Chemistry Safety Plan
Department of Chemistry, Stony Brook University

Contents

Introduction

It is critical that the Chemistry Department promotes a strong safety culture throughout the Department. This document, the Chemistry Safety Plan (CSP), endeavors to provide Department members with access to: a) information on expected conduct and safe practices, b) safety policies and regulations of Federal and State organizations, the University, and the Department, and c) information and tools. It focuses not only on chemical safety, but all hazards found within the building. Its overall goal is to enhance the safety consciousness in the Department, and enable research groups and teaching labs to remain in compliance with policies and regulations.

This document supplements those of the Environmental, Health and Safety Department (EH&S[1]) of Stony Brook University. A Chemical Hygiene Plan[2] (CHP) for the University as a whole has been developed in accordance with Occupational Safety and Health Administration[3] (OSHA) requirements. OSHA requirements are the 'bare minimum' standards which must be met by the University. In addition to the CHP, EH&S has developed policies for training and waste handling, to name but a few areas. Additional issues and situations specific to chemistry and the Chemistry Building are covered in this Department CSP.

This Chemistry Safety Plan is to be evaluated and updated annually for both content and effectiveness in promoting a strong safety culture. Later installments of this Plan will contain additional information about both biological and radiation-related hazards. This document can be accessed at the Chemistry Library, Chemistry Main Office, or online on the Safety page[4] of the Chemistry Department website. Additionally, a copy will be provided to every research and instructional group.

[1] http://www.stonybrook.edu/ehs/
[2] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0221/$FILE/EHSD0221.pdf
[3] http://www.osha.gov/
[4] http://www.chem.sunysb.edu/safety/

Responsibilities

The responsibility for maintaining a safe working environment rests with everyone in the Department. Policies can be in place, reviews and inspections done, and safety equipment maintained, but if the individual does not make the safety of her/himself, coworkers, staff, and the surroundings a priority, then it is for naught. Again – safety is the responsibility of everyone and is, by necessity, everyone's business.

Key players in the creation of a safe work environment include:

Lab personnel:

Laboratory workers, including high school, undergraduate, and graduate students, postdoctoral researchers, faculty, and visiting researchers, bear the primary responsibility for their own safety practice. Prior to working in a laboratory, they must complete all appropriate safety training courses[5] and read this Chemistry CSP. They are expected to act in accordance with the provisions of the CSP and to stay current with changing safety requirements and procedures. The responsibilities of all researchers in the Chemistry Department include but are not limited to: dressing correctly, utilizing proper Personal Protective Equipment (PPE), consulting Safety Data Sheets (SDSs) and Standard Operating Procedures (SOPs) prior to engaging in any experiment involving hazardous materials, developing SOPs as needed; storing chemicals and hazardous waste correctly, and reporting hazards, exposures, and accidents to the PI, the Director of Chemical Laboratories, and the University Chemical Hygiene Officer (CHO).

Principal Investigator, Laboratory and Instructional Supervisors:

Supervisors, including professors, are collectively referred to as PIs and are responsible for overseeing the safe arrangement of their laboratory space and conduct within. They are to perform and supervise the following:

- Know and implement the requirements of this CSP. Stay current and compliant with changing regulations.
- Ensure researchers' access to SOPs, CSP, and the OSHA Laboratory Standard and SDSs. See that SDSs are prepared and updated, as needed.
- Conduct laboratory specific training for all personnel. This training is to include proper experimental practices, proper handling of lab-specific

[5] http://www.stonybrook.edu/ehs/lab/training/

hazards, and symptoms of exposure to hazardous materials. Maintain laboratory-specific training records of all personnel, and provide records to the Director of Chemical Laboratories. Ensure all training is up-to-date.

- With group members, develop and implement lab-specific safety policies and training, develop and maintain copies of laboratory-specific SOPs, and work with lab personnel to update training whenever a new technique or apparatus is utilized.
- Provide proper Personal Protective Equipment (PPE) and exposure monitoring when required. Ensure that personnel know how to properly use PPE.
- Ensure that a laboratory chemical inventory (including acquisition dates and amount on hand) is maintained and updated upon acquisition or removal of chemicals. Provide an electronic copy of the inventory annually to the Chemistry Department Chair and Director of Chemical Laboratories for inclusion in the Department Chemical Inventory.
- Conduct routine inspections of laboratories. Ensure all engineering controls are in good working order. Maintain lab self-inspection records.
- Designate safety responsibilities at the laboratory level to appropriately trained personnel.
- Submit any incident reports to the Chemistry Department Chair and University CHO.
- Include provisions for CSP and University CHP compliance in grant proposals.

<u>Chemistry Department Safety Committee:</u>

The Chemistry Department Safety Committee provides oversight and guidance to encourage a robust safety climate in the Department. The committee's membership rotates and includes faculty, staff, and on occasion, graduate students/postdoctoral fellows. The committee performs the following functions:

- Meets regularly to discuss current and ongoing safety issues.
- Establishes Departmental policies regarding proper safety practices and required training. Keeps the Department members apprised of changes in University and departmental safety policies and regulations.
- Maintains the online Chemistry Department inventory and the Departmental Safety website.
- Updates, as necessary, departmental documents regarding safety, including but not limited to the Chemistry CSP and student safety handouts.
- Conducts and maintains records of routine laboratory safety reviews. Provides informational reports to the PI, with copies sent to the Department Chair.

Additionally, the Chair of the Safety Committee works with the Student Affairs Coordinator to provide first-year graduate students with informational safety training, as required by EH&S and the University.

Chemistry Laboratory Safety Coordinator

The Lab Safety Coordinator is appointed by the Department. The position is frequently held by the Chair of the Safety Committee or the Director of Chemical Laboratories, but any member of the Department can be appointed. The Coordinator will assist with the implementation of the EH&S Laboratory Safety policies and in the establishment of a safe work environment through a collaborative effort with faculty, lab instructors, and researchers, as well as EH&S. The full list of responsibilities and duties are listed on the EH&S Lab Safety Coordinator[6] webpage. The Coordinator must take the course for Lab Safety Coordinators[7].

Chemistry Department Chair

The Department Chair must know Department and University policies covering laboratory safety and practices. The Chair must see that these policies are implemented. The Chair is responsible for ensuring that the following are carried out, typically by the Safety Committee or Lab Safety Coordinator:

- Appropriation of safety equipment for teaching laboratories.
- Reporting of any laboratory creation, modification, or closing to the University CHO.
- Inspections of laboratories are carried out with follow-up reports provided to the PIs.
- Maintenance of up-to-date training records, department safety documents, lab inspection reports, and Departmental chemical inventory.

University Chemical Hygiene Officer

The Chemical Hygiene Officer (CHO) has oversight of all laboratories on campus. The holder of the position is responsible for the University CHP, coordination of lab safety education, implementation of University and government policies on hazardous waste and chemical storage, investigation and record-keeping of all accidents, and inspections of fume hoods, safety showers, and eyewashes. The

[6] http://www.stonybrook.edu/ehs/lab/lab-safety-coordinators/
[7] http://www.stonybrook.edu/ehs/training/courses.shtml?els015

CHO is a resource for research groups developing lab-specific training and Standard Operating Procedures, as well as for general laboratory safety and health information. The CHO conducts lab inspections together with the EH&S and the University Laboratory Safety Council and maintains records, and has the authority to issue an immediate "Stop Work" order, shutting down or suspending operations until safety issues have been resolved. Serious health or safety problems are brought to the attention of the departmental chairs of the University by the CHO.

University:

At the University level, the Chemical Hygiene Officer (CHO), the Director of Environmental, Health and Safety, the University Laboratory Safety Council (ULSC), and the University President have responsibilities regarding safety in the laboratory. As per University Policy, these include education of members of the University, policy determination, and implementation of OSHA Laboratory Standards. The University CHP[8] is the source of information regarding responsibilities of these individuals and groups.

[8] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0221/$FILE/EHSD0221.pdf

Information sources

This Chemistry Safety Plan provides information and/or links to information on and requirement for safe laboratory working practices. Topics covered include the administrative and engineering controls which are in place, required safety practices, and general laboratory housekeeping rules. Hard copies of the CSP will be distributed to each Principal Investigator, Departmental facility/teaching lab, the library and Main Office. Annual updates or addendums prepared by the Chemistry Safety Committee will be electronically distributed; fully revised hard copies will be distributed every 5 years.

In addition to this CSP, important chemical and safety information can be found in the University CHP[9], OSHA Laboratory Standard[10], National Library of Medicine[11], and Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards or other lab and chemical safety books available in the Chemistry Library or from the Director of Chemical Laboratories.

Chemical inventory information

The presence in the lab of any chemical listed on the OSHA[12] must be reported to EH&S and entered into their chemical inventory database. Members of research groups and stockroom staff are responsible for maintaining a current inventory list of hazardous chemicals kept in stock, and for providing this information to EH&S. The research group inventory must include the full chemical name of the chemical hazard, the manufacturer(s), the Chemical Abstracts Service (CAS) number, its specific location within the lab, and the initial quantity. It also should note when a hazardous chemical is no longer stocked in the lab. The group inventory is to be updated annually and provided to the Director of Chemical Laboratories. We should note that the storage, use, and consumption of nitric acid and biological 'select agents' will require special reporting.

[9] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0221/$FILE/EHSD0221.pdf
[10] http://www.osha.gov/pls/oshaweb/owasrch.search_form?p_doc_type=STANDARDS&p_toc_level=1&p_keyvalue=1910
[11] http://go.usa.gov/gxHk
[12] http://www.labor.state.ny.us/formsdocs/wp/Part%20800.5.pdf

The Chemistry Department maintains a separate chemical inventory[13] which is not limited to hazardous chemicals. This is a Google Apps spreadsheet accessible by any member of the department upon request. Included in the departmental inventory are: CAS number, SDS link, associated hazards, chemical name, approximate total amount in the Department, and each group which reports having the chemical. This list is based on information provided by the research groups. For access, please contact the Director of Chemical Laboratories.

Safety Data Sheets

A Safety Data Sheet (SDS; formally referred to as a Material Safety Data Sheet) is prepared by the manufacturer for each of their chemicals and contains the following: name, hazardous components, properties, hazards (fire, explosion, health and reactivity), first aid, clean up measures, protective equipment and any special precautions that should be taken when working with the chemical.

Before using a chemical, the researcher is required to read that chemical's SDS in order to become familiar with the chemical's hazards, proper handling, compatibility, and emergency information. Each laboratory should have a rapid means of locating the SDS for a chemical in case of emergency. SDSs can be printed out and filed, or bookmarked in a browser. SDSs can also be found through the Chemistry Inventory Google Docs spreadsheet (must request access from the Director of Chemical Laboratories), the EH&S website[14], or by searching any chemical company website.

New substances made and used in laboratories generally have not been tested for toxicity. These compounds should be used with the utmost caution and handled as if they are particularly hazardous substances. If any newly synthesized chemical is made available to anyone outside of your laboratory, an SDS must be prepared by the Lab staff and provided to the user. Please refer to the EH&S website, entitled "How to Write MSDS", as well as to the OSHA Hazard Communication Standard[15] for more information.

[13] https://docs.google.com/a/stonybrook.edu/spreadsheet/ccc?key=0AqK1ppvxAPoydHlDM090UkYzTUxCTllwNlJkT2hTX2c#gid=0
[14] http://asa-msds.campus.stonybrook.edu/
[15] http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10103

Exposure limits and monitoring information

Occupational exposure limits (OELS) have been established by several organizations, including NYS PESH site[16],[17], for approximately 500 chemicals. Frequently, the SDS for a chemical will list the OEL. EH&S has specific policies and training courses for some of the chemicals with OELs. These include methylene chloride and formaldehyde.

The PI must periodically review the list of chemicals with exposure limits to ensure that, even as experimental methods and chemical usage change, their research staff members remain properly protected. If there is reason to believe that exposure levels have increased, an initial monitoring of exposure to the substance must be conducted. Contact EH&S[18] for further information on both initial and routine exposure monitoring. The Chemical Hygiene Officer for the University maintains records of exposure monitoring.

When an injury occurs

Every researcher in Chemistry must be familiar with the hazards associated with the chemicals they are using, the symptoms of exposure, and the appropriate measures to take if exposed. If exposure occurs, medical attention should be sought as quickly as possible. Be certain to give the medical staff the full name of the chemical involved and a copy of the SDS. Employees and students must report the accident to their supervisor or instructor, and file an accident report[19] with both the Director of Chemical Laboratories and EH&S. This accident report link will also take you to HR reporting. Employees should apply for Workman's Compensation through the Human Resources' Time and Attendance Office[20].

[16] http://www.labor.state.ny.us/formsdocs/wp/Part%20800.5.pdf
[17] http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9761
[18] http://www.stonybrook.edu/ehs/
[19] http://www.stonybrook.edu/ehs/lab/general-lab-safety/accident-report.shtml
[20] http://www.stonybrook.edu/hr/tawc/

Administrative Controls

Administrative controls include policies, regulations, training, and established practices designed to create a safe laboratory working environment.

Policies

Stony Brook University's EH&S Department and the University Laboratory Safety Council develop and implement University-wide laboratory policies[21]. Some policies are focused on the establishment of safe work practices with specific hazards such as radioactivity or hazardous chemicals. Laboratory management policies have been developed, covering lab close-outs, registration, and emergency plans. The Chemistry Department also has established requirements which are specific to our discipline and building. Each PI and researcher must be aware of these policies and ensure that they are enforced.

The PI is highly encouraged to develop and maintain lab specific policies and other administrative controls. The policies can cover instrumentation use, specific reactions or experimental procedures, or recording requirements. In particular, a policy should be developed which specifies the conditions under which approval from the PI is required prior to beginning an experiment. Information on these lab-specific policies must be included in the lab-specific training provided to each researcher in the group. The policies must be made readily available to all group members.

New labs

New faculty members are recommended to visit the New Faculty[22] website maintained by EH&S. Lab registration and links to lab policies can be found there. Training information is found in the following section.

Current faculty members who take on new lab space must also register[23] that space with EH&S.

[21] http://www.stonybrook.edu/ehs/policy/campus.shtml
[22] http://www.stonybrook.edu/ehs/lab/newfaculty.shtml
[23] http://www.stonybrook.edu/ehs/resources/lab_registration.shtml

Training

Several levels of safety training are required for members of the Chemistry Department: Chemistry Department training, University level training offered by EH&S and Human Resources, and Lab-specific training. In all cases, records of completed training must be kept. Currently, for Blackboard courses only, students must print out the completion page at the end of each course's quiz as proof of completion. Employee training records are kept in Solar. Keeping up-to-date records of the status of all lab group members' safety training is particularly important for Lab-specific training and relies solely upon the PI.

Chemistry Department training: The Chemistry Department arranges for the initial training of all new Chemistry graduate students at the beginning of each Fall semester. This training includes Lab Safety/Chemical Hazards Training Workshop (ELS 002), Lab Safety/Biological Hazards (ELS 003), Hazardous Waste Management Training Workshop (ENV001), Fire Safety/Fire Extinguisher Demo and Practice (EFS 001, EFS 003), Academic Honesty, Right to Know (HR), and Sexual Harassment Sensitivity Training (HR). A Chemical Hazards/Laboratory Safety Quiz is administered to the students at the conclusion of the Lab Safety/Chemical Hazards class. The Department will provide the following to all upon joining the Department: *Safety in Academic Chemistry Laboratories* from the American Chemical Society and the Chemistry Department Safety Supplement with current emergency contact information. Safety quiz grades will be communicated to first-year students through CHE 581. A grade of 80/100 or higher is required on the Safety Quiz in order to pass. Students who do not pass the Safety Quiz will be required met with a representative of the Safety Committee and may be asked to re-take one or more online EH&S courses in their area of weakness, to be determined by the Safety Committee Chair. Refusal to take the required courses will delay the student's ability to serve as a Teaching Assistant for laboratory courses, and/or to commence research.

People joining the Department at times other than the start of the Fall semester must take the online EH&S courses, ELS 002[24] and ENV 001[25], prior to working in a lab. Right to Know[26] and Sexual Harassment Prevention[27] courses must be taken within a month of joining the Department. The Fire Safety and Academic Honesty courses must be taken when offered at the start of the subsequent Fall semester.

It is the policy of the Chemistry Department that Chemical Hazards ELS 002 and Hazardous Waste Handling ENV 001 be taken annually by PIs and researchers.

Alternatively, PIs and researchers may choose to satisfy the annual training requirement by attending four safety seminars/workshops that will be held regularly within the department, including any safety seminars given at the annual departmental Chemistry Safety Day. Seminars will include topics such as Conducting a Hazard Assessment and Writing Standard Operating Procedures (SOPs). The four seminars must be completed within the 12 months following initial training in order for researchers to be cleared to work in the lab for the following year. Researchers attending only 2-3 seminars during the year following their initial training will still be required to take ELS 002, and researchers attending less than two workshops during the year following their initial training will still be required to take both ELS 002 and ENV 001. Graduate students enrolled in seminar courses that include regular "safety moment" presentations, including CHE 693, CHE 694, and CHE 696, may use one semester of attendance in these courses to count for the equivalent of one safety seminar. Attending one hour of safety demonstrations held during the annual departmental Chemistry Safety Day can also be used count for the equivalent of one safety seminar; the Safety Committee will determine how this will be tracked when planning Safety Day each year.

[24] http://www.osha.gov/pls/oshaweb/owastand.display_standard_group?p_toc_level=1&p_part_number=1910#1910_Subpart_Z
[25] http://www.stonybrook.edu/ehs/training/courses.shtml?env001
[26] http://www.stonybrook.edu/ehs/training/courses.shtml?eos018
[27] http://www.stonybrook.edu/hr/training/courses.shtml

The Safety Committee strongly recommends that 1st year graduate students who perform experimental research satisfy their first annual re-training requirement by taking ELS 002 and ENV 001 after they are assigned to a research group, ideally in the late spring or early summer of their first year. In this way, students will be able to understand how concepts from these training sessions apply directly to the laboratories where they are conducting research. PIs should notify the staff person responsible for safety compliance and records (currently Dr. Sandhya Muralidharan) if they wish their 1st year students to re-take the EH&S courses rather than satisfy the re-training requirement through safety seminars.There are several other courses requiring annual refreshers include Lab Safety – Formaldehyde ELS 009[28], Nitric Acid Safety and Security ELS 024[29], X-Ray Diffraction Safety[30], Laser Safety[31], Regulated Medical Waste[32], and Lab Safety – Biological Hazards[33]. Individual PIs may require additional courses. The departmental safety seminars/workshops cannot be used in lieu of the annual re-training requirement for these courses.

EH&S and Human Resources courses: Training classes are given monthly by EH&S[34]. Many of the courses are also available online[35]. The EH&S training website includes an easy means of determining which courses are required[36] given the type of research to be done. The Human Resources department offers the Sexual Harassment Prevention course.

Laboratory-specific training: Each laboratory is unique in the hazards present and procedures used. Each researcher must be informed of hazards in their work area. This includes hazards due to chemicals, ionizing radiation, lasers, noise, and instrumentation. Such information shall be provided at the time of a

[28] http://www.stonybrook.edu/ehs/training/courses.shtml?els009
[29] http://www.stonybrook.edu/ehs/training/courses.shtml?els024
[30] http://www.stonybrook.edu/ehs/training/courses.shtml?ers006
[31] http://www.stonybrook.edu/ehs/training/courses.shtml?ers003
[32] http://www.stonybrook.edu/ehs/training/courses.shtml?env005
[33] http://www.stonybrook.edu/ehs/training/courses.shtml?els003
[34] http://www.stonybrook.edu/ehs/lab/training/
[35] http://www.stonybrook.edu/ehs/training/online-training.shtml
[36] http://www.stonybrook.edu/ehs/lab/training/

researcher's initial assignment and prior to any assignment involving new exposure situations.

The PI will establish minimal training goals specific to each laboratory to ensure the safety of all lab personnel. The training is to be conducted by either the PI or an appointed designee prior to beginning work in the lab. Training should cover procedures for handling particularly hazardous chemicals, biological compounds, and radioactive compounds, the use of equipment which have inherent hazards such as lasers, the location of Standard Operating Procedures (SOPs) and emergency equipment, and expectations regarding workspace and hood conditions. Subjects covered during EH&S training must be reinforced at the laboratory level. In addition, lab-specific training must cover the following:

- Location of the OSHA Laboratory Standard and Chemistry CSP
- Lab-specific procedures, including emergency response in case of accidental release of hazardous chemicals
- Use of hoods and assessment of their function
- Emergency procedures and phone numbers

Importantly, this lab-specific training **must** be documented. Documentation must be kept on file by the PI as long as that particular researcher is a member of the University community. Provide copies to the Directory of Chemical Laboratories as a backup.

Tools to assist the PI in complying with the training and record-keeping requirements are available through EH&S as well as on the Lab Safety Coordinator page: New Worker Check List and Training Tracker.

Signage/labeling

Laboratories: A complete "Laboratory Emergency Information[37]" sign must be posted at each entrance to a laboratory. This alerts other researchers, custodial staff, visitors, and emergency responders to any hazards located within the laboratory. A Laboratory Emergency Plan[38] is required for each research group. This document is to be posted either at the telephone or near the exit doors. All members of the group must know the specifics of their group's plan. The latest

[37] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSF0038/$FILE/EHSF0038.pdf

version of the Chemistry Safety Supplement (LINK) is to be posted by all telephones. The locations of emergency equipment, chemical spill kits and first aid supplies are to be clearly indicated by signage in the laboratory.

Chemical storage areas: Each chemical cabinet, flammables cabinet, refrigerator, and freezer should have a list of contents posted on the door. Complete chemicals names must be used, not formulas or structural representations. At a minimum, the names of all hazardous chemicals stored within must be posted. Refrigerators and freezers must have labels indicating whether or not they can store flammables or are explosion proof. On the doors of non-explosion proof refrigerators and walk-in cold rooms, the following sign: “Store no flammables with a flash point below 100° F” must be posted. This is available in the EH&S signs page.

Purchased chemicals: The existing label should clearly indicate the hazards associated with the chemical within. If not, this information (available on any SDS) should be added to the label. The expiration date should also be clearly visible. Unstable chemicals must be labeled with the date the container was opened. This is to facilitate periodic testing (e.g. ethers). If a chemical has been transferred to another container, that container must be labeled with the name and associated hazards, as listed on the original container. Formulas and abbreviations may not be used in lieu of the full chemical name. Hazards may be indicated by symbols, pictures, and/or words.

Synthesized chemicals and by-products: If the hazards of a substance or by-products produced in the lab are unknown, the substance must be assumed to be hazardous and be appropriately labeled. An abbreviation system coded to a notebook or other reference may be used for labels on small containers of newly synthesized chemicals. The notebook must be easily accessed by all in case of an emergency. Large containers should be labeled fully with possible chemical structure and hazards. The PI should develop a preliminary SDS at the earliest opportunity, and expand it as relevant substance properties become known. If specific hazards are determined, the employer shall provide appropriate training. If

[38] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0012/$FILE/EHSD0012.pdf

the substance is to be transferred off-campus, the PI must comply with the University Hazard Communication Right-to-Know Program. The sample must be properly labeled and the end users provided with a preliminary SDS. Should the chemical be intended for eventual commercial purposes, EPA Toxic Substances Control Act regulations apply. Contact the University CHO for additional information.

Experiments: A sign must be posted near any unattended experiment[39]. This sign should include the nature of the experiment, hazards, the contact person, his/her phone number, and expected time of return.

Hazard review

A hazard review is a process used to determine the potential hazards and risks involved with a particular procedure. It is required by federal law that a hazard review be conducted prior to the initiation of new experiments or procedures. EH&S provides guidance on how to conduct a hazard review[40]. Briefly, risks of the chemicals and procedures used are to be identified. Appropriate protective measures, including PPE, must also be identified and implemented, and all lab workers must have completed the appropriate training courses prior to beginning work.

A Hazard Review must be done whenever:

- A new procedure, process, or test is added, even if similar to prior practices.
- There is a change, substitution, or deletion of any of the chemicals used.
- The quantity of a chemical changes by more than 25%.
- There is a failure of any equipment used in the procedure, particularly safeguards.
- There are unexpected results which may impact the required safety practices.
- Members of the group become acutely ill, exposure is suspected, a chemical odor detected, or a failure of any safeguard is suspected.

In general:

- Do not underestimate the risks associated with chemicals and procedures. Always minimize exposure.
- Assume that any mixture will be more toxic than its most toxic component, and that all substances of unknown toxicity are toxic.
- Be familiar with the symptoms of exposure to the chemicals used.

[39] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0310/$File/EHSD0310.pdf
[40] http://www.stonybrook.edu/ehs/lab/general-lab-safety/hazard-reviews.shtml

- If there is contact with a hazardous chemical, follow the instructions in the SDS and the SOP for the procedure.

Personal Protective Equipment (PPE)

PPE is used when a risk of injury of any type exists which cannot be addressed adequately with administrative and engineering controls only. The PPE requirements for a procedure should be listed in the corresponding Standard Operating Procedure. In the absence of an SOP, please use the guidelines which follow. EH&S PPE policy[41] is also a source of information. PPE must be provided (purchased and maintained) by the lab PI (lab workers not required to buy it). Students in the teaching laboratories must supply their own goggles.

Eye and face protection: When in a laboratory, appropriate eye protection must be worn by all persons at all times. The type of protection used (safety glasses with side shields versus chemical splash goggles defined as eye protection made of a non-corrosive material that fits snugly against the face and has indirect ventilation ports) depends on the hazard level present in the lab. In wet labs[42], goggles must be worn. Eye protection requirements in laser or computational labs will depend upon the hazard assessment of work performed in those areas. Laser labs must provide laser goggles appropriate for the wavelengths present in the lab. When a variety of activities occur in a lab, eye PPE must provide protection from the most hazardous activity.

All students, teaching assistants, faculty, and staff of the general and organic lab courses must wear chemical splash goggles (not safety glasses) at all times, even when not performing an experiment. Required eye protection in the physical chemistry instructional labs is determined by the instructor based on the exercises to be performed. If the work involves any wet chemistry, splash goggles are required. It is the responsibility of the course instructors to enforce this policy.

[41] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0243/$FILE/EHSD0243.pdf

[42] Wet Laboratory space types are defined as laboratories where chemicals, drugs, or other material or biological matter are tested and analyzed requiring water, direct ventilation, and specialized piped utilities. Wet Laboratory space types do not include biohazards in Levels BL-2, BL-3, and BL-4 as defined by the 2007 NIH/CDC guideline "Biosafety in Microbiological and Biomedical Laboratories (BMBL) 5th Edition,". Source: www.wbdg.org/design

Face protection, such as a face shield, is required when there is a potential for injury from flying objects, chemical exposure, injurious radiation, or if the procedure has a high risk of explosion. Splash goggles must always be worn under face shields.

Gloves: Many types of gloves are commercially available. Each has unique characteristics with regard to chemical and mechanical resistance. Gloves appropriate for the work being done must be worn. To determine which glove type provides the greatest protection given the chemicals and solvents being used, please refer to the glove selection guide provided by Ansell[43] or EH&S[44].

Do not wear gloves used for chemical work outside of the laboratory. Non-lab workers must not be exposed to chemicals via contact with, for example, door handles, phones, or elevator buttons. Disposable gloves are to be discarded when removed and not re-used. Gloves contaminated with chemicals should be discarded as solid chemical waste.

Nitrile gloves are currently supplied to the organic teaching labs by the department and are to be worn during experiments in which hazardous chemicals are handled.

Clothing: Clothing should be fitted, and not excessively loose or flowing. The trunk of the body and legs must be covered. Long pants or long skirts must be worn so that no part of the legs is showing. Natural fabrics (e.g. cotton) are more resistant to solvents and are recommended (and safer, if on fire). The dress code applies to both research and teaching laboratories.

Disposable protective clothing must be worn when an activity has the potential of causing exposure to asbestos, PCB oil, pesticide spray, or similar contaminant.

Shoes must cover the entire foot (no sandals or slip-ons or flip-flops) and provide protection against chemical spills, broken glass, trip hazards, electrical hazards, etc.

/lab_wet.php
[43] http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf
[44] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0058/$FILE/EHSD0058.pdf

Lab Coats: Lab coats provide an additional layer of protection from laboratory hazards and are required in every wet lab and whenever chemicals are handled in 'dry' labs. A requirement for the wearing lab coats in the teaching labs is under consideration at this time. Lab coats should be made of 100% cotton. Flame retardant lab coats are required when the following chemical classes are in use: pyrophoric, water or air reactive, potentially explosive, or flammable. Should the lab coat become contaminated with hazardous chemicals, it must be disposed of as hazardous waste. Place it in a plastic bag, knot the bag, and place within a sturdy box. Use an orange Hazardous Waste label to specify the hazardous chemicals present.

Respirators: When an operation or activity has the potential for causing injury from harmful concentrations of dusts, fumes, gases, vapors, or radionuclides in the work environment, a respirator[45] must be used.

Selection of respirators and respirator accessories, fitting, and training must be coordinated through the CHO. EH&S will evaluate the work area for chemical toxicity, the potential for exposure, the concentration used, and possible duration of exposure. They will use this information to determine the appropriate type of respiratory protection.

A respirator must never be worn before an evaluation has been made. Any laboratory user who is required to wear a respirator must receive medical clearance and be fit-tested and trained before using this equipment. Each respirator face piece is specific for the individual; therefore the respirator cannot be shared. It is dangerous for an untrained individual to use a respirator, or to use a respirator in an application other than that for which it was designed and approved.

When the use of respirators is required, the employer shall provide the proper respiratory equipment, at no cost to the student or employee.

Hearing: Areas with a noise level of 85 dB or greater require workers to use hearing protection. If you suspect that noise in the area where you work exceeds this threshold, please contact EH&S. They can provide assistance both in determining if a hearing hazard exists and in the selection of appropriate protective equipment.

Standard Operating Procedures (SOPs)

An SOP is to be maintained for any class of procedures or reactions which involve the possible exposure of the worker to a chemical hazard or physical danger. SOPs are to be kept easily accessible to all in the research group, and available to others as requested. The Chemistry Department will maintain copies of all SOPs generated or utilized by members of the Department, both in an electronic format on the Chemistry website and hard copy in the office of the Director of Chemical Laboratories. EH&S provides instructions and templates[46] for preparing an SOP. SOPs can also be found online through other university websites.

The contents of the SOP must include the following:

- Description of experiment or identification of procedure
- Identification of hazards (chemical and other) associated with the experiment or procedure
- The identity of trainer or resource person (typically the PI)
- Health & safety information: labeling requirements, SDS information, the location of chemical spill and other emergency equipment and procedures, (the SDS may be attached to the SOP)
- PPE required for procedure (specifics including glove type etc.) and decontamination procedures
- Engineering controls and containment devices required
- Waste disposal procedures
- Emergency requirements (including, if applicable, the need for specialized fire extinguisher, first aid/antidote kits, etc..)

In addition, procedures involving particularly hazardous substances (acutely toxic or carcinogenic chemicals, infectious materials, etc.) require that the area to be worked in is clearly marked and with proper signage. Additionally, the names of those authorized to perform this work and their emergency contact information should be clearly visible.

When an experiment is substantially modified from the SOP on file due to changes in conditions or concentrations used, scale ups, or the presence of additional hazards, the PI must ensure that a new SOP is prepared.

[45] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0244/$FILE/EHSD0244.pdf
[46] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0311/$FILE/EHSD0311.pdf

Laboratory inspections

Periodic inspections of laboratories are conducted both by EH&S and the Chemistry Safety Committee. Both use a standard inspection checklist[47] created by EH&S. It is recommended that each research group conduct periodic self-inspections using the same checklist. The NY State Fire Marshal inspects the Chemistry building on an annual basis. Most common violations are 'daisy-chained' surge protectors, extension cords, and hazardous working conditions (i.e. poor housekeeping in both offices and labs). The Fire Marshal has the authority to cite the PI for infractions and require a daily fine until the infraction is rectified.

Accident reporting

Accidents involving injury are to be reported, as discussed in the procedure outlined in the ''When an injury occurs" section. Records of such accidents are to be maintained by the CHO and Director of Chemical Laboratories. The EH&S website contains appropriate forms.

Accidents involving chemical spills or explosions which do not result in injury must be reported to EH&S (x2-6410) and the Director of Laboratories (x2-7920). Both keep records of such incidents.

Emergencies such as broken water pipes or loss of power to select rooms or labs must be reported to both the Campus Operations and Maintenance hotline at x2-6400 and the Chemistry Building Manager (Mike Teta at 631-922-0232). The Director of Chemical Laboratories keeps records of these incidents.

Lab close-outs and researcher departures

In the event of retirement or departure of a PI and the subsequent relinquishing of lab space, it is the policy of the University[48] that the PI is responsible for the disposal of all hazardous materials, chemicals, and hazardous waste. The Chemistry Department expands the lab close-out requirement to include reassignment of equipment to other researchers or Property Control and the complete clean out and

[47] http://www.stonybrook.edu/ehs/lab/general-lab-safety/lab-inspection-checklist.shtml
[48] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0410/$FILE/EHSD0410.pdf

decontamination of the lab space such that it is ready for EH&S inspection. As such if such a task may present a hardship to retirees, it is highly advisable to plan in advance while there are still group members who can do most of the work. Chemistry Department staff members are available to provide limited assistance.

Departing lab researchers (students, postdocs, and staff members) are required by that same University policy to:

- Ensure that all hazardous materials are appropriately labeled with the name of the material. This includes all hazardous materials on shelves, inside cabinets, refrigerators, and freezers.
- Complete an inventory of all samples being left behind.
- Properly dispose of all hazardous materials that are not being saved.

The Chemistry Department further requires that departing students label with full chemical names and associated hazards all samples or solutions which are to be retained by the research group. Lab notebooks detailing potential associated safety hazards are to be kept by the PI. The lab bench, bench drawers, and hood(s) used by the departing student are to be fully emptied of chemicals and decontaminated. Office space is to be left clean with the desk emptied and readied for a new occupant. Departing students and staff are also advised to check the service chaseways for research-related or personal items.

Engineering Controls

Engineering controls help provide for a safe physical lab environment. They are expected to be in place and used properly at all times. Engineering controls within the Chemistry building include ventilation systems, fume hoods, glove boxes, laminar flow hoods, and biosafety cabinets.

General laboratory ventilation

Laboratory spaces containing hazardous chemicals must be kept at a negative pressure compared with surrounding hallways and chaseways. General laboratory ventilation continuously provides air ('make-up air') into the lab. This air is exhausted via either fume hoods or other ventilation devices. A full exchange of room air should occur four to twelve times per hour. Keeping the laboratory doors closed greatly assists in maintaining the proper rate of air exchange. It is important to note that general laboratory ventilation cannot be relied on for protection from toxic substances. Inform the Building Manager if the lab appears to have inadequate ventilation.

Local ventilation

Every effort must be made to eliminate possible exposure to hazardous or toxic compounds. Isolation of the compound, experimental protocol changes, or replacement of the hazardous constituent with a less harmful material are all methods of risk reduction. However, these measures are not always feasible. Local ventilation systems are therefore used. These include fume hoods, glove boxes, spot exhaust, and canopies.

Procedures which must be conducted in a fume hood or glove box include:

- Reactions
- Heating or evaporating solvents
- Work involving production of nanoparticles and/or dust (this can be performed in a laminar flow hood).
- Work involving explosive or reactive chemicals
- Work involving use of 100 mL or more of a compound which is a fire hazard

Local exhaust ventilation systems are to be used to exhaust items including but not limited to vacuum pumps and gas chromatographs.

Fume Hoods: Fume hoods must be operated in a manner which ensures the safety of the scientist and others in the area. This includes keeping sash at or below the maximal height as indicated by the manufacturer, keeping a glass panel between the researcher and the reaction vessel, and keeping the hood free of clutter. More information can be found at on the EH&S Fume Hood Guidelines[49] website. The CHO arranges for annual testing of fume hoods throughout the University. Only fume hoods which have passed inspection can be used for experiments involving hazardous chemicals. If highly toxic compounds are being used in the hood, the exhaust air from the ventilation systems may require scrubbing before being released into the atmosphere. The CHO should be consulted.

Glove boxes: Glove boxes and glove bags are used for handling air or moisture reactive chemicals, toxic chemicals, and carcinogens. The ventilation rate must be at least two volume changes per hour. When working with highly toxic substances, glove boxes must be kept at negative pressure with respect to the surroundings, whereas positive pressure is required when working with moisture or air sensitive chemicals. Toxic chemicals should never be used in a positive pressure unit. EH&S provides a full list of requirements for glove box[50] use.

Storage

Each chemical must have an identifiable storage location to which it should be returned after every use. Segregation of incompatible chemicals[51] must be ensured. To the best extent possible, keep flammable, oxidizing, reactive, corrosive, and toxic chemicals isolated from each other. Do not use or store highly volatile or flammable chemicals in a cold room or box, or in a refrigerator which is not explosion proof. Cold rooms and cold boxes ('deli boxes') typically do not have fresh air ventilation and are not explosion proof. Also note that liquid nitrogen stored in a cold room can displace oxygen, leading to oxygen-deficient conditions.

[49] http://www.stonybrook.edu/ehs/lab/lab-equipment/fume-hoods.shtml
[50] http://www.stonybrook.edu/ehs/lab/lab-equipment/glove-box.shtml
[51] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0261/$FILE/EHSD0261.pdf

General chemical storage[52] policy:

- Do not store chemicals in service chaseways. The only exceptions to this are innocuous biological solutions (e.g. buffers) and substances (e.g. agar plates, plasmids, and enzymes). The list of allowed chemicals in the chaseways will include inert gas cylinders, but specifically exclude cylinders of hazardous gases, such as ammonia, etc.
- Do not store any chemicals (liquid or dry) on the floor, as these pose a trip hazard.
- Chemicals must not be stored without secondary containment. Do not use secondary containers which are cracked. Secondary containers used for liquids must accommodate the full volume of the largest container, or 10% of the total volume of liquid stored.
- Minimize long-term storage of chemicals in fume hoods. Each item kept in a hood can restrict air flow or create turbulence, reducing the ability of the hood to provide adequate protection for the user. Should a reaction or chemical transfer conducted in the hood result in a fire or explosion, stored chemicals can increase the magnitude of resulting destruction and injuries. If a few chemicals must be stored in a hood, they must be in secondary containers.
- Minimize long-term storage of chemicals on bench tops and other work spaces. Keep your work areas neat.
- Check storage areas semi-annually for cracked bottles, deteriorating labels, past expiration dates and other problems, and rectify immediately.
- Chemicals with moderate or higher dangers, if not used frequently, should be kept out of view.

Refrigeration of chemicals:

- Chemicals or solvents which require refrigeration must be stored in explosion proof refrigerators. Each refrigerator must have a sign which clearly states whether or not it is explosion proof.

Storage of Flammables and Combustibles:

- No more than 25 gallons of flammable liquids (flashpoint below 22.8^{o}C; boiling point below 37.8^{o}C) can be stored in a lab outside of a flammables cabinet.
- Flammables in containers 500 mL and greater must be stored in cabinets. A maximum of 60 gallons of flammables and 120 gallons of combustibles can be stored in a flammables cabinet.
- Flammables cabinets must meet OSHA and National Fire Protection Association (NFPA) specifications: Contents must be protected from temperatures exceeding 160^{o}C for at least 10 minutes in order to allow for the evacuation of personnel. Cabinet doors must be kept closed unless chemicals are being transferred in or out. Do not remove air vent covers from the cabinets. The cabinets are NOT to be vented to surrounding air or the building ventilation system.

[52] http://www.stonybrook.edu/ehs/lab/chemstor.shtml

- Flammable liquids purchased in large containers should be repacked into smaller safety cans. In-lab storage of containers larger than 5 gallons or 20 liters is not allowed. Approved portable safety cans[53] should be used when possible for storing flammable liquids. Quantities greater than 1L should be stored in metal containers.

Storage of Oxidizers and Corrosives:

- Oxidizers must be stored away from incompatible materials including flammables, greases, paper trash bins, finely divided metals, organic liquids, and other oxidizers.
- Strong oxidizing agents should be stored and used in either glass or other inert containers. Corks and rubber stoppers should not be used. High energy oxidizers should be segregated.
- Nitric, hydrochloric, sulfuric, and perchloric, etc. acids should be placed in acid-resistant trays and stored in cabinets separately from organic acids.

High-Hazard and Homeland Security monitored chemicals:

- Storage of nitric acid and the monitoring of it must follow EH&S nitric acid policies[54].
- Radioactive materials[55] and pathogens[56] must be secured at all times. Use the links to access additional information.
- Toxic compounds must be stored out of view (e.g. cyanide, strychnine, arsenic). Extremely toxic substances[57] must be stored in unbreakable chemically resistant secondary containers. Toxic compounds with a high vapor pressure must be stored in areas with adequate ventilation. All work with toxic chemicals must be conducted in a fume hood or glove box.
- Peroxides and chemicals[58] that tend to form peroxides must be stored in airtight containers in a dark, cool, and dry place. To minimize the rate of decomposition, peroxides and peroxidizable materials should be stored at the lowest possible temperature consistent with their solubility and freezing point. Liquid peroxide or solutions should not be stored at or below temperatures where the peroxide freezes or precipitates. These systems should be dated when opened with monthly and 6-month checks for the presence of peroxides. Please refer to /ehs/waste/news.shtml. Also, consider Section 9.6[59] of EH&S's Lab Safety Manual.

Compressed Gases

- All compressed gas cylinders, including empties, must be secured in an upright position with chains, straps, or special stands of adequate strength.

[53] A Safety Can is a container, no more than 5 gallons in size, that has a spring-closing lid and spout cover that allows the safely relieve internal pressure when exposed to high temperatures. Source: http://www.safetyinfo.com/guests/Safe-Chemical-Storage-OSHA-Requirements.htm
[54] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0373/$FILE/EHSD0373.pdf
[55] http://www.stonybrook.edu/ehs/radiation/
[56] http://www.stonybrook.edu/ehs/lab/bio-safety/
[57] http://homer.ornl.gov/rq/355.pdf
[58] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0364/$FILE/EHSD0364B.pdf
[59] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0136/$FILE/EHSD0136.pdf

Cylinders must be securely capped when stored, not in use, or moved. A maximum of three cylinders may be chained together in a nested, pyramid shape. Empties (i.e. no pressure left on the regulator) should be stored separately from full tanks and clearly labeled as empty. A hand-truck must be used to move cylinders.

- Compressed gases must be stored away from direct or localized heat sources (radiators, steam pipes, boilers, etc.) in dry, well-ventilated areas, and not in areas where they might be knocked over (e.g. near elevators or service corridor doors). Incompatible gases must be separated by distance. Flammable gases must be stored in the laboratory, not service chaseways, and away from other cylinders. Acutely toxic gases must be stored in a fume hood or other area which connects directly to the exhaust system of the building. Toxic, corrosive, and flammable gases must be used within 36 months or less, i.e. within the expiration period.

Emergency equipment

As part of their lab specific training, all new workers in a laboratory must be made aware of the location of emergency equipment and first aid supplies. These include but are not limited to:

- Eye wash
- Emergency shower
- Fire extinguisher
- Sand (for fires and flammable solids)
- Spill kit
- Dust pan and broom for broken glass
- Calcium gluconate (for HF)
- First aid kit

Access to these items cannot be blocked. EH&S is responsible for the annual testing of the emergency eye wash and shower. Those labs with the new wand style eye wash installed near the sink must run water through them weekly. The Fire Marshal is responsible for the replacement of fire extinguishers once used.

Working in the laboratory

Working in a research or teaching laboratory is not to be taken lightly. Hazards abound, and accidents do happen. Following established rules and guidelines is essential for the safety of all.

General lab practices

The Chemistry Department expects researchers to adhere to the following guidelines and policies.

Housekeeping, conduct, and practices:

- EH&S is developing guidelines regarding working alone in the lab. A link will be added when available.
- Do not eat or drink, handle, or store food or beverages in the laboratory or in laboratory refrigerators. Do not use laboratory glassware or utensils for food or beverages. Do not apply cosmetics in a lab area.
- Do not smoke in the Chemistry Building or in the immediate vicinity. University policy currently states that smoking must be done at least 15 feet away from any building.
- Be sensible in your grooming and work attire. When doing wet chemistry, observe the following practices: Tie back long hair, remove artificial fingernails or plastic jewelry (fire hazards), wear fitted clothing, preferably of natural fabric and flat, closed shoes. Wash hands thoroughly after working with hazardous chemicals and before leaving the laboratory, even if gloves have been worn.

Laboratory:

- Keep your work area clean and uncluttered, particularly when done for the day. If paper bench covers are used and a hazardous chemical spill occurs, dispose of the bench cover as hazardous waste and re-cover with new paper. Decontaminate lab benches at regular intervals as determined by the PI.
- Report loose floor tiles, wet ceiling tiles, leaking pipes and other problems to the Building Manager (631-922-0232). PIs and administrative staff can directly submit work orders at FixIt[60]. Currently, this website can only be accessed using Internet Explorer. The Building Manager and Facilities hot line (x2-6400) are to be contacted immediately in the case of emergencies such as burst pipes.
- Periodically run water into all lab sinks (including cups sinks on along the benches and in the fume hoods). This will prevent noxious gases from accumulating in the room. Do not block drains with glassware, soaking pans or garbage (Eppendorf tubes, tissues, foil, caps, pipetmen tips, etc.). Doing so will lead to floods and/or blockage of the drain pipe.

[60] http://www.stonybrook.edu/fixit/fixit.shtml

- All water lines must be clamped, including those associated with aspirators and vacuum traps.
- Check the air flow of the fume hood every time it is used with a tissue or a velocity meter if available.
- Know the location of emergency supplies and spill kits.

Chemical:

- Minimize exposure to all chemicals; be aware of compatibility issues. General precautions include avoiding skin contact with chemicals at all times and keeping chemical containers closed when not in use.
- Label commercial chemical containers with the date when initially opened. The manufacturer's expiration date should be clearly displayed.
- Label containers with the full chemical names of the contents and with their hazards; do not use formulas or abbreviations. Assume that a chemical mixture is as toxic or hazardous as its most toxic/hazardous component.
- Minimize quantities of hazardous chemicals kept in the laboratory. When possible, minimize the concentrations of hazardous liquids. Substitute with a less toxic chemical whenever possible.
- Use a bottle carrier for secondary containment when you transport reactive chemicals (e.g. strong acids or bases, flammables) through common areas (e.g. hallways and elevators).
- Work in the fume hood when using lachrymators, flammables, foul-smelling compounds (e.g. thiols), suspected carcinogens, and toxins.
- If hydrogen fluoride is kept or used in the lab, keep the calcium gluconate, an HF antidote, close at hand and know how to use it.
- Do not use mouth suction for pipetting or starting a siphon.
- Keep aisles clear of empty bottles, boxes and other clutter.

Glassware:

- Store and handle glassware so as to minimize breakage and injury.
- Thoroughly inspect the glassware for star cracks, etc. before using.
- Tape glassware to be used under a vacuum to minimize potential implosions.
- Dispose of uncontaminated broken glassware in a sturdy cardboard box. When full, tape the box closed, label as 'broken glassware', and dispose of as regular trash. Please see the Hazardous Waste section for instruction on disposal of glassware contaminated with hazardous chemicals.

Equipment:

- Extension cords and chain linked surge protectors are prohibited. Do not extend cords or hoses across aisles.
- Inspect all laboratory equipment on a periodic basis. Maintain equipment as recommended by the manufacturer. Make repairs or arrange for a service call if necessary. Keep all manufacturers' manuals for reference.
- Use laboratory equipment only for its intended or minimally modified purpose.
- Turn off and/or unplug equipment at the end of the day.

Planning for emergencies:

- Be familiar with Chemistry Department procedures and policies regarding emergencies.
- Post emergency numbers by lab phones. Update the phone list annually.
- Keep ample supplies of spill containment and first aid materials.
- If hydrogen fluoride is kept or used in the lab, maintain a supply of calcium gluconate, an HF antidote.
- The Fire Marshal is in charge of maintenance of fire extinguishers and AED equipment. If the lab extinguisher has been used, arrange for a replacement with the Fire Marshal. A report must be made to EH&S on why the extinguisher was used. AEDs are kept in the closets near the freight elevator and use the CA8 key. AED/CPR training[61] is available through the Fire Marshal's office. If you notice a beeping alarm originating from an AED, contact the Building Manager.
- A ringing alarm in a laboratory indicates that fume hoods in the room are no longer providing adequate protection from toxic fumes. All work with hazardous chemicals is to cease. The alarm of an older, blue fume hood is located near the chaseway door and can be silenced by flipping the switch next to the bell. The bell will ring again when the hood is operational. Again silence the alarm by flipping the switch.

Emergencies:

- Immediately contact the appropriate people or organizations (e.g. fire, police, medical, EH&S); these contacts are listed on the Emergency Phone list located near each phone.
- In the event of a flood and if you can shut down the water source of water, do so and call 2-6400 and the Building Manager to report the flood and ask for cleanup assistance. Several wet-vacs are located in room 700 (accessible with the CA8 key). If the water is contaminated with hazardous chemicals, dispose of any collected liquid as hazardous waste. Be certain that the custodial staff is made aware of the contamination and associated hazards.
- In the event of a flood where the water cannot be shut off, again contact x2-6400 and the Building Manager. If safe to do so, unplug and cover with plastic if available equipment, and remove from the immediate area any hazardous waste and samples. Move cardboard boxes (e.g. glass waste boxes) off of the floor. Set out as many containers as possible to collect the water or divert the water to a sink if possible. Inform researchers working one flight down of the flood to be alert for water seeping through the ceiling.
- If the fire alarm sounds, immediately stabilize all reactions and close fume hood panels, and evacuate the building, closing the lab doors behind you as you leave.
- If you pull the fire alarm, immediately thereafter call University Police (632-3333) and inform them of any chemicals involved in the fire. If it is safe to do so, wait by the pull station or the stairwell door until the Fire Marshal arrives.

[61] http://www.stonybrook.edu/hr/training/courses.shtml

Otherwise leave the building and remain in the area so that you can provide the Fire Marshal and Building Manager with the specifics of the incident.

Experimental procedures

Any experiment in which hazardous compounds, procedures, or equipment are used must first be reviewed for hazards and risks as discussed in the Hazard Review section. Proper PPE must be determined and procured. An SOP must be prepared and reviewed as per EH&S instructions. The SOPs are to be kept on file with both the PI and Director of Chemical Laboratories, and made readily available to group members.

Hazardous waste

Hazardous waste includes all hazardous chemical waste, sharps waste, and regulated medical waste (RMW). All hazardous waste must be disposed according to EPA and University requirements. EH&S has prepared a flowchart to assist in the identification of hazardous waste (LINK to PDF).

Hazardous chemical waste: A list of commonly recognized hazardous chemicals[62] has been prepared by OSHA. Any liquid or solid waste resulting from use of these chemicals in reactions, purifications, etc. must be disposed as hazardous waste. Below are Chemistry Department requirements. Additional information can be found at the University EH&S website[63]. Important: No hazardous chemical waste may be poured into a sink or placed with the regular garbage.

Transfer and labeling of chemical waste

- Remove or completely efface any label on the bottle which is to be used for hazardous waste. Triple rinse with water. Standard everyday lab glassware is not acceptable for use as hazardous waste storage containers. An example of an acceptable waste container is an empty and clean 4L solvent bottle, whose original label has been removed. Containers must be tightly closed and in good condition.
- When waste is to be added, attach an orange hazardous waste label to the container. These are available from the Chemistry Business office or from the hazardous waste collection personnel. If one is not available,

[62] http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9761
[63] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0336/$FILE/EHSD0336.pdf

create a label which will include the words Hazardous Waste, the room number, phone number, whether liquid or solid, full name of every chemical added to the container, and the hazardous properties of each (toxic, flammable, corrosive, etc.).

- Fill out the entire label in permanent ink. It is critical that chemical names be added when added to the container, not at a later date.
- The following metals must be listed, regardless of concentration: arsenic, barium, cadmium, chromium, lead, mercury, silver and selenium. Other chemicals which constitute <1% of the total need not be listed.
- EH&S no longer allows the neutralization and sink disposal of acids or bases. Contact EH&S for further information.

Storage of chemical waste in the laboratory

- Keep waste in the same room in which it was generated until ready for pickup.
- Keep incompatibles separate (acids and bases, hazard classes, etc). Use a separate container for waste containing halogens.
- Bottles must be capped at all times, except when actively adding additional waste.
- HPLC waste collection bottles must be labeled as per chemical waste instructions above. The bottles must be capped. Tubing can run through holes in the cap. Foil caps are not allowed as they do not prevent spillage should the container tip over.
- All liquid waste must be kept in a secondary container which holds at least 10% of the total volume stored within, or which holds the entire volume of the largest container stored within, including HPLC waste.
- Store filled containers no more than one week. See below regarding waste pick-up. Do not transfer waste to a larger container to extend the time kept in the laboratory.

Sharps waste: Sharps are defined as syringe needles, disposable syringes with or without needle, razors blades, and any other sharp or pointed item capable of puncturing a plastic garbage bag. These are to be collected in an EH&S-approved red sharps container. Plastic pipette tips and broken glass, if not included with Regulated Medical Waste (see below), should be collected in a cardboard box, taped, labeled as Trash or Broken Glass as appropriate, and discarded with regular garbage. Important: No sharps may be placed in the regular garbage. Contact the Director of Chemical Laboratories if you need a sharps container.

Regulated Medical Waste (RMW): The definition of and full policies regarding RMW can be found at the EH&S RMW website[64].

[64] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0424/$FILE/EHSD0424.pdf

There are currently five categories of RMW: cultures/stocks of infectious agents, human pathological waste, human blood/blood products, used/unused sharps associated with either animal or human patient care, and animal waste. In addition, Stony Brook University considers anything generated from work with recombinant DNA to be RMW. EH&S has developed a RMW Determination Flowchart to help you to identify what items are considered regulated medical waste (LINK TO RMW Flowchart PDF.

RMW must be disposed of in a properly labeled red bag, tied and placed in a RMW box. The box must be labeled with the name of the research group, the date, and sealed completely with tape. RMW cannot be added to the regular garbage; likewise regular garbage should not be placed in RMW containers. RMW contaminated sharps must be in a puncture resistant container and included in the red bag. Proper PPE (gloves and goggles) must be worn while preparing the waste for pick up. RMW boxes are to be brought to the Chemistry loading dock on any Wednesday, between 10 and 10:30 AM for pick up.

Hazardous waste pickup: EH&S arranges with an outside contractor to have all hazardous waste (solid, liquid, sharps, and RMW) picked up at the Chemistry loading dock at 10AM every Wednesday. Be certain that:

- Filled containers are stored for no longer than one week.
- All labels are complete and legible. If the contents of a container should not be combined with other chemical waste, add the words “Not for Bulking” to the label.
- Contents of all containers are listed on the Chemical Waste Manifest form (available from Chemistry Business Office or at loading dock during waste pick-ups).

<u>Security</u>

The laboratories and offices must be secure in order prevent theft of chemicals, equipment and personal items. There have been many instances of people not affiliated with the University seeking an unlocked room for shelter, and then spending the night in the building. For the safety of everyone, the building must remain secure.

Policies concerning maintaining a secure work environment have been established by the Department, University, and government agencies. These policies must be followed.

Building security:

- After hours, do not admit anyone to the building unless you know they have the right to be in the building. Check ID if necessary. Do not prop open the entrance doors to the building.
- Do not prop open the stair tower doors.

Lab and office security[65]:

- Doors from the hall into service chaseways must be locked at all times. Do not prop them open. Also, doors between the labs and the chaseways are not propped open and are to remain locked, when the labs are unoccupied.
- Lock doors to offices and laboratories when unoccupied. Note that thefts are often thefts of convenience, i.e. grabbing a wallet or laptop while walking past an open door.
- When labs are occupied, doors should be left open to facilitate calls for help or access to a phone if there is an emergency. Additionally, OSHA requires unimpeded access to safety showers, which are located in the hallways.

Security of hazardous materials:

- Radioactive materials[66] and select agents and toxins[67] must be locked up and secured at all times.
- Nitric acid must be stored in a locked cabinet within the laboratory. Usage must be tracked and reported as per EH&S policy[68]. All users must complete Nitric Acid Security training[69] available through EH&S.

[65] http://www.stonybrook.edu/ehs/lab/security/
[66] http://www.stonybrook.edu/ehs/radiation/guide.shtml?protection
[67] http://www.stonybrook.edu/ehs/lab/bio-safety/sa.shtml
[68] http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0373/$FILE/EHSD0373.pdf
[69] http://www.stonybrook.edu/ehs/training/courses.shtml?els024

Contacts

Environmental Health & Safety	632-6410	ehsafety@stonybrook.edu
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Abbreviations

CAS	Chemical Abstracts Service
CHO	Chemical Hygiene Officer
CHP	Chemical Hygiene Plan
CSP	Chemistry Safety Plan
EH&S	Environmental Health and Safety
NFPA	National Fire Protection Association
OEL	Occupational Exposure Limit
OSHA	Occupational Safety and Health Administration
PI	Principal Investigator, Supervisor of research and teaching labs
PPE	Personal Protective Equipment
SDS	Safety Data Sheet (formerly known as Materials Safety Data Sheet
SOP	Standard Operating Procedure
ULSC	University Laboratory Safety Council