

LABORATORY SAFETY

1. [The Chemistry Department Chemical Hygiene Plan \(CHP\)](#)

- [Safety Information Supplement - 2005 Revision](#)

2. [Stony Brook Environmental Health and Safety Office](#)

- [The University Laboratory Safety Plan](#)
- [The on-line Hazardous Waste Management Training Program](#)
- [Lab Safety during severe weather](#)

3. Toxicology and Safety Links

- [Agency for Toxic Substances and Disease Registry](#) at CDC
- The [Laboratory Safety Workshop](#)
- [MSDSolutions.com](#) - FREE Online MSDS Database
- [Vermont Safety Information Resources on the Internet](#) (includes MSDS index and more)
- [Knowing how to practice Safe Science](#) - a course in **laboratory safety** at the **Howard Hughes Medical Institute**
- [OSIRIS Property Explorer](#) at Organicchemistry.org in Switzerland
- [Tutorial in Laboratory Safety at Baruch](#)

4. [Occupational Safety and Health Administration \(OSHA\)](#)

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**Department of Chemistry
SUNY at Stony Brook
Chemical Hygiene Plan
Revision Approved January 2003**

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(1) Introduction and Legal Requirement for a Chemical Hygiene Plan (CHP)

The Occupational Safety and Health Administration document that mandates the establishment of a Chemical Hygiene Plan is Standard [29 CFR 1910.1450](#), *Occupational Exposure to Hazardous Chemicals in Laboratories* [1]. In addition to this document, OSHA has web-posted fact sheets elucidating various provisions.

OSHA, recognizing the unique characteristics of the laboratory workplace, has tailored a standard for occupational exposure to hazardous chemicals in laboratories . . . Where hazardous chemicals are used [in] a laboratory covered by this standard, the employer [2] must develop and carry out the provisions of a written Chemical Hygiene Plan. The CHP must include the necessary work practices, procedures, and policies to ensure that employees are protected from all potentially hazardous chemicals in use in their work area [3].

The American Chemical Society lists the major elements required by OSHA to be included in the CHP. This list is given in the box on the following page and is the framework for the CHP [4] developed and adopted by the Chemistry Department at Stony Brook. OSHA mandates that the effectiveness of the CHP be evaluated annually by the employer and that it be available for OSHA inspection.

In designing our own, we have consulted web-posted plans from the University of Illinois at Urbana-Champaign [5] and the University of Vermont [6], and the plan from Stanford University. We have modified sections of the draft of the Stony Brook University Chemical Hygiene Plan [7]. A useful guide has been the American Chemical Society publication, *Living with the Laboratory Standard* [8], from which particularly illuminating selections are quoted in Appendix I. A list of references that includes our sources is given in [section 16](#).

For the most part limited to issues specifically required by the OSHA ([29 CFR](#)) Laboratory Standard, this CHP may not address safety issues required by other regulatory bodies such as the Environmental Protection Agency. However, the following requirements are specifically noted in the text: EPA waste handling; lab and building security.

OSHA-Required Elements of the Chemical Hygiene Plan

1. Standard operating procedures.
2. Criteria to determine and implement specific control measures such as engineering controls and personal protective equipment.
3. A requirement that fume hoods be functioning properly.
4. Information and training requirements. Specifically, employees must be informed of:
 - the content of the OSHA ([29 CFR](#)) Laboratory Standard,
 - the location of the CHP,
 - the PELs or other recommended exposure limits,
 - signs and symptoms of exposure to hazardous chemicals, and
 - the location of reference material.
5. Training must include:
 - the methods and observations to detect the presence or release of hazardous chemicals,
 - the physical and health hazards of chemicals in the work area, and
 - the measures employees can take to protect themselves from these hazards.
6. Circumstances under which a particular laboratory operation shall require prior approval from the employer.
7. Provisions for medical consultation and medical exams.
8. Designation of a Chemical Hygiene Officer.
9. Provisions for additional protection for work with select carcinogens, reproductive toxins, and substances with a high degree of acute toxicity, including establishment of a designated area, use of containment devices, procedures for safe removal of wastes, and decontamination procedures.

References:

[1] OSHA Regulations (Standards-29 CFR) [Occupational Exposure to Hazardous Chemicals in Laboratories – 1910.1450](#). [accessed Jan, 2003]
This reference will hereafter be abbreviated **OSHA (29 CFR) Laboratory Standard**.

[2] In this document, the terms “employer” and “employee” are used when OSHA is quoted or referenced; otherwise, more applicable terms are used, for example “University” or “Department” rather than “employer.”

[3] [OSHA Fact Sheets](#)

[4] [American Chemical Society OSHA Hazard Communication Standard](http://www.acs.org:80/government/publications/tech_oshastandard.html)
<http://www.acs.org:80/government/publications/tech_oshastandard.html>

[5] [UIUC Model Chemical Hygiene Plan](#) [accessed January 03]. For guidance, several university plans are posted on the [OSHA Laboratories webpage](#) accessed January 03.

[6] [University of Vermont Chemical Hygiene Plan for Laboratories Using Hazardous Chemicals](#)

[7] [Environmental Health and Safety Chemical Hygiene Plan](#) [accessed January 03]. This reference will hereafter be abbreviated **Stony Brook University CHP**.

[8] Kingsley, W. K., and Phifer, R., *Living with the Laboratory Standard: A Guide for Chemical Hygiene Officers*, American Chemical Society, Washington DC, 1998.

(2) Definitions and Acronyms

Definitions of terms other than abbreviations or acronyms are primarily from OSHA references cited in this document.

ACGIH [American Conference of Governmental Industrial Hygienists](#).

Action level A concentration designated in [the [OSHA \(29 CFR\) Laboratory Standard](#) for a specific substance, calculated as an eight-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

ANSI [American National Standards Institute](#).

Chemical Hygiene Officer An employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan.

Chemical Hygiene Plan A written program developed and implemented by the employer which (1) sets forth procedures, equipment, personal protective equipment, and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace, and (2) meets the requirements [shown in the list on [page 3 of this document](#)].

CHO The Chemical Hygiene Officer, a member of the [Stony Brook University Department of Environmental Health and Safety](#).

CHP Chemical Hygiene Plan; in the context of this document, the CHP of the Stony Brook Chemistry Department.

Designated area An area which may be used for work with select carcinogens, reproductive toxins, or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood.

EHS The [Stony Brook University Department of Environmental Health and Safety](#).

EPA [Environmental Protection Agency](#).

Hazardous chemical A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes. (See also definitions of specific and physical hazards.)

OSHA The [Occupational Safety and Health Administration](#).

Oxidizer A chemical, other than a blasting agent or explosive as defined in [[OSHA Regulations \(Standards-29 CFR\) - 1910.109a](#)], that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

NFPA [National Fire Protection Association](#).

PEL Permissible exposure limit. PELs are regulatory limits on the amount or concentration of a substance in the air. They may also contain a skin designation.

Physical hazard A combustible liquid, compressed gas, oxidizer, or organic peroxide; or a material with explosive, flammable, pyrophoric, unstable (reactive), or water-reactive properties.

PPE Personal protective equipment.

PI The Principal Investigator (or the Laboratory or Instructional Supervisor).

Reproductive toxin A chemical which affects the reproductive capabilities, or damages the chromosomes (mutation) or fetus (teratogenesis).

Select carcinogen Any substance which meets one of the following criteria: (1) it is regulated by OSHA as a carcinogen; or (2) it is listed under the category "known to be carcinogens" in the [Annual Report on Carcinogens](#) published by the [National Toxicology Program \(NTP\)](#) (latest edition); or (3) it is listed under Group 1 ("carcinogenic to humans") by the [International Agency for Research on Cancer](#) Monographs (IARC) (latest editions); or (4) it is listed in either Group 2A or 2B by IARC or under the category "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria: (a) after inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m³; (b) after repeated skin application of less than 300 (mg/kg of body weight) per week; or (c) after oral dosages of less than 50 mg/kg of body weight per day.

TLV Threshold limit value.

Sharps With respect to disposal, defined in this document as syringe needles, disposable syringes, and razor blades.

SOP Standard operating procedure.

(3) Responsibilities of Personnel [9]

3.1 - University President

The OSHA Laboratory Standard specifically requires the Chief Executive Officer of the facility to hold the ultimate responsibility for its implementation [10]. The University President has delegated the purview of compliance to the Director of Environmental Health and Safety (EHS).

3.2 - Director of Environmental Health and Safety

The Director of EHS has responsibility for chemical hygiene within the institution, and along with other officers and administrators, provides continuing support for efforts to improve laboratory safety and health.

3.3 - Chemical Hygiene Officer (CHO)

The Chemical Hygiene Officer is a member of the Department of Environmental Health and Safety. The Officer is responsible to perform the following duties:

- a. Evaluate, update, and implement the University Chemical Hygiene Plan and individual departmental CHPs.
- b. Keep informed of campus-wide safety- and health-related activities.
- c. Provide technical expertise to the laboratory community in the area of laboratory safety and health, and direct inquiries to appropriate resources.
- d. Work with the administration to make sure that all of the appropriate resources are provided. [11]
- e. With Department personnel, coordinate or conduct Department-specific health and safety orientation sessions. With Principal Investigators and Laboratory Supervisors, develop or conduct lab-specific orientation sessions.
- f. According to the provisions of this CHP, ensure that hazardous substances are appropriately labeled, handled, and stored, and that specific standard operating procedures (SOPs) which instruct all personnel in the safe use of these substances are developed and followed.
- g. Maintain supplier-provided MSDSs (see **Sections 9, 10**).
- h. According to the provisions of this CHP, review specific operating procedures developed by Department personnel and Principal Investigators for the use, disposal, spill cleanup, and decontamination of extremely hazardous chemicals and substances.
- i. According to the provisions of this CHP, review new research protocols prior to their initiation to determine if hazardous chemicals are used and, if so, ensure that proper measures are taken to protect laboratory personnel.
- j. Conduct annual inspections of laboratories and storage areas and provide inspection forms to Department personnel and Principal Investigators to conduct their own routine inspections.
- k. Write inspection reports and recommend follow-up activities (with input from other members of the inspection team).
- l. Review and approve the acquisition, operation, and maintenance of fume hoods, emergency safety showers, eyewashes, and fire extinguishers in all laboratories where chemicals are handled. This duty includes the arrangement for annual EHS or Fire Marshal inspections of hoods, showers, and fire extinguishers; and arrangement for prompt repair when problems are identified.
- m. Ensure that hazardous waste generated in laboratories is disposed of in accordance with University policy.
- n. Investigate all reports of laboratory hazards incidents, chemical spills, and near-misses to prevent repeat occurrences.
- o. Maintain records to ensure their availability to workers and administrative personnel.
- p. Review and approve the creation, modification, or closing of laboratories.
- q. Act as liaison between the laboratory and the departmental administrator and, if necessary, bring unresolved and potentially serious health and safety problems to the administrator's attention.
- r. If such action is necessary to minimize the short- and long-term dangers to laboratory workers, other workers, the community, and the environment, shut down or suspend operations that do not conform to the CHP.

3.4 - Chemistry Department Chair

The Department Chair is responsible to perform or ensure the performance of the following duties:

- a. Know and implement the guidelines and procedures of the CHP.
- b. Designate safety responsibilities at the departmental level.
- c. Train all laboratory workers and other departmental personnel who may come in contact with hazardous chemicals.
- d. Ensure access to Material Safety Data Sheets (MSDSs) for chemicals used in laboratories in the Department.
- e. Arrange routine inspections of departmental laboratories and maintain a file of completed inspection forms.
- f. Maintain an inventory of chemicals in storage rooms and laboratories in the Department.
- g. Purchase and use safety equipment for the Department laboratories.
- h. Inform the CHO of the creation, modification or closing of Department laboratories.

3.5 - Chemistry Department Safety Committee

Safety is the responsibility of all Department members. In this spirit, the departmental Safety Committee does not have any unique safety responsibilities. The Committee's membership rotates and includes faculty and staff; graduate students participate in some activities. The Safety Committee is responsible to perform the following functions:

- a. Hold regular meetings to discuss ongoing and current safety issues.
- b. Carry out routine inspections of departmental laboratories; produce inspection reports for departmental files.
- c. Arrange with the EHS Chemical Hygiene Officer for the annual Fall safety orientation for new Department personnel.

- d. Report unresolved safety issues to the attention of the Chair.

The Director of Laboratories and Building Manager are often consulted when safety problems arise. Routine matters are best handled by a call to the Director's office (2-7900).

3.6 - Principal Investigator/Laboratory Supervisor/Instructional Supervisor

The Principal Investigator or Supervisor (hereafter PI) oversees the safe arrangement of his or her laboratory space and the conduct therein. The PI is responsible to perform or supervise the duties listed. Appendix IV gives section references for these duties.

- a. Know and implement the guidelines and procedures of the CHP.
- b. Ensure that new workers have received safety orientation (available from EHS - see section 11). Check that all workers have received annual EPA hazardous waste training.
- c. Develop and communicate lab-specific safety policies, i.e. administrative controls.
- d. Designate safety responsibilities at the laboratory level.
- e. Ensure workers' access to standard operating procedures (SOPs).
- f. When an SOP must be substantially modified for a specific lab situation, or when one is not available, ensure that one be written, a record maintained, and lab workers be appropriately informed.
- g. Ensure lab workers' access to required sources of safety and hazard information - OSHA (29 CFR) Laboratory Standard, CHP, MSDSs.
- h. Prepare or update MSDSs for new substances or new hazards.
- i. Conduct routine inspections of his/her laboratories.
- j. Maintain an inventory of chemicals and provide it to designated departmental representatives.
- k. Ensure responsible chemical storage and waste disposal.
- l. Provide and require the use of appropriate personal protective equipment (PPE).
- m. Ensure that all appropriate controls including hoods and safety equipment are available and in good working order in his/her laboratories.
- n. Implement exposure monitoring when appropriate.
- o. Ensure that significant incidents occurring in his/her laboratories are reported to the CHO and that a written incident report is filed.
- p. Include provisions for CHP compliance in grant proposals.

3.7 - Laboratory Workers

Because laboratory workers bear the responsibility for their own safety practice, they must be well-informed about this CHP and act in accord with its provisions. Specifically, they must consult MSDSs, follow standard operating procedures, wear appropriate personal protective equipment, and report hazards and exposures to the PI.

References:

[9] Except as otherwise noted, this section is adapted from the Stony Brook University CHP, pp 4-8.

[10] Living with the Laboratory Standard, p 3

[11] Living with the Laboratory Standard, p 4

(4) Standard Operating Procedures (SOPs)

4.1 - OSHA Requirement

The Chemical Hygiene Plan shall include . . . standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals.

4.2 - Chemistry Department Implementation of the OSHA Requirement

The Chemistry Department has traditionally relied for guidance on the American Chemical Society handbook, Safety in Academic Chemistry Laboratories, and will continue to do so. Department-specific information is given in [Appendix II](#).

The standard operating procedure for a particular situation may simply be to follow generally accepted practice. Guidelines familiar to chemists are outlined here in [Section 4](#). However, there are times when an SOP must be substantially modified for a specific lab situation, or when one is not available; for these, the PI must ensure that an SOP be written and a record maintained.

4.3 - Controlling Chemical Exposure

Each laboratory worker should minimize personal and coworker exposure to the chemicals in the laboratory. General precautions for handling and using chemicals follow:

- a. Consult Material Safety Data Sheets (MSDSs) for chemical substances (see [Section 9](#)).
- b. Consider substitution of a less toxic chemical for a more toxic one.
- c. Assume that a chemical mixture is at least as toxic as its most toxic component.
- d. Label chemicals and equipment with appropriate hazard notations.
- e. Be familiar with the symptoms of exposure for the chemicals with which you are working and the precautions necessary to minimize exposure (see section 5 on personal protective equipment).
- f. Avoid skin contact with chemicals. After skin contact with a toxic or hazardous chemical, wash thoroughly and seek assistance if necessary.
- g. Even if you wear gloves, wash your hands thoroughly after working with hazardous chemicals. Wash thoroughly before you leave the laboratory.
- h. Be sensible in your grooming and work attire. In lab situations where you will be doing wet chemistry, observe the following practices: Tie back long hair. Do not wear artificial fingernails, which are a fire hazard. Wear fitted clothing, preferably long and of natural fabric. Wear flat closed shoes. Do not wear plastic jewelry.
- i. Add reagents together slowly. Add concentrated solutions to dilute ones with stirring.
- j. Keep your work area clean and uncluttered, and be sure it is reasonably clean and clear at the end of each work day or operation.
- k. Use judgment about when to work in the hood. For example, work in the hood with lachrymators, foul-smelling compounds, suspected carcinogens, or teratogens (reproductive toxins).
- l. Do not use mouth suction for pipeting or starting a siphon.
- m. Do not eat or drink, handle, or store food or beverages in the laboratory area or in laboratory refrigerators. Do not use laboratory glassware or utensils for food or beverages. Do not apply cosmetics in a lab area.
- n. Use a bottle carrier for secondary containment when you transport reactive chemicals (e.g. strong acids or bases, flammables) from the stockroom or into common areas such as hallways or elevators.
- o. Do not smoke in the Chemistry Building.
- p. Consult the PI for additional specific precautions to be implemented, based on the toxicological characteristics of individual chemicals.

4.4 -Laboratory Equipment

- a. Inspect all laboratory equipment on a periodic basis and replace or repair as necessary. Don't neglect to check electrical cords.
- b. Use laboratory equipment only for its intended purpose or an appropriate modification.
- c. Handle and store glassware in such a manner as to minimize breakage.
- d. Shield evacuated glass apparatus to contain chemicals and glass fragments should implosion occur.

4.5 - Waste Storage

This and the next two sections contains specific EPA requirements.

- a. Consult the EHS webpage for University policy [\[14\]](#) and [Appendix II](#) for Chemistry Department policy.
- b. Follow prudent practice to segregate waste according to hazard class, disposal requirements, etc. Have separate containers for halogenated and non-halogenated materials and for corrosives.
- c. Label each waste container. The specific wording "Hazardous Waste" must be used unless the contents are entirely innocuous.
- d. Remove or completely efface a previous label - that is, do not double-label.
- e. On each label, give the hazard class (for example, corrosive). List the contents, as described in the next section.
- f. EHS requires that contents greater than 1% be specifically listed on the label or the manifest.
 - i. It may not be practical to track serial additions to containers by multiple workers. In this situation, each addition to a waste container should be noted so that there is a complete record of the contents. The amount of each component need not be specified.
 - ii. In general, if a component is present in less than 1%, it need not be listed.
 - iii. However, certain metals must be listed in any amount: arsenic, barium, cadmium, chromium, lead, mercury, silver, and selenium.

- iv. Note: The list of contents may be on the manifest, not necessarily on the label. A sheet might be posted in lab on which workers could make their entries. The information on this sheet could ultimately be consolidated for the manifest.
- g. Keep waste containers tightly closed with screwcaps other than at times when material is being transferred to them.
- h. Provide secondary containment which holds the volume of the largest container or at least 10% of the volume of all containers in the accumulation area.
- i. Do not transfer waste from the room in which it was generated, other than for final disposal. For an exception to this rule, you may establish a storage area [\[15\]](#).
- j. Use the red container approved and provided by EHS for "sharps": syringe needles, disposable syringes, and razor blades. Note that a disposable syringe (not simply its needle) must be discarded intact in the "sharps" container.

4.6 - Waste Treatment

- a. **OLD** - Do not attempt to process waste so as to make it less hazardous, but rather dispose of it according to EPA regulations. The only exception is simple neutralization of acids or bases.
- b. **NEW** - The policy is being developed in accord with new EPA guidelines and will be distributed for separate approval.

4.7 - Waste Disposal

- a. Do not pour chemical waste down the drain.
- b. Dispose of waste within one week of a container's being filled. EHS has a convenient pickup every Wednesday at the Chemistry Building. Waste cannot be transferred to a larger container for the purpose of extending the storage period.
- c. At pickup, waste containers must bear the EHS label, with hazard boxes checked. Manifests must accompany all waste for disposal. Labels and manifests may be obtained from Joan Conforte.
- d. There are certain situations in which a container should not be emptied for bulking because of a specific hazardous component. In addition to checking the applicable boxes on the EHS label, clearly and prominently write the name of the specific compound and its hazard, and the words "not for bulking."
- e. Only containers that are acceptable for disposal will be taken. Flasks, beakers, etc, are not acceptable containers. Acceptable containers must be tightly closed and in good condition. EHS staff have the final decision on what an acceptable container is.

4-8 - Planning for Emergencies

- a. Be familiar with the Chemistry Department procedure and policies for emergencies (see [Appendix II](#)).
- b. Post emergency numbers by lab phones. Update the phone list annually.
- c. Check emergency equipment on a regular basis to ensure its readiness. This includes fire extinguishers, hood alarms, eyewashes, and specific items such as spill containment equipment.
- d. Be sure the lab first aid supplies are adequate. If your lab has hydrogen fluoride, stock your kit with the antidote calcium gluconate and learn how to use it.
- e. Before any lab work, develop a specific emergency plan for the particular procedure you will be following. Plan for fire, chemical spill, and personnel exposure. If you will be working with a chemical that is particularly hazardous or odiferous, inform the office of the Director of Labs in advance.
- f. Immediately evacuate the building every instance the fire alarm sounds. If possible, stabilize reactions before leaving. Close hood doors. (Be aware that because the hoods shut down when the fire alarm is activated, they may not be functioning at the time when you return to lab).
- g. Pay attention to hood alarms and take appropriate action.
- h. Do not do lab work out of easy communication range of other people.

References:

[12] OSHA (29 CFR) Laboratory Standard. Hereafter, all sections titled "OSHA Requirement" refer to this Standard.

[13] The majority of section 4 is adapted from the University of Vermont CHP. References cited therein are Safety in Academic Chemistry Laboratories (American Chemical Society, latest edition); Prudent Practices for Handling and Disposing of Hazardous Chemicals (National Research Council, 1995).

[14] Environmental Health and Safety [policies on main campus hazardous waste management](#).

[15] The requirements for a storage area may be obtained from EHS.

(5) Personal Protective Equipment (PPE)

5.1 - OSHA Requirement

The Chemical Hygiene Plan shall include . . . criteria that the employer will use to determine and implement control measures to limit employee exposure to hazardous chemicals, including . . . the use of personal protective equipment and hygiene practices [16]. . . Where the use of respirators is necessary to maintain exposure below PELs [that is, OSHA permissible exposure limits], the employer shall provide, at no cost to the employee, the proper respiratory equipment.

5.2 - Chemistry Department Implementation of the OSHA Requirement

Guidelines for use of personal protective equipment are given here in [Section 5. \[17\]](#) Certain PPE, such as eye protection, should be worn in all laboratories where chemical splash hazards exist. Other PPE may be specified in SOPs or worn at the discretion of the user. SOPs generated by PIs must specifically include information on the type of PPE required.

Users must be trained in the proper use of PPE. If respiratory protection is required, medical clearance and fit testing are also required - for assistance, contact the EHS Chemical Hygiene Officer.

5.3 - Overview of Types of PPE and Their Application

- a. Eye protection: When an operation or activity has the potential of causing an eye injury from flying objects, chemical splash, or injurious radiation.
- b. Face protection: When an operation or activity has the potential of causing a face injury from flying objects, chemical splash, or injurious radiation. Eye protection must always be worn under face protection.
- c. Gloves: When an operation or activity has the potential to cut, burn, blister or bruise the hands, especially when working with chemicals, high voltages, metal plates, or pipes.
- d. Protective clothing (including lab coats): When an operation or activity involves a situation where normal working attire will not afford suitable protection from injury.
- e. Disposable clothing: When an operation or activity has the potential of causing exposure to asbestos, PCB oil, pesticide spray, or similar contaminant.
- f. Respiratory protection: 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.
- g. Hearing protection: When the area is designated as a hearing protection area and/or when equipment generates a noise level of 85 dB or greater. EHS can give assistance in determining this type of hazard.
- h. Safety shoes: When an operation or activity has the potential for causing foot injury from falling and/or rolling objects, from piercing the sole, or from electrical hazards.

5.4 - Eye Protection [18]

In any area at any time where there exists the possibility of an eye hazard, suitable protection must be worn by all persons in the area. This rule applies to visitors and staff as well as to laboratory workers.

The type of protection - safety glasses or chemical splash goggles - depends on the hazard level. If there is a splash hazard, goggles should be worn. If there is a radiation hazard, specialized eye protection may be necessary.

For all general, all organic/inorganic, and most physical chemistry instructional labs, all persons in the laboratory must wear chemical splash goggles (not safety glasses or spectacles) at all times, even when not performing a chemical operation. It is the responsibility of each instructor to enforce this policy; alternate forms of eye protection are not permitted. However, in those physical chemistry labs where a chemical splash incident is extremely unlikely, the judgment of the instructor regarding eye protection will be accepted.

Recommendations for types of eye protection are given in the University CHP. [\[19\]](#)

5.5 - Gloves

It is appropriate to wear gloves in many laboratory situations. However, gloves should not be worn outside of the laboratory. Non-lab workers should not be exposed to chemical contact from using, for example, the lavatory facilities or the elevator buttons.

There are no gloves available that protect against all potential hand hazards, and commonly available glove materials such as latex provide only limited protection against many chemicals. Therefore, it is important to select the most appropriate glove for a particular application and to determine how long it can be worn, and whether it can be re-used. For the best protection, check with the manufacturer for degradation and permeation information. Recommendations for gloves are given in the University CHP.

Disposable gloves should be discarded when removed. They should not be washed or re-worn. Gloves contaminated with chemicals should be discarded as chemical waste.

5.6 - Shoes and Clothing

Clothing should be fitted, not excessively loose or flowing. The body should be covered, and the arms and legs from elbow to knee. Natural fabrics are more resistant to solvents and are recommended. To protect body and clothing, a lab coat or long-sleeved cotton shirt is recommended. Shoes must be flat and closed - no sandals or slides.

5.7 - Cleaning Lab Coats

Lab coats that may be contaminated with harmful residues must be cleaned in a responsible fashion; they should not be taken home for washing along with personal laundry. Conveniently, the University Hospital has arranged to include Chemistry Department lab coats in the cleaning service to which it subscribes.

Coats must be labeled with indelible pen. They should be bagged in plastic and taken to the receiving dock, Hospital level 1. At the present time, dropoff and pickup dates are Monday-Thursday or Thursday-Monday. The cost per coat is inexpensive. For further information, contact the Hospital Director of Linen Services (4-1462).

(An alternative is to use disposable coats.)

5.8 - Respirator Selection and Use

Selection of respirators and respirator accessories, fit testing, and training must be coordinated through the Department of Environmental Health and Safety. EHS will evaluate the work area for chemical toxicity, the potential for exposure, the concentration and duration of exposure, and the limitation of the various types of respiratory protection that are available.

A respirator must never be worn before an evaluation has been made. Use of a respirator by an untrained individual, or in an application other than that for which it was designed, can prove extremely dangerous. In addition, a single respirator facepiece cannot be designed to fit the entire working population. Any laboratory user who is required to wear a respirator must receive medical clearance and be fit-tested and trained before using this equipment.

References:

[16] Hygiene practices are discussed above in [Section 4](#).

[17] Except as otherwise noted, section 5 is adapted from the Stony Brook CHP pp 47-53. Standards for compliance are given at [OSHA Technical Links](#): Personal Protective Equipment accessed September 00. Specific requirements for eye, face, hand, and respiratory protection are given on links provided at this site.

[18] Adapted from the UIUC CHP.

[19] Stony Brook University CHP pp 48-49.

(6) Engineering Controls - Laboratory Ventilation; Fume Hoods [21]

6.1 - OSHA Requirement

The Chemical Hygiene Plan shall include . . . criteria that the employer will use to determine and implement control measures to limit employee exposure to hazardous chemicals, including . . . engineering controls . . . [It shall include] a requirement that fume hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment.

6.2 - Chemistry Department Implementation of the OSHA Requirement

Engineering controls provide a safe physical lab environment. They are expected to be in place at all times. OSHA specifically cites hoods, which are discussed here in section 6. [Section 7](#) addresses other engineering controls mandated but not specified by OSHA.

6.3 - Lab Ventilation

General laboratory ventilation must operate continuously to provide a source of air for input to local ventilation devices (make-up air). In general, a change of room air four to twelve times per hour is adequate. The ventilation system directs air flow into the laboratory from non-laboratory areas and out to the exterior of the building. General laboratory ventilation should not be relied on for protection from toxic substances.

6.4 - University Fume Hood Policy

EHS Policy 4-5 applies with respect to design and failure protocols [\[22\]](#). The EHS Chemical Hygiene Officer will arrange for annual hood inspections and follow-up.

6.5 - Guidelines for Use of Hoods

- a. A worker should not lean into the hood so that his/her head is inside the plane of the hood face, except for setup work or hood maintenance.
- b. Equipment in the hood should not block airflow to slots in the baffle.
- c. Flammable liquids should not be stored permanently in the cabinet under the hood unless that cabinet meets the requirements of ANSI/NFPA 30 and 45 [\[23\]](#) for this type of storage.
- d. The hood sash or panels should not be removed except as necessary for set-up and should be replaced as soon as practicable.
- e. The hood sash or panels should be closed to the maximum position possible while still allowing comfortable working conditions.
- f. Each hood must be posted with a notice giving the date of the last periodic field test. If the hood failed the performance test, it should be taken out of service until repaired or posted with a restricted use notice. The notice should state the partially closed sash position necessary and any other requisite precautions concerning the type of work and materials permitted or prohibited.
- g. During Physical Plant maintenance outages, hoods must not be used for their normal function.

6.6 - Hood Failure Procedures

- a. Immediately stop all work in the hood.
- b. If possible, stabilize reactions and turn off equipment (for example, hot plates).
- c. Report the problem to:
 - i. The PI.
 - ii. The Director of Laboratories and/or the Building Manager.
 - iii. Physical Plant (2-6400).
 - iv. Environmental Health and Safety (2-6410).
- d. Notify others in the area and on additional shifts that the hood is not operating and cannot be used. This may be done by posting the hood with a sign. This must be strictly enforced.
- e. Seal off any opened/exposed containers of chemical or radioactive materials currently under the hood, or remove any supplies or equipment which may be required, as access to hood may be denied due to repair.
- f. Work with the PI either to arrange for the use of other hoods which are operating properly or to postpone work until repairs are made.
- g. Do not use the hood until it is re-tested and approved for use by the Department of Environmental Health and Safety.

References:

[21] Section 6 is adapted from the Stony Brook University CHP pp 35-38.

[22] Environmental Health and Safety <http://www.ehs.sunysb.edu/policies/main/campus/laboratory_hood_safety> accessed October 00.

[23] National Fire Protection Agency, Standard 45 on Fire Protection for Laboratories Using Chemicals, 2000 Edition.

(7) Additional Engineering Controls [\[24\]](#)

7.1 - Chemical Storage

Good housekeeping practice suggests that every chemical have an identifiable storage place and if such is practical be returned there after use. A storage scheme should be developed that ensures the segregation of incompatibles.

7.2 - General Guidelines for Storing Chemicals in Individual Laboratories

- a. Because of the risk of placing incompatible materials side-by-side, a storage scheme based solely on alphabetizing is prohibited. An effort must be made to isolate particularly flammable, reactive, and/or toxic materials. Lists of incompatibles are available in various references. [\[25\]](#)
- b. Storage areas should be checked periodically for cracked bottles, deteriorating labels, and other problems.
- c. Storage trays are recommended to contain possible spills.
- d. Chemicals should not be stored on the floor.
- e. Chemical storage on benchtops should be kept to a practical minimum.
- f. Chemical storage in hoods should be kept to a practical minimum for better airflow and more workspace. EPA requires secondary containment of chemicals stored in our hoods because they are fitted with drains; a chemical spill could potentially contaminate the groundwater.
- g. Date labeling (discussed further in [Section 10](#))
 - i. Chemical containers should be labeled with the date when they are initially opened.
 - ii. At that time, it is recommended that a decision date be assigned and recorded on the label. On the decision date, an evaluation should be made as to whether to keep the chemical (assigning a new decision date) or to dispose of it. The practice of recording a decision date is particularly helpful in determining when certain tests, such as for peroxides, must be done.
 - iii. When provided, the manufacturer's expiration date should be displayed.
- h. Appropriate spill-control, cleanup, and emergency equipment must be available wherever chemicals are stored.
- i. Refrigerators in which flammable materials are stored must be explosion-proof according to NFPA standards. Each refrigerator must have a sign with the information as to whether or not it may be used for storage of flammables.
- j. In addition to the requirements for high-hazard materials (see [Section 7.5](#)), the following are in effect for security purposes:
 - i. Chemicals stored in chaseways must be kept out of view. For this reason, glass-door cabinets and open shelving may not be used for chemical storage in chaseways.
 - ii. If not frequently used, large containers of even moderately dangerous chemicals should also be out of view.

7.3 - Storage of Flammables and Combustibles

Legal limits [\[26\]](#) on amounts of flammables and combustibles will be observed for each laboratory space. As a rule of thumb, in any one lab outside of an approved flammable storage cabinet, no more than 25 gallons of flammable liquids with flashpoints below 22.8 C and boiling points below 37.8 C can be stored. Above these limits, up to 120 gallons of flammables can be stored.

- a. Storage in cabinets
 - i. Large containers of flammable materials must be stored in cabinets that meet OSHA and National Fire Protection Association specifications: Cabinet contents must be protected from temperatures exceeding 160 C for at least 10 minutes, enough time for personnel to evacuate the area.
 - ii. The cabinet doors must be kept closed other than at times of chemical transfer. Do not remove the air vent covers. Do not duct the cabinets to the ventilation system.
 - iii. No more than 60 gallons of flammables and 120 gallons of combustibles may be stored in one of these cabinets.
- b. Storage on the bench
 - i. Maximum container size: OSHA and NFPA limit the size of the container for classes of flammable and combustible materials. The more fire-resistant a container, the larger it may be. Only certified containers may be used.
 - ii. Safety cans: Portable and approved safety cans should be used when possible for storing flammable liquids. Flammable liquids in quantities greater than 1L should be stored in metal containers. Flammable liquids purchased in large containers should be repacked into smaller safety cans for distribution to laboratories. Cans greater than 5 gallons must be grounded and bonded during transfer of contents.

7.4 - Storage of Oxidizers and Corrosives: Guidelines are given in general references and in the University CHP.

7.5 - High-Hazard Materials

- a. High-hazard materials have special storage requirements with respect to security.
 - i. Radioactive materials and pathogens must be locked up and secured at all times.
 - ii. The following materials must be stored out of view: hazardous chemicals whose names would be popularly recognized,

such as cyanide, strychnine, arsenic, etc.; large containers (kilogram quantities) of highly toxic or otherwise hazardous chemicals.

- b. Extremely toxic substances must be stored in unbreakable chemically resistant secondary containers.
- c. Adequate ventilation must be provided in storage areas especially for toxics that have a high vapor pressure.
- d. All dispensing of these materials must be conducted in a hood or glove box.

7.6 - Compressed Gases - Nonflammable, Flammable

- a. Compressed gases must be stored away from direct or localized heat (including radiators, steam pipes, or boilers) in well-ventilated and dry areas and away from areas where they may be capsized (e.g. near elevators or doors to service corridors).
- b. All compressed gases, including empty cylinders, must be secured in an upright position with chains, straps, or special stands of adequate strength; and must be capped when stored or moved. A maximum of three cylinders may be chained together in a nested, pyramid shape.
- c. Empty cylinders should be separated from non-empty cylinders and labeled "empty."
- d. A hand truck must be used for transporting gas cylinders to and from storage areas.
- e. Cylinders of incompatible gases must be segregated by distance.
- f. Cylinders of flammable gas should be segregated from other types.

7.7 - Glove Boxes

- a. Glove boxes and glove bags are isolation units used for handling highly toxic chemicals and carcinogens. These are negative pressure units, so air leakage is into the unit. The ventilation rate must be at least two volume changes per hour and pressure at least 0.5 inch of water.
- b. With a positive pressure unit, there exists the potential hazard of leakage into the laboratory.
 - i. Positive pressure units are used when protection from atmospheric moisture or oxygen is required. Toxic chemicals should not be used in a positive pressure unit.
 - ii. These units must be regularly tested for leaks and must have a shutoff valve and pressure gauge installed.
- c. Exhaust air must be treated by scrubbing and/or absorption prior to release into the regular exhaust system.

7.8 - The Cold Room [27]

Temperature control rooms do not generally have fresh air ventilation. Do not use highly volatile chemicals in the cold room. Also note that liquid nitrogen stored in this room can displace oxygen and cause oxygen-deficient conditions.

7.9 - Emergency Equipment

At an orientation session for the individual PIs lab, all workers should be made aware of the location of emergency equipment and first aid supplies. These must be checked and maintained on a regular basis. Access must be free and clear.

- a. Eye wash.
- b. Shower - annual inspection arranged by the CHO.
- c. Fire extinguishers - annual inspection arranged by the CHO.
- d. Spill kit or absorbent material.
- e. First aid kit.

7.10 - Miscellaneous

- a. Trip hazards - Report loose floor tiles to the building manager for prompt repair. Do not extend cords or hoses across aisles. Do not allow empty bottles to accumulate in aisles.
- b. Drains - Lab drain traps should be periodically filled with water so as to prevent toxic gases from entering the room via the building exhaust system.
- c. The Chemistry Department maintains a shop vacuum system for cleaning up floods. It is located in room 599A, next to the freight elevator, along with plastic tarps, pail and mop, and ladder.

7.11 - The Chemistry Department Stockroom

Stockroom access is limited to specified personnel. General design and operation of stockrooms are discussed in the University CHP [28].

The stockroom can supply most of the safety items mentioned in this CHP. It can also supply a limited number of chemicals. Be sure to use a bottle carrier for secondary containment when you transport reactive chemicals (e.g. strong acids or bases, flammables) from the stockroom.

References:

[24] Except as otherwise noted, section 7 is adapted from the Stony Brook University CHP pp 40-42.

[25] See for example Safety in Academic Chemistry Laboratories, 1995 edition, pp 73-75.

[26] OSHA Regulations (Standards-29 CFR) Flammable and Combustible Liquids. - 1910.106 <<http://www.osha->

slc.gov/OshStd_data/1910_0106.html> accessed November 00.

[27] From the University of Vermont CHP.

[28] Stony Brook University CHP pp 42-44. This reference is for informational purposes only. Many of its provisions are not applicable to the Chemistry Department stockroom.

(8) Administrative Controls

Administrative controls are the policies that are conducive to a safe laboratory environment. This CHP is itself the master administrative control for the Chemistry Department. Specific controls include exposure monitoring and signage (this section), information dissemination ([Section 9](#)), labeling ([Section 10](#)), training ([Section 11](#)), and record keeping ([Section 12](#)).

8.1 - OSHA Requirement for Exposure Monitoring

For laboratory usage of OSHA regulated substances, the employer shall assure that employees' exposures to such substances do not exceed the permissible exposure limits specified in 29 CFR part 1910, subpart Z [29]. . . The employer shall measure the employees' exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL). . . If the initial monitoring discloses employee exposure over the action level . . . or PEL, the employer shall immediately comply with the exposure monitoring provisions of the relevant standard.

8.2 - Chemistry Department Implementation of the OSHA Requirement

The list of substances regulated in subpart Z is too extensive to be given here. The PI will periodically review the list and will implement exposure monitoring if so warranted.

8.3 - Signage

- a. Building exits must be clearly marked.
- b. Location of emergency equipment such as the phone, first aid kit, spill control supplies, safety shower, eyewash, and fire extinguisher should be clearly marked with wall signs. Moveable supplies should be returned to their original location, and consumables should be restocked.
- c. For rooms that are not fully stocked with emergency equipment, it is a good idea to prominently post a map showing the location of the nearest such equipment. This signage is required for a shared phone.
- d. Emergency numbers must be posted next to the phone in each laboratory, storeroom or stockroom, and storage area. Appendix II gives departmental, University, and local emergency numbers. Each PI should add his or her number to this list.
- e. On the outside door of each room, there must be posted the name and 24-hour phone number of the person to contact in an emergency.
- f. Special hazards which must be indicated by door signs are the following:
 - i. Radioactive materials.
 - ii. High-field magnets.
 - iii. Lasers.
 - iv. Biohazards.
 - v. Unusual hazards such as large cylinders of ammonia.
- g. An unattended experiment should be labeled with a sign giving the nature of the experiment, the contact person, and warnings where appropriate.
- h. A permanent sign will be attached to each refrigerator identifying whether or not it has been modified for safe storage of flammable materials.

8.4 - Lab-Specific Administrative Controls

Each PI will need additional policies for his or her own lab. For example, there must be a policy about visitors. Lab regulations should be written down and posted or kept for reference at a convenient location.

References:

[29] OSHA Regulations (Standards-29 CFR) Toxic and Hazardous Substances - 1910 Subpart Z <http://www.osha-slc.gov/OshStd_toc/OSHA_Std_toc_1910_SUBPART_Z.html> accessed October 00.

(9) Information Requirements

9.1 - OSHA Requirement

Employees shall be informed of [the following]:

- a. Contents of [the OSHA (29 CFR) Laboratory Standard] and its appendices which shall be made available to employees.
- b. Location and availability of the employer's Chemical Hygiene Plan.
- c. Permissible exposure limits for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard.
- d. Signs and symptoms associated with exposure to hazardous chemicals used in the laboratory [see [Section 11](#)].
- e. Location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Material Safety Data Sheets received from the chemical supplier.

9.2 - Chemistry Department Implementation of the OSHA Requirement

All members of the Chemistry Department, including office and shop staff and cleaners, must be informed of the location and content of the OSHA Standard, the Department CHP, and individual references such as MSDSs for encountered chemical substances. [Section 9](#) details plans for information dissemination.

Documents and references must be located so that they can be readily accessed by Department members; in some cases, web-based access is the most convenient.

9.3 - The Departmental Chemical Hygiene Plan

Printed copies of the CHP will be distributed to each PI for location in that person's laboratory area, and to strategically located offices and shops. Updates will be distributed annually. The CHP will be posted on the Internet and be linked to the Chemistry Department webpage.

9.4 - MSDS and PEL

- a. Manufacturers' Safety Data Sheets (MSDSs) [\[30\]](#)

For each hazardous chemical in the lab, the PI must ensure the availability in an easily accessible location of an MSDS which meets the criteria of the applicable OSHA standard (29-CFR 1910.1200 g).

Law requires that for incoming shipments, the accompanying MSDS must be retained, not simply a generic version for that particular chemical (see section 10). However, at Stony Brook, the majority of MSDSs are received directly and retained by EHS; their contents are posted on the EHS website. PIs are responsible for training lab workers to retrieve MSDS information from Internet postings including but not limited to the EHS website [\[31\]](#).

If the PI becomes aware of any data or if a report is published suggesting a hazard not indicated on the current MSDS for a particular chemical, the PI must prepare a new MSDS as a replacement within three months, and must discuss the new information with the preparer of the original data sheet.

The minimum content but not the format of the MSDS is specified by the OSHA regulation. For this reason, MSDSs differ in quality, and it is often useful to consult more than one. The ACS website gives information on the federal standard for MSDS content, and suggestions for interpretation.

The Chemical Hygiene Plan is required to provide that signs and symptoms of exposure to hazardous chemicals be communicated to lab workers. The MSDS of a substance is a convenient source of this information.

- b. Permissible Exposure Limits (PELs) and Other Recommended Exposure Limits
MSDSs must include known exposure limits, either OSHA PELs or American Conference of Governmental Industrial Hygienists' threshold limit values (ACGIH TLVs). The Merck Index gives LD50 information in some of its entries.

OSHA sets PELs to protect workers against the [adverse] health effects of exposure to hazardous substances. PELs are regulatory limits on the amount or concentration of a substance in the air. They may also contain a skin designation. PELs are enforceable . . . PELs are based on an 8-hour time weighted average (TWA) exposure [\[32\]](#)

The OSHA reference gives links that supply PELs for a number of regulated substances.

9.5 - Inventory

Although not mandated by OSHA to be part of the CHP, [\[33\]](#) an inventory is required by other regulations. [\[34\]](#) The PI should maintain an inventory of chemicals in his or her lab area. The inventory will record for each substance the following information: name, manufacturer, CAS number, specific location, initial quantity, and eventual removal from stock. A check of which substances remain in stock will be done annually. To facilitate communication among groups, it is recommended that PIs all use the same Excel format for inventory.

References:

[30] Useful information about MSDSs is found on the ACS OSHA Hazard Communication Standard website, which is the source for the

information in this section, The ACS reference summarizes OSHA Regulations (Standards 29-CFR) Hazard Communication - 1910.1200 g <http://www.osha-slc.gov/OshStd_data/1910_1200.html> accessed October 00.

[31] MSDS Pro <<http://www.msds.sunysb.edu>> accessed October 00; or Environmental Health and Safety <<http://www.ehs.sunysb.edu/MSDS>> accessed May 02.

[32] OSHA Permissible Exposure Limits <<http://www.osha-slc.gov/SLTC/pel/index.html>> accessed July 00.

[33] Living with the Laboratory Standard, p 20. "Although the Laboratory Standard does not require an entire inventory of your chemical supply, it does require that you have a MSDS for all hazardous chemicals. This in itself requires an inventory."

[34] EPA Part 370 Hazardous Chemical Reporting - Community Right-to-Know <<http://www.epa.gov/docs/epacfr40/chapt-l.info/subch-J/40P0370.pdf>> accessed November 00; EPA Part 355.30 Emergency Planning and Notification <<http://www.epa.gov/docs/epacfr40/chapt-l.info/subch-J/40P0355.pdf>> accessed November 00; the New York State Department of Environmental Conservation regulation 6 NYCRR; the New York State Office of Fire Prevention and Control regulation 9 NYCRR part 1174. This last requires reporting of "any amount" of explosive, poison gas, poison and irritant, flammable solid, radioactive material, dangerous-when-wet material, or etiologic material; or five gallons of flammable liquid within the building.

(10) Labeling

10.1 - OSHA Requirement

With respect to labels and MSDSs, employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced; employers shall maintain any MSDSs that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees.

The following provisions shall apply to chemical substances developed in the laboratory:

- a. If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the employer shall determine if it is a hazardous chemical [as defined in section 2]. If the chemical is determined to be hazardous, the employer shall provide appropriate training as required [see sections 11 and 15].*
- b. If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and shall implement [the applicable portion of the CHP].*
- c. If the chemical substance is produced for another user outside of the laboratory, the employer shall comply with the OSHA Hazard Communication Standard 29 CFR 1910.1200, including the requirements for preparation of MSDSs and labeling.*

10.2 - Additional Information from ACS [\[35\]](#)

OSHA's stated purpose is to have labels serve only as an immediate warning and a reminder that more detailed information is available elsewhere. Employees already should be aware that they are working with hazardous chemicals through in-house training programs. These programs will have informed employees of the nature of the hazards present in their workplace and of the availability of MSDSs as their principal source of information. When a chemical has several potential hazards, all of them need to be listed unless the substance is in a physical state that does not allow exposure to occur (e.g. physically bound). Labels may use symbols, pictures, and/or words to present their message.

10.3 - Chemistry Department Implementation of the OSHA Labeling Requirement [\[36\]](#)

- a. If the substance is a commercial product in its original container, the manufacturer's label should not be removed or defaced. A label must contain the manufacturer's name, substance's chemical name, and appropriate hazard warnings. Common hazard designations are "carcinogen," "corrosive," "irritant," "sensitizer," and "toxic" - any of these properties warrant a hazard warning on the label.
- b. Large containers of stored chemicals, no matter what the source, must be labeled with the same information as above, i.e. name and hazards.
- c. If the lab area is accessed only by authorized trained workers, chemicals may be transferred to temporary containers that are labeled simply with an identifying name, formula, or abbreviation. Note that such practice requires unsupervised cleaning staff not be admitted to the lab.
- d. For unstable substances that must be tested after a period of storage, such as ethers for peroxide formation, it is important to note on the label the date the container was initially opened. Date-labeling is discussed in [Section 7](#).
- e. New chemical substances [\[37\]](#)
 - i. The PI is responsible for ensuring that newly synthesized chemicals are used within his or her own lab (or that of a University colleague) and are properly labeled.
 - ii. If the substance is to be transferred off-campus, the PI must comply with the University Hazard Communication Right-to-Know Program, including labeling and insofar as possible preparation of the MSDS.
 - iii. An abbreviation system coded to a notebook or other reference may be used for labels on small containers of newly synthesized chemicals. Large containers should be labeled as described earlier in this section.
 - iv. If the hazards of a substance produced in the lab are unknown, the substance must be assumed to be hazardous. The PI should develop a preliminary MSDS at the earliest opportunity, and add to it as properties of the substance become known (see [Section 9](#)).
 - v. Newly synthesized chemicals may be subject to the requirements of the EPA Toxic Substances Control Act (TSCA) 40 CFR 700 [\[38\]](#). Chemical substances manufactured solely for non-commercial research and development purposes are exempt from TSCA reporting requirements unless their production is for eventual commercial purposes. TSCA requires that notification of health and safety hazards for chemical substances used for research must be made to all persons handling the chemical, particularly if the chemical is sent to another laboratory on or off campus. Contact the Department of Environmental Health and Safety CHO for specific requirements.

10.4 - Chemistry Department Implementation of the OSHA MSDS Requirement (see [Section 9](#))

References:

[35] ACS OSHA Hazard Communication Standard.

[36] Adapted from the UIUC and the Stanford CHPs.

[37] Adapted from the Stony Brook University CHP p 15.

[38] EPA Part 370 Hazardous Chemical Reporting.

(11) Training Requirements

11.1 - OSHA Requirement

The employer shall provide employees with . . . training to ensure that they are appraised of the hazards of chemicals present in their work area. Such information shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. The frequency of refresher information and training shall be determined by the employer.

[Training shall include:]

- a. Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.).*
- b. Physical and health hazards of chemicals in the work area.*
- c. Measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.*
- d. Applicable details of the employer's written CHP.*

11.2 - Chemistry Department Implementation of the OSHA Requirement [\[39\]](#)

A Department-specific orientation is offered at the beginning of the Fall semester. Upon joining the Department, every member must attend this safety orientation, which is conducted by the Environmental Health and Safety Chemical Hygiene Officer. The attendance requirement applies to faculty, post-doctoral candidates, graduate and undergraduate students, and office and shop staff. Janitorial staff will be trained according to University CHP requirements.

Upon request, the EHS CHO will conduct an orientation for individuals who join the Department at a time other than the beginning of the Fall semester. This orientation will take place within 1-2 weeks of the request. The person responsible for making the arrangement is the PI for self or students; Laboratory or Instructional Supervisor for TAs; post-doc for self; or Director of Laboratories for staff. Attendees at one of these specially-scheduled orientations must also attend the fire safety portion of the next earliest departmental Fall orientation.

In its orientation, EHS will cover rights and responsibilities under the OSHA Standard, and procedures for working with chemicals. The PI must provide lab-specific safety training.

11.3 - Safety Orientation Organization

- a. The CHO, working with members of the Chemistry Department Safety Committee, will develop the contents of the orientation and will arrange the time and location.
- b. The CHO will take attendance at the orientation and retain the record. The Department may take punitive action against workers who neglect to attend.

11.4 - Safety Orientation Topics

- a. Contents of the applicable OSHA Standard(s), and how the University meets its responsibilities.
- b. Availability of the Chemistry Department Chemical Hygiene Plan, MSDSs, and additional resources on all aspects of laboratory health and safety relevant to employee exposure.
- c. How to read an MSDS.
- d. Physical and health hazards of chemical classes (flammables, reactives, carcinogens, corrosives, etc.) and general procedures for handling, storing, and disposing of these materials.
- e. Methods and observations to detect the presence or release of hazardous chemicals.
- f. Signs and symptoms of exposure to chemicals and availability of medical consultations and exams.
- g. Measures to protect from health hazards - use of fume hoods and personal protective equipment.
- h. Protocol for dealing with faulty hoods and equipment and with lack of proper safety equipment.
- i. Special operating procedures to be used for extremely hazardous chemicals.
- j. How to conduct a hazard evaluation of lab operations.
- k. How to conduct a laboratory inspection.
- l. OSHA PELs and other recommended limits (by the National Institutes for Occupational Safety and Health, and by ACGIH).
- m. First aid and fire safety.
- n. Use of emergency equipment.
- o. Filing incident report forms.

11.5 - Distribution of Safety Materials

At the beginning of their relationship with the Department, all members will receive copies of the American Chemical Society Safety in Academic Chemistry Laboratories and the Department-specific safety supplement.

The following materials will be distributed by the CHO at each Fall safety orientation session:

- a. OSHA Standard fact sheet.
- b. List of emergency telephone numbers including that of the CHO.
- c. Sample MSDSs and fact sheets on how to read them.
- d. Chemical storage scheme chart.
- e. List of hazard classes and chemical examples.
- f. Hazard review checklist.
- g. Waste disposal guideline sheet.
- h. Laboratory inspection form.
- i. Incident report form.

11.6 - Department Safety Quiz

In order to hold a TA position, or to receive a lab or shop key, a Department member must pass a safety quiz based on the ACS manual and the Department supplement. At the time a key is issued, the recipient must sign a voucher, indicating agreement to read the Chemical Hygiene Plan and to observe its standards.

Records of quiz passes will be kept by the office of the Director of Laboratories.

11.7 - Safety Training Responsibilities of the PI

The PI must ensure that all workers are trained to deal with laboratory hazards. The training requirement may be satisfied in part by having workers attend either the EHS Fall safety orientation or another specially scheduled orientation as described in section 11.2. Additionally, the PI must provide the lab-specific training specified in the CHP, some points of which are listed here:

- a. Location and contents of the OSHA (29 CFR) Laboratory Standard and the departmental CHP.
- b. Standard and lab-specific operating procedures.
- c. Location of MSDSs and how to read them.
- d. Use of hoods and assessment of their function.
- e. Emergency equipment and procedures.
- f. Emergency phone numbers.
- g. Responsible waste disposal.

The PI will arrange special training for his/her workers whenever novel hazards are introduced, or when lab conditions or practices change. Such refresher training will be scheduled or integrated into other lab activities as needed. Assistance may be provided by the CHO.

The PI is responsible for ensuring that all workers receive the EPA training (see the next section).

11.8 - EPA Hazardous Waste Training

In addition to the above OSHA-mandated training requirements, the EPA has its own hazardous waste training requirements. Everyone who generates or handles hazardous waste must receive training in EPA-approved procedures. The initial training must be updated annually, most conveniently by completing a review at the EHS website. [\[40\]](#)

References:

[39] Adapted from the Stony Brook University CHP pp 66-74.

[40] Environmental Health and Safety < <http://www.ehs.sunysb.edu/waste/certs.asp>> accessed May 02.

(12) Record Keeping

12.1 - OSHA Requirement

a. The employer shall establish and maintain for each employee an accurate record of any measurements taken to monitor employee exposures and any medical consultation and examinations including tests or written opinions required by [the OSHA] Standard.

b. The employer shall assure that such records are kept, transferred, and made available in accordance with OSHA Employee Exposure Standard 29 CFR 1910.1020. [41]

12.2 - Maintenance of Records

Records will be maintained as follows:

- a. University CHO
 - i. Attendance at training sessions.
 - ii. Incidents.
 - iii. Medical records required by the OSHA standard.
- b. Chemistry Department Director of Laboratories
 - i. Safety quiz passes.
 - ii. Incidents.
- c. Chemistry Department Chair - inspections by the departmental Safety Committee.
- d. PI
 - i. Inventory.
 - ii. Lab-specific policies and SOPs.
 - iii. MSDSs for new materials.

References:

[41] OSHA Regulations (Standards-29 CFR) Access to Employee Exposure and Medical Records - 1910.1020 <http://www.osha-slc.gov/OshStd_data/1910_1200.html> accessed November 00.

13) Provisions for Medical Consultation and Examinations

13.1 - OSHA Requirement [42]

All employees who work with hazardous chemicals must be given the opportunity to receive medical attention, including any follow-up examinations which the examining licensed physician determines to be necessary under certain circumstances. Medical examinations and consultations must be provided without cost to the employee, without loss of pay and at a reasonable time and place. The employer must provide certain information to the physician, including the identity of the hazardous chemicals, a description of the conditions under which the exposure occurred, and a description of the signs and symptoms of exposure that the employee is experiencing.

13.2 - University Implementation of the OSHA Requirement [43]

a. The University will provide all workers using hazardous chemicals the opportunity to receive appropriate medical consultations and examinations, including follow-up examinations which the physician deems necessary, under any of the following circumstances:

- i. Whenever the worker develops signs and symptoms associated with a hazardous chemical to which he or she may have been exposed.
- ii. Whenever OSHA-regulated substances are measured above permissible exposure limits (PELs).
- iii. When an event takes place in the work area (such as a spill, leak, or explosion) resulting in the likelihood of a hazardous exposure.

b. The medical examination and consultation must conform to the following rules:

- i. It is performed by or under the direct supervision of a licensed physician. Every effort should be made to refer workers to licensed physicians who have been trained to recognize signs and symptoms of chemical-related exposure and disease. For this reason, a first choice of provider is the Center for Occupational and Environmental Medicine, Stony Brook Medical Park, phone 444-2167.
- ii. It is provided at no cost to the worker.
- iii. It is provided without loss of pay to the worker.
- iv. It is performed at a reasonable time and place for the worker. Every effort should be made to schedule medical examinations and consultations during the worker's regularly scheduled work hours, provided there is no undue delay in medical attention.

c. Note: The worker may choose to forego the consultation and/or the examination.

d. If possible, the PI should provide to the examining physician the information listed below; in the PI's absence, the information may be provided by the lab worker him- or herself, or another knowledgeable individual.

- i. The identity (preferably, generic and trade names) of the hazardous chemicals to which the worker may have been exposed, and if available, the MSDS references for these chemicals.
- ii. A description of conditions under which the exposure occurred, including quantitative exposure data if available.
- iii. A description of signs or symptoms of exposure experienced by the worker. In the event that the worker is unable to communicate, others in the lab may be able to recall symptoms either that they observed or that they know the worker complained of.

e. Within proximity of the exposure, other workers should be interviewed to determine if they experienced similar symptoms.

f. The University must obtain a written opinion from the examining physician. The written opinion must include the information on the following list. It must not reveal specific findings of diagnoses unrelated to occupational exposure.

- i. Any recommendation for medical follow-up.
- ii. Results of the medical examinations and associated tests.
- iii. Any medical condition revealed in the course of the examination which may place the worker at increased risk as a result of exposure to hazardous chemicals.
- iv. A statement confirming that the worker has been informed by the physician of the results of the consultation or examination, and of any medical condition that may require further examination or treatment.

g. Medical records will be kept by the EHS Chemical Hygiene Officer for 40 years. Medical records are confidential information and must be kept in a secured location.

References:

[42] OSHA Fact Sheets 01/01/1995. The OSHA standard is too lengthy to be reproduced in its entirety here, but may be found at the OSHA (29 CFR) Laboratory Standard website. Its provisions are closely reflected in the Implementation section.

[43] Adapted from the Stony Brook University CHP pp 64-65.

(14) Procedures Requiring Prior Approval

14.1 - OSHA Requirement

The Chemical Hygiene Plan shall include . . . the circumstances under which a particular laboratory operation, procedure, or activity shall require prior approval from the employer or the employer's designees before implementation.

14.2 - Chemistry Department Implementation of the OSHA Requirement

- a. Departmental training requirements ensure that all lab workers have received traditional, sensible guidelines for chemistry laboratory practice. However, there is diversity among lab workers, depending on their educational level and years of experience. With this in mind, the PI should establish and communicate basic ground rules for when individuals require prior approval and from whom (for example, an undergraduate from a supervising graduate student).
- b. OSHA mandates special provisions for handling particularly hazardous substances (see [Section 15](#)). A lab worker using one of these substances for the first time is required to get prior approval from the PI. [\[44\]](#)
- c. Certain hazardous procedures, for example those involving radioactive or biohazardous materials, recombinant DNA, or animals, may require prior University or external approval. Information is available from EHS.
- d. The presence in wastes of multiple hazards (chemical, radioactive and/or bio-) often complicates disposal. Because there may be no convenient outlet for such wastes, the PI should contact EHS prior to conducting experiments that may generate them.

References:

[44] The remainder of this section is adapted from the UIUC CHP.

(15) Work with Particularly Hazardous Substances

15.1 - OSHA Requirement

The Chemical Hygiene Plan must include . . . provisions for additional employee protection for work with particularly hazardous substances. These [substances] include "select carcinogens," [45] reproductive toxins, and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate: establishment of a designated area; use of containment devices such as hoods or glove boxes; procedures for safe removal of contaminated waste; and decontamination procedures.

15.2 - Chemistry Department Implementation of the OSHA Requirement

Specialized hazards differ from lab to lab. For this reason, each PI must ensure that appropriate measures are taken to minimize risks and prepare for emergencies. Section 15 [46] is the plan for dealing with these hazards.

15.3 - Designation of Areas for Work with High-Hazard Substances

- a. Each laboratory utilizing these substances must designate an area for this purpose and mark this area with an appropriate hazard sign. The designated area may be an entire laboratory, an area of the laboratory, or a device such as a hood or glove box. The designated area should be marked with a "danger (specific agent), authorized personnel only," or comparable warning sign.
- b. An emergency response plan should be posted at the designated area.
- c. Detection equipment may be required in laboratories where highly toxic chemicals (especially poisonous gases) are used.

15.4 - Use of Containment Devices such as Fume Hoods or Glove Boxes

- a. Work with carcinogens, reproductive toxins and acutely toxic chemicals should be performed within a functioning hood, glove box, sealed system, or other containment device designed to minimize exposure to these substances. The exhaust air from the ventilation systems may require scrubbing before being released into the atmosphere. In all cases, work with these types of chemicals should be done in such a manner that the OSHA PELs or similar standards are not exceeded.
- b. The ventilation efficiency of the containment device, and the operational effectiveness of mechanical and electrical equipment used to contain or manipulate these special substances, should be evaluated periodically by the laboratory personnel at intervals determined by the PI.
- c. Compressed gas cylinders that contain acutely toxic chemicals should be kept in ventilated gas cabinets.

15.5 - Personnel

- a. It is the responsibility of the PI to train all workers in the high-hazard area with regard to symptoms and deleterious effects of exposure. The training is required for all those who may be exposed, even if they do not actually work with the substances.
- b. Laboratory workers using these substances must have access to appropriate personal protective equipment (available at no expense to the workers) and must be trained on how to properly utilize this equipment.
- c. If respirators are to be worn, special training is required - contact EHS (see section 5.7).

15.6 - Specialized Handling Procedures

- a. Quantities of these chemicals used and stored in the laboratory should be minimized, as should their concentrations in solution or mixtures.
- b. Special precautions to avoid release of and exposure to these chemicals should be observed. For instance, volatile substances should be kept cool and contained. Gas cylinders should have properly functioning valves, check valves, regulators, containment which can withstand pressure buildup, and appropriate piping. Dispersive solids should be kept in closed containers and used in places with minimal air currents. Appropriate contact materials should be used to avoid static charging.
- c. Emergency response planning for releases or spills should be prepared by the PI and included in the training of the lab workers and others who may be affected in the building. EHS and the fire department should be involved in this planning.

15.7 - Procedures for Safe Removal of Contaminated Waste and Decontamination

- a. Procedures must be reviewed and approved by the PI.
- b. Treatment of waste products to lessen or eliminate their toxicity as part of the experimental protocol is encouraged as a way of minimizing health hazards and the amount of waste, only if such treatment can be performed safely.
- c. Before initiating disposal, treatment, or recycling of a hazardous waste, generators must contact EHS to ensure that the process meets safety, regulatory, and record keeping requirements.
- d. The designated working area shall be thoroughly decontaminated and cleaned at regular intervals determined by the PI.

15.8 - Hazardous Procedures

In his or her own lab area, the PI is responsible for establishing policies for operations that may present special hazards, such as the use of lasers or high-pressure systems.

References:

[45] The term "select carcinogens" is defined in [Section 2](#) of the CHP

[46] Adapted from the UIUC CHP.

(16) References

Links were active as of Feb 14, 2003

1. American Chemical Society OSHA Hazard Communication Standard
<http://www.acs.org:80/government/publications/tech_oshastandard.html> accessed July 00.
2. American Chemical Society, **Safety in Academy Chemistry Laboratories, 5th/6th ed.**, Washington DC, 1991/95.
3. [EPA Part 370 Hazardous Chemical Reporting: Community Right-to-Know](#)
4. [EPA Part 355.30 Emergency Planning and Notification](#)
5. Kingsley, W. K., and Phifer, R., **Living with the Laboratory Standard: A Guide for Chemical Hygiene Officers**, American Chemical Society, Washington DC, 1998.
6. Merck Research Laboratories, **The Merck Index, 12th ed.**, Whitehouse Station NJ, 1996.
7. National Fire Protection Agency, **Standard 45 on Fire Protection for Laboratories Using Chemicals, 2000 Edition.**
8. National Research Council, **Prudent Practices for Handling and Disposing of Hazardous Chemicals in Laboratories**, National Academy Press, Washington DC, 1995.
9. OSHA Fact Sheets 01/01/1995 Occupational Exposure to Hazardous Chemicals in Laboratories <http://www.osha-slc.gov/OshDoc/Fact_data/FSNO95-33.htm> accessed July 00.
10. [OSHA Laboratories](#)
11. [OSHA Permissible Exposure Limits](#)
12. [OSHA Regulations \(Standards-29 CFR\) Access to Employee Exposure and Medical Records - 1910.1020](#)
13. [OSHA Regulations \(Standards-29 CFR\) Flammable and Combustible Liquids - 1910.106](#)
14. [OSHA Regulations \(Standards-29 CFR\) Hazard Communication - 1910.1200](#)
15. [OSHA Regulations \(Standards-29 CFR\) Occupational Exposure to Hazardous Chemicals in Laboratories - 1910.1450](#)
16. [OSHA Regulations \(Standards-29 CFR\) Toxic and Hazardous Substances - 1910 Subpart Z](#)
17. [OSHA Technical Links: Personal Protective Equipment](#)
18. **Stanford University Chemical Hygiene Plan** (unpublished).
19. [Stony Brook University Chemical Hygiene Plan](#)
20. Stony Brook University Environmental Health and Safety Waste Training <<http://www.ehs.sunysb.edu/waste/certs.asp>> accessed May 02.
21. [UIUC Model Chemical Hygiene Plan](#)
22. [University of Vermont Chemical Hygiene Plan for Laboratories Using Hazardous Chemicals](#)

(17) Appendix I

Purpose and Scope of the OSHA (29 CFR) Laboratory Standard

The ACS reference, Living with the Laboratory Standard, gives a clear description of this topic. Selections are given here.

The primary purpose of the OSHA Laboratory Standard, as described in 29-CFR 1910.1450, is to provide a means to protect laboratory workers from exposure to hazardous chemicals. The Standard requires employers to develop a written plan, called a Chemical Hygiene Plan, which details how the facility will control exposures. As a performance-oriented Standard, the administrative and engineering controls utilized by the facility are to be uniquely designed to fit the laboratory's specific circumstances and procedures. In other words, while the Hazard Communication Standard (which exempts laboratories) details the information to be provided to employees about hazards, the Laboratory Standard leaves the design of the program up to the facility's management. While there are specific areas of concern which must be addressed, there is considerably more flexibility allowed the facility than when the Hazard Communication Standard applies. The Laboratory Standard does not supersede or replace other OSHA regulations such as those dealing with fire, electrical, or reporting.

...

Much has been made of the term "performance-oriented" with respect to the Laboratory Standard. When OSHA first issued the Hazard Communication Standard to address employees' "right-to-know" regarding the hazardous substances present, the assumption was that employees had little knowledge about chemical hazards. This did not take into account the academic chemistry training and hazard awareness inherent to those who work in the laboratory; as a result, laboratory facilities were exempted. When attempting to apply the same objectives to laboratory workers in a different Standard, however, it was realized that laboratory facilities themselves were too different from each other to regulate uniformly. Thus, the idea of a performance-oriented Standard was developed. Perhaps a better description might be "achievement-based," as OSHA expects laboratories to achieve a level where routine operations are accomplished safely and chemical exposures are minimized, utilizing the special skills and knowledge of the laboratory employee. Still, the structure had to be in place and additional "teeth" had to be put into the Standard to force laboratories to pay more than lip service to the requirements. The OSHA Laboratory Standard became the first Standard to specifically require the Chief Executive Officer of the facility to hold the ultimate responsibility for implementation.

...

The basis of the [Chemical Hygiene Plan] is an evaluation of the hazards of the chemicals used in the laboratory. While the Standard provides the basic elements that the plan must cover, how these elements are covered is dependent on the facility's policies and procedures. The employer, however, is required to provide a workplace where laboratory procedures and equipment conform to generally accepted laboratory safety practices, or to be able to show that these are effective in minimizing exposures.

(18) Appendix II

**SUNY STONY BROOK CHEMISTRY DEPARTMENT
SAFETY INFORMATION SUPPLEMENT
2003 WEB-POSTED REVISION**

INTRODUCTION TO OUR SAFETY PROGRAM

As a member of the Chemistry Department, you are covered by the Department Chemical Hygiene Plan (webposted and in the Chemistry Library). You should become familiar with the aspects of the plan that apply to your situation.

You will also receive a copy of the most recent edition of Safety in Academic Chemistry Laboratories, published by the American Chemical Society. Read this manual and retain it as a reference. It clearly summarizes much useful commonsense information. However, there are of course facts you will need to know that are specifically pertinent to operations at Stony Brook. Such material is presented here.

At the beginning of your relationship with our Department, you will be required to pass a safety quiz based on the ACS manual and this supplement. You will also be given a voucher to sign, indicating your agreement to abide by the provisions of the Chemical Hygiene Plan and to observe accepted standards of laboratory safety.

OPPORTUNITIES FOR EDUCATION IN SAFETY

Orientation and Other Training

Towards the beginning of each academic year, our Department offers a safety orientation program in cooperation with the Department of Environmental Health and Safety (EH&S). Topics include chemical safety, first aid, and fire safety. In addition to attending lectures and discussions, participants practice using a fire extinguisher. The Department Chemical Hygiene Plan requires attendance for all new faculty, staff, post-docs, and students.

Upon request, EH&S will conduct an orientation for individuals who join the Department at a time other than the beginning of the Fall semester. Attendees at one of these specially-scheduled orientations must also attend the fire safety portion of the next earliest Department Fall orientation.

In addition to the above, all personnel who handle hazardous waste must receive specialized training for this purpose as approved by the US Environmental Protection Agency (EPA). The initial training must be updated annually, most conveniently by completing the Hazardous Waste Management Training Program at the EH&S website (<http://www.ehs.sunysb.edu>).

The Chemistry Library

The Chemistry Library has safety references shelved in a central location.

The Safety Newsletter

Periodically by email, you will receive our newsletter titled Safety News You Can Use. Please read it to keep up to date on the important topics that affect your work.

PERSONNEL WITH SAFETY INTERESTS AND RESPONSIBILITIES

The Departmental Safety Committee

The membership of the Safety Committee rotates and includes faculty and staff. The Committee serves to provide information and assistance. You are welcome to share your concerns with any Committee member. The Committee does not have any unique safety responsibilities. Safety is the responsibility of all Department members.

Graduate Student Participants

Second-year graduate students may participate in the annual safety inspections of research labs.

The Director of Laboratories and Building Manager

The Director of Labs and the Building Manager are often consulted when safety problems arise. Routine matters are best handled by a call to the Director's office (2-7900).

Environmental Health and Safety

This department has broad responsibilities for safety on campus, including formulating policies and procedures in accordance with state and federal laws. EH&S is useful as a source of information (phone 2-6410).

University Police

This is the campus security unit (333 from a campus phone or 631-632-3333 from a non-campus phone. The University Police can also be reached from all "blue light" campus phones).

EMERGENCIES, ACCIDENTS, INJURIES:

PREVENTION OF, PREPARATION FOR, AND DEALING WITH THEM

Reference Phone Numbers

Numbers you might need in an emergency are found at the end of this supplement. A more complete list, for posting by the lab phone, is found in the print version of the Chemical Hygiene Plan.

Hood Alarm Bells

When the hood alarm bell rings and the red light is on, the hood is not operating. The bell may be silenced by flipping the switch, but the hood remains off while the light is on. Please take appropriate precautions for a non-operational hood.

When the bell rings again and the light goes off, the hood has resumed operation. The bell may again be silenced by flipping the switch.

Summary of Procedures for Dealing with a Fire

1. First, activate the fire alarm in the nearest stairwell.
2. From a safe place, call 333 to report the location and nature of the fire.
3. If you know the correct way to deal with your fire, and if you feel confident you can handle it, return to the scene and put your plan into action.
4. If you cannot handle the fire yourself or quickly find someone who can do so, then you should evacuate the building along with everyone else. See the instructions in the next section.

Fire Drills and Evacuation of the Building

Our procedure for evacuating the building is the same for a fire drill as a genuine emergency:

1. When the alarm bell begins intermittent ringing, plan to leave the building immediately. Instructional staff are responsible for evacuating their students in an orderly fashion.
2. All hoods in the building shut down when a fire alarm is activated. For this reason, if at all feasible, stabilize your reactions before leaving the area. That is, unplug heating/stirring devices, cover open containers, and close hood doors.
3. If you are the last one to leave the lab and you can do so quickly, close all connecting doors; place a fire extinguisher outside the lab door; and close your exit door behind you.
4. If a Fire Warden is managing traffic, follow his or her directions.
5. Exit at the nearest stairway. Do not use the elevator.
6. Stand at least 100 feet from the building. Do not re-enter the building until the "all clear" signal has been given.

Personal Emergencies

1. For emergencies requiring medical attention, call 333 and get the ambulance; or send the injured on foot to the infirmary with a trustworthy escort.
2. Initiate evacuation of the area if necessary, according to routine procedures.
3. If the incident takes place in an instructional lab, the faculty member assigned to that section is responsible for decisions in an emergency. The faculty member, or coordinator if there is one, is responsible for having the report filed.
4. For all serious accidents, the injured should fill out an SUSB form 3019 R3 as soon as is practical. If the injured is unable to do so, or if there is no injury involved (an accident such as a fire or spill), the form should be completed by an individual who is well-informed of the circumstances. The form is obtainable from the office of the Director of Labs and after completion should be returned to that office.

Noxious Chemicals in the Building

Our procedure for reporting potential problems follows:

1. If you will be working with a chemical that is particularly hazardous or noxious, please inform the Building Manager or (2-7956) or the Director of Labs' office (2-7900) in advance. The information will facilitate a prompt response if a problem should arise.
2. If you have a spill of or another problem with a volatile offending substance, call the Building Manager or the Director's office; staff will inform Environmental Health and Safety personnel if appropriate.
3. If you have a problem and there is no answer at 2-7900, you should call EH&S through the University Police at 333.
4. If the situation seems to warrant it, the building will have to be evacuated. If the chemical is not identified, or if its odor is bothering you, it is up to you to decide whether or not to leave the area. If you are in doubt, consult others who are more informed.

WASTE HANDLING

The Environmental Protection Agency sets regulations for waste storage and disposal. A summary of their requirements follows. More complete information is contained in the Chemical Hygiene Plan.

Waste Storage

1. Follow prudent practice to segregate waste according to hazard class, disposal requirements, etc. Have separate containers for halogenated and non-halogenated materials and for corrosives.
2. Label each waste container. The specific wording HAZARDOUS WASTE must be used unless the contents are non-hazardous by EPA standards.
3. Remove or completely efface a previous label - that is, do not double-label.
4. On each label, give the hazard class (for example, corrosive). List the contents, as described in the next section.
5. EH&S requires that contents greater than 1% be specifically listed on the label or the manifest.
6. Keep waste containers tightly closed with screwcaps other than at times when material is being transferred to them.

7. Provide secondary containment that holds the volume of the largest container or at least 10% of the volume of all containers in the accumulation area.
8. Do not transfer waste to a larger container for the purpose of extending the storage period.
9. Do not transfer waste from the room in which it was generated, other than for final disposal. For an exception to this rule, you may establish a 90-day storage area. You must contact EH&S to inform them of this storage area and obtain the additional information required for maintenance.

Waste Disposal

1. Do not pour chemical waste down the drain.
2. Do not attempt to process waste so as to make it less hazardous, but rather dispose of it according to EPA regulations. The only exception is simple neutralization of acids or bases.
3. Dispose of waste within one week of a container's being filled. EH&S has a convenient pickup every Wednesday from 10:00 to 10:30 at the Chemistry Building loading dock.
4. At pickup, waste containers must bear the EH&S label, with hazard boxes checked. Manifests must accompany all waste for disposal. Labels and manifests may be obtained from the office of the Director of Labs.
5. There are certain situations in which a container should not be emptied for bulking because of a specific hazardous component. In addition to checking the applicable boxes on the EH&S label, clearly and prominently write the name of the specific compound and its hazard, and the words "not for bulking."
6. Only containers that are acceptable for disposal will be taken. Flasks, beakers, etc. are not acceptable containers. Acceptable containers must be tightly closed and in good condition. EH&S staff have the final decision on what an acceptable container is.

Glass

The container should be a sturdy cardboard box labeled GLASS. In addition to broken glass, the box may be used for clean empty bottles (rinsed, uncapped, labels removed or crossed out). Do not overfill. Seal it for disposal.

Syringes, Needles, Razor Blades

There is an approved red container, labeled SHARPS; it is available from the Chemistry Department stockroom. Note that a disposable syringe (not simply its needle) must be discarded intact in this container.

PERSONAL PROTECTION

Eye Protection

The type of protection - safety glasses or goggles - depends on the hazard level. If there is a splash hazard, goggles should be worn. If there is a radiation hazard, specialized eye protection may be necessary.

Contact Lenses

The American Chemical Society Committee on Chemical Safety has recently revised its contact lens policy. The revision is contained on pp 3-4 of the ACS publication, *Safety in Academic Chemistry Laboratories*, sixth edition (blue cover version). A portion is quoted in the next paragraph. Please refer to the source if you need further information.

Recent studies and experience have suggested that . . . contact lenses do not increase risks but can actually minimize or prevent injury in many situations. Because of the ever-increasing use of contact lenses and the benefits they provide, the American Chemical Society Committee on Chemical Safety, having studied and reviewed the issue, is of the consensus that contact lenses can be worn in most work environments provided the same approved eye protection is worn as required of other workers in the area.

Gloves

It is appropriate to wear gloves in many laboratory situations. Gloves of different materials from different manufacturers have different degradation and permeability rates. Contact EH&S if you need assistance in glove selection.

Gloves should not be worn outside of the laboratory. Non-lab workers should not be exposed to chemical contact from using, for example, the lavatory facilities or the elevator buttons.

WEB-POSTED SUMMARY OF EMERGENCY INFORMATION

A more complete version, useful for posting, is found in the print Chemical Hygiene Plan.

Useful reference numbers are listed in the inside front cover of the ACS publication, *Safety in Academic Chemistry Laboratories*.

EMERGENCY NUMBERS - FIRE, POLICE, AMBULANCE - CALL 333

For outside lines, key "9," and for long-distance, also key "1."

" University Infirmary 2-6740

" University Hospital Emergency Room 4-2465

" 24-Hour Services

Long Island Regional Poison Control Center 800-222-1222

Nassau County Medical Center Poison Control 516-542-2323

New York City Poison Control Center 212-764-7667

" Director of Laboratories 2-7900

" Secretary to the Director of Labs 2-7900
" Building Manager 2-7956

SAFETY INFORMATION ON THE NET

The Environmental Health and Safety site is www.ehs.sunysb.edu. For more general safety information, see links to the Chemistry Department Homepage. Specifically, to get information on toxicology, follow this path: Chemistry Homepage Other Links Chemistry Related Resources on the Net Toxicology and Safety (The Vermont site, for example, is good for Material Safety Data Sheets.)

SUMMARY OF PROCEDURES FOR DEALING WITH A FIRE

1. First, activate the fire alarm in the nearest stairwell.
2. From a safe place, call 333 to report the location and nature of the fire.
3. If you know the correct way to deal with your fire, and if you feel confident you can handle it, return to the scene and put your plan into action.
4. If you cannot handle the fire yourself or quickly find someone who can do so, then you should evacuate the building along with everyone else. See the instructions in the next section.

FIRE EMERGENCIES

1. When the alarm bell begins intermittent ringing, plan to leave the building immediately. Instructional staff are responsible for evacuating their students in an orderly fashion.
2. All hoods in the building shut down when a fire alarm is activated. For this reason, if at all feasible, stabilize your reactions before leaving the area. That is, unplug heating/stirring devices, cover open containers, and close hood doors.
3. If you are the last one to leave the lab and you can do so quickly, close all connecting doors; place a fire extinguisher outside the lab door; and close your exit door behind you.
4. If a Fire Warden is managing traffic, follow his or her directions.
5. Exit at the nearest stairway. Do not use the elevator.
6. Stand at least 100 feet from the building. Do not re-enter the building until the "all clear" signal has been given.

PERSONAL SAFETY EMERGENCIES

1. For emergencies requiring medical attention, call 333 and get the ambulance; or send the injured on foot to the infirmary with a trustworthy escort.
2. Initiate evacuation of the area if necessary, according to routine procedures.
3. If the incident takes place in an instructional lab, the faculty member assigned to that section is responsible for decisions in an emergency. The faculty member, or coordinator if there is one, is responsible for having the report filed.
4. For all serious accidents, the injured should fill out an SUSB 3019 form as soon as is practical. If the injured is unable to do so, or if there is no injury involved (an accident such as a fire or spill), the form should be completed by an individual who is well-informed of the circumstances. The form is obtainable from the office of the Director of Labs and after completion should be returned to that office.

(19) Appendix III

**Lab and Building Security
Excerpted from the Chemistry Department Safety Newsletter Issue #7
October 24, 2001**

Doors

1. Chaseway end doors must be kept locked at all times. They may not be propped open at any time.
2. All doors must be locked when offices and labs are unoccupied. You may leave the room for a few minutes, but if you will not be returning shortly, you must lock the door behind you. Note that locked door status will be checked by the Safety Committee, and problems will be reported to the Director of Labs.
3. When labs are occupied, doors should be kept open for safety reasons. In an emergency, you may need to call for help from neighbors, or to quickly access the phone in a nearby lab - some of the labs do not have phones. Moreover, OSHA standards require unimpeded access to safety showers without an intervening closed door and in our building safety showers are located in the corridors outside the labs.
4. In the instructional labs, two doors will be kept open when classes are in session.

Storage

1. Radioactive materials and pathogens must be locked up and secured at all times.
2. Chemicals stored in chaseways must be kept out of view. For this reason, glass-door cabinets and open shelving may not be used for chemical storage in chaseways.
3. In the following categories, chemicals stored in labs will also be out of view:
 - a. Hazardous chemicals whose names would be popularly recognized, such as cyanide, strychnine, arsenic, etc.
 - b. Large containers (kilogram quantities) of highly toxic or otherwise hazardous chemicals.
 - c. Large containers of even moderately dangerous chemicals if not frequently used.

Building Security in the Evenings and on Weekends

1. You have been issued a building key. It is for your use only. Never admit another person into the building at times when the building is locked, unless you know the person has a right to access.
2. Further building security rules will be implemented in the near future.

(20) Appendix IV

Summary of Main Responsibilities of the Principal Investigator, Laboratory Supervisor, or Instructional Supervisor

The Principal Investigator or Supervisor oversees the safe arrangement of his or her laboratory space and the conduct therein. Specific responsibilities are discussed in the referenced sections.

- 1) Know and implement the guidelines and procedures of the CHP.
 - 11.2, 11.7, 11.8
- 2) Ensure that new workers have received safety orientation (available from EHS). Check that all workers have received annual EPA hazardous waste training.
 - 7.9, 8.4, 11.6, 12.3, 14.2, 15.5, 15.8
- 3) Develop and communicate lab-specific safety policies, i.e. administrative controls.
- 4) Designate safety responsibilities at the laboratory level.
- 5) Ensure workers' access to standard operating procedures (SOPs).
 - 12.3
- 6) When an SOP must be substantially modified for a specific lab situation, or when one is not available, ensure that one be written, a record maintained, and lab workers be appropriately informed.
 - 9.4
- 7) Ensure lab workers' access to required sources of safety and hazard information - OSHA (29 CFR) Laboratory Standard, CHP, MSDSs.
 - 9.4, 10.3, 12.3
- 8) Prepare or update MSDSs for new substances or new hazards.
- 9) Conduct routine inspections of his/her laboratories.
 - 9.5, 12.3
- 10) Maintain an inventory of chemicals and provide it to designated departmental representatives.
- 11) Ensure responsible chemical storage and waste disposal.
 - 5.3, 5.4, 5.5
- 12) Provide and require the use of appropriate personal protective equipment (PPE).
 - 7.9, 15.4
- 13) Ensure that all appropriate controls including hoods and safety equipment are available and in good working order in his/her laboratories.
 - 8.2, 13.2
- 14) Implement exposure monitoring when appropriate.
- 15) Ensure that significant incidents occurring in his/her laboratories are reported to the CHO and that a written incident report is filed.
- 16) Include provisions for CHP compliance in grant proposals.

**SUNY STONY BROOK CHEMISTRY DEPARTMENT
SAFETY INFORMATION SUPPLEMENT
2005 REVISION**

INTRODUCTION TO OUR SAFETY PROGRAM

As a member of the Chemistry Department, you are covered by the [Department Chemical Hygiene Plan](#) (webposted and in the Chemistry Library). You should become familiar with the aspects of the plan that apply to your situation.

You will also receive a copy of [Safety in Academic Chemistry Laboratories](#), published by the American Chemical Society. Read this manual and retain it as a reference. It clearly summarizes much useful commonsense information. However, there are of course facts you will need to know that are specifically pertinent to operations at Stony Brook. Such material is presented here.

At the beginning of your relationship with our Department, you will be required to pass a safety quiz based on the ACS manual and this supplement. You will also be given a voucher to sign, indicating your agreement to abide by the provisions of the Chemical Hygiene Plan and to observe accepted standards of laboratory safety.

OPPORTUNITIES FOR EDUCATION IN SAFETY

Orientation and Other Training

Towards the beginning of each academic year, our Department offers a safety orientation program in cooperation with the Department of Environmental Health and Safety (EH&S). Topics include chemical safety, first aid, the Right-to-Know Law, waste management, and fire safety. In addition to attending lectures and discussions, participants practice using a fire extinguisher. The Department Chemical Hygiene Plan requires attendance for all new faculty, staff, post-docs, and students.

Upon request, EH&S will conduct an orientation for individuals who join the Department at a time other than the beginning of the Fall semester. Attendees at one of these specially-scheduled orientations must also attend the fire safety portion of the next earliest Department Fall orientation.

In addition to the above, all personnel who handle hazardous waste must receive specialized training for this purpose as approved by the US Environmental Protection Agency (EPA). This training must be obtained once while at Stony Brook, either by attending one of the frequent Hazardous Waste Management Courses or by completing the Hazardous Waste Management Training Program at the EH&S website (<http://www.stonybrook.edu/ehs/>).

The Chemistry Library

The [Chemistry Library](#) has safety references shelved in a central location.

PERSONNEL WITH SAFETY INTERESTS AND RESPONSIBILITIES

The Departmental Safety Committee

The membership of the Safety Committee rotates and includes faculty and staff. The Committee serves to provide information and assistance. You are welcome to share your concerns with any Committee member. The Committee does not have any unique safety responsibilities. Safety is the responsibility of all Department members.

The Director of Laboratories and Building Manager

Al Silverstein and Mike Teta are often consulted when safety problems arise. Routine matters are best handled by a call to Joan Conforte, Al's secretary (phone 2-7900).

Environmental Health and Safety

This department has broad responsibilities for safety on campus, including formulating policies and procedures in accordance with state and federal laws. EH&S is useful as a source of information (phone 2-6410).

University Police

This is the campus security unit (dial 911 from a campus phone or 631-632-3333 from a non-campus phone. The University Police can also be reached from all "blue light" campus phones).

**EMERGENCIES, ACCIDENTS, INJURIES:
PREVENTION OF, PREPARATION FOR, AND DEALING WITH THEM**

[Reference Phone Numbers](#)

Numbers you might need in an emergency are found at the end of this supplement. The list is intended for posting by a lab telephone or exit.

Hood Alarm Bells

When the hood alarm bell rings and the red light is on, the hood is not operating. The bell may be silenced by flipping the switch, but the hood remains off while the light is on. Please take appropriate precautions for a non-operational hood.

When the bell rings again and the light goes off, the hood has resumed operation. The bell may again be silenced by flipping the switch.

Summary of Procedures for Dealing with a Fire

1. First, activate the fire alarm in the nearest stairwell.
2. From a safe place, call 911 to report the location and nature of the fire.
3. If you know the correct way to deal with your fire, and if you feel confident you can handle it, return to the scene and put your plan into action.
4. If you cannot handle the fire yourself or quickly find someone who can do so, then you should evacuate the building along with everyone else. See the instructions in the next section.

Fire Drills and Evacuation of the Building

Our procedure for evacuating the building is the same for a fire drill as a genuine emergency:

1. When the alarm bell begins intermittent ringing, plan to leave the building immediately. Instructional staff are responsible for evacuating their students in an orderly fashion.
2. All hoods in the building shut down when a fire alarm is activated. For this reason, if at all feasible, stabilize your reactions before leaving the area. That is, unplug heating/stirring devices, cover open containers, and close hood doors.
3. If you are the last one to leave the lab and you can do so quickly, close all connecting doors; place a fire extinguisher outside the lab door; and close your exit door behind you.
4. If a Fire Warden is managing traffic, follow his or her directions.
5. Exit at the nearest stairway. Do not use the elevator.
6. Stand at least 100 feet from the building. Do not re-enter the building until the "all clear" signal has been given.

Personal Emergencies

1. For emergencies requiring medical attention, call 911 and get the ambulance; or send the injured on foot to the infirmary with a trustworthy escort.
2. Initiate evacuation of the area if necessary, according to routine procedures.
3. If the incident takes place in an instructional lab, the faculty member assigned to that section is responsible for decisions in an emergency. The faculty member, or coordinator if there is one, is responsible for having the report filed.
4. For all serious accidents, the injured should fill out an SUSB form 3019 R3 as soon as is practical. If the injured is unable to do so, or if there is no injury involved (an accident such as a fire or spill), the form should be completed by an individual who is well-informed of the circumstances. The form is obtainable from the office of the Director of Labs and after completion should be returned to that office.

Noxious Chemicals in the Building

Our procedure for reporting potential problems follows:

1. If you will be working with a chemical that is particularly hazardous or noxious, please inform Mike Teta (2-7956) or the Director of Labs' office (2-7900) in advance. The information will facilitate a prompt response if a problem should arise.
2. If you have a spill of or another problem with a volatile offending substance, call Dave or the Director's office; staff will inform Environmental Health and Safety personnel if appropriate
3. If you have a problem and there is no answer at 2-7900, you should call EH&S through the University Police at 911.
4. If the situation seems to warrant it, the building will have to be evacuated. If the chemical is not identified, or if its odor is bothering you, it is up to you to decide whether or not to leave the area. If you are in doubt, consult others who are more informed.

WASTE HANDLING

The Environmental Protection Agency sets regulations for waste storage and disposal. A summary of their requirements follows. More complete information is contained in the Chemical Hygiene Plan.

Waste Storage

1. Follow prudent practice to segregate waste according to hazard class, disposal requirements, etc. Have separate containers for halogenated and non-halogenated materials and for corrosives.
2. Label each waste container. The specific wording HAZARDOUS WASTE must be used unless the contents are non-hazardous by EPA standards.
3. Remove or completely efface a previous label – that is, do not double-label.
4. On each label, give the hazard class (for example, corrosive). List the contents, as described in the next section.
5. EH&S requires that contents greater than 1% be specifically listed on the label or the manifest. Use compound names, not formulas.
6. Keep waste containers tightly closed with screwcaps other than at times when material is being transferred to them.
7. Provide secondary containment that holds the volume of the largest container or at least 10% of the volume of all containers in the accumulation area.
8. Do not transfer waste to a larger container for the purpose of extending the storage period.
9. Do not transfer waste from the room in which it was generated, other than for final disposal. For an exception to this rule, you may establish a 90-day storage area. You must contact EH&S to inform them of this storage area and obtain the additional information required for

maintenance.

Waste Disposal

1. Do not pour any chemical waste down the drain.
2. Do not attempt to process waste so as to make it less hazardous, but rather dispose of it according to EPA regulations. The only exception is simple neutralization of acids or bases.
3. Dispose of waste within three days of a container's being filled. EH&S has a convenient pickup every Wednesday from 10:00 to 10:30 at the Chemistry Building loading dock.
4. At pickup, waste containers must bear the EH&S label, with hazard boxes checked. Manifests must accompany all waste for disposal. Labels and manifests may be obtained from Joan Conforte.
5. There are certain situations in which a container should not be emptied for bulking because of a specific hazardous component. In addition to checking the applicable boxes on the EH&S label, clearly and prominently write the name of the specific compound and its hazard, and the words "not for bulking."
6. Only containers that are acceptable for disposal will be taken. Flasks, beakers, etc, are not acceptable containers. Acceptable containers must be tightly closed and in good condition. EH&S staff have the final decision on what an acceptable container is.

Glass

The container should be a sturdy cardboard box labelled GLASS. In addition to broken glass, the box may be used for clean empty bottles (rinsed, uncapped, labels removed or crossed out). Do not overfill. Seal it for disposal.

Syringes, Needles, Razor Blades

There is an approved red container, labeled SHARPS; it is available from the Chemistry Department stockroom. Note that a disposable syringe (not simply its needle) must be discarded intact in this container.

PERSONAL PROTECTION

Eye Protection

The type of protection – safety glasses or goggles – depends on the hazard level. If there is a splash hazard, goggles should be worn. If there is a radiation hazard, specialized eye protection may be necessary.

Contact Lenses

The American Chemical Society Committee on Chemical Safety has recently revised its contact lens policy. The revision is contained on pp 3-4 of the ACS publication, [Safety in Academic Chemistry Laboratories, sixth edition](#) (blue cover version). A portion is quoted in the next paragraph. Please refer to the source if you need further information.

Recent studies and experience have suggested that . . . contact lenses do not increase risks but can actually minimize or prevent injury in many situations. Because of the ever-increasing use of contact lenses and the benefits they provide, the American Chemical Society Committee on Chemical Safety, having studied and reviewed the issue, is of the consensus that contact lenses can be worn in most work environments provided the same approved eye protection is worn as required of other workers in the area.

Gloves

It is appropriate to wear gloves in many laboratory situations. Gloves of different materials from different manufacturers have different degradation and permeability rates. Contact EH&S if you need assistance in glove selection.

Gloves should not be worn outside of the laboratory. Non-lab workers should not be exposed to chemical contact from using, for example, the lavatory facilities or the elevator buttons.

SAFETY REFERENCES 2004 REVISION – POST A COPY BY THE LAB PHONE EMERGENCY – FIRE, POLICE, AMBULANCE – CALL 911

Emergency on a cell phone - 631-632-3333

For an outside line, key "9," and for long-distance, also key "1."

- University Infirmary2-6740
- University Hospital Emergency Room4-2465
- 24-Hour Services

- Long Island Regional Poison Control Center800-222-1222
- Nassau County Medical Center Poison Control516-542-2323
- New York City Poison Control Center212-764-7667

- Director of Laboratories (Al Silverstein)2-7900

-Home 516-349-1125
- Secretary to the Director (Joan Conforte)2-7900
- Building Manager (Mike Teta)2-7956 – or see box below
- Research Director..... Work _____ Home _____

You can leave a message for Mike Teta at 2-7956. To reach him more quickly during regular hours, call Joan Conforte at 2-7900. His pager number is 631-349-0221. After the tone, type in the phone number at which you can be reached followed by the pound sign. In an emergency after hours, if you cannot reach Mike, call Al Silverstein at 516-349-1125.

SAFETY INFORMATION ON THE NET

The Chemistry Department webpage is linked to a [variety of safety information sites](#).

SUMMARY OF PROCEDURES FOR DEALING WITH A FIRE

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1. For emergencies requiring medical attention, call 911 and get the ambulance; or send the injured on foot to the infirmary with a trustworthy escort.
2. Initiate evacuation of the area if necessary, according to routine procedures.
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