

Chemical Hygiene Plan

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AUTHORIZATION SHEET

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PART I
THE OSHA LABORATORY STANDARD
AND
THE SOUTHERN STATE COMMUNITY COLLEGE
CHEMICAL HYGIENE PLAN

THE OSHA LABORATORY STANDARD

The basis for this standard is 29 CFR 1910.1450. The Occupational Safety and Health Administration (OSHA) determined that laboratories differ from industrial operations in their use and handling of hazardous chemicals due to the lesser quantities of chemicals typically present. The final standard applies to all laboratories that use hazardous chemicals in accordance with the definitions of laboratory use and laboratory scale provided in the standard. In general, where this standard applies, it supersedes the provisions of all other standards in 29 CFR 1910 subpart Z, except in specific instances identified by exposures at or below the Permissible Exposure Limits (PEL) specified in 29 CFR 1910 subpart Z. The means by which this standard is met is determined by each employer through the implementation of a Chemical Hygiene Plan. The Chemical Hygiene Plan must include all work practices, engineering controls, procedures and policies that insure employees are protected from potentially hazardous chemicals used or stored in their work area. Hazardous chemicals are defined by the final standard in both 29 CFR 1910 subpart Z and 29 CFR 1910.1200c.

EMPLOYEE RIGHTS AND RESPONSIBILITIES

Employees have the right to know and are required to know about the physical and health hazards of the chemical substances in their work areas. They have the right to be properly trained to work safely with these chemical substances. They have the right to file a complaint with Ohio OSHA if they feel they are being exposed to unsafe or unhealthy work conditions. Employees cannot be discharged, suspended or otherwise discriminated against by their employer because of filing a complaint, or exercising any of their other rights under the law.

Employees have the responsibility to attend training sessions concerning the Laboratory Standard and the Chemical Hygiene Plan. They have to stay informed about the chemicals used in their work area. Further, they have the responsibility to use safe work practices including Personal Protective Equipment required for safe performance of their job. Finally they have the responsibility to report to their supervisors any accidents, conditions or work practices they believe to be a hazard to their health or to the health of others.

HAZARDOUS CHEMICALS

The Laboratory Standard defines a hazardous chemical as any element, chemical compound or mixture of elements and/or compounds which is a physical or health hazard. A chemical substance is a physical hazard if there is scientifically valid evidence

that it is a flammable liquid, a combustible liquid, a compressed gas, an explosive, an organic peroxide, an oxidizer, a pyrophoric material, an unstable material or water reactive. A chemical substance is a health hazard if there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute and/or chronic health effects may occur in exposed employees. Such health hazards include: carcinogens, mutagens, teratogens, sensitizers, neurotoxins, hepatotoxins, hematopoietic toxins, irritants, corrosives, radioactive materials, biohazards, nephrotoxins and agents that damage the lungs, skin, eyes, or mucous membranes. Appendix F, Glossary, gives the definitions for these terms.

In most instances, the label will indicate if the chemical is hazardous. Key words to find on the label are: caution, hazardous, toxic, dangerous, corrosive, irritant, carcinogen, mutagen, etc. Note that containers that are older than 1985 may not contain a hazard warning. Another means of establishing the hazard of a chemical substance is through the Material Safety Data Sheet.

The standard indicates that a designated area be established and posted for work with certain chemicals and mixtures that are acutely toxic (Appendix E). These substances include select carcinogens, reproductive toxins and/or substances which have a high degree of acute toxicity. The designated area may be a select part of the laboratory, the entire laboratory and/or a select laboratory hood.

MATERIAL SAFETY DATA SHEETS

A Material Safety Data Sheet (MSDS) is a document containing chemical hazard and safe handling information prepared in accordance with the OSHA Hazard Communication Standard. Chemical manufacturers, suppliers and distributors must provide a MSDS the first time a hazardous chemical or product is shipped to a facility. In this case, SSCC is considered a facility. The MSDS received must be retained and made available to any and all laboratory workers. If SSCC makes and ships a chemical product to another facility, other than another SSCC campus, SSCC is required to send a MSDS to the facility to which the product is shipped.

CHEMICAL INVENTORIES

The OSHA standard does not require chemical inventories. However, it is prudent to adopt this practice. An annual inventory can reduce the number of unknown substances and the tendency to stockpile unused or old chemicals.

SOUTHERN STATE COMMUNITY COLLEGE CHEMICAL HYGIENE PLAN

This document serves as the written Chemical Hygiene Plan for laboratories using chemical substances at all campuses of Southern State Community College. An important part of the Chemical Hygiene Plan is the establishment of the Chemical Hygiene Officer position. The Chemical Hygiene Plan is a living document. It is not a short term program. The document is designed to cover all laboratory activities for all Divisions at SSCC.

SCOPE AND APPLICATION

The Chemical Hygiene Plan applies to all personnel at all campuses at SSCC. The Chemical Hygiene Plan does not apply to:

1. Uses of hazardous chemicals which do not meet the definition of laboratory use such as janitorial cleaners and maintenance supplies.
2. Laboratory uses of hazardous chemicals which provide no potential for employee exposure, such as:
 - a. Procedures using chemically impregnated test media, for example, Dip-and-Read tests, where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip, and
 - b. Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit.

The chemical substances not covered by the Chemical Hygiene Plan are still subject to the full provisions of the OSHA Hazard Communication Standard. These chemical substances will be handled by the Chemical Hygiene Officer under the Right-to-Know sections of the Standard.

RESPONSIBILITIES

President of Southern State Community College – The President of the College shall provide endorsement, support and implementation for the Chemical Hygiene Plan at the College level. It is the responsibility of the President to approve all aspects of the Chemical Hygiene Plan, to ensure that the resources are provided to implement the plan, and to hold either directly or through subordinates, individuals accountable for their individual performance of duties related to the Chemical Hygiene Plan including budget. Also, the President has the additional responsibility to prioritize all building utility and engineering needs such that the College operates within all safety parameters written in the Chemical Hygiene Plan.

Vice President of Academic Affairs – The Vice President of Academic Affairs shall provide endorsement, support and implementation for the Chemical Hygiene Plan at the Division level. It is the responsibility of the Vice President of Academic Affairs to provide a list of all Full Time Instructors and all Adjunct Instructors to the Chemical Hygiene Officer. Further, the Vice President of Academic Affairs must make sure that all Instructors provide a means by which they can be contacted for training purposes and in case of emergency. The list provided to the Chemical Hygiene Officer must include the contact information. In addition, it is the responsibility of the Vice President of Academic Affairs, together with the Director of Human Resources, to administer progressive discipline as outlined in college policy or collective bargaining for those personnel that fail to follow the Chemical Hygiene Plan.

Vice President of Business and Finance – The Vice President of Business and Finance in the role of Vice President of Business and Finance and in the role of Maintenance Director shall provide endorsement, support and implementation of the Chemical Hygiene Plan at both the Business and Finance level and the Maintenance level. It is the responsibility of the Vice President of Business and Finance to review the detailed and prioritized budget requests presented to his office in conjunction with the Chemical Hygiene Plan. Those requests shall receive full consideration and attention within the constraints of available resources. It is the responsibility of the Maintenance Director to work with the Chemical Hygiene Officer for the training of Maintenance Personnel. Further, the Maintenance Director must assist in providing a safe working environment for all College personnel that may be affected through Maintenance activities that pertain to chemicals.

Director of Human Resources – The Director of Human Resources shall provide endorsement, support and implementation of the Chemical Hygiene Plan at the human resources level.

The Dean of Technical and Career Studies, the Dean of Core Studies and the Dean of Instructional Operations - The Dean of Technical and Career Studies, the Dean of Core Studies and the Dean of Instructional Operations shall provide endorsement, support and implementation of the Chemical Hygiene Plan at the Program and the Department levels. It is the responsibility of these Deans to forward the names of all Full-time and Adjunct Faculty that require training in the content of the Chemical Hygiene Plan to the Vice-President of Academic Affairs at the beginning of each Academic Term. The list must include the contact information for each individual. Additionally, these Deans are to assist in the development and implementation of a policy ensuring all faculty follow the Chemical Hygiene Plan.

Campus Directors – All Campus Directors shall provide endorsement, support and implementation of the Chemical Hygiene Plan at the Campus level. It is the responsibility of each Campus Director to make certain all laboratories on their campus meets the requirements of the Chemical Hygiene Plan. Further, it is the responsibility of the Campus Directors to immediately contact the Vice President of Academic Affairs

and/or the Director of Human Resources with any personal chemical safety issue affecting their campus. In addition, it is the responsibility of the Campus Directors to immediately contact the appropriate Dean or the Chemical Hygiene Officer regarding any chemical problems that arise on their campus. The Campus Directors need to contact the Chemical Hygiene Officer for chemical waste disposal and removal.

Instructors – The Instructors shall provide endorsement, support and implementation for the Chemical Hygiene Plan at the class level. The duties of the Instructors include:

1. Read the Chemical Hygiene Plan; know and follow its rules and conditions.
2. Receive training concerning all general laboratory safety rules and engineering controls.
3. Receive training concerning all specific chemical hazards in their laboratories including exposure symptoms and personal protective equipment.
4. Complete fire extinguisher training.
5. Instruct all Students at the inception of any new class concerning general laboratory safety rules as outlined in Appendix F.
6. Instruct all Students concerning specific hazards related to all experiments before that experiment is performed.
7. Provide all Students with the appropriate personal protection equipment and engineering controls for any and all experiments.
8. Report any and all problems or failures associated with any engineering control device to the Chemical Hygiene Officer.

Chemical Hygiene Officer – The Chemical Hygiene Officer shall provide endorsement, support and implementation of the Chemical Hygiene Plan at the College level. The Chemical Hygiene Officer duties include:

1. Develop and oversee the implementation of the Chemical Hygiene Plan in conjunction with the Southern State Education Association Safety Committee.
2. Monitor the procurement, use and disposal of chemicals campus wide.
3. Approve any new laboratory procedure using input from the Chemical Hygiene Committee.
4. Formally inspect all laboratory fume hoods and safety showers on a quarterly basis and provide the date of inspection on the equipment tag.
5. Informally inspect any and all other engineering control devices at any time and report any problems to the Maintenance Manager using Form SSCC-CHP-M.
6. Bring to the attention of the appropriate level supervisor any failure of personnel and/or engineering control device related to the effective implementation of the Chemical Hygiene Plan.
7. Re-inspect engineering control device issues that were previously addressed via Form SSCC-CHP-M.
8. Train all Instructors in the Chemical Hygiene Plan and chemical handling.
9. Review the Chemical Hygiene Plan annually and make any and all appropriate changes.

10. Maintain all documentation concerning training, accidents, spills and maintenance of engineering control devices.

Southern State Education Association Safety Committee – The SSEA Safety Committee shall provide endorsement, support and implementation of the Chemical Hygiene Plan at the College level. The Safety Committee responsibilities include:

1. Assist the Chemical Hygiene Officer with the development and implementation of the Chemical Hygiene Plan.
2. Approve all new laboratory procedures with input from the Chemical Hygiene Officer.
3. Review the Chemical Hygiene Plan annually in conjunction with the Chemical Hygiene Officer and suggest any and all appropriate changes.

Maintenance Manager – The Maintenance Manager shall provide endorsement, support and implementation for the Chemical Hygiene Plan at the maintenance level. The duties of the Maintenance Manager include:

1. Make certain that all eye wash stations are inspected on a monthly basis and provide the date of inspection on the equipment tag.
2. Make certain that all eye wash stations are in working order at all times.
3. Make certain that all maintenance workers are trained to adjust eye wash stations.
4. Make certain that any and all engineering control device problems brought to the attention of the Maintenance Manager via Form SSCC-CHP-M from the Chemical Hygiene Officer are solved in accordance to the time frame denoted on Form SSCC-CHP-M.
5. Make certain that all Maintenance Personnel are trained by the Chemical Hygiene Officer according to the Chemical Hygiene Plan and according to the chemicals used in their everyday work.

EXPOSURE LIMITS

The College must make certain that laboratory Instructors and Students exposure to hazardous substances do not exceed either the Permissible Exposure Limits (PELs) specified in 29 CFR 1910 subpart Z or the Threshold Limit Values (TLVs) published by the American Conference of Governmental Industrial Hygienist (ACGIH), whichever is lower. This is accomplished through proper standard operating procedures for experiments and the use of engineering devices and Personal Protective Equipment.

EMPLOYEE INFORMATION AND TRAINING

The College must provide employees with information and training to make certain that they are apprised of the hazards associated with the chemical hazards in their area. The

information and training must be provided at the time of the employee's initial entry into the College and continue throughout their teaching assignments. Division Coordinators, full time professors, adjunct professors and laboratory workers are required to take this training. Also, before any new procedures are adopted by the College, all employees affected by the new procedure have to be trained on the procedure.

Information provided to employees must include:

1. The contents of the OSHA Standard 29 CFR 1910.1450 and its appendices.
2. The location of the College Chemical Hygiene Plan.
3. The PELs of substances in the employee's area.
4. Signs and symptoms associated with exposure to hazardous substances used in the employee's area.
5. The location of the MSDSs and any other documentation that references the safe handling, storage and disposal of hazardous substances in the employee's area.

Training provided to employees must include:

1. Methods and observations that may be used to detect the presence or release of a hazardous substance.
2. Physical hazards and health hazards associated with each hazardous substance.
3. Measures employees can take to protect themselves from hazardous substances.
4. The details of the College's Chemical Hygiene Plan.

DOCUMENTATION

The Chemical Hygiene Officer will maintain documentation of each employee's training record and a copy of the training record will be sent to the Human Resources Office for inclusion in the employee's personnel file. These include all records of the employee's successful completion of all information and training as stated above. The Chemical Hygiene Officer will maintain all records regarding accidents and spills. The Chemical Hygiene Officer and the Maintenance Manager will maintain records documenting all repairs initiated and/or completed concerning any Form SSCC-CHP-M items.

MEDICAL CONSULTATIONS AND EXAMINATIONS

Any work related injury or illness must be reported immediately to the employee's supervisor whether or not medical treatment is needed. Refer to the Policy and Procedure manual for additional information.

The College must provide all employees who work with hazardous substances an opportunity to receive medical attention, including any follow-up examinations which the physician determines necessary, under the following circumstances:

1. Anytime an employee develops signs or symptoms associated with a hazardous substance which the employee may have been exposed to in the laboratory.
2. Anytime an employee may be exposed to a hazardous substance determined by an exposure level above the stated PEL for the hazardous substance.
3. Anytime an employee may be exposed to a hazardous substance due to a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous substance exposure.

All medical examinations and consultations must be performed by or under the direct supervision of a licensed physician. All examinations and consultations must be provided by the College without cost to the employee, without loss of pay and at a reasonable time and place.

HAZARD IDENTIFICATION

With respect to labels and Material Safety Data Sheets:

1. All Instructors and Laboratory Workers must make certain that labels on incoming containers of hazardous substances are not removed or defaced, marked with the date received and marked with the date opened.
2. All Instructors and Laboratory Workers must maintain any MSDS that is received with incoming shipments of hazardous substances and make certain that they are readily available to all persons, including Students, working in the laboratory.

USE OF RESPIRATORS

The current Chemical Hygiene Plan does not anticipate the need for respirators for any laboratory use at any of the campuses associated with the College. If a new procedure is adopted that the use of respirators is necessary, the Chemical Hygiene Plan will be modified to reflect that action.

CHEMICALS DEVELOPED IN THE LABORATORY

The following requirements apply to all chemical substances developed in the laboratory. The requirements apply regardless of whether the chemical substance is for internal use, such as a solution or dilution needed within a laboratory, or for external use.

1. If the composition of the chemical substance is known, the principal investigator must determine if it is a hazardous substance according to the OSHA Standard. If it is determined to be hazardous, the principal investigator must provide appropriate training to all Laboratory Workers and Students. NOTE: the conditions of this item do not require the principal investigator to perform

toxicological testing of the chemical substance. If questions arise, seek the help of the Chemical Hygiene Officer.

2. If the chemical substance is of an unknown composition, the principal investigator must assume that the chemical substance is hazardous and must comply with the requirements of the Chemical Hygiene Plan.
3. If the chemical substance is produced for an external user outside of the College, the principal investigator must comply with the OSHA Standard including the requirement for the preparation of a Material Safety Data Sheet.

STANDARD OPERATING PROCEDURES

All experiments used at the College shall follow a standard format. It is understood that there exists slight differences between an experiment performed in a chemistry laboratory and those performed in a biology laboratory. However, the intent of the standardization is to aid in the identification of any and all hazardous substances or hazardous procedures that may be used to complete the experiment. Specifically all experimental write-ups must contain the following:

1. The scope and/or purpose of the experiment.
2. A list of ingredients and hardware needed to perform the experiment.
3. A list of cautions regarding any hazardous ingredients or procedures necessary to complete the experiment.
4. A step-by-step procedure necessary to perform the experiment.
5. How and/or where to dispose of any ingredient that is not consumed or that is produced by the experiment.
6. Any data collection, questions and comments regarding the experiment can follow these first five steps in any order the writer prefers.

Note that if the experiment involves the use of any extremely toxic chemical substance, any known carcinogen or any known teratogen, the Standard Operating Procedure also must include:

1. The establishment of a designated area to store the chemical.
2. The use of an engineering device such as a fume hood or a glove box.
3. The exact procedures for safe removal of any and all waste.
4. Any decontamination procedures necessary in case of accident.

CONTROL MEASURES

The College must implement control measures to reduce or eliminate any exposure to employees that exceed the PEL (or TLV) of a hazardous substance. These control measures include:

1. Engineering devices – fume hoods, glove boxes, autoclaves, ventilation systems, eye wash stations and safety showers.
2. Personal protection equipment (PPE) – gloves, goggles, safety glasses and aprons.
3. Hygiene practices – clean laboratories with minimum clutter, sterile biology laboratory benches and clean-up stations for laboratory hardware.

The College discourages the use of extremely toxic substances including carcinogens, teratogens. If these substances are necessary, the least amount possible for any particular purpose is encouraged. The College will not allow any microorganisms other than Biosafety Level 1 (BSL-1). No known BSL-2, BSL-3 or BSL-4 agents are allowed on any campus at any time for any purpose.

ANNUAL REVIEW

A review of the Chemical Hygiene Plan must be performed by the Chemical Hygiene Officer annually. The review will utilize such resources as results of inspections, both formal and informal, accident reports, notices of violation, maintenance repair Form SSCC-CHP-M results and any personal input from any personnel responsible for the implementation of the Chemical Hygiene Plan. The main purpose of the review is to identify the strengths and the weaknesses of the Chemical Hygiene Plan and to evaluate the overall effectiveness of the program.

Any changes, additions or subtractions to the Chemical Hygiene Plan will be disseminated by the Chemical Hygiene Officer within one month of the initiation of the review process to all responsible College personnel of the Chemical Hygiene Plan for approval. Once received, those personnel responsible for signature approval will have three weeks to review and approve the revision. Once approved, the revised Chemical Hygiene Plan will supersede the original Chemical Hygiene Plan immediately.

PART II
HAZARDOUS SUBSTANCES GUIDELINES

SAFE HANDLING OF CHEMICALS

Instructors need to be aware of all physical hazards and health hazards associated with any and all chemicals in use. They need to consider the physical state of the chemical; solid, liquid or gas. Each of these requires specific needs for use including dispensing, storing, safe handling and disposal. The process using the chemical also needs consideration. Most importantly, the Instructor needs to know what facilities and equipment are needed in case of emergency.

Once the potential hazards associated with the chemicals and processes are thoroughly evaluated, the Instructor can design work procedures needed to minimize or eliminate the hazards. The following sections provide work procedures and engineering controls that can be useful in helping the Instructor minimize or eliminate hazards in the laboratory. In the case of classroom experiments, it is imperative that the Instructor design and implement his process knowing the level of Student knowledge. The Instructor needs to remember most, if not all, Students at the College do not have the expertise, experience or knowledge of the Instructor. The safety of the Students relies on the Instructor following the CHEMICAL HYGIENE PLAN.

GENERAL SAFETY GUIDELINES

1. Know the hazards associated with the substances in use. Carefully read the label before using a chemical. Review the Material Safety Data Sheet for any special handling information.
2. Be prepared for emergencies including what actions to take in the event of an emergency. Be certain that necessary supplies and equipment are available for handling small spills of hazardous substances.
3. Know the location of safety equipment including safety showers, eye wash stations, fire extinguishers, fire blankets and fire alarm systems.
4. Never work alone in the laboratory if working with a hazardous substance.
5. Preparation rooms are for authorized personnel only. These personnel include the Division Coordinator, the Instructors and Laboratory Workers.
6. Purchase the minimum amount of hazardous substances necessary to accomplish your work. Dispense only the minimum amount for immediate use.
7. Use hazardous substances only as directed and for their intended use.
8. Never smell or taste a hazardous substance.
9. Vent apparatus which may discharge hazardous substances, such as vacuum pumps or distillation columns, into local exhaust devices.
10. Use the required Personal Protective Equipment.
11. Inspect gloves and all other Personal Protective Equipment before use. Equipment such as fume hoods, safety showers, eye wash stations and fire extinguishers should be tagged with inspection dates. This is performed by either the Maintenance Manager or the Chemical Hygiene Officer.

12. Do not use damaged equipment. Inspect equipment and/or apparatus before introducing a hazardous substance or beginning a hazardous procedure.
13. Glass vacuum lines, pressure lines and Dewar flasks need to be taped or caged.
14. Make certain that ventilation is adequate for the substances used.
15. Avoid direct contact with any substance, hazardous or not. Keep substances off of hands, face and clothing, including shoes.
16. Wear shoes at all times in the laboratory. Clogs, sandals, flip-flops and other types of perforated shoes are not allowed in the laboratory.
17. Confine long hair and loose clothing especially when working with an open flame.
18. Avoid practical jokes and/or other behavior that might confuse, startle or distract another laboratory worker.
19. Keep the work area clean and free of clutter. Always put substances and equipment away after completion of the laboratory task.
20. Label all secondary containers with appropriate hazard information. Make sure all labels on primary and secondary containers do not become damaged. Replace labels when necessary.
21. Use good hygiene practices. Keep your hands and face clean. Always wash thoroughly with soap and water after handling any chemical substance.
22. Smoking, drinking, eating and the application of cosmetics if forbidden in areas where hazardous chemicals are used or stored.
23. Do not store food or drink that is used for human consumption, or utensils or equipment for preparing food or drink in the same cabinet, drawer, refrigerator or freezer that is used to store any chemical substance.
24. Never use mouth suction to fill a pipette.
25. Electrically ground and bond containers using approved methods before transferring or dispensing a flammable liquid from a large container.
26. Promptly clean up spills. Use appropriate protective apparel, equipment and procedures when doing so.

ENGINEERING CONTROLS

According to the OSHA Standard, the first line of control regarding exposure to hazardous substances is by use of engineering controls. This equipment is used to negate contamination from exposure to any hazardous substance. At SSCC engineering controls include the following:

1. Laboratory ventilation systems.
2. Chemical fume hoods.
3. Safety showers.
4. Eye-wash stations.
5. Autoclaves.

All devices are checked on a quarterly or monthly basis by the Chemical Hygiene Officer or Maintenance. All Instructors, Laboratory Workers and other impacted personnel can

check any engineering control device at any time. If found to be not working properly, inform the Chemical Hygiene Officer.

Laboratory Ventilation Systems

The laboratory ventilation systems are designed to remove normal laboratory fumes away from the breathing zone of the employee. Air flow for these systems will give a minimum of four room air exchanges per hour. All systems are switched and need to be manually operated by engaging the ON / OFF switch. Anytime the laboratory is used for experimental purposes, the ventilation switch needs to be activated. This is especially true for chemistry experiments using volatile organic substances and biology experiments using formalin fixed animals.

Chemical Fume Hoods

As a rule of thumb, use chemical fume hoods when using any hazardous, volatile substance or when the MSDS for the substance requires the use of a hood. When such substances become airborne, the possibility of inhalation by an employee is great. This can be detrimental to the health of the employee. Fume hoods are not to be used to store chemicals. If it is necessary to store a chemical in the hood, no work should take place in that hood.

All Instructors need to check that the hoods are operational before any experiment using the hoods is started. If the hood is not operating properly, **DO NOT USE THE HOOD**. Report the problem to Maintenance or the Chemical Hygiene Officer as soon as possible.

Fume hoods are designed to be used with the sash at the mark shown on the hood. This will be when the sash is approximately half closed. This allows the insertion of hands and arms into the hood but not the head or face of the individual using the hood. Any body part other than arms and hands should never be allowed in the hood. The sash is equipped with safety glass. This further protects the user's face and upper body from potential explosion. The OSHA standard requires any user of a fume hood to have 2.5 linear feet at the hood opening. This means that all chemical fume hoods at SSCC accommodate one person at a time at the hood opening. It is the responsibility of the Instructor to make certain Students understand the proper use of the hood. All chemical fume hoods are checked for air flow once a quarter by the Chemical Hygiene Officer. A flow of 100 feet per minute is established as the minimum air flow for all hoods.

Safety Showers

Every laboratory at SSCC is equipped with a safety shower. These showers are to be used in cases of extreme emergency. Anytime anyone in the laboratory is sprayed or splashed with a hazardous substance over a large extent of their body, they need to be under the shower for a minimum of 15 minutes. Any and all contaminated clothing needs to be removed while under the shower. Since this may be quite embarrassing, this

document suggests that the laboratory be evacuated of other personnel when someone is under the shower. A fire blanket or clean lab coat can be used to cover the person once the time limit under the shower is reached. If the hazardous substance is corrosive, 911 should be called. Under other circumstances, the person in charge should encourage the affected person to seek medical advice. The College will pay for this service if the incident meets the requirements of the Medical Consultations and Examinations Section of the Chemical Hygiene Plan.

All safety showers will be checked to be operational on a quarterly basis by the Chemical Hygiene Officer. The showers are tagged with the date of their last check.

Eye Wash Stations

All laboratories at SSCC are equipped with eye wash stations. These stations are located such that they can be reached virtually immediately from any point in the lab. The OSHA standard suggests that eye wash stations be placed every 25 feet. To this end, the larger chemical laboratories at both North campus and Central campus have, at least, two eye wash stations.

If, at any time, anyone in any laboratory contaminates their eyes with a known hazardous substance, or with a substance that is suspected to be hazardous, that person needs to flush their eyes with copious amounts of water for a minimum of 10 minutes. The eye wash stations are designed to work when the eyes are approximately two to six inches from the water source. Place the eyes between the nozzles and engage the valve. The valves are adjusted to give optimum performance.

All eye wash stations will be checked by Maintenance on a monthly basis. Each is tagged with the date of the last check.

Autoclaves

Every biology laboratory is equipped with an autoclave. All biology Instructors need to make certain the autoclave is functioning properly before any experiment. It is the duty of the Instructor to decontaminate any specimen or equipment or clothing that is suspected of harboring a hazardous substance immediately after an experiment is finished. If the autoclave is not working properly, Maintenance or the Chemical Hygiene Officer needs to be informed. Never start or complete an experiment that requires the use of the autoclave if the autoclave is not operational.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal Protective Equipment may be needed to supplement available engineering controls, but are never used as a replacement for engineering controls. The MSDS will

provide some information on the PPE recommended for use with the chemical or biological agent. The MSDS addresses worst case conditions. It is suggested by this document that the worst case conditions are normal conditions at SSCC. The MSDS also may provide the type of glove appropriate for the hazardous substance. If the MSDS does not provide adequate information to satisfy the type and kinds of PPE to be used with a particular hazardous substance, consult with the Chemical Hygiene Officer.

Hazard Assessment

The Instructor is responsible for determining which PPE are required for each task performed by Laboratory Workers or Students. This is accomplished by performing a hazards assessment and documenting the findings on the experimental procedure sheet. There is no harm in being over cautious when it comes to PPE, but the minimum requirements are to be indicated by the hazards assessment.

The Vice President of Academic Affairs, the Vice President of Business and Finance, the Campus Directors and the Division Coordinators must provide PPE for all employees at the request of the employee. Training on how to use the PPE is provided by the Chemical Hygiene Officer.

Protection Against Inhalation Hazards

All laboratories are equipped with ventilation systems. Anytime ventilation is needed while performing an experiment, the Instructor must switch the ventilation system ON. If the Instructor is unsure whether ventilation is necessary, use the ventilation system or consult with the Chemical Hygiene Officer. All chemistry laboratories are equipped with chemical fume hoods. These are to be used if the chemical is hazardous and volatile.

Presently, SSCC does not use any hazardous substances that require the use of respirators. If in the future such a material is needed, training on the use of the respirator and fitting the respirator are required by the OSHA Standard.

Protection of Skin and Body

Eye and face protection includes the use of chemical splash goggles in the chemistry laboratories and safety glasses in the biology laboratories. Presently there is no need for full face shields at SSCC. Splash-proof goggles provide superior protection against dust, flying objects, splash, spray and mist hazards. They should be the first Chemical Hygiene Officer's choice for primary eye protection and are recommended for biology Students that wear contacts.

Skin surfaces should be covered during an experiment using a hazardous substance. Laboratory Workers, Instructors and Students are required to wear shoes that completely

cover the feet. It is recommended that biology Instructors, Laboratory Workers and Students wear lab coats when working with microorganisms. These coats should be cleaned and decontaminated on-site or through a commercial laundry which has been apprised of potential hazards. Employees should never take coats home for cleaning.

Chemical Storage

It is important that chemicals be stored properly. Certain chemicals cannot safely be stored or mixed with other chemicals due to the potential of severe reaction or the generation of toxic reaction products. A list of incompatible chemicals can be found in Appendix A. Only Instructors and Laboratory Workers are authorized to store chemicals using the following rules.

- 1) Carefully read the label before storing a hazardous chemical. The MSDS provides any specific storage information and incompatibilities.
- 2) Make certain all containers are in good condition and properly labeled.
- 3) Whenever possible separate chemicals into the following general hazard classes:
 - a) flammable / combustible liquids
 - b) flammable solids
 - c) mineral acids
 - d) organic acids
 - e) caustics
 - f) oxidizers
 - g) water reactive
 - h) air reactive
 - i) heat reactive
 - j) unstable
 - k) gases
- 4) Store chemicals according to hazard class.
- 5) Determine what equipment and space is needed for safe storage of chemicals
- 6) Keep chemical containers tightly closed.
- 7) Use approved storage cabinets, containers and safety cans for flammable liquids.
- 8) Use approved refrigerators and freezers for chemicals requiring cooling.
 - a) Flammable and combustible chemicals that require cooling must be stored in explosion proof refrigerators or freezers. These refrigerators and freezers must be posted "NO FOOD ALLOWED" and "FLAMMABLE AND COMBUSTIBLE CHEMICALS ALLOWED". Other chemicals other than flammable or combustible also can be stored in the same refrigerator or freezer as long as they meet the criteria of non incompatibility stated above.
 - b) Chemicals and laboratory supplies can be stored in any refrigerator as long as the chemicals are not flammable or combustible. These refrigerators and freezers must be posted

“NO FLAMMABLE OR COMBUSTIBLE CHEMICALS ALLOWED” and “NO FOOD ALLOWED”.

- c) Food is defined as any substance that is to be consumed. No FOOD ONLY refrigerators or freezers are allowed in any SSCC laboratory.
 - d) NO FOOD IS ALLOWED TO BE STORED IN ANY REFRIGERATOR USED FOR CHEMICAL STORAGE.
- 9) Never store food, beverages, food preparation supplies or other food related equipment in an area that is used for chemical storage. These areas include refrigerators, freezers, cabinets, shelves, drawers, sinks or, in general, any laboratory preparation room.
 - 10) Do not store liquids above eye levels.

PHYSICAL HAZARDS

Physical hazard refers to a chemical for which there is evidence that is a combustible liquid, a compressed gas, explosive, flammable, organic peroxide, oxidizer, pyrophoric, unstable or water reactive. Materials which present a physical hazard can be safely used if the specific hazard is understood and measures are taken to address the hazards. If appropriate precautions are not taken, a fire, explosion, unwanted corrosion, personal injury or property damage could occur. The special precautions described in the following sections are to be used in conjunction with the information detailed in the General Safety Guidelines.

Special Precautions for Working with Flammables and Combustibles

Flammable and combustible substances are materials which under standard conditions can generate sufficient vapor to cause a fire in the presence of an ignition source. Flammable substances can generate sufficient vapors at temperatures below 38°C (100°F). Combustible substances can generate sufficient vapors at temperatures above 38°C (100°F) and below 60°C (140°F). The vapors of these substances are invisible and a vapor trail to an ignition source away from the immediate area can result in a flashback. Flammables are more hazardous at elevated temperatures due to higher vapor pressure. Also, flammable and combustible substances react with oxidizers which can result in fire. Observe the following precautions when working with flammable or combustible substances.

- 1) Eliminate ignition sources such as open flames, hot surfaces, sparks, operation of unshielded electrical equipment and static electricity.
- 2) Minimize the quantity kept in the work area.
- 3) Store in approved flammable liquid containers (safety cans) and storage cabinets. Store away from oxidizers.
- 4) Flammable liquids stored in glass containers shall not exceed four liters.

- 5) Refrigerators and freezers used for the storage of flammable or combustible liquids must have no internal ignition source.
- 6) Make certain that there is proper bonding and grounding when transferring or dispensing a flammable liquid from a large container.
- 7) Make certain that appropriate fire control systems are available.

Special Precautions for Working with Corrosives

Corrosive substances are materials which can destroy human tissue and react with metal causing deterioration of the metal surface. Acids and bases are corrosives. Observe the following special precautions.

- 1) Containers and equipment used for storage and processing of corrosive substances should be corrosive resistant.
- 2) Eye protection and rubber gloves should always be used when handling corrosive substances. A face shield, rubber apron and rubber boots also may be appropriate depending upon the work performed.
- 3) When mixing concentrated acids with water, always add the acid slowly to the water. Never add water to acid; a violent, uncontrollable reaction will occur.
- 4) Acids and bases should be stored separately from each other. Organic acids should be stored with flammable substances, separate from oxidizers and oxidizing acids.
- 5) In general, nitric acid should always be stored separate from all other acids, by using a separate storage box or plastic container, within the acid storage cabinet.

Special Precautions for Working with Oxidizers

The process of oxidation is a reaction where the products have an increase in positive valence or a decrease in negative valence. Many times this is accomplished using chemicals that readily yield oxygen or other oxidizing gas. Oxidation reactions are a frequent cause of chemical accidents. Observe these precautions to reduce risk when storing or handling oxidizers.

- 1) Know the reactivity of the substances involved in the experiment or process. Make sure that there are no extraneous substances in the area which could become involved in a reaction.
- 2) If the reaction can be violent or explosive, use shields or other methods for isolating the chemicals or the process.
- 3) Use the minimum amounts necessary for the procedure. Do not keep excessive amounts of the material in the vicinity of the process.
- 4) Store properly, away from organic substances, flammable substances and other reducing agents.
- 5) Perchloric acid and hydrofluoric acid are forbidden at SSCC.

Special Precautions for Working with Water Reactive Substances

Substances that react with water to produce a flammable or toxic gas are classified as water reactive. Fire and explosion are expected when working with these chemicals. Examples of water reactive chemicals are alkali metals, alkaline earth metals, metal hydrides, some metal and nonmetal chlorides, calcium carbide, acid halides and acid anhydrides. Observe these precautions to reduce risk when storing or handling water reactive substances.

- 1) Always store water reactive substances away from other chemicals that may supply a source of water including water solutions and hydrates.
- 2) Use extreme caution when handling water reactive substances. Always wear impervious gloves during handling. Water inherent in the skin is often enough to react with water reactive chemicals.
- 3) Use extreme caution when adding a water reactive substance to water or a chemical that contain water. Make certain that the reaction products are controlled using proper ventilation.

Special Precautions for Working with Pyrophoric Substances

Pyrophoric substances ignite spontaneously upon contact with air. The flames generated may or may not be visible. Examples of pyrophoric substances include butyllithium, silane and yellow phosphorus. Pyrophoric substances are not allowed at SSCC.

Special Precautions for Working with Peroxidizable Substances

Peroxidizables are substances that react with oxygen to form peroxides. Several peroxides can explode with impact, heat or friction. An action as simple as removing a lid can cause some peroxides to explode. Peroxides form inside containers of some chemicals even if they have never been opened. Examples include ethyl ether, tetrahydrofuran, high carbon content alkanes (paraffins) and alkenes. Additional chemicals that may form peroxides are listed in Appendix B. The following precautions should be taken before using peroxidizables.

- 1) Always order or purchase only peroxidizables or peroxides that contain inhibitors if possible.
- 2) Date all peroxidizables and peroxides upon receipt and upon opening. If the chemical does NOT contain an inhibitor, the chemical should be disposed of after 18 months from date of receipt or 3 months from the date of opening.
- 3) NEVER open any container that has obvious crystal formation around the lid.
- 4) Since many peroxidizables are flammable, the special precautions used for flammable liquids needs to be heeded.

Special Precaution for Working with Light Sensitive Substances

Light sensitive substances are unstable with respect to light energy. They tend to degrade in the presence of light, forming new compounds which can be hazardous. One common hazard is the build up of pressure in a container or vessel due to gas formation. This can cause an explosion hazard. Another common hazard is the formation of peroxides. The following precautions should be taken before using light sensitive substances.

- 1) Always store light sensitive substances in a cool, dark place. Use amber, or other containers, that exclude or eliminate the penetration of light.
- 2) Date all containers upon receipt and upon opening.
- 3) Dispose of light sensitive substances 12 months from date of receipt or 6 months from date of opening.

Special Precautions for Working with Shock Sensitive or Explosive Substances

Shock sensitive and explosive substances can spontaneously release large amount of energy under a variety of conditions. These conditions include normal ambient conditions, when shocked or struck, or when vibrated or shook. Some substances become increasingly shock sensitive or explosive with age, others with a loss of moisture. A list of some shock sensitive substances is found in Appendix C. The following precautions should be taken before using shock sensitive or explosive substances.

- 1) Always order or purchase shock sensitive or explosive substances that contain an inhibitor, if possible.
- 2) Date all containers of shock sensitive or explosive substances upon receipt and upon opening. If the substance does NOT contain an inhibitor, the substance should be disposed within 12 months of receipt or within 6 months from the date of opening.
- 3) Always check the lid before opening a container of any shock sensitive or explosive substance. If the lid shows crystal growth, DO NOT OPEN. If the lid shows a bulge, such as a pressure build, DO NOT OPEN. Call the Chemical Hygiene Officer for disposal.
- 4) Keep the minimum amount of shock sensitive or explosive substance on hand.
- 5) Use the minimum amount of shock sensitive or explosive substance necessary for a procedure.
- 6) If there is a chance of explosion during a procedure, use barriers for isolating the procedure.

Special Precautions for Working with Compressed Gases

Special systems are needed for handling substances under pressure. The physical and health hazards of any substance are compounded by the pressure hazard. The following precautions should be taken when working with compressed gases.

- 1) Always use the smallest cylinder required to perform the work.
- 2) Cylinders of compressed gases must be handled as high energy sources.
- 3) Cylinders on wheeled carts must be capped and secured by an approved cylinder support strap or chain. The cart must be an approved cylinder cart. NEVER take a cylinder cart up or down a stairway.
- 4) All uncapped cylinders must be secured individually to a solid element of the lab structure. Carts are NOT acceptable for supporting uncapped cylinders or cylinders in use.
- 5) NEVER bleed a cylinder completely empty. Leave a slight pressure to keep out contaminants.
- 6) Oil or grease on the high pressure side of an oxygen cylinder can cause an explosion. Do NOT lubricate an oxygen regulator or use a fuel gas regulator on an oxygen cylinder.
- 7) Always wear goggles when handling compressed gases.
- 8) Always use the appropriate regulators, gauges, fittings and other materials compatible with the gas being handled. DO NOT USE ADAPTERS.
- 9) NO toxic gases are allowed at SSCC.

Special Precautions for Working with Cryogenics

Some of the hazards associated with cryogenics include fire, pressure, embrittlement of materials, and skin or eye burns upon contact with the liquid. Cryogenics can condense nearly pure liquid oxygen from the air thus creating a severe fire risk. A pressure hazard exists because of the large expansion ratio from the liquid state to the gas state. This can cause a pressure build up in containers. Many materials become brittle at extremely low temperatures. Dropping or shocking such materials can cause sharp projectiles that can pierce the skin or eyes. Even brief contact with materials at low temperatures can cause burns similar to thermal burns. The following precautions should be used when using cryogenics.

- 1) Equipment should be kept clean, especially when working with liquid or gaseous oxygen.
- 2) Mixtures of gases or fluids should be strictly controlled to prevent formation of flammable or explosive mixtures.
- 3) Always wear goggles when handling cryogenics. If there is a splash or spray hazard, a face shield over the goggles, an impervious apron or coat, cuffless trousers and full foot covering non-lacing shoes are required.
- 4) Always wear large, impervious gloves when handling cryogenics. The gloves need to be sized for quick removal should a cryogen be spilled into the sleeve of the glove.
- 5) NEVER wear watches, rings or other jewelry when handling cryogenics.
- 6) Containers and systems containing cryogenics must have pressure relief valves.

- 7) Containers and systems used for cryogenics must be able to withstand extreme cold without becoming brittle. Glass containers must be wrapped solidly with tape around the outside of the container and encased in plastic mesh.
- 8) Transport of cryogenics between buildings or classrooms is accomplished using a container having a handle and a lid.
- 9) NEVER store or leave a cryogen in a public area.

HEALTH HAZARDS

The term health hazard refers to substances for which there is statistically significant evidence that acute or chronic health effects may occur in exposed employees. The evidence must be based on at least one study conducted in accordance with established scientific principles. This category includes carcinogens, mutagens, teratogens, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, hematopoietic toxins, and any substance that can damage the lungs, eyes, skin or mucous membranes. A list of substances used at SSCC that meet the criteria for this category can be found in Appendix XXX (not completed at print).

Hygienic standards are established for many toxic substances. It is the responsibility of the Chemical Hygiene Officer and the Instructor to take action to prevent personnel, including Students, from receiving exposures in excess of these standards. The duty of the Chemical Hygiene Officer is to monitor all Engineering Controls to ensure proper ventilation and safety equipment is in working order. The duty of the Instructor is the same as the Chemical Hygiene Officer with the addition of training all Laboratory Workers and Students about substance health hazards.

Standards for health hazards typically are given as Threshold Limit Values (TLV) or Permissible Exposure Limits (PEL). The definition for these two terms can be found in the glossary. Laboratory ventilation systems are used to minimize or eliminate air born, inhalation exposure. PPE are used to minimize or eliminate hazards associated with bodily exposure including skin and eyes. Good laboratory practices, such as no eating or drinking in the laboratory, minimize or eliminate ingestion exposure.

There are three types of exposure possible with any substance. These are inhalation, ingestion and skin contact. The MSDS is a good source for the type of exposure associated with the substance that is problematic and the proper PPE to use to minimize or eliminate the exposure. If unsure, contact the Chemical Hygiene Officer for a more thorough review of the substance.

Special Precautions for Working with Allergens

The term allergens describe a wide variety of substances that can produce skin and lung hypersensitivity. Examples include such substances as formaldehyde, isocyanates, chromium compounds and epoxides. Always wear suitable gloves to prevent hand

contact when working with allergens. Always use a fume hood or biosafety cabinet for procedures that may produce aerosols. Instructors need to understand that some Students may show an allergic effect to almost any chemical. Make certain that Students understand the risk associated with an allergen and that appropriate PPE are used to minimize exposure.

Special Precautions for Working with Teratogens and Embryotoxins

Teratogens and embryotoxins are substances that cause malformations or birth defects by directly damaging tissues in the fetus developing in the mother's womb. There are many examples of substances that can cause such an effect including alcohol, lead compounds and cigarette smoke. Because the period of greatest susceptibility is the first and second trimester of pregnancy, which includes the period when a woman may not know she is pregnant, women of child bearing potential should take care to avoid skin contact with all chemicals. The Chemical Hygiene Officer has a list of known reproductive toxins. However, the problem is that no chemicals make the list until after the reproductive effect is established. There are no known tests for teratogens or embryotoxins. The following precautions should be used when working with know reproductive toxins.

- 1) Only use known reproductive toxins for any procedure as a last resort. Always use an alternative substance if possible.
- 2) Notify all Laboratory Workers and Students of the reproductive toxin potential and Make certain the proper PPE is available.
- 3) Make certain all engineering controls are in good working order before beginning a procedure involving reproductive toxins.
- 4) All known reproductive toxins need to be labeled: CAUTION REPRODUCTIVE TOXIN.
- 5) In case of exposure due to a large spill, immediately initiate evacuation procedures of the area.

Special Precautions for Working with Substances of Chronic or Acute Toxicity

Substances that can bioaccumulate in the body or otherwise cause harm over a long period of time are chronic toxins. Acute toxins act in a shorter time period. There are many chemicals that can show either or both effects including mercury, lead, hydrofluoric acid and asbestos. The following precautions should be taken when working with known chronic or acute toxins.

- 1) Consult the MSDS for known chronic or acute effects. Use the appropriate PPE when working with these substances. If unsure about effects, consult with the Chemical Hygiene Officer.
- 2) Always use a fume hood or biosafety cabinet for procedures which may result in the generation of aerosols or vapors. Trap released vapors to prevent their release with fume hood exhaust.
- 3) Avoid skin contact through the use of gloves and long sleeves.

- 4) In case of exposure due to a large spill, immediately initiate evacuation procedures of the area.
- 5) Thoroughly decontaminate or dispose of contaminated clothing or shoes.
- 6) Always store contaminated waste in closed, labeled, impervious containers.

Special Precautions for Working with Carcinogenic or Mutagenic Substances

Many substances can cause carcinogenic or mutagenic effects in human beings. Carcinogens are substances that can cause cancer in the host. Examples of carcinogens include chemicals such as benzene or dimethylmercury and microbes such as chicken pox and goat pox viruses. Mutagens are substances that can cause a change in DNA transcription thus inducing genetic mutations. Examples of mutagens include chemicals such as peroxides or amino compounds and microbes such as ebola. The following precautions should be taken when working with known carcinogenic or mutagenic substances.

- 1) Only use known carcinogenic or mutagenic substances as a last resort. Always use an alternate substance if possible.
- 2) Notify all Laboratory Workers and Students of the cancer or mutation potential associated with the substance and Make certain the proper PPE is available.
- 3) Always use a fume hood or biosafety cabinet for procedures which may result in the generation of aerosols or vapors.
- 4) Avoid skin contact through the use of gloves and long sleeves.
- 5) In case of exposure due to a large spill, immediately initiate evacuation procedures of the area.

BIOLOGICAL HAZARDS

Personnel that work in microbiological laboratories are susceptible to the occupational hazard of infections derived from agents they manipulate. The most common infections are caused by bacterial agents due to the very limited viral agent manipulation. In general, viral agents are more dangerous than bacterial agents in that many bacterial agents can be nullified by vaccination. NO viral agents are allowed at SSCC. Only Biosafety Level 1 (BSL-1) bacterial agents identified as BSL-1 at www.ATCC.org are allowed at SSCC. Designations from various vendors are NOT allowed. Microorganisms can still be purchased from various vendors if their designation agrees with the designation at the ATCC web-site.

According to the third edition of *Biosafety in Microbiological and Biomedical Laboratories* (BMBL) published by the Center for Disease Control and Prevention, "Biosafety Level 1 is suitable for work involving well characterized agents not known to consistently cause disease in healthy adult humans, and of minimal potential hazard to laboratory personnel and the environment. The laboratory is not necessarily separated from the general traffic patterns in the building. Work is generally conducted on open bench tops using standard microbiological practices. Special containment equipment or facility design is neither required nor generally used. Laboratory personnel have specific

training in the procedures conducted in the laboratory and are supervised by a scientist with general training in microbiology or a related science”.

The BMBL standard specifies the practices, safety equipment and facility specifications necessary to maintain a laboratory at Biosafety Level 1. All Instructors are required to meet the standard shown below.

Standard Microbiological Practices

- 1) Access to the laboratory is limited or restricted when experiments or other work with cultures and specimens is in progress.
- 2) Make certain Laboratory Workers and Students wash their hands after handling viable materials, after removing gloves, and before leaving the laboratory.
- 3) Make certain Laboratory Workers and Students do not eat, chew gum, drink, smoke, handle contact lenses, apply cosmetics or store food in the work area. Persons who wear contact lenses also should wear goggles during experiments.
- 4) Make certain Laboratory Workers and Students do not use mouth pipetting.
- 5) Make certain Laboratory Workers and Students understand and use all policies related to the safe handling of sharps.
- 6) Make certain Laboratory Workers and Students understand the need to perform procedures such that splashes and aerosols are minimized.
- 7) Decontaminate all work surfaces at least once a day or immediately after any spill of viable material.
- 8) Autoclave any waste culture or contaminated equipment before disposal.
- 9) Place a biohazard sign at the entrance to the laboratory whenever infectious agents are present.

Safety Equipment

- 1) Special containment devices or equipment such as a biological safety cabinet are generally NOT required for BSL-1.
- 2) Laboratory coats are recommended (not required) to prevent contamination of street clothes. Aprons can replace lab coats when they are not available.
- 3) Gloves should be worn if the skin on the hands is abraded or if a rash is present.
- 4) Protective eyewear is required whenever work with the biological agent might include splashing or aerosol formation.

Laboratory Facilities

- 1) Laboratories should have doors for access control.

- 2) Each laboratory contains a sink for hand washing.
- 3) The laboratory is designed such that it can be cleaned easily. In general, carpet, rugs, cloth drapes and fabric covered furniture are not appropriate in the laboratory. Infectious agents can attach to fabric fibers making their decontamination difficult.
- 4) Bench tops need to be impervious to water, heat, acids, organic solvents alkalis and decontamination chemicals.
- 5) Laboratory furniture has to be capable of supporting anticipated loads and uses. Spaces between benches, cabinets and equipment make cleaning accessible.
- 6) Windows have to be fitted with screens to eliminate insect contamination.

TRANSPORTATION OF HAZARDOUS SUBSTANCES

Transportation Over the Road

Any container of hazardous material transported on a road accessible to or used by the public is subject to the regulation by the U. S. Division of Transportation (DOT). DOT regulations require that no person may offer or accept a hazardous material for transportation unless the material is properly classified, described, packaged, marked, labeled, manifested and in condition for shipment. This includes hazardous materials transported between the various campuses of the College. DOT regulations require the driver of a vehicle transporting hazardous materials in quantities requiring a placard to possess a Commercial Driver's License. There is no exempt quantity for material classified as "dangerous by inhalation".

Small quantities of some hazardous materials are allowed to be carried by Instructors or Laboratory Workers between campuses by following the rules listed below. The amount of any particular hazardous material allowable is determined by the DOT. Check with the Chemical Hygiene Officer or Shipping to determine the maximum allowable amount.

- 1) The hazardous material must be packaged such that the container is shock resistant. Cardboard boxes and Styrofoam peanuts usually are sufficient.
- 2) If the container is glass, wrap the glass in tape. Cover the label with paper before taping so that it is not destroyed when unwrapped.
- 3) Create a manifest for all the hazardous materials to be shipped.
- 4) Make and take a copy of each hazardous material's Material Safety Data Sheet.
- 5) Complete and sign the shipping transportation form found in every laboratory.
- 6) Upon delivery, complete and sign the receiving transportation form found in every laboratory.

Transportation Inside Buildings or Between Buildings By Foot

Two means of transportation are approved to move hazardous substances inside or between buildings. Listed below are the means for that approval.

Use of an approved transport container

- 1) An approved container for transportation of hazardous substances is the rubber containers found in every chemistry laboratory.
- 2) The container to be transported must fit into the approved transport container. If the material amount is too great to fit into the approved transport container, it must be broken down into smaller containers until it will fit.

Use of a laboratory cart

- 1) All carts used for transportation must be stable and in good condition.
- 2) Only use carts with lips able to contain any spill.
- 3) Do not over stock carts. Do not place containers on top of each other to transport.

WASTE DISPOSAL

There are five waste stream categories at SSCC. These are chemicals, non-infectious animal waste, fluorescent bulbs, batteries and electronic components. The types of components and disposal method for each category is given below. SSCC has a contract with Clean Harbors to provide assistance and waste disposal of all categories of waste.

1. Chemicals include hazardous solid materials and hazardous liquid materials generated mostly in the chemical laboratories, the biology laboratories and the art Divisions including the theater Division and the Gateway Center. The disposal means for each type of chemical is different. Solid hazardous substances will be lab-packed and recycled or disposed via incineration by our waste provider. There are two main liquid waste streams: a high BTU stream and a low BTU stream. Liquids such as toluene, hexane, cyclohexene and chlorobenzene are high BTU substances. These substances are typically stored in fire-proof flammable containers in the laboratory and will be disposed in the same containers via incineration. Low BTU substances include all of the Ward Safe solvents used for animal fixation. Once the animals have served their purpose, the solvent is placed in a drum for disposal via destructive incineration.
2. Non-infectious animal waste is generated in the biology laboratories. The animals are used for dissection training. Once the animals have served their purpose, they are placed in a 16 gallon poly-drum. Once the drum is full, the waste provider will repack the 16 gallon drum into a larger drum. The waste is destructively incinerated.
3. Fluorescent bulbs contain mercury. Old and burn-out bulbs are to be packaged in their original boxes or specialty containers. Our waste provider will reclaim and recycle the materials.

4. Batteries containing lead or lithium need to be reclaimed. The batteries need to be segregated and placed into plastic pails for waste provider pick-up.
5. Electronic components such as computers, keyboards, monitors, televisions, audio equipment, printers, laptops, fax machines, telephones and other electronic equipment contain various hazardous substances. Lead is used in cathode ray tubes; arsenic in older cathode ray tubes. Selenium is in circuit boards. Polybrominated and antimony trioxide flame retardants are used in casings, cables and circuit boards. Cadmium is in circuit boards and semiconductors. Chromium and cobalt are in steel. Mercury is in switches and housings. All of these components should be recycled or smelted. Our waste provider handles both. The Chemical Hygiene Officer will contact the waste provider for pick-up and disposal..

APPENDIX A Incompatible Chemicals

Certain chemicals should not be stored with certain other chemicals due to severe heat of reaction or uncontrolled release of a toxic product. In the event of disaster, such as earthquake or fire, the breakage and mixing of incompatible chemicals can cause highly toxic chemical products. These products have the potential to be fatal to staff, fire fighters and other emergency responders. Below is a list of common chemicals found in all types of laboratories. The list is by no mean all inclusive and is not considered complete. More complete information about storage of a specific chemical can be found in the Material Safety Data Sheet for that chemical. If still unclear how to store a specific chemical, contact the Chemical Hygiene Officer.

Chemical	Incompatible Chemical(s)
acetic acid	aldehydes, bases, carbonates, hydroxides, metals, oxidizers, peroxides, phosphates, xylene, chromic acid, nitric acid, ethylene glycol, perchloric acid, permanganates
acetone	concentrated nitric acid, concentrated sulfuric acid, amines, oxidizers, plastics
alkali and alkaline earth metals	water, chlorinated hydrocarbons, carbon dioxide, halogens, aldehydes, ketones, sulfur, plastics, acids
anhydrous ammonia	mercury, calcium hypochlorite, hydrofluoric acid, acids, aldehydes, amides, halogens, heavy metals, oxidizers, plastics, sulfur
aniline	acids, aluminum, oxidizers, plastics
bromine	acetaldehyde, alcohols, alkalis, ammonia, amines, petroleum gases, combustible materials, ethylene, fluorine, hydrogen, ketones, metals, sodium carbide, sulfur
calcium oxide	water, acids, ethanol, fluorine, organic compounds
activated carbon	alkali metals, calcium hypochlorite, halogens, oxidizers
carbon tetrachloride	sodium
chlorine	acetylene, alcohols, ammonia, benzene, butadiene, butane, combustible compounds, ethylene, flammable compounds, hydrocarbons, hydrogen, hydrogen peroxide, iodine, metals, nitrogen, oxygen, sodium carbide, sodium hydroxide
chromic acid	acetone, alcohols, alkalis, ammonia, bases, acetic acid, naphthalene, camphor, glycerol, flammable liquids, camphor, benzene, hydrocarbons, metals, organic compounds, phosphorus, plastics
chromic oxide	acetone, alcohols, alkalis, ammonia, bases, acetic acid, naphthalene, camphor, glycerol, flammable liquids, camphor,

	benzene, hydrocarbons, metals, organic compounds, phosphorus, plastics
copper	calcium, hydrocarbons, oxidizers, acetylene, hydrogen peroxide
cumene hydroperoxide	acids
flammable liquids	ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens, oxygen, oxidizers
hydrogen peroxide	all organic compounds, nitric acid, phosphorous, sulfuric acid, sodium, alkali metals, alkaline earth metals
hydroperoxides	reducing agents
iodine	acetylaldehyde, metals, oxidizers, metals, hydrogen
mercury	acetylene, aluminum, amines, ammonia, calcium, lithium, oxidizers, sodium
nitric acid	acids, nitrites, metals, sulfur, organic compounds, plastics, sodium
nitrites	acids
oxygen	flammable compounds, combustible compounds, ammonia, carbon monoxide, metals, phosphorus, plastics
organic peroxides	acids
potassium permanganate	benzaldehyde, ethylene glycol, glycerol, sulfuric acid
sodium	carbon tetrachloride, carbon dioxide, water, acids, metals, oxidizers
sulfides	acids
sulfuric acid	alcohols, bases, chlorates, perchlorates, potassium permanganate, lithium, sodium, magnesium, calcium

APPENDIX B Peroxidizables

Peroxidizable chemicals are required to be dated upon receipt and upon opening. Storage and use should be limited to the time indicated for each class shown below. Containers that show signs of crystal formation, especially on or around the lid, need to be handled with extreme caution. Metal oxide crystals, especially iron oxide and copper oxide, are known to promote peroxide formation.

Below are listed three categories of peroxidizable compounds. The most hazardous category is List A. These compounds can accumulate a hazardous level of peroxides simply upon storage after exposure to air. This means that once the containers are opened, the chemicals become extremely hazardous. Compounds that form peroxides with concentration, such as distillation or evaporation, are listed in List B. List C consists of vinyl monomers that may form peroxides that can initiate a Traumsdorf effect, spontaneous explosive polymerization of the monomers.

The time limitations for List A compounds is 12 months from date of receipt. The time limitations for List B and List C compounds is 18 months from date of receipt.

List A	List B	List C
Diethyl ether	Acetal	Styrene
Isopropyl ether	Dioxane	Butadiene
Divinyl acetylene	Tetrahydrofuran	Tetrafluoroethylene
Vinylidene chloride	Vinyl ether	Chlorotrifluoroethylene
Ethylene glycol dimethyl ether	Vinyl acetate	2-butanol
Dicyclopentadiene	Vinyl chloride	2-propanol
Methyl acetylene	Vinyl pyriden	3-methyl-1-butanol
Cumene	Chlorobutadiene	2-pentanone
Tetrahydronaphthalene	Ethylbenzene	3-pentanone
Cyclohexene	Methylcyclopentane	
1-pentene	Benzyl alcohol	
1-octene		

APPENDIX C

Shock Sensitive Chemicals

The following compounds are examples of chemicals that are shock sensitive. Dropping or shaking the container of any of these compounds could cause an explosion. Always be extremely cautious when using any of these chemicals.

acetylides	hydrazine mixtures	picryl chloride
aluminum ophorite	hydrazinium nitrate	picryl fluoride
amatol	hydrazoic acid	polynitro aliphatics
ammonal	lead azide	potassium nitrate mixtures
ammonium nitrate	lead mannite	potassium
		nitroaminotetrazole
ammonium perchlorate	lead mononitroresorcinate	silver acetylide
ammonium picrate	lead picrate	silver azide
ammonium salt	lead salts	silver styphnate
butyl tetryl	lead styphnate	silver tetrazene
calcium nitrate	magnesium ophorite	sodatol
copper acetylide	mannitol hexanitrate	sodium amatol
cyanuric triazide	mercury oxalate	sodium dinitro cresole
cyclotrimethylene	mercury tartrate	sodium nitrate mixtures
trinitramine		
dinitroethyleneurea	nitrated carbohydrate	sodium picramate
dinitroglycerine	nitrated glucoside	syphnic acid
dinitrophenol	nitrated polyhydric alcohol	tetrazine
dinitrophenolates	nitrogen trichloride	tetranitrocarbazole
dinitrophenyl hydrazine	nitrogen triiodide	tetrytol
dinitrotoluene	nitroglycerin	trimonite
dipicrylsulfone	nitroglycide	trinitroanisole
dipicrylamine	nitroglycol	trinitrobenzene
erythritol tetranitrate	nitroguanidine	trinitrobenzoic acid
fulminate of mercury	nitroparaffins	trinitrocresol
fulminate of silver	nitronium pechlorate	trinitronaphthalene
fulminating gold	nitrotoluene	trinitrophenetol
fulminating mercury	nitrourea	trinitrotoluene
fulminating platinum	organic amine nitrates	tritonal
gelatinized nitrocellulose	organic nitramines	urea nitrate
guanyl nitrosamino	organic peroxides	
guanyltetrazene		
guanylnitrosamino	picramic acid	
guanylidene hydrazine		

guanylidene
heavy metal azides

picramide
picric acid

APPENDIX D
Common Chemicals In Use At SSCC
(TO BE DETERMINED)

APPENDIX E
Acutely Toxic Materials
(TO BE DETERMINED)

APPENDIX F

Glossary

ACGIH – The American Conference of Governmental Industrial Hygienists

ACUTE – Severe, often dangerous, rapid physical or physiological changes caused by exposure to a toxic substance.

ACUTE EXPOSURE – An intense exposure over a relatively short time period.

AEROSOL – Extremely fine ($>100\mu\text{m}$) liquid droplets or solid particles dispersed in air consistent over a period of time.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS - A voluntary membership organization of professional industrial hygiene personnel in governmental or educational institutions. The ACGIH develops and publishes recommended occupational exposure limits each year. These limits are called Threshold Limit Values (TLV) for hundreds of chemicals, physical agents and biological exposure indices.

ANSI – American National Standards Institute is a voluntary membership organization that develops consensus standards nationally for a wide variety of devices and procedures.

AROMATIC – Compounds containing or consisting of benzene rings and/or substituted benzene rings.

ASPHYXIANT – A chemical that can cause death or unconsciousness by suffocation and are especially dangerous in confined or enclosed spaces.

BOILING POINT – The temperature at which the vapor pressure of a liquid equals one atmosphere. The temperature at which a chemical changes from the liquid state to the gas state.

CEILING (C) – An amount of a toxic substance not to be exceeded. For example, TLV - C or Threshold Limit Value – Ceiling.

CANCER – a malignant tumor characterized by proliferation of abnormal cells.

CARCINOGEN – Any substance that produces cancer in animals and humans. Three agencies identify carcinogens and/or potential carcinogens:

- 1) National Toxicology Program, Annual Report of Carcinogens
- 2) International Agency for Research on Cancer, Monographs
- 3) OSHA, 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances

C.A.S. NUMBER – Chemical Abstracts Service is an organization that indexes information published in *Chemical Abstracts* by the American Chemical Society. The C.A.S. Number is used to identify specific chemicals and their hazards.

CFR – Code of Federal Regulations.

CHEMICAL – Any element, compounds of elements or mixture of elements and/or compounds.

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

CHEMICAL HYGIENE PLAN – A written program developed and implemented by the employer that sets forth procedures, equipment, personal protective equipment and work practices that are capable of protecting employees from the health hazards presented by hazardous substances used in the workplace and meets the requirements of OSHA regulation 29 CFR 1910.1450

CHEMICAL NAME – The scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) rules of nomenclature, or, a name that will clearly identify the chemical for the purpose of conducting a hazard evaluation.

CHEMICAL REACTION – A change in arrangement and attachment of atoms to yield substances of different composition and properties.

CHEMICAL HYGIENE OFFICER – Chemical Hygiene Officer

CHEMICAL HYGIENE PLAN – Chemical Hygiene Plan

CHRONIC – Persistent, prolonged or repeated conditions.

CHRONIC EXPOSURE – A prolonged exposure occurring over a period of time.

COMBUSTIBLE LIQUID – Any liquid that has a flashpoint at or above 100 °F (37.8 °C) but below 200 °F (93.3 °C).

COMMON NAME – Any designation or identification, such as code name, code number, trade name, brand name or generic name, used to identify a chemical other than by its chemical name.

COMPRESSED GAS – Any container of a gas or mixture of a gases that has an absolute pressure exceeding 40 psi (2.7 atm) at 70 °F (21.1 °C). Any container of a gas or a mixture of gases that has an absolute pressure exceeding 104 psi (7.1 atm) at 130 °F (54.4 °C), regardless of the pressure at 70 °F (21.1 °C). Any container of a liquid having a vapor pressure exceeding 40 psi (2.7 atm) at 100 °F (37.8 °C) as determined by ASTM D-323-72.

CONCENTRATION – The relative amount of a substance in combination with another substance or substances.

CONTAINER – Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like.

CORROSIVE – A substance that causes visible destruction or permanent changes in human skin tissue, in eye membranes or is highly corrosive to steel.

CUTANEOUS – Pertaining to or affecting the skin.

DECOMPOSITION – The breakdown of a chemical substance, regardless of means, into different parts or simpler compounds.

DERMAL – Pertaining to or affecting the skin.

DESIGNATED AREA – An area that has been established and posted with signage for work involving hazardous substances. A designated area may be the entire laboratory, an area of the laboratory or a device such as a fume hood.

DOT – The United States Division of Transportation regulates the labeling and transportation of hazardous substances.

DUST – Solid particles that range in size from 0.1 μm to 25 μm .

DYSPNEA – Shortness of breath. Difficult or labored breathing.

EMPLOYEE – An individual employed in a workplace who may be exposed to hazardous substances as part of his job description. For this document, employee means anyone paid by SSCC, or visiting SSCC, or is a Student of SSCC.

EMPLOYER - Southern State Community College.

EPA – The United States Environmental Protection Agency deals with regulation and enforcement of environmental laws. The agency administers the Clean Air Act, the Clean Water Act, FIFRA, RCRA and TSCA.

EPA NUMBER – The number assigned to chemicals regulated by EPA.

EPIDEMIOLOGY – The study of disease in human populations.

ERYTHEMA – A reddening of the skin.

EVAPORATION RATE – The rate at which a liquid is converted to a vapor at a given temperature and pressure.

EXPLOSIVE – A substance that reacts so violently and so fast that it causes an instantaneous release of pressure, gas and/or heat when subjected to a sudden shock, pressure or high temperature.

EXPOSURE – The amount of a hazardous substance that has been absorbed, inhaled, ingested or injected into an employee during the normal course of his duties.

FLAMMABLE AEROSOL – Any aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or causes a flashback at any degree of valve opening.

FLAMMABLE GAS – Any gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13% by volume or less.

FLAMMABLE LIQUID – Any liquid having a flashpoint below 100 °F (37.8 °C), except any mixture of liquids having components with flashpoints of 100 °F (37.8 °C) or higher if the total of those components make up a minimum of 99% of the total volume of the mixture.

FLAMMABLE SOLID – Any solid, other than a blasting agent as described in 29 CFR 1910.109(a), that is capable of causing a fire through friction, absorption of water moisture or spontaneous chemical change including latent heat of manufacture or process. Any solid that can be easily and readily ignited, and, once ignited, burns so vigorously and persistently as to create a serious hazard. Any solid that ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second according to the test method described in 16 CFR 1500.44.

FLASHPOINT – The minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite in the presence of an ignition source when tested using standard test procedures.

FORESEEABLE EMERGENCY – Any potential occurrence that could result in an uncontrolled release of a hazardous substance into the workplace.

FORMULA – The scientific designation for the amount of elements combined by mass to create a compound, such as, H₂O or CO₂.

FUME – Small solid particles that have condensed in the air. Fumes are generated from the heating of a solid body. Gases and vapors are not fumes.

GENERAL VENTILATION – A system of ventilation consisting of either natural or mechanically induced fresh air movements that mix with and dilute the concentration of contaminants in the workplace. This type of ventilation is not recommended to control contaminants that are highly toxic, that may be

corrosive, when the worker is close to where the contaminant is generated or where fire or explosion hazards are generated close to sources of ignition.

HAZARD ASSESSMENT – A formal procedure undertaken by the Instructor or the CHEMICAL HYGIENE OFFICER in which occupational hazards for all employees are described for a particular task or procedure. The assessment includes defining which body parts or organs are targets and the proper PPE required.

HAZARD WARNING – Any words, pictures, symbols or combination appearing on a label or other appropriate form of warning that convey the hazards of the substance in the container.

HAZARDOUS SUBSTANCE - Any substance that is a potential or actual physical or health hazard to humans.

HAZARDOUS CHEMICAL – A chemical for which there is statistically significant evidence, based on at least one study conducted in accordance with established scientific principles, that acute or chronic health effects may occur in exposed employees.

IARC – The International Agency for Research on Cancer

IDENTITY – Any chemical or common name that is indicated on the MSDS for the chemical. The identity used shall permit cross references to be made among the required list of hazardous chemicals, the label and the MSDS.

IGNITABLE – A solid, liquid or compressed gas that has a flashpoint of less than 140 °F (60 °C).

IMMEDIATE USE – The hazardous substance is under the control of, and used only by, the person who transfers it from a labeled container and only within the work shift in which it is transferred.

INCOMPATIBLE – The term applies to two substances that cannot be mixed without the possibility of a dangerous reaction.

INGESTION – The taking of a substance into the body through the mouth.

INHALATION – The breathing in of an airborne substance that may be in the form of gases, fumes, vapors, dusts or aerosols.

INHIBITOR – A substance that is added to another to prevent or slow down an unwanted reaction or change.

INTERNATIONAL AGENCY FOR RESEARCH ON CANCER - An agency of the World Health Organization (WHO) whose mission is to coordinate and conduct research on the causes of human cancer, the mechanisms of carcinogenesis and to develop scientific strategies for cancer control.

IRRITANT – A substance that will cause an inflammatory response or reaction of the eye, skin, nose or respiratory system given sufficient concentration and time. The contact may be a single exposure or multiple exposures.

LABEL – Any written, printed or graphic material displayed on or affixed to containers of chemicals or other substances.

LABORATORY – A facility where small amounts of substances are used on a nonproduction basis.

LABORATORY SCALE – Work with substances in which the containers used for reactions, transfers and other handling of substances are designed to be easily and safely manipulated by one person.

LC₅₀ – Lethal Concentration 50 is

LETHAL CONCENTRATION 50 - The concentration of an air contaminant that will kill 50% of the test animals in a group during a single exposure.

LD₅₀ – Lethal Dose 50

LETHAL DOSE 50 - The dose of a substance that will kill 50% of the test animals in a group within the first 30 days of dosage

LEL – Lower Explosive Limit

LOWER EXPLOSIVE LIMIT - The lowest concentration of a substance that will produce a fire or flash when an ignition source is present. It is expressed in a percent of vapor or gas in the air by volume.

MSDS – Material Safety Data Sheet

MATERIAL SAFETY DATA SHEET – A written or printed document concerning a hazardous chemical which is prepared in accordance with paragraph (g) of 29 CFR 1910.1200

MELTING POINT – The temperature at which a solid changes to a liquid.

MIST – Small suspended droplets of liquid generated by the condensation of liquids or by breaking a liquid through splashing.

MIXTURE – Any combination of two or more chemicals or substances.

MUTAGEN – Any substances that can cause a change in the genetic material of a gene or living cell.

NARCOSIS – A stupor or unconsciousness caused by exposure to a substance.

NATIONAL TOXICOLOGY PROGRAM (NTP) – A collaborative program including the National Institute of Health, the National Institute for Occupational Safety and Health and the National Center for Toxicological Research that publishes the *Report On Carcinogens* used by OSHA regulations as part of the definition of select carcinogens.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) – A voluntary membership organization whose aims are to promote and improve fire protection and prevention. The NFPA has developed a system that rates the hazards of a substance during a fire. The hazards are divided into three categories; health, flammability and reactivity and are designated by the familiar diamond patch. A rating of 4 is highest and a rating of 0 is lowest.

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY (NIOSH) – A federal agency that trains occupational health and safety professionals, conducts research on health and safety concerns, and test and certifies respirators for workplace use.

NFPA – National Fire Protection Association

NIOSH – National Institute for Occupational Safety

NTP – National Toxicology Program

ODOR THRESHOLD – The minimum concentration of a substance at which a majority of test subjects can detect and identify the substance's characteristic odor.

ORAL – Having to do with the mouth.

ORGANIC PEROXIDE – An organic compound that contains the bivalent oxygen structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) – A federal agency that publishes and enforces safety and health regulations for most businesses and industries in the United States.

OXIDATION – The process of combining oxygen with some other substance or a chemical change in which an atom loses electrons.

OXIDIZER – A substance that gives up oxygen easily to stimulate combustions of organic material.

PEL – Permissible Exposure Limit

PERMISSIBLE EXPOSURE LIMIT (PEL) – An exposure specified in OSHA standard 29 CFR 1910, subpart Z. They may be given as a Time Weighted Average (TWA) over 8 hours, a 15 minute Short-Term Exposure Limit (STEL) or a Ceiling (C).

PERSONAL PROTECTION EQUIPMENT (PPE) – Any device or clothing worn by an employee to protect against hazardous substances in the environment.

PHYSICAL HAZARD – A substance for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, an explosive, a

flammable substance, an organic peroxide, an oxidizer, a pyrophoric, a reactive substance or water reactive substance.

POLYMERIZATION – A chemical reaction in which one or more smaller molecule(s) react(s) to form a larger molecule that contains repeating structural units of the original molecule(s).

PUBLISHED EXPOSURE LIMITS – The exposure limits published in *NIOSH Recommendations for Occupational Health Standards* (current edition). If no limits are found from NIOSH, use the ACGIH publication *Threshold Limit Values and Biological Exposure Indices* (current edition)

PYROPHORIC – A substance that will ignite spontaneously in an air at or below a temperature of 130 °F (54.4 °C).

REACTIVITY – The ability of a substance to undergo a chemical change. An unwanted reaction can result in toxic gas release, a fire, an explosion or other unwanted product. The “Conditions to Avoid” section of an MSDS deals directly with reactivity.

REPRODUCTIVE TOXINS – Substances that affect the reproductive capabilities of humans.

RESPIRATORY HAZARD – The concentration of an airborne contaminant that results in respiratory impairment.

SELECT CARCINOGEN – Any substance that meets any of the following conditions:

- 1) it is regulated by OSHA as a carcinogen,
- 2) it is listed under the category “known to be carcinogens” in the Annual Report on Carcinogens published by NTP (current edition),
- 3) it is listed under Group 1 (“carcinogen to humans”) in Monographs of IARC (current edition),
- 4) it is listed in either Group 2A or 2B by IARC,
- 5) it is listed as “reasonably anticipated to be carcinogens” by NTP.

SENSITIZER – A substance that may cause no reaction in a person during initial exposure, but further exposures cause an allergic response.

SHORT-TERM EXPOSURE LIMIT (STEL) – The maximum concentration of a substance that a worker can be exposed for a period of 15 minutes for four times a day with at least one hour between exposures.

STEL – Short-Term Exposure Limit

SUBSTANCE – Any element, compound, chemical, mixture or biological material that may or may not be hazardous to humans.

SYSTEMIC – Anything that is spread throughout the body and may affect many or all body systems including organs.

TERATOGEN – An agent or substance that may cause physical defects in the developing embryo or fetus of an exposed pregnant female.

THRESHOLD LIMIT VALUE (TLV) – The upper limit at which airborne concentration of a substance is hazardous to employees. TLVs are advisory exposure guidelines, not legal standards, that are based on evidence from industrial experience, animal studies or human studies. The three types of TLVs are TWA, STEL and C.

TIME-WEIGHTED AVERAGE (TWA) – The average time of an employee's exposure to a hazardous substance over a given work period. TWA is determined by sampling for the substance over the work period.

TLV – Threshold Limit Value

TOXICITY – The concentration of a substance under specific conditions that causes a toxic affect to humans and/or animals.

TRADE SECRET – Any confidential formula, pattern, device, information or compilation of information that is used by a business.

TRAUMSDORF EFFECT – An uncontrolled polymerization that causes an uncontrolled release of energy and/or release of gas that may be toxic.

TWA – Time Weighted Average

UEL – Upper Explosive Limit

UNSTABLE – A substance that will polymerize, decompose, condense or become self-reactive under the conditions of shock, pressure and/or temperature.

UPPER EXPLOSIVE LIMIT (UEL) – aka. Upper Flammable Limit – The highest concentration of a substance that will burn or explode when an ignition source is present. UEL is expressed as percent of vapor or gas in the air by volume.

VAPOR – The gaseous state of a substance at that temperature when the substance would normally be in the liquid state or the solid state.

WATER REACTIVE – A substance that reacts with water to release a gas that is either flammable or presents a health hazard.

WORK AREA – The Division, office, laboratory, classroom, storage room or preparation room in which an employee works.