3. Have a full-time, active status with NEU;
4. Be a faculty or staff member – Students and visiting scholars may not be designated;
5. Not travel, be on sabbatical, or be on leave for any portion of the traveling faculty member’s absence;
6. Must agree to supervise the laboratory of the traveling faculty member in writing to the Department Chair;
7. Must be approved in writing by the Department Chair;  
8. The DSO may be designated only if he/she meets the criteria listed above.

Research faculty must notify the DSO and Department Chair of the designated faculty supervisor before their travel begins.

LABORATORY SAFETY OFFICERS (LSO)

Each PI must designate a LSO. The responsibilities of the LSO include managing the chemical inventory, orienting new researchers to the PI’s laboratory, and notifying the PI and DSO of any safety concerns. For a complete list of the current BioE LSOs, contact the DSO.

CHEMICAL & BIOLOGICAL MATERIALS

LABORATORY SIGNAGE

NEU laboratory doors are posted with emergency information to inform occupants and Boston Fire Department personnel of the presence of hazardous materials inside each laboratory. Posted information includes NFPA diamonds, BSL level (or BL level), the presence of radiation or other hazards, emergency contact information, and other important information.

Laboratory users and workers must be know how to interpret NFPA diamonds. NFPA diamond information is available here and summarized as follows:

NFPA has developed a system for indicating the health, flammability, reactivity and special hazards for many common chemicals through use of the NFPA 704 Diamond (Figure 1).

FIGURE 1: NFPA DIAMOND

The NFPA 704 Hazard Identification System provides:
1. Planning guidance to the fire departments
2. Immediate information to firefighters, emergency responders, and others who may be involved in an emergency situation
3. For students, staff, and faculty, a means of identifying hazardous materials and areas in which they are stored.

How to interpret NFPA diamonds:

- Numbers: The higher the hazard rating on the NFPA diamond, the higher the hazard.
  - 0 = minimal hazard, 4 = severe hazard
- Blue = Health
- Red = Flammability
- Yellow = Reactivity/Instability
- White = Special hazards
  - $\mathcal{W}$ = water reactive or water incompatible
  - OX = oxidizer
  - SA = simple asphyxiant gas (nitrogen, helium, neon, argon, krypton or xenon)
- Other symbols you may see include
  - RAD = radioactive material or radiation
  - OXY = compressed oxygen
  - G = compressed gas(es)
  - LHE = liquid helium
  - LN2 = liquid nitrogen

Important:

- NFPA diamonds give a general idea of the inherent chemical hazards in a laboratory.
- Not all chemicals have been rated with the NFPA system.
- The quantity of a chemical can influence the degree of hazard present.
- NFPA diamonds generally do not address biological hazards.

MINIMIZING CHEMICAL & BIOLOGICAL REAGENT STOCKS
Since chemical and biological reagent storage space is limited and many reagents can become useless or even dangerous as they age, it is the goal of BioE to minimize the use of chemicals whenever practical. As research goals are contemplated, PIs, and laboratory user and workers, should evaluate their processes, taking projected use quantity into account. Refrain from ordering large quantities of material when a small quantity is all that is needed, even if the price is better for the larger container.

NEU offers a [chemical recycling program](#) whereby research groups can offer unused, unwanted chemicals and reagents to other research groups throughout the university.

Reach out to the DSO with questions on small-quantity suppliers, sharing chemicals among BioE faculty, and the NEU Chemical Recycling program.

Minimizing chemical use makes sense at all levels since it reduces procurement costs, storage demand, risk, and disposal costs.

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**CHEMICAL, BIOLOGICAL, & RADIOLOGICAL PROCUREMENT**

**Before purchasing a chemical or biological material, researchers must assess the following:**

1. **Proper handing requirements, including**
   a. PPE
   b. Decontamination
   c. Spill response and specialist spill kits
   d. Any first aid measures or materials, e.g. calcium gluconate gel for working with hydrofluoric acid (HF)

2. **Storage requirements, including**
   a. Storage temperature
   b. Segregation from incompatible chemicals and materials
   c. Ventilation

3. **Disposal requirements**

4. **Whether the laboratory is approved for use of the chemical or material, for example:**
   a. All BioE laboratories are approved for use of BSL1 and BSL2 materials only
   b. Alcohol burners and liquid oil burners are prohibited in all NEU facilities
   c. Protocols involving perchloric acid must be reviewed and approved by EHS, the BioE DSO and ISEC laboratory management before implementation. ISEC fume hoods are not rated for all uses of perchloric acid.
d. Purchases of and protocols involving hydrofluoric acid (HF) must be reviewed and approved by EHS, the BioE DSO and ISEC laboratory management before implementation.

e. Purchases of and protocols involving peroxidizable chemicals must be reviewed and approved by the BioE DSO and ISEC laboratory management before implementation.

f. Equipment containing or procedures involving liquid mercury must be reviewed and approved by EHS, the BioE DSO and ISEC laboratory management before purchase or implementation.

5. Whether the material must be registered

a. The chemicals listed in Appendix A of the NEU Chemical Hygiene Plan must be registered with and approved by NEU EHS prior to purchase and use.
   i. The registration form is available [here](#).

b. Some chemicals and biological materials must be registered with the Federal Select Agents and Toxins Registry.

c. All radioactive material (RAM) must be reviewed, approved, and purchased by EHS Office of Radiation Safety using an online form.

Resources to make these assessments include:

1. The SDS provided by the vendor
2. Technical data sheets
3. Technical specifications
4. Federal and academic databases:
   a. For hazardous materials
   b. For drugs, herbs, and supplements
   c. For chemicals
   d. For pesticides and other toxicological information

5. BioE DSO
6. EHS

HAZARD LABELING ON CONTAINERS

- Manufacturer labels on chemical containers will often contain some information on any hazards associated with the chemical, including GHS pictograms and statements. However, this
information is rarely comprehensive.

- Consult the SDS for more details on hazards, storage requirements, incompatible materials and chemicals, PPE requirements, and other details.
- EHS offers online training about GHS labeling. OSHA also offers resources on this labeling system.
- SDS are available from databases, suppliers, and manufacturers, including:

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<tr>
<th>Source</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Avantor</td>
<td>Formerly known as Mallinckrodt Baker</td>
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<tr>
<td>Bio-Rad</td>
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<td>Fisher Scientific</td>
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<td>Compressed gases</td>
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<td>Public Health Agency of Canada</td>
<td>Pathogen SDS</td>
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<td>Sigma-Aldrich</td>
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<td>SIRI SDS database</td>
<td>EHS recommended site (mirror link here)</td>
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<td>ThermoFisher Scientific</td>
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<td>VWR</td>
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**TRANSPORTATION OF CHEMICALS, BIOLOGICAL MATERIALS, & RAM**

Chemical transportation requirements vary based on the type of chemical, the starting location, and the destination. The following steps are required when planning and executing chemical transport.

When transporting within a laboratory space, take proper steps to prevent spills and exposures, including:

1. Chemicals
   a. Place chemical container(s) in secondary containment.
   b. Use a sturdy cart with a substantial rim around the edge and wheels large enough to negotiate uneven surfaces without tipping or stopping.
   c. Consult with the DSO and EHS on additional containment or transport requirements, and on
approved transport routes within the building.

2. Compressed gas tanks (except for liquid nitrogen and helium)
   a. Safely and properly remove the regulator from the tank.
   b. Cap the tank using the rigid cap provided by the supplier.
   c. Use an approved tank transport cart with proper restraints to transport the tank.
   d. Consult with the DSO and EHS on additional containment or transport requirements, and on approved transport routes within the building.

3. Liquid nitrogen and helium tanks
   a. Safely and properly ensure that the dispensing valve is closed.
   b. Secure any dispensing hose(s).
   c. If the tank has wheels, carefully roll the tank to transport it.
   d. If the tank does not have wheels, consult with the DSO and EHS for transport requirements.
   e. Consult with the DSO and EHS on additional containment or transport requirements, and on approved transport routes within the building.

4. Biological materials
   a. Place biological materials in leak-proof, shatter-proof secondary containment labeled with a biohazard label.
   b. Decontaminate the outside of the secondary containment.
   c. Consult the project’s biosafety registration, the DSO, and EHS Biosafety for additional guidance.

5. Radioactive material (RAM)
   a. Consult the project’s RAM permit and protocols, the DSO, and EHS Radiation Safety Program for containment, packaging, transport, and paperwork requirements.

When transporting within the same building through public corridors or other non-laboratory spaces, take proper steps to prevent spills and exposures, including:

1. Chemicals
   a. Place chemical container(s) in secondary containment
   b. Use a sturdy cart with a substantial rim around the edge and wheels large enough to negotiate uneven surfaces without tipping or stopping.
   c. Consult with the DSO and EHS on additional containment or transport requirements,
and on approved transport routes within the building.

2. Compressed gas tanks (except for liquid nitrogen and helium)
   a. Safely and properly remove the regulator from the tank.
   b. Cap the tank using the rigid cap provided by the supplier.
   c. Use an approved tank transport cart with proper restraints to transport the tank.
   d. Consult with the DSO and EHS on additional containment or transport requirements, and on approved transport routes within the building.

3. Liquid nitrogen and helium tanks
   a. Safely and properly ensure that the dispensing valve is closed.
   b. Secure any dispensing hose(s).
   c. If the tank has wheels, carefully roll the tank to transport it.
   d. If the tank does not have wheels, consult with the DSO and EHS for transport requirements.
   e. Consult with the DSO and EHS on additional containment or transport requirements, and on approved transport routes within the building.

4. Biological materials
   a. Place biological materials in leak-proof, shatter-proof secondary containment labeled with a biohazard label.
   b. Decontaminate the outside of the secondary containment.
   c. Consult the project’s biosafety registration, the DSO, and EHS Biosafety for additional guidance

5. Radioactive material (RAM)
   a. Consult the project’s RAM permit and protocols, the DSO, and EHS Radiation Safety Program for containment, packaging, transport, and paperwork requirements

When transporting between buildings through the NEU tunnel system, take proper steps to prevent spills and exposures, including:

1. Chemicals
   a. Place chemical container(s) in secondary containment
   b. Use a sturdy cart with a substantial rim around the edge and wheels large enough to negotiate uneven surfaces without tipping or stopping.
c. Consult with the DSO and EHS on additional containment or transport requirements, and on approved transport routes.

2. Compressed gas tanks (except for liquid nitrogen and helium)
   a. Safely and properly remove the regulator from the tank.
   b. Cap the tank using the rigid cap provided by the supplier.
   c. Use an approved tank transport cart with proper restraints to transport the tank.
   d. Consult with the DSO and EHS on additional containment or transport requirements, and on approved transport routes.

3. Liquid nitrogen and helium tanks
   a. Safely and properly ensure that the dispensing valve is closed.
   b. Secure any dispensing hose(s).
   c. If the tank has wheels, carefully roll the tank to transport it.
   d. If the tank does not have wheels, consult with the DSO and EHS for transport requirements.
   e. Consult with the DSO and EHS on additional containment or transport requirements, and on approved transport routes.

4. Biological materials
   a. Place biological materials in leak-proof, shatter-proof secondary containment labeled with a biohazard label.
   b. Decontaminate the outside of the secondary containment.
   c. Place the secondary container in an opaque tub or box without a biohazard label.
   d. Consult the project’s biosafety registration and EHS Biosafety Program for additional guidance.

5. Radioactive material (RAM)
   a. Consult the project’s RAM permit and protocols, the DSO, and EHS Radiation Safety Program for containment, packaging, transport, and paperwork requirements.

When transporting between buildings on outside streets or sidewalks, take proper steps to prevent spills and exposures, including:

1. Chemicals
   a. Consult with the DSO and EHS on containment or transport requirements, and on approved transport routes.
i. Note that a licensed hazardous materials transport company may need to be engaged for this transport.

2. Compressed gas tanks (except for liquid nitrogen and helium)
   a. Consult with the DSO and EHS on containment or transport requirements, and on approved transport routes within the building.
   i. Note that a licensed compressed gas transport company may need to be engaged for this transport.

3. Liquid nitrogen and helium tanks
   a. Consult with the DSO and EHS on containment or transport requirements, and on approved transport routes within the building.
   i. Note that a licensed liquified gas transport company may need to be engaged for this transport.

4. Biological materials
   a. Place biological materials in leak-proof, shatter-proof secondary containment labeled with a biohazard label.
   b. Decontaminate the outside of the secondary containment.
   c. Place the secondary container in an opaque tub or box without a biohazard label.
   d. Consult the project’s biosafety registration, the DSO, and EHS Biosafety for additional requirements.

5. Radioactive material (RAM)
   a. Consult the project’s RAM permit and protocols, the DSO, and EHS Radiation Safety Program for containment, packaging, transport, and paperwork requirements

**When transporting between buildings over railroad tracks of any kind**, take proper steps to prevent spills and exposures, including:

1. Chemicals
   a. Consult with the DSO and EHS on containment or transport requirements, and on approved transport routes.
      i. Note that a licensed hazardous materials transport company may need to be engaged for this transport.

2. Compressed gas tanks (except for liquid nitrogen and helium)
   a. Consult with the DSO and EHS on containment or transport requirements, and on approved transport routes within the building.
i. Note that a licensed compressed gas transport company may need to be engaged for this transport.

3. Liquid nitrogen and helium tanks
   a. Consult with the DSO and EHS on containment or transport requirements, and on approved transport routes within the building.
      i. Note that a licensed liquefied gas transport company may need to be engaged for this transport.

4. Biological materials
   a. Place biological materials in leak-proof, shatter-proof secondary containment labeled with a biohazard label.
   b. Decontaminate the outside of the secondary containment.
   c. Place the secondary container in an opaque tub or box without a biohazard label.
   d. Consult the project’s biosafety registration, the DSO, and EHS Biosafety for additional requirements.

5. Radioactive material (RAM)
   a. Consult the project’s RAM permit and protocols, the DSO, and EHS Radiation Safety Program for containment, packaging, transport, and paperwork requirements.

When transporting via FedEx, UPS, DHL, USPS, or another commercial shipping company, take proper steps to prevent spills and exposures, including:

1. Chemicals
   a. Consult with the DSO and EHS on containment, packaging, and paperwork requirements.

2. Compressed gases (except for liquid nitrogen and helium)
   a. Consult with the DSO and EHS on containment, packaging, and paperwork requirements.

3. Liquid nitrogen and helium
   a. Consult with the DSO and EHS on containment, packaging, and paperwork requirements.

4. Biological materials
   a. Consult the project’s biosafety registration, the DSO, and EHS Biosafety for containment, packaging, and paperwork requirements.
5. Radioactive material (RAM)
   a. Consult the project’s RAM permit and protocols, the DSO, and EHS Radiation Safety Program for containment, packaging, transport, and paperwork requirements.

**CHEMICAL SEGREGATION**

Proper segregation and storage of chemicals is important for the health and safety of the all laboratory workers and building occupants. Improper storage can result in hazardous situations that may endanger laboratory user and workers, building occupants, passersby, and physical property.

SDS, the DSO, and EHS are resources for questions on chemical segregation and storage requirements. Some general segregation and storage guidelines include:

1. **Never** store chemicals only by alphabetical order. Segregate all chemicals according to hazard class then place alphabetically, if desired.
2. **Avoid** storing chemicals in a fume hood;
3. Return all chemicals to their appropriate storage areas at the end of the day;
4. Flammable chemicals that need to be refrigerated or frozen must be stored in approved explosion-resistant cold storage that has been labeled as such. Note that most refrigerators and freezers are **not** rated for flammables storage.
5. Never stack bottles on top of each other;
6. Store chemicals only on sturdy shelving;
7. Do not store liquid chemicals above the eye level of the shortest person in the research group.
8. Bottles of flammable liquids should not be stored near combustible materials.
9. Store FLAMMABLE and COMBUSTIBLE chemicals in approved flammables cabinets
10. Segregate REACTIVES from IGNITABLES
11. Segregate ACIDS from BASES, store them in separate corrosives cabinets
12. Segregate CORROSIVES from FLAMMABLES
13. Segregate strong OXIDIZERS from EVERYTHING
14. Store liquid and solid OXIDIZERS in separate secondary containment
15. Store liquid and solid ACIDS in separate secondary containment
16. Store liquid and solid BASES in separate secondary containment
17. Store WATER-REACTION chemicals in their own secondary containment and away from water or water sources
18. Store TOXIC chemicals in their own secondary containment

19. Keep chemicals away from heat, ignition sources, and direct light

20. Store liquid and solid FLAMMABLES and COMBUSTIBLE chemicals in separate secondary containment

21. Store FLAMMABLE ACIDS in flammables cabinets in their own, chemical-specific, secondary containment

22. Store ORGANIC REACTIVES separately from INORGANIC REACTIVES (metals)

Some hazardous chemical combinations include:

1. Acid + Oil or Grease = Fire
2. Flammable Liquid + Hydrogen Peroxide = Fire/Explosion
3. Acid + Caustic = Heat/Spattering
4. Aluminum Powder + Ammonium Nitrate = Explosion
5. Caustics + Epoxies = Extreme Heat
6. Sodium Cyanide + Sulfuric Acid = Lethal Hydrogen Cyanide
7. Chlorine Gas + Acetylene = Explosion
8. Ammonia + Bleach (or other Chlorine source) = Toxic Chloramines (i.e., Mustard Gas)

Resources on chemical segregation and storage include:

1. DSO
2. EHS
3. Cole Parmer chemical compatibility database

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**COMPRESSED GASES**

Compressed gases can present a physical, asphyxiation, freezing, and chemical hazard, depending on the particular gas.

**General guidelines:**

- Compressed gas deliveries must be met, inspected, and signed off by a research group faculty or representative
  - When placing the order, provide the mobile and office phone number of the individual
assigned to receive the delivery.

- Inspect tanks for leaks, dents, and other defects
- Inspect labels for the correct gas contents
- Inspect tanks for the most recent hydrostatic test date. Do not accept tanks that are beyond their test date.

- Gas cylinders must be properly restrained at all times, even when empty.
- Gas cylinders must be properly labeled as full, in-use, or empty.
- Keep compressed gases away from heat and ignition sources.
- Do not store flammable compressed gases, flammable liquids, or flammable solids next to compressed oxygen or other accelerants.
- Compressed gas cylinders must be transported using approved carts or dollies.
- The cylinder valve must be accessible at all times.
- The main cylinder valve must be closed as soon as the gas flow is no longer needed.
- Do not store gas cylinders with pressure on the regulator.
- Use wrenches or other tools provided by the cylinder supplier to open a valve if available. **Do not use pliers to open a cylinder valve.**
- Use soapy water to detect leaks. Leak test the regulator, piping system and other couplings after doing maintenance or modifications.
- Do not lubricate an oxygen regulator or use a fuel/gas regulator on an oxygen cylinder. Using oil or grease on the high pressure side of an oxygen cylinder can cause an explosion.
- If at all possible, avoid the purchase of lecture bottles. These cylinders are not returnable and it is extremely difficult and costly to dispose of them. Use the smallest returnable sized cylinder.
- Alert the DSO and EHS **prior** to the first purchase of toxic, reactive, or flammable gases.

**Cryogenic gas guidelines:**

- Users of cryogenic gases such as liquid nitrogen and liquid helium must:
  - Complete the EHS online Cryogenic gases training
  - Wear appropriate clothes for the work, including covering all exposed skin
  - Wear the appropriate PPE for the work, including specialized cold gloves, eye protection, and face shield.
EXPOSURES

If any chemical, biological, radiation, laser, or other exposure occurs, contact NEU Public Safety at 617-373-3333 and follow instructions.

For any exposure, complete the following incident report paperwork within 24 hours:

- If the affected individual(s) are students: use this form
- If the affected individual(s) are non-student staff or faculty: use this form and/or this form

CHEMICAL EXPOSURES

- Remove contaminated PPE and clothing.
- Consult the SDS for proper exposure first aid (e.g. flushing affected area(s) with water).
- Use an emergency eyewash and/or safety shower as required.
- Contact NEU Public Safety at 617-373-3333
- Have a paper copy of the SDS for each chemical involved in the exposure available for emergency responders.
- Be prepared to provide emergency responders with details of the exposure (e.g. skin contact, needlestick, eye contact, ingestion, etc) and the sequence of events

BIOLOGICAL EXPOSURES

- Remove contaminated PPE and clothing.
- Wash the affected area with soap and water for 15 minutes.
- Either during the washing or immediately afterwards, call NEU Public Safety at 617-373-3333
- Notify your PI/supervisor, EHS, and DSO
- Have a paper copy of the biosafety registration, the product data sheet, and the SDS for each biological hazard involved in the exposure available for emergency responders
- Be prepared to provide emergency responders with details of the exposure (e.g. skin contact, needlestick, eye contact, ingestion, etc) and the sequence of events
RADIOACTIVE MATERIAL (RAM) EXPOSURES

- Remove contaminated PPE and clothing.
- Consult the SDS for proper exposure first aid (e.g. flushing affected area(s) with water).
- Use an emergency eyewash and/or safety shower as required.
- Contact NEU Public Safety at 617-373-3333
- Have a paper copy of the SDS for each RAM involved in the exposure available for emergency responders.
- Be prepared to provide emergency responders with details of the exposure (e.g. skin contact, needlestick, eye contact, ingestion, etc) and the sequence of events

LASER EXPOSURES

- Contact NEU Public Safety at 617-373-3333
- Have a paper copy of the technical data for each laser involved in the exposure available for emergency responders (including class, type, and wavelength).
- Be prepared to provide emergency responders with details of the exposure (e.g. skin exposure, eye exposure, exposure duration, etc) and the sequence of events

SPILLS

CHEMICAL SPILLS

NEU EHS spill response guidance and requirements are listed in sections 2.5 and 2.6 of the CHP.

Every BioE laboratory user and worker should try to anticipate the types of chemical spills that can occur, familiarize themselves with minor chemical spill clean-up procedures, and ensure the necessary equipment (spill kits and personal protective equipment) to respond to a minor spill is readily available. SDS contain special spill clean-up information and should also be consulted.

Major chemical spills:

If the spill is too large for you to handle, is a threat to health, safety or the environment, or involves a highly toxic or reactive chemical, immediately notify the following for assistance:

- First: call NEU Public Safety: 617-373-3333 (24/7)
- Then contact:
  - EHS: 617.373.2769 (8:30 a.m. to 4:30 p.m.), ehs@northeastern.edu
  - DSO
PI of the research group and/or your supervisor

**Minor chemical spills:**

If you are cleaning up a minor spill yourself, make sure that you are aware of the hazards associated with the materials spilled, have adequate ventilation and proper personal protective equipment (gloves, goggles, laboratory coat, and respirator if necessary). Consider all residual chemical and cleanup materials (adsorbent, gloves, etc.) as hazardous waste. Place these materials in a sealed container and store in a chemical fume hood. Contact the DSO and the Office of Environmental Health and Safety for spill response and disposal instructions prior to cleaning up a small spill.

**Not sure if a spill is major or minor?**

- **First:** call NEU Public Safety: 617.373.3333 (24/7)
- **Then:** Consult EHS, the DSO, and/or NEU Public Safety

**If any chemical spill occurs:**

- Alert people in the immediate area;
- Increase ventilation in area of spill (turn on chemical fume hoods);
- Always wear proper PPE;
- Avoid breathing vapors from spill;
- Use appropriate kit to neutralize and absorb inorganic acids and bases. Collect residue, place in sealed container(s), and dispose of properly as hazardous chemical waste;
- Notify the DSO, the PI, and EHS of the spill.

**If a chemical spill threatens the health or safety of any laboratory users and workers:**

- Alert people in the laboratory to evacuate;
- If spilled material is flammable, turn off ignition and heat sources. Place another device (plastic bag) over spilled material to keep substance from volatilizing;
- **Call NEU Public Safety at 617.373.3333;**
- Close the doors to the affected area;
- **Obtain the SDS and technical data sheets for the chemical(s) involved in the spill. Emergency personnel will need these when they arrive.**
- Assign a person with knowledge of the incident and of the laboratory to answer the questions of responding emergency personnel.
- Complete an incident report form for any exposure, injury, or illness resulting from the spill:
  - If the affected individual(s) are students: [use this form](#)
If the affected individual(s) are non-student staff or faculty: use this form and/or this form.

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CHEMICAL SPILL KITS
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“Universal” chemical spill kits, appropriate for spills of most acids, bases, toxics, and solvents, are available in some NEU laboratory facilities such as ISEC. Some materials, such as hydrofluoric acid (HF) and oils, require specialized spill kits.

It is the responsibility of the PI to provide the appropriate spill kits for the materials in their laboratory. For assistance in selecting the appropriate spill kit(s), consult the DSO or EHS.

BIOLOGICAL SPILLS

Spill response requirements for biological spills are listed in the biosafety registration for laboratories using biohazards and in the NEU Biosafety Plans and Manuals.

Every BioE laboratory user and worker should try to anticipate the types of biological spills that can occur, familiarize themselves with minor biological spill clean-up procedures, and ensure the necessary equipment (disinfectants and personal protective equipment) to respond to a minor spill is readily available. Biosafety registrations contain special spill clean-up information and should also be consulted.

Major biological spills:

If the spill is too large for you to handle, is a threat to health, safety or the environment, or involves a highly infectious or dangerous material, immediately notify the following for assistance:

- First: call NEU Public Safety: 617.373.3333 (24/7)
- Then contact:
  - EHS: 617.373.2769 (8:30 a.m. to 4:30 p.m.)
  - DSO
  - PI of the research group and/or your supervisor

Minor biological spills:

If you are cleaning up a minor spill yourself, make sure that you are aware of the hazards associated with the materials spilled, have adequate ventilation and proper personal protective equipment (gloves, goggles, laboratory coat, and respirator if necessary). Consider all residual biological and cleanup materials (absorbent materials, gloves, etc.) as hazardous waste. Place these materials in a sealed container and store in the appropriate biohazardous waste container. Contact the DSO and the Office of Environmental Health and Safety for spill response and disposal instructions prior to cleaning up a small spill.
To determine if a spill is major or minor:

- **First:** call NEU Public Safety: 617.373.3333 (24/7)
- **Then:** Consult EHS, the DSO, and/or NEU Public Safety

If any biological spill occurs:

- Alert people in the immediate area;
- Always wear proper PPE;
- Notify the DSO, the PI, and EHS of the spill.

If a biological spill threatens the health or safety of any laboratory users and workers:

- Alert people in the laboratory to evacuate;
- **Call NEU Public Safety number 617.373.3333;**
- Close the doors to the affected area;
- Obtain the SDS, technical data sheets, and biosafety registration for the material(s) involved in the spill. Emergency personnel will need these when they arrive.
- Assign a person with knowledge of the incident and of the laboratory to answer the questions of responding emergency personnel.
- Complete an incident report form for any exposure, injury, or illness resulting from the spill:
  - If the affected individual(s) are students: [use this form](#)
  - If the affected individual(s) are non-student staff or faculty: [use this form](#) and/or [this form](#)

### SPILLS OF RADIOACTIVE MATERIAL (RAM)

Spill response requirements for spills of RAM are listed in Appendix D of the [NEU Radiation Safety Manual](#).

Every BioE radiation worker should try to anticipate the types of spills that can occur, familiarize themselves with minor spill clean-up procedures, and ensure the necessary equipment (cleaning materials and personal protective equipment) to respond to a minor spill is readily available. The NEU Radiation Safety Manual contains special spill clean-up information and should also be consulted.

**Major RAM spills:**

If the spill is too large for you to handle, or is a threat to health, safety or the environment, immediately do the following:

CLEAR THE AREA: Notify all persons not involved in the spill to vacate the room.
PREVENT SPREADING: Cover the spill with absorbent pads, but do not attempt to clean it up. Confine the movement of all personnel potentially contaminated to prevent the spread.

SHIELD THE SOURCE: If possible, the spill should be shielded, but only if it can be done without further contamination or without significantly increasing your radiation exposure.

CLOSE THE ROOM: Leave the room and lock the door(s) to prevent entry.

PERSONNEL CONTAMINATION: Contaminated clothing should be removed and stored for further evaluation by the Radiation Safety Officer. If the spill is on the skin, flush thoroughly and then wash with mild soap and lukewarm water.

REPORT:

- **First:** call NEU Public Safety: 617.373.3333 (24/7)
- Then contact:
  - Radiation Safety Officer: Chris Bingel 617-373-2769 (office); after hours, request assistance from the Public Safety Division (617-373-3333) so that on-call personnel can be paged

**Minor RAM spills:**

NOTIFY: Notify all persons in the area that a spill has occurred.

PREVENT SPREADING: Cover the spill with absorbent paper.

CLEAN UP: Use disposable gloves and remote handling tongs. Carefully fold the absorbent paper and pad. Insert into a plastic bag and dispose of in the radioactive waste container. Also insert into a plastic bag all other contaminated materials such as disposable gloves.

SURVEY: with a low-range, thin-window G-M survey meter, check the area around the spill, hands, and clothing for contamination.

REPORT: Report incident to the Radiation Safety Officer, to the DSO, to the PI, and complete the Radiation Spill Documentation Form.

If you are cleaning up a minor spill yourself, make sure that you are aware of the hazards associated with the materials spilled, have adequate ventilation and proper personal protective equipment (gloves, goggles, laboratory coat, and respirator if necessary). Consider all residual chemical and cleanup materials (absorbent materials, gloves, etc.) as hazardous waste. Place these materials in a sealed container and store in the appropriate RAM waste container. Contact the DSO and the Office of Environmental Health and Safety for spill response and disposal instructions prior to cleaning up a small spill.

To determine if a spill is major or minor:

- **First:** call NEU Public Safety: 617.373.3333 (24/7)
Then: Consult EHS, the DSO, and/or NEU Public Safety

If any RAM spill occurs:

- Alert people in the immediate area;
- Always wear proper PPE;
- Notify the DSO, the PI, and EHS of the spill.

If a RAM spill threatens the health or safety of any laboratory users and workers:

- Alert people in the laboratory to evacuate;
- Call NEU Public Safety number 617.373.3333;
- Close the doors to the affected area;
- Obtain the SDS, technical data sheets, and biosafety registration for the material(s) involved in the spill. Emergency personnel will need these when they arrive.
- Assign a person with knowledge of the incident and of the laboratory to answer the questions of responding emergency personnel.
- Complete an incident report form for any exposure, injury, or illness resulting from the spill:
  - If the affected individual(s) are students: use this form
  - If the affected individual(s) are non-student staff or faculty: use this form and/or this form

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**WASTE**

**CHEMICAL HAZARDOUS WASTE DISPOSAL**

Laboratory hazardous chemical waste must be disposed of in accordance with local, state, federal and NEU requirements. **Anyone who generates or manages hazardous waste must complete online and classroom Hazardous Waste training from EHS.**

Every BioE laboratory user and worker should become familiar with the [Hazardous Waste Management](#) section of the EHS website.

**Important:**

- Satellite accumulation areas must be properly labeled with [this sign](#).
- Satellite accumulation areas must be appropriate for the type of waste they contain (e.g. inside a flammables cabinet for flammable/ignitable waste).
o No more than one container per hazardous waste stream may be stored in a satellite accumulation area.

o No more than 55 gallons per hazardous waste stream may be stored in a satellite accumulation area.

o Hazardous waste containers must be closed at all times during storage, except when waste is being added or removed.

o All hazardous waste must be properly labeled at the time the waste is first placed in the container.
  • Label hazardous chemical waste using the official hazardous waste label
  • Use the complete, English-language chemical names on the label. Do not use abbreviations or chemical formulas.

o Hazardous waste must be disposed of within 72 hours of the container becoming full (write the filled date on the container once it becomes full).

o Generators of hazardous waste are required to incorporate waste minimization into any process that generates hazardous waste.

o Request hazardous waste pickup using this online form.

o DO NOT use sinks for hazardous waste disposal.

o For disposal of peroxidizable wastes, consult the DSO and EHS about required testing and procedures.

o For used or broken lamps, ballasts, or thermometers that contain mercury, consult the DSO and EHS about proper disposal.

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**BIOHAZARDOUS WASTE DISPOSAL**

All BioE personnel who generate or handle biohazardous waste must complete classroom Biosafety training and online Regulated Medical Waste training.

NEU policies and procedures for biohazardous waste disposal are available here.

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**RADIOACTIVE MATERIAL (RAM) WASTE DISPOSAL**

All BioE personnel who generate or handle RAM waste must complete classroom and online Radiation Worker training, training by the NEU Radiation Safety Officer in waste management, and training from the PI.
PERSONAL PROTECTIVE EQUIPMENT (PPE)

It is the responsibility of the PI or supervisor to provide students and staff with appropriate PPE for the tasks performed. Consult the DSO and EHS for assistance with selecting appropriate PPE.

EYE PROTECTION

Eye protection is required for all personnel and any visitors to BioE laboratory facilities. Appropriate styles of safety glasses, goggles and face shields must be worn based on the nature of the task and materials. Assess each laboratory method and protocol for risks and select eye protection accordingly:

- Safety glasses are inadequate splash protection when bulk quantities of chemicals are handled and/or splashes to the face are possible.
- Do not wear contact lenses when working in the laboratory.
- Eye protection must be worn even if a laboratory worker also wears eyeglasses.
- To protect from impact, eye protection must meet the appropriate ANSI standards.
- For work with lasers, eye protection must be selected based on the laser class, wavelength, and other parameters. Not all tinted safety glasses are appropriate for all lasers.

RESPIRATORY PROTECTION

Use ventilation or respiratory protection to control inhalation standards. Check the label and SDS for information on a substance's inhalation hazard and special ventilation requirements.

Take appropriate precautions before using these substances. Controlling inhalation exposures via engineering controls (ventilation) is always preferred.

If respirators are required, consult with the DSO and EHS on the appropriate type, style, and fitting before beginning work. Respirators must be used in conjunction with a complete respiratory protection program mandated by OSHA.

CLOTHING & GLOVES

Laboratory clothing and glove requirements:

1. Close-toed shoes that cover the top of the foot and toes (e.g. no ballet flats, loafers, sandals, or Crocs)
2. Long trousers or skirts that reach the ankles
3. No sleeveless tops
4. Long hair tied back
5. No very loose-fitting clothes, long fringe, or floaty/drapey clothes

6. No easily combustible clothes or clothes that easily melt

7. No dangling jewelry

8. No ties

9. No contact lenses

10. Laboratory coat. NEU provides blue, cuffed, flame-retardant laboratory coats for use. These coats are available and laundered free of charge. For questions on how to access clean laboratory coats and return soiled ones for laundering, contact the DSO.

11. Appropriate eye protection for the task being performed. Laboratory users and workers must wear eye protection at all times in BioE laboratory facilities.

12. Appropriate gloves for the task being performed. Consult the DSO and EHS for help determining the appropriate glove style and material of construction.

13. Additional PPE as required by the task and/or materials, including but not limited to chemical resistant apron, respiratory protection, arm protection, safety-toe and safety-shank boots, and specialty eye protection, chemical resistant suits.

**PPE COMMON SENSE**

- **Opening laboratory doors while wearing gloves.** Since facilities and other personnel move around the laboratory spaces without gloves, the door handles cannot be contaminated. Door handles should be handled only with clean hands without gloves. This includes all laboratory doors handles, including the inner door handles of side labs, the autoclave room, teaching laboratory doors, and pass-through doors. This is to protect everyone who works in the BioE laboratories from chemical and biological hazard exposure.

- **Do not re-use disposable gloves**

- **Remove gloves without exposing yourself to contaminants on gloves.** Consult the DSO or EHS with questions.

- **When removing PPE, remove in the following order:**
  1. Gloves
  2. Eye protection
  3. Laboratory coat

- **Disinfect eye protection after use if the eye protection is used by more than one person in a research group or laboratory**

- **Wash hands after removing PPE and before leaving the laboratory**
FOOD & DRINK

- Food and drink are prohibited in all BioE laboratory facilities.
- BioE refrigerators, freezers, and microwaves must be clearly labeled “no food or drink”.

SAFETY SHOWERS

Safety showers provide a high volume of water for rapidly rinsing a chemical off of a person’s skin and clothing. Anytime a person has spilled a chemical on themselves and the chemical is of a nature that it must be removed rapidly the person should use the nearest safety shower.

EYEWASH STATIONS

Eye wash stations provide a high flow of water to flush a chemical from eyes. In the event of any chemical, biological, radioactive, or other material enters the eye, the eye wash must be used without delay:

1. Activate the eyewash.
2. Hold opened eyes in the eyewash water flow for 15 minutes.

**Do not block or obstruct eyewashes or safety showers.** Keep eyewash dust covers in place when eyewash is not in use.

FIRST AID KITS

PIs must provide and resupply first aid kits for use in their laboratory/ies.

It is the responsibility of BioE laboratory users and workers to inform the PI and DSO of any accidents requiring first aid. Complete a NEU Accident/Illness report form for any injury or illness that happens in a BioE facility.

CHEMICAL FUME HOODS & BIOLOGICAL SAFETY CABINETS (BSC)

GENERAL GUIDELINES

- Complete online EHS Laboratory Chemical Fume Hood training prior to using a chemical fume hood.
- Complete classroom and online Biosafety training prior to using a BSC.
- Never use an inoperative fume hood or BSC.
- Never use a fume hood or BSC with an expired certification. The unit will have a label listing the expiration date. Notify the PI and DSO of any expired units.
Do not store chemicals in fume hoods or BSCs.
Do not use BSC to work with hazardous or volatile chemicals. It can release harmful fumes into the laboratory and damage the BSC filter.
Use fume hoods and BSCs at the appropriate sash height.
Do not block air intake of fume hoods or BSCs.

**LASER FACILITY ENGINEERING CONTROLS**

Engineering controls, special signage, and interlocks to prevent accidental exposure to laser beams are required for facilities using lasers that are not fully enclosed:

- Laser facilities must be inspected and approved by the EHS Laser Safety Officer prior to a laser being energized.
  - Laser facility workers and users must be trained on the engineering controls and interlocks specific to the facility(ies) in which they will work, prior to beginning work.

**OPEN FLAME**

Open flames in the laboratory must be generated using Boston Fire Department approved devices. **Alcohol burners are prohibited by the Boston Fire Department.** Approved alternatives include:

- Lab Micro Burner
- Butane Micro Burner
- Fireboy Safety Burner

**LABORATORY HOUSEKEEPING**

It is the responsibility of the laboratory workers, users, and PIs to ensure proper laboratory housekeeping, including:

- Work surfaces cleaned and decontaminated at the end of each workday
- Floors clear of trash, debris, and obstructions
- Egresses and fire exits unobstructed
- Safety showers and eyewashes unobstructed
- Minimum clearance of 36 inches from ceiling- and/or wall-mounted sprinkler heads
- Minimize cardboard and other combustible storage materials
- No used gloves or consumables left on work surfaces
- Equipment properly decontaminated and switched off at the end of each work day
PERSONAL ITEMS IN LABORATORY FACILITIES

Cell phones, tablets, earphones, earbuds, laptops, other personal electronics, notebooks, writing implements, and other tools or items that are used outside of the laboratory areas should not be placed on laboratory benches, handled with gloved hands, or handled with contaminated equipment or hands. This is in order to protect individuals themselves and others in BioE, at Northeastern, at home, and in public from the risk of exposure to chemical and biological hazards.

LABORATORY FURNITURE

Furniture from writing areas, common seating areas, offices, and any other non-laboratory space may not be brought into or used in a laboratory space because of the risk of contamination with biological and chemical hazards. Laboratory furniture may not leave laboratory spaces for the same reason.

LABORATORY AUDITS & INSPECTIONS

EHS will conduct annual Laboratory Safety audits of each laboratory. If a laboratory has a Biosafety Registration, EHS Biosafety will perform a separate annual Biosafety Audit.

PIs must conduct a self-inspection of their laboratories every six months. This self-inspection may be scheduled with the DSO. Use the following forms for the self-inspection:

1. Laboratory self-inspection checklist
2. Biosafety inspection checklist

LABORATORY CLOSE-OUT

When a student researcher, postdoctoral researcher, or staff member will be leaving BioE laboratory facilities upon graduation or end of employment:

1. The individual must clear their laboratory and desk/office work space of personal items.
2. Properly dispose of any chemicals, biological materials, RAM, or other materials that will no longer be used by the research group.
3. Complete and safely shut down all experiments or transfer them to a colleague with the guidance and approval of the PI.
4. Decontaminate and clean all work spaces.
5. Place any used laboratory coats in the soiled laboratory coat bin.
6. Return all NEU property to the PI and/or DSO. Note that NEU Asset Disposition may be required.
7. Notify the DSO of the date of their last day at NEU.
8. Complete the BioE Researcher Facility Close-Out Form and submit to the DSO.

When a PI relocates or closes their laboratory:
1. **Prior to** relocation or closing-out, consult with the DSO and EHS for required procedures to decontaminate, pack, move, and/or dispose of the laboratory equipment and hazardous materials safely. Note that [NEU Asset Disposition](#) may be required.

2. Review the [EHS Laboratory Close-out Procedure](#).

3. Notify EHS of the relocation and/or close-out and complete the required paperwork:
   - a. [Biosafety Registration Amendment](#) or [Biosafety Registration Termination](#)
   - b. [Biosafety/IACUC Addendum](#)
   - c. [IACUC Protocol Amendment (Supplement A)](#)
   - d. Written (email) notification to the Radiation Safety Officer if the laboratory has RAM
   - e. [Human subjects research](#) amendment application(s)
   - f. Complete the [EHS Laboratory Closeout Procedure Clearance Form](#)
   - g. Complete the [EHS BSL2 Laboratory Close-out Checklist](#)

## COMPLIANCE

It is the responsibility of the PI to ensure compliance of their research activities.

### BIOSAFETY REGISTRATIONS

PIs and researchers using any biological materials must consult [EHS Biosafety](#) to determine if a biosafety registration is required. Projects involving infectious materials, recombinant DNA, transgenics, or human materials will always require a biosafety registration.

Amendments to approved registrations must be submitted per EHS policy, including for:

- o Protocol changes
- o Location changes

Biosafety plans and manuals can be found [here](#).

### ACUTELEY HAZARDOUS CHEMICALS & SELECT AGENTS AND TOXINS

1. The chemicals listed in Appendix A of the NEU Chemical Hygiene Plan must be registered with and approved by NEU EHS prior to purchase and use.
   - a. The registration form is available [here](#).

2. Some chemicals and biological materials must be registered with the [Federal Select Agents and Toxins Registry](#).

### RADIOACTIVE MATERIAL (RAM)
Researchers must obtain a permit from the EHS office of Radiation Safety prior to beginning any work with RAM.

All RAM must be reviewed, approved, and purchased by EHS Office of Radiation Safety using an online form.

Amendments to approved registrations must be submitted per EHS policy, including for:

- Protocol changes
- Location changes

**HUMAN SUBJECTS RESEARCH**

Research involving human subjects, including some clinical samples and patient data, must be reviewed and approved by the NEU Institutional Review Board (IRB) and the Office of Human Subject Research Protection. Contact the Office of Human Subject Research Protection to determine IRB compliance requirements.

Amendments to approved registrations must be submitted per IRB requirements, including for:

- Protocol changes
- Location changes

**ANIMAL RESEARCH**

Research involving animals may need to be reviewed and approved by the NEU Institutional Animal Care and Use Committee (IACUC) and the Department of Laboratory Animal Medicine (DLAM). Contact the DLAM to determine IACUC compliance requirements.

Amendments to approved registrations must be submitted per EHS policy, including for:

- Protocol changes
- Location changes
## ENFORCEMENT

**Laboratory safety rules will be enforced as follows:**

<table>
<thead>
<tr>
<th>Violation Number</th>
<th>Actions</th>
</tr>
</thead>
</table>
| 1st violation     | 1. immediately don appropriate PPE  
                     2. decontaminate or properly discard affected device(s), supplies, or equipment  
                     3. verbal warning |
| 2nd violation     | 1. immediately don appropriate PPE  
                     2. decontaminate or properly discard affected device(s), supplies, or equipment  
                     3. written warning  
                     4. LSO and PI notified in writing |
| 3rd violation     | 1. immediately don appropriate PPE  
                     2. decontaminate or properly discard affected device(s), supplies, or equipment  
                     3. written warning  
                     4. LSO and PI notified in writing  
                     5. Husky card access to laboratory areas suspended until the individual completes a laboratory safety walkthrough together with the Department Safety Officer and the Laboratory Safety Officer for their research group |
| 4th violation     | 1. immediately don appropriate PPE  
                     2. decontaminate or properly discard affected device(s), supplies, or equipment  
                     3. written warning  
                     4. LSO and PI notified in writing  
                     5. Husky card access to writing area/office area and laboratory areas suspended until the individual completes a laboratory safety walkthrough together with the Department Safety Officer, the Laboratory Safety Officer for their research group, and their PI |
| 5th violation     | 1. immediately don appropriate PPE  
                     2. decontaminate or properly discard affected device(s), supplies, or equipment  
                     3. written warning  
                     4. LSO and PI notified in writing  
                     5. Husky card access to writing area/office area and laboratory areas suspended until all online and classroom EHS trainings (initial or refresher) required for laboratory access are taken again. |
| 6th and subsequent violations | 1. immediately don appropriate PPE  
                     2. decontaminate or properly discard affected device(s), supplies, or equipment  
                     3. written warning  
                     4. matter referred to Department Chair  
                     5. Husky card access to writing area/office area and laboratory areas suspended pending Department Chair action. |