St. Louis Community College
Environmental, Health and Safety

Chemical Hygiene Plan

Document #EHS-700 (revised 6/12/2023)

Table of Contents

SECTION 1 - INTRODUCTION

The purpose of this Chemical Hygiene Plan is to define work practices and procedures to help ensure that students, laboratory workers, and employees at St. Louis Community College (“the College”) are protected from health hazards associated with the hazardous chemicals with which they work. This Chemical Hygiene Plan is part of the College's compliance with the standard promulgated by OSHA entitled "Hazardous Work in Laboratories." For simplicity, this standard will be referred to as the Lab Standard in this document.

This Plan is organized into two main parts. The first is general in nature and addresses safety-related practices and policies common to all labs. The second part consists of Annexes that contain information specific to each location / lab / storeroom.

1.1 Explanation of the Lab Standard

The Lab Standard defines a hazardous chemical as "a chemical for which there is statistically significant evidence, based on at least one study conducted in accordance with established scientific principles, that acute or chronic health effects may occur in employees who are exposed to the chemical." In addition, the Lab Standard defines a laboratory as "a facility where the laboratory uses relatively small quantities of hazardous chemicals are used on a non-production basis." Finally, an employee in the Lab Standard is defined as "a person who is assigned to work in a laboratory workplace and who may be exposed to hazardous chemicals in the course of his or her assignments."

For the purposes of this Chemical Hygiene Plan, the employee described above will be called a laboratory worker. An example of a laboratory worker would be a laboratory assistant, or staff or faculty member preparing, instructing, or performing experiments in a laboratory. Students in the academic laboratory would not be considered laboratory workers, although every effort should be made to meet the safety needs of the students within the spirit of this standard.

If there is any confusion about whether a particular workplace is considered a laboratory that utilizes hazardous chemicals or whether someone is considered a laboratory worker, the Environmental, Health, and Safety Office will, upon request, make this determination.

1.2 Guiding Principles

A. The Chemical Hygiene Plan provides specific laboratory practices designed to minimize the exposure of employees to hazardous substances. Employees should follow the practices specified in the Chemical Hygiene Plan to minimize their health and safety risks.

B. It is prudent to minimize all chemical exposures because most laboratory chemicals present hazards of one type or another. Laboratory workers will follow general precautions for handling all laboratory chemicals. Specific guidelines for some chemicals, such as those found in the appropriate SDSs, will also be followed.

C. Laboratory workers are cautioned against the underestimation of risk; exposure to hazardous substances should be minimized. The decision to use a particular substance will be based on the

best available knowledge of each chemical's particular hazard and the availability of proper handling facilities and equipment. Substitutions, either of chemicals, demonstrations, or experiments, will be made where appropriate to reduce hazards without sacrificing instructional objectives. When the risk outweighs the benefit and no substitute is available, then the experiment, demonstration, procedure, or chemical should be eliminated.

D. The permissible exposure limit (PEL) and threshold limit value (TLV) of a typical chemical used in the laboratory are available on the SDS for that chemical. Employee exposure to hazardous chemicals should not exceed these limits.

E. The best way to prevent exposure to airborne substances is to prevent their escape into the laboratory by using hoods or other ventilation devices. These devices should be kept in good working order to provide employees with a safe working area.

F. The College will not accept a chemical from a supplier unless it is accompanied by the corresponding SDS. All SDSs should be accessible to employees at all times, and employees should be trained to read and use the information provided on the SDSs.

1.3 Applicability of Plan

This plan applies to any St. Louis Community College laboratories where chemicals are being utilized for instructional and research purposes. Based on a hazard assessment of sites at all College locations, this plan applies to the following laboratories / programs:

Florissant Valley	Biology/Microbiology, Chemistry
Forest Park	Biology/Microbiology, Chemistry, Dental Hygiene, Clinical Lab
Meramec	Biology, Microbiology, Chemistry
South County	Unified Science
Wildwood	Unified Science
BRDG Park	Research and Instructional Labs
Harrison Center	Unified Science (currently not in use)

SECTION 2 – STANDARD OPERATING PROCEDURES

2.1 General Laboratory Safety

A. The design of the laboratory facility will provide sufficient space for safe work by the number of persons to be in the laboratory. Exit doors will be clearly marked and free of obstructions to permit quick, safe escape in an emergency.

B. Laboratory facilities will be used only by people with proper qualifications and training. The number of students assigned to the laboratory shall not exceed the number of laboratory stations available. The maximum number of students shall not exceed 24.

C. In order to permit a quick, safe escape in an emergency, exit doors will be clearly marked and free of obstructions.

D. Laboratory workers and students should follow the Chemical Hygiene Plan to minimize their health and safety risks.

E. It is prudent to minimize all chemical exposures because most laboratory chemicals present hazards of one type or another. Employees will follow general precautions for handling all laboratory chemicals. Specific guidelines for some chemicals, such as those found in the appropriate SDSs, will also be followed.

F. Laboratory workers should not underestimate the risk, and exposure to hazardous substances should be minimized. The decision to use a particular substance will be based on the best available knowledge of each chemical's particular hazard and the availability of proper handling facilities and equipment. Substitutions, either of chemicals or experiments, will be made where appropriate to reduce hazards without sacrificing instructional objectives. When the risk outweighs the benefit and no substitute is available, then the experiment, procedure, or chemical should be eliminated.

G. Chemicals should not be accepted from a supplier unless it is accompanied by the corresponding SDS, or an SDS from that supplier for that chemical is already on file. All SDSs should be accessible to employees at all times. Employees should be trained to read and use the information found on SDSs.

H. Generally, textbooks, laboratory manuals, and other instructional materials designate the safety precautions needed for a particular laboratory activity. However, total reliance on such publications to provide complete and accurate information is not advisable. Laboratory workers should consult additional references, including Safety Data Sheets (SDS)s (SDS), before undertaking an unfamiliar activity.

2.2 Laboratory Safety Rules

A. Appropriate clothing must be worn in laboratory work areas. Arms, shoulders, legs, feet, and mid-sections must be completely covered. Wear long sleeves, long pants that completely cover the leg, and shoes that completely cover the foot. Sandals, ballet-style shoes, Croc-style footwear, slippers, high-heeled shoes, and open-toe shoes are not allowed. Students will not be allowed in the laboratory if not dressed appropriately."

B. Fingernails are to be kept at a length consistent with what is required of the laboratory class, including considerations for patient safety as well as infection control. When looking at the palm side of the hand, nails should not be seen. Nail polish may not be worn, including clear polish.

C. Side shield eye protection must be worn in laboratory work areas at all times.

D. Eating, drinking, gum chewing, application of cosmetics, manipulation of contact lenses, or other such activities are not to be done in the laboratory.

E. Unprofessional behavior in the laboratory is strictly prohibited. Students involved in misbehavior, throwing objects, and/or pranks are subject to dismissal from the laboratory course.

F. Laboratory workers should not work alone in the lab or chemical storage area unless other employees are in the vicinity and are aware that someone is in the laboratory. Students are not allowed to work in the teaching laboratory alone and may only work in laboratories that are supervised by a laboratory instructor or supervisor.

G. Unauthorized experimentation is prohibited. The removal of any chemical substance or chemical equipment from the laboratory is also prohibited. Students involved in any of these activities are subject to dismissal from the laboratory course and to college disciplinary action.

H. A fume hood must be used for all procedures that could result in the formation of toxic vapors. Procedures that could result in an explosion or implosion must be carried out behind an explosion shield.

I. "Wafting" to test chemical odors should only be done with extreme caution and only when specifically directed to do so in the written experimental procedure. Also, chemicals should never be tasted.

J. Never pipette by mouth. Always use a bulb or other device for suction.

K. Do not force glass tubing into rubber stoppers. Lubricate the glass and hold the tubing with a cloth towel as the tubing is inserted into the stopper.

L. Proper Bunsen burner procedures shall be followed. Never leave a flame unattended. Always turn off Bunsen burners when not in use. Double-check to ensure the flame is not lit and there is no gas leaking from the Bunsen burners before leaving the lab area. Gas to the laboratory should be also just off prior to leaving the lab. (The main shut-off valve/switch, not just the individual burners)

M. Should a fire drill or any other evacuation occur during a lab activity, turn off all Bunsen burners and electrical equipment. Leave the room as directed. When practical, the emergency gas shut-off switch shall be turned off prior to evacuating the lab.

N. Hot glass looks like cold glass, as hot metal looks like cold metal, and both remain hot for a long time. Determine if an object is hot by bringing your hand close to the object but do not touch the object.

O. Careful storage and handling procedures should be used to avoid glassware breakage. In the event of breakage, protection for the hands should be worn when picking up the broken pieces. Small pieces should be swept up with a brush and pan. Broken glass should be separated from other waste by placing it in a special container marked "Broken Glass". Broken glass contaminated with chemicals must be treated as hazardous waste.

P. Flammable liquids kept in laboratories and not stored in a flammables cabinet shall be limited to the amount that can be consumed in one day. This statement is not meant to limit what is stored in a flammables cabinet located in the laboratory prep room, although that amount should be minimized to what may be needed during a term.

Q. Laboratory work areas must be cleaned at the end of any laboratory work period.

R. All laboratory waste must be disposed of properly. Separate containers are identified for solid chemical waste, liquid chemical waste, and glass. In general, the laboratory sink is not a waste container. In certain situations, the laboratory instructor or research advisor may give disposal instructions for specific chemicals.

S. All laboratory accidents (spills, cuts, burns, etc.) must be reported to the laboratory instructor or supervisor.

T. Students shall only work in a laboratory or chemical storage area under the direct supervision of a laboratory instructor or supervisor.

2.3 Housekeeping Practices

A. All laboratory areas must be kept clean and contain only those items needed for the task at hand.

B. Place all waste in appropriate, segregated receptacles that are properly labeled.

C. Sinks are to be used only for the disposal of water and those solutions designated by the instructor. Other solutions must be placed in the appropriately labeled waste container.

D. Tabletops are to be cleaned and washed at the end of the lab activity.

E. Clean up all chemical spills as soon as they occur. Chemicals and cleanup materials should be disposed of correctly.

F. Never block access to emergency equipment, showers, eyewashes, or exits.

G. Store chemicals and equipment properly. Chemicals should not be stored in aisles, on the floor, in stairwells, on desks, or on laboratory tables.

H. Before leaving the laboratory, turn off services (gas, electricity, water).

I. Keep all cabinets and drawers closed when not in use to avoid catching and bumping hazards.

J. Floors should be cleaned daily.

K. Students should leave backpacks, other books, and any food or drinks in a designated area and bring only lab instructions, calculators, and writing instruments to the laboratory area.

2.4 Chemical Procurement

A. The purchasing of chemicals should be guided by the principle that less is better. The lower the chemical inventory, the fewer the problems associated with storage, and the less likely that the College will face excessive costs to dispose of outdated or surplus chemicals.

B. Chemicals should be ordered in quantities that are likely to be consumed in one year and should be purchased only in a quantity sufficient for the declared use.

C. A chemical should not be accepted without an accompanied safety data sheet (SDS) and an adequate identifying label.

D. When a chemical is received, proper handling, storage, and disposal should be known.

E. The container should be marked with the full level and date(s) it is received and opened.

F. The chemical inventory list should be updated each time a chemical is received.

G. St. Louis Community College generally does not accept donated chemicals. Donated chemicals can be accepted only after approval is obtained from the Chemical Hygiene Officer. It should be established that the donated chemical is in excellent condition, that an appropriate SDS is available, and that there is a specific use for the donated material.

2.5 Storage and Distribution

A. All chemicals should be in tightly closed, sturdy, and appropriate containers.

B. If the chemical has been transferred to a secondary container, the new container should be appropriately labeled, including all of the hazard information. Full chemical names (not just chemical formulas) will be used on labels. All laboratory faculty and staff should be aware of right-to-know laws. Students should be able to understand what a label is saying regarding the safety of the chemical.

C. Chemicals should be stored based on the reactive nature, and compatibility group, of the chemical.

D. Large containers and containers with reactive chemicals, such as acids and bases, should be on low shelves.

E. The classification system used for the storage of chemicals should be displayed in the principal storage area.

F. Flammable chemicals shall be stored in approved storage containers and approved flammable chemical storage cabinets.

G. Combustible packaging material should not be stored near flammable chemical storage cabinets.

H. All storage areas should be securely locked when not in use. Storage and preparation areas should be accessible only to those persons authorized to use the chemicals.

I. Glass bottles containing highly flammable liquids (Class 1A) shall not exceed 500 mL. For larger volumes, metal or approved plastic may not exceed 1 gallon, and safety cans shall not exceed 2 gallons.

J. Chemicals should not be distributed to persons or other areas of the school without the prior approval of the Chemical Hygiene Officer. Chemicals should not be transferred to another location without the simultaneous transfer of a copy of the appropriate safety data safety sheet, nor should they be transferred without the person receiving the chemicals having had appropriate training in their use, storage, and disposal. Under no circumstances should chemicals be transported in a personal or College-owned vehicle or offered for shipment by a courier or transportation company without approval from the Environmental, Health & Safety (EHS) office. Household refrigerators are not to be used to store flammable chemicals.

K. Refrigerators used to store flammable chemicals shall be labeled and shall be explosion-proof or of lab-safe design.

L. Occupational Safety & Health Administration (OSHA) standards and National Fire Protection (NFPA) Guidelines or local fire regulations should be consulted on the proper use of flammable chemicals in the laboratory.

M. Compressed Gases

a. A compressed gas is defined as any material or mixture having in the container either an absolute pressure greater than 276 kPa (40 lb/in 2) at 21 °C, or an absolute pressure greater than 717 kPa (104 lb/in 2) at 54 °C or both, or any liquid flammable material having a Reid vapor pressure greater than 276 kPa (40 lb/in 2) at 38 °C.

b. Gas cylinders should only be moved from one location to another with the protective cap securely in place. Cylinders shall be moved one at a time, on an approved dolly or cart, strapped down to ensure transport stability.

c. Both full and empty cylinders should only be stored where they may be securely restrained by straps, chains, or a suitable stand.

d. A cylinder should be considered empty when there is still a slight positive pressure.

e. An empty cylinder should be returned to the supplier as soon as possible after having been emptied or when it is no longer needed.

f. Cylinders should not be exposed to temperatures above 50 °C.

g. Store flammable gases separately from oxidizer gases.

2.6 Laboratory Waste Disposal

Hazardous Wastes are ruled by increasingly stringent and complex state and federal regulations and must be managed following Missouri Department of Natural Resources and/or EPA regulations. This may be accomplished with the assistance of the Environmental Health and Safety Office. However, it is the generator who is ultimately responsible for assuring that the waste generated is managed safely and appropriately. Any waste material that may, upon contact, present a hazard to one's health or surrounding environment should be treated as potentially hazardous waste. This includes spent or unused chemicals, cleaning solutions, oils, etc. If there is any doubt whether a material should be treated as hazardous, contact the EHS Office for assistance. Only aqueous/non-hazardous waste may be disposed of in the sewer or trash.

A. Waste Minimization

The College will strive to minimize or prevent waste generation. Waste minimization is an action of both local and global significance and staff are encouraged to share thoughts and ideas concerning waste minimization and prevention. Inevitably, some waste will be generated. St. Louis Community College is committed to managing waste in a safe and efficient manner. These procedures govern the management of hazardous and radioactive waste at the College.

a. Waste minimization or prevention can be accomplished in many different ways. Generators are strongly encouraged to be alert for alternative procedures or products that will reduce or prevent waste generation. Departments should be familiar with the nature of the waste they generate, including composition and quantity. Quantities of procured hazardous materials should be limited to the amount that can be used within one year. Materials often become unstable with time and required waste disposal. If an appreciable amount of time has expired with no result, place the material on the hazardous waste inventory and it will be disposed of by the EHS.
b. Waste generated through classroom instruction has additional reduction options available. These include converting to micro-scale experiments and incorporating material neutralization or inactivation into experimental procedures.
c. Hazardous chemicals that are no longer needed in one department may be transferred to another lab that can use the chemical within the same campus. Any materials that would be transported to another campus must be shipped per Department of Transportation regulations. This would involve arrangements with a courier licensed to transport hazardous chemicals. Hazardous chemicals may not be transported offsite in personal or college vehicles. Contact the EHS for help with chemical transportation.
d. Before ordering new chemicals, using existing chemicals, or creating products from reactions, employees shall determine if the material will need to be treated as hazardous waste.

B. Labeling Waste Containers

a. All containers should be labeled with contents including amount, accumulation date, any special associated hazards and/or necessary precautions, and generator identification.

b. When a material has not been spent or otherwise altered, and has the original label in good condition, the original label will be sufficient. If for some reason the uniform waste label cannot be used, the generator shall be sure to label the waste container with all of the information included in the uniform label.

c. A Safety data sheet (SDS) (SDS) can often provide information necessary to label a container. An SDS should be obtained and kept on file for each potentially hazardous material brought on campus.

C. Storing Waste

a. All waste shall be stored in a safe and secure area. Waste shall remain in such areas until picked up by the designated waste hauler. Never leave waste in a hallway or other unsecured area where it may be subject to public contact.

b. Waste should be properly segregated. Halogenated materials should be kept separate from non-halogenated materials and solids should be separated from liquids.

c. Generators are responsible for obtaining necessary storage containers. Containers shall be structurally sound, in good condition, and have a tight-fitting cap. Stoppered bottles and plastic milk or soda bottles are not acceptable. A waste generator shall assure that a container is compatible with the material to be stored.

d. Materials that may generate vapor, such as solvents and other low boiling-point materials should be stored in a properly ventilated area.

e. All waste containers should have at least 10 to 20% headspace left in them to avoid pressure build-up that may occur with expansion.

D. Using Sink Drains and the Sewer

a. Sink drains or the sewer should never be used to dispose of hazardous or other chemical waste unless it is known to be environmentally compatible. Chemical and waste products should enter the sewer only through actions incident to the process or experiment, such as container washing and rinsing.

b. Waste material should otherwise be collected for pick-up and disposal. Materials of questionable nature should not be put down the drain without first contacting EHS.

c. Never allow flammable, combustible, water-immiscible, water-soluble, mercury-containing or extremely toxic substances to enter the sewer.

E. Radioactive Waste

a. Radioactive waste should be stored and labeled in a similar fashion as other hazardous wastes. However, generators must assure that adequate shielding of the storage area is

provided to keep exposure as low as possible. Liquid and solid wastes should always be segregated and collected in separate containers. The same waste labels and request forms used for other hazardous waste should be used for radioactive waste. The container label must indicate the chemical composition of the contents, isotopes used, quantity in microcuries, and any associated hazards.

F. Potentially Infectious Material Waste

a. Potentially Infectious Material (PIM) refers to materials that can be infectious to humans and associated biological materials. These types of material are generated in connection with: diagnosis, treatment (i.e. provision of medical services), immunization of human beings or animals; medical research; or the production or testing of biological materials. Examples of potentially infectious materials include:

i. The following human body fluids: blood, semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any bodily fluid that is visibly contaminated with blood, and all bodily fluids in situations where it is difficult or impossible to differentiate between bodily fluids.

ii. Any unfixed tissue, organs (other than intact skin), and/or body parts (except teeth and the contiguous structures of bone and gum) from a human (living or dead).

iii. HIV-containing cell or tissue cultures, organ cultures, and HIV- or HBV-containing culture medium or other solutions; blood, organs, or other tissues from experimental animals infected with HIV or HBV.

iv. Cultures and stocks of agents infectious to humans, and associated biological materials; wastes from the production of biological materials; discarded live or attenuated vaccines; culture dishes and devices used to transfer, inoculate, or mix cultures.

v. Waste materials originating from animals inoculated during research, production of biological materials, or pharmaceutical testing with agents infectious to humans; carcasses, body parts, blood, or bedding of animals known to have been in contact with agents infectious to humans.

b. Regulated Waste means liquid or semi-liquid blood or other potentially infectious materials and includes the following:

i. Contaminated items that would release blood or other potentially infectious material in a liquid or semi-liquid state if compressed.

ii. Items that are caked with dried blood or potentially infectious material and are capable of releasing these materials during handling.

iii. Contaminated sharps and unused needles or syringes.

iv. Pathological and microbiological wastes containing blood or other potentially infectious material.

c. Non-Regulated Waste material includes:

i. Waste generated as general household waste.

ii. waste (except for sharps) for which the infectious potential has been eliminated by autoclaving.

iii. Sharps that meet both of the following conditions:

1. The infectious potential has been eliminated from the sharps by autoclaving.

2. The sharps are placed in leak-proof, puncture-resistant containers.

iv. Non-regulated waste that is contained in biohazard bags or biohazard sharps containers must first be marked "Treated" on the outside of the container, if the container does not already have an autoclave heat/pressure tape indicator affixed to it, prior to disposing into general trash receptacles.

d. Potentially infectious material can be disposed of in one of several manners:

i. Rendering the material non-infectious (by such means as autoclaving) to allow the material to be considered a non-regulated waste. See Appendix C for disposal procedures for non-regulated waste.

ii. Totally destroying the material through incineration requires that each department collect the PIM in appropriate containers, store the material, and contact the EHS to pick up the material for incineration in an EPA-approved incinerator.

iii. Under no circumstances are any sharps to be discarded into the general trash.

A. Departments will utilize the following storage requirements for regulated waste before treatment or transport off-site:

    a. Regulated waste must be collected or secured at the end of each day by the generators of the waste. If there is sufficient waste in the container at the end of the day, the container should be removed from the storage area. If the storage container is to be left in the use area, it must be secured so no other person can get into the material or such that any of the infectious material cannot contaminate any other material.

    b. Store waste in a manner and location that provides protection from water, rain, and wind.

    c. Maintain PIM in a non-putrescent state, using refrigeration when necessary.

    d. Lock outdoor storage areas to prevent unauthorized access.

    e. Limit access to on-site storage areas to authorized employees.

    f. Store in a manner that affords protection from animals and does not provide a breeding place or a food source for insects and rodents.

B. If PIM is to be rendered non-infectious through autoclaving, the following should be adhered to:

    a. All autoclaving of PIM must be documented. This documentation should include the date, the person conducting the autoclaving, the material autoclaved, and the verification that the material was rendered non-infectious.

    b. Verification that the autoclave reached the right temperature and pressure for the required amount of time is required. One way to do this is by autoclaving, along with the waste, a jar with spores in it. The jar is to be placed in the center of the waste bags; then, if the spores are destroyed, it is feasible that the infectious material has been rendered non-infectious. Monthly spore testing shall be completed and documented. At all other times, heat/pressure tape is required to be placed on the bags.

    c. All autoclaves used for this type of work should also be inspected annually by a certified inspector. These inspections are to ensure that the autoclaves are capable of conducting the procedures for which they are being used.

2.7 Chemical Spills

Prompt response to chemical spills is critical to protect student and worker health & safety and to mitigate adverse effects on the environment.

A. Chemical Spill Characteristics

How a chemical spill is handled is dependent on its size, associated hazards of the released material(s), available resources, and the experience/competence level of the laboratory personnel/responder.

a. Minor Chemical Spill

- Within capabilities and resources to clean
- A small amount (volume)
- No inhalation hazard (i.e., no toxic vapor or toxic dust)
- Does NOT require respiratory protection
- Not highly hazardous by skin contact
- Spill in an easily accessible area or confined area (e.g., secondary containment or fume hood)

b. Major Chemical Spill

- Beyond capabilities and resources to clean
- A large amount (volume)
- Highly hazardous substance
- Emits harmful/toxic vapor, gas, or dust
- High risk for responder while cleaning up
- Spill entering public areas, floor drains, or inaccessible locations (e.g., under cabinets)
- **Note: Lab personnel should NOT attempt to clean up a major chemical spill.**

B. Spill Kit Contents - A spill kit should be accessible for each laboratory area where chemicals are used. The kit might include:

   a. Spill control pillows

   b. Inert absorbents such as vermiculite, clay, sand, or kitty litter

   c. Neutralizing agents for acid spills such as sodium carbonate and sodium hydrogen carbonate

   d. Neutralizing agents for alkali spills such as sodium hydrogen sulfate and citric acid

   e. Quantities of cleanup materials sufficient for the largest anticipated spill.

   f. Large plastic scoops and other equipment such as brooms, pails, bags, and dustpans.

   g. Appropriate personal protective equipment

C. Response Procedures

   a. DO NOT attempt to clean a spill beyond your level of comfort or expertise. When in doubt, contact the EHS office for guidance.

      i. If the chemical involved in the spill is judged to present an immediate hazard, evacuation is to be absolute, and the area should be isolated until a HAZMAT team arrives.

      ii. If hazardous vapors are present, the area should be isolated. Only persons trained in the use of respirators may enter the area. This will frequently mean waiting for the arrival of a HAZMAT team.

      iii. If a volatile, flammable material is spilled, immediately extinguish flames, turn off all electrical apparatus, and evacuate the area.

   b. If there is no immediate danger (flammability, toxicity, reactivity, corrosivity) to personnel, containment should be accomplished by the use of spill pillows, towels, rolls, or other devices that will keep the spill from spreading.

   c. For MINOR spills, ensure that clean-up materials are compatible with spilled materials. A spill kit should be readily available in the laboratory area.

   d. All laboratory personnel must be familiar with the spill kit storage location and use of the spill kit. If the spill kit is not conspicuously located (e.g., a storage cabinet), then post signage marking its location.

   e. Follow the protocols provided by EHS, the safety data sheet (SDS), or the manufacturer of a professional spill kit to clean up a minor chemical spill.

   f. If the spilled material was a hazardous chemical, all of the materials involved in the cleanup will usually be considered hazardous waste and must be disposed of as such.

2.8 Incident & Accident Reporting

A. All injuries and accidents occurring on College property shall be reported to College Police immediately. College Police will prepare an incident report. If a hazardous condition exists that may have contributed to the accident or injury, College Police will contact the appropriate department and notify them of the condition. (Board Policy B.22)

B. College police will forward the completed accident/injury report form to Environmental, Health & Safety. The EHS will investigate reported incidents / accidents. The purpose of the investigation will be to determine the cause and how future incidents can be prevented. Laboratory Safety Committee members and laboratory workers are encouraged to participate in the investigation process.

SECTION 3 – CONTROL MEASURES

3.1 Personal Protective Equipment

A. Laboratory aprons or coats, eye protection, and non-permeable gloves are considered standard equipment for College laboratory programs and should be readily available to employees and students. The College is responsible for providing safety equipment to employees. Students may need to provide their own equipment, such as safety glasses or lab coats.

B. The hazard assessment shall be done in compliance with the OSHA standard on general requirements for personal protective equipment (29 CFR 1910.132). Selection shall be done in compliance with the OSHA standard on hand protection (29 CFR 1910.138).

C. Protective apparel shall be compatible with the required degree of protection for the substances being handled.

D. All eye protection devices should conform to ANSI Standard Z87.1-2020. Eyeglasses, even with side shields, are not acceptable protection against chemical splashes.

E. Chemical splash safety goggles should be used as the standard protective eyewear. Such goggles should fit the face surrounding the eyes snugly to protect the eyes from a variety of hazards. These goggles will carry the ANSI Z87.1 D3 rating for splash and droplet protection.

F. Any experiment that involves heating or the use of chemicals, or glassware shall require the use of chemical splash safety goggles. The goggles also serve to reduce dust and fumes from reaching the eye.

G. Full face shields protect the face and throat. They must be worn for protection when there is a greater risk of injury from flying particles and harmful chemical splashes. A full face shield should also be worn when an operation involves a pressurized system that may explode or an evacuated system that may implode. For full protection, safety goggles must be worn with the face shield.

H. Standing shields should be used when there is a potential for explosions, implosions, or splashes, or when corrosive liquids are used. Goggles should be worn whenever using a standing shield.

I. A standing shield should be used for group protection from chemical splash and impact. The standing safety shield should be used with safety goggles and, if appropriate, with a face shield.

J. Hair ties will be required to contain long hair. Floppy clothing shall be restrained, either by wearing a lab coat or by other means.

K. Feet shall be adequately covered to protect them from chemical hazards. Sandals or open-toe shoes will not be allowed in the lab. Splashes of chemicals on shoes or clothing shall be cleaned off immediately.

L. Lab coats or aprons worn in the laboratory offer protection from splashes and spills. Wear a lab coat and/or rubber, neoprene, or PVC apron when using large quantities and splash potential exists. Lab coats and aprons shall be discarded if damaged sufficiently to reduce protective quality.

M. When gloves are required, it should be remembered that no one kind of glove is suitable for all situations. The SDS should be consulted for information regarding the proper type of gloves to be used.

3.2 Administrative Controls

A) Laboratory Security

a. Laboratory security has evolved in the past decade, reducing the likelihood of some emergencies and assisting in preparation and response for others. Most security measures are based on the laboratory's vulnerability. Risks to laboratory security include, but are not limited to:

i) Theft or diversion of chemicals, biologicals, and radioactive or proprietary materials, mission-critical or high-value equipment;

ii) Threats from activist groups;

iii) Intentional release of, or exposure to, hazardous materials;

iv) Sabotage or vandalism of chemicals or high-value equipment;

v) Loss or release of sensitive information; and

vi) Rogue work or unauthorized laboratory experimentation.

b. Security systems in the laboratory are used to detect and respond to a security breach, or a potential security breach, as well as to delay criminal activity by imposing multiple layered barriers of increasing stringency.

c. A good laboratory security system will increase overall safety for laboratory personnel and the public, improve emergency preparedness by assisting with preplanning, and lower the organization's liability by incorporating more rigorous planning, staffing, training, and command systems and implementing emergency communications protocols, drills, background checks, card access systems, video surveillance, and other measures.

d. The security plan should clearly delineate response to security issues, including the coordination of institution and laboratory personnel with both internal and external responders.

B) Inventory Control

a. A chemical inventory should be updated each time a chemical is received or consumed. The list should be audited for accuracy on at least an annual basis.

b. The chemical inventory list should contain the following information about each chemical found in storage: the chemical name, location, the date purchased, the amount present, the CAS number, and the examination date for possible disposal.

c. Every area in which chemicals are used or stored should have an up-to-date inventory.

d. A printed copy of the most recent inventory should be kept by the laboratory manager and by the chemical hygiene officer.

C) Hazard Identification and Labels

a. Labels on incoming containers of hazardous chemicals are not to be removed or defaced.

b. Laboratory chemicals should be properly labeled to identify any hazards associated with them for the employee's information and protection.

c. If a chemical is stored in its original bottle, it should have the manufacturer's original label identifying potential hazards, the date of purchase, the date opened, and the initials of the person who opened the container.

d. If a chemical has been transferred to a secondary container, the new container should be appropriately labeled with the chemical name, formula, concentration (if in solution), solvent (if in solution), hazard warnings, and name or initials of the person responsible for the transfer.

e. Unlabeled bottles should not be opened, and such materials should be disposed of promptly, as outlined in the section on disposal procedures.

D) Signs and Posters

a. Emergency telephone numbers shall be posted in all laboratory areas.

b. Signs shall be used to indicate the location of exits, evacuation routes, safety showers, eyewash stations, fire extinguishers, fire blankets, first aid kits, fume hoods, and other safety equipment.

c. Warnings at areas or equipment where special or unusual hazards exist.

d. Posters to reinforce laboratory safety procedures should be displayed in the laboratory and the classroom.

E) Safety Data Sheets (SDS)

a. Each SDS received with incoming shipments of chemicals should be maintained and made readily available to laboratory employees and students.

b. The safety data sheets for each chemical in the laboratory usually give recommended limits or OSHA-mandated limits, or both, as guidelines for exposure limits. Typical limits are expressed as threshold limit values (TLVs), permissible exposure limits (PELs), or action levels. When such limits are stated, that limit, along with any other information about the

hazardous characteristics of the chemical, should be used to set laboratory guidelines. These laboratory guidelines may be used in determining the safety precautions, control measures, and personal protective equipment that apply when working with toxic chemicals.

c. Safety data sheets for each compound on the chemical inventory should be available in the department.

d. Safety data sheets can often be obtained by requesting them from companies that currently sell the chemicals. Chemical manufacturers and suppliers are required to supply one copy of a safety data sheet (SDS) the first time the chemical is purchased by the school or institution.

F) Recordkeeping

a. Chemical Inventory Records

i. An inventory of all chemicals shall be conducted annually and chemical usage determined.

ii. The chemical hygiene officer shall retain a copy of the chemical inventory.

b. Inspection Records

i. Reports must be completed and retained by the chemical hygiene officer.

ii. Safety equipment should be tagged to indicate the date and the results of the last inspection.

iii. Records indicating the dates of repairs and regular maintenance of safety equipment should be maintained.

c. Training Records

Training records shall include the dates of the training sessions and the contents (or a summary) of the training. The training records shall be maintained for three (3) years from the date on which the training occurred.

d. Incident Report

Accident reports must be completed for any incident. Copies are to be retained by the EHS Office.

e. Medical and Exposure Records

Records of air concentration monitoring, exposure assessments, medical consultations, and medical examinations must be kept for at least 30 years after the employee ceases employment with the district.

f. Waste Disposal Records

The College shall retain records of the disposal of hazardous waste. The records shall conform to the requirements of the Missouri Department of Natural Resources and/or EPA.

g. Safety Data Sheets

The College should maintain a file of SDSs and should make them accessible to employees. If an SDS is not available when a new chemical is received, that chemical should not be used until an SDS is obtained.

G) Exposure Monitoring

a. If there is reason to believe that exposure levels for a regulated substance have exceeded the action level or permissible exposure limit, the chemical hygiene officer should ensure that the employee or student's exposure to that substance is measured.

b. Factors that may raise the possibility of overexposure and therefore warrant an initial measurement of employee or student exposure include:

i. The manner in which the chemical procedures or operations involving the particular substances are conducted.

ii. The existence of historical monitoring data that shows elevated exposures to the particular substance for similar operations.

iii. The use of a procedure that involves significant quantities or is performed over an extended period of time.

iv. There is reason to believe that an exposure limit may be exceeded.

v. Signs or symptoms of exposure (e.g., skin or eye irritation, shortness of breath, nausea, or headache) that are experienced by employees or students.

vi. (Some of these symptoms are very general and can be due to many other causes including emotional stress or hysteria.)

c. If the substance in question does not have exposure monitoring or a medical surveillance requirement, exposure monitoring, and medical surveillance shall be continued until exposure levels are determined to be below the action level or 50% of the PEL. In the absence of PELs, the ACGIH TLVs should be referenced.

d. If a substance has an exposure monitoring requirement and if there is reason to believe that exposure levels for that substance routinely exceed the action level or in the absence of the action level, the employer shall measure the employee or student's exposure to the substance.

e. If the initial monitoring (described in d. above) discloses employee exposure over the action level or in the absence of an action level, the PEL, the employer shall immediately comply with the exposure monitoring provisions of the relevant standard for that substance.

f. The employer shall, within 15 working days after the receipt of any monitoring results notify the employee or student of these results in writing either individually or by posting the results in an appropriate location that is accessible to employees.

g. The following substances are regulated by OSHA standards and require monitoring: lead, benzene, 1,2-dibromo-3-chloropropane, acrylonitrile, ethylene oxide, formaldehyde, asbestos, vinyl chloride, and inorganic arsenic.

SECTION 4 – SAFETY / EMERGENCY FACILITIES AND EQUIPMENT

4.1 Equipment

A) The College should ensure that adequate emergency equipment is available in the laboratory and inspected periodically to ensure that it is functioning properly. All employees should be properly trained in the use of each item.

B) Emergency equipment items that should be available include eyewash stations, fire extinguishers of the appropriate type, safety showers, telephones for emergencies, fire blankets, and identification signs.

C) Each laboratory should have a standard first aid kit stocked according to the recommendations of the EHS.

D) Multipurpose fire extinguishers should be available in the laboratory. A multipurpose, ABC, fire extinguisher, can be used on all fires EXCEPT for class D fires. Extinguishers should be visually checked monthly and inspected and tested annually (completed by Facilities).

E) Every eye wash station will be capable of supplying a continuous flow of aerated, tepid, potable water to both eyes for at least 15 minutes. The valve should remain in the open position without the need to hold the valve. (ANSI Z358.1-1990) Eyewash stations will be checked weekly for proper operation and flow (completed by Laboratory Coordinators).

F) Safety showers should be capable of supplying a continuous flow of tepid potable water for at least 15 minutes. The shower should have a quick-opening valve requiring manual closing. (ANSI Z358.1-1990) Safety showers will be tested monthly for proper operation and flow (completed by Laboratory Coordinators).

G) Eye wash stations and safety shower stations shall be located so they will be accessible within 10 seconds. (ANSI Z358.1-1998)

H) Safety equipment will be tagged following an inspection, showing the date, inspector, and results.

I) Laboratories in which hazardous substances are being used should have spill control kits tailored to deal with the potential risk associated with the materials being used. If there is no immediate danger to employees or students, containment should be accomplished by spill pillows, towels, rolls, inert absorbents, neutralizing agents, or other devices.

J) Each storeroom shall be equipped with a heat sensor and smoke alarm.

4.2 Facilities

A) Fume hoods

a. Laboratory fume hoods are the most important components used to protect laboratory employees and students from exposure to hazardous chemicals and agents used in the

laboratory. Functionally, a standard fume hood is a fire and chemical-resistant enclosure with one opening (face) in the front with a movable window (sash) to allow user access into the interior. Large volumes of air are drawn through the face and out the top to contain and remove contaminants from the laboratory.

b. Laboratory fume hoods are not meant for either storage or disposal of chemicals. If a hood must be used for storage, in order to provide adequate ventilation for flammable chemicals, for example, it must not be used for laboratory experiments or transfer of chemicals. In that event, it must be used only for storage.

c. Laboratory activities that may release airborne contaminants above the Permissible Exposure Limit (PEL) or Thresholds Limit Value (TLV) concentrations must be carried out in the fume hood. Also, if laboratory activities produce potentially hazardous vapors or gaseous substances, laboratory activities should be conducted in the fume hood.

d. In most cases, the recommended face velocity is between 80 and 100 feet per minute (fpm).

e. Fume hoods should be positioned in the laboratory so that air currents do not draw fumes from the hood into the room.

f. The exhaust stack from a fume hood shall be in a vertical-up direction at a minimum of 10 feet above the adjacent roof line and so located with respect to openings and air intakes of the laboratory or adjacent buildings to avoid reentry of the exhaust into the building. (ANSI/AIHA Z9.5 – 1992)

g. Fume hoods or other local ventilation devices should be used when working with any appreciably volatile substance with a TLV of less than 50 ppm. (Standard)

h. All biohazard and fume hoods shall be inspected annually and certified by an outside contractor as contracted by Facilities. Any hood not passing inspection must be taken out of service immediately and not be used until the hood has passed inspection. It is the responsibility of the employer to purchase the parts and replace the unit in a timely fashion so as not to endanger the health and well-being of the employee or place the facility at risk.

i. Facilities Department is responsible for maintaining the fume hood and will ensure the air velocity is tested annually.

B) Ventilation

a. General laboratory ventilation should not be relied on for protection from exposure to hazardous chemicals. A rate of 4 - 12 room air exchanges per hour should be the accepted standard when local exhaust systems, such as hoods, are used as the primary method of control.

b. Laboratory airflow should not be turbulent and should flow continuously throughout the laboratory.

c. Any alteration of the ventilation system should be made only if thorough testing indicates that employee and student protection from airborne toxic substances will continue to be adequate.

d. Exhaust from the fume hoods should be vented directly to the outside.

C) Flammable Storage

a. Chemicals with a flash point below 93.3 ° C (200 ° F) should be considered "fire hazard chemicals". Any chemical whose SDS or label states "Flammable" is in this category.

b. Fire hazard chemicals in excess of 500 mL should be stored in a flammable solvent storage area, safety cans, or in storage cabinets designed for flammable materials.

c. Flammable materials should be stored in a flammable liquid storage cabinet or other appropriate locations. When transferring significant quantities of flammable liquids from one container to another, they must be properly grounded to prevent accidental ignition of flammable vapors and liquids from static electricity or other sources of ignition. Large quantities of flammable chemicals stored outside cabinets should be in flame-proof storage cans which conform to NFPA guidelines. NFPA 30, Flammable and Combustible Liquids Code, and NFPA 45, Fire Protection for Laboratories Using Chemicals, and/or the applicable local fire codes should be followed.

D) Electrical

a. All electrical outlets should have a grounding connection accommodating a three-prong plug.

b. All laboratories should have circuit breakers readily accessible. Employees should know how to cut off electricity to the laboratory in case of an emergency.

c. Laboratory lighting should be on a separate circuit from electrical outlets.

d. All electrical outlets should be checked for continuity after initial occupancy or whenever electrical maintenance or changes occur.

e. If electrical equipment shows evidence of undue heating, it should be immediately unplugged.

f. Install ground-fault circuit interrupters (GFCIs) as required by code to protect users from electrical shock, particularly if an electrical device is hand-held during a laboratory operation.

SECTION 5 – TRAINING AND INFORMATION

5.1 General Training Information

The objective of the employee training and information program is to assure that all individuals at risk are adequately informed about: the physical and health hazards associated with hazardous chemicals present in the laboratory; the proper procedures to minimize the risk of exposure; and the proper response to accidents.

All individuals who work in laboratories and may be exposed to hazardous chemicals must be apprised of the hazards of chemicals present in their work area. This information and training as outlined below must be provided before the initial assignment and before new exposure situations. Equipment necessary for the safe handling of hazardous substances must also be provided. Laboratory faculty, staff, and others with responsibilities or access to the labs will be trained on the following subjects. However, training specific to the particular lab where an employee is assigned is the responsibility of that employee's supervisor.

5.2 Training for Laboratory Workers

Laboratory workers will be trained in the methods of detecting the presence of hazardous chemicals, physical and health hazards of chemicals in the lab, and measures employees can take to protect themselves from these hazards.

The training will present the details of the Chemical Hygiene Plan, and shall include:

A. The contents of the OSHA Laboratory Standard (29 CFR Part 1910.1450) and its appendices

B. The location and availability of this Chemical Hygiene Plan

C. The permissible exposure limits for OSHA-regulated substances or recommended exposure values for other hazardous chemicals not regulated by OSHA which are present in the laboratory

D. Signs and symptoms associated with exposure to the chemicals present in the laboratory

E. Safety data sheet (SDS)s (SDS) for the chemicals being used in the laboratory

F. Location of personal protective equipment and emergency equipment as outlined in the chemical hygiene plan.

G. Location and availability of reference material on the hazards, safe handling, storage, and disposal of hazardous chemicals where there is no applicable OSHA standard.

H. Methods and requirements of hazardous waste management.

5.3 Training for Students

A. Instruction in laboratory safety shall be provided to all students involved in laboratory activities.

B. The extent of student training should be based on their course of study, the laboratory facility, college policies, the chemical hygiene plan, and the level of chemical handling and potential exposure to hazardous chemicals.

C. Safety training should include the importance and the content of the label and safety data sheets (SDS). As appropriate, the student should also be introduced to other sources of chemical safety information.

D. At the beginning of the school year and before laboratory activities, class time shall be devoted to safe laboratory practices and the student safety agreement. Locations of safety equipment, such as safety showers, eye wash stations, fire extinguishers, AEDs, and First Aid kits will be included in this discussion.

5.4 Safety and Health References

Several resources are available from EHS or through college library resources for staff to review for additional information on the chemicals they are interacting with. These resources cover a wide variety of topics ranging from specific chemical toxicity to general safe lab practices. Among them are:

A. Dangerous Properties of Industrial Materials [Lewis R. J. (2012). Sax's dangerous properties of industrial materials (12th ed.). John Wiley & Sons.]

B. The Merck Index [O'Neil M. J. & Royal Society of Chemistry (Great Britain). (2013). *The merck index : an encyclopedia of chemicals drugs and biologicals* (Fifteenth). Royal Society of Chemistry.]

C. Fundamentals of Industrial Hygiene [Niland J. & Elam L. A. (2020). *Fundamentals of industrial hygiene* (Seventh). National Safety Council.]

D. Laboratory Health and Safety Handbook [Workers' Compensation Board of British Columbia. (2008). *Laboratory health and safety handbook* (2008th ed.). WorkSafeBC.]

E. Sigma-Aldrich Regulatory and Safety Data [Lenga R. E. Votoupal K. L. & Sigma-Aldrich Corporation. (1993). *The sigma-aldrich library of regulatory and safety data*. Sigma-Aldrich Corp.]

F. Regulatory Standards, Including Documentation of Permissible Exposure Levels and Threshold Limit Values

G. Safety data sheet (SDS)s (SDS)

H. Safety Supply Catalogs

SECTION 7 – MEDICAL CONSULTATION AND MEDICAL EXAMINATIONS

7.1 Medical Surveillance

A) College laboratory workers do not regularly handle significant quantities of materials that are acutely or chronically toxic. Therefore, regular medical surveillance is not justified.

7.2 Medical Examinations

A) Medical examinations will be provided to all employees who work with hazardous chemicals, including any follow-up examinations that the examining physician determines to be necessary, under the following circumstances:

   a. Employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory.

   b. Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA-regulated substance.

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

B) All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician through STLCC Workman's Compensation Program and shall be provided without cost to the employee.

C) The employer shall provide the following information to the physician:

   a. The identity of the hazardous chemical(s) to which the employee may have been exposed;

   b. A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and,

   c. A description of the signs and symptoms of exposure that the employee is experiencing if any.

7.2 Physician's Written Opinion

A) A written opinion from the examining physician shall be obtained and shall include the following:

a. Any recommendations for further medical follow-up;

b. The results of the medical examination and any associated tests;

c. Any medical condition that may be revealed in the course of the examination that may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace; and,

d. A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment. The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.

SECTION 8 – RESPONSIBILITIES

It is the responsibility of all administrators, faculty, staff, and students to promote safety in the laboratories. This section outlines specific roles for this plan.

8.1 Laboratory Safety Committee (LSC)

The Laboratory Safety Committee is responsible for developing and implementing the laboratory safety program. This committee meets regularly to discuss new issues and program items that may arise, including reviewing lab incidents, approving permits to use particularly hazardous substances, and collaboratively suggesting annual revisions to the CHP. The committee is selected by department chairs, deans & administrators.

8.2 Environmental, Health & Safety (EHS)

The Environmental Health and Safety Department shall:

- Provide technical assistance to laboratory supervisors and workers concerning appropriate storage, handling, and disposal of hazardous chemicals;
- Conduct exposure assessments and laboratory inspections upon request and on a routine basis;
- Remain knowledgeable of rules and regulations concerning chemicals used on campus;
- Ensure that copies are maintained of safety data sheets (SDS) and other laboratory and chemical safety literature;
- Maintain records of exposure monitoring and any written opinions from examining physicians;
- Maintain the following records: Copy of inspections by regulatory agencies and OEHS, Reports or warnings of CHP non-compliance, Approval requests of lab operations involving hazardous substances, and Attendance sign-in log from training sessions.
- Provide technical assistance concerning personal protective equipment and laboratory safety equipment

8.2 Chemical Hygiene Officer

A. The Chemical Hygiene Officer is the Environmental, Health & Safety Manager or their designee at St. Louis Community College.

B. The Chemical Hygiene Officer should be qualified by training and experience to provide technical guidance in the development and implementation of the Chemical Hygiene Plan.

C. The Chemical Hygiene Officer has the responsibility to:

a. Develop and implement the chemical hygiene plan and the safety plan for the college, including training, reporting, and other functions.

b. Work with administrators and instructors to develop and implement the safety program.

c. Conducts regular inspections of the laboratories, preparation rooms, and chemical storage rooms and submits detailed laboratory inspections to EHS and administration for review and remediation.

d. Monitor the procurement, use, and disposal of chemicals used in the college's laboratory programs.

e. Provide technical assistance to each campus/program and employees on the chemical hygiene plan.

f. Assure that the chemical hygiene plan is reviewed annually and revised as needed so that it is always in compliance with current legal requirements.

g. Make decisions regarding requests to use chemicals identified as explosive, carcinogenic, mutagenic, highly toxic, or otherwise unsuitable for general school laboratories.

h. Determine the need for personal equipment beyond that specified for general laboratory use.

i. Implement appropriate training concerning chemical hygiene for all college employees whose normal work locations include laboratory areas.

j. Ensure that employees have received appropriate training.

k. Ensure that employees have access to the chemical hygiene plan, SDSs, and other suitable reference materials.

8.4 Academic Deans / Department Chairpersons

The Academic Deans and respective Department Chairpersons have the primary responsibility for the health and safety of the faculty, staff, and students. Specific responsibilities regarding the implementation of the Chemical Hygiene Plan shall be to:

A. Make budget arrangements for health and safety improvements; and,

B. Work with EHS in implementing the Chemical Hygiene Plan.

C. Inform the faculty and staff about general safety procedures and the tenets of the Chemical Hygiene Plan;

D. Approve the acquisition and use of hazardous chemical agents within the department;

E. Ensure faculty and staff comply with the Chemical Hygiene Plan;

F. Seek ways to improve the Chemical Hygiene Plan.

8.5 Laboratory Technicians / Coordinators

Laboratory Technicians/Coordinators shall:

A. Monitor procurement of extremely hazardous and less hazardous bulk volume chemicals used in the labs, and provide information to EHS or the Laboratory Safety Committee as requested;

B. Receive and inventory all chemicals entering the storeroom.

C. Maintain a complete inventory of all materials in the storeroom and the laboratories;

D. Maintain copies of SDS documents for all on-site hazardous materials.

E. Flush eyewash stations once per week and maintain a log of usage;

F. Flush emergency showers once per month and maintain a log of usage;

G. Conduct internal inspections of labs for health and safety concerns;

H. Request assistance from Environmental Health and Safety

I. Maintain the following records: Storage of hazardous peroxide-forming materials. Waste records for the laboratory. Use, storage, and monitoring of formaldehyde. Inventories of hazardous and radioactive substances. Keep an updated record of chemicals stored in the lab including amounts and dates of procurement;

J. Request allocation of funds from supervisors for health and safety improvements

K. Notify Environmental Health and Safety immediately if conditions pose a serious threat, or if a serious accident or injury occurs that requires medical attention.

8.6 Faculty & Staff (Laboratory Supervisors)

Faculty and staff in charge of supervising laboratories (referred to as Laboratory Supervisors) are ultimately responsible for the safety of their teaching laboratories and have the following responsibilities for implementing the Chemical Hygiene Plan:

A. Ensure that laboratory personnel comply with the CHP and do not operate equipment or handle hazardous chemicals without proper training and authorization.

B. Always wear personal protective equipment (PPE) that is compatible with the degree of hazard of the chemical.

C. Follow all pertinent safety rules when working in the laboratory

D. Review laboratory procedures for potential safety problems before assigning them to other laboratory personnel.

E. Ensure that visitors follow the laboratory rules

F. Ensure that PPE is available for use by employees and visitors.

G. Maintain and implement safe laboratory practices.

H. Provide regular, formal chemical hygiene and housekeeping inspections, including regular checks to make sure emergency equipment (fire extinguishers, first aid kits, showers, and eyewash stations) are ready in the event they are needed.

I. Report problems with the facilities or the chemical fume hoods.

8.7 Students

Student responsibilities regarding the Chemical Hygiene Plan are the following:

A. Follow all health and safety standards and rules set forth by this Chemical Hygiene plan and the Laboratory Supervisors;

B. Report all hazardous conditions and/or accidents to the Laboratory Supervisor and seek treatment immediately;

C. Utilize required personal protective equipment;

D. Do not operate any equipment or instrumentation without proper instruction or authorization;

E. Request information and training when unsure how to handle a hazardous chemical or procedure.

8.8 Maintenance/Facilities

The Facilities Department of St. Louis Community College shall:

A. Provide for annual inspections and repairs of fume hoods.
B. Maintain inspection and repair records for the fire extinguishers.
C. Provide repairs to eyewash stations and safety showers as requested by laboratory staff.
D. Provide at least one-week advance notice of any planned/non-emergency water, steam, and electrical outages.

8.9 Outside Contractors / Maintenance Workers / Custodial Workers

Departments, the Environmental Health and Safety Specialist, and the employees are all responsible for the safety of outsiders in the lab areas. Lab Supervisors shall ensure that contractors are informed of the hazards in the lab and that precautions have been taken to protect the contractors against any hazards present.

In general, lab employees are responsible for the daily maintenance of their areas. Maintenance workers are not expected to be present in lab areas on a daily basis. Work by outside contractors or maintenance workers should be scheduled so that one or more responsible lab employees are present for questions and explanations of lab safety requirements. The scope of cleaning by custodial workers should be limited to floors, windows, blackboards / dry-erase boards, and the removal of non-hazardous trash. Cleaning of counters and shelves should be conducted by lab employees.

SECTION 9 – PARTICULARLY HAZARDOUS SUBSTANCES (PHS)

9.1 General Information

A. This section of our plan describes the specific and general control measures which are designed to reduce the exposure of instructors, aides, students, and other employees to especially hazardous substances. Employees should read and understand these practices before commencing a procedure using particularly hazardous substances.

B. The Occupational Safety and Health Administration's (OSHA's) Hazardous Chemicals in Laboratories Standard (29 CFR 1910.1450) defines particularly hazardous substances (PHSs) as including select carcinogens, reproductive toxins, and chemicals with high acute toxicity. The College also considers highly reactive, highly flammable and highly corrosive materials to be particularly hazardous and "high risk".

C. Labs should evaluate GHS-compliant Safety Data Sheets (SDS), the GHS Lookup Tool, and other chemical information.

D. The use of these substances requires prior approval of the Chemical Hygiene Officer.

E. PHSs shall be used in designated areas and fume hoods.

F. The use of PHSs shall require the removal of contaminated waste and the decontamination of contaminated areas.

9.2 Highly Toxic Chemicals

A. Chemicals having high acute toxicity include the following GHS classifications:
   a. Acute Toxicity by Inhalation or Dermal exposure — Category 1 or 2
   b. Acute Toxicity by Oral exposure — Category 1
   c. Specific Target Organ Toxicity—Single Exposure — Category 1
   d. Skin or Respiratory Sensitizer—Category 1A
   e. Strong Hydrogen Fluoride releaser
   f. Corrosive to the respiratory tract

B. When a PEL or TLV value is less than 50 ppm or 100 mg/m3, the user should use it in an operating fume hood, glove box, vacuum line, or other device equipped with appropriate traps. If none is available, no work should be performed using the chemical.

C. If a PEL, TLV, or comparable value is not available, the animal or human median inhalation lethal concentration information, LC 50, should be used as a guideline. If that value is less than 200 ppm or 2000 mg/m3 when administered continuously for one hour or less, then the chemical should be used in an operating fume hood, glove box, vacuum line, or other device equipped with appropriate traps. If none are available, no work should be performed using that chemical.

D. Examples of highly toxic chemicals (acute or chronic) that were commonly used in the past are benzene, chloroform, formaldehyde, bromine, carbon disulfide, carbon tetrachloride, cyanide salts, and hydrofluoric acid.

9.3 Highly Flammable Chemicals

A. The College defines Class 1A liquids as highly flammable chemicals. Class 1A liquids have a flashpoint of less than 73 ° C and a boiling point of less than 100 ° C.

B. Examples of highly flammable chemicals are diethyl ether, acetone, pentane, petroleum ether, acetaldehyde, and ligroines.

9.4 Highly Reactive Chemicals

A. Reactivity information may be given in a manufacturer's safety data sheet (SDS) and on labels. The most complete and reliable reference on chemical reactivity is the current edition of Bretherick's Handbook of Reactive Chemical Hazards.

B. A reactive chemical is one that:

   a. Is described as such on the label, in the SDS, or by Bretherick.

   b. Is ranked by the NFPA as 3 or 4 for reactivity.

   c. Is identified by the Department of Transportation (DOT) as an oxidizer, an organic peroxide, or an explosive (Class A, B, or C).

   d. Fits the Environmental Protection Agency's definition of reactive in 40 CFR 261.23.

   e. Is known or found to be reactive with other substances.

C. Reactive & explosive chemicals considered Particularly Hazardous (and High Risk) include the following GHS and European classifications. (Note that some SDSs may not show the European classifications.)

   a. In contact with water liberates toxic gas
   b. Reacts violently with water
   c. Pyrophoric liquid or solid—Category 1, or Pyrophoric Gas
   d. Explosives—Unstable or Divisions 1.1—1.3
   e. Explosive when dry, or Explosive with or without air contact
   f. Self-reactive or Organic peroxides—Type A
   g. Self-heating category 1
   h. Oxidizing liquid or solid, category 1
   i. In contact with water releases flammable gas — Category 1 or 2
   j. In contact with acids liberates (very) toxic gas
   k. Self-reactive or Organic peroxides—Type B

D. Reactive chemicals should be handled with all proper safety precautions, including segregation in storage, prohibition of mixing even small quantities with other chemicals without prior approval, and appropriate personal protection and precautions.

E. Examples of commonly encountered highly reactive chemicals are ammonium dichromate, nitric acid, perchloric acid, hydrogen peroxide, potassium chlorate, azides, organic nitrates, and acetylides.

9.5 Highly Corrosive Chemicals and Contact Hazard Chemicals

A. Corrosivity, allergen, and sensitizer information is provided in manufacturers' SDSs and on labels.

B. A corrosive chemical is one that:

   a. Fits the OSHA definition of corrosive in 29 CFR 1910. 1200

   b. Fits the EPA definition of corrosive in 40 CFR 262.22 (has a pH greater than 12 or a pH less than 2.5)

   c. Is known to be reactive to living tissue, causing visible destruction, or irreversible alterations of the tissue at the site of contact.

C. A contact-hazard chemical is an allergen or sensitizer that:

   a. Is so identified or described in the SDS or on the label.

   b. Is so identified or described in medical or industrial hygiene literature.

   c. Is known to be an allergen or sensitizer.

D. Corrosive and contact hazard chemicals will be handled with all proper safety precautions, including wearing safety goggles, using gloves tested for the absence of pinholes and known to be resistant to permeation or penetration by the chemical, and wearing a laboratory apron or laboratory coat.

E. Examples of highly corrosive chemicals are hydrochloric, sulfuric, nitric, phosphoric, and perchloric acids (all acids in greater than 1 Molar concentration), and potassium hydroxide (either solid or in aqueous solution greater than 1 Molar concentration).

9.6 Reproductive Toxins

A. A reproductive toxin refers to chemicals that affect reproductive capabilities including chromosomal damage (mutations) and which affect fetuses (teratogenesis). (Standard)

B. A reproductive toxin is a compound that:

   a. Is described as such in the applicable SDS or label (listed as GHS Category 1A or 1B for reproductive toxicity).

   b. Is identified as such by the Oak Ridge Toxicology Information Resource Center (TIRC), (615) 576-1746.

C. No reproductive toxins should be allowed in College laboratories without written authorization from the chemical hygiene officer.

D. If such chemicals are used,

   a. They should be handled only in a hood and when the satisfactory performance of the hood has been confirmed.

   b. Skin contact should be avoided by using gloves and wearing protective apparel.

c. Persons using such substances should always wash their hands and arms immediately after working with these materials.

d. Unbreakable containers of these substances should be stored in a well-ventilated area and will be labeled properly.

E. Examples of reproductive toxins are organomercurial compounds and ethidium bromide, carbon disulfide, xylene, toluene, benzene, mercury, lead compounds, ethyl ethers, and vinyl chloride.

9.7 Select Carcinogens

A. Select carcinogen means any substance which meets one of the following criteria:

a. It is regulated by OSHA as a carcinogen

b. GHS Carcinogenicity Category 1A or 1B, or

c. IARC Group 1, or NTP "Known to be Human Carcinogens" or OSHA-listed carcinogens, or

d. GHS Category 2 AND IARC Group 2 (A or B), AND NTP "Reasonably Anticipated to be Human Carcinogens"

e. It is listed under the category, "known to be carcinogens," in the National Toxicology Program (NTP) Annual Reports on Carcinogens.

f. It is listed under Group 1 "carcinogenic to humans" by the International Agency for Research on Cancer Monograms (IARC).

g. It is listed in either Group 2A or 2B by IARC or under the category "reasonably anticipated to be carcinogens" and causes statistically significant tumor incidents in experimental animals under set criteria of exposure.

B. All work with these substances should be conducted in a designated area, such as a fume hood, glove box, or a portion of a laboratory designated for use of chronically toxic substances. Such a designated area should be clearly marked with warning and restricted access signs.

C. Any procedure that may result in a generation of aerosols or vapors should be performed in a hood whose performance is known to be satisfactory.

D. Skin contact should be avoided by using gloves and other protective apparel as appropriate. Any protective clothing should be removed before leaving the designated area and placed in a labeled container. Hands, arms, and neck should be washed after working with these materials.

E. Select carcinogens should be stored in unbreakable containers in a ventilated area with controlled access. All containers should be labeled with the identity and hazard of the substance. Immediately upon completion of the project, all unused reproductive toxins should be disposed of following standard hazardous waste disposal procedures.

F. No select carcinogens are allowed in College laboratories without written authorization from the chemical hygiene officer.

G. Examples of select carcinogens are benzene, nickel metal dust, vinyl chloride, and formaldehyde.

REFERENCES

A Model Chemical Hygiene Plan for High Schools, American Chemical Society, Washington, DC,1995.

Chemical Hygiene Plan, Kentucky Department of Education: Frankfort, KY, 1990.

Hall, Stephen K., Chemical Safety in the Laboratory, Lewis Publishers, Boca Raton, FL, 1994.

Kaufman, James A., Laboratory Safety Guidelines, Laboratory Safety Institute, Natick, MA, 1999.

Maryland Science Safety Manual K – 12, Maryland Science Supervisors Association, Maryland State Department of Education, 1999.

Mercier, Paul, Laboratory Safety Pocket Handbook, Genium Publishing, Schenectady, NY, 1996.

NFPA Standard 30, Flammable and Combustible Liquids Code, National Fire Protection Association, Quincy, MA, 1996.

NFPA Standard 45, Fire Protection for Laboratories Using Chemicals, National Fire Protection Association, Quincy, MA, 1991.

Occupational Exposure to Hazardous Chemicals in Laboratories; Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1910. 1450, Federal Register, Washington, DC, January 31, 1990.

Prudent Practices in the Laboratory, Handling, and Disposal of Chemicals, National Research Council, National Academy Press: Washington, DC, 1995.

Safety in Academic Chemistry Laboratories, 6th ed., American Chemical Society, Washington, DC, 1995.

Science Safety Handbook for California Public Schools, California Department of Education, Sacramento, CA, 1999.

State of New Hampshire's Hazardous Waste Rules; New Hampshire Department of Environmental Services, Concord, NH, 1994.

ADDITIONAL RESOURCES

American National Standard for Laboratory Ventilation, Z-9.5, American Industrial Hygiene Association, Fairfax, VA, 1993.

Chemical Storage Guidelines, New York State Department of Education, Albany, NY, 1999.

Fire Protection Guide to Hazardous Materials, National Fire Protection Association, Quincy, MA, 1997.

Flinn Chemical & Biological Catalog Reference Manual 2000, Flinn Scientific Inc., Batavia, IL, 2000.

Furr, Keith A., CRC Handbook of Laboratory Safety, 4th ed., CRC Press: Boca Raton, FL, 1995.

Gerlovich, Jack A. School Science Safety – Secondary, Flinn Scientific Inc., Batavia, IL, 1988.

Kaufman, James A. Laboratory Safety and Health Audio Course, Kaufman & Associates, Natick, MA, 1994.

Laboratory Waste Management, A Guidebook, American Chemical Society, Washington, DC, 1994.

Manual of Safety and Health Hazards in the School Science Laboratory, U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, Cincinnati, OH, 1984.

NIOSH Pocket Guide to Chemical Hazards; U.S. Department of Health and Human Services, Superintendent of Documents, Washington, DC, 1997.

Pocket Guide to Safety Data Sheets and Labels, Business and Legal Reports, Madison, CT, 1990.

Speaking of Safety, Laboratory Safety Institute, Natick, MA, 2000.

Wahl, George H., Reduction of Hazardous Wastes from High School Chemistry Laboratories, Kaufman & Associates, Natick, MA, 1994.

Wood, Clair G., Safety in School Science Labs; Kaufman & Associates, Natick, MA, 1991.

Working Safely with Chemicals in the Laboratory, 2nd ed., Genium Publishing, Schenectady, NY, 1997.

Young, J. A., Kingsley, W. R., and Wahl. G. H. Jr., Developing A Chemical Hygiene Plan, American Chemical Society, Washington, DC, 1990.

Young, J. A., Improving Safety in the Chemical Laboratory - A Practical Guide, Wiley & Sons, Inc., New York, NY, 1991.

SUMMARY OF REVISIONS

6/12/2023 – 3.1 D & E changed after discussion in Laboratory Safety Committee Meeting with regards to protective eyewear meeting ANSI Z87.1-2020 versus previous Z87.1-1989