



Chemical Hygiene Plan

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INTRODUCTION

PURPOSE

The College has developed a Chemical Hygiene Plan to explain the policies and procedures that will promote the safe operation of the college's 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.

"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, the College extends the provisions of the Chemical Hygiene Plan to our students in addition to our employees.

I. Standard Operating Procedures

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. The number of students assigned to the laboratory shall not exceed the number of laboratory stations available.
2. Exit doors of labs and chemical storage rooms will be clearly marked and free of obstructions to permit quick, safe escape in an emergency.
3. Laboratory facilities will be used only by persons with proper qualifications and training.
4. Staff and students should follow the Chemical Hygiene Plan to minimize their health and safety risks.
5. It is prudent to minimize all chemical exposures because most laboratory chemicals present hazards of one type or another. Specific guidelines for some chemicals, such as those found in the appropriate material safety data sheets (MSDSs), will also be followed.
6. 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.
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 shall be trained to read and use the information found on MSDSs.
8. Employees/students should consult additional references, including MSDSs, before undertaking an unfamiliar activity.

B. Laboratory Procedures

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/students 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, dangling jewelry and hair. Blouses and shirts shall cover the body from the neck to the waste including the upper arm. Pants, slacks, skirts or dresses shall cover from the waste to the ankles, with no gap between the top and bottom. Finally, the feet shall be covered with substantial shoes, open toed shoes or sandals are permitted.
 - 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 shall 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 five gallons.
 - m. Containers of chemical substances shall be closed when not in use.
 - n. Evaporation is not an acceptable means to dispose of chemical materials.
2. Students in the laboratory:
- a. Must read lab directions ahead of time and follow all verbal and written instructions.
 - b. Shall only perform 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 University Physicians Group for the treatment of cuts, burns, accidental ingestion of chemicals, or inhalation of fumes. The faculty member must complete an Incident Report (found online at www.etown.edu/safety) and forward it to Human Resources.
 - d. Shall only work in a laboratory or chemical storage area under the direct supervision of a faculty member.

C. Housekeeping Practices

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. Keep all cabinets and drawers closed when not in use to avoid catching and bumping hazards.
 - h. Aisles should be kept clear; no chemicals may be stored on the floors.
2. Students in the laboratory:
 - a. Bring only your lab instructions, calculators, writing instruments, and any required personal protective equipment (e.g. safety goggles) to the laboratory area.
 - b. Leave backpacks and other books in the classroom area.



D. Chemical Procurement

1. The purchasing of chemicals should be guided by the philosophy that less is better.
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 MSDS and an adequate identifying label.
5. When a chemical is received, proper handling, storage, and disposal should be known.
6. The container should be marked with the date(s) it is received.
7. The chemical inventory list should be updated each time a chemical is received.
8. Donated chemicals should 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 MSDS is available, and that there is a specific use for the donated material.

E. Storage and Distribution

1. All chemicals should be in tightly closed, sturdy, properly-labeled containers that are compatible with the chemical.
2. Chemicals shall not be stored where they have access to the sanitary or storm sewers.
3. All cup sinks in hoods will be protected with a permanent barrier to keep chemicals out of the sanitary sewer. Quantities of chemicals in the hood will not exceed the capacity of the barrier.
4. If the chemical has been transferred to a secondary container, the new container should be appropriately labeled, including the hazard information.
5. Chemicals should be stored based on the compatibility group of the chemical.
6. Large containers and containers with reactive chemicals, such as acids and bases, should be on low shelves.
7. The classification system used for the storage of chemicals should be displayed in the principal storage area.
8. Flammable chemicals shall be stored in approved storage containers and in approved flammable chemical storage cabinets.
9. Combustible packaging material should not be stored near flammable chemical storage cabinets.
10. 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.
11. Refrigerators used to store flammable chemicals shall be labeled and shall be of explosion proof or of lab safe design. (NFPA 45)
12. OSHA standards and NFPA Guidelines or local fire regulations should be consulted on the proper use of flammable chemicals in the laboratory.
13. Compressed Gases
 - a. Gas cylinders should only be moved from one location to another with the protective cap securely in place.
 - b. Both full and empty cylinders should only be stored where they may be securely restrained by straps, chains, or a suitable stand.
 - c. A cylinder should be considered empty when there is still a slight positive pressure.



- d. An empty cylinder should be returned to the supplier as soon as possible after having been emptied or when it is no longer needed.
 - e. Cylinders should not be exposed to temperatures above 50 °C.
 - f. Store flammable gases separately from oxidizer gases.
 - g. Storage: Full cylinders are currently stored in the Chemistry stockroom by the outside door. All cylinders should have a protective cap securely screwed on to the tank.
 - h. When a cylinder is empty, it is to be secured to one of the cylinder mounts found on the tables located near the outside entrance. Protective cap should be fully screwed on and a sign placed on the empty cylinder indicating it is empty.
 - i. Transport: When transporting gas cylinders, proper protective eyewear is required. The cylinder must be securely fastened to an approved cart. When transporting a gas cylinder using an elevator, never ride the elevator with the cylinder. Place the cylinder on the elevator and push the button for the desired floor and walk up to meet the elevator.
14. Used oil will be stored in a closed and properly labeled container and disposed of at the College's used oil storage site.
15. Minimal amounts of solvents and other chemicals should be kept in the teaching and research laboratories. Primary storage should be the chemical storage area of the Biology and Chemistry stockrooms.

F. Waste Disposal

1. Chemical Wastes shall be disposed of in accordance with the Environmental Protection Agency/Department of Environmental Protection Regulations.
 - a. A waste characterization will be performed when generator knowledge is not sufficient to determine whether a waste is hazardous or not.
2. The College is considered a Small Quantity Generator (SQG) of hazardous waste .The college must generate in each and every calendar month, less than:
 - a. 100 kg of hazardous waste
 - b. 1 kg of acutely hazardous waste
3. Guidelines for waste minimization:
 - 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.
4. Guidelines for waste disposal:
 - a. Municipal Waste – These are the waste materials that are generally placed into a waste container such as but not limited to coffee cups, apple cores, used towels, etc. These materials are picked up by ES and taken to the Brown Building and placed in the compactor. When the compactor is full it is taken to the incinerator to be burned.
 - b. Broken Glass – There are special cardboard containers located throughout the laboratories for uncontaminated broken glass. These containers have lids on them which are not to be taken off. The Chemical Hygiene Officer will seal the containers when they are full and move them to the trash site outside the building for facilities pickup. Facilities will place them in the open top dumpster for burial.



- c. Sharps – There are small sharps containers throughout the laboratories. Sharps should be placed in these containers when they are no longer being used. The CHO will empty these containers when they are full. They are placed in a large sharps container located in the hazardous waste storage site in the chemical storage room #107. When this container is full it is processed out with the shipment of hazardous waste to be buried.
 - d. Universal Wastes – For laboratory purposes this includes fluorescent light bulbs and batteries of all types. The fluorescent bulbs are to be put out for the ES staff to pick up and move to the universal waste site at the Brown Building. The batteries are to be placed in the battery container in the hazardous waste storage area room 107. The CHO will move the batteries to the universal waste site at the Brown Building. The universal wastes will be removed from the site by a certified hauler.
 - e. Hazardous Waste – Waste from laboratory work must be processed into one of two locations. Those wastes that meet the definition of hazardous waste must be placed in the “Hazardous Wastes” containers in the satellite accumulation areas (SAA) . Others chemicals substances are to be placed in the sanitary sewer. (See list of materials allowed to be placed in the sanitary sewer). The hazardous waste in the SAA(s) are to be taken to the hazardous waste storage site in room 107 where it will remain until a certified hazardous waste hauler removes it from the site.
 - f. Flammable, combustible, water-immiscible materials, or water soluble solutions of toxic substances shall not be poured down the drain.
 - g. Separate waste containers should be provided for heavy metal compounds, chlorinated hydrocarbons, nonchlorinated hydrocarbons, and any other categories recommended by the College’s hazardous waste transporter company.
 - h. Waste chemicals should be stored in appropriately labeled containers that include “hazardous waste”, chemical name, start accumulation date, fill date, and date moved to central storage area. These containers must be stored inside SAA(s) secondary containment and must remain closed at all times when waste is not being added to the container.
 - i. Hazardous wastes should never be placed in the common solid trash container.
 - j. Upon completion of the laboratory activity, the waste containers shall be placed in the Satellite Accumulation Area (SAA) and the appropriate label (see Appendix A) must be completed and attached.
 - k. When the waste containers become full, the containers shall be transferred to the hazardous waste central storage area (CSA) within three (3) days. In addition, waste in SAAs should be moved to the CSA at the end of every semester. Hazardous waste will be removed from the CSA once a semester. In chemical laboratories (both teaching and research), organic solvent waste containers should be clearly labeled as to whether they are halogenated or nonhalogenated; whenever possible, halogenated solvents should not be mixed with nonhalogenated solvents.
 - l. A list should be maintained with each container so the exact contents and the approximate amounts are known. When the container is 80% full, the list should be secured onto the container and the container transported to the chemical storage area in the stockroom.
 - m. Acid or base waste solutions should be neutralized (verified by pH paper or a pH meter) and poured down the drain in consultation with a faculty member.
 - n. For containers bearing reagent that has lost its potency or have been contaminated, the container should be labeled as such and the container properly transported to the chemical waste area of the chemical storage area in the stockroom.
5. Biological Waste
- a. The following protocols should be adhered to regarding wastes generated in the Biology Department.
 - i. Uncontaminated Broken Glass – Uncontaminated broken glass is to be placed in the corrugated cardboard containers placed in each laboratory for this purpose. The CHO will check these containers and seal the full ones and place them in the area north of Lyet for the ES waste hauler to pick up and place it in the recycling container behind the Brown Building.



- ii. Hazardous Chemical Waste – Chemical Wastes are to be placed in a container marked with the following information: Hazardous Waste, the date the container was started, and the contents of the container. The containers are to be stored in a Satellite Accumulation Area (SAA) in a secondary container. When the containers are full they shall be moved to the holding area in Room 247 and logged in. A hazardous waste hauler removes them from this area.
- iii. Animal Carcasses: When the faculty and students are done with the animal bodies and parts they should be wrapped in plastic bags and placed in appropriate freezers or into the 55 gal drum in room 247. Once a year a biological waste hauler will come to the department and remove all the animal carcasses.
- iv. Contaminated Sharps – Contaminated sharps are to be disposed of in the small red containers marked accordingly. When the small containers become full they are to be moved to the hazardous waste holding area and logged in. When the hauler removes the animal bodies they will take the sharps as well.
- v. Empty Reagent containers: When a reagent container is empty it should be placed in the container in each of the laboratories marked “empty reagent containers”. On a regular basis the CHO will consolidate all the empty reagent containers and place them in a waste bag and put them in the waste area north of the building for the ES waste hauler to pick up and place in the recycling dumpster at the Brown Building.
- vi. Contaminated Biological Waste – Contaminated biological waste shall be double bagged in the universally marked “biological waste” bags and taken to the autoclave. The waste should be placed in a pan with low profile sides. The bag should be left open to allow “all air” to escape during the vacuum cycle. In addition, a biological indicator ampule (10x6) in a bag every week, a steam integrator strip in every bag and a Bowie-Dick pack in a bag every two weeks. If all tests are negative, the biological waste bags shall be placed in a municipal waste bag and put out for ES to remove with the rest of the municipal waste.

EMERGENCY PROCEDURES

The following procedures should be followed when addressing different types of emergencies:

Sickness

1. If someone becomes ill students should inform their instructor.
2. The instructor should assess the person's condition and either make arrangements to have them transported to the University Physician's Group or call dispatch at extension 1111 and report the illness. If the condition appears to be life threatening, share that information to dispatch as well.

Injuries

1. Depending on the severity of the injury the person can be given first aid in the laboratory and then transported to the University Physicians Group for follow up.
2. If the injury is more serious make the individual comfortable, attempt to stop/control any bleeding that may be occurring, and call dispatch at extension 1111. Dispatch will respond and either provide the necessary care themselves or have them transported to a medical facility for treatment.
3. Complete an accident investigation form and forward it to HR.

Fires

1. If the fire is in the incipient stage ask everyone to leave the building and pull the fire alarm on the way out. If you are confident using an extinguisher attempt to put the fire out. ALWAYS keep on the exit side of the fire and DON'T attempt to fight a fire where there is a lot of fumes being given off or you know that the fumes are toxic.
2. If the fire is in the working stage evacuate the building immediately and pull the fire alarm on the way out.



3. When you exit the building report to the assembly area.
4. Complete a report on the fire.

Chemical Spills

1. When a spill occurs students should report the incident to their instructor. Students should not attempt to clean up or contain the spill.
2. Instructors should notify the Chemical Hygiene Officer at 585-7578 immediately.
3. The instructor and the CHO will first determine whether the incident can be safely mitigated in house or whether outside agencies need to be notified.
4. If the spill is to be cleaned up in house the necessary clean up materials need to be moved to the site, proper personal protective equipment needs to be donned.
5. Attempt should first be made to contain the spill. Next the chemical in the spill should be neutralized and finally absorbed.
6. The waste materials should then be placed into a container, label the container "Hazardous Waste", the name of the material and the date. The container should then be moved to the hazardous waste holding area.
7. Complete a report on the incident.
8. Depending on the size of the spill and the nature of the chemical spilled certain government agencies may need to be notified.
9. If outside HAZMAT services are needed call one of the following in the order they are listed:

Environmental Products and Services
717-564-4200

Bishop Associates
Tom Robinson
800-966-0700

HMHTTC Response
800-927-9303

When speaking with one of these organizations give them your name, the organization, location and the nature of the incident.

II. Control Measures

A. Personal Protective Equipment

1. It is the responsibility of the College to require appropriate safety and emergency equipment for employees and students.
2. 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.
3. Additional PPE over and above the standard shall be compatible with the required degree of protection of the substances being handled.
4. Glasses with side shields are not be used where there is a splash potential.



5. Contact lenses are not necessarily prohibited in the laboratory. If contact lenses are permitted, chemical splash goggles must be worn at all times.
6. 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.
7. Standing shields should be used when there is a potential for explosions or implosions.. The standing safety shield should be used with safety goggles and, if appropriate, with a face shield.
8. 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.
9. 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 shall be maintained. The inventory will reflect purchases made, containers removed from inventory and movement of chemicals in and out of the chemicals storage area.
2. Hazard Identification and Labels
 - a. Labels on incoming containers of hazardous chemicals are not to be removed or defaced.
 - b. 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.
 - c. If a chemical has been transferred to a secondary container, the new container should be appropriately labeled.
 - d. Unlabeled bottles should not be opened, and such materials should be disposed of.
3. Signs and Posters
 - a. Emergency telephone numbers (i.e. Campus Security) 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 shall be posted at areas or equipment where special or unusual hazards exist.
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.
 - b. All chemicals must have a MSDS. These forms must be stored in the department in which they are used or in the administrative assistant's office. They must be easily accessible. The College also subscribes to an MSDS on-demand service through 3E Company. Individuals can call 1-800-451-8346 to have an MSDS faxed for specific chemicals. This permits quick access should an emergency situation arise regarding that chemical. You will need the product/chemical name and the manufacturer name to access this system.
5. Records
 - a. Chemical Inventory Records
 - i. An inventory of all chemicals shall be conducted and maintained.
 - ii. The chemical inventory shall reside on the departmental shared file system.
 - b. Inspection Record
 - i. Inspections of the hazardous waste central storage areas (CSA) must occur monthly and be recorded on the checklist in the CSA.



- ii. Safety equipment should be tagged to indicate the date and the inspector. Eyewash stations must be inspected monthly; hoods must be inspected annually.
- iii. Records indicating the dates of repairs and regular maintenance of safety equipment should be maintained.
- c. Training Records: the college should maintain records of employee training, and they should be made available to employees.
- d. Incident Report: incident reports must be completed for any incident. Copies are to be retained by the Human Resource Department.
- 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: The college shall retain records of disposal of hazardous waste.
- g. 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 an MSDS is obtained.

C. Special Hazards

1. Freezers and Refrigerators

- a. All items kept in freezers and refrigerators should be properly labeled.
- b. Each unit should be labeled as to what may (or may not) be placed in the unit.
- c. The faculty member responsible for each unit should ensure that it is properly maintained, including defrosting whenever necessary.
- d. Key storage freezers and refrigerators should be clearly identified and powered by a back-up generator in case of electrical power failure.

2. Transporting Chemicals

- a. Persons should have the proper PPE when transporting chemicals.
- b. Rubber carriers should be used for transporting smaller quantities kept in glass bottles.
- c. For larger containers, or several items that cannot safely fit into rubber container, the carts with elevated side panels should be used. Acids and bases should not be transported together.

3. Hot Plates & Heating Mantles

- a. Reactions and solutions requiring heating should adhere to the following advisements:
 - i. Faculty and students should be aware of various solvents reaching their flash point while being heated
 - ii. Caution should be used when using heating plates that are not explosion/fire proof.
 - iii. When heating solutions/reaction mixtures, appropriate stirring devices should be used to avoid superheating of the contents.

4. Needles & Syringes

- a. Syringes and needles should not be stored out in the open. They should be placed in a locked drawer when not being immediately used.
- b. For schlenk lines bearing needles at the ends (via a luer lock attachment), they should be capped to prevent accidental needle sticks.
- c. Proper disposal of needles, includes disposable needles and non-disposable needles that have expired, requires they be placed in a sharps container for subsequent transfer to a sharps container in the hazardous waste holding area.
- d. Especially while using glass syringes, students must be reminded they must keep their safety glasses on at all times.

III. SAFETY / EMERGENCY FACILITIES AND EQUIPMENT



A. Equipment

1. The college should ensure that adequate emergency equipment is available in the laboratory and inspected regularly to ensure that it is functioning properly. All employees should be properly trained in the use of each item.
2. Emergency equipment items that should be available include: eyewash station, fire extinguishers, safety shower, telephones for emergencies, fire blanket, and identification signs.
3. Each laboratory should have a standard first aid kit appropriately stocked.
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)
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)
7. Eye wash stations and safety shower stations shall be located so they will be accessible within 10 seconds. (ANSI Z358.1-1998)
8. Safety equipment will be tagged, showing the inspection date and inspector.
9. Buildings 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. Each storeroom shall be equipped with a heat sensor, smoke alarm, fire extinguisher, safety shower, eye wash, fire blanket, and first aid kit.

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.
 - 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, the laboratory activities should be conducted in the fume hood.
 - d. In most cases, the recommended face velocity is between 80 and 120 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 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. All BSCs and fume hoods shall be inspected annually by the Chemical Hygiene Officer. 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.
 - h. Hoods should not be cluttered so as to maintain maximum flow across the surface of the hood.



- i. When a reaction is to be run in a hood overnight (or over the weekend), the reaction must be clearly labeled as to the reaction that is being performed and who should be contacted in case of an emergency regarding the reaction. A sign with this information should be posted on the hood.
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. Laboratory airflow should not be turbulent and should flow continuously throughout the laboratory.
 - 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.
3. Flammable Liquid Storage and Handling
 - a. To the extent possible flammable liquids should be stored in approved flammable liquid cabinets. When flammables are removed from the cabinet they should be replaced when they are no longer needed.
 - b. 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.
4. Electrical
 - c. All electrical outlets should have a grounding connection accommodating a three-prong plug.
 - d. Employees should know how to cut-off electricity to the laboratory in case of emergency.
 - e. If electrical equipment shows evidence of undue heating, it should be immediately unplugged.
 - f. Ground-fault circuit interrupters (GFCIs) should be installed as required by code to protect users from electrical shock, particularly if an electrical device is hand held during a laboratory operation.

IV. Training and Information

The following training will be provided annually. Additional training will be provided on a need to basis.

- A. Students – All students will receive training in those general topics that exist in all laboratory environments (for example: the use of extinguishers, eyewash stations/showers, msds's, etc.). The faculty will provide that information at the beginning of the semester. Additionally the faculty will provide appropriate risk and environmental information relevant to the work about to be done. This information can also be found in the faculty's course hand book in the front of each section. And finally the faculty will highlight the Chemical Hygiene Plan with the students and indicate to them where the CHP will be located.
- B. Research Assistants – In the fall of each year before school begins all research assistants will receive training in at least the following topics: Fire Extinguishers, Emergency Eyewash/Showers, Hazard Communications, Bloodborne Pathogens, Emergencies, Compressed Gas Cylinders, Chemical Inventory, 3E, Waste Streams, Personal Protective Equipment (PPE), Electrical Safety, Environmental Issues (EPA Results), Chemical Hygiene Plan (Overview). The Chemical Hygiene Officer will provide this instruction.
- C. Faculty – Each summer the faculty will receive, at a minimum, training in OSHA 1910:120 First Responder Operations Level. This will include a review of the standard itself, a familiarization of the materials to be used in an emergency response, and a review of the personal protective equipment available to them. Also included will be a review of the chemical hygiene plan. Other related or appropriate topics may also be included.
- D. Information
 1. Employees shall be informed of the content of the "Laboratory Standard", 29 CFR Part 1910.1450.
 2. Employees shall be informed of the location and availability of the chemical hygiene plan.
 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.



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.
5. Employees shall be informed of the location of material safety data sheets.
6. Employees shall be informed of the location of personal protective equipment and of emergency equipment as outlined in the chemical hygiene plan

V. Environmental Surveillance, Medical Consultations and Examinations

ENVIRONMENTAL SURVEILLANCE

1. For substances regulated by OSHA, NIOSH, ACGIH or other creditable agencies necessary testing will be conducted to insure that permissible exposures are not exceeded.
2. This testing will be initiated when there is reason to believe that exposures are at or exceeding the action levels or in the absence of an action level the permissible exposure levels (PEL).
3. If elevated exposures persist then engineering or administrative controls or a respirator protection program will be applied to lower the exposures.

EMPLOYEE/STUDENT NOTIFICATION OF TESTING RESULTS

1. Employee's/Student's will be notified of the testing results within 15 days after the receipt of the results.

MEDICAL CONSULTATION AND EXAMINATIONS

Medical examinations/consultations will be provided to employees/students under the following circumstances:

1. When there are signs or symptoms associated with the chemicals being used in the laboratory.
2. Where the exposures have routinely exceeded the action level or the PEL.
3. Whenever there is an event that takes place in the laboratory such as a spill, leak, explosion or other occurrences which would likely cause hazardous exposures.
4. Physicians will be given at least the hazardous chemical involved, the exposure levels and the signs and symptoms experienced.
5. The College will request from the physician a written opinion that will include at least the following: recommendations for further follow up, results of the examination and any testing conducted, any condition that may exist that may place the employee/student at an increased risk in the laboratory environment, a statement that the physician has provided to the employee/student the results of the examination or consultation.

VI. Responsibilities

A. Chemical Hygiene Officer

1. Develop, implement, update and maintain the chemical hygiene plan, including training, reporting, and other functions.
2. Assure that inspections in the laboratory are performed when appropriate and that records of inspections are maintained. This includes reports of accidents, fires, spills and other incidents. Also results of fire extinguisher, eyewash/shower stations, laboratory hoods and biological safety cabinets. And finally it also includes inspection of laboratories.



3. Monitor the procurement, use, and disposal of chemicals used in the College's laboratory programs.
4. Assist in the decision making regarding requests to use chemicals identified as explosive, carcinogenic, mutagenic, highly toxic, or other highly hazardous substances.
5. Determine the need for personal protective equipment beyond that specified for general laboratory use.
6. Implement appropriate training with regard to chemical hygiene for all employees whose normal work locations include laboratory areas.
7. Ensure that employees/students have received appropriate training.

B. Department Chair

1. The Department Chair is responsible for chemical hygiene programs within their department. The Department Chair shall monitor compliance with the chemical hygiene plan.

C. Employees who work in laboratories

1. Participate in training programs provided by the College
2. Maintain an awareness of health and safety hazards
3. Plan and conduct each operation in accordance with the chemical hygiene plan procedures
4. Consult reference materials, including MSDSs, related to chemical safety where appropriate
5. Use and model good personal chemical hygiene habits
6. Report accidents, injuries, unsafe practices, and unsafe conditions; if a student is injured in class, faculty member must fill out an Incident Report (found online at www.etown.edu/safety) and forward it to Human Resources.
7. Ensure that employees/students have access to the CHP, MSDSs, and other suitable reference materials.

D. Students

1. 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. Students shall come to the laboratory dressed in the appropriate clothing.

VII. 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.
2. PHSs include highly toxic chemicals, reproductive toxins, and select carcinogens. In addition, the College 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.



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.
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.
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.
4. Pyrophoric Materials (Aldrich Technical Bulletin AL-134) – When working with Pyrophoric Materials the following practices should be observed:
 - a. Glassware should be heated in an oven before using to drive off moisture and oxygen. It should be cooled in an inert environment.
 - b. Glass syringes should be used in preference to plastic.
 - c. Needles should be 1' to 2' long and should be at least a 16 gage needle.
 - d. Reagent bottle should be pressurized with 3 – 5# of Nitrogen to assist in moving the syringe back.
 - e. The capacity of the syringe should be twice as much as the sample being drawn.



Evaluation

The Safety Committee shall be responsible for evaluating this policy annually.

Document History

Created: 7/2006; Audited: 7/2007; Revised: 3/2008; Audited: 7/2009

APPENDIX A
Labels for Hazardous Waste

Hazardous Waste
Start accumulation date: _____
Container fill date: _____
Date moved to HW storage area: _____

*For containers that still have original label
(including chemical name & specific hazards)*

Hazardous Waste
Start accumulation date: _____
Container fill date: _____
Date moved to HW storage area: _____
Chemicals in container: _____
Specific Hazards: _____

For chemicals that are no longer in original containers