

Boston University Chemical Hygiene Plan

**Boston University Charles River Campus
Boston University Medical Center Campus**

**Version 1.4
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1.0 Purpose and Applicability

This Chemical Hygiene Plan (CHP) defines laboratory work practices, laboratory equipment, personal protective equipment, and procedures to help ensure that laboratory workers at Boston University are protected from the hazards associated with the chemicals they use. The Chemical Hygiene Plan is also intended to meet and exceed the University's compliance with the requirements of a Chemical Hygiene Plan as defined in the regulations promulgated on January 31, 1990 by the U.S. Department of Labor entitled "Occupational Exposures to Hazardous Chemicals in Laboratories" (29CFR 1910.1450). This regulation is known as the Occupational Safety and Health Administration (OSHA) Laboratory Safety Standard and will be referred to as such within this document.

According to the Laboratory Safety Standard, the Chemical Hygiene Plan must include:

- Standard operating procedures;
- Criteria to determine and implement specific control measures, such as engineering controls and personal protective equipment;
- A requirement that an ongoing program be developed to ensure that fume hoods and other engineering controls are functioning properly;
- Information and training requirements;
- Circumstances under which a particular laboratory function will require "prior approval";
- Provisions for medical consultation and medical exams;
- Designation of a Chemical Hygiene Officer; and
- Additional precautions for work with select carcinogens, reproductive toxins, and extremely toxic substances.

This Chemical Hygiene Plan has been developed by Environmental Health and Safety in collaboration with the Laboratory Safety Committees. It describes in detail the policies, practices, procedures, equipment, and facilities used by Boston University's Charles River Campus (BUCRC) and Medical Campus (BUMC) to ensure that all persons who work with chemicals at this institution do so in a safe manner and in compliance with all applicable federal, state, and municipal regulations and University guidelines.

The Chemical Hygiene Plan applies to every laboratory or related facility at Boston University that uses or stores hazardous chemicals. Employees should direct questions about the Chemical Hygiene Plan or the safe use of chemicals to their Laboratory Safety Coordinator, their Laboratory Supervisor/Principal Investigator, the Laboratory Safety Committees, and/or Environmental Health and Safety.

In addition to the Laboratory Safety Committee, several other committees have authority to regulate certain aspects of work in laboratories. These committees may include the Radiation Safety Committee, the Institutional Biosafety Committee, the Laser Safety Committee, and the Institutional Animal Care and Use Committee. This document does not preempt any of the policies or procedures issued by these other committees. In cases where the jurisdictions of two committees overlap, the more stringent constraint

applies.

This Chemical Hygiene Plan must be available to all laboratory workers prior to the commencement of laboratory duties. In addition to the Chemical Hygiene Plan, laboratory workers must be familiar with and adhere to all laboratory safety guidelines and procedures developed by their laboratory supervisor, Environmental Health and Safety and other University departments, and any federal, state, or municipal regulatory agencies.

This Chemical Hygiene Plan will be reviewed annually by the Laboratory Safety Committee and Environmental Health and Safety.

2.0 Roles and Responsibilities

The chief element in this section is the designation of authority and responsibility for implementation of the Chemical Hygiene Plan. The following are responsible for implementing the requirements of the Chemical Hygiene Plan.

Laboratory Safety Committee (LSC)

Each campus has its own Laboratory Safety Committee. The Laboratory Safety Committees are composed of faculty members and administrative departments that have laboratories working with or storing hazardous chemicals. The committees also include members of Environmental Health and Safety, Office of the Provost, Research Occupational Health Program, Office of Facilities Management, and other University departments that support laboratories at the University.

The committees meet on at least a quarterly basis. The duties of the committees include:

- Annual review of the Chemical Hygiene Plan;
- Implementation of the Chemical Hygiene Plan;
- Review of Standard Operating Procedures, as necessary;
- Review of written guidelines and training programs, as necessary; and
- Discussion on laboratory safety issues and incidents;
- Development of policies/practices regarding laboratory safety issues.

Environmental Health and Safety (EHS)

EHS responsibilities include the following:

- Design safety training programs;
- Conduct safety training programs that are not site-specific;
- Conduct site- or topic-specific trainings as requested or required;
- Conduct laboratory safety inspections on a routine basis and at request;
- Conduct periodic and requested inspections of engineering controls;

- Make recommendations for corrective actions in cases of non-compliance;
- Provide assistance in hazard assessment and standard operating procedure development;
- Investigate cases of suspected exposure or exposure due to accident;
- Provide chemical spill response, as needed;
- Maintain laboratory safety training records and ensure, in collaboration with the PI, that all laboratory workers attend annual Laboratory Safety Training;
- Assist the PI and laboratory workers with compliance with this Plan;
- Maintain incident reports; and
- Manage the hazardous waste program.

Chemical Hygiene Officer (CHO)

The Chemical Hygiene Officer is a staff member of Environmental Health and Safety. Responsibilities of the CHO include:

- Develop and implement appropriate laboratory safety policies, practices and procedures in collaboration/consultation with the Lab Supervisor/PI and with approval by the Lab Safety Committee when appropriate;
- Ensure that the Chemical Hygiene Plan is readily accessible to all employees, either as a paper copy, as an electronic copy online, or by another applicable means;
- Communicate to each Laboratory Supervisor/Principal Investigator (PI) any relevant safety information or concerns pertaining to his/her laboratory;
- Ensure that each PI is aware of the Chemical Hygiene Plan; and
- Inspects laboratories for compliance with the Chemical Hygiene Plan.

Laboratory Supervisor/Principal Investigator (PI)

The responsibility for ensuring that all work in Boston University laboratories is safe and in compliance rests with the Laboratory Supervisor/Principal Investigator and Environmental Health and Safety. The Laboratory Supervisor/Principal Investigator designations are used interchangeably, but both refer to the faculty member or administrator responsible for work in a specific laboratory or related facility. This person, in collaboration with Environmental Health and Safety, must develop any laboratory-specific standard operating procedures to be followed in his or her laboratory. His or her duties also include the following:

- Define the location of work areas where toxic substances, potential carcinogens, and other hazardous chemicals will be used;
- Ensure that an inventory of these and all other chemicals is provided to EHS;
- Assist EHS and the CHO in defining all hazardous operations, alerting employees to the hazards, and establishing safe procedures for these operations by selecting suitable engineering controls and personal protective equipment;
- Ensure, in collaboration with Environmental Health and Safety, that all new

laboratory workers attend Laboratory Safety Training before working unsupervised in the laboratory and that all workers attend annually thereafter;

- Ensure that all laboratory workers receive instruction in safe work practices, proper use of personal protective equipment, and emergency procedures;
- Ensure that all laboratory workers are familiar with the Chemical Hygiene Plan and where it can be found;
- Designate a Laboratory Safety Coordinator for their laboratory, as necessary;
- Provide access to safety information and specific training to laboratory workers for the hazardous chemicals with which they work (which may include training when the employee's exposure changes or when new workers start in the laboratory);
- Ensure that the Chemical Hygiene Plan is supplemented with Standard Operating Procedures applicable to the hazardous chemicals or operations used in the laboratory, as necessary;
- Provide all appropriate and required personal protective equipment to laboratory workers and ensure that they utilize the protective equipment necessary for the safe performance of their jobs;
- Assist the Chemical Hygiene Officer and/or EHS personnel in fulfillment of their duties with respect to his or her laboratory;
- Correct deficiencies identified during inspections, as appropriate;
- Report all accidents or near-accidents that occur in his or her laboratory and take corrective measures so that these will not recur;
- Oversee proper disposal of all laboratory waste including hazardous waste, biological waste, and sharps waste from his or her laboratory; and
- Maintain relevant safety information for the laboratory in the appropriate safety logbooks (i.e., Chemical Safety, Biological Safety, and Radiation Safety) in a designated Safety Center within the laboratory.

Laboratory Workers

Individuals who work in or frequently visit laboratories where hazardous chemicals are used and/or stored are responsible for performing their work in accordance with the Chemical Hygiene Plan. Responsibilities of laboratory workers include:

- Follow all University, Federal, State, and local health and safety standards, rules and regulations, as they apply to the laboratory;
- Report all hazardous conditions to their PI, the Chemical Hygiene Officer, Environmental Health and Safety, and/or the Laboratory Safety Committee, as necessary;
- Inform the PI and/or Lab Safety Coordinator of any substantive changes in protocol or the introduction of new chemicals to the laboratory;
- Wear and use prescribed personnel protective equipment;
- Report any suspected job-related injuries or illnesses to the PI and seek

treatment immediately;

- Refrain from the operation of any equipment or instrumentation without proper instruction and authorization;
- Remain aware of the hazards of the chemicals in the laboratory; and
- Request information and training when unsure of how to handle a hazardous chemical or procedure.

Laboratory Safety Coordinators

The Lab Safety Coordinator is assigned by the Laboratory Supervisor/Principal Investigator (PI) to assist with safety and compliance efforts in the laboratory, as necessary. The Laboratory Safety Coordinator is authorized to represent the PI in matters related to the implementation of laboratory and worker safety. The duties of the Lab Safety Coordinator include:

- Participate in specialized Lab Safety Coordinator training and discussions sponsored by Environmental Health and Safety (EHS);
- Assist the PI with maintaining laboratory compliance;
- Serve as the primary laboratory contact with EHS for issues related to safety (i.e., biological, chemical, fire & general safety, controlled substances, etc.);
- Take positive actions to help reduce the potential for accidents and incidents associated with laboratory operations;
- Inform laboratory personnel and/or students of the safety hazards associated with their work and instruct laboratory personnel and students in safe work methods;
- Report all accidents, near misses, or safety concerns to the PI and EHS;
- Ensure that appropriate SOPs are established and that lab personnel and students are appropriately trained and follow them;
- Work with EHS to determine the best safe practices and procedures;
- Work with EHS to ensure that lab personnel and students complete all required safety trainings in a timely manner;
- Ensure that all deficiencies identified by EHS or outside regulatory inspectors are addressed and corrected within the time required;
- Participate in the incident review process;
- Stop operations that are in clear violation of the safety requirements or approved SOPs or that may potentially result in injuries or potential exposures; and
- Maintain relevant safety information for the laboratory in the appropriate safety logbooks (i.e., Chemical Safety, Biological Safety, and Radiation Safety) in a designated Safety Center within the laboratory.

3.0 Laboratory Safety Training

All individuals who work in laboratories must be apprised of the hazards of chemicals present in their work area. This information must be provided before initial assignment and before new potential exposure situations. It is the co-responsibility of the Principal Investigator and Environmental Health to ensure that all laboratory workers have been properly trained.

The training program for all laboratory workers consists of two parts; general Laboratory Safety and Hazardous Waste Management training conducted by EHS, and site-specific training conducted by the PI or his/her designee.

Laboratory Safety Training for Researchers

All laboratory workers who participate in laboratory activities that utilize hazardous chemicals or biological media and/or generate or handle hazardous waste must participate in this training. All laboratory workers must attend an EHS Laboratory Safety and Hazardous Waste Management Training session before conducting laboratory work without direct supervision and annually thereafter. EHS maintains the training records of those who attend this training. Laboratory Safety and Hazardous Waste Management training concentrates on the following Laboratory Safety topics:

- The University's Chemical Hygiene Plan
- Emergency Procedures
- Medical Consultations and Examinations
- OSHA's Laboratory Safety Standard
- Hazard Recognition
- Material Safety Data Sheets
- Safety Equipment
- Defining Hazardous Waste
- Identifying Waste Streams
- Proper Container Management and Storage
- Weekly Inspections
- Requesting Disposal
- Personal Protective Equipment
- Exposure Control
- Engineering Controls
- Chemical Management
- Biosafety
- Universal Precautions
- Sharps Safety and Disposal
- Electrical, Heat and Other Non-Chemical Hazards

Site-Specific Training

The site-specific training consists of the details of local engineering and administrative control programs within the laboratories, as well as laboratory-specific policies and procedures. It is up to the discretion of the Laboratory Supervisor/Principal Investigator, the Laboratory Safety Coordinator, or the Laboratory Worker when site-specific training is necessary.

Site-specific training may be required before a laboratory worker conducts any hazardous activities in the laboratory and before a laboratory worker uses a new hazardous chemical or conducts a potentially hazardous procedure.

4.0 Medical Services and Surveillance

The Laboratory Safety Standard does not mandate medical surveillance for all laboratory workers. There may be, however, circumstances when employers must provide any employees an opportunity for medical attention. Specifically, medical attention, including any follow-up examination and treatment recommended by the examining physician, must be offered as per the following:

A medical consultation conducted to determine the need for a medical examination must be offered to any employee who is present in the work area when a spill, leak, explosion, or other accident occurs that results in a potential significant exposure to a hazardous chemical.

A medical examination must be provided to any employee who exhibits signs or experiences symptoms associated with exposure to a hazardous chemical used in the laboratory.

Medical surveillance, as defined by the particular standard for that substance, must be provided to any employee who is routinely exposed above the action level or, in the absence of an action level, above the Permissible Exposure Limit for an OSHA-regulated substance for which there are exposure monitoring or medical surveillance requirements. Please refer to Section 5: *Exposure Monitoring* for more information.

Additionally, the provisions of Boston University's Respiratory Protection Program require that any employee required to wear a negative-pressure respirator in performance of his or her duties must undergo a medical evaluation in addition to a fit-test. Medical Evaluations do not need to be repeated unless the person wearing the respirator appears to have difficulties wearing it or gains or loses 10 pounds or more.

The Chemical Hygiene Officer acts as a liaison for employees who request medical services. The Research Occupational Health Program (ROHP) provides medical consultation services. All medical consultations, examinations, and surveillances are free to University employees. The Research Occupational Health Program can be reached at (617) 414-7647.

As the events triggering the request involve potential chemical exposure, you must also contact Environmental Health and Safety for an investigation as to the extent of the exposure. ROHP needs the information gathered in EHS's investigation in order to appropriately scale their response. Any required records will be kept by ROHP and Environmental Health and Safety, as necessary.

In the event of an injury in the laboratory, Laboratory Supervisors/Principal Investigators must complete an Accident Report and Analysis Form within 24 hours of the incident. See "Injury and Accident Reporting" under Section 8 for more information.

5.0 Exposure Monitoring

Employee exposure determination shall be done in accordance with paragraph (d) of 29 CFR 1910.1450.

Initial monitoring will be performed if there is reason to believe that exposure levels for an OSHA-regulated substance routinely exceed the action level or, in the absence of an

action level, the permissible exposure limit (PEL).

The Permissible Exposure Limits for OSHA-regulated substances can be found in 29 CFR part 1910, subpart Z as indicated below:

TABLE Z-1 Limits for Air Contaminants. - 1910.1000 TABLE Z-1

www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9992

TABLE Z-2 - 1910.1000 TABLE Z-2

www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9993

TABLE Z-3 Mineral Dusts - 1910.1000 TABLE Z-3

www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9994

Periodic monitoring will be conducted if the initial monitoring performed discloses employee exposure over the action level (or, in the absence of an action level, the permissible exposure limit). Boston University shall immediately comply with the exposure monitoring provisions of the relevant standard. Please refer to Section 4: *Medical Services and Surveillance* for more information.

Within 15 working days after the receipt of any monitoring results, the employee will be notified of these results in writing either individually or by posting results in an appropriate location that is accessible to employees.

Any Boston University employee with a reason to believe that exposure levels for a substance exceed the action level or, in the absence of an action level, the PEL may initiate the monitoring process. Requests for monitoring should be made to the Chemical Hygiene Officer or Environmental Health and Safety. Monitoring may be requested at any time. Environmental Health and Safety is responsible for coordinating exposure monitoring requests.

6.0 Emergency Procedures and Response

In the event of any type of emergency in a laboratory environment, quick and decisive action is important. All individuals who work in laboratories are trained annually on appropriate general response procedures to various emergency situations (see Section 3: *Laboratory Safety Training*). Information specific to the laboratory must be provided by the Principal Investigator, as appropriate.

“Health and Safety Procedures and Emergency Instructions” Flipchart

The “Health and Safety Procedures and Emergency Instructions” flipchart is provided to all laboratories to serve as a quick reference in the event of an emergency. This flipchart lists important phone numbers, contact information, and procedures for various laboratory emergencies, including medical emergencies, fires, chemical, biological, and radiation spills, splashes to the body, and university-wide emergencies. The flipchart is also available online at <http://www.bu.edu/emergency/> on the Charles River Campus and at www.bumc.bu.edu/emergency on the Medical Campus.

Emergency phone numbers and procedures vary between the two campuses. Listed below is information for the Boston University Charles River Campus and the Boston University Medical Campus

University-wide Emergencies

Boston University has a response plan for large scale emergencies that affect University-wide operation. Visit the Boston University Emergency Management website at www.bu.edu/emergency for more information.

CHARLES RIVER CAMPUS:

Important Emergency Phone Numbers (in order)

Boston University Police Department (BUPD)	617-353-2121
Environmental Health and Safety (EHS)	617-353-7233 (617-353-SAFE)
Office of Facilities Management and Planning (FMP)	617-353-2105
Research Occupational Health Program (ROHP)	617-414-7647
Student Health Services (SHS)	617-353-3575

Medical Emergencies

- Contact the BUPD at 353-2121 for emergency medical assistance
- Administer first aid until help arrives, if properly trained to do so

Fire

- Follow “ACES”:
 - **Alert:** Alert everyone in the lab to the fire, and ask them to leave immediately
 - **Confine:** Confine the fire by closing the doors to the laboratory
 - **Evacuate:** Evacuate the building by activating the nearest fire alarm pull station and exiting the building immediately
 - **Special Assistance:** Assist persons requiring special assistance to evacuate
- Contact the BUPD at 353-2121 to report the fire

Chemical or Biological Spills

- Restrict access to or evacuate the spill area, as appropriate
- Contact the BUPD at 353-2121 if there are any injuries associated with the spill
- Contact Environmental Health and Safety at 353-7233 for assistance cleaning the spill

Chemical or Biological Splashes to the Body

- Contact the BUPD for medical assistance at 353-2121
- Remove exposed clothing as quickly as possible
- Using the safety shower, flush any exposed skin or hair with water for at least 15 minutes

- If exposed in the eyes, flush the eyes in the eye wash station for at least 15 minutes
- Contact Environmental Health and Safety at **353-7233** to report the exposure
- Contact the Research Occupational Health Program at **617-414-7647** for follow-up medical consultation

BOSTON UNIVERSITY MEDICAL CAMPUS:

Important Emergency Phone Numbers

Control Center (Fire, Health and Safety and Facilities Emergencies)	617-414-6666
Public Safety (Security, Medical Emergencies)	617-414-4444
Environmental Health and Safety (non-emergency)	617-638-8830
Research Occupational Health Program	617-414-7647

Medical Emergencies

- Contact the Control Center at **414-6666** for emergency medical assistance
- Administer first aid until help arrives, if properly trained to do so

Fire

Follow "RACE":

- **R**escue/Remove affected individuals from the immediate fire area
- **A**lert: Alert everyone in the laboratory to the fire. Call out "Code Red."
- **C**onfine: Confine the fire by closing the doors to the laboratory
- **E**vacuate: Evacuate the building by activating the nearest fire alarm pull station and exiting the building immediately

Contact the Control Center at **414-6666** to report the exact location for the fire

Chemical or Biological Spills

- Restrict access to or evacuate the spill area, as appropriate
- Contact the Control Center at **414-6666** for medical attention and/or for assistance cleaning the spill

Chemical or Biological Splashes to the Body

- Contact the Control Center for medical assistance at **414-6666**.
- Remove exposed clothing as quickly as possible
- Using the safety shower, flush any exposed skin or hair with water for at least 15 minutes
- If exposed in the eyes, flush the eyes in the eye wash station for at least 15 minutes

- Contact the Research Occupational Health Program at 414-7647 for medical follow-up

7.0 Laboratory Design and Engineering Controls

Whenever feasible, engineering controls should be implemented within the laboratory to minimize exposure to hazardous chemicals. Engineering controls may include: general laboratory ventilation, chemical fume hoods, point-source ventilation, filtered enclosures, product substitution, secondary containment, and other physical systems used to minimize exposure.

It is the responsibility of the department and Facilities Management and Planning (FMP) to inform Environmental Health and Safety when a laboratory is selected to be renovated or redesigned. EHS will meet with the Laboratory Supervisor/Principal Investigator (PI) of the laboratory to understand the nature of the research, including which hazards may be present, and to recommend appropriate engineering controls for the new laboratory.

If ventilation engineering controls implemented are not working properly in the laboratory, the laboratory worker must immediately stop work, secure all chemicals, and contact Facilities Management and Planning for repair. On the Charles River Campus, FMP's Emergency Control Desk can be contacted 24 hours per day at 353-2105. On the Medical Campus, the Control Center is available 24 hours per day at 414-6666.

The PI can contact EHS at any time to request an evaluation or meeting to discuss engineering controls in his or her laboratory.

A common engineering control installed in laboratories is the chemical fume hood. Details of chemical fume hood use, maintenance, and annual testing can be found in this manual under Section 8: *Standard Operating Procedures*.

In addition to reviewing and approving engineering controls in new laboratory design projects, EHS is responsible for the review of laboratory design plans to assist in assuring compliance with appropriate environmental health and safety local, state, and federal codes, regulations, and standards.

8.0 Standard Operating Procedures (SOPs)

Boston University has developed a program to provide the Laboratory Supervisor/Principal Investigator with a set of rules comprising a "Generic SOP," which is applicable to the use of most chemicals under most circumstances.

The purpose of these SOPs is to define the baseline set of procedures and practices for employees, students, visitors, or any other persons working in a laboratory at Boston University. These SOPs have been developed by Environmental Health and Safety and/or the Laboratory Safety Committees.

The following Policies and Procedures have been developed in order to help ensure a safe environment when working with chemicals:

Safe Work Practices

- Read and become familiar with the Chemical Hygiene Plan and any Standard Operating Procedures developed specifically for the laboratory prior to working in the laboratory.
- Become familiar with the location and use of emergency equipment and facilities, such as:
 - i. eyewash and safety showers,
 - ii. fire extinguishers,
 - iii. fire blankets, if applicable,
 - iv. fire alarm pull stations,
 - v. emergency exits, and
 - vi. chemical spill equipment.
- Never eat, drink, smoke, chew gum, apply cosmetics, or manipulate contact lenses in the laboratory.
- Never leave exposed sharps, micropipettes, or broken glass on the bench or in washing facilities.
- Keep chemical containers closed unless actively in use.
- Clearly label all containers of any substances. The label must include, at a minimum, the complete chemical name of the substance. If possible, it should also include the concentration and any hazards of the substance.
- Remove Personal Protective Equipment (gloves, aprons, protective foot and headgear) before leaving the laboratory space. Gloves should never be worn in non-laboratory areas.
- Discard, decontaminate, clean, or sanitize personal protective equipment on a regular basis.
- Always wash hands after removing gloves before leaving the laboratory.

Working Alone

Working in a laboratory alone or in isolated areas presents unique risks and hazards. Working alone is prohibited in certain laboratories (as described in laboratory-specific SOPs) and is discouraged in all other laboratories. In the event a worker must work alone in the laboratory, these guidelines should be followed:

- Schedule work so that hazardous tasks are performed during times when the worker is not alone.
- The worker should inform a co-worker, or even a friend, family member, or colleague, that they will be in the laboratory alone and give them information on who to contact in the event that the worker does not check in.
- On the Boston University Medical Campus (BUMC), the worker can notify Public Safety at 414-4444, and officers will include the laboratory on the building's walk-through, if applicable.

Material Safety Data Sheets (MSDSs)

The Occupational Safety and Health Administration requires that MSDSs are available to employees for potentially harmful substances. An MSDS summarizes information about the material, including chemical components, hazard identification, first aid, spill, and fire fighting procedures, incompatibilities, safe handling and storage requirements, and disposal guidelines. The Laboratory Supervisor/Principal Investigator (PI) or his/her designee is responsible for providing access to MSDSs to workers in the laboratory. Here are a few guidelines:

- Workers should review an MSDS prior to working with a chemical. MSDSs should also be readily available for quick response to spills, medical emergencies, and other situations involving the chemical.
- Principal Investigators are encouraged to keep hard copies of MSDSs in the laboratory. Hard copies can be obtained in two ways:
 - Chemical manufacturers often ship an MSDS with a chemical or mail it to the laboratory separately. When a hard copy of an MSDS is received in the laboratory, it should be saved for future reference. New copies should replace older versions.
 - MSDSs are also often available online. Laboratory workers can download and print copies of MSDSs from manufacturers' websites and keep them in or near the laboratory.
- Digital copies of MSDSs are only acceptable if there is a computer station or stations available in the laboratory from which they can be accessed at all times. Laboratories are encouraged to use digital copies of MSDSs to supplement their hard copies, not replace them.

Safe handling and storage of chemicals

By following a few simple guidelines, the risks associated with the handling and storage of materials within the laboratory can be reduced considerably.

- Laboratory workers should date containers of chemicals that have the potential to form organic peroxides with the day, month, and year that they are first opened and first received.
- Laboratory doors should remain closed at all times.
- Work surfaces and laboratory furniture should be impervious.
- Workers should not use chemicals or equipment if they have not been trained to do so.
- The following chemical storage guidelines should be used for work with specific chemical hazards:

General Chemical Safety Guidelines

Acids

- Store large bottles of acids on low shelves or on trays in acid cabinets or a cabinet marked “Corrosives.”
- Segregate oxidizing acids from organic acids and flammable and combustible materials.
- Segregate acids from bases, active metals such as sodium, potassium, and magnesium, and other incompatible materials.
- Use bottle carriers or a cart when transporting acid bottles.
- Have spill-control pillows or acid neutralizers available in the event of a spill. Do not use bases to neutralize acid spills.

Bases

- Segregate bases from acids and other incompatible materials.
- Store large bottles of liquid bases on trays in a cabinet marked “Bases” or “Corrosives.”
- Store solutions of inorganic hydroxides in polyethylene containers.
- Have spill-control pillows or caustic neutralizers available for caustic spills. Do not use acids to neutralize base spills.

Flammables

- Only store flammable liquids in a specially equipped, explosion-proof or flammable-safe refrigerator or flammables cabinet.
- Keep flammables away from sources of ignition.
- For flammable metals, have a Class-D fire extinguisher available. See the “Fire Extinguishers” part under Section 8 for more information.

Oxidizers

- Store oxidizers in a cool, dry area.
- Store these away from flammable and combustible materials, such as paper, wood, etc.

Peroxide-Forming Chemicals

- Date the containers of these chemicals as to when received and when opened.
- Store these chemicals in airtight containers in a dark, cool, dry area.
- Check containers for the formation of peroxides, as needed, using appropriate indicator strips.
- Dispose of peroxide forming chemicals on or before the expiration date or one year after opening, whichever is first.

Compressed Gases

- Store compressed gases in a secure and upright position.
- Secure cylinders individually with a chain or strap, 2/3 to 3/4 up the height of the cylinder from the floor.

- Indicate the status of the cylinder: “Full” or “In Use” or “Empty”.
- When not in use, replace the valve cap.
- For transport, use a cylinder cart.
- Remove all manifolds and regulators, secure the valve cap, and chain or strap the cylinder to the cart before moving.

Laboratory Door Labeling

The Boston Fire Department requires the National Fire Protection Association (NFPA) 704 Diamond be posted on all laboratory doors. These diamonds are also displayed on most chemical labels. The laboratory must inform EHS if the lab acquires different chemicals or gases so that the door sign can be updated.

Injury and Accident Reporting

On the Charles River Campus:

For emergency medical assistance, contact the BUPD at **353-2121**.

For non-emergency medical attention, contact the Research Occupational Health Program at 414-7647. Environmental Health and Safety is available around the clock at **353-7233**.

In the event of an injury to a University employee, the Laboratory Supervisor/Principal Investigator should complete a Worker’s Compensation accident report and forward it to the Office of Risk Management. The appropriate form can be found under the Worker’s Compensation section at www.bu.edu/risk.

In the event of an injury to a student or visitor, the Laboratory Supervisor/Principal Investigator should complete an incident report detailing the incident and injuries. The appropriate form can be found under the Personal Liability Accidents section at www.bu.edu/risk.

On the Medical Campus:

For emergency medical assistance, contact the Control Center at **414-6666**.

For non-emergency medical attention, contact the Research Occupational Health Program at 414-7647.

Contact the Control Center at **414-6666** to report the incident to EHS.

The Laboratory Supervisor/Principal Investigator should complete an Accident Reporting and Analysis form, available from Research Occupational Health Program

Personal Protective Equipment

Personal Protective Equipment (PPE) is available in a variety of forms, depending on the type of hazard, the design of any available engineering controls, and the route of exposure.

The Laboratory Supervisor/Principal Investigator (PI) is responsible for selecting, in collaboration with Environmental Health and Safety, and providing the appropriate PPE for the laboratory.

The laboratory worker must wear PPE as directed and notify the PI if the PPE provided is damaged or inadequate.

Environmental Health and Safety (EHS) is available to assist in the selection of appropriate PPE, to train laboratory employees on proper use of the PPE, to inspect laboratories for compliance, and to enforce the use of appropriate PPE.

Laboratory Safety Equipment

There may be many different types of safety equipment in laboratories at Boston University. The Laboratory Supervisor/Principal Investigator (PI) should ensure that laboratory workers are familiar with the location and proper operation of safety equipment available to the laboratory. Basic information on safety equipment is provided to researchers by EHS in Laboratory Safety Training. EHS and/or Facilities Management and Planning also annually verify that this equipment is in place and functioning properly. A few of the more common pieces of laboratory safety equipment include:

Emergency Eye Wash Station

The emergency eye wash station provides a means to remove chemical contamination from the eyes and/or face. Laboratory personnel should follow these guidelines when using the eye wash station:

Eye wash stations are inspected annually to ensure they meet appropriate standards and regulations. On the Charles River Campus, EHS oversees the annual inspection. On the Medical Campus, eye wash stations are inspected by Facilities Management. Repairs on both campuses are conducted by Facilities Management.

Laboratory workers should flush their eye wash stations weekly to ensure clean water is available in the event of an emergency.

Eye wash stations should be clearly marked and kept free from obstructions.

In the event of eye contamination, the laboratory worker should hold his/her eye open and rinse for a minimum of 15 minutes; then, he/she should seek medical attention (see Section 6: *Emergency Procedures and Response*).

In the event of face contamination where the chemical has not reached the eye, the laboratory worker should leave any eye protection on to prevent secondary contamination from reaching the eyes and rinse the affected area for a minimum of 15 minutes; then, he/she should seek medical attention (see Section 6: *Emergency Procedures and Response*).

Emergency Safety Shower

The emergency safety shower provides a mean to remove gross chemical contamination from the body or to extinguish a fire on the body. Laboratory personnel should follow these guidelines when using the safety shower:

Emergency safety showers are inspected annually to ensure they meet appropriate standards and regulations. On the Charles River Campus, EHS oversees the annual inspection. On the Medical Campus, eye wash stations are inspected by Facilities Management. Repairs on both campuses are conducted by Facilities Management.

Emergency safety showers should be clearly marked and kept free from obstructions.

In the event of a fire on the body, implement the ACES or RACE fire plan, as appropriate. The laboratory worker should activate the safety shower and stand under

the water flow until the fire is extinguished; then, he/she should seek medical attention (see Section 6: *Emergency Procedures and Response*).

In the event of gross chemical contamination on the body, the laboratory worker should remove contaminated clothing, activate the safety shower, and stand under the water for a minimum of 15 minutes; then, he/she should seek medical attention (see Section 6: *Emergency Procedures and Response*).

Fire Blankets

Some laboratories are provided with fire blankets. Fire blankets are only required in the event that a laboratory works with flammable materials but has no safety shower available. The laboratory is responsible for maintaining fire blankets.

Fire Extinguishers

Fire extinguishers are provided to laboratories in the event a fire blocks a means of egress and the laboratory worker must fight a fire to save his or her own life. No laboratory worker is expected or required to use a fire extinguisher except to escape a life-threatening situation.

Fire extinguishers are inspected annually and replaced as needed. Facilities Management and Planning (FMP) manages the installation, inspection, and replacement of fire extinguishers.

Laboratories should have the appropriate class of extinguisher for the fire hazards in the laboratory. In general, a class BC or class ABC extinguisher is appropriate. In some instances, this extinguisher is supplemented with a class D fire extinguisher, as required.

Laboratory personnel are trained on basic fire extinguisher use in annual Laboratory Safety and Hazardous Waste Management Training (see Section 3: *Laboratory Safety Training*).

Chemical Spill Containment Kits

EHS provides Chemical Spill Containment Kits in common areas to provide laboratories with basic equipment to contain a chemical spill. These kits are stocked with general material to help contain a large chemical spill. The Laboratory Supervisor/Principal Investigator (PI) is responsible for determining whether additional spill containment/clean-up material appropriate to the chemicals used in the laboratory is required and for providing that material, if necessary.

Chemical Fume Hoods

Chemical fume hoods are the most common engineering control to protect against the inhalation of chemicals at Boston University.

Environmental Health and Safety (EHS) coordinates the annual inspection of chemical fume hoods to ensure they are functioning properly.

The Office of Facilities Management and Planning (FMP) repairs chemical fume hoods that are not functioning. If a laboratory worker suspects that a chemical fume hood is not functioning properly, he or she should contact FMP at 353-2015 (Charles River Campus) or 414-6666 (Medical Campus).

When using a chemical fume hood, laboratory workers should follow these guidelines:

- On sashes that open vertically, keep the sash as low as possible. The sash should never exceed the maximum sash height indicated on the inspection sticker.
- Keep only what is needed for the task in the hood. Excess equipment in the hood can reduce the provided protection.
- Work as far back in the hood as possible, ideally at least 6” from the opening.

Laboratory Waste Management

Solid waste

Solid waste is waste that is not regulated for special disposal and therefore can be placed in a standard dumpster for disposal. Solid waste is removed from the laboratory by Office of Facilities Management staff. Examples of solid waste include:

- Office waste – papers, plastics, and other non-contaminated trash. Office waste can be placed in a general trash receptacle.
- Glass waste – non-contaminated broken or whole glass, glass or plastic pipettes, or pipette tips. Glass waste should be placed in a sturdy, cardboard box with a top that is lined with a plastic bag. The box should be clearly marked “Broken Glass – Trash”.
- Uncontaminated animal bedding. Uncontaminated animal bedding should be placed in a sturdy bag and sealed.
- Autoclaved biological material. After the material has been confirmed to be sterile, biohazardous labels should be removed and the material should be placed in a sturdy bag.

Universal waste

- Batteries. Batteries may be collected in the laboratory’s hazardous waste area. Collect in a properly labeled plastic bag. Pickup can be arranged by selecting the “hazardous waste removal” link at www.bu.edu/ehs or www.bumc.bu.edu/ehs, as appropriate.
- Fluorescent lamps. Fluorescent lamps may be collected in the laboratory’s hazardous waste area. Do not place fluorescent lamps in the broken glass box. Collect in a properly labeled plastic bag or sturdy box. Pickup can be arranged by selecting the “hazardous waste removal” link at www.bu.edu/ehs or www.bumc.bu.edu/ehs, as appropriate.

Chemical waste

- Most chemical waste is regulated as hazardous waste. For assistance in making a waste determination, contact Environmental Health and Safety.
- Collect chemical waste in an appropriately labeled container within the laboratory’s hazardous waste satellite accumulation area (SAA). Pickup can be arranged by selecting the “hazardous waste removal” link at www.bu.edu/ehs or www.bumc.bu.edu/ehs, as appropriate.

Biological and sharps waste

- Red bag waste – solid, non-sharp biohazardous waste that is not decontaminated before leaving the laboratory. On the Boston University Medical Campus (BUMC), red bag waste is removed daily by the custodians. On the Charles River Campus, red bag waste is removed weekly, by request. To fill out a Charles River Campus biowaste removal request, visit www.bu.edu/ehs.
- Orange bag autoclave waste – solid, non-sharp biohazardous waste that is autoclaved by laboratory personnel prior to disposal as red bag waste or solid waste.
- Sharps waste – needles, syringes, razor blades and other metal sharps, regardless of whether they are contaminated with biohazardous materials. Sharps waste must be placed in approved sharps containers. On the Boston University Medical Campus (BUMC), sharps containers for the laboratory are available from Facilities Management’s custodial staff. On the Medical Campus, Office of Facilities Management staff removes full sharps containers from laboratories. On the Charles River Campus, sharps containers are provided and removed on request. To fill out a Charles River Campus sharps request, visit www.bu.edu/ehs.

Mercury-Containing Chemicals and Equipment

- Boston University discourages the use of mercury in chemicals or equipment anywhere on campus unless absolutely required for a particular use. Replacement non-mercury thermometers, barometers, manometers, and other basic equipment is available free of charge from Environmental Health and Safety. Contact EHS for more information.

Laboratory Safety Inspection Program

Environmental Health and Safety regularly inspects laboratories for compliance with federal, state and municipal regulations as well as health and safety guidelines outlined in this and other manuals.

Laboratory Safety Inspections are the traditional inspection method at Boston University. A Laboratory Safety Inspection is scheduled with the Laboratory Supervisor/Principal Investigator or his/her delegate in advance. As part of the Laboratory Safety Inspection process, the PI or delegate submits or updates information such as a chemical inventory and a roster of laboratory personnel. Environmental Health and Safety performs periodic, topic-specific laboratory safety inspections. Laboratories are inspected for chemical safety at least annually.

During the inspection, the EHS inspector reviews a checklist to help identify areas for improvement within the laboratory. Following the inspection, the PI receives an inspection report and may be asked to correct the unsatisfactory conditions. The PI should contact EHS with any questions prior to, during, or following an inspection.

The goal of the Laboratory Safety Inspection program is to make Boston University, its laboratories, campuses, and community safe and compliant.

Laboratory Security

Boston University laboratories often contain valuable equipment and materials, equipment and materials that may pose a danger to public safety, and equipment and materials that may pose a danger to an un-trained visitor. Therefore, it is important that the laboratory remain secure at all times. Some laboratories may have special precautions given the nature of the materials stored in the laboratory. In general, all laboratories should follow these tips to help keep the laboratory secure:

- Question visitors. Do not hesitate to contact the authorities to report a suspicious person. On the Charles River Campus, contact the BUPD at 353-2121. On the Medical Campus, contact Public Safety at 414-4444.
- On the Boston University Medical Campus, laboratory workers should wear their BUMC ID.
- Always keep doors between the laboratory and hallways or other common places closed.
- Always lock the doors between the laboratory and hallways or other common places when leaving the laboratory unattended.

Laboratory Visitor Policy

A laboratory visitor is any person who is not assigned to work in the laboratory space on a regular basis. To protect the visitor and reduce the risk to the University, the following guidelines for visitors to laboratories should be followed:

- No person under the age of 18 should be allowed to work in a laboratory without the expressed, written permission of Environmental Health and Safety (EHS). Contact EHS for more information.
- All visitors must be escorted and supervised by laboratory personnel at all times while the visitor is in the laboratory.
- Visitors to the laboratory are expected to follow the same requirements as the laboratory workers in regards to such items as personal protective equipment (PPE), proper dress, food and drink, etc.
- A student or other person regularly visiting the lab, even if just as a volunteer, should follow the requirements for a laboratory worker laid out in this plan, including the training requirements.

Transporting Chemicals between Laboratories

Laboratory workers and Principal Investigators are permitted to transfer chemicals between laboratories on the same campus. The preferred method is to transport these materials on a clean cart. The materials themselves must be in sealed containers, clearly labeled with the contents name and applicable hazard(s) classification. The cart must be leak-proof and have ≥ 2 inch lip to contain a potential spill and/or prevent the container from sliding off.

If being carried by hand, or transported on a cart that does not meet the requirement above, the container must be sealed, clearly labeled as above, and packaged within *ANOTHER* tightly sealed, clean container or packaged just as it was when first shipped to the laboratory.

If chemicals must be transferred between campuses or to an off-campus location, Environmental Health and Safety must be contacted for assistance in complying with applicable transport regulations.

Laboratory-Specific Standard Operating Procedures (SOPs)

If required by the task, the PI, the Chemical Hygiene Officer or Environmental Health and Safety, laboratories may be responsible for developing their own SOPs beyond what is described in this Chemical Hygiene Plan's SOPs. The process of developing laboratory-specific SOPs is intended to characterize various toxicological, regulatory, and physical criteria or to identify conditions that might require additional control measures, as well as to aid in the identification of those control measures.

It is the responsibility of the Laboratory Supervisor/Principal Investigator (PI) to review all materials and substances being used. Upon such review, a determination and implementation of more stringent Site-Specific SOP's will need to be developed by the individual laboratory, as necessary. Contact Environmental Health and Safety (EHS) for assistance in generating laboratory-specific SOPs.