Chemical Hygiene Plan

Suffolk University

Boston, Massachusetts

Revised: Jan 2018

EMERGENCY CONTACT INFORMATION

In case of an emergency please contact the following:

Suffolk University Police Department (SUPD)	(617) 573-8111	Extension: 8111 or 8333
Boston Fire, Police, EMS	Call 911 Dial 9-911 from a campus phone	Direct line: (617) 343-4911
Office of Environmental Health & Safety (OEHS)	(617) 570 - 4849 (617) 573 - 8628	Cellphone: (617) 947-8573 Cellphone: (857) 330-0914

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Section I. Getting Started

1. INTRODUCTION

1.1 Purpose, Policy, and Scope

It is the policy of Suffolk University to provide a safe and healthy workplace, with adequate protection from exposure to hazardous chemicals and biological or physical agents. The purpose of this document is to define the basic policies, procedures, and practices for employees, students, visitors, or any other persons working in Suffolk University laboratories. These policies, practices, and procedures constitute the core Standard Operating Procedures (SOP's) for the handling of hazardous chemicals, biological agents, and physical agents.

Departments that use and maintain teaching laboratories, research laboratories, and workshops on campus or conduct related activities at off campus sites are responsible for implementing applicable safety programs to ensure that these work areas are in full compliance with federal, state, and local regulatory requirements and with Suffolk University policy.

To ensure that liability risk is properly managed, qualified supervisors must fulfill their responsibilities to ensure that all activities with hazardous materials and/or in potentially hazardous work environments are done in compliance with all applicable environmental, health, and safety standards and regulations.

Qualified supervisors must be Suffolk University employees who actively participate in the applicable safety programs by attending safety training/awareness sessions. They are assigned responsibility and authority from their department to conduct routine safety audits of work areas, provide oversight of all activities in assigned work areas, and take necessary action to abate unsafe activities or conditions. Qualified supervisors can include faculty, staff, and other laboratory workers.

All Suffolk University laboratory personnel must attend a scheduled laboratory safety training session provided by Office of Environmental and Safety (OEHS) before beginning any work in the labs. It is the responsibility of each laboratory faculty member to ensure their students are properly trained before beginning any work in the laboratories.

Departments must ensure that proper supervision is provided during Suffolk University affiliated activities conducted off campus.

1.2 Plan Organization

Section I. Getting Started contains the basic information laboratory personnel need to know before using hazardous chemicals. It is designed to direct laboratory personnel to the relevant information they need before beginning their laboratory work. This section contains the purpose, policy, and scope of the plan, and also defines the roles and responsibilities for developing and implementing the plan. Requirements for training and chemical information available to personnel are also detailed here.

Section II. General Chemical Hygiene Practices contains descriptions of the administrative controls, engineering controls, general practices, and standard operating procedures (SOPs) for working with laboratory chemicals in Suffolk University laboratories. These precautions address broad classes of chemicals. This section contains chemical hazard and risk assessment information, and general procedures for chemical management including the purchasing, use, labeling, storage, disposal, and shipping of chemicals.

Section III. Standard Operating Procedures for Hazardous Chemicals contains specific standard operating procedures (SOPs) generated by individual departments for specialized equipment, procedures, materials, and other practices related to chemical usage that are not adequately addressed in Section II of this plan. This section is department specific and describes the procedures and operations, in detail, within the specified department. This section mentions the chemical, biological, and physical hazards pertinent to the specified department. The current Suffolk University Standard Operating Procedure template required for departmental SOPs is also contained in this section.

Section IV. Additional Administrative Provisions contains information and procedures essential to a successful chemical hygiene program that addresses activities other than the direct handling and use of hazardous chemicals. These additional administrative provisions include information on the Suffolk University CAS Safety Committee, medical evaluations and assessments, record keeping, laboratory inspections and audits, compliance and enforcement, and related issues that have an impact at Suffolk University.

2. ROLES AND RESPONSIBILITIES

This document constitutes the Chemical Hygiene Plan required by the Occupational Safety & Health Administration (OSHA) Laboratory Standard. It has been reviewed by both the CAS Safety Committee and the Suffolk University Office of Environmental Health and Safety (OEHS). It describes in detail the policies, practices, procedures, equipment, and facilities used by Suffolk University to ensure that all persons who work with chemicals at this institution do so safely. Each department that uses chemicals at Suffolk has a Chemical Hygiene Officer (CHO) who has overall responsibility for implementation and interpretation of the CHP in that department. Employees should direct questions about the CHP and safe use of chemicals to their CHO and/or OEHS.

This CHP must be read by all laboratory faculty members; this includes full and part-time, adjunct, laboratory managers, and paid student laboratory assistants, prior to the commencement of laboratory duties. In addition to the plan, the laboratory workers must be familiar with and adhere to prudent laboratory safety guidelines developed by their laboratory supervisor, Suffolk University requirements, and other relevant regulatory requirements.

This CHP will be reviewed on an annual basis by OEHS and the CAS Safety Committee.

The purpose of this Chemical Hygiene Plan (CHP) is to define work practices and procedures to help ensure that all laboratory personnel at Suffolk University are protected from health and safety hazards associated with the hazardous chemicals with which they work. The CHP is part of the University's compliance with "Occupational Exposures to Hazardous Chemicals in Laboratories" (29 CFR 1910.1450) and is hereafter referred to as the OSHA Laboratory Standard. Appendix A contains information on this standard.

According to the OSHA Laboratory Standard, the CHP must include:

- Standard operating procedures;
- Criteria to determine and implement specific control measures, such as engineering controls and personal protective equipment;
- A requirement that an ongoing program be developed to ensure that engineering controls are functioning properly;
- Information and training requirements;
- Circumstances under which a particular laboratory function will require "prior approval;"

- Provisions for medical consultation and medical exams;
- Designation of a Chemical Hygiene Officer; and
- Additional precautions for work with select carcinogens, reproductive toxins, and extremely toxic substances.

The chief element in this section is the designation of authority and responsibility for the implementation of the CHP. Responsibility for chemical health and safety rests at all levels. The following are responsible for implementing the requirements of the CHP.

2.1 Office of Environmental Health and Safety (OEHS)

OEHS is charged with the responsibility for control, review, monitoring, and advice with respect to exposure to chemical and biological agents used in teaching and research. OEHS provides oversight and control of physical hazards in the workplace, including general and laboratory safety and chemical waste disposal.

(a) Authority

OEHS has the authority to stop a particular activity if it is determined that if it is continued, the activity has a high likelihood of resulting in serious injury to people, property or a damaging release to the environment. OEHS provides technical guidance and support in the implementation of the Chemical Hygiene Plan. The procedures in this plan are designed to maintain a safe and healthy workplace.

(b) Resources

OEHS has professional staff that can be called upon for advice and help on safety and environmental health problems. The following services relating to chemical hygiene are offered for the University:

- Design and conduct site-specific training programs;
- Conduct laboratory safety inspections on a routine basis and upon request;
- Conduct periodic and requested inspection of engineering controls;
- Make recommendations for corrective actions in cases of non-compliance;
- Provide assistance in hazard assessment and standard operating procedure design;
- Investigate cases of suspected exposure or exposure due to accident;
- Provide chemical spill control services;
- Maintain general laboratory safety training records; and

- Maintain employee exposure records (with HR).

OEHS services are available on a regular basis and during emergency situations.

2.2 Suffolk University Chemical Hygiene Officer (CHO)

The Suffolk University CHO oversees and manages chemical hygiene for the entire University. The duties of the Suffolk University CHO are as follows:

- Develop and implement University-wide components of the CHP to ensure consistent and well documented program procedures and policy decisions. University-wide components will typically exclude specific departmental components such as laboratory standard operating procedures, training schedules, and other responsibilities given to the department CHO/laboratory supervisors.
- Work with department chairs or department CHO/laboratory supervisors to develop specific components of the CHP. Special attention will be given to the safe procurement, use, and disposal of chemicals.
- Assist department CHO/laboratory supervisors with conducting training sessions for all laboratory workers including supervisors, faculty, laboratory supervisors, teaching assistants, students, visiting scholars, etc.
- Assist department CHO/laboratory supervisors with required safety audits and the documentation (record keeping) of audits and all employee training sessions.
- Advise department CHO/laboratory supervisors on implementation of all components of the CHP and any specific concerns regarding the appropriate use of audits and all employee training sessions.

In addition, the Suffolk CHO will be responsible for knowing the contents of the relevant regulations and conducting any required updates of the CHP as regulations require.

The Suffolk University CHO is the Director of Environmental Health and Safety or a qualified member of the Office of Environmental Health and Safety as delegated by the Director.

2.3 Suffolk University Chemical Safety Committee

The CAS Safety Committee is composed of department chairs, faculty members and non-faculty laboratory managers acting as departmental safety officers or departmental CHOs from science, arts, and engineering departments within the College of Arts and Sciences. The committee also includes a representative from OEHS.

The committee will meet monthly and as needed. The duties of the committee include:

- Annual review of the CHP;
- Monitoring the status and implementation of the CHP;
- Review of Standard Operating Procedures;
- Review of written guidelines and training programs; and
- Forum for discussion of laboratory safety issues.

2.4 Department Chairperson

The Department Chairperson is responsible for chemical hygiene in the department. He/she may choose to serve as the departmental CHO or find a full time faculty member in the department who is willing to assume the duties of CHO or hire a person whose job description specifically includes CHO duties. The CHO activities do not correspond to routine university service such as committee assignments.

The Department Chairperson is responsible for ensuring that all laboratory personnel in their department have attended the laboratory safety training provided by OEHS. OEHS must be notified of all newly hired employees prior to them beginning any work in the laboratories.

2.5 Department Chemical Hygiene Officer

The Department CHO has the responsibility to implement the CHP, thus ensuring compliance with the regulatory requirements and maintaining a safe work environment. The Department CHO has the following duties:

- Ensure that all work is conducted in accordance with the department CHP.

- Work with laboratory supervisors to define the location of work areas where toxic substances and/or potential carcinogens will be used and to ensure that the inventory of these substances is properly maintained.
- Work with OEHS and laboratory supervisor to obtain, review, and approve standard operating procedures (SOPs), detailing all aspects of proposed research activities that involve hazardous agents or practices not covered under the "Basic Standard Operating Procedures for Hazardous Chemicals."
- Ensure that lab supervisors receive instructions and training in safe work practices, use of personal protective equipment (PPE), and in procedures for dealing with accidents involving toxic substances.
- Ensure that all laboratory personnel understand the training received.
- Monitor the safety performance of staff to ensure that the required safety practices and techniques are being employed.
- Assist OEHS when necessary.
- Investigate accidents and report them to the Suffolk University CHO. Recommend procedures that will minimize the repetition of that type of accident.
- Report to the Suffolk CHO incidents that cause personnel to be seriously exposed to hazardous chemicals or materials.
- Ensure that each laboratory in his or her department has a complete CHP that is readily accessible to all employees.
- Communicate to the Laboratory Supervisors, any relevant safety information or concerns pertaining to his/her department.
- Conduct periodic safety inspections of the laboratories in his or her department.

For current list of CHOs see relevant CHOs list attached as appendix

2.6 Laboratory Supervisor

The Laboratory Supervisor has the primary responsibility for chemical hygiene in the laboratory. Laboratory Supervisors are full time faculty members. In the event of a laboratory supervisor's absence an adjunct professor may assume the duties as temporary laboratory supervisor and become responsible for chemical hygiene in the laboratory until the acting laboratory supervisor returns. Whoever is considered the laboratory supervisor is ultimately responsible for implementing the chemical hygiene plan. He or she is responsible for:

- Acquiring the knowledge and information needed to recognize and control chemical hazards in the laboratory.
- Selecting and employing laboratory practices and engineering controls that reduce the potential for exposure to hazardous chemicals to the appropriate level.
- Informing all laboratory employees of the potential hazards associated with the use of chemicals in the laboratory and instructing them in safe laboratory practices, adequate controls, and procedures for dealing with accidents involving hazardous chemicals.
- Verify that all personnel obtain training and protective equipment and clothing necessary for the safe performance of their jobs.
- Ensuring that action is taken to correct work practices and conditions that may result in the release of toxic chemicals.
- Supervising the performance of the laboratory personnel in their department to ensure the required chemical hygiene rules are adhered to while in the lab.
- Defining hazardous operations, designating safe practices, and selecting personal protective equipment.
- Ensuring that appropriate engineering controls and personal protective equipment are used and are in good working order.
- Obtaining approval, when required, prior to using particularly hazardous substances.
- Developing an understanding of the current requirements regulating hazardous substances used in his/her laboratory.
- Conducting formal laboratory inspections routinely to ensure compliance with existing laboratory SOP's.
- Preparing procedures for dealing with accidents that may result in the unexpected exposure of personnel, or the environment, to toxic substances.
- Properly disposing of unwanted and/or hazardous chemicals and materials.
- Documenting and maintaining compliance with all applicable local, state, and federal requirements.
- Ensuring that, in case of job transfer or termination, laboratory personnel properly dispose of or transfer all chemicals to another responsible party before leaving.

2.7 Employees, Staff and Students

All employees working in laboratories are responsible for performing their work in accordance with the CHP for the laboratory in which he or she works, including the standard operating procedures applicable to hazardous chemicals and operations. Laboratory personnel are also responsible for bringing to the attention of their supervisor, CHO, OEHS, and/or the CAS Safety Committee, problems relating to the laboratory in which they work. Laboratory personnel are responsible for informing their Laboratory Supervisor of any substantial changes in protocol or the introduction of new chemicals to a procedure.

Additional responsibilities of laboratory workers include:

- Follow all health and safety standards and rules;
- Report all hazardous conditions to the laboratory supervisor;
- Wear or use proper personal protective equipment (PPE);
- Report any suspected job-related injuries or illnesses to the laboratory supervisor and seek treatment immediately;
- Refrain from the operation of any equipment or instrumentation without proper instruction and authorization;
- Remain aware of the hazards of the chemicals in the laboratory; and
- Request information and training when unsure how to handle a hazardous chemical or procedure.

Suffolk University students are responsible for:

- Attending required training sessions and following all standard operating procedures of working in a laboratory;
- Wearing personal protective equipment as directed;
- Wearing safety goggles at all times when in the laboratory; and
- Reporting to the faculty member or department CHO/laboratory supervisor any accidents that result in the exposure to toxic chemicals, and/or any action or condition that may exist which could result in an accident.

2.8 Minors, Visitors, Pets, and Tours

Any person under the age of 16 will not be allowed to work in a laboratory where hazardous chemicals are stored or used. The Suffolk University CHO must approve any exceptions to this requirement. Underage personnel, including high school students or visitors, must be directly supervised by faculty or staff at all times.

3. TRAINING

All faculty, staff, and other laboratory workers who work in any laboratory where hazardous chemicals are stored or used must complete the required safety training appropriate for the operations conducted in that laboratory. All faculty, staff, and other laboratory workers must complete the Suffolk University Lab Safety/HAZCOM Safety training prior to beginning any work in the lab. Other safety awareness training may include Hazardous Waste Management and Biological Safety. In addition, the laboratory supervisor must ensure that undergraduate students and visitors are sufficiently informed and aware of potential hazards in the lab and receive appropriate safety awareness training.

The training and information program will describe the:

- physical and health hazards of various classes of laboratory chemicals handled;
- methods/procedures for safely handling and detecting the presence or release of hazardous chemicals present in the laboratory;
- appropriate response in the event of a chemical emergency (spill, overexposure, etc.);
- chemical safety policies; and
- applicable details of the Chemical Hygiene Plan.

The training requirements referenced in the Chemical Hygiene Plan include the requirement to make this site-specific information available to each employee. While general laboratory safety procedures are presented in Section III of this document, any department-specific details, and any variation from the university-wide standard practices must be clearly presented to the employees, with complete documentation to be forwarded to OEHS for record keeping purposes.

When an employee is asked to perform a non-routine task presenting hazards for which he or she has not already been trained, the employee's supervisor will be responsible for discussing with the

employee the hazards of the task and any special measures that should be used to protect the employee. OEHS should be consulted when working with any new hazard.

3.1 Laboratory Safety Training

General laboratory safety training gives a brief overview of the necessary precautions taken to reduce employee exposure to harmful chemicals and operations in the laboratory. All laboratory workers must attend laboratory safety training prior to beginning work in the labs. There may also be other types of training that may be necessary depending on the work performed in the laboratory. Lab Safety/HazCom training is required for anyone who will be generating hazardous waste. Requests for any additional training can be directed to OEHS.

Laboratory worker training must include:

- Description of engineering controls;
- Suffolk University Lab Safety/HAZCOM Safety training
- Physical and health hazards of chemicals;
- Routes of entry
- Introduction to Safety Data Sheets (SDSs) program
- Emergency equipment located within the laboratory; and
- The work practices, personal protective equipment, and emergency procedures to be used to ensure that the employee can protect themselves from exposure to hazardous chemicals.

3.2 Training Recordkeeping Requirements

A written record of all laboratory training is kept by Suffolk University OEHS. Access to Employee Exposure and Medical Records will be kept as per OSHA requirements.

These records are available upon request by an employee, the employee's representative, or an OSHA Compliance Officer.

Exposure Recordkeeping

All exposure assessments and occupational medical consultation/examination reports will be maintained in a secure area by Human Resources in accordance with OSHA's medical records rule (29 CFR 1910.20). Individuals may obtain copies or read their reports by making a request in writing to Human Resources.

4. INFORMATION REQUIREMENTS

4.1 Basic Requirements

The following is information that must be made available to laboratory personnel:

- A copy of the OSHA Laboratory Standard and Appendices. The Laboratory Standard can be accessed on the OSHA website via http://www.OSHA.gov. From there the Lab Standards for working with hazardous chemicals can be found by searching "29 CFR 1910.1450"
- The Permissible Exposure Limits (PELs) for OSHA regulated substances and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) for hazardous substances not given OSHA PELs. Website links to these lists are provided in this documents Section II-10.0
- Signs and symptoms of exposure to hazardous substances used in the Universities laboratories. Information on this can be found in Section II parts 2 and 3 of this document.
- The locations and availability of known reference materials on work with and safe handling of hazardous substances, storage and disposal requirements for these substances and the limitations associated with them can all be found in the next part of this document.

If any have questions regarding any part of the safety information presented here please contact OEHS, your department CHO, or you department supervisor.

4.2 Chemical Safety Information Sources

Safety data sheets (SDSs)

In order to be adequately prepared, read the chemical specific safety information on an SDS before you begin any job involving chemicals. A Safety Data Sheet is a detailed document prepared by the manufacturer written to inform you about the hazards and characteristics of the product you work with. Information included in an SDS aids in the selection of safe products, personal protective equipment and spill control measures. Under OSHA's Hazard Communication Standard (HCS or HazCom), employers are required to have SDSs accessible at all times. The new HCS updated based on the GHS rules provides a 16-section SDS. The SDS has to contain the following sections according to the new format:

Section 1. Identification

Section 2. Hazard(s) identification

Section 3. Composition/information on ingredients

Section 4. First-Aid measures

Section 5. Fire-fighting measures

Section 6. Accidental release measures

Section 7. Handling and storage

Section 8. Exposure controls/personal protection

Section 9. Physical and chemical properties

Section 10. Stability and reactivity

Section 11. Toxicological information

Section 12. Ecological information

Section 13. Disposal considerations

Section 14. Transport information

Section 15. Regulatory information

Section 16. Other information, including date of preparation or last revision

It will list everything that is known about the chemical, its hazards, and the steps to avoid injury and illness when handling that hazardous substance.

The revised HCS based on the Global Harmonized System (GHS) also requires labels on chemical containers to use

- Pictograms
- Signals words
- Hazard Statement
- Precautionary Statement

Chemical manufacturers and distributors must provide the buyers of hazardous chemicals an appropriate SDS for each hazardous chemical purchased. If an SDS was not provided with the shipment of a hazardous chemical, the department must obtain one prior to using the material.

The University maintains SDSs for all chemicals on file are available with the use of the CEMS Chemical Inventory System for lab chemicals and department SDS binders. All chemical's used on campus and their associated SDSs can be found here Suffolk University CEMS (You can search for an SDS by chemical name or CAS number) or check you locations SDS binder. If the SDS is not available request it from your supervisor or ask OEHS for assistance.

Section II. General Chemical Hygiene Practices

1. INTRODUCTION

This section of the Chemical Hygiene Plan contains the minimum required precautions and standard operating procedures (SOPs) for working with laboratory chemicals at Suffolk University. This section contains measures for general lab practices including usage, labeling, purchasing, storing, and safe disposal of chemicals at the university. Also included in this section are provisions for administrative and engineering controls, such as chemical fume hoods.

There are four main routes of entry for hazardous materials into the body: inhalation, ingestion, injection, and absorption. The nature of the hazardous chemical and the routes by which it enters or contacts the body determine the type of controls that are needed. The Occupational Safety and Health Administration (OSHA) and other organizations have set occupational exposure limits on airborne chemical exposure. Keeping exposures below these limits is generally believed to protect employees and students from harm. Permissible Exposure Limits (PELs) set by OSHA are contained in Appendix II-A. Threshold Limit Values (TLVs) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are contained in Appendix II-B. For many laboratory chemicals, exposure limits have not been established.

OSHA recognizes that some classes of chemical substances pose a greater health and safety risk than others. To identify this risk, OSHA identifies two categories of hazardous chemicals: hazardous chemicals and particularly hazardous substances. *Particularly hazardous substances* (PHSs) are a subset of hazardous chemicals that are regulated more stringently because they have been deemed to pose a substantially greater risk. Because of this, OSHA requires additional precautions and procedures to be undertaken when *particularly hazardous substances* are used in the laboratory.

1.1 Introduction to Standard Operating Procedures

A standard operating procedure (SOP) is a written set of instructions that detail the procedures to be followed routinely and safety precautions to be taken when carrying out a particular experiment or procedure. The development and implementation of SOPs for critical activities is a core component of

promoting success in a laboratory setting and for ensuring a safe, healthy, and environmentally sound workplace. For these reasons, the development of SOPs is an essential administrative tool to be used in the laboratory as well as a requirement of the OSHA Laboratory Standard.

There are hundreds of different chemicals and compounds involved in the research being conducted at the university. The specific health hazards associated with many of these laboratory test solutions are unknown, and many of these test solutions form compounds which are not reported previously in chemical literature. Consequently, it is impossible in this Chemical Hygiene Plan to provide standard operating procedures for each specific hazardous substance. Instead, this section outlines general procedures that should be employed in the use of all hazardous substances. Individual research at Suffolk may be required to supplement these general procedures with additional standard operating procedures for handling specific hazardous substances or operating special machinery and equipment used in their laboratories.

Faculty and staff are required to develop additional written standard operating procedures if the general SOPs provided in Section II of this Plan do not adequately ensure the protection of personal health and safety, and the environment for a particular activity, operation, or experiment conducted in your laboratory. This requirement is particularly applicable if a procedure requires detailed and specific guidance to avoid dangerous exposures or consequences resulting from the improper use of chemicals or equipment. SOPs must be developed prior to initiating any hazardous procedures.

A template for SOPs and guidelines for their development are contained in Section III of this Plan. A copy of all SOPs developed must be located in the laboratory spaces, and available to all lab personnel. OEHS will also keep a record of all active SOPs for each department. Part III will also include a list of all SOPs on file by department.

2. IDENTIFICATION AND CLASSIFICATION OF HAZARDOUS CHEMICALS

It is important to determine the specific chemicals you are working with and the type of hazard they present. Suffolk University uses a wide array of chemicals in its laboratories. Included among them are flammable, toxic, corrosive, reactive, and possibly some new and untested substances. Many of these substances represent one or more hazards. Thus, it is essential that all laboratory workers recognize the routes of exposure and are familiar with the major hazard classes of chemicals. The most important single generalization regarding chemical hazards in research is to treat all compounds as

potentially harmful, especially new and unfamiliar materials, and work with them under conditions to minimize exposure.

When considering possible toxicity hazards while planning an experiment, it is important to recognize that the combination of the toxic effects of two substances may be significantly greater than the toxic effect of either substance alone. Because most chemical reactions are likely to contain mixtures of substances whose combined toxicities have not been evaluated, it is prudent to assume that mixtures of different substances (e.g., chemical reaction mixtures) will be more toxic than the most toxic ingredient contained in the mixture. Furthermore, chemical reactions involving two or more substances may form reaction products that are significantly more toxic than the starting reactants.

The OSHA Laboratory Standard defines a **hazardous chemical** as *"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".* Highly flammable and explosive substances comprise a category of hazardous chemicals.

The major classes of *hazardous* and *particularly hazardous chemicals* and their related health and safety risks are discussed in further detail below.

2.1 Irritants

Irritants are materials that cause inflammation of the mucous membranes with which they come in contact. Inflammation of tissue results from exposure to concentrations far below those needed to cause corrosion. Irritants can also cause changes in the mechanics of respiration and lung function. Long term exposure to irritants can result in increased mucous secretions and chronic bronchitis.

- A primary irritant exerts no systemic toxic action either because the products formed on the tissue of the respiratory tract are non-toxic or because the irritant action is far in excess of any systemic toxic action.
- A secondary irritant's effect on mucous membranes is overshadowed by a systemic effect resulting from absorption.

2.2 Sensitizers

Sensitizers are chemicals that cause a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical.

2.3 Carcinogens

Carcinogens are agents or substances that cause cancer or are believed to cause cancer. Carcinogens are generally toxic substances that cause damage after repeated or long term exposure. Usually these effects do not become evident until long after repeated exposures.

- A known carcinogen is an agent with sufficient evidence of a cause and effect relationship between exposure to the material and cancer in humans.

- A Suspected Carcinogen is an agent with a cause and effect interpretation that is credible, but that alternative explanations such as chance, bias, or other variables cannot be ruled out.

2.4 Flammable Materials

There are numerous flammable substances in use throughout our University's laboratories. Flammable substances are those gases, liquids, and solids that will ignite and continue to burn in air if exposed to a source of ignition. Many flammable and combustible liquids and solids are volatile in nature; that is, they evaporate quickly and are continually giving off vapors. The rate of evaporation varies greatly from one liquid to another and increases with temperature. It is their vapors combined with air, not the liquid or solids themselves, that ignite and burn. In many instances, an increase in temperature creates a more hazardous condition because of the increase in the rate at which vapors are evolved.

2.5 Peroxide Forming Compounds

Peroxides form by the reaction of the chemical with oxygen allowed in the headspace of chemical containers once the container is opened for the first time. Most organic peroxides are sensitive, to varying degrees, to shock, heat or friction. Peroxide forming substances are not explosive initially, but their decomposition over time can lead to the formation of explosive peroxides. Please see Part II Section 3.3(F) for detailed precautions to be taken when using peroxide forming substances.

2.6 Explosive Materials

Suffolk University does not permit the use of any type of explosive materials on campus. Explosive substances are materials that violently decompose under certain conditions. Explosions from these materials can occur from chemical reactions, mechanical shock or rises in temperature. Any questions about the use of explosives should be directed to OEHS.

2.7 Corrosive Substances

A corrosive substance is one that will destroy or irreversibly damage materials in which it comes in contact with. Corrosives can cause severe burns upon contact with human tissue. The major classes of corrosive substances are acids (sulfuric acid, nitric acid, hydrochloric acid), bases (sodium hydroxide potassium hydroxide, ammonia), and oxidizing agents (hydrogen peroxide, chlorine, bromine). The main health hazards include damage to eyes, skin and tissue under the skin, but inhalation or ingestion of a corrosive substance can damage the respiratory and gastrointestinal tracts. There are also serious physical hazards associated with corrosive substances. These include the corrosion of metals, violent chemical reactions resulting from mixing different classes of corrosive substances, and chemical reactions resulting in the generation of poisonous gases.

2.8 Toxic Substances

A toxic substance is a substance that impairs health or destroys life when ingested, inhaled, or absorbed by the body in relatively small amounts.

Hepatotoxic agents: cause damage to the liver.

Nephrotoxic agents: damage the kidneys.

Neurotoxin agents: damage the central nervous system. The central nervous system is especially sensitive to organo-metallic compounds and certain sulfide compounds.

Some toxic agents act on the **blood or hematopoietic system**. The blood cells can be affected directly or the bone marrow can be damaged.

There are toxic agents that produce damage of the **pulmonary tissue** (lungs) but not by immediate irritant action. Fibrotic changes can be caused by free silica and asbestos. Other dusts can cause a restrictive disease called **pneumoconiosis.**

2.9 Particularly Hazardous Substances / Select Carcinogens

As discussed in earlier sections of this Chemical Hygiene Plan, hazardous chemicals are chemicals for which there is scientific evidence that adverse acute or chronic health effects may occur in exposed workers. An agent is an acute toxin if its toxic effects are manifested after a single or short-duration exposure. Chronically toxic agents show their effects after repeated or long-duration exposure and the effects usually become evident only after a long latency period. Many of the substances in frequent use in laboratories are classified as hazardous substances, and the procedures for working with these chemicals are detailed in Section II Part 3.1 and 3.2 There are some substances, however, that pose such significant threats to human health that they are classified as "particularly hazardous substances" (PHSs). The OSHA Laboratory Standard requires that special provisions be established to prevent the harmful exposure of researchers to PHSs. General procedures for working with such materials are presented in detail in Part 3.3.

Chemicals are classified as *particularly hazardous substances* if they belong to one or more of the following three categories. Compounds classified as *particularly hazardous substances* generally must then be handled using the procedures outlined in Section II. Part 3.3 **in addition to** the procedures outlined for hazardous chemicals in Section II. Part 3.1 and 3.2. Appendix II. C. provides procedures to assist you in how to determine if a chemical is a particularly hazardous substance, as well as additional information on PHSs.

2.9.1 Select Carcinogens

Certain potent carcinogens are classified as "select carcinogens" and treated as PHSs. A select carcinogen is defined in the OSHA *Laboratory Standard* as a substance that meets one of the following criteria:

a) It is regulated by OSHA as a carcinogen,

b) It is listed as "known to be a carcinogen" in the latest Annual Report on Carcinogens published by the National Toxicology Program (NTP),

c) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer (IARC), or

d) It is listed under IARC Group 2A or 2B, ("probably carcinogenic to humans") or under the category "reasonably anticipated to be a carcinogen" by the NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria: (i) 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; (ii) after repeated skin application of less than 300 mg/kg of body weight per week; or (iii) after oral dosages of less than 50 mg/kg of body weight per day.

The following Table lists the substances meeting criteria (a), (b), or (c). For information on compounds meeting criteria (d), examine IARC Group 2A and 2B lists and the NTP lists that are available on the Internet. See Appendix II-C for more information on PHSs.

Partial List of Select Carcinogens (Includes OSHA Carcinogens)

2-acetylaminofluorene
acrylamide
acrylonitrile
4-aminodiphenyl
arsenic and certain arsenic compounds
asbestos
azathioprine
benzene
benzidine
bis(chloromethyl) ether
1,3 butadiene
1,4-butanediol dimethylsulfonate (myleran)
cadmium
chlorambucil
chloromethyl methyl ether
chromium and certain chromium compounds
coal-tar pitches
coal tars
coke oven emissions
conjugated estrogens
cyclophosphamide
1,2-dibromo-3-chloropropane
3,3'-dichlorobenzidine (and its salts)
diethylstilbestrol
dimethylaminoazobenzene
dimethyl sulfate
ethylene dibromide
ethylene oxide
ethylenimine
formaldehyde
hexamtehylphosphoramide
hydrazine
melphalan
4,4'-methylene-bis(2-chloroaniline)
methylene chloride
methylene dianiline
mustard gas
N,N'-bis(2-chloroethyl)-2-naphthylamine
(chlornaphazine)
alpha-naphthylamine
beta-naphthylamine
nickel carbonyl
4-nitrobiphenyl
N-nitrosodimethylamine
beta-propiolactone
thorium dioxide
treosulphan
vinyl chloride

Note: The above list is not complete. Due to the fact that no regulatory agency has compiled a complete list of all PHSs it is the responsibility of the researcher (in consultation with their laboratory supervisor) to evaluate each compound involved in their work and to determine whether it should be handled as a select carcinogen.

2.9.2 Reproductive and Developmental Toxins

Reproductive toxins can affect the reproductive health of both male and female employees and students if the proper procedures and controls are not utilized. For women, exposure to reproductive toxins during pregnancy can cause adverse effects on the fetus; these effects include embryolethality (death of the fertilized egg, embryo or fetus), malformations (teratogenic effects), and postnatal functional defects. Examples of embryotoxins include thalidomide and certain antibiotics such as tetracycline. Women of childbearing potential should note that embryotoxins have the greatest impact during the first trimester of pregnancy. Because a woman often does not know that she is pregnant during this period of high susceptibility, special caution is advised when working with all chemicals, especially those rapidly absorbed through the skin. Pregnant women and women intending to become pregnant should consult with their laboratory supervisor and OEHS before working with substances that are suspected to be reproductive toxins. As minimal precautions, the general procedures outlined in Section II. Part 3.3 below should then be followed for work with such compounds. For men, the effects of certain reproductive toxins may include decline in fertility, malformations in off-spring, and certain types of cancer. Therefore, adequate protection from exposure must be employed.

Information on reproductive toxins can be obtained from Safety Data Sheets, or by contacting OEHS.

The following Table lists some common materials that are suspected to be reproductive toxins; these compounds could also be handled as *particularly hazardous substances*.

Partial List of Reproductive Toxins

arsenic and certain arsenic compounds	lead compounds
benzene	mercury compounds
cadmium and certain cadmium compounds	toluene
carbon disulfide	vinyl chloride
ethylene glycol monomethyl and ethyl ethers	xylene
ethylene oxide	

Note: The above list is not intended to be complete, and it is the responsibility of the researcher (in consultation with their laboratory supervisor) to evaluate each compound involved in their work and to determine whether it should be handled as a reproductive toxin.

2.9.3 Compounds with a High Degree of Acute Toxicity

Compounds that have a high degree of acute toxicity comprise a third category of *particularly hazardous substances* as defined by the OSHA *Laboratory Standard*. Acutely toxic agents include certain corrosive compounds, irritants, sensitizers (allergens), hepatotoxins, nephrotoxins, neurotoxins, agents that act on the hematopoietic systems and agents which damage the lungs, skin, eyes, or mucous membranes. Substances that have a high degree of acute toxicity are interpreted by OSHA as being substances that "may be fatal or cause damage to target organs as the result of a single exposure or exposures of short duration".

Toxic and Highly Toxic Agents

OSHA regulations (29 CFR 1910.1200 Appendix A) define toxic and highly toxic agents as substances with median lethal dose (LD_{50}) values in the following ranges:

Test	Toxic	Highly Toxic
Oral LD_{50} (albino rats)	50-500 mg/kg	<50 mg/kg
Skin Contact LD_{50} (albino rabbits)	200-1000 mg/kg	<200 mg/kg
Inhalation LC_{50} (albino rats)	200-2000 ppm/air	<200 ppm/air

It is important to note that the above classification does not take into consideration *chronic toxicity* (e.g. carcinogenicity and reproductive toxicity). Also, note that LD_{50} values vary significantly between different species, and the human toxicity for a substance may be greater or less than that measured in test animals. OSHA considers substances that are either toxic or highly toxic, as defined above, to be *particularly hazardous substances*.

In evaluating the **acute toxicity** of chemical substances, the **HMIS** (Hazardous Materials Identification System) rating criteria developed by the National Paint and Coatings Association may be helpful. HMIS numbers can often be found in SDSs. LD_{50} values can be found in SDSs and in references

such as the *Sigma-Aldrich Library of Chemical Safety Data* and Patnaik's *A Comprehensive Guide to the Hazardous Properties of Chemical Substances.*

Partial List of Compounds with a High Degree of Acute Toxicity

abrin
Acrolein
Arsine
chlorine
diazomethane
diborane (gas)
hydrogen cyanide
hydrogen fluoride
methyl fluorosulfonate
nickel carbonyl
nitrogen dioxide
osmium tetroxide
Ozone
phosgene
Ricin
sodium azide
sodium cyanide (and other cyanide salts)
strychnine

Note: the above list is not intended to be complete, and it is the responsibility of the researcher (in consultation with their laboratory supervisor) to evaluate each compound involved in their work and to determine whether it is a substance with a high degree of acute toxicity.

Compounds classified as having a high degree of acute toxicity must generally be handled using the procedures outlined in Section II. Part 3.3 below **in addition to** the procedures outlined for hazardous chemicals in Section II Part 3.1 and 3.2. Finally, several of the compounds listed may require prior approval from OEHS before work with them can be carried out. See Section IV. Part 1.2 for a discussion of prior approval requirements.

In evaluating the hazards associated with work with toxic substances, it is important to note that a number of factors influence the response of individuals to exposure to toxic compounds. For example, people are rarely exposed to a single biologically active substance. With this point in mind, it is noteworthy that one toxin can influence the effect of a second. This underscores the importance of maintaining good laboratory practices at all times, and with all chemicals.

2.10 Sharps Containers

A **sharp** is any item having corners, edges, or projections capable of cutting or piercing the skin. The following items (whether contaminated with biohazardous waste or not) are considered sharps and must be disposed in sharps containers and managed as sharps waste.

- Needles
- Needles with syringes
- Blades (razors, scalpels, X-acto, etc.)
- Needles with attached tubing

Broken glassware contaminated with biohazardous waste - Broken glassware is not considered a sharp unless it is contaminated with biohazardous materials. Glassware with sharp edges or points contaminated with biohazardous waste must be disposed into a sharps container.

- Contaminated Pasteur pipettes
- Contaminated glass slides
- Contaminated broken glassware

"Clean" Broken Glass - Use the broken glass containers for clean broken glass disposal.

Disposal - Sharps should be contained in the tight sealing hard sided containers found in the labs. These containers are red and marked with a biohazard symbol. Sharps are to be labeled and handled according to Suffolk's hazardous waste requirements.

2.11 Biohazard Waste

The Massachusetts Department of Public Health defines certain materials as Infectious or Physically Dangerous Medical or Biological Waste. By law, this material must be disposed of according to procedures discussed below. Suffolk University collects and disposes of Infectious or Physically Dangerous Medical or Biological Waste as well as other non-regulated biological materials that might cause public concern.

Infectious or Physically Dangerous Medical or Biological Waste is a waste which because of its characteristics may: cause or significantly contribute to an increase in mortality or an increase in

serious irreversible or incapacitating reversible illness; or pose a potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

The following types of waste are identified and defined as infectious or physically dangerous medical or biological waste, and shall be subject to the requirements of 105 CMR 480.000:

- **Blood and Blood Products** – Discarded bulk human blood and blood products in free draining, liquid state; body fluids contaminated with visible blood; and materials saturated/dripping with blood.
- **Pathological Waste** – Human anatomical parts, organs, tissues and body fluids removed and discarded during surgery or autopsy, or other medical procedures and specimens of body fluids and their containers.
- **Cultures and Stocks** of Infectious Agents and Associated Biologicals – All discarded cultures and stocks of infectious agents and associated biologicals, biotechnological by product effluents, cultures of specimens from medical and pathological laboratories, cultures and stocks of infectious agents from research laboratories, wastes from the production of biologicals, and discarded live and attenuated vaccines intended for human use.
- **Contaminated Animal Carcasses, Body Parts and Bedding** – The contaminated carcasses and body parts and bedding of all research animals known to be exposed to pathogens.
- **Sharps** – Discarded medical articles that may cause puncture or cuts, including but not limited to all used and discarded hypodermic needles and syringes, Pasteur pipettes, broken medical glassware, scalpel blades, disposable razors, and suture needles.
    - ***Please see above Part 2.8 for a detailed description of "Sharps"**
- **Biotechnological By-Product Effluents** – Any discarded preparations made from genetically altered living organisms and their products.

2.12 Infectious Waste Management Procedures

It is the responsibility of CHO or lab supervisor to set up a packaging, storage, and pickup system prior to generating infectious waste. OEHS will assist in the development of a workable system. Supervisors or other employees generating infectious waste are responsible for compliance with applicable regulations and disposal program requirements. Procedures below apply to the campus with the exception of Health Services, where some procedures vary.

2.13 Storage and Disposal of Infectious Waste

- All red biohazard bags must be placed in secure, leak-proof boxes, and stored to prevent decomposition or deterioration during storage and in a manner which limits exposure to the public.
- All non-liquid materials, except for sharps must be contained in red bags which are impervious to moisture and will not tear under normal conditions.
- Use only designated collection boxes and red plastic bags. These boxes and bags meet regulatory and safety requirements and are marked with biohazard warnings. Do not substitute other containers.
- Mixtures of biological specimens and hazardous chemicals, including specimens preserved in alcohol or formaldehyde may need to be handled as hazardous waste.
- Biological waste with the appearance of having human origin and waste that would pose a sanitary concern must be disposed of as biological waste.
- Collection boxes with biohazard warnings and red bags must never be disposed of in the regular trash or used for any other purpose.
- The pickup procedure for infectious waste is similar to the chemical waste pickup procedure. Accurate identification of contents is required.
- Contact OEHS for a biological waste pickup.

Also refer to your lab specific biosafety manual to make sure there is variation to the above requirements.

3. STANDARD OPERATING PROCEDURES FOR USE OF HAZARDOUS MATERIALS

3.1 Preliminary Steps and Procedures

All work involving chemicals in Suffolk University laboratories must be conducted using the "Standard Operating Procedures" outlined below. In addition, laboratory personnel must determine whether any of the chemicals to be handled in the planned experiment meet the definition of a particularly hazardous substance due to high acute toxicity, carcinogenicity, and/or reproductive toxicity. If so, consider the total amount of the substance that will be used, the expected frequency of use, the chemical's routes of exposure, and the circumstances of its use in the proposed experiment. Use this

information to determine whether it is appropriate to apply the "Additional Procedures for Work with Particularly Hazardous Substances" outlined in Part II. Section 3.3.

STEP 1: Determine the toxicity and warning properties of the chemicals to be used in your experiment.

- Identify the chemicals involved in the proposed experiment and determine the amounts that will be used.
- Use an up-to-date SDS to determine the exposure limit, type of toxicity, warning properties (smell, irritation, etc.) and symptoms of exposure for each chemical involved in the planned experiment.
- If a new chemical substance(s) will be produced during the experiment and the toxicity is unknown, assume it is a particularly hazardous substance and follow the procedures in Section II. Part 3.3.
- Assume that any mixture of chemicals will be more toxic than its most toxic component.

STEP 2: Determine most likely routes of exposure based on how chemicals will be used and their physical/chemical properties.

- *Inhalation* – Inhalation risks are highest when volatile liquids, gases, dusts, or mists are used or generated. Heating will increase the volatility of liquids. Pay particular attention to chemicals with low exposure limits. Potential for inhalation is highest when chemicals are used on an open lab bench. Use in enclosed apparatus or chemical laboratory hoods decreases inhalation exposure potential.
- *Absorption* – Chances for skin exposure exist for most laboratory chemical procedures. When the "skin" notation is listed in the exposure limit section of the SDS, the chemical can be absorbed through the intact skin.
- *Injection or ingestion* – Not normally a major route of exposure if proper handling procedures are used. Determine whether the experiment involves a significant risk of inadvertent ingestion or injection of chemicals.

STEP 3: Determine required control measures, personal protective equipment, and proper work practices to minimize exposure.

A. Inhalation Control Measures

Determine When to Use Laboratory Chemical Hoods (Fume Hoods)

Procedures involving volatile toxic substances and those operations involving solid or liquid toxic substances that may result in the generation of vapors or aerosols should be conducted in a laboratory hood. See Section II. Part 5. for a more detailed discussion of laboratory hoods. Other types of control devices include glove boxes and shut-off valves.

B. Personal Protective Equipment For Eyes and Skin

Select and wear appropriate eye and face protection. Wearing eye protection is required by OSHA regulation whenever and wherever potential eye hazards exist. Hazards requiring eye and/or face protection include flying particles; liquids including acids and caustic materials, biological materials; and chemical gases or vapors. Use safety glasses with side shields as basic eye protection for handling chemicals where there is a low risk of splash or splatter. When pouring large amounts of chemicals, observing processes that are under heat or pressure, making adjustments to chemical containing apparatus, or performing other operations or tasks with a moderate to high potential splash risk or severe consequences in the event of a splash, chemical goggles or face shields should be used. Details on proper selections of PPE for specific applications can be found in Part II Section 4.

STEP 4: Be Prepared for Emergencies

Before beginning an experiment, know what specific action you will take in the event of the accidental release of any hazardous substances involved. Know the location and how to operate all safety equipment including fire blankets, eye washes, safety showers, spill kits and spill control materials. Be familiar with the location of the nearest fire alarm and telephone, and know what telephone numbers to call in the event of an emergency. Know the location of the circuit breakers for your laboratory.

For all accidents requiring emergency police, fire, or medical response, contact the Suffolk University Police Department at ext. 8111 or 8333 from a Suffolk University telephone.

Emergency Action Plans are required for each department and their laboratories under the Occupational Health and Safety Administration (OSHA) regulations. All staff and students should be familiar with their laboratory's Emergency Action Plan, as it specifies the appropriate response and building exit plans for a variety of life-safety emergency situations.

If a chemical exposure occurs, as time permits and if you will not be placed at risk, attempt to identify the chemicals involved and obtain the SDS or other relevant information. Provide the SDS to the ambulance crew or SUPD.

Chemicals Exposure on the Body and in the Eyes

- Quickly remove all contaminated clothing and footwear.
- Immediately flood the affected body area with cold water for at least 15 minutes. Remove jewelry to facilitate removal of any residual material.
- Wash off chemical with water only. Do not use neutralizing chemicals, unguents, creams, lotions, or salves.
- Get medical attention promptly by dialing ext.8111
- Irrigate the eyeball and inner surface of eyelid with plenty of cool water for at least 15 minutes. Use eyewash or other water source. Forcibly hold eyelids open to ensure effective wash.
- Check for contact lenses.
- Get medical attention promptly by dialing ext.8111.

**** NOTE**

Please note that there are chemicals at Suffolk University, though limited, that should not be flushed with water after contact with the eyes and skin. Chemicals, such as Phenol, will react with water and cause more damage to the affected area than before the water was applied. Please consult the SDS to know and understand the hazards of the chemicals you are using before you begin work with them. Whenever in doubt consult your supervisor or OEHS.

Personal Contamination and Injury

- Know the locations of the nearest safety shower and eye wash station.
- Report all incidents and injuries to your supervisor.

- If an individual is contaminated or exposed to a hazardous material in the laboratory, do what is necessary to protect their life and health as well as your own. Determine what the individual was exposed to. The SDS will contain special first aid information.
- Do not move an injured person unless they are in further danger.
- Cover the victim with a blanket immediately to protect them from shock and exposure.
- Get medical attention promptly by dialing ext.8111.

Ingestion of Hazardous Chemicals

- Identify the chemical ingested.
- Call University Police by dialing ext.8111.
- Call the Poison Information Center by dialing (617) 232-2120 or (800) 682-9211.
- Provide the ambulance crew and physician with the chemical name and any other relevant information. If possible, send the container, SDS or the label with the victim.

Inhalation of Smoke, Vapors and Fumes

- Anyone overcome with smoke or chemical vapors or fumes should be removed to uncontaminated air.
- Do not enter the area if you expect that a life threatening condition still exists - oxygen depletion, explosive vapors, or highly toxic gases (cyanide gas, hydrogen sulfide, nitrogen oxides, carbon monoxide)
- Get medical attention promptly dialing ext.8111

3.2 Chemical Spills, Definitions and Policies

Minor vs. Major

A Minor Spill is one in which ALL of the following conditions are met:

- ❖ the responsible party is at the scene; and
- ❖ the material spilled is not highly toxic, corrosive, reactive, potentially infectious material, biohazard, or a special hazard; and
- ❖ the quantity spilled is small; and

- there is no fire hazard present; and
- the spill is completely contained inside a building; and
- the material has little or no potential to reach the environment (e.g., via a floor drain, sinks, etc); and
- the spill is not in a common area (e.g., a hallway) or other area accessible to the general public; and
- advanced personnel protective equipment (i.e., more than gloves and safety glasses) is not needed to respond to the spill

A Major Spill is one in which ANY of the following conditions apply:

- the responsible party or the chemical spilled is unknown ; or
- the material spilled is highly toxic, corrosive, reactive, potentially infectious material, biohazard or a special hazard; or
- a large (or undetermined) quantity was spilled; or
- a significant fire hazard may be present; or
- the material has the potential to reach the environment (e.g., via a floor drain); or
- the spill is in a common area (e.g., hallway) or other area accessible to the general public; or
- advanced personnel protective equipment (more than gloves and safety glasses) is required to respond to the spill; or
- a responder is unsure whether the spill should be considered “Minor” or “Major”.

POLICY AND PROCEDURES

Minor Spills - Suffolk University policy is that minor, indoor spills of hazardous materials or waste that present no immediate threat to personal health or safety, or of being released to the environment, are to be cleaned up by the personnel responsible for the spill unless they are not comfortable doing so. Hazardous material users and hazardous waste generators must be aware of the properties of the materials they use and the waste they generate.

All chemical and petroleum spills must be reported. Notification for minor spills is generally made directly to Campus Police OR OEHS (617-570-4849) or (617-573-8628). If the Campus Police receives the initial contact, they contact OEHS. Once assessment and clean up is complete OEHS will give the "all clear" for an area to be reoccupied.

Major Spills - Major spills are to be reported to the Suffolk University Police Department emergency number (x 8111) or (x 8333) from a University phone or (617) 573- 8111 or 8333 from any other phone immediately. If initial notification is made of a major spill, or if at any time during the spill response it is determined that the incident should be considered a "Major Spill", OEHS is contacted immediately to respond to the site. OEHS will take control of the situation once they are on site, fully briefed, and accept control. OEHS will defer to the Boston Fire Department once either party is on site, fully briefed, and accepts control. OEHS will determine if notification to outside authorities is required (and if so, will make the notification).

More detailed information on this policy can be found in Section IV Part 6.1

Handling of Broken Glassware

Properly use, maintain, and dispose of laboratory glassware. Improper use of glassware is a frequent cause of injuries and accidents in the laboratory.

- Careful handling and storage procedures should be used to avoid damaging glassware. Always carefully inspect glassware for flaws and cracks before use. Damaged items should be discarded or repaired if possible.

- Adequate hand protection should be used when inserting glass tubing into rubber stoppers or corks or when placing rubber tubing on glass hose connections.

- Hand protection should be used when picking up broken glass. Small pieces should be swept up with a brush into a dustpan.

- Broken glassware (broken glassware containers) should be disposed off properly. Such waste should be separated from other trash and stored for pickup in clearly marked containers labeled "Broken Glass".

3.3 Standard Safe Lab and Chemical Hygiene Practices

A. Establish Good House Keeping

There is a relationship between safety and orderliness in the laboratory. The following housekeeping rules should be strictly practiced in all laboratories:

- Clean bench tops and other work areas and equipment regularly. Do not allow dirty glassware, expired or unneeded samples or chemicals, and trash or boxes to accumulate. When floors require cleaning, notify facilities.

- Maintain ready access to exits and safety equipment such as fire extinguishers, eyewashes, and safety showers. Do not store materials in a way that will block access to exits or safety equipment.

- Ensure all compressed gas tanks are properly secured to walls or benches.

- Chemical storage refrigerators should be marked as “lab use only”, defrosted periodically and should not be overcrowded.

Avoid work conducted outside normal hours.

Researchers should avoid conducting work with hazardous substances when they are alone in the laboratory. Strictly follow and apply the applicable working alone and or afterhours.

Laboratory operations involving hazardous substances are sometimes carried out continuously or overnight. It is the responsibility of the researcher to design these experiments with provisions to prevent the release of hazardous substances in the event of interruptions in utility services such as electricity, cooling water, and inert gas. Laboratory lights should be left on and appropriate signs should be posted identifying the nature of the experiment and the hazardous substances in use. In some cases arrangements should be made for periodic inspection of the operation by other workers. Information should be left indicating how to contact you in the event of an emergency.

Discourage children and pets in laboratories.

Prudent safety practices discourage allowing children and pets in laboratories where hazardous substances are stored or are in use. It is therefore urged that children and pets not be permitted in laboratories. However, if children are allowed, they must be under the direct supervision of their parent or other qualified adult, and should be allowed to visit only for a brief period of time.

B. Establish and follow safe chemical storage procedures for your laboratory.

Researchers should consult OEHS on standard operating procedure (SOP) on Chemical Storage. All procedures employed must comply with Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), Mass Department of Environmental Protection (MassDEP), Mass Department of Public Health (MA-DPH) and Boston Fire Department (BFD) regulations. The following minimum guidelines must be adhered to:

- Access to all hazardous chemicals, including toxic and corrosive substances, should be restricted at all times. Specifically, good practice would dictate that these materials are stored in laboratories or storerooms that are kept locked at all times when laboratory personnel are not present. In the case of unusually toxic or hazardous materials, additional precautions are advisable and likely required, such as keeping the materials in locked storage cabinets. Contact OEHS to determine the appropriate controls.
- To avoid the accumulation of excess chemicals, it is recommended that you maintain a list of chemicals in your lab and check this list prior to purchasing new chemicals. When purchasing new chemicals, purchase the minimum quantities of commercial chemicals necessary for your research.

- Make sure all containers of chemicals are in good condition.
- Make sure all containers of chemicals, (including research samples), are properly labeled. When appropriate, special hazards should be indicated on the label. For certain classes of compounds, (e.g. ethers), the date the container was received, as well as the date the container was last opened should be written on the label. More guidance on labeling is provided in Section II. Part 6.
- Store incompatible materials in separate cabinets. If they must be stored together due to space limitations, provide secondary containment to separate incompatible materials.
- Do not store liquids above eye-level. Particularly, large containers (more than 1 liter) should be stored below eye-level on low shelves. Avoid storage of hazardous chemicals on the floor. If such storage is required, provide secondary containment for liquids stored on the floor.
- For refrigerated storage of chemicals, ensure refrigeration equipment is selected properly for the types of materials to be stored. Food should never be kept in refrigerators used for chemical storage.
- Do not store items in the working space of fume hoods.

C. Take precautions when transporting hazardous substances between laboratories.

Approved secondary containers are defined as commercially available bottle carriers made of rubber, metal, or plastic, with carrying handle(s), and which are large enough to hold the contents of the chemical container in the event of breakage. Secondary containment carts should be used whenever you are transporting more than one container. When transporting cylinders of compressed gases, always strap the cylinder in a suitable hand truck and protect the valve with a cover cap. For shipping hazardous materials off-site, please refer to Part II. Section 9.

D. Follow established procedures for handling excess and waste chemicals to ensure compliance with regulatory requirements.

Consideration of the means of disposal of chemical wastes should be part of the planning of all experiments before they are carried out. The cost of disposing of excess and waste chemicals has become extremely expensive, and frequently exceeds the original cost of purchasing the chemical. Whenever practical, order the minimum amount of material possible in order to avoid the accumulation of large stocks of "excess chemicals" which will not be needed in future research. Such collections of "excess chemicals" frequently constitute safety hazards, since many substances decompose upon long

storage and occasionally their containers become damaged or degrade. In addition, the disposal of significant quantities of excess chemicals ultimately presents a very significant financial burden.

The procedures for handling excess and waste chemicals are outlined in Part II. Section 8.

E. Take additional precautions for work with flammable substances.

Flammable substances are among the most common of the hazardous materials found in campus laboratories. Flammable substances are materials that readily catch fire and burn in air. It is not the flammable liquid itself that burns; it is the vapors from the liquid that burn. The rate at which these vapors are produced is based on the chemicals vapor pressure. The degree of fire hazard depends also on the ability to form combustible mixtures with air, the ease of ignition of these mixtures, and the relative densities of the liquids.

Precautions for handling flammable substances include:

- Flammable substances should be handled only in areas free of ignition sources. In addition to open flames, ignition sources include electrical equipment, static electricity, and even hot surfaces.
- Never heat a flammable substance with an open flame.
- When transferring flammable liquids in metal equipment; static-generated sparks should be avoided by bonding and the use of ground straps.
- Adequate ventilation is a must when mixing flammable materials. A laboratory fume hood should be used whenever flammable substances are transferred, allowed to stand or be heated in open containers, or handled in any other way. Be sure that the hood is free of all ignition sources.
- Generally, only small quantities of flammable liquids should be kept at work benches. Larger quantities should be stored away from ignition sources in flammable storage cabinets. It is advisable to purchase highly flammable solvents (e.g., acetone, hexane, diethyl ether, ethyl acetate, tetrahydrofuran) only in metal or break-resistant (e.g., plastic or plastic-coated), containers.

- Refrigerators used for storage of chemicals must be explosion-proof or flame proof and labeled as “Lab Use Only”. Storage trays or secondary containers should be used to minimize the distribution of material in the event a container should leak or break.

F. Take additional precautions for handling peroxide forming substances.

Peroxide formation in laboratory solutions and reagents by auto-oxidation has caused many laboratory accidents, including unexpected explosions of residues remaining after solvent distillation. Many liquid, a few solid and a few gaseous organic and a few inorganic solid compounds form peroxides over time. Peroxides form by the reaction of the chemical with oxygen allowed in the headspace of chemical containers once the container is opened for the first time. Most organic peroxides are sensitive, to varying degrees, to shock, heat or friction.

Peroxide formations are explosive substances that can decompose under conditions of mechanical shock, elevated temperature, or chemical action, with the release of large volumes of gases and heat. Special precautions are required for the safe use of peroxide forming materials. These substances must be disposed of no longer than one year after they are opened, or before their expiration date, whichever occurs first. Peroxide forming compounds should have a “date received” date, as well as a “date last opened” date. These should be clearly marked on the outside of their containers.

Organic peroxides are among the most hazardous substances handled in campus laboratories. As a class, they are low-power explosives, hazardous because of their sensitivity to shock, sparks, and even friction (as in a cap being twisted open). Many peroxides that are routinely handled in laboratories are far more sensitive to shock and heat than many high level explosives such as dynamite or trinitrotoluene (TNT), and may detonate rather than burn. All organic peroxides are highly flammable, and most are sensitive to heat, friction, impact, light, as well as strong oxidizing and reducing agents.

Many common solvents and reagents are known to form peroxides on exposure to air, and these chemicals often become contaminated with sufficient peroxides to pose a serious hazard. Below you will find proper precautions that should be taken when working with and storing peroxides as well as a list of possible peroxide forming chemicals that may be encountered while working in the Suffolk University laboratories:

Tetrahydrafuran
Diethyl Ether
1-4 Dioxane

Precautions for work with peroxide forming materials:

- Store peroxide forming materials away from heat and light.
- Protect peroxide forming compounds from physical damage, heat, and light.
- Peroxide forming chemicals should have both the date of receipt and date of opening clearly marked on the label. Affixing a label stating "Warning, Peroxide Former" can also be helpful to alert others regarding these materials.
- Use or dispose of peroxides within time limits recommended on the label or SDS.
- Test for peroxides before distilling or evaporating peroxide forming solvents for research purposes. Do not distill for research purposes without treating to remove peroxides. It is illegal to evaporate or treat a regulated waste to avoid disposal of that material. All waste material should be disposed of properly as outlined in Part II. Section 8.
- If crystals are visibly present on the container or lid, or if the container is open but has not been tested, do not open. Contact OEHS to arrange for chemical inspection and disposal.
- Immediately rinse empty containers that once held peroxide forming compounds. Do not let residues evaporate.

G. Take additional precautions for work with corrosive substances.

Corrosivity is a complex hazard. Corrosives can be solids, liquids, and gases and includes acids, bases, oxidizers, as well as other chemical classes. Corrosives may belong to more than one chemical class. A corrosive is any chemical that can rapidly deteriorate human tissue, metals, and other

compounds, upon contact. Corrosives must be stored by compatibility. Segregate acids from bases. Segregate oxidizing acids, such as nitric acid from organic acids, such as acetic acid.

- Store corrosives on a lower shelf or in ventilated corrosive storage cabinets.
- Make sure containers and equipment, such as tubing, etc. used with corrosive materials is compatible with those materials.
- Personal protective equipment is important for work with corrosives. Neoprene or rubber gloves, goggles and face shield, should be considered.
- When mixing or reducing acids with water, **always add acid to water, never water to acid**.
- Wherever corrosives are used or stored, be sure there is a working, readily accessible eyewash and safety shower, and
- Seek medical attention immediately in the event of a potentially injurious exposure.

H. Special Precautions for Work with Formaldehyde

Formaldehyde is a *particularly hazardous substance* that is covered under a specific OSHA Standard 1910.1048. Suffolk must identify all laboratory activities that are above the OSHA action level or STEL through initial air monitoring and provide training, medical surveillance, and engineering and work practice controls if air levels warrant it.

Formaldehyde is an animal carcinogen and a suspect human carcinogen according to OSHA and IARC. It is also a sensitizer and can cause allergic skin reactions and asthma-like respiratory symptoms. It is an irritant to eyes, nose, and throat.

All formaldehyde procedures should be performed with ventilation such as a fume hood, slot hood, or vented downdraft table. All work should be done using gloves with adequate resistance to formaldehyde.

With proper exhaust ventilation, you should not detect any odors from formaldehyde work nor experience any symptoms of exposure such as eye tearing or throat irritation. If you do, please contact OEHS immediately at 617-570-4849 or 617-573-8628 for an evaluation.

I. Additional Procedures for Work with Particularly Hazardous Substances

Compile Information

Before beginning a laboratory operation, each researcher should consult the appropriate literature for information about the toxic properties of the substances that will be used. The precautions and procedures described below should be followed if any of the substances to be used in significant quantities is known to have high acute or moderate chronic toxicity. If any of the substances being used is known to be highly toxic, it is desirable that there be at least two people present in the area at all times. These procedures should also be followed if the toxicological properties of any of the substances being used or prepared are unknown. Appendix II-C outlines a process for determining whether a chemical is considered a particularly hazardous substance (PHS).

Establish designated areas in the laboratory for use of Particularly Hazardous Substances.
A key requirement of the OSHA Laboratory Standard is that all work with particularly hazardous substances be confined to designated areas. The designated area established in your laboratory depends on the circumstances of use for the PHS. A designated area may be the laboratory, a specific area of the laboratory, or a device such as a glove box or fume hood. There also may be designated equipment such as a specific balance, or centrifuge in which you work with or process PHS materials. It is most common for laboratory hoods to serve as designated areas for most research. Laboratory supervisors are required to notify the Chemical Hygiene Officer of the specific location of any designated areas established in their research groups that are not laboratory hoods.

It is the responsibility of laboratory supervisors to define the designated areas in their laboratories and to post these areas with conspicuous signs reading "DESIGNATED AREA FOR USE OF PARTICULARLY HAZARDOUS SUBSTANCES--AUTHORIZED PERSONNEL ONLY". Printed signs can be obtained from OEHS if needed. In some cases it may be appropriate to post additional signs describing unusual hazards present and/or identifying the specific hazardous substances in use. You can also consider marking with yellow tape a section of a bench space or section of a lab hood where PHSs are used.

OSHA requires there be an established designated area for use of particularly hazardous substances prior to the start of any work. Using PHSs outside of areas designated for their use, poses a significant danger to you and the others in your laboratory and surrounding areas, as well as violates OSHA rules and regulations.

Take action to prevent skin contact

Contact with the skin is a frequent mode of chemical injury. Avoid all skin contact with particularly hazardous substances by using suitable protective apparel including the appropriate type of gloves and a suitable laboratory coat or apron that covers all exposed skin. Always wash your hands and arms with soap and water immediately after working with these materials. In the event of accidental skin contact, the affected areas should be flushed with water and medical attention should be obtained as soon as possible.

Avoid inhalation of PHSs

Avoid inhalation of PHSs by ensuring that work involving potential for exposure to a gas, vapor or airborne dust is conducted in a laboratory hood, or other suitable certified containment device.

Thoroughly decontaminate and clean the designated area(s) at regular intervals. Decontamination procedures should be established in writing, especially those involving chemical treatments, and consist of any necessary periodic (daily, weekly, etc.) procedures performed to control exposure of employees. Depending on the chemical material, this may consist only of wiping a counter with a wet paper towel, or periodic use of a neutralizing agent. To determine the proper decontamination procedures, one must consider the chemical (or type of chemical), the amount of chemical used, the specific use, the location of use, and other factors. Contact OEHS if assistance is needed to determine the most appropriate decontamination procedures.

Be prepared for accidents

The laboratory worker should always be prepared for possible accidents or spills involving toxic substances. To minimize hazards from accidental breakage of apparatus or spills of toxic substances in the hood, containers of such substances must be stored in secondary containment.
If a major release of a particularly hazardous substance occurs outside the hood, then the room or appropriate area should be evacuated and necessary spill procedures should be followed.

Recordkeeping

Every research group in the department must maintain a list of all particularly hazardous substances in use in their laboratories, including an inventory of the maximum quantity present at any given time. It is recommended that CAS Representatives be assigned the responsibility for ensuring that this inventory list is kept up to date. In addition, records that include amounts of material used and names of workers involved should be kept as part of a laboratory notebook. Please be sure to record all experiments involving particularly hazardous substances. Currently Suffolk University is well below all TLV levels which require reporting of PHSs. It is essential that these records be kept accurate and up to date to ensure the Universities compliance in its reporting.

Below is an abbreviated list of Particularly Hazardous Substances. There is currently no governing agency that will provide a complete list of all PHSs; therefore it is the responsibility of each department to determine whether the chemicals they are working with are PHSs.

OSHA MANDATED CHEMICALS		
2-Acetylaminofluorine	Acrylonitrile	4-Aminodiphenl
Arsenic (Inorganic)	Asbestos	Benzene
Benzidine	Bis-Chloromethyl Ether	1,2-Dibromodichloropropane
3,3-Dichlorobenzidine	4-Dimethylaminoazobenzene	Ethylene Oxide
Ethyleneimine	Formaldehyde	Lead
Methyl Chloromethyl Ether	2-Naphthylamine	3-Naphthylamine
N-Nitrosodimethylamine	ß-Propiolactone	Vinyl Chloride
1,3-Butadiene	Cadmium	2-Ethoxy Ethanol
2-Ethoxy Ethanol Acetate	Ethylene Dibromide	2-Methoxy Ethanol
Methylene Chloride	4,4-Methylenedianiline	

If the laboratory uses any of the above substances you will have to incorporate the prevailing government standard for these materials into your specific standard operating procedures. OEHS will assist with obtaining the specific government standard so that the standard operating procedures meet regulatory requirements.

4. PERSONAL PROTECTIVE EQUIPMENT

- Personal Protective Equipment (PPE) and clothing should be selected carefully on a task by task basis and checked to ensure it is in proper working order prior to use. These devices are viewed as less protective than other controls because they rely heavily on each employee's work practices and training to be effective. The engineering and administrative controls which should always be considered first when reducing or eliminating exposures to hazardous chemicals include:

- All Laboratory Personnel should wear long sleeved/long legged clothing. A laboratory coat should be worn over street clothes. A laboratory coat is intended to prevent contact with dirt, chemical dusts and minor chemical splashes or spills. If it becomes contaminated, it should be removed immediately and the affected skin surface washed thoroughly. Closed toe shoes must be worn in the laboratory at all times. Sandals, flip flops, and perforated shoes are not permitted. In addition, long hair and loose clothing should be tied back and confined.

- Select and wear appropriate hand protection, generally gloves, to prevent injury to hands or exposure by absorption of chemicals through the skin of the hands. Gloves for work with chemicals must be selected based on the potential contact hazard, and the permeability of the glove material. For incidental skin contact with small amounts of chemicals on a surface, or work with most powders, disposable nitrile gloves are usually adequate. You should always evaluate the need for hand protection from physical hazards such as extreme heat or cold, and make sure you use appropriate gloves. If you have questions about what types of gloves provide adequate protection for your needs, consult your Lab CHO or OEHS.

- Eye protection is required for all personnel and any visitors present in locations where chemicals are handled and a chemical splash hazard exists. Safety glasses, goggles, and face shields should be worn in the laboratory based upon the physical state, the operation, or the level of toxicity of the chemical used.

- Never use mouth suction to pipette chemicals or to start a siphon; a pipette bulb or aspirator should instead be used to provide vacuum.

- Never taste laboratory chemicals.

- Wash your hands with soap and water immediately after working with hazardous chemicals, even after wearing gloves.

- Eating, drinking (including water), smoking, gum-chewing, and applying cosmetics (including skin moisturizers and lip balms) in laboratories where hazardous substances are in use is strictly prohibited. Do not store food, beverages, cups, or other drinking and eating utensils in areas where hazardous chemicals are used or stored.

- Properly use and maintain personal protective equipment (PPE).

Personal protective equipment should be kept clean and stored in an area where it will not become contaminated. Personal protective equipment should be inspected prior to use to be sure it is in good condition. It should fit properly and be worn properly. If it becomes contaminated or damaged, it should be cleaned or fixed if possible.

For additional requirements and information on selection of PPE, contact OEHS.

5. OTHER SAFETY AND STORAGE EQUIPMENT

5.1 Laboratory Fume Hoods / Ventilation

Engineering Controls: Monitoring and Maintenance

Repair and maintenance of engineering control systems at Suffolk University is the responsibility of Facilities Management. Any observed malfunction should be reported immediately to OEHS and/or Facilities Management.

The major engineering control unit in the laboratories is the laboratory ventilation hood, which exhausts to the outside. Every laboratory ventilation hood used for the control of air contaminants is tested once per year to ensure that adequate airflow is being maintained and to provide continued protection against employee over-exposure. OEHS is responsible for performing this testing. Laboratory hood airflow shall be considered adequate when the average face velocity equals a minimum of a 100

feet/minute with the hood sash at a working height (14 to 20 inches). Results of laboratory ventilation tests shall be recorded and maintained by OEHS. The results will also be posted on the equipment.

Chemical (Fume) Hoods

In the laboratory, the chemical hood is the primary means of controlling inhalation exposures. Hoods are designed to retain vapors and gases released within them, protecting the laboratory employee's breathing zone from the contaminant. This protection is accomplished by having a curtain of air (approximately 100 linear feet per minute) move constantly through the face (open sash) of the hood. Chemical hoods can also be used to isolate apparatus or chemicals that may present physical hazards to employees. The closed sash on a hood serves as an effective barrier to fires, flying objects, chemical splashes or spattering, and small implosions and explosions. Hoods can also effectively contain spills which might occur during dispensing procedures particularly if trays are placed in the bottom of the hoods.

Data on annual fume hood monitoring will be kept by OEHS. Fume hood monitoring data are considered maintenance records, and as such, the full data will be kept for one year and summary data for 5 years.

When using a chemical fume hood keep the following principles of safe operation in mind:

- Keep all chemicals and apparatus at least six inches inside the hood (behind the sash).
- Hoods are not intended for storage of chemicals. Materials stored in them should be kept to a minimum. Stored chemicals should not block vents or alter air flow patterns.
- Keep the hood sash at a minimum height (4 to 6 inches) when not manipulating chemicals or adjusting apparatus within the hood.
- When working in front of a fume hood, make sure the sash opening is appropriate. This can be achieved by lining up to arrows placed on the sash door and hood frame. This sash opening will ensure an adequate air velocity through the face of the hood.
- Do not allow objects such as paper to enter the exhaust ducts. This can clog ducts and adversely affect their operation.

Follow the chemical manufacturer's or suppliers specific instructions for controlling inhalation exposures with ventilation when using their products. These instructions are located on the SDS/MSDS and or label.

If specific guidance is not available from the chemical manufacturer or supplier or if the guidance is inappropriate for the laboratory environment, contact the Suffolk University CHO and/or review the hood use guidelines in the table below. These guidelines are based on information readily available on a chemical's SDS/MSDS:

- applicable workplace exposure standards [Threshold Limit Values (TLV) or Permissible Exposure Limits (PEL)];
- acute and chronic toxicity data (LD50 and specific organ toxicity); and
- potential for generating airborne concentrations (vapor pressure).

5.2 Respiratory Protection

No lab personnel are permitted to pour off any hazardous or potentially hazardous waste. An outside vendor provides this onsite service. Students and lab personnel will never be required to wear personal respirators and/or self contained breathing apparatus's (SCBA's). If a situation should arise in a lab that creates an inhalation hazard that requires a respirator or SCBA all lab work will cease. If there is a question of whether a substance will create an inhalation hazard please contact OEHS.

Inhalation hazards can be controlled using ventilation (engineering controls). Check the label and SDS for information on a substance's inhalation hazard and special ventilation requirements. When a potential inhalation hazard exists, a substance's label or SDS/MSDS contains warnings such as:

- Use with adequate ventilation
- Avoid inhalation of vapors
- Use in a fume hood
- Provide local ventilation

Take appropriate precautions before using these substances. Controlling inhalation exposures via engineering controls is always the preferred method.

5.3 Fire Extinguishers, Safety Showers, and Eye Wash Stations

Eyewash Stations and Safety Showers

Every lab where the use of materials that are either corrosive or that otherwise present a significant skin/eye contact or absorption hazard must have access to an unobstructed safety shower and eyewash facility that meets the requirements of OSHA regulations (29 CFR 1910.151(c)). All laboratory personnel should be aware of eyewash and safety shower locations.

Eyewash stations should be flushed routinely to be certain that water flows adequately and is clean.

Safety showers should be checked routinely to ensure that access is not restricted and that the pull chain/bar is within reach.

OEHS coordinates a yearly inspection and certification of all eyewashes and safety showers in accordance to ANSI Z358.1 recommendations.

Fire Extinguisher and Blanket

Fire extinguishers are not a substitute for calling the fire department in the event of a fire. In a fire emergency, evacuation is the highest priority. Fire blankets provide protection in the event that clothing catches fire. Laboratory personnel should be familiar with the stop-drop-roll-yell method to extinguish clothing fire.

If a fire extinguisher is used, contact SUPD at x8111. OEHS and Facilities should also be contacted.

- All fire extinguishers should be mounted on a wall in an area free of clutter or stored in a fire extinguisher cabinet
- It is Suffolk University's policy that fire extinguishers are to be used by trained personnel only. In the event of a fire a safe evacuation is the highest priority.
- Fire blankets will be inspected annually along with eyewashes and safety showers.

5.4 Safe Use of Cold Rooms

There are two cold rooms in use at Suffolk University. Currently there are no temperature sensitive chemicals being stored in these cold rooms. Refrigerators and cold rooms pose a special hazard for the accumulation of high air concentrations of volatile chemicals, therefore it is recommended that time in these rooms be kept as brief as possible. Each room is equipped with an auditory alarm system. Read the detailed instructions on what to do in the event of the alarm sounding posted on the cold room door, see attachment in Section III Part 4.1.

6. CHEMICAL CONTAINER LABELING GUIDELINES

The labeling of chemical containers is fundamental in ensuring the safe management of laboratory chemicals. Labeling is important in preventing accidental mixing of incompatible chemicals and the inadvertent misuse. It also helps ensure the proper storage of these chemicals and in turn helps facilitate a quick response in the event of a chemical spill or exposure. Lastly accurate and proper labeling prevents the high costs of audit fines as well as the expensive disposal of chemical "unknowns"

6.1 Proper Labeling of Laboratory Chemicals

It is Suffolk University policy that under no circumstances should there ever be an unlabeled chemical container in the laboratories. Original manufacturer labels should not be removed, defaced, or tampered with in any way until the container is empty and no longer in use. Upon arrival into the University new chemicals should be inspected to be sure the label is attached and in good condition. It is advisable to date new containers once they are received in the lab.

Under no circumstances should chemical abbreviations or chemical formulas ever be substituted for full chemical names in English on container labels, e.g., *sodium hydroxide* should be clearly written on the label and NOT NaOH).

In addition, small containers such as test tubes and vials can be labeled as a group by labeling the outer container, box, or rack these smaller containers are held in, as long as all the smaller containers all possess the same constituents.

Containers of non-toxic materials, such as water, must also be labeled with content information, including squirt bottles, small vials, etc., to avoid confusion.

Labels with the phrase “Lab Use Only” are required on food and beverage containers containing foodstuffs that are to be used in experiments and all refrigerators used for chemical storage.

6.2 Active Use Container Labels

Labels are legally required by OSHA's Laboratory Standard and the University's Chemical Hygiene Plan.

Chemical containers in active use need labels with the following minimum information:

- Contents - The substance's common name and manufacturer's name. Abbreviations, acronyms and formulas are not acceptable.
- Proportions – Relative proportions of contents.
- Preparer's Name - Individual who prepared the container.
- Date - Date opened or prepared.

Labels that are defaced, deteriorated, or difficult to read must be replaced.

6.3 Hazardous Waste Container Labels

Waste materials which have been identified as hazardous waste or are suspected to be hazardous waste must be held in containers and clearly labeled. The following guidelines apply to the labeling of the containers:

Label containers as they are put into use. The following information must be on the label:

- The words "HAZARDOUS WASTE" must appear on the label.
- The complete chemical names of all waste in the container must be listed. Full chemical names must be written out. Chemical formulas, acronyms, trade names, and abbreviations are not acceptable.
- Relative proportions of contents - concentration or volume %.
- Hazard category - check off whether the material is known to be flammable, air/water reactive, toxic, and/or corrosive. List any other specific hazards.
- The date in which the container was “full”

Managing Unknowns

Before calling for pickup of a container with unidentified contents, "unknowns," a laboratory must gather all relevant information on the material. Identification and disposal of chemical unknowns is an expensive, time consuming, and a potentially dangerous process. Often personnel can provide valuable information on the chemical constituents or rule out hazardous constituents in an "unknown." Containers whose contents are unknown are required to have at minimum contact information for the person assuming responsibility. This is required in order to determine how to properly ship the package.

7. COMPRESSED GAS CYLINDERS

7.1 Compressed Gases

Compressed gases include those contained in large cylinders, stubbies, lecture bottles, propane and butane fuel bottles, and aerosol cans. Most compressed gas cylinders used at the University are leased from the vendor and are returned for reuse or disposal. Cylinder purchases are strongly discouraged because of the expense and difficulty associated with disposing of unused gases and cylinders. Prior to ordering a compressed gas cylinder, a disposal or return plan should be agreed upon in writing with the vendor. This plan should spell out all procedures necessary for returning the cylinder to the vendor. If no arrangements were made prior to purchase, attempts to return unwanted cylinders to the distributor or the manufacturer must still be made by the University purchaser.

7.2 Disposal of Cylinders

Large cylinders and lecture bottles must be returned to the vendor for reuse or disposal. This is a departmental responsibility. If a vendor does not accept a gas cylinder for return, it may be necessary to treat the cylinder and contents as hazardous waste.

7.3 Unknown Cylinders

A gas cylinder with unknown contents must be handled as a hazardous waste through OEHS. Every attempt must be made by the user to identify the vendor and contents of an unknown cylinder.

Unknown content cylinders must be handled with extreme care and caution. For more information on handling of compressed gas cylinders, consult the vendor or contact OEHS.

7.4 Storing Cylinders

The Boston Fire Department requires that compressed gas supplies in laboratories do not exceed a one to two month supply. Long-term storage must be in approved storage areas separate from the laboratory with proper protection for valves. Cylinders must be properly strapped (secured) at all times to prevent overturning. Always cap cylinders that are not in use.

7.5 Transportation of Cylinders

Ask for and follow the instructions provided by the distributor or manufacturer to return the gas cylinder. The return of purchased cylinders is generally done via common carrier. The transportation cost is the responsibility of the laboratory's department.

Over-the-road transportation by any Suffolk University staff member, faculty member, or student is not permitted. A special permit and license is required to transport hazardous materials by the state of Massachusetts.

7.6 Handling cylinders

Compressed gas cylinders are used in many workplaces to store gases that vary from flammable (acetylene) to inert (helium). Many of these cylinders store gases at high pressures that can turn a damaged cylinder into a torpedo, capable of going through multiple concrete block walls. Other cylinders store the contents as a liquid (acetylene) and have special orientation requirements. If handled properly, compressed gas cylinders are safe. Regardless of the properties of the gas, any gas under pressure that is improperly stored can result in a hazardous release of energy.

Any person who handles compressed gas cylinders should be informed of their potential health and safety hazards and trained to handle them properly.

8. CHEMICAL WASTE MANAGEMENT

8.1 Waste Management Responsibility

The proper disposal of waste chemicals at Suffolk University is a serious concern and we are strongly dedicated to our compliance with applicable federal, state, and local regulations. Hazardous waste is generated from various activities throughout campus. Whether it is laboratory operations, photo processing and development, school of art and design projects, construction and renovation, or a variety of other activities that occur, every effort is made to ensure this is done safely and efficiently.

The responsibility for the identification, and proper management of waste chemicals at the University prior to pickup by OEHS or their contractors, falls on the individuals who have generated the waste. All University employees who use or handle hazardous materials must follow the guidelines set forth in this Manual. It is the collective responsibility of individual employees, supervisors, and OEHS to ensure that hazardous waste is managed safely and appropriately here at Suffolk.

Hazardous Waste Management Policy

Suffolk University is committed to protecting the environment as well as the health and safety of our staff, faculty, and students. Our objective is to promote the safe handling and disposal of all waste in an environmentally sound manner consistent with all applicable regulations. Generators are required to coordinate management of all hazardous waste at Suffolk University with the Office of Environmental Health and Safety. OEHS will ensure that hazardous waste management will be performed by properly trained personnel.

Waste Minimization Policy

Suffolk University is committed to protecting the environment and our facilities. Our objective is to reduce the hazardous waste generated to the lowest practical amount. Reducing the volume and toxicity of hazardous waste minimizes adverse impacts on the air, water, land, and our facilities. By successfully reducing hazardous waste, Suffolk achieves cost savings, increases operational efficiencies, and improves the quality of our services. Effective waste minimization enhances health and safety for the University community.

The Office of Environmental Health and Safety manages the hazardous waste management program on campus. Hazardous materials generated in laboratories, art studios, shops, or other workplaces on campus are collected, labeled, and stored according to procedures detailed in this manual. Hazardous materials are shipped off campus by a licensed disposal firm. OEHS is responsible for the following:

- Maintain storage, shipping, and other related records and ensure compliance with reporting requirements.
- Consult with hazardous waste generators to develop and implement appropriate hazardous waste disposal procedures and waste minimization strategies for their specific areas.
- Consult and provide training on proper practices for the purchase, storage, and disposal of chemicals, and identified hazardous waste.
- Coordinate and manage the disposal activities associated with hazardous waste generated at the University.
- Maintain, review, and approve contracts with the hazardous waste disposal companies.
- Understand the legal requirements regarding all regulated waste streams and provide training and consultation on these regulations to University waste generators.

8.2 Training

All personnel at Suffolk University using hazardous chemicals must complete the training requirements on managing hazardous waste as outlined in Section I Part 3 of this plan.

8.3 Procedures

The following summarizes the general regulatory requirements applicable to generators of hazardous waste.

8.3.1 Waste Identification

A. Waste Identification

A hazardous waste is a solid, liquid, or contained gas that poses substantial or potential threats to public health or the environment and has characteristics of ignitability, toxicity, corrosivity, or reactivity. If a material is regulated as hazardous waste, it must be handled in compliance with the hazardous

waste regulations and the CHP. Until determined otherwise, most chemicals that are intended for disposal should be considered hazardous.

A waste is also considered hazardous if it is identified on the list of hazardous wastes and spent materials. These lists are prepared by the Massachusetts Department of Environmental Protection (MassDEP) and/or the US Environmental Protection Agency (EPA). Listed wastes may be spent materials, unused discarded chemicals, and specific process wastes. Wastes that fall within the listed descriptions are regulated as hazardous wastes regardless of the actual hazard they may present.

B. Containers and Labeling Requirements

- Use plastic or glass containers compatible with the waste.
- Containers must have a screw on cap (or other equivalent secure closure).
- Use smallest containers possible to hold the waste.
- Containers must be clean and free of residue.
- Rusted, dented, or degraded containers are not acceptable.
- Do not use beakers, or other lab ware, coffee cans, plastic milk jugs, or soda bottles to store chemicals.

Before reusing Empty Chemical Containers the following steps should be taken:

- Triple rinse the container with water or an appropriate solvent. Rinse solvent may require collection as hazardous waste. (Whenever possible, reuse the rinse solvent for cleaning until it is spent; use fresh solvent only for the final rinse).
- Remove the old label.
- Clearly and properly re-label the container.

Disposal of Empty Chemical Containers

- Triple rinse the container with water or an appropriate solvent. Rinse solvent may require collection as hazardous waste. (Whenever possible, reuse the rinse solvent for cleaning until it is spent; use fresh solvent only for the final rinse).
- Remove the label.
- Place in glass collection boxes in the laboratory.

8.3.2 Accumulation and Storage

A. Accumulation and Storage

Laboratory hazardous "chemical" waste must be disposed of in accordance with local, state, federal, and Suffolk University requirements. These waste management practices are designed to ensure maintenance of a safe and healthy environment for laboratory personnel and the surrounding community without adversely affecting the environment. This is accomplished through regular removal of hazardous waste and disposal of these wastes in compliance with all regulations and policies.

The U.S. Environmental Protection Agency and the Massachusetts Department of Environmental Protection allow for two types of hazardous waste storage and management areas: Main Accumulation Areas (MAA) and Satellite Accumulations Areas (SAA).

Main Accumulation Area: The main Accumulation Area for the 20 Somerset is in room G13 near the loading dock. Waste stored in this area cannot exceed 180 days. All waste must be dated before it is brought into the MAA, and all containers should be properly labeled in accordance with the labeling guidelines contained in this manual.

Satellite Accumulation Areas: SAAs must be established at or near the point of generation and remain under the control of the person in charge of generating the waste. SAAs must be clearly marked and are to be posted with the sign “Hazardous Waste Accumulation Area.”

A maximum of 55 gallons of hazardous waste or 1 quart of acutely hazardous waste may be accumulated at each SAA. Only one in-use container is allowed per waste stream. Hazardous waste containers must be closed unless waste is being added to the container.

Hazardous wastes with free liquids must be kept within secondary containment. OEHS will provide secondary containers upon request. In addition, containers of incompatible wastes must be kept segregated and stored in separate secondary containers.

All hazardous waste containers in SAAs should be properly labeled in accordance with the labeling guidelines contained in this manual.

Once a hazardous waste container is filled, the label must be dated and the container moved from the satellite accumulation area to the main accumulation area within three business days.

Hazardous waste “pour-offs” are performed by Clean Harbors upon a request being made to OEHS.

Segregating Waste

Not all wastes can be stored in the same container. Wastes that could react together to cause explosions, fires, leaks, fumes, heat, or other releases must be collected and stored in separate containers. The correct segregation of waste allows the best disposal options - both economically and environmentally.

Use separate containers for each of the following types of waste:

- Halogenated Organic Solvents
- Non-halogenated Organic Solvents
- Corrosives - Acids
- Corrosives - Bases
- Heavy Metals
- Elemental Mercury
- Reactives
- Oxidizers
- Toxic chemicals (Poisons)
- "Acutely" hazardous chemicals

Collecting and Storing Waste

- Keep containers tightly closed except when you fill them.
- Do not fill liquid containers completely full. Leave about 2" of headspace to prevent buildup of pressure.
- A funnel may help prevent spills when adding waste to containers; make sure it is clean and free of residues. Do not leave funnels in containers.
- Wear goggles, gloves, and a lab coat when adding waste to containers.
- Keep containers in good condition, handle them carefully, replace any leaking ones immediately, and make sure the outside is clean.

- Inspect stored waste weekly for leaking or damaged containers and tightly closed lids.
- Separate and protect reactive or ignitable waste from sources of ignition or reaction.
- Segregate waste containers according to chemical compatibility just as you would unused chemicals - flammables, oxidizers, reactives, corrosive acids and bases must be stored separately.
- Use secondary containment for liquid waste. Secondary containment may be a tray, pan, bucket, or other container capable of holding the contents of the primary container.

When hand-carrying open containers of hazardous chemicals or unopened containers; place the container in a secondary container or a bucket. Secondary containment and rubberized buckets are commercially available and provide secondary containment as well as "bump" protection. If several bottles must be moved at once, the bottles should be transported on a small cart with a substantial rim to prevent slippage from the cart.

B. Inspections

Hazardous waste areas (MAAs and SAAs) must be inspected on a weekly basis. OEHS performs these routine inspections as described and also keeps documentation of any findings that are noticed.

8.4 Sink Discharges/ Wastewater Disposal in Sinks

Hazardous materials must not, under any circumstances be disposed of in the sink. If there is ever a question on whether or not something can be disposed of in the sink contact OEHS. Suffolk University's Spill Prevention Control and Countermeasure program (SPCC) prohibits the disposal of any chemicals down the drain. The SPCC plan was established to comply with Mass DEP, EPA, and Mass Water Regulatory Agency (MWRA) standards. It is against the law to dispose of any chemicals down the drain. If there was a discharge to the sink due to a spill or accidental release please notify OEHS immediately.

9. SHIPPING HAZARDOUS MATERIALS

Any of these substances that need to travel over public roadways will be done by licensed vendors who will be sure to comply with the regulations regarding quantity, packaging and labeling. If you have any questions regarding the transportation of hazardous materials over the roadways please feel free to contact OEHS.

Only OEHS personnel are allowed to sign hazardous waste manifests after a shipment.

10. APPENDICES

10.1 Appendix II-A OSHA Permissible Exposure Limits (PELs)

Most SDSs provide PELs for the chemicals they refer to as long as a PEL for that chemical has been established. Please refer to the OSHA website for a complete list of all PELs and also the

10.2 Appendix II-B ACGIH Threshold Limit Values (TLVs)

Most SDSs also provide TLVs for individual chemicals. American Conference of Governmental Industrial hygienists (ACGIH) TLVs can also be looked up on the National Library of Medicine Toxnet website at http://toxnet.nlm.nih.gov...

A complete list of all ACGIH TLVs is available at http://www.acgih.org/home.html.

10.3 Appendix II-C How to determine if a chemical is a Particularly Hazardous Substance

11. DEFINITIONS

Asphyxiants have the ability to deprive tissue of oxygen.

- **Simple asphyxiants** are inert gases that displace oxygen.
- **Chemical asphyxiants** reduce the body's ability to absorb, transport, or utilize inhaled oxygen. They are often active at very low concentrations.

Primary anesthetics have a depressant effect upon the central nervous system, particularly the brain.

A **carcinogen** is an agent that can initiate or increase the proliferation of malignant neoplastic cells or the development of malignant or potentially malignant tumors.

A **mutagen** interferes with the proper replication of genetic material in exposed cells. If germ cells are involved, the effect may be inherited and become part of the genetic pool passed onto future generations.

A **teratogen** (embryotoxic or fetotoxic agent) is an agent, which interferes with normal embryonic development without causing a lethal effect to the fetus or damage to the mother. Effects are not inherited.

A **sensitizer** is a chemical, which can cause an allergic reaction in normal tissue after repeated exposure to the chemical. The reaction may be as mild as a rash or as serious as anaphylactic shock.

Radioactive: requires OEHS approval, Suffolk does not hold a license for radioactive material.

Toxicology is the study of the nature and action of poisons.

Toxicity is the ability of a chemical substance or compound to produce injury once it reaches a susceptible site in or on the body.

A material's **hazard potential** is the probability that injury will occur after consideration of the conditions under which the substance is used.

Routes of Entry into the Body

There are four main routes by which hazardous chemicals enter the body:

Inhalation- Entry through the respiratory tract.

Absorption- Entry through the skin via dermal contact.

Ingestion- Entry the digestive tract. (Ingestion can occur through eating, drinking, or smoking with contaminated hands or in contaminated work areas.)

Injection- Introducing the material directly into the bloodstream. (Injection may occur through mechanical injury from "sharps".)

Most exposure standards, such as the Threshold Limit Values (TLV's) and Permissible Exposure Limits (PEL's), are based on the inhalation route of exposure. These limits are normally expressed in terms of either parts per million (ppm) or milligrams per cubic meter (mg/m3) concentration in air. If a significant route of exposure to a substance is through skin contact, the SDS, PEL, and/or TLV will have a "skin" notation.

Types of Effects

Acute poisoning is characterized by sudden and severe exposure and rapid absorption of the substance. Normally, a single large exposure is involved. Adverse health effects are sometimes reversible.

Chronic poisoning is characterized by prolonged or repeated exposures of a duration measured in days, months, or years. Symptoms may not be immediately apparent. Health effects are often irreversible.

A **local effect** refers to an adverse health effect that takes place at the point or area of contact. The site may be skin, mucous membranes, the respiratory tract, gastrointestinal system, or eyes. Absorption does not necessarily occur.

A **systemic effect** refers to an adverse health effect that takes place at a location distant from the body's initial point of contact and presupposes absorption has taken place.

Cumulative poisons are characterized by materials that tend to build up in the body as a result of numerous chronic exposures. The effects are not seen until a critical body burden is reached.

Section III. Basic Standard Operating Procedures

1. INTRODUCTION

This plan represents a minimum set of guidelines for the handling of hazardous chemicals in Suffolk University laboratories. Laboratory Supervisors are responsible for developing more detailed procedures for specific hazards. These procedures must be written, added to the laboratory's CHP, and made available to laboratory personnel. Generic laboratory standard operating procedures such as those in Appendix D-G may be adopted or may be useful in developing additional procedures. In all situations, individual faculty or staff will be responsible for enforcing adequate safety and hygiene measures in laboratories they supervise. If necessary, additional assistance from the OEHS is available.

2. STANDARD OPERATING PROCEDURE FORM INSTRUCTIONS

2.1 Purpose

The purpose of this procedure is to <describe the objective of the procedure here>

2.2 Scope

This procedure is required <provide a description of why the procedure is needed referencing regulation and/or directive here>.
This procedure applies to <provide the applicability of the procedure and whom it provides guidance to here>

2.3 Definitions

Provide definitions of words and key terms within the context of the procedure to ensure uniform interpretation and use (use bullet list format or an appropriate numbering scheme, and format the text as shown below).
Term goes here in bold—Definition goes here in plain text.

2.4 Responsibilities

Describe by job title a list of activities the individual is responsible for performing in the procedure.

Title 1

Describe responsibilities (relative to implementing this SOP) for personnel functioning as <Title 1> here.

Title 2

Describe responsibilities (relative to implementing this SOP) for personnel functioning as <Title 2> here.

2.5 Safety

Include all personal protective equipment and engineering controls needed for a safe operation.
Subheadings examples include: Personal Protective Equipment, Safety Equipment, etc.
Examples within these subheadings include: safety goggles, gloves, spill materials, fume hood, etc.
Safety Precautions
Identify the possible hazards and risks involved resulting from failure to follow this SOP.

2.6 Procedure

Provide instructions for the effective implementation of established requirements (normally includes a step by step core operating procedure). Use a numbered list for steps that must be completed in a specific order; use a bullet list for steps or items that require no particular sequence. Use subheadings as needed. Subheadings examples include: Equipment, Supplies, Recordkeeping, Special Precautions, Storage Requirements, Decontamination, Disposal Requirements, etc.

2.7 Emergency Procedure

List the procedure to be taken in the event of an emergency situation such as a spill, injury, leak, fire, or explosion. Include emergency contact numbers, equipment and first aid treatment steps.

2.8 Preparation and Approval

Suffolk University's department management will assign responsibility for the preparation of a procedure. The person preparing the procedure should be intimately familiar with the details of the activities involved and should consult with others who are knowledgeable and /or actively involved with the activities.

A draft procedure should be reviewed by the Suffolk University's Department Management and the Office of Environmental, Health, & Safety (OEHS). Prior to final approval, the step-by-step procedural portion should be validated by the reviewer through actual observation of the step-by-step activities. The final procedure must be approved by the Department Supervisor and OEHS by a signature and date (use the format of text shown below).

3. STANDARD OPERATING PROCEDURES

Biology

Ph Meters

Stirrers

Heated Stirrers

Mixers

Water Baths

Incubators

Shakers/Rotators

Microscopes

Electric Pipet Aids

Ovens / Microwave Ovens

Beckman-Coulter Particle Counter

Power Supply

Liquid Nitrogen

Autoclave

Compressed Gas (Carbon Dioxide)

Centrifuges

Ultraviolet (UV) Light

Thermal Cyclers/Polymerase Chain Reactor (PCR) machines

Spectrophotometers

Fraction Collectors

Scanners

Flammable Gas Lines (Natural Gas), etc

Physics

Colilert System—Quanti-tray Laser

Earth's Field NMR

Ellipsometer 1

Ellipsometer 2

Laser System Class IIIB, 50 W 405 nm

Laser System Scheppens

Lasers (3), He-Ne, Class II, 1.0 mW

Lasers (5), He-Ne, Class IIIA, 5.0 mW max

Ocean Optics Spectrometer

Portable Gas Analyzer

Portsable Gas Chromatograph

SEM Nanosurf EastScen 2

STM

X-ray Fluorescence Spectrometer

X-ray Analyzer

Ocean Optics Spectrometer, etc

Chemistry

Amersham Bio UVvis

Analytical Balancer

Autoclave

Balance

Drying Oven

Eppendorf Microcentrifuge

GOW-MAC GC 580

Hotplates

Liquid Nitrogen

PE UVvis

Perkin Elmer AA Instrument

Perkin Elmer HPLC

Ph Meter

Px2 Thermal Cycler

Sorvall Refrig Centrifuge

Spectriflourometer

Ugenius

Water Bath Shaker G76D, etc

Art & Design Dept. Woodshop

Belt and Disc Abrasive Finishing Machine

Baldor Grinder

Delta Drill Press

Delta Wood Cutting Band Saws

Delta Hollow Chisel Mortiser

Delat Unisaw Table Saw

Jet Edge Sander

Makita Slide Compound (Radial Arm) Saw

Porter Cable Belt Sander

JET Benchtop Oscillating Spindle Sander

Milwaukee Router Motor and Jessem Benchtop

Porter Cable Brad Nailer

Section IV. Additional Administrative Provisions

1. SECURITY, PRIOR APPROVALS, INVENTORIES AND PROCUREMENT

1.1 Laboratory and Chemical Security

To minimize the theft and improper use of hazardous chemicals including toxic and corrosive substances the following actions should be taken:

- Access to all hazardous chemicals, including toxic and corrosive substances, should be restricted. Specifically, these materials should be stored in laboratories or storerooms that are kept locked when laboratory personnel are not present.
- Restrict access to the laboratory to authorized personnel only and become familiar with these people
- Ship chemicals by following requirements in Section II part 9 to ensure safety and security.

1.2 Department and Laboratory based Prior Purchase Approvals

The following list of equipment, chemicals, products, etc all require pre-approval before being purchased, by OEHS:

- Lab Equipment/Instruments that require the following
  - High Voltage
  - Uses a compressed Gas
  - Requires Ventilation
  - Can be a hazardous process
  - Requires special training/certification to operate
- Biological Toxins (microorganisms that are pathogenic to humans, plants, or animals)
- Biological Safety Cabinets
- Chemical Fume (Exhaust) Hoods
- High Hazard Chemicals (Carcinogens, EPA P-Listed, Peroxides, Unstable/Reactive)
- Lasers-Class 3b or 4
- X-ray Machines
- Syringes and hypodermic needles

- Living animals

1.3 Department and Laboratory based Banned Products

The following list of equipment, chemicals, products, etc are all prohibited at Suffolk University:

- Radioactive Material (requiring a radioactive license)
- Living animals beyond mice and fish (ex. rabbits)
- Mercury Containing Devices
- Department of Homeland Security Chemicals of Interest
  http://www.dhs.gov/xlibrary/assets/chemsec_appendixa-chemicalofinterestlist.pdf
- DEA Controlled Substances

1.4 University Purchasing of Chemicals

It is strictly prohibited to purchase chemicals from non-permitted vendors. (Such as eBay)

Suffolk University does not accept any chemicals for donation.

Accepting a donation of equipment from another entity requires prior OEHS approval.

1.5 Purchase of Large Chemical Quantities

Suffolk discourages the practice of bulk ordering of chemicals that reduces the chemical cost per unit volume. Although bulk orders may save individual departments money in the short-term, in the long run, the cost of disposal of unused chemicals can far outweigh any savings from the bulk order. However, if it can be demonstrated that the bulk purchase of a chemical for an on-going laboratory process can simultaneously reduce disposal costs and not increase risks to environment, health and safety, OEHS may support some degree of bulk purchasing. Contact OEHS to discuss particular situations if you are considering a bulk purchase.

The following points should be addressed to determine the proper volume of any chemical to order.

Consider the following when placing an order:

- Investigate if there is a less hazardous substitute that can be used to achieve the same results. This could reduce the hazards involved in the process as well as the waste disposal costs.

- Order only the amount likely to be used for its intended purpose within the specified shelf life of the material and within the planned timeframe of the procedure. This can minimize chemical waste if processes or research changes and previously purchased chemicals are no longer needed. Although many chemicals can be safely stored over long periods of time, decomposition can result in explosions, ruptured containers and the formation of hazardous by-products.
- Order only the quantity that will fit into the appropriate storage area(s). Storing excess chemicals in a fume hood or outside adequate storage facilities will create other hazards.
- Consult laboratory chemical inventory lists, if available, before ordering additional stock. If the decision is made to order new stock because of concerns about quality of existing stock, please properly dispose of existing stock of questionable quality as soon as possible.
- Manage the stock so that the oldest materials are used first.

If you need assistance in making a determination on the most appropriate quantity of chemical to purchase, please contact the OEHS at 617-570-4849/617-573-8628

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1.6 Purchase of Non-Returnable Gas Cylinders

The purchase of non-returnable gas cylinders should be avoided. All gas cylinders should be returned to the supplying vendor when their use is completed. All non-returnable cylinders will have to be disposed of as hazardous waste, and the cost of doing so will be charged to the Department.

2. MEDICAL EVALUATION, EXAMINATION AND SURVEILLANCE

2.1 Medical Consultation

Suffolk University shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

- Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory.
- Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements.

- Whenever an event takes place in the work area such as a spill, leak, explosion, or other occurrence resulting in the likelihood of a hazardous exposure.

2.2 Reporting of an Accident

All accidents and incidents that require medical treatment shall be reported to OEHS, direct supervisors, and human resources. The S.U. Incident Form should be completed and sent to OEHS after the incident. This applies to all faculty, staff, students, and visitors. This also includes reporting of near misses, incidents that had the potential to cause an injury or property damage. A copy of the Suffolk University incident form can be found on the OEHS webpage. If necessary OEHS will perform an accident investigation in order to prevent an incident from reoccurring. Incident report forms can be found by visiting the Suffolk University OEHS website.

3. LABORATORY INSPECTIONS AND AUDITS, COMPLIANCE AND ENFORCEMENT

3.1 Inspections and Audits

OEHS has implemented a framework for conducting laboratory and workspace inspections and audits to determine compliance with environmental, health, and safety policies, laws, and regulations. These inspections and audits examine a broad spectrum of areas including, but not limited to: postings and signage, documentation, training, safety equipment, laboratory and workplace protocols, waste, labeling, and satellite & main accumulation areas (SAA & MAA).

The purpose of these inspections and audits is to aid the University and its laboratories in maintaining a safe and healthy work and study environment. Suffolk University is committed to complying with all applicable environmental, health and safety standards, laws, and rules and regulations.

3.2 Compliance and Enforcement

Each individual at the University is responsible for complying with all federal, state, local and Suffolk rules, regulations, and required procedures; and is held accountable for their actions. If a CHO/Supervisor does not take appropriate action to address problems noted during inspection or audits, he or she may be subject to compliance and enforcement action. Issues of non-compliance will be taken to the CAS Committee for recommendations regarding disciplinary action. The CAS Committee will provide recommendations to the Department Head for action. Deliberate failure to

comply with those results could place the safety and health of individuals or the environment in serious jeopardy and may result in the loss of laboratory privileges.

4. SUFFOLK UNIVERSITY SPECIFIC POLICIES FOR LABORATORY PERSONNEL

4.1 After Hours Laboratory Work Policy

A. DEFINITIONS

AFTER HOURS – Monday through Friday from 10:00 p.m. – 8 a.m. when classes are in session, and all day Saturday and Sunday, on holidays, and during breaks.

LABORATORY USE - This policy applies only to the use of laboratories for conducting laboratory procedures. It does not apply to the use of computers in laboratories, use of laboratories for reading or other uses not involving laboratory procedures.

SIGN IN/SIGN OUT – Faculty and staff must sign in before beginning any work in the laboratories during afterhours by calling SUPD Dispatch Center, X8333. Faculty and staff must also sign out when work is complete in the laboratories. This is the responsibility of the faculty/staff member working in the lab to sign in/out with SUPD. Each faculty/staff member must also be approved to work during after hours by their department chair person.

WORKING ALONE - A person is "working alone" when there is no second person in the laboratory or within voice contact. The second person must be a member of the Suffolk University community who is familiar with emergency procedures and aware that they are serving in the "buddy" capacity.

B. FACULTY/STAFF RESEARCH

Faculty or department staff are expected to avoid working alone whenever possible and to use good judgment as to the performance of hazardous operations in "working alone" situations. This in no way implies that other safety requirements are waived; on the contrary, the use of good judgment implies expert knowledge of safe practices.

C. STUDENTS

Use of Teaching Laboratories

Students are permitted to work in undergraduate teaching laboratories only during assigned hours unless the faculty member grants permission and s/he, a staff member, or teaching assistant is present. Students are responsible for performing all work in accordance with those procedures and for reporting all accidents, chemical spills, and unsafe conditions to the faculty member.

4.2 Visitor Policy

OEHS requires anyone under the age of 18 that performs operations within a laboratory to meet the following criteria:

- Contact OEHS prior to working in the laboratory to coordinate general laboratory safety training for the individual.
- The Laboratory Supervisor that has a minor working under his or her charge is to provide training on the specific hazards found in the laboratory where the minor will perform his or her work.

This training must be documented. The student should also be informed of any standard operating procedures that may apply to the work being performed.

4.3 Reproductive Policy for Laboratory Personnel

Laboratory personnel should discuss the use of chemicals and other materials with their physician if they have recently conceived or are anticipating conception. In the case of certain laboratories, the use of mutagenic and teratogenic chemicals may be required. Mutagens are substances that can cause a change or mutation in the genetic material of a living cell. Teratogens can cause injury or deformity in unborn children after absorption of the substance by the pregnant mother. Specific details concerning health issues should be discussed with a physician. If there are any questions about specific chemicals please contact OEHS.

4.4 University Mercury Policy

Mercury spills occur primarily due to the use of mercury thermometers, pressure measurement, and similar devices. Mixtures of mercury compounds and other wastes are difficult waste streams to dispose of.

Suffolk University prohibits the use of mercury thermometers on campus. The University also prohibits the use of mercury compounds in laboratory experiments. In the event you find a mercury containing device please discontinue the use of the item and contact OEHS.

5. UNIVERSITY WASTE MINIMAZATION AND VOLUME REDUCTION

5.1 Purchasing to Minimize Waste

Good purchasing decisions are the first steps in minimizing hazardous waste. Every effort must be made to keep purchase quantities to a minimum. Purchase only the quantity of material that will be completely used within a reasonable time frame. The following guidelines should be followed:

- Limit the amount you order.
- Do not stockpile chemicals.
- Keep up to date chemical inventories.
- Check your inventory to avoid ordering chemicals that are already in stock.
- Purchase chemicals only from an approved vendor.
- Rotate chemical stocks to use up chemicals before their shelf lives expire.
- Laboratories must investigate pre-weighed packaging options now available from chemical vendors, particularly with highly toxic materials. The purchase of pre-weighed materials avoids unnecessary handling, storage, and disposal of excess toxic materials.
- Do not accept offers of "free" or donated research materials or chemicals from outside the University.
- Do not accept excess chemicals or inventories from another institution.

5.2 Source Reduction

Source reduction refers to practices that reduce, avoid, or eliminate hazardous waste at the point of generation. The following source reduction guidelines should be followed:

- Use smaller quantities of chemicals in the experiment or process.
- Substitute less toxic or non-hazardous chemicals for their toxic counterparts.
- Plan the experiment to consume hazardous materials to the extent feasible and to minimize the amount and toxicity of waste materials produced.
- Do not dispose of chemicals as hazardous waste when they can be recycled or reused. If you have no further need of a hazardous material, determine whether Suffolk University colleagues can use it.
- Do not mix chemical wastes. Mixing reduces the likelihood that materials may be reused or redistributed and often increases disposal costs.
- Do not combine other chemicals with organic solvents. Acids, bases, heavy metals, carcinogens, oxidizers, cyanides, sulfides, pesticides, non-halogenated solvents, and halogenated organic solvents must be collected in separate, labeled, and dated waste containers.

5.3 Reuse and Recycling

Reuse and recycling includes any practice employed to extend the useful life of a substance. Whenever possible, laboratories should try to recover, re-distill, and reuse organic solvents. When cleaning with solvents, reuse the spent solvent for the initial rinsing and use fresh solvent only for the final rinse. Recycle and share chemicals within a lab group or department. Investigate whether unused and unopened reagent chemicals and compressed gas cylinders can be returned to the vendor.

5.4 Waste Pick Up

Before requesting a waste pickup, make sure you have followed the procedures above for container selection, labeling, handling, and storage of hazardous waste. Make sure containers are clean on the outside and have caps that are tightly closed. The following are guidelines for requesting a waste pick up:

- your name
- phone number
- department name
- building and room number

- material(s) name(s) - content of the waste
- quantity
- size of containers to be picked up
- physical state of the material

6. APPENDICES

6.1 Official Suffolk University Forms

ATTACHED: *STANDARD OPERATING PROCEDURE TEMPLATE*

ATTACHED *SATELLITE ACCUMULATION AREA INSPECTION CHECKLIST*

ATTACHED *MAIN ACCUMULATION AREA INSPECTION CHECKLIST*

ATTACHED *STANDARD LABORATORY INSPECTION*

ATTACHED *SPILL RESPONSE PROCEDURE*

ATTACHED *ACCIDENT/INCIDENT REPORT*

ATTACHED *HAZARDOUS WASTE LABEL EXAMPLE*

ATTACHED *UNCHEMS User Guide*

ATTACHED *COLD ROOM ALARM PROCEDURES*

Add relevant lab specific appendices and new SOPs to the CHP file copy in the lab.