The bulk of this document has been taken from the Chemical Hygiene Plan for the University of Alaska at Anchorage. See: http://www.triumvirate.com/ehs-university-resources-we-love?utm_source=hs_email&utm_medium=email&utm_content=17565160&_hsenc=p2ANqtz-__Djf48GavdQU8u_4JzVne_ZdI9_CbtM4ZQQ__F1nJ3eFEdAHPls9W-T9laO-SUzbHpHisarVyGQIfpdZr5LMtkkHVw&_hsmi=17565160 viewed on August 11, 2015.
# TABLE OF CONTENTS

I. LIST OF ABBREVIATIONS ...........................................................................................................3
II. INTRODUCTION AND PURPOSE .............................................................................................5
III. SCOPE ..................................................................................................................................6
   A. Employees ...............................................................................................................................6
   B. All Others ...............................................................................................................................6
IV. UNIVERSITY RESPONSIBILITIES .........................................................................................6
   A. President .................................................................................................................................6
   B. Chemical Hygiene Officer .......................................................................................................6
   C. Laboratory Chemical Hygiene and Safety Committee (LCHSC) .........................................6
   D. Environmental Health and Safety Office ............................................................................7
   E. Employees ...............................................................................................................................7
   F. Students .................................................................................................................................8
   G. Visitors & Volunteers ...........................................................................................................8
V. GENERAL LABORATORY SOPs ..............................................................................................8
   A. Teaching & Research Laboratories ...................................................................................8
   B. Activity Specific SOPs .........................................................................................................11
VI. CONTROL MEASURES FOR REDUCING CHEMICAL EXPOSURES AND RISK ............11
   A. Eliminate or Substitute ........................................................................................................12
   B. Engineering Controls ........................................................................................................12
      1. Use of Chemical Fume Hoods and Biosafety Cabinets ................................................12
      2. Inspections of Fume Hoods and Biosafety Cabinets ....................................................15
      3. List of Fume Hoods and Biological Safety Cabinet Locations .....................................16
      4. Safety Showers and Eyewash Stations ..........................................................................17
   C. General Administrative Controls .....................................................................................17
      1. Required Laboratory Contact Lists & Signage ............................................................17
      2. Laboratory Inspections ..................................................................................................17
   D. Personal Protective Equipment (PPE) ..............................................................................17
# I. LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>American Conference of Governmental Industrial Hygienists</td>
<td>ACGIH</td>
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<tr>
<td>Center for Disease Control</td>
<td>CDC</td>
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<tr>
<td>Chemical Hygiene Officer</td>
<td>CHO</td>
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<tr>
<td>Chemical Hygiene Plan</td>
<td>CHP</td>
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<tr>
<td>Chemical Hygiene and Safety Committee</td>
<td>CHSC</td>
</tr>
<tr>
<td>Conditionally Exempt Small Quantity Generator</td>
<td>CESQG</td>
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<tr>
<td>Drug Enforcement Agency</td>
<td>DEA</td>
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<tr>
<td>Department of Agriculture</td>
<td>USDA</td>
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<tr>
<td>Department of Environmental Conservation</td>
<td>DEC</td>
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<tr>
<td>Department of Health and Human Services</td>
<td>USDHHS</td>
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<tr>
<td>Department of Homeland Security and Emergency Services</td>
<td>DHSES</td>
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<tr>
<td>Department of Transportation</td>
<td>DOT</td>
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<tr>
<td>Environmental Health and Safety</td>
<td>EHS</td>
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<tr>
<td>Environmental Protection Agency</td>
<td>EPA</td>
</tr>
<tr>
<td>Facilities Chemical Hygiene and Safety Committee</td>
<td>FCH&amp;SC</td>
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<tr>
<td>Globally Harmonized System</td>
<td>GHS</td>
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<tr>
<td>Institutional Animal Care and Use Committee</td>
<td>IACUC</td>
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<tr>
<td>International Agency for Research on Cancer</td>
<td>IARC</td>
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<tr>
<td>Laboratory Chemical Hygiene and Safety Committee</td>
<td>LCHSC</td>
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<tr>
<td>Personal Protective Equipment</td>
<td>PPE</td>
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<tr>
<td>Public Employee Safety and Health</td>
<td>PESH</td>
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<tr>
<td>National Institute of Health</td>
<td>NIH</td>
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<tr>
<td>Nuclear Regulatory Commission</td>
<td>NRC</td>
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<td>Occupational Safety and Health Agency</td>
<td>OSHA</td>
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<tr>
<td>Term</td>
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<td>----------------------------------------------------------------------</td>
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<tr>
<td>Office of Fire Prevention and Control</td>
<td>OFPC</td>
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<tr>
<td>Principal Investigator and Research Investigator</td>
<td>PIs or RIs</td>
</tr>
<tr>
<td>Radiation Safety Officer</td>
<td>RSO</td>
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<tr>
<td>National Fire Protection Association</td>
<td>NFPA</td>
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<tr>
<td>(Material) Safety Data Sheet</td>
<td>(M)SDS</td>
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<tr>
<td>Safety Conscious Approach</td>
<td>SCA</td>
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<tr>
<td>Standard Operating Procedure or Process</td>
<td>SOP</td>
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<tr>
<td>Science Programs and Facilities Support Professional</td>
<td>SPFSP</td>
</tr>
<tr>
<td>SUNY Plattsburgh</td>
<td>PLA</td>
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<tr>
<td>University Police</td>
<td>UP</td>
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<tr>
<td>Workplace Hazardous Materials Information System</td>
<td>WHMIS</td>
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</table>
II. INTRODUCTION AND PURPOSE

The Science Laboratory Chemical Hygiene Plan (hereafter referred to as the Chemical Hygiene Plan or CHP) for SUNY Plattsburgh (PLA) provides written policies as required primarily by OSHA (PESH2), but it also provides guidance on regulations promulgated by other agencies such as EPA. While laboratory accidents such as spills, cannot be completely avoided, taking a safety conscious approach (SCA) will serve to limit the severity of an accident and will greatly reduce the risk of an accident resulting in serious damage to property or injury to staff, students, visitors, and or volunteers.

The SCA encourages a culture of safety3 in all teaching and research laboratories where laboratories are defined as in the OSHA Laboratory Safety Standard4. As a philosophy, it would encourage the perusal and use of the precepts in Prudent Practices in the Laboratory (2011 updated edition)5. SCA, when practiced, encourages the safe use of all scientific equipment or hand/power tools in the teaching and research laboratories. Application of the SCA to laboratory work would help to minimize risks from chemical or biological substances by protecting employees and students from potential health hazards arising from the handling, use, storage and disposal of chemical substances. General requirements covering the associated physical hazards from the use of cryogenic liquids, high voltage electrical equipment, compressed gases, and work involving pressures above and or below ambient require prior planning to ensure safety of the practitioner under a SCA. A SCA attitude should be an integral part of employment here at PLA. In addition, it is expected that the precepts presented in this document will be applied to the education of students in teaching and research laboratory experiences. Surveys of industries who hire graduates of laboratory-based college programs indicate that lack of knowledge of safety is a key weakness in those new hires.6

This CHP is designed to meet the requirements outlined in the U.S. Department of Labor, OSHA, 29 CFR Parts 1910.1450. This plan shall comply with any additional requirements outlined in Occupational Exposures to Hazardous Chemicals in Laboratories as enforced by PESH. These sets of regulations are commonly known as the ‘Laboratory Standard’. 

6 See: http://sciencecareers.sciencemag.org/career_magazine/previous_issues/articles/2013_06_05/caredit.a1300120 viewed on July 16, 2015 for quote: “...industry figures argue from experience that this gap in safety practices is large and significant. Science Careers recently quoted William Banholzer, Dow’s chief technology officer, saying that new hires from academe, be they bachelors or doctoral graduates, all require "remedial" safety training.”
III. SCOPE

A. Employees

The CHP covers all employees (anyone receiving pay for working in a science laboratory) who use or are exposed to hazardous chemicals or processes in teaching and research laboratories at PLA under the Laboratory Standard regulations. Current laboratory standards, processes and procedures are outlined at https://www.osha.gov/dcsp/osp/stateprogs/new_york.html and http://www.labor.state.ny.us/workerprotection/safetyhealth/DOSH_PESH.shtml. These standards primarily apply to laboratory rooms in Hudson Hall Main, Hudson Hall Annex, Beaumont Hall, and Ward Hall.

B. All Others

Non-laboratory employees (students and visitors to laboratories - while not strictly covered under the OSHA Hazard Communications requirements) shall be educated in the precepts of this plan. Supervisors of laboratories where these individuals may visit or take classes are responsible for training and supervision. Additional policies on general safety beyond this CHP can be found at: http://www.plattsburgh.edu/offices/admin/businessaffairs/ehs/policies.php.

IV. UNIVERSITY RESPONSIBILITIES

A. President

The university president has the legal responsibility for the development and enforcement of PLA’s CHPs. The President, or someone delegated to do so, has responsibility for the chemical hygiene and safety committees. These committees facilitate the development of hygiene and safety plans. The President or designee appoints the campus Chemical Hygiene Officer (CHO) following campus policy.

B. Chemical Hygiene Officer

The CHO is responsible for carrying out the duties noted in the College Policy on chemical hygiene and safety committees: “Work with the various Chemical Hygiene and Safety committees to develop hygiene plans; work with the committees to plan educational programs on CHP and safety; collaboration in the development and revision of CHPs; serve on each of the CHSCs; collaborate in record keeping; develop a process for regular quarterly inspections of all areas covered by CHP; and appropriately collaborate in reporting lapses in compliance with the CHP.”

C. Laboratory Chemical Hygiene and Safety Committee (LCHSC)

Current PLA policy for the establishment of rules governing CHSCs is outlined in the Campus Handbook Section VIII, under Campus Hygiene and Safety Program.

The Laboratory Chemical Hygiene and Safety Committee has the delegated responsibility to:

1. make recommendations on the content, implementation and effectiveness of the CHP

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8 Ibid.
9 Ibid.
2. Collaborate in the development and execution of educational programs regarding the CHP.
3. Produce an annual report on effectiveness of the campus efforts relating to the CHP.

The PLA’s CHO and EHS staff serve as the ultimate subject matter experts in the development of PLA’s CHPs. In addition, they collaborate in the education of staff in the details of the plans.

The makeup of the LCHSC will follow the approved College Policy noted above (Section 5.3 of the College Policy, pages 206-207).

D. Environmental Health and Safety Office

In collaboration with the administrative structure, the EHS department is responsible for:

1. Compliance education regarding EPA, DHS, DEA, CDC, NIH, DEC, OSHA, NRC, and PESH regulations and policies (Deans and Directors are responsible for enforcement of all pertinent regulations and policies and the accountability of the staff to comply with those regulations)
2. Collaborating with other staff and Chemical Hygiene and Safety Committees as appropriate on:
   a. Standard Operating Procedures (SOPs) to ensure that appropriate chemical and physical risk/hazard assessments are completed, distributed, and inculcation of their details
   b. Development of CHPs
   c. Consideration of necessary safety rules.
3. Assisting and advising departments, committees, instructors, and researchers with selection of appropriate PPE
4. Evaluation of the suitability of facilities for performing projects
5. Approving waste generation plans and oversight of waste collection
6. Oversight of chemical inventory control and ordering mechanisms
7. Oversight of fume hood/ventilation functioning.

The authority of EHS is administered through the President, Provost, Deans, Chairs, and Directors except in cases of imminent threats to life, limb and property when it may become impractical, or impossible to consult with normal administrative chains of command in a timely manner. An EHS representative will serve on each of the CHSCs and the radiation safety committee to provide advice to and assist with identifying physical and training resources as well as to review issues for regulatory compliance.

E. Employees

Each individual member whose appointment requires work in and/or supervision of a science laboratory area has the responsibility for maintaining compliance with the PLA’s CHP and all applicable OSHA/PESH, EPA/DEC regulations and SOPs based on their level of responsibility within their laboratory and the School of Arts and Sciences. In addition, they are accountable to the Chair or Director of their unit, the Dean of Arts and Science, Provost, and ultimately the President for executing this responsibility. Employees are responsible for participating in school, department-specific or research-specific safety trainings annually, periodically, and/or as required when assignments or research projects change. Employees must be aware of the health hazards and safety risks presented by the chemicals and equipment they are working with, or may come in contact with in the laboratory. Current PLA safety procedures and policies are found at: http://www.plattsburgh.edu/offices/admin/businessaffairs/ehs/.

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Ibid
F. Students

Students must observe and practice all safety procedures outlined in the PLA CHPs and any teaching or research lab-specific SOPs. Students must be aware of the health hazards and safety risks presented by the chemicals and equipment with which they work, or with which they may come in contact in the laboratory. It is the responsibility of the instructor or supervisor of the lab session to ensure that students are aware of the risks of the work they undertake and the proper protective measures to take.

G. Visitors & Volunteers

Visitors and volunteers must follow all of the policies and procedures found in PLA CHPs as well as other safety rules and regulations found in SOPs or on the EHS web site. Prior to entering any PLA teaching or research laboratory, all visitors and volunteers are required to participate in lab-specific safety training. For teaching labs, this training must be given by the respective lab supervisor. For research labs, safety training is the responsibility of the scientific investigator or supervisor responsible for the laboratory and or work. Visitors and volunteers must be made aware of the health hazards and safety risks presented by the chemicals and equipment with which they may make contact. All visitors shall be escorted by appropriately trained lab-specific (i.e. Biology, Chemistry) individual(s) during their visit(s) to any PLA laboratory or others with approval of the Dean’s Office.

V. GENERAL LABORATORY SOPs

All faculty, staff and students must adopt SCA for working in a laboratory by following the general laboratory safety practices presented in training sessions and relevant SOPs for particular procedures, processes, or areas. Doing so will minimize risks to their overall health and safety, and decrease the probability of incidents.

A. Teaching & Research Laboratories

1. Laboratory facilities may be used only by individuals who have the proper documented qualifications and training.
2. Emergency eyewash and shower stations are to remain free and clear of all obstructions to permit their use when the need arises.
3. Exit doors and aisles between lab benches shall remain clear of all obstructions (including book bags and coats) to permit an orderly escape in the event of an emergency.
4. All injuries or incidents shall be reported as soon as possible to the Department Supervisor (Chair or Director), Dean of Arts and Sciences and EHS.
   a. Incident forms must be filled out and sent to EHS within 48 hours. This effort should be followed by a discussion within the Department and with EHS regarding a review of the incident with respect to devising a preventative measure for future operations. “Near misses” should also be reported and discussed in a similar manner. Incident and near miss forms can be found on the EHS website or by the following link: http://www.plattsburgh.edu/offices/admin/businessaffairs/ehs/forms.php.
5. The dissemination of all relevant or pertinent safety data, chemical hazard warnings, and waste disposal procedures for each experiment shall be an integral part of the pre-lab lecture or other preparative assignments or processes before the students undertake the experiment, or in the lab book used for the experiment.
a. For research labs, the dissemination of all relevant or pertinent safety data, chemical hazard warnings, and waste disposal procedures for all research experiments and processes shall be through lab-specific SOPs or other well established research protocols.

b. SOPs should include the location, process and or operation of the following safety devices or materials: SDS, emergency shower, eye wash, first aid kit, fire alarm, fire extinguisher, fume hoods, emergency gas and electric shut downs, and lab phone.

c. Information should be updated as required or needed in both teaching and research venues.

6. **Chemical exposure must be minimized** by using all current methods of PPE provided or available. (See: ANSI/ISEA Z87.1-2010 for approved goggles, non-permeable gloves etc.) The wearing of lab coats and aprons is highly recommended and is required when indicated by the SDS or lab supervisor.

7. **All books, backpacks, coats and other personal items must be stored in a designated area** and should not be placed on the floor, bench tops, or in cabinets under sinks.

8. The **consumption of food or drinks, chewing of tobacco, gum, mints and the application of make-up in any lab is prohibited.**

9. **Pets are not allowed into any laboratory or building.** Exceptions need to be made for trained animals for persons with documented disabilities (on file in the Student Support Office or the Human Resource Services Office) and an approach developed on a case-by-case basis to protect the animals from any harm.

10. **Minors (including infants) are not allowed to be present in any laboratory** without permission or enrollment and a prior risk assessment. Visitors are allowed access after appropriate training.

11. **Chemicals may only be transported outside of laboratories using secondary containment (i.e. a rubber boot) preferably using a cart.** Secondary containment is recommended even when transporting chemical substances on carts. In addition, when the transport occurs to a floor different from the original location, an elevator shall be used. It is advised that secondary containment is an additional safety precaution when moving chemical containers around within a laboratory space.

12. **Chemicals shall be stored by compatibility group** in approved glass-fronted cabinets, flammable cabinets, or appropriately labeled cabinets with solid doors. Chemicals stored on shelves shall have seismic lips on each shelf. In addition, the storage area itself must be compatible to the hazard or character of the chemical being stored. Large glass bottles shall not be stored above eye level.

13. **Chemical spills should be cleaned up immediately** using the appropriate materials and PPE. Spill cleanup plans should be in place prior to undertaking any experiment or transporting a chemical. See the EHS website for additional information

14. **Deposit waste in properly labeled designated waste containers only and store those containers in designated Satellite Storage areas.** Sink or drain disposal of laboratory chemicals, lab solutions or any lab waste shall not occur until it has been determined and documented via written waste determination that the chemical, solution or waste is classified as non–hazardous under all current applicable regulations and policies. Wastes shall not be stored in fume hoods or biological safety cabinets. See the EHS web site for current hazardous waste disposal policy.

15. **All gas tanks (cylinders) shall be secured to a solid object** such as a wall or lab bench at two/thirds of the height of the tank. Tank valves shall be closed when the tank is not in use. **All tanks shall be transported secured on tank carts with the protective valve cap screwed onto the tank.** This does not apply to lecture bottles. They should be transported as appropriate to the tank size but with the safety cap attached.
16. **Consult EHS for special safety precautions** that may be needed when changing or scaling up experimental procedures. When performing an experiment, scale up and or substitution of reagents different than suggested in a procedure can increase the hazards or risks to laboratory personnel.

17. **When dissecting**, always cut or slice in a direction away from your body.

18. **Any employee or student that suffers a “needle stick” or sharps injury must report this** to their supervisor or instructor immediately. See EHS web site for current policy on blood borne pathogens and sharps injuries and complete the Exposure Incident Report Form: [http://www.plattsburgh.edu/offices/admin/businessaffairs/ehs/accident.php](http://www.plattsburgh.edu/offices/admin/businessaffairs/ehs/accident.php).

19. **Loose clothing or long hair shall be restrained or tied back.** Unrestrained long hair or loose clothing can accidently fall into an experiment causing injury.

20. **Rings should not be worn** when working with machinery or chemicals. Rings increase the risk of chemical injury when a splashed chemical cannot be washed out from under the ring. They also pose snag hazards when working with machinery. This can lead to hands being drawn into cutting or other types of power tools.

21. **Closed-toed shoes, long pants with socks, and long-sleeved shirts are required when working with hazardous chemicals.**

22. Biological waste shall be disposed as per the EHS policy. See: [http://www.plattsburgh.edu/offices/admin/businessaffairs/ehs/medicalwaste.php](http://www.plattsburgh.edu/offices/admin/businessaffairs/ehs/medicalwaste.php).

23. **Written permission from the SPFSP and departmental supervisor must be obtained prior to the removal of any chemicals, culture specimens, equipment or other university property from the premises.**

24. **Bringing any personal chemicals, culture specimens, or equipment into the Hudson Hall Science Complex or other science laboratories requires approval** of the SPFSP and departmental supervisor.

25. **Laboratories should be kept in clean and orderly condition with all installed building equipment/appliances functional:**
   a. **equipment and supplies stored in the laboratory should be neatly organized;** not pose any tripping or falling-object hazards; and not violate current fire codes
   b. **no combustible materials shall be stored on an open shelf within 18 inches of the ceiling**
   c. **all electric panels shall be clear of obstruction** so that the clearance complies with current fire, NFPA or building codes (currently a 36-inch square of clearance with one side of the square centered on the middle of a double column circuit panel is required)
   d. the accumulation of trash (packaging materials, broken equipment to be discarded, refuse of any kind outside of a trash receptacle) is to be avoided due to fire hazards they pose
   e. **fume hoods shall not be used for storage** of equipment or chemicals.
   f. **report all malfunctioning facilities equipment in the Hudson Science Complex (eye washes, fume hoods, leaking sinks, light bulb replacement, leaky ceilings, ventilation issues etc.) to the SPFSP, in a timely fashion.** The SPFSP will schedule the appropriate repairs and/or testing. Submit your report to the SPFSP either in person, via email or via phone call (518)593-9612. The SPFSP will follow up with the appropriate departments and also send the work request to hudlabinfoexch@plattsburgh.edu, where it will be distributed to the department chairs and department secretaries.

26. **Inform non-laboratory personnel of any lab-specific hazards prior to their working** on or repairing any building facilities, (electrical, plumbing, etc.) or specialized equipment (refrigerators, freezers, etc.). Any identified hazard should be minimized or removed if necessary to provide a safe working environment for non-laboratory personnel.
27. **Correct all inspection-cited deficiencies in a timely manner** after an inspection by EHS, OFPC, DEC, PESH, or EPA and other internal or external inspection or audit groups. Remediation should occur as soon as possible, but no later than specified deadline(s).

28. **Individuals who pose a danger to themselves or others by being under the influence of any drug including alcohol, inhibiting medication or who become violent or threatening should be asked to leave the laboratory area** or if necessary, be removed by UP.

29. **If an emergency occurs in the laboratory (spill, accident, injury, fire, etc.) please call 911 from a phone that is located in a safe area.** Yellow emergency phones are located in hallways of Hudson Hall Science Complex. Each laboratory has a phone in it and is 911 capable. If possible, follow-up that call to University Police at 518-564-2022. When making an emergency call, dispatch will need to know:
   a. your name **and** location (building, room #, building address) 31 Beekman Street
   b. nature of the emergency
   c. type and severity of any injuries
   d. if a Hazmat team is needed
   e. SDS information and or SDS sheets.

B. **Activity Specific SOPs.**

The Laboratory Supervisor (or Instructor) is responsible for creating written activity-specific SOPs when appropriate for their teaching or research programs. Appropriateness SOPs must follow the approved outline. See the EHS website for current policies and procedures on SOPs.

SOPs are specifically required for:
1. standard processes or procedures that might require more demanding laboratory techniques to ensure safety
2. work with particularly dangerous materials
3. those processes for which the LCHSC requires an SOP

SOPs should normally be generated by the practitioners without impetus from the committee. SOPs are to be reviewed by the Laboratory Chemical Hygiene and Safety Committee with final approval from the Director of EHS. After approval, they will be posted to the EHS web site so that they can be shared by all members of the laboratory staff.

VI. **CONTROL MEASURES FOR REDUCING CHEMICAL EXPOSURES AND RISK**

Several steps shall be utilized to minimize the exposure to...
hazardous chemicals and mitigate any associated health and physical risks due to their use in Plattsburgh’s teaching and research labs. Controlling chemical exposures shall be accomplished by applying the hierarchy of controls (See Figure 1 at left\(^\text{11}\)). Practitioners should attempt to limit chemical exposure risks by following these considerations in order: 1) elimination of a chemical or substitution of a less hazardous chemical (best control on reducing hazard) or process; 2) use of engineering controls such as fume hoods (controls that don’t require human intervention to be effective); 3) administrative guidelines (as for example: never open a bottle of flammable or volatile toxic chemicals on a bench top (control requires individual to do or not do something to limit their exposure); 4) use of personal protective equipment (requires individuals to use something that may be less than 100% in limiting exposure – least effective control).

A. Eliminate or Substitute

The first and most effective reduction in risk for injury from chemical substances or laboratory processes is to eliminate the hazardous material or process while still achieving your scientific goal. The second consideration to make if a process or chemical substance type can’t be eliminated is to determine if an alternate less risky material or process can be substituted. Finally, the consideration of scale in the achievement of the goal should also be made. Following literature methods without consideration of scale, needlessly wastes time, resources and is a deterrent to achieving a sustainable environment. Pursuing elimination, substitution, and reduction in scale is in line with a SCA as opposed to an unexamined approach to achieving research and teaching goals.

B. Engineering Controls

If elimination or substitution of a less risky approach or use of a chemical substance cannot be made then the next consideration to make is whether engineering controls can be used to ensure safety even if an accident occurs. Engineering controls are those that do not require the scientist to do something but are rather controls that ensure safety because of their inherent design. Example of such engineering controls are fume hoods, eye washes, or safety showers. They are built into the design of the laboratory area.

1. Use of Chemical Fume Hoods and Biosafety Cabinets

a. All laboratories using any chemicals that have high rating for any risk parameter (flammability, combustibility, reactivity, instability, toxicity, infectivity, carcinogenicity, mutagenicity, teratogenicity, offensive odor, or can create a dust) shall do so in a fully functional and operational chemical fume hood or biological safety cabinet. See Figure 2 below for pictures of a fume hood, a biosafety cabinet (Class II A2), and higher level biosafety Cabinet (Class II, B2)\(^\text{12}\). Fume hoods and biosafety cabinets are devices that contain the hazardous chemical or biological substances being used and limit exposure of the scientist to the materials (https://www.bakerco.com/introduction-biological-safety-cabinets). In addition, when using chemical or biological materials with these hazards, the laboratory should also have a safety shower and an eye wash station.

b. In varying degrees, a laminar flow biological safety cabinet is designed to provide three basic types of protection:
   i. personnel protection from harmful agents inside the cabinet

\(^{11}\)Diagram taken from OSHA. See: http://www.safetyproresources.com/blog/how-to-apply-oshas-hierarchy-of-controls-to-mitigate-safety-hazards

ii. product protection to avoid contamination of the work, experiment, or process
iii. environmental protection from contaminants contained within the cabinet.
c. **Alarms** Prior to using a hood, users must check the status of the hood by observing the continuous air-flow meters on the front of the hood and make sure that neither device is in alarm mode. See Figure 3 for the hood sensor alarms.

![Flow Alarms on Hoods](image3)

**Figure 3. Flow Alarms on Hoods**


d. **Logistics of Hood Use** All work should be done at least six (6) inches from the back side of the front sash to prevent turbulence and possible escape of hazardous vapors from inside the hood. Any large pieces of equipment used inside a hood should be elevated and placed as far back as possible in the hood without blocking the movement of the baffles in the rear of the hood. Care must be taken to prevent equipment from obstructing the movement of the rear baffles of the hood. These baffles change position in response to a need for increased or decreased air flow.

Hood sashes should always be completely closed when not in use. See Figure 4 for appropriate positions for the sash when using a hood. The use of the biosafety cabinet requires more considerations. See the operators’ manuals for biosafety cabinet operations.
Fume Hoods are not to be used for storage of chemicals or equipment, except in the case of continuous procedures that are being carried out in the hood. Do not allow debris such as paper, latex/nitrile gloves, or small objects to be sucked up into the exhaust ducting as this may cause serious damage to the variable air valve or exhaust fan and impair fume hood operation.

The hoods installed in the Hudson Hall Science Complex are high efficiency. They have many moving parts as compared to the older laminar flow hoods and as a result run effectively at lower face velocities (around 70 fpm).

2. **Inspections of Fume Hoods and Biosafety Cabinets**

Fume Hoods and Biosafety Cabinets shall be tested each year and certified as meeting minimum specifications of designed operation. Fume Hoods should be fully tested every fourth year in order to determine their compliance with ASHRAE Standard 110-2016 -- Method of Testing Performance of Laboratory Fume Hoods. Documentation of test results will be kept on file in the EHS office. Each hood will have the test result displayed on a sticker affixed to the hood or safety cabinet.

When a hood fails or has cfm readings below recommended values or its alarm sounds, it shall immediately be tagged with a placard as out of order by the supervisor of the laboratory at the

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*Figure 4. Appropriate positions for sash in different stages of operation*
moment of alarm. It shall not be used for any procedure that requires ventilation in order to control any type of chemical exposure until the alarm condition is addressed. Hood alarms should be immediately called in to the Central Heating Plant by calling 564-5030. When the fume hood is returned to fully operational mode, the placard shall be removed.

Currently PLA has a two BSL-2 research capability biosafety cabinets as well as isolated biosafety cabinets. Biological safety cabinets are to be tested annually by an outside vendor. Filters need to be replaced per manufacturer’s recommendations.

3. List of Fumes Hood and Biological Safety Cabinet Locations

<table>
<thead>
<tr>
<th>Hudson Annex</th>
<th>Room Number</th>
<th>Hood/Cabinet#</th>
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4. Safety Showers and Eyewash Stations

All safety showers and eyewash stations are to be tested and maintained according to ANSI/ISEA Z358.1-2014 standards. All safety showers and eye washing stations are to be tested (activated) weekly.

C. General Administrative Controls

1. Required Laboratory Contact Lists & Signage

   a. Emergency contact lists will be compiled and maintained by the SPFSP. Additionally, emergency contact (list of numbers) information will be provided to appropriate personnel for emergency situations.

   b. All laboratories will have the appropriate signage to identify the location of all emergency equipment such as emergency showers, eyewash stations, first-aid kits, and fire extinguishers.

   c. All laboratories will have the appropriate signage to identify the specific hazards as required by law (e.g. cancer [formaldehyde] or radiation propeller [radioactive isotope work] and biohazard sticker [infectious agents].)

2. Laboratory Inspections

   a. Inspections. Laboratory inspections are essential to developing an effective SCA. They help in the identification and addressing of potential safety deficiencies. Lab inspections will be performed quarterly as described in section 5.5 of the College Policy on Chemical Hygiene and Safety Program\textsuperscript{13}. While the laboratory will be inspected on a quarterly basis, deficiencies of engineering controls in the laboratory should be determined by every laboratory supervisor before working or teaching in an area and reported to the M&O office (5038) or heating plant (5030). If the deficiency creates a dangerous situation, the laboratory supervisor shall not allow anyone to work in the area until it is rectified. Signage should be applied by the supervisor to indicate that the equipment is out-of-order.

   b. Records. The process for retention of the inspection records and responses will be determined by EHS.

   c. Accountability for remediating lapses identified on inspections is described in section 5.6 of the College Policy on Chemical Hygiene and Safety Program.

D. Personal Protective Equipment (PPE)

1. EHS Policy on Personal Protective Equipment

   See the EHS website for the policy on personal protective equipment.

VII. STANDARD PROCEDURES FOR LAB CHEMICALS

The standard and prudent practices outlined below must be followed to ensure the safety of employees and students, and to minimize the risks associated with the usage, storage, handling and disposal of chemicals. The

use of specialty chemicals in the research labs will be addressed in the lab specific SOPs. Plattsburgh follows a “just the amount, just in time”\textsuperscript{14} ordering philosophy. Large quantities of chemicals should not be order or stored. Chemicals no longer needed or beyond their expiration date, should be discarded immediately.

\section*{A. Chemical Procurement}
See the EHS website for the policy on chemical procurement.

\section*{B. Chemical Inventories}
All research and teaching labs that use or store chemicals or chemical substances shall have a complete online chemical inventory maintained in Vertere by the SPFSP. Chemical inventories will be updated biannually. Completed chemical inventories may be submitted to EPA, DHS, OSHA, PESH, DEA, and emergency response teams for regulatory compliance, reporting requirements, or response to an emergency.

\section*{C. Chemical Storage}
1. \textit{Chemical storage is determined by chemical storage code, chemical class and chemical compatibility.} Storage should follow the recommendations found in the Prudent Practices in the Laboratory and will be the responsibility of the individual noted as a supervisor for a laboratory space. A color coding system will be developed to aid in this storage process.

2. \textit{Chemical storage facilities should be approved for the type of chemicals to be stored, such as flammable chemicals in flammable cabinets, corrosive chemicals in corrosive cabinets, etc.} Chemicals shall only be stored in clearly marked cabinets and \textit{never in unmarked drawers/cabinets, non glass-fronted wall cabinets or non glass-fronted floor cabinets.} If possible, chemical cabinets should be secured with a lock. When storing flammable liquids, uniform/local building fire codes, and OSHA\textsuperscript{15} guidelines shall be followed. The type and size of container used for holding various classes of flammable liquids will adhere to all applicable OSHA guidelines, except where hazards warrant smaller sizes.

\hspace{1em} a. \textit{Flammable chemicals that require refrigeration shall be stored in explosion-proof refrigerators, or a UL listed flammable liquids refrigerator.} Household refrigerators in labs shall not be used for the storage of flammable chemicals. There shall be no storage of chemicals or biologicals in any office or breakroom refrigerator. All refrigerators shall be marked as to whether they are reserved for food or for chemical/biological substances.

\hspace{1em} \footnotesize{\textsuperscript{14} While ordering large quantities of chemicals may improve a cost per unit amount, it is the position of the Vice President for Business Administration that the higher costs incurred due to smaller amount premiums, are to be sustained in the more important effort to limit the amount of chemicals stored on campus. In addition, the inherent dangers of trying to separate large quantity volumes into several smaller secondary quantities, the increased cost for the smaller quantity container is a tradeoff for increased safety. Each laboratory is expected to run on its own and lab supervisors should anticipate needs for each semester or for each project so that chemicals are ordered only for that immediate use.}

\hspace{1em} \footnotesize{\textsuperscript{15}See: (a)\url{https://www.osha.gov/dte/library/flammable_liquids/flammable_liquids.html} viewed on July 28, 2015 - “Flammable and Combustible Liquids 29 CFR 1910.106” - “Not more than 60 gallons of Class I and/or Class II liquids, or not more than 120 gallons of Class III liquids may be stored in an individual cabinet” - “The quantity of liquid that may be located outside of an inside storage room or storage cabinet in a building or in any one fire area of a building shall not exceed: 25 gallons of Class IA liquids in containers, 120 gallons of Class IB, IC, II, or III liquids in containers...” (b) For good advice and information see the UC Davis “Flammable and Liquid Storage” at: \url{http://safetyservices.ucdavis.edu/ps/fp/fn/biefs/flammable-liquid-storage} viewed on July 28, 2015.}
D. Chemical Handling-Transport

1. **Secondary containment is to be used in addition to any other required storage facilities for acid, base and flammable solvent bottles larger than 500 ml**, etc. Cardboard boxes or other porous materials are not suitable as secondary containment. While no standards exist for the transport of chemicals generally used in the lab (1 gallon or less) secondary containment should be able to hold the quantity of a given chemical should a container rupture during transport and or transfer.

2. Depending on its chemical hazards, **all chemicals shall be stored in chemically compatible containers of an appropriate size**. Containers holding liquids should have at least a 10% air space in the bottle for expansion of the liquid.

3. **Chemical waste will be stored separately from unused chemicals and only in satellite storage areas - not hoods.** No chemicals shall be allowed to evaporate in hoods or on the bench as a mode of concentration or disposal. Any solvents used for washing glassware such as acetone shall be collected and sent for proper disposal.

4. All empty containers with their original label and barcode shall be placed in the satellite storage area.

E. Labelling

1. In addition to the manufacturer’s label, **all primary chemical containers shall be labeled with date received, name of person ordering the chemical, expiration date and inventory bar code sticker**. The term primary chemical container refers to the container in which the chemical substance is shipped (this does not include packaging for shipment purposes). These three items in addition to the manufacturer’s label will be applied by the SPFSP for new chemicals ordered after September 2015. All chemicals on hand prior to this date may not include the name of the person ordering the chemical or the date received. **The practitioner in the laboratory is responsible for adding a date of opening to the bottle when it is first used.** So primary bottles of chemicals shall include a bar code and manufacturer’s label if obtained before September 2015 or if obtained after September 2016 a bar code, date received, date opened, expiration date, and ordering party’s name as well as a manufacturer’s label. The Peroxide Former tables must be consulted for those chemicals that form peroxides for the appropriate disposal date.

2. **When a chemical is transferred to a secondary container, it must be labeled with the chemical name, date of transfer, name of the responsible staff member, appropriate GHS pictogram(s) and an indicator word or words.**

F. Extremely Hazardous Substances

Extremely hazardous substances are those substances with the following properties or characteristics: highly toxic, select carcinogens, reproductive toxins, P-listed materials, on DEA restricted list, on the DHSES list of tracked chemicals, and or require additional provisions to ensure employee and student safety.

**To ensure the highest level of safety and minimize the risks associated with the usage, storage, handling and disposal of extremely hazardous substances prudent practices outlined below are required.** Where warranted, the use of special PPE, techniques or protocols will be addressed in the chemical-specific SOP.

1. Use only the minimum amount of chemical needed for the procedure.

2. Perform all work in a fume hood, glove box, sealed system such as Schlenk system or a designated area when performing operations listed in sections a through c below. Using HEPA filters, carbon filters or
scrubber systems with containment devices can be used to protect effluent and vacuum lines/vacuum pumps from unwanted contamination. Any area where extremely hazardous substances are used shall be decontaminated after the activity is completed.

a. Volatilizing or dissolving the materials.
b. Any manipulation that produces aerosols, fines, particulates, or mists.
   c. Weighing out extremely hazardous materials using the tare method with a sealed container or by transfer of the required volume in hood using the density to determine weight of material.

3. Restricted Chemicals

   a. DEA Controlled Substances - Controlled substances must be stored in a secondary secured lock box within a limited access controlled area with a sign indicating ‘controlled substance’ storage.
      i. View the current list of DEA controlled substances at: [http://www.deadiversion.usdoj.gov/schedules/](http://www.deadiversion.usdoj.gov/schedules/)
   b. DHSES Chemicals of Interest - See the current list at: [http://www.dhs.gov/xlibrary/assets/chemsec_appendixafinalrule.pdf](http://www.dhs.gov/xlibrary/assets/chemsec_appendixafinalrule.pdf)
   c. EPA P-Listed Chemicals - All p-listed chemicals (Acutely Toxic) are to be stored in a secondary secured lock box within a limited access area and labeled ‘p-listed chemical’ storage. The P-list is chemicals that are deemed hazardous by EPA and require special handling and disposal. Chemicals included on the P-list can be found in the regulations: [http://www.gpo.gov/fdsys/pkg/CFR-2012-title40-vol27/xml/CFR-2012-title40-vol27-sec261-33.xml](http://www.gpo.gov/fdsys/pkg/CFR-2012-title40-vol27/xml/CFR-2012-title40-vol27-sec261-33.xml)

G. Shipment of Chemicals or Chemical Substances Off-Campus

Chemicals and biologicals must be shipped according to current Department of Transportation (DOT) regulations using a DOT certified outside vendor. This is to ensure proper packaging and limited liability in case of an exposure from an accident and leakage. In addition, shipping requires prior written approval of the EHS department and shall be accomplished through the SPFSP.

H. Lab Specific SOPs for Chemicals and Hazardous Processes - General

See EHS web site for the SOP policies and procedures.

Laboratory personnel and students must have a clear understanding of the associated physical, chemical, and toxicological properties of any chemical with which they come in contact. All employees and students must review the SDS for each new chemical they will be using PRIOR to ordering or actually beginning any work. Based on the characteristics of a chemical substance, standard operating procedures may be necessary to ensure all individuals using a chemical substance understand the proper way to handle it in order to limit the possibility for injury and or damage to the environment. The characteristics to consider under the Global Harmonizing System are listed below.

1. Physical Hazards

   a. Explosives
   b. Flammable Gases
   c. Flammable Aerosols

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16 See: [https://www.osha.gov/dsg/hazcom/ghs.html](https://www.osha.gov/dsg/hazcom/ghs.html)
d. Oxidizing Gases  
e. Gases Under Pressure  
f. Flammable Liquids  
g. Flammable Solids  
h. Self- Reactive Substances  
i. Pyrophoric Liquids  
j. Pyrophoric Solids  
k. Self- Heating Substances  
l. Substances Which in Contact with Water Emit Flammable Gases  
m. Oxidizing Liquids  
n. Oxidizing Solids  
o. Organic Peroxides  
p. Substances Corrosive to Metal  

2. Health Hazards  
a. Acute Toxicity  
b. Skin Corrosion  
c. Skin Irritation  
d. Eye Effects  
e. Sensitization  
f. Germ Cell Mutagenicity  
g. Carcinogenicity  
h. Reproductive Toxicity  
i. Target Organ Systemic Toxicity: Single Exposure & Repeated Exposure  
j. Aspiration Toxicity  

3. Environmental Hazards  
a. Hazardous to the Aquatic Environment  
b. Acute Aquatic Toxicity  
c. Chronic Aquatic Toxicity  

4. Explanation of Classification  
Severity descriptions can be found at the web site: https://www.osha.gov/dsg/hazcom/ghs.html  

I. Specific Chemical SOPs  
See the EHS website for approved SOPs.  

VIII. CHEMICAL EXPOSURE ASSESSMENT and MEDICAL EXAMS  

A. Personal Exposure Monitoring  
Personal monitoring is conducted by EHS if there is a reason to believe an employee or student has been exposed to an OSHA-regulated chemical above the action level or the permissible exposure level,\(^\text{17}\) or is required because of the work environment such as exposure to noise above 85 decibels.  

\(^{17}\) See: https://www.osha.gov/Publications/osha3162.pdf for a list of medical surveillance requirements.
B. Medical Examinations and Records

The EHS department coordinates the required pre-exposure/post-exposure medical exams for employees as required under OSHA regulations. See EHS web site for the Medical Examination Policy

IX. SAFETY TRAINING & INFORMATION

Employee training must be ongoing throughout the employee’s career. The objective of the training is to inform individuals of the associated physical and chemical hazards they may encounter when working with hazardous chemicals, performing hazardous procedures or using hazardous equipment. Appropriate safety training of students is also required and is the responsibility of the supervising faculty instructor. Training is necessary for those non-laboratory individuals such as visitors or volunteers who upon entering any teaching or research lab might be exposed to a hazardous chemical or an ongoing hazardous procedure. All employees are required to attend safety training presentations on a periodic basis as determined by EHS.

A. Employee Training

1. General Hazard Communication and RCRA training of an employee shall take place immediately upon hire, and thereafter annually. This training will be organized by the College in consultation with the EHS Department.

2. Safety training specific to a particular worksite shall take place and is the responsibility of the employee’s supervisor in collaboration with the EHS Department. This training should include SOPs for the lab on materials handled/processes encountered/equipment operated, specific room emergency protocols, specific hazardous waste issues, and any other best practices appropriate to the specifics of the laboratory. Since faculty undertake many new processes, it is incumbent upon them to make EHS and their supervisors aware of the need for new and or additional training.

3. Whenever a current employee initiates a significantly new laboratory procedure, will experience a new exposure situation, or operate new or unfamiliar laboratory equipment, training should occur and be arranged by the supervisor through discussion with EHS.

4. All safety training for each employee shall be documented and the documents kept for the OSHA required period of time by the EHS Department. In addition, all State and SUNY requirements for records retention shall be followed.

5. Employee training shall cover the PLA CHP, departmental CHPs if they exist, and PLA’s emergency procedures as applicable based on individual work assignments.

6. Additional training shall be done on an ongoing basis and at the discretion of EHS upon regulation changes, updated information on risks, occurrence of accidents, and legal requirements.

7. The training of volunteers, guests, and students is the responsibility of the supervising faculty or staff member. Training efforts for these individuals shall be documented and effective. Documentation of training such as safety quizzes and handouts shall be maintained under the PLA Document Retention policy.\(^\text{18}\)

B. Information Pertinent to Training

1. Employees shall be provided with the PLA’s CHP, and lab specific SOPs as appropriate. They shall be given the url for the location of the PLA CHP on-line.

\(^\text{18}\) See: [http://www.plattsburgh.edu/offices/admin/records/](http://www.plattsburgh.edu/offices/admin/records/) viewed on August 5, 2015.
2. Employees shall be shown the location of personal protective equipment and trained in the selection of appropriate PPE related to their work assignments. Employees must be trained in the donning, doffing, maintenance, and disposal of PPE.

3. Employees shall be shown the location of and trained on the reading, interpretation and understanding of SDSs including all hazard information, exposure limits, and exposure signs as related to their work assignments.

4. Employees shall be trained in the details of hazardous waste disposal procedures.

5. Employees shall be trained in the details of hazardous spill procedures.

6. Employees shall be trained in identification of radiation hazard presence.

7. Since faculty/staff are the designers of experiments and act independently of EHS, lab supervisors/instructors/research supervisors in collaboration with EHS are responsible for items 2 to 6 of this section in terms of specifics of the situations that are encountered in the labs by the faculty/staff because of the pursuit of their disciplines. This collaboration needs to be effective and built on frequent communication regarding laboratory pursuits such that the need for training and development of SOPs is addressed when needed.

X. HAZARDOUS WASTE DISPOSAL

Hazardous waste falls into three categories: biological, chemical and radioactive. The EHS department provides for the disposal of hazardous chemicals and certain hazardous biological wastes, while assuring the university’s compliance with all EPA, DEC, and DOT regulations under a cradle to grave philosophy. Departments and researchers must abide by the policies set forth in this document and the PLA Laboratory Hazardous Waste Policies\(^\text{19}\). Disposal of Radioactive materials shall follow procedures as outlined in the PLA Radiation Policy.

The University is currently classified as a Small Quantity Generator (SQG) by the EPA. Contact the EHS or the SFPSP for any questions regarding hazardous disposal.

A. General Precepts

1. Sink disposal of chemicals should be used only for those chemicals, and solutions, and that are water soluble and that have been determined to be non-hazardous to the environment. This is determined by completing a waste determination form and the results show that it is a non-hazardous.

2. *Disposal of chemicals that are deemed hazardous in some way is to be accomplished in consultation with the Laboratory Facilities and Program Support Professional.*

3. All chemicals not declared hazardous waste by the EPA, but indicated as ‘harmful to aquatic environment,’ by their SDS may have DEC or other regulations regarding their disposal and should be considered hazardous and disposed of through the PLA process.

4. Hazardous waste generation is to be minimized through the use of a ‘green’ chemistry approach (Eliminate, Substitute, Minimize volumes/amounts) and through the use of modern protocols and technology-aided techniques.

5. No experiment, process, or procedure that will generate a hazardous waste will be undertaken without a disposal plan in place.

\(^{19}\) See the EHS web site for the Hazardous Waste Disposal Policy.
6. Broken lab glassware shall be placed in the broken glass boxes located in labs. When the box is full, contact the SPFSP for details on the disposal of the box. Do not fill boxes to the extent they cannot be comfortably lifted.

XI. WORKING ALONE

See the EHS website for the “Working Alone” Policy.

XII. HAZARDOUS EQUIPMENT OPERATION

The operation of all laboratory equipment shall follow all recommended safety precautions prescribed by the manufacturer as well as any additional safety precautions warranted by the use of standard and prudent practices outlined in any lab-specific SOP. Equipment examples include: scientific instrumentation, gas generators, vacuum pumps, roto-evaporators, shakers, freezers, refrigerators etc.

Individuals should be aware of the hazards that equipment may pose including high voltage (electrical), high pressure (pneumatic pressure), low pressure, fluid hazards (hydraulic pressure), radiation and or mechanical part hazards.

Equipment that may fall under OSHA authority due to required safety devices such as belt guards for example must comply with these regulations as well.  

XIII. EMERGENCY SITUATIONS and EVACUATIONS

Emergency situations can occur from natural disasters such as earthquakes, severe storms, or manmade events such as accidental-, biological-, chemical-, and radiological spills, terrorist attacks, active shooters, medical emergencies, etc. In the event of campus-wide emergency, be prepared for messages to be sent through the SUNY New York Alert System. If the situation is within your laboratory domain or building, the lab supervisor will provide instructions or activate pre-planned responses such as would be in place for a spill.

A. Emergency Building Evacuation

In the advent of a visible fire or the sound of a building fire alarm, building occupants should remain calm and follow your lab supervisor’s directions for evacuating the building. During a building evacuation, if time and safety permits, all electrical devices should be turned off and any chemical procedures halted. If time permits, personal belongings should be collected prior to calmly exiting the building via the nearest and safest exit. Elevators should not be used. Once outside, everyone should stay at least 50 to 100 feet from any buildings and out of fire lanes. Instructors should personally account for everyone in their classes. The class evacuation assembly point should not be left by anyone prior to receiving approval from instructors to do so.

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21 See: http://www.plattsburgh.edu/emergency/sunynyalert.php for more information on SUNY NY Alert and how to sign up for it.
B. Chemical Spills
See the EHS website for the Chemical Spill Policy.

IX. Tables

TABLE 1: ORGANIC COMPOUNDS FORMING PEROXIDES

1. Ethers, Acetals
2. Olefins with allylic hydrogens, chloro- and fluoro-olefins, terpenes
3. Dienes, vinyl acetylenes
4. Aldehydes
5. Ureas, amides, lactams
6. Vinyl monomers including vinyl halides, acrylates, methacrylates, vinyl esters
7. Secondary Alcohols

INORGANIC COMPOUNDS OR ELEMENTS

1. Alkali metals particularly potassium
2. Alkali metal alkoxides and amides
3. Organometallics

TABLE 2: Peroxidizable Chemical Classification

<table>
<thead>
<tr>
<th>Peroxidizable Chemical Classification</th>
<th>Disposal Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unopened chemicals from the manufacturer</td>
<td>18 months after receipt or printed manufacturer’s expiration date (earliest)</td>
</tr>
<tr>
<td>Opened containers</td>
<td></td>
</tr>
<tr>
<td>Table 3 Chemicals</td>
<td>3 months</td>
</tr>
<tr>
<td>Table 4 Chemicals</td>
<td>12 months</td>
</tr>
<tr>
<td>Table 5 Chemicals</td>
<td>12 months</td>
</tr>
<tr>
<td>Table 6 Chemicals</td>
<td>Inspect periodically</td>
</tr>
</tbody>
</table>

Note: Never open or test containers of unknown origin or age, or those that have visible evidence of peroxides!

TABLE 3: Severe Peroxide Hazard. These are chemicals that can spontaneously decompose, becoming explosive after exposure to air without concentration. These chemicals must be stabilized or decontaminated and discarded within three months of opening. This list is not all inclusive!

<table>
<thead>
<tr>
<th>Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropyl ether (108-20-3)</td>
</tr>
<tr>
<td>Potassium amide (17242-52-3)</td>
</tr>
<tr>
<td>Divinylacetylene (31014-03-6)</td>
</tr>
<tr>
<td>Potassium metal (7440-09-7)</td>
</tr>
<tr>
<td>Sodium amide (7782-92-5)</td>
</tr>
<tr>
<td>Vinylidene chloride (75-35-4)</td>
</tr>
<tr>
<td>Butadiene (106-99-0)</td>
</tr>
<tr>
<td>Chloroprene (126-99-8)</td>
</tr>
<tr>
<td>Tetrafluoroethylene (116-14-3) (liquid)</td>
</tr>
</tbody>
</table>

TABLE 4: Concentration Hazard. These chemicals typically require external energy for spontaneous decomposition, forming explosive peroxides when distilled, evaporated or otherwise concentrated. The formation of peroxides in these
There are over 200 organic and inorganic compounds capable of forming peroxides under the right conditions. This list is not all inclusive! Lab personnel should always refer to the SDS, contact the chemical manufacturer, or contact EH&S to determine if chemicals are potential peroxide formers.
<table>
<thead>
<tr>
<th>Chemical</th>
<th>Chemical</th>
<th>Chemical</th>
<th>Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>p-Di-n-butoxybenzene</td>
<td>1,2-Dibenzylxythane</td>
<td>p-Dibenzylxythane</td>
<td>2,4-Dichlorophenoxyacetic</td>
</tr>
<tr>
<td>1,2-Dichloroethyl ethyl ether</td>
<td>2,4-Dichlorophenetole</td>
<td>1,2-Diethoxymethylene</td>
<td>2,4-Dichlorophenoxyacetate</td>
</tr>
<tr>
<td>Diethoxymethane</td>
<td>2,2-Diethoxypropane</td>
<td>Diethyl acetate</td>
<td>Diethylketene</td>
</tr>
<tr>
<td>Diethyl furinate</td>
<td>Diethoxybenzaldehyde</td>
<td>M,o,p-diethoxybenzene</td>
<td>1,2-Diethoxyethane</td>
</tr>
<tr>
<td>M,o,p-diethoxybenzene</td>
<td>Diethoxybenzaldehyde</td>
<td>p-Doxane</td>
<td>1,2-Diethoxyethane</td>
</tr>
<tr>
<td>Diisobutylene(pract)</td>
<td>Triethylene glycol dipropionate</td>
<td>Dimethoxyethane</td>
<td>1,1-Dimethoxyethane</td>
</tr>
<tr>
<td>Dimethylethane</td>
<td>2,4-Dimethoxybenzoic acid</td>
<td>3,4-Dimethoxybenzaldehyde</td>
<td>3,4-Dimethoxybenzaldehyde</td>
</tr>
<tr>
<td>3,3'-Dimethoxy benzidine</td>
<td>Tetrahydropyran</td>
<td>4,4-Dimethoxy2butanone</td>
<td>4,4-Dimethoxy2butanone</td>
</tr>
<tr>
<td>1,2-Dimethoxyethane</td>
<td>Phenyl o-phenoxyacetyl chloride</td>
<td>Dimethoxyethane</td>
<td>2,2-Dimethoxypropene</td>
</tr>
<tr>
<td>3,3-Dimethoxypropene</td>
<td>2,4-Dinitrophenetole</td>
<td>2,5-Dimethoxytoluene</td>
<td>2,5-Dimethoxytoluene</td>
</tr>
<tr>
<td>1,3-Dioxepane</td>
<td>p-Dioxane</td>
<td>1,3-Dioxolane</td>
<td>1,3-Dioxolane</td>
</tr>
<tr>
<td>1,2-Epoxy-3-isoproxypropane</td>
<td>Di(2-propynyl)ether</td>
<td>Di-n-propoxymethane</td>
<td>2-(2-Ethoxyethoxy)ethanol</td>
</tr>
<tr>
<td>p-Ethoxybenzaldehyde</td>
<td>o-Ethoxybenzoic acid</td>
<td>2-Ethoxyethyl acetate</td>
<td>2-Ethoxyethyl acetate</td>
</tr>
<tr>
<td>1-(2-Ethoxyethoxy)ethyl acetate</td>
<td>2-Ethoxyethyl acetate</td>
<td>1-Ethoxynaphthalene</td>
<td>p-Ethoxyphenol</td>
</tr>
<tr>
<td>(2-Ethoxyethyl)-o-benzoyl benzoate</td>
<td>Ethoxy-2-propylene</td>
<td>o,p-lodophenetole</td>
<td>3-Ethoxypropionitrile</td>
</tr>
<tr>
<td>O,p-Ethoxyphenyl isocyanate</td>
<td>2-ethylisobutyl</td>
<td>Isobutyl vinyl ether</td>
<td>Ethyl B-ethoxypropionate</td>
</tr>
<tr>
<td>2-Ethylacrylaldehyde oxime</td>
<td>2-Ethylbutanol</td>
<td>Isophorane</td>
<td>Ethyl vinyl ether</td>
</tr>
<tr>
<td>Ethylenesbis-(2-oxyethyl acetate)</td>
<td>Furan</td>
<td>o,p-lodophenol</td>
<td>2,5-Hexadiyn-1-ol</td>
</tr>
<tr>
<td>p-Formylphenoxyacetic acid</td>
<td>(2-methoxyethoxy)ethanol</td>
<td>Nitrophenyl phenetone</td>
<td>Isoamyl benzyl ether</td>
</tr>
<tr>
<td>(pHydroxyphenoxy)acetic acid</td>
<td>Methoxypropynitrile</td>
<td>o,p-lodophenol</td>
<td>Isoeugenol</td>
</tr>
<tr>
<td>Isoamyl ether</td>
<td>Methoxyacetic acid</td>
<td>Methoxyethoxymethane</td>
<td>Isophorone</td>
</tr>
<tr>
<td>Isoprene</td>
<td>Methoxyacetic acid</td>
<td>Methoxypropynitrile</td>
<td>Isopropyl 2,4,5-trichlorophenoxy-acetate</td>
</tr>
<tr>
<td>Lignole</td>
<td>4-methyl-2-pentanone</td>
<td>0-Methoxypropionitrile</td>
<td>1,5-p-Methadiene</td>
</tr>
<tr>
<td>Methofuran</td>
<td>3-Methoxy-1-butyl acetate</td>
<td>2,5-Norbordiene</td>
<td>p-Methoxybenzylamine</td>
</tr>
<tr>
<td>Methyl p-(n-amyloxy)benzoate</td>
<td>2-Methoxyethyl acetate</td>
<td>1-Octene</td>
<td>n-Methylphenol</td>
</tr>
<tr>
<td>2-methyltetrahydrofuran</td>
<td>2-methoxyethyl vinyl ether</td>
<td>4,4’-Oxydiphenol</td>
<td>2-methoxyethanol</td>
</tr>
<tr>
<td>2-(2-methoxyethoxy)ethanol</td>
<td>4-Methoxy-2-nitroaniline</td>
<td>p-Pentylxyaniline</td>
<td>3-methoxyethyl acetate</td>
</tr>
<tr>
<td>2-methoxyethylamine</td>
<td>o-Methoxyphenyl isocyanate</td>
<td>Phenoxyacetic acid</td>
<td>1-Methoxynaphthalene</td>
</tr>
<tr>
<td>Methoxy-1,3,5,7-cyclocta-tetraene</td>
<td>0-Methoxypropionitrile</td>
<td>a-Phenoxypropionyl chloride</td>
<td>m-Methoxyphenol</td>
</tr>
<tr>
<td>Methoxyphenacetic acid</td>
<td>2,5-Norbornadiene</td>
<td>n-Propyl ether</td>
<td>3-methoxypropionitrile</td>
</tr>
<tr>
<td>B-methoxypropionitrile</td>
<td>Oxybis(2-ethyl benzate)</td>
<td>Sodium 8,11,14-eicosa-tetraenoate</td>
<td>m-Nitrophenolote</td>
</tr>
<tr>
<td>o-Nitrophenyl phenylether</td>
<td>1-Pentene</td>
<td>Tetraethylene glycol</td>
<td>1-Octene</td>
</tr>
<tr>
<td>Oxybis(2-ethyl acetate)</td>
<td>p-Pentyloxybenzylchloride</td>
<td>Triethylene glycol</td>
<td>4,4’-Oxydiphenol</td>
</tr>
<tr>
<td>B, B-oxydipropionitrile</td>
<td>m-(mPhenoxyphenoxy)phenol</td>
<td>1,2,3-Tetrachloro-1,3 Butadiene</td>
<td>p-Pentyloxyaniline</td>
</tr>
<tr>
<td>Phenyldiisobutylene</td>
<td>p-Phenylphenetone</td>
<td>Vinylidene chloride</td>
<td>Phenoxyacetic acid</td>
</tr>
<tr>
<td>Phenyl o-propyl ether</td>
<td>Sodium 8,11,14-eicosa-tetraenoate</td>
<td>Tetraethyleneglycolmonomethylether</td>
<td></td>
</tr>
<tr>
<td>n-Propyl isopropyl ether</td>
<td>Tetraethylene glycol</td>
<td>Trimethoxybenzaldehyde</td>
<td>Sodium ethoxyacetylide</td>
</tr>
<tr>
<td>Tetrahydropryan</td>
<td>Triethylene glycol dipropionate</td>
<td>Tetraethyleneglycolmonomethylether</td>
<td></td>
</tr>
<tr>
<td>Triethylene glycol diacetate</td>
<td>1,1,2,3-Tetrachloro-1,3 Butadiene</td>
<td>Trimethoxybenzaldehyde</td>
<td>4-Vinyl cyclohexene</td>
</tr>
<tr>
<td>1,3,3-Trimethoxypropene</td>
<td>Vinylidene chloride</td>
<td>4-Vinyl cyclohexene</td>
<td>4-Vinyl cyclohexene</td>
</tr>
<tr>
<td>Vinylene carbonate</td>
<td></td>
<td></td>
<td>4-Vinyl cyclohexene</td>
</tr>
</tbody>
</table>
X. References


