CHEMICAL HYGIENE PLAN

Chemical Hygiene Officer,
Jamie Herrick
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Westfield State University
Chemical Hygiene Plan

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1. Introduction

A. Purpose

In 1990, the Occupational Safety and Health Administration (OSHA) adopted a health standard, "Occupational Exposure to Hazardous Chemicals in Laboratories," 29 CFR 1910.1450, to protect laboratory workers from chemical hazards in their workplace. This Laboratory Standard requires written health and safety practices and procedures in all laboratories that use hazardous chemicals. This written document is called a Chemical Hygiene Plan (CHP). A Chemical Hygiene Officer (CHO) must be appointed to develop, implement, and maintain the CHP. The Laboratory Standard also requires record keeping, employee information and training, use of personal protective equipment, labeling and hazard identification, exposure monitoring, and medical surveillance.

B. Scope

A hazardous chemical is defined by OSHA as a substance for which there is statistically significant evidence, based on at least one scientific study, showing that acute or chronic harm may result from exposure to that chemical. This definition clearly applies to most of the chemicals typically used in laboratories at Westfield State University. The laboratories covered by the CHP are in the departments of Biology and Chemical and Physical Sciences. Personnel who work regularly within these laboratories must follow the rules of the CHP. In addition, this also includes personnel such as custodial, maintenance and repair personnel who spend a significant amount of their time within a laboratory. The primary emphasis of the CHP is on administrative controls necessary to protect workers from overexposure to hazardous substances in laboratories. Each department can use this CHP as a guide to develop their own specific CHP or safety manual.

2. Responsibilities

The responsibility for chemical safety rests at all levels, from the highest administrative level to the individual laboratory employee. The specific aspects of this responsibility are assigned to those employees best suited to carry them out.

A. The **University President** has the ultimate responsibility for the safety and health of the faculty, staff and students at Westfield State University.

B. The **Dean of the Faculty** has the responsibility to appoint the CHO and ensure that the CHP is written, implemented, and updated.

C. The **Chemical Hygiene Officer** has the direct responsibility to write, implement, and update the CHP. The CHO will provide technical advice with regards to chemical and laboratory safety as well as current legal requirements concerning regulated substances. The CHO will work with departments to develop and implement standard operating procedures (SOPs) for the handling and storage of hazardous materials and hazardous waste. The CHO has the right to identify and minimize dangers to persons working in the laboratories and suspend operations that do not conform to the CHP. He/she will notify the Dean of the Faculty of unresolved chemical safety issues. In addition, the CHO will maintain a master inventory for all chemicals. He/she will maintain inspection, training and medical documentation as well as accidents, spills and emergencies. The CHO also has the responsibility to coordinate the creation and closing of all laboratories.

D. The **Chemical Safety Committee** will be comprised of the CHO, Associate Director of EH&S, a member of University Police, and representatives from each of the following departments: Biology and Chemical and Physical Sciences. The committee has the responsibility, at least annually, to review the CHP and recommend any updates. The CHO will work with the committee members to implement the standard operating procedures. Members also have the responsibility to annually review the safety protocols and accident reports, and to discuss laboratory safety issues with members of their departments.

E. The **Department Chair** is responsible for chemical safety in his/her department and must understand the goals of the CHP. The Department Chair must notify the CHO to ensure the hazardous material and safety training, impending creation or closing of laboratories, personnel, and support routine inspections of all laboratories.

F. **Laboratory Personnel: laboratory instructors** and **laboratory technicians** are responsible for understanding and following the safety training and SOPs. They are directly responsible for the implementation

of the procedures and requirements of the CHP. They must understand the function and proper use of all personal protective equipment (PPE) and wear them in accordance with the standard operating procedures in the lab. They must know where the safety equipment and evacuation routes are for their laboratories and periodically check to be sure the emergency equipment is present, unobstructed and inspected. They must notify the CHO, University Police and the Department Chair of all accidents, reportable spills and unsafe conditions.

G. S**tudents who work in a laboratory** must follow the procedures and guidelines of the CHP. They must understand the function of PPE and wear the appropriate equipment in the laboratory. Knowledge of the evacuation routes and location of safety equipment is required. They must notify a laboratory employee who will then notify the CHO, University Police, and the Department Chair of accidents, reportable spills and unsafe conditions. Students must be trained and advised of the specific requirements within their department.

H. **Maintainers, Repair Personnel, University Police Officers, and Outside Contractors** must follow the general laboratory safety rules and regulations.

I. **Visitors** are not allowed in laboratories without a Westfield State University employee escort**.** No children are allowed in the laboratories unless they are participants in one of the University's programs or functions. Pets are not allowed in the laboratories.

3. General Principles

A. Minimize routine exposure

It is important to minimize all chemical exposures. Few laboratory chemicals are without hazards, therefore general procedures for handling all laboratory chemicals must be followed. Exposure should be minimized; even for substances of no known significant hazard. For work with substances that present special hazards, additional precautions must be taken. PPE must be used in accordance with standard operating procedures. All protective equipment must be inspected before using. There must be no eating, drinking or smoking in any laboratory. Inhalation of chemicals and direct skin contact with chemicals should be avoided. Use of hoods or other ventilation devices is recommended to prevent the release of airborne substances. **If in doubt about any operation, chemical use, or safety issue, ask before proceeding.**

B. Avoid Underestimation of Risk

Most chemicals in a laboratory can present a hazard if used or stored improperly. Chemicals purchased by manufactures will have the appropriate warnings on the labels and Safety Data Sheets (SDSs). However, new and untested chemicals may be used or produced in the laboratory in which the hazards are unknown. It is important to treat these substances as potentially toxic. In addition, many mixtures are used or formed in the laboratory. All mixtures should be treated as though they are as toxic as their most toxic component.

C. Provide Adequate Ventilation

The best way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by using fume hoods, biosafety cabinets, and other ventilation devices. The Permissible Exposure Limits (PELs) of OSHA and the current Threshold Limit Values (TLVs) of the American Conference of Governmental Industrial Hygienists must not be exceeded. Refer to specific SDSs for these values.

D. Chemical Hygiene Program

A Chemical Hygiene Plan must be written and maintained by the University. There must be at least yearly reviews of the CHP and adjustments made when necessary. All laboratory personnel working in both the teaching and research laboratories must follow the rules of the CHP.

4. Components of the Chemical Hygiene Plan

A. Basic Rules and Procedures

The following are general safety and health rules that must be followed for essentially all laboratory work with hazardous chemicals. It is required that laboratory personnel review and comply with these basic safety rules. Laboratory personnel may need to modify these rules to provide additional protection from chemical and physical hazards associated with the specific operation being conducted.

B. Personal apparel

Shoes must be worn at all times: no sandals, perforated or open-toed shoes. The specific type of shoes, length of shorts, skirts, dresses or sleeves is determined by faculty and technicians. Short dresses, skirts, shorts, and tank tops, or clothing that leave the mid-section and chest area exposed should be discouraged. For those who work with highly hazardous materials or processes, stricter personal apparel regulations, such as requiring clothes that fully cover legs and upper body or use of laboratory coats with long sleeves, must be determined and enforced. Loose clothing is also a hazard and should be avoided. Long hair should be tied back to reduce the risk of catching on fire or becoming contaminated with chemicals

C. Preventing chemical exposure

It is important to develop and encourage safe habits in the laboratory. Exposure to chemicals by inhalation, absorption through skin or ingestion should always be avoided. Chemicals must not be smelled or tasted. Eating, drinking, chewing gum, or application of cosmetics is prohibited in laboratories. Hands should be washed thoroughly after handling any chemical; especially before eating or drinking. Storage or consumption of food or drinks in the laboratory is prohibited. Refrigerators used for chemical storage must be labeled. Mouth suction for pipeting or starting a siphon is prohibited. Proper gloves and goggles must be worn. A visual inspection of gloves should be done before use. Fume hoods and other ventilation devices should be used as much as possible and when required as a result of the hazards associated with the chemicals.

D. Housekeeping

Safety equipment must never be blocked and exits must be kept clear. Aisles, walkways, hallways, and exits must be free of chemical containers, obstructions, and tripping hazards. Spills must be cleaned up and disposed of in the proper manner and place (section 10 of CHP). Contaminated or dirty glassware should not be left in the work area. Glass must be discarded in the "Glass Only" containers. The laboratory hoods should not be used for chemical storage except as required and or noted by the CHO. Chemicals should be returned to their proper location after use.

E. Choice of chemicals

Only chemicals for which there are controls available to minimize exposure should be used. Whenever possible, less hazardous chemicals should be substituted for highly hazardous chemicals. The smallest possible quantities of chemicals possible for an experiment or technique should be used. The practice of searching for existing inventories and use of chemicals in stock before purchasing new chemicals should be followed. The following link from MIT can be used to investigate other suggestions concerning chemical choices: http://web.mit.edu/environment/reduce/env_living.html. Laboratory personnel using or storing highly hazardous materials must notify the CHO who in turn will notify EH&S and University Police. Refer to Appendix E for list of highly hazardous chemicals.

Particularly hazardous substances (PHS) are those chemicals with special acute or chronic toxicity. The OSHA Laboratory Standard defines a PHS as being a select carcinogen, reproductive toxin, or having a high degree of acute toxicity. In the Laboratory Standard, OSHA does not provide a list of PHSs because new chemicals are continually being developed and tested in laboratories. The OSHA Laboratory Standard requires an SOP for use of chemicals that are PHSs and requires that areas where PHS materials are used be designated with signage.

F. Procedures for Procurement and Distribution of Chemicals

Chemical Management System: Procedures and Protocols document must be followed when purchasing chemicals. It requires all requests to purchase chemicals be approved by the CHO. Preferably, all chemicals should be received in a central location. No container should be accepted without an identifying label. All SDSs that are packaged with chemicals must be forwarded to EH&S. When chemicals are hand carried, the container should be placed in an outside container or bucket. Plastic coated bottles should be purchased if there is a choice. When transporting gas cylinders, an appropriate hand truck should be used. The valve cover cap should remain on until the cylinder is in place.

G. Chemical Storage

Amounts of hazardous chemicals stored should be as small as possible. All containers must be in good condition and properly labeled. Storage on bench tops and in hoods is not advisable. Spill trays, secondary containment, and proper receptacles should be used. Bottles of chemicals greater than 500 mL should not be stored on shelves higher than 6 feet. Flammables must be stored in approved safety cabinets. Caustic or

corrosive chemicals should be stored near the floor and not higher than eye level. Highly reactive or corrosive liquids must be stored in appropriate containers. The date of receipt must be added to each container of peroxide forming chemicals. Peroxide forming chemicals must be disposed of at appropriate time. Exposure to heat or direct sunlight should be avoided. A list of common peroxide forming chemicals can be found in Appendix E. Toxic substances should be segregated in a well-identified area with local exhaust ventilation. Stored chemicals should be examined periodically (at least annually) for replacement, deterioration, and container integrity. Stockrooms should not be used as preparation or repackaging areas. Every chemical should have an identifiable storage place and be returned to that location after use. Chemicals must be stored to ensure the segregation of incompatible chemicals. Common categories for storage are: Toxic, Corrosive, Flammable, Combustible, Irritant, Reactive, and Non-hazardous. Labels must be maintained on all stored materials. Gas cylinders must be fully secured and away from heat sources.

H. Equipment and glassware

Laboratory glassware should be handled and stored with care to avoid damage. Glassware should be inspected for damage prior to each use. Damaged glassware must not be used. It must be disposed of in a designated broken glass container. Extra care should be taken with Dewar flasks and other evacuated glass apparatus. They should be shielded or wrapped to contain chemicals and fragments should an implosion occur. All high vacuum glassware should be taped. Equipment should be used only for its designed purpose. Damaged equipment or electrical equipment with frayed wiring must be discarded or repaired.

I. Unattended operations

The name for the responsible person should be placed near the equipment. Containment for toxic substances in the event of failure of a utility service (such as cooling water) to an unattended operation is necessary. Whenever possible, automatic shutoff devices on long term or unattended operations should be used (water, over-temperature, etc.).

J. Working alone

Faculty and technicians should avoid working alone when working on procedures involving particularly hazardous substances and procedures. They should notify a department member or University Police if they choose to work alone with particularly hazardous chemicals or procedures in the laboratory after normal working hours. Approved Independent Research students may work alone during the day if they have completed the laboratory safety training and have been approved after submitting the Research Working Alone documents in Appendix K .

K. Personal Protection Equipment

1. Eye protection

Appropriate eye protection must be worn in areas where chemicals are stored or handled. Safety goggles must be worn when handling potentially hazardous chemicals or working with processes that may endanger the eyes. All safety glasses should comply with the Standard for Occupational and Educational Eye and Face Protection (Z87.1) established by the American National Standards Institute. Safety glasses with side shields may not be appropriate protection with some chemicals. Goggles give protection from chemical splashes. Face shields should be worn when maximum protection is needed. Specialized goggles or masks should be used to protect against laser hazards and ultraviolet light sources. Contact lens use is allowed in the laboratory.

2. Gloves

Appropriate gloves must be worn when the potential for contact with toxic materials exists. Different gloves provide protection from certain chemicals. Refer to the information in Appendix F on the resistance to chemicals of common glove materials. No latex gloves should be used when handling chemicals. Gloves should be inspected before each use and replaced periodically. Disposable gloves must be discarded immediately following overt contamination with highly toxic materials (pages 108-117). Gloves should be removed before handling objects such as doorknobs, computer keyboards, telephone, etc.

3. Respirators

Laboratory fume hoods and other devices are the preferred method of control. If the engineering controls are not sufficient to provide adequate protection, testing and subsequent evaluations will be done to determine how best to correct the situation. The solutions could involve new engineering controls, a re-design of the existing system, use of less hazardous materials, change in procedure, use of respirators, or cessation of process.

If this involves the use of respirators, laboratory personnel must first undergo fit testing, medical approval, and training.

L. Protective Equipment

1. Fume Hood

A fume hood should be used when handling toxic chemicals that could result in the release of toxic chemical vapors, fumes or dust. When working with particularly hazardous materials (Appendix B and E), a fume hood must be used. Adequate hood performance should be tested before use to see if it is functioning properly. A piece of tissue paper or other thin paper can be held at or near the surface of the hood. When the hood is working properly the paper should be drawn into the hood. The hood sash should be lowered to the height (or lower) recommended by the inspectors. If the inspection sticker is more than one year old, do not use the hood. Contact EH&S for repair or inspection when necessary. Materials stored in hoods should be kept to a minimum and not allowed to block vents or airflow located in the rear of the hood. The chemicals should be kept at least six inches behind the plane of the sash. No one should put their head inside an operating hood to check an experiment. Large pieces of equipment should not be placed inside the fume hood as this can change the airflow patterns and make the hood unsafe. A hood with an automatic night or timed setback should not be used when conducting long-term procedures with acutely toxic materials. EH&S must approve any alteration of the ventilation system.

2. Fire Extinguishers, Safety Showers, Eyewash Facilities

Everyone working in a laboratory should know the location of the fire extinguishers, safety showers, and eyewash stations before they begin work. All safety equipment must be accessible to everyone who works in the laboratory, and the areas must be obstacle free. Contact EH&S for repair or inspection when necessary. Laboratory personnel are discouraged from extinguishing fires that occur in their work areas. **Do not use a fire extinguisher unless trained.** If a fire extinguisher is used, the CHO must be informed.

M. Labeling and Identification

Laboratory personnel must ensure that labels on containers of hazardous chemicals are not removed or displaced. Chemicals transferred from stock bottles to other secondary containers must be labeled with the identity of the chemical immediately and must include the hazard notices such as “toxic” or “flammable.” Labeling must be consistent with the primary container. All bottles of chemicals and waste must be labeled with the name of the chemical; not the symbol. Special signs should be placed in the work areas where the hazard indicated is present: Acid/Caustic, Corrosive, Flammable, Combustible, Carcinogen, and Chemical Storage Area. Prominent signs and labels of the following types should be posted: Emergency telephone numbers for University Police and Health Services, as well as location signs for safety showers, eyewash stations, fire extinguishers, and exits. There should be warning signs at areas or equipment where special or unusual hazards exist.

N. Chemical Inventory

A chemical inventory must exist for each laboratory and stockroom. The University uses a web-based chemical inventory program to maintain an accurate account of the inventory. Chemical containers are barcoded after arrival on campus. The inventory consists of the name of the location (building name and room number), the person’s name in charge of the room, the name of the hazardous material, the approximate amount stored or purchased, and the name of manufacturer. The CHO and laboratory technicians will be responsible for entering the data into the inventory program and removing them when empty or discarded as hazardous waste. New SOPs must be written to reflect current chemical use and storage.

O. Fire, Accident, and Spill Reporting

When a fire occurs, the nearest fire alarm must be pulled and everyone must exit the building. Laboratory personnel should not attempt to put out the fire. When a major accident or spill occurs University Police must be notified (**x911**). For more detailed information, refer to Emergency/Contingency Planning (section 10).

P. Prior Approval

The CHO can assist in identifying situations when there should be prior approval. General guidelines and recommendations for safe handling, and information about working with select carcinogens, highly acute toxins, oxidizers, and other high hazard chemicals can be obtained from the CHO.

Q. Procedures for Work with Particularly Hazardous Substances

A particularly hazardous substance is one that belongs to one or more of the following categories: select carcinogens (regulated by OSHA, listed by National Toxicology Program, and listed under Group 1 of International Agency for Research on Cancer), human teratogens and reproductive toxins, severe corrosives, explosives, pyrophorics, strong oxidizers, and sensitizers. Special rules must be followed when working with these chemicals. Hands and arms must be washed before leaving the area. University Police, **911 or 413/572-5262,** must be contacted if there is a spill. The area must be evacuated. The containers of chemicals must be stored only in chemically resistant secondary containment trays with all the appropriate labels. Appendix B and D contains individual SOPs for Particularly Hazardous Chemicals.

R. Outreach Program

Only students working through a University sponsored program are permitted to conduct demonstrations or hands-on experiments that use chemicals. The students handling the chemicals must have completed the University's chemical safety training requirements. In addition, prior to the event, the students must inform the program's faculty advisor of the demonstrations and experiments they intend to perform as well as a list of the chemicals they will be using. The advisor will discuss how to conduct the demonstrations and experiments in a safe manner, as well as the potential hazards associated with the chemicals or procedure. The faculty advisor makes the final decision as to which activities can be done and which chemicals can be used. Also, when hazardous materials are used at any event, the advisor or another qualified employee must be present.

No student will transport any flammable, water reactive, or cryogenic materials in a private or University owned vehicle. Only household or over-the-counter types of chemicals can be transported in a vehicle on or off campus by a student. Prior approval for vehicle transport must be obtained from the CHO.

At the event, the students must give the participants a brief overview of the safety precautions necessary to handle the chemicals and assume responsibility for ensuring the proper use of personal protective equipment. The safety data sheets (SDS) must be copied in advance and present at the function. Finally, the handling of any hazardous waste and spent chemicals must be discussed in advance with the faculty advisor and carried out properly by the appropriate person.

5. Training and Information Program

A. Information

Laboratory personnel and students must be provided with information about the hazards of chemicals present in their work area. This information must be provided at the time of a laboratory employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. They must be made aware of the CHP, told of its location and availability. In addition, the location and availability of reference material on the hazards, safe handling, storage and disposal of hazardous chemicals must be discussed.

B. Training

Laboratory personnel must be trained on the applicable details of the CHP. They must attend a Laboratory Safety training session given by the CHO at the time of initial employment. Yearly re-training can be done by successfully completing an on-line test or attending the CHO presentation.

The training must include methods and observations that may be used to detect the presence or release of a hazardous chemical (continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.), the physical and health hazards of chemicals in the work area, and the measures personnel can take to protect themselves from these hazards. Also, engineering controls, appropriate work practices, emergency procedures, and PPE must be discussed. The location and types of reference materials related to laboratory safety (such as SDSs, safety manuals, PEL for OSHA regulated substances, etc.) must be included.

Custodians and repair personnel, who occasionally clean or do repair work in a laboratory, may receive training by the CHO. University Police Officers who are responsible for patrolling laboratories may also receive this training. The training must consist of methods of observation that may be used to detect the presence or release of a hazardous chemical as well as proper safety protocols for reporting an accident or spill.

Laboratory Safety training for new research students must be conducted annually and before laboratory work is started. The training must include the location of safety equipment, rules about working alone, proper personal protection equipment, emergency procedures, and the individual hazards associated with the laboratories. Yearly re-training can be done by successfully completing an on-line test or attending the CHO presentation.

C. Training Records

The CHO must maintain records of all laboratory training. Faculty, if they opt to conduct their own training, must keep records including sample agendas, sign-in sheets, and name of person conducting the training.

6. Hazardous Waste

A. Small Quantity Generator

Westfield State University is a Small Quantity Generator (SQG). This means that no more than one thousand pounds of hazardous waste and less than 2.2 pounds of acutely hazardous waste (http://web.princeton.edu/sites/ehs/chemwaste/spec_list.htm#plist) are generated each month. The goal of the waste disposal program is to dispose of laboratory chemical waste in a manner that will prevent harm to people and the environment.

B. Locations

Within each laboratory where waste is generated there must be a specific place where waste is temporarily stored. This is called the Satellite Accumulation Area (SAA). There must be a sign identifying the area as a SAA. The waste container should be as close as possible to the area of waste generation. This space can be part of a hood area. The waste containers must be kept in a secondary container at all times. When the waste container is full it must be dated and removed within three days to the Main Accumulation Area (MAA). Do not date the bottle until it is full. The MAA is the place where the waste should be collected and stored until its final removal from the University. In the MAA, waste can be stored for up to six months before removal.

C. Labels

All waste containers must have a label that clearly defines the container as Hazardous Waste. The names of all the chemicals must be written on the label. The full chemical name(s) must be written on the label; not symbols or shorthand notations. The particular hazards of the chemicals must be checked on the label. Labels are available from EH&S.

D. Chemical Waste Consultant

All hazardous chemical waste generated in the laboratories must be collected for characterization and disposal. A chemical waste firm that specializes in hazardous waste management periodically inspects and picks up the waste stored in the SAA and MAA. Contact the CHO or EH&S if there are concerns about hazardous waste inspections or disposal.

E. Disposal of Hazardous Chemicals

Hazardous chemical waste should be separated, to the extent possible, according to classes and potential hazards. Disposal by pouring hazardous waste chemicals down the drain is unacceptable. Hoods must not be used as a means of disposal for volatile chemicals. Caps should remain on the waste bottles unless waste is being added to the bottle. Only one container at a time may be used to collect one waste stream (one type of waste). If a bottle is filled prior to the pickup time, the bottle must be dated, and sent to the MAA within three days. The waste bottles must be placed in secondary containment.

F. Disposal of Non-Hazardous Chemicals and Materials

Gloves, paper towels, chromatographic adsorbent, glassware, filter papers, and filter aids can be placed in the trash if they are not contaminated with hazardous material. They should be cleaned or rinsed before disposal. The resulting liquid should be placed in a hazardous waste container. Refer to Appendix I for the list of solid chemicals which are not considered hazardous and are therefore suitable for disposal with regular trash. It is impossible for custodians to distinguish between hazardous and non-hazardous wastes. Therefore, the packaging of non-hazardous solid waste for disposal must be secure and labeled with the name of the waste material. Plastic bags are an acceptable form of containment.

G. Hazardous Waste Training

Hazardous waste training is covered in the laboratory safety training and is required for all personnel who handle and generate hazardous waste. Yearly re-training can be done by successfully completing an on-line test or attending the CHO presentation.

7. Inspections

A. Purpose

In order to ensure that a laboratory's overall safety is being maintained, inspections must be performed. Routine inspections must be done by faculty and laboratory technicians to ensure their laboratory areas are compliant with the CHP. Official inspections by the CHO must be conducted at least yearly and may be unannounced. These shall consist of maintenance checks of safety related equipment, general safety practices, and housekeeping. The CHO may conduct announced or unannounced spot checks on a routine or sporadic basis. These inspections will consist of proper PPE and personal apparel, ventilation equipment use, hazardous waste container use and labeling, and proper container labeling. Also, verification of no food or drinks in the laboratories and walkways, safety equipment and exits are clear. Following a spot check, the observed faculty or staff member will receive an email from the CHO within 3-5 business days. If the CHO notes any safety concerns, the CHO will arrange for a meeting to discuss the proper lab safety measures. The CHO will conduct a second unannounced inspection during the semester. If the CHO notes the same lab safety concern during the second inspection, the CHO will provide the appropriate training and will conduct a third unannounced inspection during the semester. If the CHO notes the same issue after training, the department chair will be notified. The department chair can access the situation further and provide mentorship. If the situation is not resolved, the department chair will meet with College Dean to determine the next steps.

B. Safety Equipment

1. Chemical Fume Hoods

Hoods should be checked before beginning any operation. If not working properly, EH&S must be contacted. No work should be done in the hood until the problem has been resolved. A visual inspection of the hood should include checking the exhaust slot at the back of the hood. It should be clear and in the proper position (usually one to four inches). Also, the sash should be positioned at the proper height. The yearly inspection sticker on the side of the hood will mark the maximum height for the sash for safe operation. Annual inspections must be completed on all hoods. The inspections will be coordinated by EH&S. Copies of the inspections must be maintained by EH&S.

2. Safety Showers

Safety showers must be tested annually. EH&S will coordinate the inspections. Copies of the inspections must be maintained by EH&S.

3. Eyewash stations

Eye wash stations should be flushed on a regular basis by the laboratory personnel to ensure proper operation. If not working properly, EH&S must be contacted.

C. Laboratory Inspections

Annual inspections of each lab will be completed by the CHO. The focus should be on general safety rules. Safety equipment must never be blocked, and aisles must be free of chemical containers, obstructions, and tripping hazards. There must be proper storage of chemicals and hazardous waste. The general lab area should be free of dirty glassware and unused lab equipment. Copies of the inspections must be maintained by the CHO.

8. Medical Program

A. Personnel Rights

All personnel who work with hazardous chemicals must have an opportunity to receive medical attention if they develop signs or symptoms associated with a hazardous chemical. Medical attention is also encouraged whenever exposure monitoring reveals an exposure level routinely above the action level or PEL and whenever there is a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure. Health Services must be contacted. All medical examinations and consultations must be performed

by, or under the direct supervision of, a licensed physician. This must be provided without cost to the employee, without loss of pay, and at a reasonable time and place. The physician should be told the identity of the hazardous chemical(s) to which the employee may have been exposed, if known, a description of the conditions under which the exposure occurred, if available, and a description of the signs and symptoms that the employee is experiencing, if any. Human Resources must obtain a written statement from the examining physician concerning any work-related restrictions or situations that could put the employee at an increased risk as a result of the safety incident. Finally, Human Resources must be provided a statement from the physician that the employee has been informed of the results of the medical examination and any medical condition that may require further examination or treatment.

When exposure monitoring is performed, Human Resources must notify the employee of the results individually in writing or by posting in an appropriate location that is accessible to personnel. This notification must be done within fifteen working days after receipt of the monitoring results.

B. Record Keeping

Records must be kept by Human Resources for the following medically related information: employee exposure complaints, and suspected exposures, air concentration monitoring results, exposure assessments, medical consultations and examinations. The records must be maintained for at least the duration of employment plus thirty years and made available to personnel upon request.

9. Record Keeping

A. Safety Data Sheets (SDS)

The original SDSs must be inspected and filed. If SDSs are shipped with any chemicals, they must be forwarded to EH&S.

B. Inventories

The chemical inventories must be maintained by the CHO by the use of the chemical inventory program.

C. Accidents/Spills

It is the responsibility of the CHO, laboratory technician and/or faculty to record the information about accidents and spills. The EH&S office must be made aware of the spills. The CHO and department chairs must maintain the accident/spill reports.

D. Inspections

The results of inspections of each laboratory and equipment must be maintained by the CHO. The date and name of the person who conducted the inspection must be listed.

E. Training

Records of Laboratory Safety training must be maintained by the CHO. They must include the date, names of individuals, type of training, and name of person responsible for the training.

F. Medical Records

All medical records of personnel who have needed medical attention as result of exposure to a hazardous substance at Westfield State University must be maintained by Health Services and the EH&S. These records must be maintained for the duration of employment plus thirty years. The measurements used to monitor personnel exposures must be kept for 30 years.

10. INCIDENT PROCEDURES

All major accidents, fires, explosions, and spills must be reported to University Police, **x911**.

Hazardous Material Spills

If a spilled material is highly toxic or hazardous, or if there is a spill that results in injury, the Department Chair and EH&S must be sent a report regardless of the amount.

All spills should be considered hazards and therefore must be cleaned up promptly regardless of whether the substance is hazardous or harmless. Different materials require different clean-up equipment. For example, a corrosive liquid clean-up is different from the clean-up of a spill from a flammable liquid. The CHO can provide technical advice but is not responsible for spill clean-up. Refer to the specific SDS for more details.

A. Major Hazardous Chemical Spill

A major spill is defined as a spill of material that poses a significant threat to an employee's safety or the environment. Generally, it involves a large quantity of a moderately hazardous substance, or any amount of highly toxic or particularly hazardous material, or any material that may present a fire hazard, or if the material can not be recovered before being released to the environment. If the spill occurs in the hallway it is considered a major spill. No attempt should be made to clean up a major spill. Everyone in the immediate area must be notified, the area evacuated, and University Police contacted, **x911**. A meeting place must be determined at the time of the call so the caller can give details to University Police Officer(s). They will contact the Fire Department. In addition, Westfield State University has a contract with an outside company responsible for the clean-up of major spills of hazardous materials and waste. A report must be sent to EH&S.

B. Minor Hazardous Chemical Spill

A minor spill is defined as a spill of material that does not pose an immediate significant threat to an employee's safety or the environment. If the spilled chemical is not a highly toxic material, is not spilled in large quantity, does not pose a significant fire hazard, and can be recovered before released to the environment it can be cleaned by laboratory personnel. University Police, **x911**, can be called to request professional assistance. University Police will contact the appropriate person(s) from the Emergency Contact List. Maintainers are not permitted to clean up hazardous materials from a spill. See minor spill clean-up procedures in section below.

Minor Hazardous Chemical Spill Clean-up

1. Spill clean-up with no injury (during normal working hours)

If no one has been contaminated by the spill and the spill is localized, everyone should be told to evacuate the room, the laboratory employee responsible for the laboratory should be notified, and others kept out of the laboratory. The laboratory employee will determine if they can clean the spill or contact University Police to request professional assistance. Appropriate PPE must be worn. After the spill is cleaned, the clean-up items and PPE must be disposed of in the SAA.

2. Spill clean-up with injury (during normal working hours)

If any person has been contaminated by the spill, especially the eyes and skin, the person should be taken to an eyewash or shower, and University Police, **x911,** should be contacted**.** University Police will notify Health Services and transport the injured person if necessary. The laboratory employee responsible for the laboratory should be notified, and others kept out. Laboratory personnel can determine who will clean the spill or contact University Police to request professional assistance. Appropriate PPE must be worn. After the spill is cleaned, the clean-up items and PPE must be disposed of in the SAA.

3. Spill clean-up after normal working hours

If the spill occurs after normal working hours when no laboratory personnel are available, the call must immediately be made to University Police. A meeting place must be determined at the time of the call so the caller can give details to University Police Officer(s).

4. Clean-up equipment

Each department should have a Group Spill Kit tailored to deal with the potential hazards of the materials being used in the labs. Gloves and goggles must be worn during any clean-up. The used clean up items and PPE must be placed into a labeled hazardous waste container in the SAA.

5. Common spill clean-ups

a**.** Materials of low flammability or which have low toxicity (sulfuric, nitric, and hydrochloric acid, sodium and potassium hydroxide) can absorbed with Spill Control Pillows. Appropriate PPE must be worn. The clean-up items and PPE must be placed in a labeled hazardous waste container in the SAA.

b**.** Flammable solvents (petroleum ether, hexane, pentane, diethyl ether, and tetrahydrofuran) can be absorbed with Spill Control Pillows. All laboratory occupants should be immediately notified, all flames extinguished, and any spark producing equipment should be turned off if possible. Appropriate PPE must be worn. The clean-up items and PPE must be placed in a labeled hazardous waste container in the SAA.

c. Broken glass should be picked up with tongs, dust pan, or some other mechanical device. It should then be placed in a designated broken glass container.

C. Accidents

1. Eye Contact

The eyes must be flushed with water for at least 15 minutes. Both hands should be used to hold the eyelids open so that the entire surface of the eye is rinsed. This should be done at an eyewash station. Medical attention should be sought if necessary. The SDS should be read to determine if there is the possibility of any delayed effects.

2. Inhalation or Ingestion

Medical attention should be sought immediately. University Police, **x911**, must be contacted for transportation to Health Services.

3. Skin Contact

For spills covering small amounts of skin, the affected area should be flushed with water for at least 15 minutes. Jewelry should be removed to aid in the removal of residual materials. If there is no visible burn after the 15 minutes, the area should be washed with warm water and soap. Check the SDS to see if any delayed effects should be expected. It is advisable to seek medical attention for even minor chemical burns. For spills on clothes, no attempt should be made to wipe the clothes. They should be quickly removed while using the safety shower. Seek medical attention after 15 minutes under the shower.

D. Fires and Explosions

If a fire breaks out, everyone in the laboratory should be alerted. If a person's clothing or hair catches on fire, immediately attempt to get the person to stop, drop, and roll. University Police, **x911,** must be notified.

A fire contained in a small container can often be suffocated by covering the container with a nonflammable material or item. If the fire can't be controlled by suffocation or there is any doubt whether the fire can be controlled, the nearest emergency alarm should be pulled. No untrained laboratory personnel or students should use fire extinguishers. The building must be evacuated, and once in a safe location, University Police must be contacted. A meeting place must be determined and the person(s) must wait for a University Police Officer to arrive so the situation can be described to them.

In the event of an explosion, the nearest emergency alarm should be pulled and the building evacuated. Once in a safe location, University Police must be contacted. A meeting place must be determined and the person(s) must wait for a University Police Officer to arrive so the situation can be described to them.

11. Chemical Stockrooms

A. General Requirements

Stockrooms are areas in which large quantities of chemicals are stored for laboratory use. Chemicals must be stored according to hazard (carcinogenic, toxic, irritant, flammable, corrosive, non-hazardous, etc). Access must be limited to authorized personnel. Stockrooms must be locked and secured when laboratory personnel are not present. A mechanical exhaust ventilation system must be operational. Emergency equipment must not be obstructed. The exits must be clearly marked and unobstructed. The rooms must be well-lit so that container labels can be easily read.

B. Flammable Liquids Storage Cabinets

Flammable materials must be stored in cabinets that meet OSHA and National Fire Protection Association (NFPA) specifications. Quantities of flammables stored shall not exceed the manufacturer's specification for the cabinet. OSHA and NFPA limit the size of the container for classes of flammable and combustible materials. The more fire-resistant the container the larger it can be. Refer to Appendix G for further information.

C. Flammable and Other Compressed Gases

The names of compressed gases must be prominently posted. Flammable gas cylinders must be stored in a separate area from other types of compressed gases. Cylinders of incompatible gases must be segregated by distance. Flammable, toxic and Oxygen (or any Oxidizer) shall be separated from each other by a distance of at least 20 feet, or by a non-combustible barrier at least 5 feet high having a fire resistance rating of at least one-half hour. Inert gases (Argon, Nitrogen, Helium, Carbon Dioxide), since they are chemically inert and compatible with all other gases, may be used within the separation distance. Cylinders must be grouped by the type of gas (toxic, corrosive, etc.) All compressed gases must be stored away from direct or localized heat in

well-ventilated and dry areas and away from areas where heavy items may strike them. All compressed gases, including empty cylinders, must be secured in an upright position with chains, straps or special stands. The tanks must have the protective cap secured when the tanks are stored or moved. A hand truck must be used when transporting gas cylinders to and from storage areas. Empty cylinders should be separated from nonempty cylinders and labeled as empty. The valves should be closed when not in use. Lecture bottle purchases should be discouraged unless disposal arrangements have been made in advance.

D. Oxidizers and Peroxides

An oxidizer is a chemical which may cause the ignition of combustible substances without the aid of an external source of ignition. Also, when substances are ignited oxidizers increase the rate of burning of the materials. Some common oxidizers are: Nitric acid, sulfuric acid, and perchloric acid. Oxidizers must be stored away from incompatible materials such as**:** flammables and combustible materials, greases, finely divided metals, and organic liquids. Strong oxidizing agents must be stored and used in glass or other inert containers. Corks and rubber stoppers must not be used. High energy oxidizers must be segregated. Peroxides and chemicals that tend to form peroxides must be stored in airtight containers in a dark, cool and dry place. To minimize the rate of decomposition, peroxides and peroxidizable materials should be stored at the lowest possible temperature consistent with their solubility and freezing point. Liquid peroxide or solutions must not be stored at or below the temperature at which the peroxide freezes or precipitates, because peroxides in these forms are extremely sensitive to shock and heat. The date of receipt and date of opening must be added to each container of peroxide forming chemicals. Peroxide forming chemicals must be tested every six months of opening. Once a peroxide concentration is determined, the material will be disposed of as hazardous waste. Ether, dioxane, and tetrahydrofuran are three common peroxide forming chemicals. Refer to specific SDSs and Appendix B for more information.

E. Toxic Chemicals

Extremely toxic substances (Appendix D) must be stored in unbreakable chemically-resistant secondary containers. Adequate ventilation must be provided in storage areas especially for toxic chemicals that have a high vapor pressure. Extremely toxic chemicals must be dispensed in a fume hood and/or in a designated area.

F. Water Reactive Chemicals

Water reactive chemicals should be stored in a cool and dry location. They must be segregated from all other chemicals in the laboratory. The quantities of water sensitive chemicals stored should be minimized. These chemicals should be stored under oil at room temperature. Storage containers should be checked frequently. All water sensitive chemicals should be disposed of whenever they are no longer required for current work.

12. Standard Operating Procedures

A. Definition

Standard Operating Procedures (SOPs) describe a procedure or set of procedures to perform a certain operation. They are intended to provide guidance on how to safely work with chemicals or equipment. The OSHA Laboratory Standard requires that the CHP include specific information to help protect personnel in the laboratory. This is especially important if laboratory operations include the use of select carcinogens, reproductive toxins and substances of acute toxicity.

B. SOPs details

At a minimum, SOPs should include the following information: the name of the chemical or process, and the hazards, special hazards, use of engineering controls (such as fume hoods), required PPE, spill response measures, cleaning and waste disposal procedures. The OSHA Laboratory Standard specifies the requirement for SOPs for work involving hazardous chemicals, but SOPS should also be developed for laboratories with equipment or operations that may cause any physical hazards. SOPs do not need to be too detailed. It is acceptable to point personnel to other sources of information. For example, it is sufficient to direct personnel to the location of the SDS binder for information about a certain chemical's hazards or the Operator's manual for information about a piece of equipment.

APPENDICES

APPENDIX A

COMMON ACRONYMNS

Common Acronyms

CHO	Chemical Hygiene Officer
CHP	Chemical Hygiene Plan
WSU	Westfield State University
EH&S	Environmental Health and Safety
OSHA	Occupational Safety and Health Administration
PEL	Permissible exposure level
PPE	Personal protection equipment
SOP	Standard Operating Procedure
TLV	Threshold limit value
SDS	Safety Data Sheet

APPENDIX B

STANDARD OPERATING PROCEDURES

CHEMICAL TYPE

EXPLOSIVE & SHOCK SENSITIVE CHEMICALS

A. Description

Explosive substances are materials that decompose under conditions of mechanical shock, elevated temperature, or chemical action, with the release of large volumes of gases and heat. Organic peroxides are among the most hazardous substances. All organic peroxides are highly flammable, and most are sensitive to heat, friction, impact, light, as well as strong oxidizing and reducing agents. Some peroxides are *m*-chloroperoxybenzoic acid, benzoyl peroxide, hydrogen peroxide, and *t*-butyl hydroperoxide.

B. Chemical Storage

1. Stored in a cool, dry location.
2. Segregate from other chemicals.
3. Minimize quantities stored.
4. Storage containers should be checked frequently.
5. Should be disposed of whenever no longer required for current work.

C. Personal Protective Equipment

1. **Eye and Face Protection**
   Chemical splash proof goggles must be worn. Or face shield if particularly dangerous.
2. **Gloves**
   Appropriate gloves must be worn.
3. **Protective Clothing**
   a. Foot wear that cover top of feet.
   b. Additional protective clothing maybe necessary - such as long sleeves, lab coats, or aprons.

D. Controls

1. **Fume Hoods and Glove Boxes**
   a. Fume hoods & glove boxes are preferred method of control with sash in lowest possible position.
   b. Safety shielding is required if risk of explosion, splash hazard or a highly exothermic reaction.
   c. Portable blast shields are acceptable.
2. **Eye Wash**
   a. Flush eyes for at least 15 minutes, holding eyes open.
   b. Seek medical attention for further evaluation.
3. **Safety showers/Hand washing sinks**
   a. Rinse for minimum of 15 minutes.
   b. Seek medical attention for further evaluation
4. **Fire extinguishers**
   Personnel should not use the fire extinguishers.

E. Emergency Procedures

1. **Notification**
   a. Refer to the **Incident Response and Reporting Protocol Form**.
   b. First responders are University Police: **413/572-5262 or 911.**
2. **Major Spill, Fire, Explosion, Injury Response**
   a. Alert others. Small spill can be cleaned by lab, studio or theater personnel, if trained Read SDS.
   b. No attempt should be made to clean large spill or put out fire.
   c. Contact University Police 413/572-5262 or 911, for assistance.
   d. Remain on scene, but at safe distance, to help direct and discuss the situation with University Police.

F. Cleaning and Waste Disposal

1. **Cleaning**
   a. Everyone must wash their hands and arms with soap and water.
   b. The work area must be cleaned after use. Disposable paper, gloves, etc. must be plastic bag, labeled, and disposed of in the SAA.
2. **Waste Disposal**

Must be disposed of as hazardous waste.

WATER REACTIVE CHEMICALS

A. Description

Water reactive chemicals react vigorously with water or moist air.
Refer to inventory record for specific chemicals.

B. Chemical Storage

1. Store in a cool, dry location.
2. Segregate from other chemicals.
3. Minimize quantities stored.
4. Store under oil at room temperature.
5. Check storage containers frequently.
6. Dispose of when no longer required for current work.
7. Never return excess chemicals to original container. Small amounts of impurities may be introduced into container which may cause a fire or explosion.

C. Personal Protective Equipment

1. **Eye and Face Protection**
   Chemical splash proof goggles must be worn. Or face shield if particularly dangerous.
2. **Gloves**
   Appropriate gloves must be worn.
3. **Protective Clothing**
   a. Foot wear that cover top of feet.
   b. Additional protective clothing if the possibility of skin contact is high - lab coats, or aprons.

D. Controls

1. **Fume Hoods and Glove Boxes**
   a. Fume hoods & glove boxes are preferred method of control with sash in lowest possible position.
   b. Safety shielding is required if risk of explosion, splash hazard or a highly exothermic reaction.
   c. Portable blast shields are acceptable.
2. **Eye Wash**
   a. Flush eyes for at least 15 minutes, holding eyes open.
   b. Seek medical attention for further evaluation.
3. **Safety Showers/Handwashing Sinks**
   a. Rinse for minimum of 15 minutes.
   b. Seek medical attention for further evaluation.
4. **Fire extinguishers**
   Personnel should not use the fire extinguishers.

E. Emergency Procedures

1. **Notification**
   a. Refer to the **Incident Response and Reporting Protocol Form**.
   b. First responders are University Police: **413/572-5262 or 911.**
2. **Major Spill, Fire, Explosion, Injury Response**
   a) Alert others. Small spill can be cleaned by lab, studio or theater personnel, if trained Read SDS.
   b) No attempt should be made to clean large spill or put out fire.
   c) Contact University Police 413/572-5262 or 911, for assistance.
   d) Remain on scene, but at safe distance, to help direct and discuss the situation with University Police.

F. Cleaning and Waste Disposal

1. **Cleaning**
   a) Everyone must wash their hands and arms with soap and water.
   b) The work area must be cleaned after use. Disposable paper, gloves, etc. must be plastic bag, labeled, and disposed of in the SAA.

2. **Waste Disposal**
   Must be disposed of as hazardous waste.

PYROPHORIC CHEMICALS

A. **Description**

Pyrophoric chemicals are chemicals that will ignite in air (below 130 °F) in the absence of added heat, shock, or friction. Refer to inventory record for specific chemicals.

B. **Chemical Storage**

1. Store under an inert atmosphere or solvent as appropriate.
2. Do not store with flammable materials or in a flammable safety cabinet.
3. Store away from sources of ignition.
4. Minimize quantities stored
5. Never return excess chemicals to original container. Small amounts of impurities may be introduced into container which may cause a fire or explosion.

C. **Personal Protective Equipment**

1. **Eye and Face Protection**
   Chemical splash proof goggles must be worn. Or face shield if particularly dangerous.
2. **Gloves**
   Appropriate fire resistant gloves with chemical resistant gloves under must be worn.
3. **Protective Clothing**
   a. Foot wear that cover top of feet.
   b. Flame resistant lab coats must be worn.

D. Controls

1. **Fume Hoods and Glove Boxes**
   a. Fume hoods & glove boxes are preferred method of control with sash in lowest possible position.
   b. Safety shielding is required if risk of explosion, splash hazard or a highly exothermic reaction.
   c. Portable blast shields are acceptable.
2. **Eye Wash**
   a. Flush eyes for at least 15 minutes, holding eyes open.
   b. Seek medical attention for further evaluation.
3. **Safety Showers/Handwashing Sinks**
   a. Rinse for minimum of 15 minutes.
   b. Seek medical attention for further evaluation.
4. **Fire Extinguishers**
   Personnel should not use the fire extinguishers.

E. **Emergency Procedures**

1. **Notification**
   a. Refer to the **Incident Response and Reporting Protocol Form**.
   b. First responders are University Police: **413/572-5262 or 911.**
2. **Major Spill, Fire, Explosion, Injury Response**
   a. Alert others. Small spill can be cleaned by lab, studio or theater personnel, if trained Read SDS.
   b. No attempt should be made to clean large spill or put out fire.
   c. Contact University Police 413/572-5262 or 911, for assistance.
   d. Remain on scene, but at safe distance, to help direct and discuss the situation with University Police.

F. **Cleaning and Waste Disposal**

1. **Cleaning**
   Employees must wash their hands and arms with soap and water.
2. **Waste Disposal**
   Chemicals must be disposed of as hazardous waste.

OXIDIZING CHEMICALS

A. General Statement

Oxidizing materials are chemicals that decompose readily under certain conditions to yield oxygen. They may cause a fire in contact with combustible materials, can react violently with water, and when involved in a fire, can react violently. Refer to inventory record for specific chemicals.

B. Chemical Storage

1. Store in cool, dry location.
2. Segregate from organic or combustible materials. Oxidizers can be stored with inorganic salts.
3. Minimize quantities stored.
4. Never return excess chemicals to original container. Small amounts of impurities may be introduced into container which may cause a fire or explosion.

C. Personal Protective Equipment

1. **Eye and Face Protection**
   Chemical splash proof goggles must be worn. Or face shield if particularly dangerous.
2. **Gloves**
   Appropriate gloves must be worn.
3. **Protective Clothing**
   a. Foot wear that cover top of feet.
   b. Additional protective clothing if the possibility of skin contact is high such as long sleeves, lab coats, or aprons.

D. Controls

1. **Fume Hoods and Glove Boxes**
   a. Fume hoods & glove boxes are preferred method of control with sash in lowest possible position.
   b. Safety shielding is required if risk of explosion, splash hazard or a highly exothermic reaction.
   c. Portable blast shields are acceptable.
2. **Eye Wash**
   a. Flush eyes for at least 15 minutes, holding eyes open.
   b. Seek medical attention for further evaluation.
3. **Safety Showers/Handwashing Sinks**
   a. Rinse for minimum of 15 minutes
   b. Seek medical attention for further evaluation.
4. **Fire Extinguishers**
   Personnel should not use the fire extinguishers.

E. Emergency Procedures

1. **Notification**
   a. Refer to the **Incident Response and Reporting Protocol Form**
   b. First responders are University Police: **413/572-5262 or 911.**
2. **Major Spill, Fire, Explosion, Injury Response**
   a. Alert others. Small spill can be cleaned by lab, studio or theater personnel, if trained Read SDS.
   b. No attempt should be made to clean large spill or put out fire.
   c. Contact University Police 413/572-5262 or 911, for assistance.
   d. Remain on scene, but at safe distance, to help direct and discuss the situation with University Police.

F. Cleaning and Waste Disposal

1. **Cleaning**
   Laboratory employees must wash their hands and arms with soap and water.
2. **Waste Disposal**

Chemicals must be disposed of as hazardous waste.

HIGHLY FLAMMABLE, FLAMMABLE & COMBUSTIBLE LIQUIDS

A. General Statement

Highly flammable liquids have a flash point below 73°F (22.8° C). Flammable liquids are chemicals that have a flash point below 100°F (38.7° C) and a vapor pressure that does not exceed 25 psig at 100°F. Combustible liquids have a flash point above 100°F. Refer to Appendix G for more information.

B. Chemical Storage

1. Store in approved storage cabinet.
2. Minimize quantities stored. No more than 10 gallons outside storage cabinet.
3. Flammable materials should be stored away from oxidizers and other incompatible materials
4. Some flammable liquids, such as low molecular weight ethers and vinyl compounds, tetrahydrofuran, and dioxane, slowly form peroxides upon exposure to air and sunlight. Refer to SOPs for peroxides.

C. Personal Protective Equipment

1. **Eye and Face Protection**

Glasses or chemical splash proof goggles must be worn. Face shield if particularly dangerous.

2. **Gloves**

Appropriate gloves must be worn.

3. **Protective Clothing**

a. Foot wear that cover top of feet.

b. Additional protective clothing if the possibility of skin contact is high such as long sleeves, lab coats, or aprons.

D. Controls

1. **Fume Hoods and Glove Boxes**

a. Fume hoods & glove boxes are preferred method of control with sash in lowest possible position.

b. Safety shielding is required if risk of explosion, splash hazard or a highly exothermic reaction.

c. Portable blast shields are acceptable.

2. **Eye Wash**

a. Flush eyes for at least 15 minutes, holding eyes open.

b. Seek medical attention for further evaluation.

3. **Safety Showers/Handwashing Sinks**

a. Rinse for minimum of 15 minutes

b. Seek medical attention for further evaluation.

4. **Fire Extinguishers**

Personnel should not use the fire extinguishers.

E. Emergency Procedures

1. **Notification**

a. Refer to the **Incident Response and Reporting Protocol Form**

b. First responders are University Police: **413/572-5262 or 911.**

2. **Major Spill, Fire, Explosion, Injury Response**

a. Alert others. Small spill can be cleaned by lab, studio or theater personnel, if trained. Read SDS.

b. No attempt should be made to clean large spill or put out fire.

c. Contact University Police 413/572-5262 or 911, for assistance.

d. Remain on scene, but at safe distance, to help direct and discuss the situation with University Police.

F. Cleaning and Waste Disposal

1. **Cleaning**

Employees must wash their hands and arms with soap and water.

2. **Waste Disposal**

Chemicals must be disposed of as hazardous waste.

CORROSIVE CHEMICALS

A. **Description**

Corrosive chemicals are substances that cause destruction or permanent changes in human skin tissue at the site of contact, or are highly corrosive to steel. The major classes of corrosives include strong acids, bases, and dehydrating agents.

For a more complete list refer to Appendix E.

B. Chemical Storage

1. Separate the various types of corrosives.
2. Separate acids and bases; separate organic acids from mineral acids; separate liquids and solids.
3. Corrosives should be stored using secondary containment (such as on plastic trays).
4. They should not be stored on high cabinets or shelves (above eye level).

C. Personal Protective Equipment

1. **Eye and Face Protection**

   Chemical splash proof goggles must be worn. Or face shield if particularly dangerous.
2. **Gloves**

   Appropriate gloves must be worn.
3. **Protective Clothing**

   a. Foot wear that cover top of feet.

   b. Additional protective clothing if the possibility of skin contact is high such as long sleeves, lab coats, or aprons.

D. Controls

1. **Fume Hoods and Glove Boxes**

   a. Fume hoods & glove boxes are preferred method of control with sash in lowest possible position.

   b. Safety shielding is required if risk of explosion, splash hazard or a highly exothermic reaction.

   c. Portable blast shields are acceptable.
2. **Eye Wash**

   a. Flush eyes for at least 15 minutes, holding eyes open.

   b. Seek medical attention for further evaluation.
3. **Safety Showers/Handwashing Sinks**

   a. Rinse for minimum of 15 minutes

   b. Seek medical attention for further evaluation.
4. **Fire Extinguishers**

   Personnel should not use the fire extinguishers.

E. Emergency Procedures

1. **Notification**

   a. Refer to the **Incident Response and Reporting Protocol Form**

   b. First responders are University Police: **413/572-5262 or 911.**
2. **Major Spill, Fire, Explosion, Injury Response**

   a. Alert others. Small spill can be cleaned by lab, studio or theater personnel, if trained. Read SDS.

   b. No attempt should be made to clean large spill or put out fire.

   c. Contact University Police 413/572-5262 or 911, for assistance.

   d. Remain on scene, but at safe distance, to help direct and discuss the situation with University Police.

F. Cleaning and Waste Disposal

1. **Cleaning**

   Employees must wash their hands and arms with soap and water.

2. **Waste Disposal**
   Chemicals must be disposed of as hazardous waste.

ACUTELY TOXIC CHEMICALS

A. Description

Acutely toxic chemicals are substances that cause adverse effects from a single exposure. Some of these substances include, but are not limited to: toxic or corrosive gases such as: fluorine, chlorine, phosgene, arsine, anhydrous hydrofluoric acid, carbon monoxide, hydrogen sulfide, unstable boron hydrides; highly reactive or explosive chemicals such as: polynitrated compounds, unstable organic peroxides, heavy metal azides or acetylides. Other common chemicals include: benzyl chloride, bromine, dimethyl sulfide, iodine, methyl hydrazine, nickel carbonyl, organo-tin compounds, osmium tetroxide, phosphorous oxychloride, sulfuryl chloride, and thionyl chloride. Refer to Appendix E.

B. Chemical Storage

1. Store according to hazard classification.
2. Minimize quantities stored.
3. Should be disposed of whenever no longer required for current work.

C. Personal Protective Equipment

1. **Eye and Face Protection**
   Chemical splash proof goggles must be worn. Or face shield if particularly dangerous.
2. **Gloves**
   Appropriate gloves must be worn.
3. **Protective Clothing**
   a. Foot wear that cover top of feet.
   b. Additional protective clothing maybe necessary - such as long sleeves, lab coats, or aprons.

D. Controls

1. **Fume Hoods and Glove Boxes**
   a. Fume hoods & glove boxes are preferred method of control with sash in lowest possible position.
   b. Safety shielding is required if risk of explosion, splash hazard or a highly exothermic reaction.
   c. Portable blast shields are acceptable.
2. **Eye Wash**
   a. Flush eyes for at least 15 minutes, holding eyes open.
   b. Seek medical attention for further evaluation.
3. **Safety Showers/Handwashing Sinks**
   a. Rinse for minimum of 15 minutes
   b. Seek medical attention for further evaluation.
4. **Fire Extinguishers**
   Personnel should not use the fire extinguishers.

E. Emergency Procedures

1. **Notification**
   a. Refer to the **Incident Response and Reporting Protocol Form**
   b. First responders are University Police: **413/572-5262 or 911.**
2. **Major Spill, Fire, Explosion, Injury Response**
   a. Alert others. Small spill can be cleaned by laboratory, studio or theater personnel, if trained.
   b. No attempt should be made to clean large spill or put out fire.
   c. Contact University Police 413/572-5262 or 911, for assistance.
   d. Remain on scene, but at safe distance, to help direct and discuss the situation with University Police.

F. Cleaning and Waste Disposal

1. **Cleaning**

a. Wash hands and arms with soap and water after working with any acutely toxic chemicals.
b. The work area must be cleaned after use.
c. Disposable paper, gloves, , etc. must be labeled, and disposed of in the SAA.

2. **Waste Disposal**
Acutely toxic chemicals and contaminated materials must be disposed of as hazardous waste.

CARCINOGENS AND REPRODUCTIVE TOXINS

A. Description

A carcinogen commonly describes any substance that can cause cancer. Some common carcinogens include: acrylonitrile, benzene, chromium (VI) and its salts, and formaldehyde. Reproductive hazards are substances that affect the reproductive capabilities including chromosomal damage (mutagens) and effects on the fetus (teratogens). Some reproductive toxins include: aniline, benzene, chloroform, dimethylformamide, dimethylsulfoxide, formaldehyde, formamide, lead compounds, mercury compounds, phenol, toluene, and xylene. For a more complete list refer to Appendix E. Refer to inventory record for specific chemicals.

B. Chemical Storage

1. Store according to hazard classification.
2. Minimize quantities stored.
3. Should be disposed of whenever no longer required for current work.

C. Personal Protective Equipment

1. **Eye and Face Protection**
Glasses or chemical splash proof goggles must be worn. Face shield if particularly dangerous.
2. **Gloves**
Appropriate gloves must be worn.
3. **Protective Clothing**
a. Foot wear that cover top of feet.
b. Additional protective clothing may be necessary - such as long sleeves, lab coats, or aprons.

D. Controls

1. **Fume Hoods and Glove Boxes**
a. Fume hoods & glove boxes are preferred method of control with sash in lowest possible position.
b. Safety shielding is required if risk of explosion, splash hazard or a highly exothermic reaction.
c. Portable blast shields are acceptable.
2. **Eye Wash**
a. Flush eyes for at least 15 minutes, holding eyes open.
b. Seek medical attention for further evaluation.
3. **Safety Showers/Handwashing Sinks**
a. Rinse for minimum of 15 minutes.
b. Seek medical attention for further evaluation.
4. **Fire Extinguishers**
Personnel should not use the fire extinguishers.

E. Emergency Procedures

1. **Notification**
a. Refer to the **Incident Response and Reporting Protocol Form**
b. First responders are University Police: **413/572-5262 or 911.**
2. **Major Spill, Fire, Explosion, Injury Response**
e. Alert others. Small spill can be cleaned by lab, studio or theater personnel, if trained. Read SDS.
f. No attempt should be made to clean large spill or put out fire.
g. Contact University Police 413/572-5262 or 911, for assistance.
h. Remain on scene, but at safe distance, to help direct and discuss the situation with University Police.

F. Cleaning and Waste Disposal

1. **Cleaning**
   c. Wash hands and arms with soap and water.
   d. The work area must be cleaned after use.
   e. Disposable paper, gloves, paper towels, etc. must be labeled, and disposed of in the SAA.
2. **Waste Disposal**
   Materials must be disposed of as hazardous waste.

COMPRESSED GASES

A. Description

Cylinders of compressed gases represent high-energy sources and should be handled with regard to their potential hazards. The chemical reactivity of the gases should also be taken into account when planning for safe management and use of compressed gases.

B. Chemical Storage

1. Upright position and secured to wall or bench with chains or straps.
2. Cylinder caps or regulator on at all times.
3. In areas where they will not become overheated.
4. Transport on equipment designed for this function.

C. PPE

1. **Eye and Face Protection**
   Goggles must be worn. Or a face shield if particularly dangerous.
2. **Gloves**
   Appropriate gloves should be worn when handling hazardous materials.
3. **Protective Clothing**
   Closed toed shoes. Additional protective clothing if the possibility of skin contact is high.

D. Controls

1. **Fume Hoods and Glove Boxes**
   Fume hoods and Glove boxes are the preferred method of control with sash in lowest possible position.
   Safety shielding is required if there is a risk of explosion, splash hazard or a highly exothermic reaction. Portable blast shields are acceptable.
2. **Eye Wash**
   Flush eyes for a minimum of 15 minutes if contamination occur, holding eyes open. Medical attention should be sought for further evaluation.
3. **Safety Showers**
   Remain in shower for minimum of 15 minutes if skin or clothing is contaminated. Medical attention should be sought for further evaluation.
4. **Fire Extinguishers**
   Personnel should not use the fire extinguishers.

E. Emergency Procedures

1. **Notification**
   Refer to the Incident Response and Reporting Protocol Form. First responders are University Police: **413/572-5262**
2. **Release Response**
   a. Alert others in the area if a release of a hazardous gas occurs. Contact University Police, 911, for assistance. Evacuate area.
   b. The caller should remain on the scene, but at a safe distance, to help direct and discuss the situation when University Police arrives.
   c. Consult the SDS.

APPENDIX C

STANDARD OPERATING PROCEDURES

EQUIPMENT

Fume Hoods

Keep the Sash Down

For hoods that have a movable front sash, keeping the opening as small as reasonably possible usually increases the flow rate through the aperture and enhances effectiveness. The sash also operates as a safety shield. It is strongly recommended that the hood sash be closed to within one or two inches when not in use.

Keep Laboratory Doors and Windows Closed

In closed buildings, ventilation and fume hood systems are usually designed on the assumption that doors to the laboratory and windows will be in the closed position. If the doors and windows are left open, unplanned airflow patterns may degrade the efficiency of a hood.

Limit Traffic

Traffic or movement in front of the hood induces turbulence and can limit the effectiveness of the hood. Traffic should be limited as much as possible.

Reduce Clutter

The presence of objects in the hood tends to increase turbulence, so the more cluttered the working surface, the lower the efficiency and the less protection there is. The number of objects in a hood should be kept to a workable minimum. Keep the number of chemicals stored in a hood as low as possible. Not only does such storage decrease hood efficiency, but it also increases the possibility and seriousness of accidental fires. Solvents should be placed in vented cabinets rather than wasting useful and expensive hood space. When circumstances dictate such storage of chemicals, they should not be placed near the exhaust slots or in the front six inches of the hood.

Work Far into the Hood

Putting chemicals and equipment as far back into the hood as practical substantially increases the effectiveness of the hood. By moving back six inches into the hood's interior, the hood's effectiveness can be greatly improved. Operations should not be carried out within six inches from the plane of the sash.

Explosions

The glass sash offers protection from accidents and, when possible, it is safest to keep the sash between your face and the equipment. The glass face, however, is not designed to protect against explosions. When an explosive hazard is present, rounded safety shields should be placed between the operator and the equipment. It should be as close as possible to the plane of the hood sash. Full-face protection should also be used in such circumstances. Evaporations and digestions involving perchloric acid must not be carried out in hoods. Perchloric acid can condense in the ductwork and result in an explosion hazard.

Exhaust

Care should be taken with the use of paper products, aluminum foil and other lightweight materials within the hood. For example, a single piece of Kleenex, if sucked into the exhaust ducts, can potentially cause a reduction in the velocity of air flow.

Drains

Run water in hood drains at least once a week if the drains are not normally used. This is to prevent the drain traps from drying out and possibly perturbing airflow in the system.

Annual Testing

There is an annual testing of fume hoods. If the existing inspection sticker on a fume hood indicates a year or more has passed since it last inspected that hood, or doesn't have an inspection sticker, contact Facilities and Operations.

Mechanical Problems

If your fume hood suddenly seems to stop working and you suspect mechanical problems, contact Facilities and Operations. Remove all chemicals from the hood if maintenance workers are going to be working on the hood system.

COMMON ELECTRICAL EQUIPMENT

Vacuum pumps:
The inlet line from the system should be fitted with a cold trap to collect volatile substances and minimize the amount that enters the vacuum pump. The output should be vented to an air exhaust system. The pump oil should be changed frequently to avoid contamination. The contaminated oil should be placed in a waste container and labeled properly for disposal.
Pumps with belts should have protective covers over them.

Drying Ovens:
Ovens should not be used to dry any substances that have even moderate volatility. Substances that might pose a threat because of acute or chronic toxicity should not be dried an oven unless special precautions have been taken to vent the atmosphere in the oven. Glassware that has been rinsed with organic solvents should not be placed in the oven unless it has been rinsed with water afterwards. Household ovens should not be used as they do not have the same built-in safety devices against sparking as laboratory designed ovens. Therefore they should not be used in the laboratory.

Refrigerators:
No food or beverages should be stored in laboratory refrigerators. A flammable storage refrigerator must be used; never a kitchen refrigerator. Laboratory refrigerators should be equipped with heavy-duty cords, and preferably should be protected by their own circuit breaker. Uncapped containers should never be placed in the refrigerator. The caps should form at permanent seal in case the container is tipped over. All containers must be marked with chemical name and safety hazards.

Stirring and mixing devices:
These include magnetic stirrers, shakers, small pumps for liquids, and rotary evaporators. They are normally used in operations that occur in the hood. Only spark-free induction motors should be used in these devices.

Hot plates and heating mantles (thermowells):
Only hotplates and heating mantles with fully enclosed heating elements can be used. For heating mantles with fiberglass cloth, check to make sure the coating is not worn or broken and that no water or other chemicals are spilled in the mantle. Heating mantles should never be plugged directly into a 110-V line. A variable autotransformer should be used to control the input voltage.

Oil baths:
A saturated paraffin oil is often used for temperatures below 200^{o}C and silicone oil for temperatures up 300^{o}C. A thermometer or other temperature recording device should be used to ensure that the temperature does not exceed the flashpoint of the oil being used. A metal pan or heavy-walled porcelain dish should be used for the oil. The oil bath should be supported on a laboratory jack so it can be easily removed from the heat source if necessary. The heat source should be hotplate, nothing with bare wires. Caution should be used around water as oil can be splattered over a large area.

Air baths:
The heating element must be completely enclosed. The connection to the air bath from the variable transformer must be electrically and mechanically secure. If glass vessels are used, they must be completely wrapped with a heat resistant tape.

Heat guns:
These devices are not usually spark free. The heating coil becomes red-hot during use and it not enclosed. Heat guns always pose a serious spark hazard. Never use a heat gun on open containers that hold flammable liquids or where there are appreciable flammable vapors. Household dryers should only be used if they have three-conductor or double-insulated line cords.

AUTOCLAVE PROCEDURES

Autoclave Safety

Caution: Autoclaves may cause serious burns

To Prevent Injury:

Loosen screw caps on bottles and tubes of liquids before autoclaving.
Check that chamber pressure has returned to zero before opening door.
Wear eye and face protection.
Stand behind door when opening it.
Slowly open door only a crack. Beware rush of steam.
Keep face away from door as it opens. Escaping steam may burn face.
Wait 5 minutes after opening door before removing liquids.
Liquids removed too soon may boil up and out of container, burning operator.

Autoclaves use pressurized steam to destroy microorganisms, and are the most dependable systems available for the decontamination of laboratory waste and the sterilization of laboratory glassware, media, and reagents. For efficient heat transfer, steam must flush the air out of the autoclave chamber. Before using the autoclave, check the drain screen at the bottom of the chamber and clean if blocked. If the sieve is blocked with debris, a layer of air may form at the bottom of the autoclave, preventing efficient operation.

Container Selection

Polypropylene bags

Commonly called biohazard or autoclave bags, these bags are tear resistant, but can be punctured or burst in the autoclave. Therefore, **place bags in a rigid container during autoclaving**. Bags are available in a variety of sizes, and some are printed with an indicator that changes color when processed.

Polypropylene bags are impermeable to steam, and for this reason should not be twisted and taped shut, but gathered loosely at the top and secured with a large rubber band or autoclave tape. This will create an opening through which steam can penetrate.

Polypropylene containers and pans

Polypropylene is a plastic capable of withstanding autoclaving, but resistant to heat transfer. Therefore, materials contained in a polypropylene pan will take longer to autoclave than the same materials in a stainless steel pan. To decrease the time required to sterilize material in these containers, remove the lid (if applicable), turn the container on its side when possible, and select the container with the lowest sides and widest diameter possible.

Stainless steel containers and pans

Stainless steel is a good conductor of heat and is less likely to increase sterilizing time, though is more expensive than polypropylene.

Time Selection

Take into account the size of the articles to be autoclaved. A 2-liter flask containing 1 liter of liquid takes longer to sterilize than four 500 mL flasks each containing 250 mL of liquid.

Material with a high insulating capacity (animal bedding, high sided polypropylene containers) increases the time needed for the load to reach sterilizing temperatures.

Autoclave bags containing biological waste should be autoclaved for 50 minutes to assure decontamination.

Removing the Load

Check that the chamber pressure is zero.
Wear lab coat, eye protection, heat insulating gloves, and closed-toe shoes.
Stand behind door when opening it.
Slowly open door only a crack. Beware of rush of steam.
After the slow exhaust cycle, open autoclave door and allow liquids to cool for 20 minutes before removing.

Use and Disposal of Sharps

To prevent needle stick injuries:

- Avoid using needles whenever possible.
- Do not bend, break, or otherwise manipulate needles by hand.
- Do not recap needles by hand. Do not remove needles from syringes by hand.
- Immediately after use, discard needle and syringe (whether contaminated or not) into puncture resistant sharps containers.
- **Never** discard sharps into regular trash.
- **Never** discard sharps into bags of biological waste.
- Do not overfill sharps containers. Close completely when they are ¾ full.

In the event of a needle stick injury:

- Wash thoroughly with soap and water. Notify personnel and/or immediately call University Police, **413/572-5262 or 911**, for assistance.

Is it a Sharp, Laboratory Glass or Plastic Pipette Tip?

This policy describes the disposal of **sharp waste** as part of the Biohazardous Waste Program, in compliance with 105 Code of Massachusetts Regulation 480.200 (E). There is a difference between "sharps" waste, "laboratory glass" waste and “plastic pipette tips” and it is important to understand the difference and handle these wastes accordingly.

SHARPS

"Sharps" are a restricted waste and must not be disposed in the regular waste stream. The term "sharps" is a regulatory waste classification associated with ***those instruments used to puncture, cut, or scrape body parts*** and that, as waste, can cause punctures or cuts to solid waste handlers or the public. The sharps definition includes, but is not limited to, the following "SHARPS" items:

The following items **whether contaminated with biological materials or not** are considered sharps:

- Syringes, with or without needles (syringe components, suture needles, pen needles);
- Needles with attached tubing;
- Scalpels, razor blades, and lancets.

The following items are considered **sharps ONLY WHEN CONTAMINATED with biohazardous materials:**

- Broken glassware, glass Pasteur pipettes, splintered plastic pipettes, empty blood vials;
- Glass slides and covers.

Note: Triumvirate Environmental removes full sharps containers at end of each semester. Contact the CHO if you need the sharps containers removed from your laboratory or studio.

LABORATORY GLASS

Uncontaminated, non-sharp and unbroken and broken “Laboratory Glass” is not a restricted waste and can be disposed in the regular waste stream *after* placement in Glass Only container.

Glass Pasteur pipettes and glass capillary tubes and glass slides and covers may be managed with uncontaminated broken laboratory glass if they are not contaminated with biohazardous materials. If used with chemicals, the pipettes must be empty. If used with radioactive materials, the pipettes may not be disposed as “Laboratory Glass” but must be managed with other radioactive waste.

PLASTIC PIPETTE TIPS

Uncontaminated plastic pipette tips are not a restricted waste and can be disposed in the regular waste stream *after* placement in a container which will eliminate the potential of punctures and cuts to solid waste handlers or the public, such as the Glass Only containers or designated container.

APPENDIX D

LISTS OF REGULATED CHEMICALS

The following is a list of substances NIOSH considers to be potential occupational carcinogens.

A number of the carcinogen classifications deal with groups of substances: aniline and homologs, chromates, dintrotoluenes, arsenic and inorganic arsenic compounds, beryllium and beryllium compounds, cadmium compounds, nickel compounds, and crystalline forms of silica. There are also substances of variable or unclear chemical makeup that are considered carcinogens, coal tar pitch volatiles, coke oven emissions, diesel exhaust and environmental tobacco smoke.

Some of the potential carcinogens listed in this index may be re-evaluated by NIOSH as new data become available and the NIOSH recommendations on these carcinogens either as to their status as a potential occupational carcinogen or as to the appropriate recommended exposure limit may change.

Acetaldehyde
2-Acetylaminofluorene
Acrylamide
Acrylonitrile
Aldrin
4-Aminodiphenyl
Amitrole
Aniline and homologs
o-Anisidine
p-Anisidine
Arsenic and inorganic arsenic compounds
Arsine
Asbestos
Asphalt fumes

Benzene
Benzidine
Benzidine-based dyes
Beryllium
Butadiene
tert-Butyl chromate; class, chromium hexavalent

Cadmium dust and fume
Captafol
Captan
Carbon black (exceeding 0.1% PAHs)
Carbon tetrachloride
Chlordane
Chlorinated camphene
Chlorodiphenyl (42% chlorine); class polychlorinated biphenyls
Chlorodiphenyl (54% chlorine); class polychlorinated biphenyls
Chloroform
Chloromethyl methyl ether
bis(Chloromethyl) ether
B-Chloroprene

Chromium, hexavalent [Cr(VI)]
Chromyl chloride; class, chromium hexavalent
Chrysene
Coal tar pitch volatiles; class, coal tar products
Coke oven emissions

DDT (dichlorodiphenyltrichloroethane)
Di-2-ethylhexyl phthalate (DEHP)
2,4-Diaminoanisoleo
o-Dianisidine-based dyes
1,2-Dibromo-3-chloropropane (DBCP)
Dichloroacetylene
p-Dichlorobenzene
3,3'-Dichlorobenzidine
Dichloroethyl ether
1,3-Dichloropropene
Dieldrin
Diesel exhaust
Diglycidyl ether (DGE); class, glycidyl ethers
4-Dimethylaminoazobenzene
Dimethyl carbomoyl chloride
1,1-Dimethylhydrazine; class, hydrazines
Dimethyl sulfate
Dinitrotoluene
Dioxane

Environmental tobacco smoke
Epichlorohydrin
Ethyl acrylate
Ethylene dibromide
Ehtylene dichloride
Ethylene oxide
Ethyleneimine
Ethylene thiourea
Formaldehyde
Gallium arsenide
Gasoline

Heptachlor
Hexachlorobutadiene
Hexachloroethane
Hexamethyl phosphoric triamide (HMPA)
Hydrazine
Kepone

Malonaldehyde
Methoxychlor
Methyl bromide; class, monohalomethanes
Methyl chloride
Methylhydrazine
Methyl iodide; class, monohalomethanes

Methyl hydrazine; class, hydrazines
4,4'-Methylenebis(2-chloroaniline) (MBOCA)
Methylene chloride
4,4-Methylenedianiline (MDA)

a-Naphylamine
B-Naphylamine
Nickel, metal, soluble, insoluble, and inorganic; class, nickel, inorganic
Nickel carbonyl
Nickel sulfide roasting
4-Nitrobiphenyl
p-Nitrochlorobenzene
2-Nitronaphthalene
2-Nitropropane
N-Nitrosodimethylamine

Pentachloroethane; class, chloroethanes
N-Phenyl-*b*-naphthylamine; class, *b*-naphthalene
Phenyl glycidyl ether; class, glycidyl ethers
Phenylhydrazine; class, hydrazines
Propane Sultone
B-Propiolactone
Propylene dichloride
Proplyene imine
Propylene oxide

Radon
Rosin core solder, pyrolysis products (containing formaldehyde)
Silica, crystalline cristobalite
Silica, crystalline quartz
Silica, crystalline ripoli
Silica, crystalline tridymite
silica, fused
Soapstone, total dust silicates

Tremolite silicates
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD) (dioxin)
1,1,2,2-Tetrachloroethane
Tetrachloroethylene
Titanium dioxide
o-Tolidine-based dyes
o-Tolidine
Toluene diisocyanate (TDI)
Toluene diamine (TDA)
o-Toluidine
p-Toluidine
1,1,2-Trichloroethane; class, chloroethanes
Trichloroethylene
1,2,3-Trichloropropane

Uranium, insoluble compounds Uranium, soluble compounds

Vinyl bromide; class, vinyl halides
Vinyl chloride
Vinyl cyclohexene dioxide
Vinylidene chloride (1,1-dichloroethylene); class, vinyl halides)
Welding fumes, total particulates
Wood dust
Zinc chromate; class, chromium hexavalent

Modified from MIT CHP: Common Chemicals and their Hazards

Terms:												
PHS = Particularly Hazardous substance determination (Y or N)												
C1 = Confirmed Human Carcinogen (International Agency for Research on Cancer)												
C2A = Probable Human Carcinogen (IARC)												
C2B = Possible Human Carcinogen (IARC)												
N1 = Known to be human carcinogen (National Toxicology Program)												
O = OSHA carcinogen												
R =reproductive toxin												
HAT = highly acute toxic												
T = Toxic												
COR = corrosive												
Chemical Name	**PHS**		**C1**	**C2A**	**C2B**	**N1**	**N2**	**O**	**R**	**HAT**	**T**	**COR**
acetaldehyde	Y				X		X					X
acetic acid, glacial	N											X
acetone	N											
acetonitrile	N											
acetylene	N											
acrolein	Y										X	
acrylamide	Y			X			X				X	X
acrylonitrile	Y				X		X	X		X	X	
aluminum trichloride	N											X
ammonia (anhydrous)	Y										X	X
ammonium hydroxide	Y										X	X
aniline	Y										X	
arsenic	Y			X		X		X			X	
arsenic pentoxide	Y			X		X		X	X	X		
arsenous oxide	Y			X		X		X	X	X		
arsine	Y			X		X				X		
benzene	Y			X		X		X	X			
benzenearsonic acid	Y									X		X
beryllium	Y			X		X				X		
boron tribromide	Y									X		X
boron trifluoride	Y									X		X
bromine	Y									X		X
butyl lithium	Y										X	X
cadmium	Y			X		X		X		X		
cadmium bromide	Y			X		X		X			X	
cadmium chloride	Y			X		X		X			X	
cadmium oxide	Y			X		X		X				
carbon disulfide	Y								X		X	

Chemical Name	PHS		C1	C2A	C2B	N1	N2	O	R	HAT	T	COR
carbon monoxide	Y								X		X	
carbon tetrachloride	Y						X					
chlorine	Y										X	X
chloroacetic acid	Y										X	X
chloroform	Y						X					
chloromethyl ether	Y			X		X		X		X		X
chlorotrimethylsilane	Y									X		X
chromium (III) chloride (anhydrous)	N											
chromium (III) chloride (hexahydrate)	N											
chromium hexacarbonyl	Y		X			X					X	
chromium trioxide (& other Cr VI salts)			X			X					X	X
cobalt carbonyl	Y				X							
cyanogen bromide	Y									X		X
cyclohexane	N											
diazomethane	Y										X	X
diborane (gas)	Y									X		
dichloromethane	Y				X		X	X				
diethyl ether (ethyl ether)	N											
diethylnitrosamine	Y										X	X
dimethyl formamide	N											
dimethyl mercury	Y								X	X		
dimethyl sulfate	Y			X			X			X	X	X
dimethyl sulfoxide	N											
dimethylacetamide	N											
dimethylaniline	Y				X						X	
dimethylethylenediamine	N											X
dioxane	Y				X		X					
ethanol	N											
ethidium bromide	Y									X		
ethyl acetate	N											
ethylene diamine	Y										X	X
ethylene dibromide	Y			X					X		X	
ethylene glycol dimethyl ether	N											
ethylene oxide	Y		X			X		X	X		X	
fluorine	Y											X
fluoroacetyl chloride	Y											X
formaldehyde	Y						X	X		X	X	X
formamide	Y			X								
formic acid	N											X
gallium trichloride	Y									X		X
glutaraldehyde	Y										X	X
heptane	N											
hexamethyldisilane	N											

Chemical Name	PHS		C1	C2A	C2B	N1	N2	O	R	HAT	T	COR
hexamethyldisiloxane	N											
hexamethylphosphoramide	Y				X		X		X			
hexane	N											
hydrazine hydrate	Y				X		X			X	X	X
hydrobromic acid	N											X
hydrochloric acid	Y										X	X
hydrofluoric acid	Y									X		X
hydrogen	N											
hydrogen bromide (gas)	Y											X
hydrogen chloride (gas)	Y											X
hydrogen cyanide	Y									X		X
hydrogen fluoride (gas)	Y									X		X
hydrogen peroxide (30 %)	Y										X	X
hydrogen selenide (gas)	Y									X		
hydrogen sulfide	Y									X		
iodine	Y										X	X
isopropanol	N											
lead and its inorganic compounds	Y				X		X		X	X		
lithium aluminum hydride	N											X
lithium hydride	N											X
manganese chloride	Y										X	
manganese oxide	N											
mercuric chloride	Y								X	X	X	X
mercuric oxide	Y								X	X	X	X
mercury	Y								X	X		X
methanol	N											
methyl ethyl ketone	N											
methyl iodide	Y										X	
methyl lithium	N											X
methyl methacrylate	N											
methyl tert butyl ether	N											
methyl vinyl ketone	Y									X		X
nickel carbonyl	Y		X				X		X	X		
nickel chloride	Y		X								X	
nickel nitrate	Y		X									
nitric acid	N											X
nitrobenzene	Y				X						X	
nitrogen dioxide	Y									X		X
osmium tetroxide	Y									X		X
oxygen	N											
ozone	Y									X		
palladium on carbon	Y										X	
paraformaldehyde	Y										X	X
peracetic acid	Y										X	X
perchloric acid	N											X

Chemical Name	PHS		C1	C2A	C2B	N1	N2	O	R	HAT	T	COR
phenol	Y										X	X
phosgene	Y									X		X
phosphine	Y									X		
phosphoric acid	N											X
phosphorus	Y									X		X
phosphorus pentoxide	Y										X	X
picric acid	Y										X	X
polyethyleneglycol methacrylate	N											
polyphosphoric acid	N											X
potassium hydroxide	Y										X	X
potassium	N											
potassium cyanide	Y									X		X
potassium ferrocyanide	N											
potassium hydride	N											X
propargyl bromide	Y									X		X
pyridine	N											
silane	Y											
silver and its compounds	N											
sodium	N											
sodium azide (Na(N3))	Y									X		X
sodium cyanide (Na(CN))	Y									X		
sodium hydride	N											X
sodium hydroxide	Y										X	X
sulfur dioxide	Y										X	X
sulfur trioxide	Y									X		X
sulfuric acid	N					X						X
tert butyl hydroperoxide	Y										X	X
tert butylmethyl ether	N											
tetrafluoroboric acid	Y										X	X
tetrahydrofuran	N											
tetramethyl ethylenediamine	Y										X	X
thallium compounds	Y										X	
toluene	Y								X			
toluene diisocyanate	Y				X		X			X		X
trichloroethylene	Y			X			X					
triethanolamine	N											
triethylamine	Y										X	X
trifluoroacetic acid	Y										X	X
trifluoromethane sulfonic acid	N											X
trimethyl aluminum	N											X
trimethyltin chloride	Y									X		X
xylene	N											

2. ACUTELY TOXIC CHEMICALS

This list is provided as a guide and is not all inclusive. Review SDSs.

Acrolein	Acrylyl chloride	2-Aminopyridine
Benzyl chloride	Bromine	Chlorine dioxide
Chlorine trifluoride	Chlorpicrin	Cyanogen chloride
Cyanuric fluoride	Decaborane	Dichloro acetylene
Dimethyl disulfide	Dimethylsulfate	Dimethylsulfide
Ethylene chlorohydrin	Ethylene fluorohydrin	Hexamethylene diisocyanate
Hexamethyl phosphoramide	Iodine	Iron pentacarbonyl
Isopropyl formate	Methacryloyl chloride	Methacryloxyethyl isocyanate
Methyl acrylonitrile	Methyl chloroformate	Methylene biphenyl isocyanate
Methyl fluoroacetate	Methyl fluorosulfate	Methyl hydrazine
Methyl Mercury (and other organicforms)	Methyltrichlorosilane	Methyl vinyl ketone
Nickel carbonyl	Nitrogen tetroxide	Nitrogen trioxide
Organo Tin compounds	Osmium tetroxide	Oxygen difluoride
Ozone	Pentaborane	Perchloromethyl mercaptan
Phosphorus oxychloride	Phosphous trichloride	Sarin
	Select Agents	
Sulfur monochloride	Sulfur pentafluoride	Sulfuryl chloride
Tellurium hexafluoride	Tetramethyl succinonitrile	Tetranitromethane
Thionyl chloride	Toluene-2,4-diisocyanate	Trichloro (chlormethyl) silane

3. REPRODUCTIVE TOXINS

This list is provided as a guide and is not all inclusive. Review safety data sheet.

Name	**Name**
Acetaldehyde	Hydrazine(s)
Arsenic	Hexafluoroacetone
Aniline	Halothane
Aflatoxins	Karathane
Benzene	Lead (inorganic compounds)
Benzo(a)pyrene	2-Methoxyethanol
Carbon disulfide	2-Methoxyethyl acetate
Chloroform	Methyl chloride
Chloroprene	N-Methyl-2-pyrrolidone
Dimethyl formamide	Propylene glycol monomethyl ether
Di-sec-octyl-phthalate	Propylene glycol monomethyl ether acetate
Dinitrooctyl phenol	Propylene oxide
Dithane	Trichloroethylene
2-Ethoxy ethanol	RH-7592
2-Ethoxyethyl acetate	Systhane/RH-3866
Ethylene thiourea	TOK (herbicide)
2-Ethyhexanol	Toluene
Glycol ethers	Vinyl chloride

4. Peroxide Forming Compounds considered Severe Hazards

Discard within 3 months after opening:

Diisopropyl ether (Isopropyl Ether)
Divinylacetylene
Potassium Metal
Potassium Amide
Sodium Amide
Vinylidene Chloride (1,1-DiChloroethylene)

Peroxide Forming Compounds considered to be Moderate Hazards

They must not be distilled without first testing for the presence of peroxides. They must be discarded or tested for peroxides within 6 months after opening:

Acetaldehyde Diethyl Acetal (Acetal)
Cumene (Isopropyl Benzene)
Cyclohexene
Cyclopentene
Decalin (Decahydronaphthalene)
Diethyl Ether (Ether)
Dioxane
Ethylene Glycol Dimethyl (Glyme)
Ethylene Glycol Ether Acetates
Ethylene Glycol Monoethers
Furan
Methylacetylene
Methylcyclopentane
Tetrahydrofuran (THF)

Compounds that can undergo Rapid Polymerization Initiated By Internally Formed Peroxides

Discard or test for peroxides after 6 months

Chloroprene (2-Chloro-1,3-Butadiene)
Styrene
Vinyl Acetate
Vinylpryidine

Discard After 12 Months

Butadiene
Tetrafluoroethylene (TFE)
Vinylacetylene
Vinyl Chloride

Class 4 - Flammable Solids

Class four materials are broken into three subgroups. They are:

1. Flammable Solids
2. Spontaneously Combustible
3. Dangerous When Wet

Flammable Solids are defined as wetted explosives that are Class 1 explosives when dry, but are sufficiently wetted to suppress explosive properties, self-reactive materials that are thermally unstable and can undergo strong exothermic decomposition even in the absence of oxygen, and readily combustible solids that can cause fire through friction, such as matches.

Spontaneously Combustible material is defined as "Pyrophoric" materials (liquids or solids that can ignite after coming into contact with air) and as "Self-heating" materials (substances that, when in contact with air, are liable to self-heat).

Dangerous When Wet materials are materials that, when in contact with water, are liable to become spontaneously flammable or to give off flammable or toxic gas.

The following list contains some examples of Class 4 materials, but is not all inclusive:

Flammable Solids	Spontaneously Combustible	Dangerous When Wet
Nitrocellulose membrane filters	Activated carbon	Alkaline earth metal alloys
Silicon powder	Lithium alkyds	Aluminum powder
Sulfur	Pentaborane	Barium
Titanium Powder, wetted	Phosphorus	Calcium Hydride
Zinc resinate	Oily rags	Calcium carbide
Naphthalene	Potassium sulfide	Magnesium
	Sodium sulfide	anhydrous Calcium
	Butyl lithium	anhydrous Lithium
		Sodium
		Sodium Borohydride

APPENDIX F

GLOVE SELECTION

Glove Selection

Glove selection is difficult for most laboratory personnel. Different references seem to give conflicting information and the many available styles and types of glove materials make it more complicated. Many chemicals used academic research laboratories are in such small quantities that the various glove manufacturers don't test these chemicals. The table below can be used as a guide for choosing the appropriate gloves, but it is always best to follow the manufacture's glove chart if there is a different recommendation. The thickness of the glove, concentration of the chemical, length of exposure time, temperature and potential risk of puncture or abrasion should be taken into account when choosing a glove.

In general, latex gloves offer little protection from commonly used chemicals. The use of latex gloves is only recommended for: most biological materials, nonhazardous chemicals, and very dilute, aqueous solutions of hazardous chemicals. They offer no protection against many common laboratory chemicals. When used with some materials, they will severely degrade, often in a very short period of time. Nitrile gloves are a better choice for use with most laboratory chemicals.

E = Excellent, generally last greater than 8 hours
G = Good, generally last greater than 4 hours
F = Fair, generally last greater than 1 hour
N = Not recommended, generally don't last an hour
? = Not tested or no information

Chemical	Rubber	Neoprene	Butyl	Nitrile	Viton
Acetaldehyde	N	N	E	N	N
Acetic acid	F	G	E	N	E
Acetic anhydride	N	F	E	N	N
Acetone	N	N	E	N	N
Acetonitrile	N	N	E	N	N
Acrylamide	N	N	G	F	G
Ammonium hydroxide (<70%)	N	G	E	G	?
Ammonium nitrate	E	E	E	E	E
Aniline	N	N	E	N	F
Benzaldehyde	N	N	E	N	G
Benzene	N	N	N	N	G
Bromine	?	F	N	N	E
Butyl acetate	N	N	F	N	N
Carbon disulfide	N	N	N	N	E
Carbon tetrachloride	N	N	N	N	E
Chlorine (aq)	?	N	F	N	E
Chloroform	N	N	N	N	E
Chromic acid (< 70%)	N	N	E	G	E
Diethyl ether	N	F	N	F	N
Dimethyl sulfoxide	N	E	E	N	N
Chemical	Rubber	Neoprene	Butyl	Nitrile	Viton
Ethanol	N	F	E	G	E
Ethanolamine	F	E	E	E	E
Ethyamine	N	F	E	N	N
Ethyl acetate	N	N	G	N	N
Ethylene glycol	N	F	E	F	E

Ferric Chloride	E	E	E	E	E
Formaldehyde	N	F	E	E	E
Formic acid	F	G	E	F	F
Gasoline	N	N	N	N	E
Hexanes	N	N	N	E	E
Hydrochloric acid (< 37%)	G	G	E	G	G
Hydrogen peroxide	E	F	E	E	E
Iodine	?	N	G	G	E
Isopropanol	N	G	E	E	E
Isopropyl ether	N	F	N	G	N
Lactic acid	E	E	E	E	E
Maleic acid	G	G	F	G	E
Mercury	?	E	E	E	E
Methanol	N	N	E	N	E
Methyl acetate	N	N	E	N	N
Methylamine	N	G	E	E	E
Methylene chloride	N	N	N	F	G
Naphthalene	N	N	N	N	E
Nitric acid	?	N	F	N	E
Oxalic acid	E	E	E	E	E
Pechloric acid (< 70%)	E	E	G	E	E
Pentane	N	N	N	G	E
Petroleum ether	N	N	N	G	E
Phenol	N	G	F	N	E
Phosphoric acid	E	E	E	E	E
Photo solutions	G	E	?	E	?
Potassium cyanide	E	E	E	E	E
Potassium dichromate	E	E	E	E	E
Potassium hydroxide (<70%)	E	E	E	E	E
Potassium permanganate	E	E	?	E	?
Pyridine	N	N	E	N	N
Sodium cyanide	E	E	E	E	E
Sodium hydroxide	E	E	E	E	E
Sodium thiosulfate	E	E	E	E	E
Sulfuric acid	N	F	E	N	F
Tetrahydrofuran	N	N	F	F	N
Toluene	N	N	N	N	E
Triethanolamine	N	N	E	E	E
Xylene	N	N	N	N	E

APPENDIX G

FLAMMABILITY DATA

Table for Container Size:

Maximum Allowable Container Capacity for Flammable Liquids

Container Type	IA Flammable	IB Flammable	IC Flammable	II Combustible	IIIA Combustible
Glass	1 pint	1 quart	1 gallon	1 gallon	5 gallon
Metal or approved Plastic	1 gallon	5 gallon	5 gallon	5 gallon	5 gallon
Safety can	2 gallon	5 gallon	5 gallon	5 gallon	5 gallon

Flammable Liquid Class I A Below 73ºF (22.8ºC) and Boiling Point below 100ºF (37.8ºC)
Flammable Liquid Class I B Below 73ºF (22.8ºC) and Boiling Point at or above 100ºF (37.8ºC)
Flammable Liquid Class I C Below 100ºF (37.8ºC) and Boiling Point at or above 73ºF (22.8ºC)
Combustible chemicals - Solid, liquid or gaseous materials that burn in the presence of oxygen.

Combustible Liquid Class II Below 140ºF (60ºC) or at or above 100ºF (37.8ºC)
Combustible Liquid Class III at or above 140ºF (60ºC)
Combustible Liquid Class III A Below 200ºF (93.4ºC) or at or above 140ºF (60ºC)
Combustible Liquid Class III B At or above 200°F (93.4ºC)

NFPA Rating

0 Materials that will not burn.
1 Materials that must be preheated before they will ignite.
2 Materials that must be moderately heated or exposed to relatively high ambient temperatures before they will ignite.
3 Liquids and solids that can ignite under almost all temperature conditions.
4 Materials which will rapidly vaporize at atmospheric pressure and normal temperatures, or are readily dispersed in air and which burn readily.

Flammability Data

values are approximate	bp, °C (1 atm)	flash pt, °C	explosive limits % v/v	PEL	Flam class	NFPA HFR
acetone	56	-18	2 - 13	1000	IB	
hexane	69	-7	1 - 8	500	IB	
pentane	36	-40	1 - 8	1000	IA	
heptane	98.4	-4	1 - 7	500	IB	
acetonitrile	82	2	3 - 16	40	IB	
methylene chloride	40	none	12 - 23 (>100°C)	12.5	none	
chloroform	62	none	none	**50 (C)**	none	
ethyl ether	35	-45	1 - 49	400	IA	
ethanol (absolute)	78	12	3 - 19	1000	IB	
ethanol (95%)		17	-	-	IB	
methanol	65	11	6 - 36	200	IB	
isopropyl alcohol	82	12	2 - 13	400	IB	
tetrahydrofuran	66	-21	2 - 12	200	IB	
p-dioxane	101	12	2 - 23	100	IB	
ethyl acetate	77	-4	2 - 12	400	IB	
toluene	112	4	3 - 19	200	IB	
xylenes	140	25	1 - 7	200	IB	
benzene	80	-11	1 - 8	1	IB	
dimethylformamide	158	58	2 - 15 at 100°C	10	II	
methyl ethyl ketone	80	-7	2 - 12	200	IB	

APPENDIX H

EMERGENCY RESPONSE

Westfield State University

Laboratory Incident Response and Reporting Protocol

If there is a fire, explosion, or toxic gas release:

Pull fire alarm and Evacuate Building

Contact University Police, 911, once in a safe location.

If there is an injury requiring medical attention:

Call University Police, 911, and/or Health Services. 413-572-5415

If there is a major spill:

University Police must be notified **911**. They will contact the Fire department or arrange for an outside contractor to clean up the spill. Department Chair must be notified

If there is a minor spill:

Laboratory employee can clean up the spill, if trained or
University Police can be contacted to arrange clean-up. **911**

Minor Spills

A minor spill is defined as a spill of material that does not pose an immediate significant threat to an employee's safety or the environment. If the spilled chemical is not a highly toxic material, is not spilled in large quantity, does not pose a significant fire hazard, and can be recovered before released to the environment it can be cleaned by personnel. University Police, **911**, can be called if necessary to request professional assistance. Custodians are not permitted to clean up hazardous materials from a spill.

Major Spills

A major spill is defined as a spill of material that poses a significant threat to an employee's safety or the environment. Generally, it involves a large quantity of a moderately hazardous substance, or any amount of highly toxic or particularly hazardous material, or any material that may present a fire hazard, or if the material can't be recovered before being released to the environment. No attempt should be made to clean up a major spill. Everyone in the area must be notified, the area evacuated, and University Police contacted, **911.** A meeting place must be determined at the time of the call so the caller can give details to University Police Officer(s). They will contact the Fire Department. Department Chair must be notified.

IN THE EVENT OF AN EMERGENCY NOTIFY
UNIVERSITY POLICE, 911 and/or Health Services, 413-572-5415
Obtain a copy of the SDS

Westfield State University

LABORATORY INCIDENT REPORT

Form must be submitted to EH&S and Department Chair within 48 hours

List the location of the incident: (Building and room number or other location)

Date and Time Incident Occurred:

Describe WHAT was being done at the time of the incident, HOW the incident occurred, and what PPE was used amount of chemical if incident involved a spill/exposure.

What:_____

How:_____

PPE:_____

Was there an injury? ___Yes ___ No Name of injured person_____

Phone Number: _____

Was anyone exposed to a hazardous material? _____ If so, identify material and amount_____

Was person exposed to blood, saliva or vomit? ___ Yes ___ No If so, explain._____

Select the person's affiliation with WSU

Student_____ **Staff**_____ **Faculty**_____ **Other (explain)**_____

OVER

Reporting Person's Name and Title_____

Personal Phone #:_____ **College Phone #:** _____

Department _____ **Supervisor** _____

Description of ANY action taken in response to the incident when it occurred:

Campus Police contacted? __Health Services contacted? _____Facilities contacted? _____

Campus Police 413-572-5262 or x 911 * Health Services 413-572-5415 * Facilities 413-572-5278

***********DO NOT WRITE BELOW THIS LINE**********

This section is reserved for the person who conducts the follow-up investigation.

FOLLOW-UP RESULTS:

_____
_____
_____
_____
_____
_____
_____
_____

Name of Person who conducted follow-up:_____
Date this final follow up documentation is submitted for archives: _____
(Final follow up documentation should be submitted to the person(s) or department(s) to whom the original Incident Report Form was submitted.)
Name of person to whom this was submitted: _____

FIRST AID

First aid is designed to prevent further injury, or death, and relieve pain until medical aid can be obtained.

Pulmonary resuscitation and heart (cardiac) resuscitation must be performed by a trained person. Contact University Police immediately for assistance if there are no trained employees available.

Heavy bleeding is caused by injury to a blood vessel. Have the injured person lie on the floor and apply pressure directly over the wound.

If a person **faints**, lay the person on the floor. Look for emergency medical identification (around the neck or wrist). Keep the person warm.

Shock usually coincides with a serious injury. The skin is cold and clammy and the person feels weak and the breathing is shallow. Lay the person down on the floor and elevate the legs if possible. Keep the victim warm.

If a person experiences **electric shock**, do not touch the person until he/she is separated from the current source. Throw the switch to turn off the current.

For **convulsions and epileptic seizures** lay the person on the floor. Don't try to restrain the movements, except to prevent an injury.

APPENDIX I

HAZARDOUS WASTE

Hazardous waste should be kept to a minimum. This can be accomplished by various means. Reducing the amounts of chemicals purchased, limiting the amounts needed for processes, and urging others to share chemicals are good practices.

All waste bottles must have a Hazardous Waste label with the complete name on the label as well as the specific hazards. They must be placed in secondary containment in an SAA that is close to where the waste is generated.

There can only be one bottle of the same waste in any given room. Once a bottle is full, it must be marked with sign to be removed to the MAA.

Chlorinated and non-chlorinated waste should be kept separate.

Common Non-Hazardous Waste items

The following information, adapted from *Prudent Practices*, lists solid chemicals which are not considered hazardous and are therefore suitable for disposal with regular trash. However, neither custodians nor trash collectors can readily distinguish between hazardous and non-hazardous wastes. Therefore, the packaging of such waste for disposal must be secure. Use of plastic bags is an acceptable form of containment.

Organic Chemicals: Enzymes, sugars, sugar alcohols, starch, naturally occurring amino acids and salts, citric acid and its Na, K, Mg, Ca, NH_4 salts, lactic acid and its Na, K, Mg, Ca, NH_4 salts

Inorganic Chemicals: Silica, Sulfates: Na, K, Mg, Ca, Sr, NH_4. Phosphates: Na, K, Mg, Ca, Sr, NH_4. Carbonates: Na, K, Mg, Ca, Sr, NH_4. Oxides: B, Mg, Ca, Sr, Al, Si, Ti, Mn, Fe, Co, Cu. Chlorides: Ca, Na, K, Mg, NH_4. Borates: Na, K, Mg, Ca

Materials Not Contaminated with Hazardous Chemicals

Gloves, paper towels, chromatographic adsorbent, glassware, filter papers, and filter aids

APPENDIX J

CHECK-OUT PROCEDURES

Check-Out Procedures for Faculty

The purpose of the check-out procedure is to ensure that hazardous wastes, unknown chemicals, unlabeled material, or other materials are not left behind when a person leaves the College. An inspection will be conducted in advance of the person's departure.

The check-out process can be made more efficient by:

1. Making sure all chemical reagent bottles, reaction flasks, vials, waste containers, etc. are labeled appropriately. No formulas or shorthand notations are permitted.
2. Placing all properly labeled waste bottles in the SAA for removal.
3. Removing old equipment and materials.
4. Confirming that there are no chemical spills or contamination in the room.
5. Contacting the CHO in advance for advice and suggestions concerning the check-out process.
6. Contacting the CHO for an appointment for final inspection.

Appendix K

Working Alone Documents

Westfield
STATE UNIVERSITY

Research Lab Access Approval Form

Student Name _____Department _____

Student Number_____Faculty Supervisor _____

Semester and Year _____ Course Name and Number _____

1. Provide a short description of the project. Include research question(s), procedures, and materials. Provide a description of possible risks, the likelihood of those risks and the resulting potential impact. Provide a procedure to eliminate or minimize the identified risks.

2. List the equipment/instrumentation that you will be using while working in the laboratory. Provide a description of possible risks, the likelihood of those risks and the resulting potential impact. Provide a procedure to eliminate or minimize the identified risks

3. Over the course of the semester, how many days/hours will you be working in a laboratory? If there is a regular schedule, please indicate. Indicate the length of time a student may be out of contact with a faculty sponsor (i.e., the frequency of regular communications). Detail where and when working alone is permitted.

4. List methods of communication that can secure emergency assistance and how emergency assistance will be provided in the event of incidents or accidents.

5. List the forms of Personal Protective Equipment that will be used while working with materials, chemicals, or instrumentation. Be as specific as possible.

6. List restrictions on independent work related to procedure, materials, chemicals, as well as time of the day or evening or weekend.

This project will involve the use of the following: (Check all that apply at least one must be checked.)

___Human Subjects ____Radioisotopes ____Recombinant DNA ___Controlled Substances ____Vertebrate Animal ____ Hazardous Chemicals or materials

___None of the above applies to this project

I certify that, with respect to all the items checked, applicable University policies will be followed and any necessary approvals have been obtained.

I have read the Laboratory Working Alone Procedures and agree to abide by their restrictions. I have received training in the proper experimental and emergency procedures and understand those procedures for the work I am authorized to do alone. I have also read and signed the Laboratory Safety Agreement. If any changes are made to the procedures, materials, or equipment/instrumentation needed for this project, I will submit an updated Research Lab Access Approval Form and wait for approval prior to implementing those changes.

Student Signature _____ Date _____

TO BE COMPLETED BY FACULTY SPONSOR:

List the tasks and hazards involved in the work to be performed.

List the frequency of supervision, it at all.

List times will the student be allowed to work alone.

I agree to supervise this student's research project in the laboratory. By signing this form, I acknowledge the student's ability to conduct research in the lab with minimal supervision.

I have reviewed the description of this procedure, the tasks and hazards involved in the work, the consequences resulting from a worst-case scenario, the possibility of an accident or incident that would prevent the laboratory personnel from calling for help, the laboratory personnel's training and experience and the time the work is to be conducted. This procedure does not involve any particularly hazardous materials or processes. I approve this request for permission to work alone on this project.

Building and room number(s):

Restrictions on independent work:

Faculty Sponsor Signature _____ Date _____

Department Chair Signature _____ Date _____

Chemical Hygiene Officer Signature _____Date _____

Westfield
STATE UNIVERSITY

Research Lab Working Alone Guidelines

Purpose

The Working Alone guidelines are intended to promote awareness and facilitate safety when working alone. Generally, it is prudent for undergraduate students not to work alone. Exceptions may be made for low-risk work if the faculty verifies that a student fully understands normal and emergency procedures and uses all required protective equipment. Students must be trained in work and emergency procedures, including use of emergency equipment. Students can work alone in the laboratory as long as the faculty and/or staff who are responsible for the students are on campus. Students are expected to follow the safety rules and act responsibly while working alone. Failure to do so is a violation of the University policy as written in the Student Handbook under Student Conduct Regulations and Procedures. Violations will be handled through the University disciplinary procedure.

Scope

These guidelines apply to students who are registered to do independent research. No students enrolled in teaching laboratories are allowed to work alone in laboratories.

Guidelines

-Students must be enrolled in independent research for credit.
-Students must have completed the Research Lab Access Approval Form.
-Students must attend the Laboratory Safety training given by the Chemical Hygiene Officer.
-Students must have approval for working alone from the faculty.
-Experiments known to be hazardous are not to be undertaken and only low-risk procedures can be conducted while working alone.
-There are certain situations where working alone will not be permitted.

The following laboratory tasks should never be conducted when alone:

-Procedures involving particularly hazardous chemicals such as air and water reactive, explosive, acutely toxic, peroxide forming, strong corrosives, oxidizing and reducing agents, and regulated carcinogens. Also, biohazardous materials such as biosafety level 2 materials and select agents.
-Procedures involving high-pressure equipment, rotovaps, autoclaves, and HPLCs.
-Procedures involving open flames with a Bunsen burner.

The following laboratory tasks can be conducted when working alone:

-Checking on laboratory equipment or experiment.
-Performing experiments with low risk as determined by faculty.
-Cleaning or maintenance activities.

Faculty responsibilities

- Complete the faculty section of the Research Lab Access Approval Form.
-Identify risks or hazards associated with work to be performed or environment where work is to be done.
- Provide written working alone procedures in order to eliminate or minimize identified risks.
- Document when working alone is permitted and/or prohibited and ensure this is effectively communicated to all.
- Schedule potentially hazardous work for times when supervisors and appropriate help will be available.
- Faculty or designee must periodically check on students when working alone.

Student responsibilities

- Complete the Research Lab Access Approval Form.
-Participate in identifying risks or hazards with faculty.
- Follow safe work practices as determined by faculty.
- Maintain regular communication as directed by faculty.
- Only work in the laboratory when the faculty or designee are in the laboratory after normal working hours.

Chemical Hygiene Officer/Laboratory Safety Committee

- Determine student eligibility for working alone based on data from Research Lab Access Approval Form.
- Monitor applicable legislation to ensure the Working Alone policy is up to date with regulatory requirements.
- Provide consultation to faculty for development of departmental and/or site-specific working alone plans.
- Develop, modify and update as required a standard working alone procedures.
- Evaluate the effectiveness of the Working Alone procedures.

Working Alone Risk Assessments

Working alone permission will be evaluated on a case-by-case basis and will consider the following risk factors for working alone:
- Tasks and hazards involved in the work to be performed.
- Consequences resulting from a “worst case scenario”.
- Likelihood for other persons to be in the area.
- Possibility that a critical injury or incident could prevent the employee from calling for help or leaving the workplace.
- Emergency response time.
- Student’s training and experience.
- Student’s physical handicaps or any preexisting medical conditions.
- Frequency of supervision, if at all.
- The time when the work is to be done.

Supervisors shall provide written working alone safety plans for the safety and security of persons working alone. Safety plans shall include:
- Identification of the risks or hazards associated with the work to be performed or the environment where the work is to be done;
-Procedures to eliminate or minimize the identified risks (e.g., buddy systems);

- Methods of communication by which the workers can secure emergency assistance and how emergency assistance will be provided in the event of incidents or accidents.
-The length of time a worker may be out of contact with a supervisor (i.e., the frequency of regular communications);
-Confirmation where and when working alone is permitted.

Supervisors must review working alone safety plans with affected employees with particular emphasis on safe work procedures and the provision of assistance to employees at risk due to infrequent supervision, intermittent communication, or physical isolation. Completed working alone plans must be copied to the employee, department Chairs, and to EH&S. Written safety plans should be reviewed and updated, if required, at least annually.

LABORATORY SAFETY AGREEMENT

As a condition for doing experimental work in this laboratory, you are required to read and then sign a form and return it to your Professor.

I UNDERSTAND THAT I WILL:

- wear approved eye protection when appropriate.
- wear gloves when appropriate.
- wear personal protective apparel when appropriate.
- report to instructor allergy, or physical condition, that may affect lab performance.
- be properly prepared to do each experiment and will perform the experiment as directed.
- act in a responsible manner at all times.
- immediately notify the lab instructor of any injuries or spills.
- assume all chemicals are hazardous and treat them with care and respect.
- know the location and operation of eyewash and safety shower.
- wash off chemicals splashed or spilled on my body immediately for a minimum of 15 minutes.
- evacuate the building if a fire occurs.
- never wear shirts that leave stomach or back area exposed, shorts, skirts or dresses above the knee.
- always wear lab-appropriate shoes (closed toe and heel)
- tie back long hair, and not wear long, loose, or bulky clothing.
- not eat, drink, chew gum, smoke, or place writing utensils, fingers, etc. in the mouth.
- clean the lab bench, put away all equipment, reagents, and glassware at the end of lab.
- wash hands at the end of each lab.
- read container labels very carefully.
- always use appropriately labeled waste bottles, and never pour any chemicals down the drain, unless directed.
- never return unused chemicals to the dispensing bottle.
- place all broken or chipped glass in the glass only container.
- never take chemicals, supplies, or equipment from the lab area.
- not conduct unauthorized experiments.
- not use equipment with damaged cords and will notify faculty sponsor if any are found.
- not allow unauthorized people to enter the laboratory.
- will report all injuries, no matter how small.

While working alone:

- Make sure the door is locked as I leave the laboratory.
- Not work with particularly hazardous materials or procedures.
- Know how to access Safety Data Sheets.

Students may work alone during regular business hours when faculty or designee are on campus and after hours if an approved designee is also in the laboratory and A Research Lab Access Approval Form has been approved by all required individuals.

I have received and read the Safety Agreement. I acknowledge and understand the responsibilities associated with the Laboratory Safety Agreement. I understand that my access to the research laboratory maybe denied and I may fail the course if I violate this agreement.

Name (Print)	
Signature	
Faculty signature	
Date	

Westfield
STATE UNIVERSITY

Student Research Laboratory Access Checklist

Student Name _____

Student Email _____

Student ID# **A**_____

Laboratory Building and Room Number(s) _____

Time Period/Semester for Laboratory Access _____

Requirements:

1) Submission of Research Lab Access Approval Form
2) Attend Laboratory Safety Training presentation by Chemical Hygiene Officer and completed Laboratory Safety Test.
3) Read, Sign and Submit Laboratory Safety Agreement Form after individual training with faculty

Date Research Lab Access Approval Form Reviewed and Approved by :

	Name	Date
Research Adviser	_____	_____
Department Chair	_____	_____
Chemical Hygiene Officer (CHO)	_____	_____
If necessary, Laboratory Safety Committee	_____	_____

Date the Student :

Attended Laboratory Safety Training presentation _____

Completed the Laboratory Safety Test _____

Read and Signed Student Agreement Form _____

Submitted the Research Lab Access Approval Form to CHO _____

**********DO NOT WRITE BELOW THIS LINE**********

Date Work Order Submitted for Laboratory Access _____

Date Student Granted Access to Research Lab _____

Work Order Number _____