Chemical Hygiene Plan

Office of Environmental Compliance and Sustainability

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INTRODUCTION

PURPOSE

Berry College has developed a Chemical Hygiene Plan to explain the policies and procedures that will promote the safe operation of its laboratories. In addition, the Chemical Hygiene Plan satisfies the requirements of the U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1910.1450, Occupational Exposures to Hazardous Chemicals in Laboratories. This regulation is known as the "Laboratory Standard"; the objective of the "Laboratory Standard" is to protect employees from health hazards associated with hazardous chemicals in the laboratory.

In Georgia, the Occupational Safety and Health Act, 29CFR1910, applies to all public and private employers. Georgia has not chosen to promulgate its own laws, regulations, and rules regarding health and safety for public employees rather than adopt the OSHA Standards.

"The Laboratory Standard" is a regulation developed for the protection of employees. Since students are not employees, they are not officially covered by provisions of the "Laboratory Standard". However, Berry College extends the provisions of the Chemical Hygiene Plan to our students in addition to our employees. "What is good for teachers is good for students!"

Many policies and practices may not be part of the Chemical Hygiene Plan, but the policies and practices may be crucial to the planning process for maintaining a safe environment for employees and students. The amount of physical space per student is an example of a policy that affects the establishment of a safe environment but is not required by the "Laboratory Standard" to be included in the Chemical Hygiene Plan.

GENERAL PRINCIPLES [ACS, Standard]

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. Employees will follow general precautions for handling all laboratory chemicals. Specific guidelines for some chemicals, such as those found in the appropriate MSDSs, will also be followed.

C. Employees 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 MSDS 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 district should not accept a chemical from a supplier unless it is accompanied by the corresponding MSDS. All MSDSs should be accessible to employees at all times, and employees should be trained to read and use the information provided on the MSDSs.

NOTE: Brackets are used throughout the text to indicate references.

CHEMICAL HYGIENE PLAN

I. Standard Operating Procedures (ACS, EHS)

A. General

1. 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. (KY)

2. Laboratory facilities will be used only by persons with proper qualifications and training. The number of students assigned to the laboratory shall not exceed the number of laboratory stations available. (KY, CA, MD, Appendix A)

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

4. Staff and students should follow the Chemical Hygiene Plan to minimize their health and safety risks. (ACS)

5. 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 MSDSs, will also be followed. (ACS, KY)

6. Employees 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. (ACS, KY)

7. Chemicals should not be accepted from a supplier unless it is accompanied by the corresponding MSDS, or an MSDS from that supplier for that chemical is already on file. All MSDSs should be accessible to employees at all times. Employees should be trained to read and use the information found on MSDSs. (ACS, Prudent, Appendix A)

8. 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. Employees should consult additional references, including Material Safety Data Sheets, before undertaking an unfamiliar activity. (ACS, KY)

B. Laboratory Procedures (ACS, EHS, Prudent)

1. Individuals in laboratories:

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

b. Conduct yourself in a responsible manner at all times in the laboratory. This means that horseplay, throwing items, and pranks are prohibited.

c. Employees 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.

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

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

f. 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.

g. Proper Bunsen burner procedures shall be followed. Never leave a flame unattended.

h. Dress appropriately for laboratory work. Avoid loose or baggy clothing and dangling jewelry. Confine or tie back long hair. Sandals or any open toed shoes are not permitted in the laboratory.

i. 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.

j. Remember hot glass looks like cold glass, and glass remains 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.

k. 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.

l. The quantities of flammable liquids used in the laboratory shall not exceed the amount that can be consumed in one day. (JK, BW)

2. Students in the laboratory: (ACS, EHS)

a. Must read lab directions ahead of time and follow all verbal and written instructions.

b. Shall only perform only authorized experiments.

c. Shall report all accidents or injuries to the instructor at once, no matter how trivial it may seem. The student must go to the nurse for the treatment of cuts, burns, accidental ingestion of chemicals, or inhalation of fumes.

d. Shall only work in a laboratory or chemical storage area under the direct supervision of a Professor or their designee. (JK, BW)

C. Housekeeping Practices (ACS, EHS)

1. Individuals in the laboratory:

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

b. Place all wastes in appropriate, segregated receptacles that are properly labeled.

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

d. Tabletops are to be swept clean 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 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. (Standard)

2. Students in the laboratory: (EHS)

a. Place backpacks and other bags and books in the storage cabinets, on shelves or in floor clear of each laboratory workbench to avoid unnecessary hazards.

D. Chemical Procurement (ACS)

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

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

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

4. A chemical should not be accepted without the material safety data sheet and an adequate identifying label. (Standard)

5. When a chemical is received, proper handling, storage, and disposal should be known. (Standard)

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

7. The chemical inventory list should be updated each time a chemical is received. (ACS, Prudent)

8. Donated chemicals should be accepted only after approval is obtained from the Environmental Compliance and Sustainability Manager. It should be established that the donated chemical is in excellent condition, that an appropriate MSDS is available, and that there is a specific use for the donated material.

E. Storage and Distribution (ACS, NFPA)

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

2. If the chemical has been transferred to a secondary container, the new container should be appropriately labeled, including all of the hazard information.

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

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

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

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

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

8. 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.

9. 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. (NFPA 45)

10. Chemicals should not be distributed to other persons or to other areas of the school without the prior approval of the Environmental Compliance and Sustainability Manager. Chemicals should not be transferred to another location without the simultaneous transfer of a copy of the appropriate material data safety sheet, nor should they be transferred without the person receiving the chemicals having had an appropriate training in their use, storage, and disposal.

11. Household refrigerators are not to be used to store flammable chemicals.

12. Refrigerators used to store flammable chemicals shall be labeled and shall be of explosion proof or of lab safe design. (NFPA 45)

13. OSHA standards and NFPA Guidelines or local fire regulations

should be consulted on the proper use of flammable chemicals in the laboratory.

14. 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. (Prudent, Mercier)

b. Gas cylinders should only be moved from one location to another with the protective cap securely in place. (ACS)

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

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

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. (ACS)

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

g. Store flammable gases separately from oxidizer gases. (JK)

F. Waste Disposal

1. Berry College and the Environmental Compliance and Sustainability Manager shall ensure that the disposal of laboratory chemicals is in compliance with the New Hampshire Department of Environmental Services, Hazardous Waste Rules. (See Appendix C for regulations)

2. Berry College and the Environmental Compliance and Sustainability Manager shall ensure that drain disposal of laboratory chemicals is in compliance with Rome, GA rules and

regulations. (See Appendix C for regulations)

3. Berry College to be considered a Conditionally Exempt Small Quantity Generator (CESQG) of hazardous waste, by the state of Georgia and the Environmental Protection Agency, must generate, in each and every calendar month, less than:

   a. less than 100 kg of hazardous waste
   b. less than 1 kg of acutely hazardous waste
      (See Appendix C for CESQG requirements)

4. Guidelines for waste minimization: (JK)

   a. Employees shall minimize generation of hazardous wastes (microscale labs, selecting less hazardous materials, etc.).

   b. Chemicals should be ordered in quantities that are likely to be consumed in one year or less.

   c. Avoid the inadvertent accumulation of hazardous waste. Potential waste materials are surplus, old, and/or unnecessary chemicals. Every attempt must be made to avoid accumulating such chemicals.

   d. Prior to 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 by referring to the Georgia Hazardous Waste Rules. (See Appendix C for definition)

5. Guidelines for hazardous waste disposal: (ACS, Prudent)

   a. Flammable, combustible, water-immiscible materials, or water soluble solutions of toxic substances shall not be poured down the drain.

   b. Separate waste containers should be provided for heavy metal compounds, chlorinated hydrocarbons, nonchlorinated hydrocarbons, and any other categories recommended by Berry College's hazardous waste transporter company. Separation of wastes in this manner will make disposal less costly.

c. Waste chemicals should be stored in appropriately labeled containers, inside secondary containment.

d. Hazardous wastes should never be placed in the common solid trash container.

e. All waste containers should have an up-to-date log of the material that is in the container. When any material is added to the container, the chemical name, the amount of the chemical, the date, and the initials of the individual adding the hazardous chemical, shall be recorded in the log for that container. (JK, BW)

f. Upon completion of the laboratory activity, the waste containers shall be returned to the preparation room. Waste materials should not be stored in the laboratory. (JK)

g. When the waste containers become full, the containers shall be transferred to a designated waste storage area within three (3) days. (JK)

G. Spills

1. 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. (ACS)

2. 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. (ACS)

3. If a volatile, flammable material is spilled, immediately extinguish flames, turn off all electrical apparatus, and evacuate the area. Consult the MSDS for appropriate cleanup procedures. If the quantity exceeds the employee's ability or training to handle the spill, seal the area until appropriately trained personnel arrive. (KY)

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

the spill from spreading. (ACS)

5. If there is no immediate danger, cleanup procedures listed on the MSDS should be followed. Appropriate personal protective equipment shall be used. (KY)

6. A spill kit should be accessible for each science laboratory. The kit might include: (MD)

   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. (JK)

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

   g. Appropriate personal protective equipment

7. If the spill material was a hazardous chemical, all of the materials involved in the cleanup will usually be considered to be hazardous waste and must be disposed of as such. (ACS)

8. If a major spill occurs (cannot be cleaned-up safely by yourself), cleanup shall only be undertaken by individuals who are trained in HAZMAT procedures. (ACS)

II. Control Measures

A. Personal Protective Equipment

1. It is the responsibility of Berry College to provide appropriate safety and emergency equipment for employees and students. (Prudent)

2. Protective apparel shall be compatible with the required degree of protection for the substances being handled. (Standard)

3. Laboratory aprons or coats, eye protection, and non-permeable gloves are considered standard equipment for Berry College laboratory programs and should be readily available to employees and students. (ACS, KY)

4. All eye protection devices should conform to ANSI Standard Z87.1-1989. Eyeglasses, even with side shields, are not acceptable protection against chemical splashes. (ACS)

5. 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. (MD)

6. 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. (CA, EHS)

7. Contact lenses are not necessarily prohibited in the laboratory. If contact lenses are permitted, chemical splash goggles must be worn at all times. (ACS)

8. 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. (Hall, Lab Safety Pocket Handbook, JK, BW)

9. 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. (ACS)

10. 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. (CA)

11. Lab coats or aprons worn in the laboratory should offer protection from splashes and spills, and should be easy to remove in case of an accident, and should be fire resistant. (ACS)

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

B. Administrative Controls

1. 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. (ACS)

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. (ACS)

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

d. A printed copy of the most recent inventory should be kept by the Lab Supervisor, Department Chair or their designee and by the EHS office.

2. Hazard Identification and Labels

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

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

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

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. (ACS)

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

3. Signs and Posters

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

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. (KY)

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

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

4. Material Safety Data Sheets

a. Each MSDS received with incoming shipments of chemicals should be maintained and made readily available to laboratory employees and to students. (ACS) (Standard)

b. The material safety data sheets for each chemical in the laboratory usually give recommended limits or OSHA - mandated limits, or both, as guidelines to 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 the toxic chemical. (ACS)

c. A material safety data sheet for each compound on the chemical inventory should be available in the department, except for those chemicals that predate the laboratory standard. Material 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 material safety data sheet the first time the chemical is purchased by the school or institution. (ACS)

5. Records

a. Chemical Inventory Records (KY)

i) An inventory of al 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 (KY)

i) Reports must be completed and retained by the EHS office.

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 (ACS)
The college should maintain records of employee training for at least 30 years, and they should be made available to employees.

d. Incident Report (KY)
Accident reports must be completed for any incident. Copies are to be retained by the, Lab Supervisor or Department Chair, the EHS office and the Human Resources 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 college.

f. Waste Disposal Records (ACS, NH)
The college shall retain records of disposal of hazardous waste. The records shall conform to the requirements of the Georgia Department of Environmental Protection Division.

g. MSDSs (ACS)
The college should maintain a file of MSDSs and should make them accessible to employees. If an MSDS is not available when a new chemical is received, that chemical should not be used until a MSDS is obtained.

6. 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 exposure to that substance is measured. (ACS)

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

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), which are experienced by employees or students. (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. (JK, BW)

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 PEL, the employer shall measure the employee or student exposure to the substance. (Standard)

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. (Standard)

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. (Standard)

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. (JK)

III. SAFETY / EMERGENCY FACILITIES AND EQUIPMENT

A. Equipment

1. 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. (ACS)

2. Emergency equipment items that should be available include: eyewash station, fire extinguisher of the appropriate type, safety shower, telephone for emergencies, fire blanket, and identification signs. (ACS)

3. Each laboratory or department should have a standard first aid kit available at all times.

4. 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.

5. 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) (ACS)

6. 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) (ACS, Prudent)

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

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

9. 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.
(ACS, Prudent)

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

B. Facilities

1. 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 interior. Large volumes of air are drawn through the face and out the top to contain and remove contaminants from the laboratory. (Prudent)

   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. (ACS)

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, the laboratory activities should be conducted in the fume hood. (KY, CA)

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

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

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 a reputable company that is qualified and trained and having all needed certifications. Any hood not passing inspection must be taken out of service immediately and not be used until such time as the hood has passed inspection.

i. Fume hood air velocity should be tested each year.

2. 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.

Laboratory airflow should not be turbulent and should flow continuously throughout the laboratory. (ACS, Standard)

b. 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. (Standard)

3. Flammable Storage

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

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. (ACS)

c. Flammable materials should be stored in a flammable liquid storage cabinet or other appropriate location. When transferring significant quantities of flammable liquids from one container to another, it is particularly important that they 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.

4. Electrical

a. All electrical outlets should have a grounding connection accommodating a three prong plug. (ACS)

b. All laboratories should have circuit breakers readily accessible. Physical Plant should be notified if Breakers need to be disconnected. (ACS)

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

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

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

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. (Prudent)

IV. Training and Information

A. Training for Employees

1. General

a. The employer shall provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area. (Standard)

b. Such information shall be provided at the time of the employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving to exposure situations. The frequency of refresher information and training shall be determined by the employer. (Standard)

2. 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 risk of exposure; and the proper response to accidents. (KY)

3. The school district shall provide training opportunities for all individuals at risk. These training opportunities should include information about the hazards of chemicals present in the laboratory and sources of information concerning hazards in the laboratory. In particular, the training program should cover the laboratory standard, material safety data sheets, the chemical hygiene plan, and the responsibilities of the district and the employee. (ACS)

4. Employees should be trained on the potential chemical hazards in the employees' work areas and on appropriate sections of the chemical hygiene plan. This training should be provided to all employees who actually work in the laboratory as well as to other employees whose assignments may require that they enter a laboratory where exposure to hazardous chemicals might occur. Employees who are responsible for receiving and handling shipments of new chemicals or chemical wastes should also be informed of the potential hazards and appropriate protective measures for chemicals they may receive. (ACS)

5. Laboratory employees should be trained on the applicable details of the chemical hygiene plan, including a review of the general rules of laboratory safety. The training program should describe appropriate sections of the standard operating procedures, particularly those procedures that require prior approval of the chemical hygiene officer. (ACS)

6. The training an employee receives should be determined by the nature of the work assignment in the laboratory. (KY)

7. Employees should be trained in measures they may take to protect themselves from exposure to hazardous chemicals, including the location and proper use of protective equipment and emergency equipment. In addition, the training must also include a discussion of inventory procedures to be followed, proper storage and ordering rules, and district hazardous waste disposal procedures. acs

8. All laboratory employees will be trained to read and understand MSDSs. (ACS)

9. All employees shall be trained in labeling and storage practices as outlined in the chemical hygiene plan. (KY)

10. All employees should be trained in the methods and observations that may be used to detect the presence or release of hazardous chemicals. (Standard)

B. Training for Students

1. Instruction in laboratory safety shall be provided to all students involved in laboratory activities. (ACS)

2. The extent of student training should be based on their grade level, course of study, the laboratory facility, school policies, the chemical hygiene plan, and the level of chemical handling and potential exposure to hazardous chemicals. (ACS)

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

4. At the beginning of the school year and prior to laboratory activities, class time shall be devoted to safe laboratory practices and to the student safety agreement. (EHS)

C. Information

1. Employees shall be informed of the content of the “Laboratory Standard”, 29 CFR Part 1910. (Standard)

2. Employees shall be informed of the location and availability of the chemical hygiene plan. (Standard)

3. Employees shall be informed of the permissible exposure limits for OSHA regulated substances on site or recommended exposure limits for other hazardous chemicals on site where there is no applicable OSHA standard. (ACS, Standard)

4. Employees shall be informed of the location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals where there is no applicable OSHA standard. (ACS)

5. Employees shall be informed of the location of material safety data sheets. (ACS)

6. Employees shall be informed of the location of personal protective equipment and of emergency equipment as outlined in the chemical hygiene plan. (KY)

7. Employees shall be informed of the signs and symptoms associated with exposures to hazardous chemicals used in the laboratory. (Standard, KY)

V. Prior Approval

1. Prior approval should be obtained from the chemical hygiene officer whenever a new laboratory experiment or test is to be carried out. This prior approval should also be sought for experiments that have not been performed recently or for which the potential for harm is present. The potential for harm may be affected by a change in the amounts of materials being used, the conditions under which the experiment is to be conducted, or the substitution, deletion, or addition of a chemical. (ACS)

2. Prior approval before doing any procedure should be obtained where one or more of the following conditions exist:

   a. Potential for a rapid rise in temperature

   b. Potential for a rapid increase in pressure

   c. Use of a flammable solvent

   d. Potential for a chemical explosion

   e. Potential for spontaneous combustion

f. Potential for the emission of toxic gasses that could produce concentrations in the air that exceed toxic limits.

g. Change in a procedure, even if the change is quite small. (ACS)

h. Involves the use of highly toxic substances.

3. Chemicals should not be distributed to other persons or to 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 material data safety sheet, nor should they be transferred without the person receiving the chemicals having had an appropriate training in their use, storage, and disposal.

4. Donated chemicals should be accepted only after approval is obtained from the District Chemical Hygiene Officer. It should be established that the donated chemical is in excellent condition, that an appropriate MSDS is available, and that there is a specific use for the donated material.

5. A list of acceptable reagents should be developed for use in the classroom. An employee who desires to use a substance that is not on the acceptable list must seek the permission of the chemical hygiene officer. The decision to use the chemical will be based on the best available knowledge of the hazards of the substance and the availability of proper handling facilities and equipment. The written request should include the following information. (MD, ACS)

a. Use of the chemical is pedagogically sound.

b. Use of the substance is an effective method to illustrate an important process, property, or concept.

c. Adequate safeguards are in place to assure proper use of the substance

d. Exposure time of the employees and students to the substance

e. Permissible exposure limit and threshold limit value of the

substance.

6. Students shall only work in a laboratory or chemical storage area under the direct supervision of a science teacher. (JK, BW)

VI. Medical Consultation and Medical Examinations

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

B. In the event that an employee is exposed to levels of a hazardous chemical exceeding the established PEL or TLV, or should the employee exhibit signs or symptoms of such exposure, the employee shall be provided an opportunity to receive an appropriate medical examination. (KY, Standard)

Physician _____ Tel._____
Hospital _____ Tel. _____

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

D. The employer shall provide the following information to the physician conducting the examination. (Standard)

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

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

3. A description of the signs and symptoms of exposure that the employee is experiencing

4. A copy of the MSDSs for the chemicals(s) involved. (NH)

E. A written opinion from the examining physician for any consultations or examinations performed under this standard should include:

1. Any recommendation for further medical attention

2. The results of the medical examination and any associated tests.

3. Any medical condition revealed during the examination which might compromise employee safety during, or as a result of, exposure to hazardous chemicals found in the workplace

4. A statement that the employee has been informed by the physician of the results of the consultation or examination and any medical condition that may require further examination or treatment.

5. A copy of the physician's report to be retained by the employer. (ACS, Standard)

6. The written opinion from the physician should not reveal specific diagnoses unrelated to the occupational exposure. (ACS, Standard)

VII. Responsibilities

A. Office of Environmental Compliance and Sustainability

1. EHS Personnel should be qualified by training and experience to provide technical guidance in the development and implementation of the Chemical Hygiene Plan.

2. The office of EHS 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 Faculty and Staff to develop and implement the safety program.

   c. Assure that inspections in the laboratory are performed when appropriate and that records of inspections are maintained.

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

e. Provide technical assistance to schools 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 with regard to chemical hygiene for all district 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 MSDSs, and other suitable reference materials.

D. Department Chair

The Department Chair is responsible for chemical hygiene programs within their department. The Department Chair shall monitor compliance with the chemical hygiene plan. The Department Chair is also responsible for enforcement of all federal state, and local health, safety, and environmental regulations and policies as applicable to their department. (JK, BW)

E. Faculty and Staff

1. Faculty and Staff, who normally work in a laboratory, are responsible for: (ACS)

a. Participating in training programs provided by the college.

b. Maintain an awareness of health and safety hazards.

c. Planning and conducting each operation in accordance with the college's chemical hygiene plan procedures.

d. Consulting reference materials, including MSDS's, related to chemical safety where appropriate.

e. Using and modeling good personal chemical hygiene habits.

f. Reporting accidents, injuries, unsafe practices, and unsafe conditions.

F. Students

Students should practice good personal hygiene habits. They should report accidents and maintain an awareness of health and safety hazards. Students should conduct all activities according to the chemical hygiene plan procedures. (JK, BW)

VIII. Particularly Hazardous Substances (PHS)

A. General

1. 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. (BW, JK)

2. PHSs include highly toxic chemicals, reproductive toxins, and select carcinogens. In addition, our school district includes highly flammable chemicals, highly reactive chemicals, and highly corrosive chemicals.

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

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

5. The use of PHSs shall require removal of contaminated waste and the decontamination of contaminated areas. (Prudent)

B. Highly Toxic Chemicals

1. 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. (ACS)

2. 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. (ACS)

3. 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. (ACS)

C. Highly Flammable Chemicals

1. Our college will define 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. (JK, BW)

2. Examples of highly flammable chemicals are diethyl ether, acetone, pentane, petroleum ether, acetaldehyde, and ligroines. (JK,BW)

D. Highly Reactive Chemicals

1. Reactivity information may be given in a manufacturers' MSDSs and on labels. The most complete and reliable reference on chemical reactivity is the current edition of Bretherick's Handbook of Reactive Chemical Hazards. (ACS, Prudent)

2. A reactive chemical is one that: (ACS)

    a. Is described as such on the label, in the MSDS, 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 definition of reactive in 40 CFR 261.23.

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

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

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

E. Highly Corrosive Chemicals and Contact Hazard Chemicals

1. Corrosivity, allergen, and sensitizer information is provided in manufacturers' MSDSs and on labels. (ACS)

2. A corrosive chemical is one that: (ACS)

    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.

3. A contact - hazard chemical is an allergen or sensitizer that: (ACS)

    a. Is so identified or described in the MSDS 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.

4. 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. (ACS)

5. 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). (ACS)

F. Reproductive Toxins

1. A reproductive toxin refers to chemicals which affect reproductive capabilities including chromosomal damage (mutations) and

which effect fetuses (teratogenesis). (Standard)

2. A reproductive toxin is a compound that: (ACS)

   a. Is described as such in the applicable MSDS or label.

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

3. No reproductive toxins should be allowed in middle or high school laboratories without written authorization from the chemical hygiene officer.

4. If such chemicals are used, (ACS)

   a. They should be handled only in a hood and when 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 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.

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

G. Select Carcinogens (ACS, Standard, Prudent)

1. Select carcinogen means any substance which meets one of the following criteria: (Standard)

a. It is regulated by OSHA as a carcinogen

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

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

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

2. 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.

3. 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.

4. 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.

5. 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 toxin should be disposed of following standard hazardous waste disposal procedures.

6. No select carcinogens are allowed in middle or high school laboratories without written authorization from the chemical hygiene officer.

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

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