BENJAMIN M. STATLER COLLEGE OF ENGINEERING AND MINERAL RESOURCES

CHEMICAL HYGIENE PLAN

May, 2012

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CEMR CHEMICAL HYGIENE PLAN

Foreword

The protection of the safety and health of its employees, students and environment is a high priority of the Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University. On January 31, 1990, the Occupational Safety and Health Administration (OSHA) promulgated a rule related to occupational exposures to hazardous chemicals in laboratories. This rule is designed to help protect laboratory workers from the hazards of the chemicals they use.

Included in the standard is a requirement that all employers covered by the standard develop a Chemical Hygiene Plan (CHP). A CHP is a written program which sets forth work practices, equipment use and maintenance procedures, and personal protective equipment requirements that protect employees from the hazards presented by chemicals used in the lab.

According to OSHA, the CHP must include standard operating procedures, criteria for the implementation of chemical control measures, measures to ensure proper operation of engineering controls, provisions for the training of workers, provisions for medical consultation in the case of exposure, designation of responsible people in the lab, and identification of procedures for the use of particularly hazardous substances or procedures. This document satisfies this requirement, but each laboratory within the college must customize this plan or one that meets the requirements under the law to meet the needs of their individual laboratory.

It is up to each Principal Investigator , Lab Supervisor and Department Chair to supplement this plan or develop their own with more detailed information about the proper use of the particular chemicals used in their lab. These supplements may be in the form of written procedures, literature libraries, video presentations, and/or group or individual training. CHEMICAL HYGIENE PLANS WILL BE REVIEWED OR UPDATED (AS NECESSARY) ANNUALLY, then re-signed by the P.I. and dated. A record of this annual review will be kept with the CHP for inspection. The Lab Supervisors, Principal Investigators and Department Chair are responsible for the interpretation and enforcement of policies described in this CHP. The college Safety Office is available to provide technical assistance with this effort. The CEMR Safety Office is available at 293-4124 or email royce.watts@mail.wvu.edu.

This Generic CHP Plan should not be used for a lab without editing. Each lab is different and should require deletions from this plan and additions of specific hazards. Each lab is required to have its own **CHP**; or, you may have a more general one for the entire department, followed by Supplements that contain information specific to the individual principal investigator. The CHP MUST include a page listing Responsible Parties as listed below: *(See Appendix A for a template table to fill)*

Name, Office Room number, Office Phone number, cell-phone number, home phone number, and email address for each of the following:

Chair Department

Chemical Hygiene Officer (CHO)

Principal Investigator

Lab Supervisor (if any)

Lab Personnel

as well as standard operating procedures and specific hazards or precautions for that lab.

Each lab must have a **chemical inventory** which lists: Chemical Name, Amount, Manufacturer or CAS number, Room number, Location (shelf, freezer, etc.), Faculty, Department, and Date inventory was done, preferably in an EXCEL format. The inventory should be updated annually, and the CHO for the department and EH&S Office should receive an electronic version of the inventory annually.

There should be a Material Safety Data Sheet (**MSDS**) for each chemical in the lab, kept as a hard copy in the lab for the use of lab personnel.

There should be a folder or notebook available for inspection that **records the training** of all lab personnel.

These four items will be needed whenever the Safety office does a lab audit, or whenever an inspection is done by a regulatory agency. Everyone in the lab should know precisely where these four items are located.

CHEMICAL HYGIENE PLAN

Purpose

The Benjamin M. Statler College of Engineering and Mineral Resources is committed to providing a safe working environment for its faculty, staff, students and visitors. The purpose of this Chemical Hygiene Plan (CHP) is to establish a written program that provides for and supports the procedures, equipment, training, personal protective equipment, and work practices for protecting laboratory personnel from potential health hazards of using hazardous chemicals in the College laboratories. Additionally, the CHP is designed to comply with the regulations of the Occupational Safety and Health Administration (OSHA).

Scope

The College of Engineering and Mineral Resources' CHP applies to all College laboratory personnel, who handle and may be exposed to hazardous chemicals during their course of work in these laboratories. This includes labs that use small quantities of off-the-shelf hazardous chemicals in their research.

This Chemical Hygiene Plan (CHP) is intended to:

1. Inform laboratory employees of the potential health and safety hazards present in their workplace.

2. Inform laboratory employees of the precautions and preventive measures that have been established by this organization to protect employees from a workplace illness or injury.

3. Inform laboratory employees of the required safety rules and procedures established by this organization to meet the requirements of 29 CFR 1910.1450 and 29 CFR 1910.1200.

Definitions

Acutely Hazardous Materials: Substances with a high degree of acute toxicity are those that can cause death, disability, or serious injury after a single, relatively low-level exposure. Pharmaceuticals and biological substances can also present Highly Acute Hazards. The following table denotes the OSHA-defined toxicity designations, for various routes of exposures. Find the LD50 on a material safety data sheet (MSDS) or in the Registry of Toxic Effects of Chemical Substances (RTECS). Compare the LD50/LC50 to the table to determine if it is acutely toxic.

OSHA Hazard Designation	Oral LD50 (rats, mg/kg)	Skin Contact LD50* (rabbits, mg/kg)	Inhalation LC50* (rats, ppm for 1 hr)
Highly toxic	<50	<200	<2000 ppm

*. LD**50**- value is the amount of a solid or liquid material that it takes to kill 50% of test animals (for example, mice or rats) in one dose.

*. LC**50**- The concentration of the chemical in air that will kill 50% of the test animals exposed to it.

Chemical Hygiene Officer is defined as an employee designated by the departmental chairperson, who is qualified by training and experience, to provide technical guidance in the development and implementation of the written Chemical Hygiene Plan.

Chemical Hygiene Plan means a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace.

Combustible liquid means any liquid having a flashpoint at or above 100 deg. F (37.8 deg. C), but below 200 deg. F (93.3 deg. C), except any mixture having components with flashpoints of 200 deg. F (93.3 deg. C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

Compressed gas means:

(i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 deg. F (21.1 deg. C); or

(ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 deg. F (54.4 deg C) regardless of the pressure at 70 deg. F (21.1 deg. C); or

(iii) A liquid having a vapor pressure exceeding 40 psi at 100 deg. F (37.8 C) as determined by ASTM D-323-72.

Designated area means an area which may be used for work with "select carcinogens," reproductive toxins or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood.

Emergency means any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the workplace.
Employee means an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

Explosive means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

Flammable means a chemical that falls into one of the following categories:

(i) **Aerosol, flammable** means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame protection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

(ii) **Gas, flammable** means:

(A) A **gas** that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or

(B) A **gas** that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit.

(iii) **Liquid, flammable** means any liquid having a flashpoint below 100 deg F (37.8 deg. C), except any mixture having components with flashpoints of 100 deg. C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.

(iv) **Solid, flammable** means a solid, other than a blasting agent or explosive as defined in § 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

Flashpoint means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested.
By OSHA definition, a **hazardous chemical** is a chemical for which there is statistically significant evidence, based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. This standard does not apply to laboratory chemicals that have no potential threat upon employee exposure (i.e., dip-and-read tests).

By OSHA definition, a **hazardous chemical** is a chemical for which there is statistically significant evidence, based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. This standard does not apply to laboratory chemicals that have no potential threat upon employee exposure (i.e., dip-and-read tests).

A **laboratory** is defined as a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory scale means work with substances in which the containers used for reactions, transfers, and other handlings of substances are designed to be easily and safety manipulated by one person.

Laboratory Supervisor is defined as the person who oversees the day-to-day operation of the research laboratory.

Laboratory use of hazardous chemicals means handling or use of such chemicals in which all of the following conditions are met:

- Chemical manipulations are carried out on a "laboratory scale;"
- Multiple chemical procedures or chemicals are used;
- The procedures involved are not part of a production process, nor in any way simulate a production process; and
- "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

A **laboratory worker** is defined as an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

Principal Investigator or Project Director is defined as an academic staff member whose project is being sponsored and who is responsible for directing the research and for ensuring that all terms and conditions of a sponsored agreement are met.

Reproductive toxins means chemicals which affect the reproductive chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

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

(i) It is regulated by OSHA as a carcinogen; or

(ii) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP)(latest edition); or

(iii) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for research on Cancer Monographs (IARC)(latest editions); or

(iv) It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

(A) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m(3);

(B) After repeated skin application of less than 300 (mg/kg of body weight) per week; or

(C) After oral dosages of less than 50 mg/kg of body weight per day.

Roles and Responsibilities

Dean and Directors

- Assumes responsibility for departments engaged in the laboratory use of hazardous chemicals and appoints one or more Chemical Hygiene Officer(s) (CHO) for each department or unit.
- Provides the Chemical Hygiene Officers with the support necessary to implement and maintain their Chemical Hygiene Programs.
- Ensures that each department remains in compliance with the departmental and CEMR CHP.
- Provides budgetary arrangements to ensure the health and safety of the employees of the college.

Department Chairperson

- Assumes responsibility for personnel engaged in the laboratory use of hazardous chemicals.
- Provides the Chemical Hygiene Officer with the support necessary to implement and maintain the Chemical Hygiene Plan.
- Ensure that the department remains in compliance with the departmental and College CHP.
- Provides budgetary arrangements to ensure the health and safety of the departmental employees, visitors, and students.

Laboratory Supervisor

- Ensures that laboratory workers comply with the CHP and do not operate equipment or handle hazardous chemicals without proper training and authorization.
- Always wears personal protective equipment that is compatible to the degree of hazard of the chemical.
- Follows all pertinent safety rules when working in the laboratory to set an example for his or her supervisees.
- Reviews laboratory procedures for potential safety problems before assigning to other laboratory workers.
- Ensures that visitors follow the laboratory rules and assumes responsibility for the laboratory visitors.
- Keeps informed of current regulations and changes regarding the OSHA Laboratory Standard.
- Ensures that personal protective equipment is available and properly used by the laboratory employee.
- Maintains and implements safe laboratory practices.
- Monitors the facilities and the hoods to ensure that they are maintained and function properly. Contacts the appropriate person, as designated by the Department Chairperson, to report problems with the facilities or the hoods.

Chemical Hygiene Officer (CHO)

- Establishes and maintains a departmental CHP and laboratory-specific CHPs that will provide a safe and healthy environment in which to teach and learn.
- Ensures CHP compliance of employees.
- Serves on the Departmental Safety Committee
- Obtains funding for safety-related purchases or training, as appropriate.
- Monitors procurement, use, storage, and disposal of chemicals.
- Conducts regular inspections of the laboratories and prep rooms.
- Maintains inspection, personnel training, and inventory records.
- Assists laboratory supervisors in developing and maintaining adequate facilities.
- Keeps current of legal requirements concerning regulated substances.
- Seeks ways to improve the chemical hygiene program.
- Ensures that employees receive appropriate training and information regarding the chemical hazards in their work area. Training and information shall be provided at the time of an employee's initial assignment to a work area and prior to assignments involving new exposure situations. The frequency of refresher information and training shall be determined by the CHO.
- Notifies employees of the availability of medical attention under the following circumstances:
    - Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory.
    - Where exposure monitoring reveals an exposure level routinely above the action level for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements.
    - Whenever a spill, leak, explosion, or other occurrence resulting in the likelihood of a hazardous exposure occurs, the employee may have a medical consultation to ascertain if a medical examination is warranted.
    - If medical attention is necessary, the CHO provides the attending physician the identity of the hazardous substance to which the employee may have been exposed; a description of the conditions under which the exposure occurred; and the signs and symptoms that the employee may be experiencing.
- The CHO will notify affected employees in writing of any monitoring results either individually or by posting results in an appropriate location accessible to employees. This information shall be distributed within five working days upon receipt of the results from the Department of Environmental Health and Safety.
- Attends annual CHO training that is conducted by the institution.
- Encourages laboratory employees to attend specialized training that is provided by the institution (i.e., first-aid training, fire extinguisher training, and gas cylinder training).

CEMR Safety Officer

- Monitors and assists in the implementation of the CEMR Chemical Hygiene Plan.
- Reviews the CEMR CHP annually and revises as necessary.
- Provides general laboratory safety training to employees.
- Provides technical assistance to laboratory employees regarding chemical handling, storage, use, and disposal.
- Conducts exposure assessments upon request.
- Maintains environmental monitoring and employee exposure records. Submits monitoring results to the Dean/Director.
- Audits the Chemical Hygiene Plan, chemical inventory, and MSDS records in each department on an annual basis.
- Provides annual laboratory inspections to ensure compliance with the CEMR Chemical Hygiene Plan.
- Provides technical assistance regarding personal protective equipment and safety equipment.
- Provides technical assistance to employees to ensure code compliance.
- Maintains a comprehensive library of safety reference materials.
- Oversees the development of and subsequent revisions of departmental Chemical Hygiene Plans, chemical inventories, emergency plans, and chemical waste disposal plans.
- Conducts laboratory inspections and submits detailed inspection reports to the Department Deans, Directors, and Chairs.
- Coordinates Chemical Hygiene Officer training for the college.

Laboratory Employee

- Reads, understands, and follows all safety rules and regulations that apply to the work area.
- Plans and conducts each operation, laboratory class, or research project in accordance with the departmental and institutional CHP.
- Promotes good housekeeping practices in the laboratory or work area.
- Communicates appropriate portions of the CHP to students in the work area.
- Notifies the supervisor of any hazardous conditions or unsafe work practices in the work area.
- Uses personal protective equipment as appropriate for each procedure that involves hazardous chemicals.
- Immediately reports any job-related illness or injury to the supervisor.

Training and Information

It is essential that laboratory employees have access to information on the hazards of chemicals and procedures for working safely. Supervisors must ensure that laboratory employees are informed about and have access to the following information sources:

- The contents of the OSHA lab standard, **Occupational Exposure to Hazardous Chemicals in Laboratories**, and its appendices (29 CFR 1910.1450). This is available in Appendix E or at http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10106
- The **Chemical Hygiene Plan** for the individual laboratory which includes standard operating procedures.
- The **Permissible Exposure Limits** (PEL) for OSHA regulated substances if used in the laboratory.
- **Material safety data sheets** (MSDS) for laboratory chemicals. MSDSs should be located in a known and accessible location within the laboratory. The location should be clearly indicated, and all MSDS's should be maintained at the same location. Departments that receive MSDSs directly with chemical shipments will make such information available to the employees using the chemicals. MSDS collections can also be located online through the "LINKS" selection on the EH&S home Web page at http://ehs.wvu.edu/hazardous_materials
- Specific safety rules, policies and procedures and regulations that apply to their individual labs.
- Training will take place upon initial employment and when work processes change.
- Training will be documented and maintained by the Laboratory Supervisor. This should include **for each laboratory worker:**
    - A record of any training completed by lab workers such as workshops, fire safety, gas cylinder usage, etc.
    - The completed and signed form "Certificate of Laboratory Training" included in Appendix G.

Criteria for Implementation of Control Measures

General Criteria

This Chemical Hygiene Plan is intended to limit laboratory workers' exposure to OSHA-regulated substances. Laboratory workers must not be exposed to substances in excess of the **permissible exposure limits** (PEL) specified in OSHA rule 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances or **Threshold Limits Values** (TLV) set by the American Conference of Governmental Industrial Hygienists. PELs refer to airborne concentrations of substances and are averaged over an eight-hour day. A few substances also have "action levels". **Action levels** are air concentrations below the PEL which nevertheless require that certain actions such as medical surveillance and workplace monitoring take place.

Guidance: *Pay particular attention to the following paragraph.* ***If you, as a lab supervisor or Chemical Hygiene Officer, suspect exposure concentrations exceed allowable levels,*** *please contact the CEMR Safety Office (3-4124) or EH&S office (3—3792) for technical assistance.*

An employee's workplace exposure to any regulated substance must be monitored if there is reason to believe that the exposure will exceed an action level or a PEL. If exposures to any regulated substance routinely exceed an action level or permissible exposure level, **control measures must be implemented.**

A. Professional Judgment

The lab supervisor can use **professional judgment** to assess the nature of chemical exposure resulting from a lab procedure and prescribe engineering controls and personal protective equipment to be used during the procedure. This judgment will be documented through use of Standard Operating Procedures and Laboratory Chemical Safety Rules written for the chemicals in use.

B. Air Sampling

Air sampling for evaluating employee exposure to chemical substances shall be **conducted on an as needed basis** (to be determined by the lab supervisor). Conduct air sampling if there is reason to believe that exposure levels for regulated substances that require sampling routinely exceed the action level, or in the absence of an action level, the PEL.

Air sampling will be conducted according to established industrial hygiene practices. It may be conducted by **EH&S staff or outside consultants.** The results of air sampling studies performed in the laboratory should be sent to the *CEMR Safety Office for records maintenance*.

Criteria for Implementation of Specific Control Measures

Engineering controls, personal protective equipment, hygiene practices, and

administrative controls each play a role in a comprehensive laboratory safety program. **Implementation of specific measures must be carried out on a case-by-case basis, using the following criteria for guidance in making decisions.**

A. When to Use Fume Hoods

The **laboratory fume hood** is the major protective device available to laboratory workers. It is designed to capture chemicals that escape from their containers or apparatus and to remove them from the laboratory environment before they can be inhaled. Characteristics to be considered in requiring fume hood use are **physical state, volatility, toxicity, flammability, eye and skin irritation, odor, and the potential for producing aerosols**. A fume hood should be used if a proposed chemical procedure exhibits any one of these characteristics to a degree that

(1) airborne concentrations might approach the **action level** (or permissible exposure limit),
(2) **flammable** vapors might approach one tenth of the lower explosion limit,
(3) materials of unknown **toxicity** are used or generated, or the **odor** produced is annoying to laboratory occupants or adjacent units.

Procedures that can generally be carried out safely outside the fume hood (depending on the capacity of the general ventilation system to remove any airborne contaminants) include those involving:

(1) **water-based solutions** of salts, dilute acids, bases, or other reagents,
(2) **very low volatility** liquids or solids,
(3) **closed systems** that do not allow significant escape to the laboratory environment, and
(4) **extremely small quantities** of otherwise problematic chemicals.

The procedure itself must be evaluated for its potential to increase volatility or produce aerosols.

B. When to Use Safety Shields or Other Containment Devices

Safety shields, such as the sliding sash of a fume hood, are appropriate when working with highly concentrated acids, bases, oxidizers or reducing agents, all of which have the potential for causing sudden spattering or even explosive release of material. Reactions carried out at non-ambient pressures (vacuum or high pressure) also require safety shields, as do reactions that are carried out for the first time or are significantly scaled up from normal conditions.

Other containment devices, such as **glove boxes or vented gas cabinets**, may be required when it is necessary to provide an inert atmosphere for the chemical procedure taking place, when capture of any chemical emission is desirable, or when the standard laboratory fume hood does not provide adequate assurance that overexposure to a hazardous chemical will not occur. The presence of biological or radioactive materials may also mandate certain special containment devices.

Local exhaust ventilation may be required for equipment that exhausts toxic or irritating materials to the laboratory environment.

Ventilated chemical storage cabinets or rooms should be used when the chemicals in storage may generate toxic, flammable or irritating levels of airborne contamination.

C. When to Use Personal Protective Equipment

Laboratory supervisors or CHOs shall designate areas, activities, and tasks requiring specific types of personal protective equipment. Protective equipment (especially masks and gloves) shall not be worn in public areas, in order to prevent the spread of chemical or biological contamination from laboratory areas, and to avoid alarming other personnel in the facility when using public areas within the facility, such as elevators or restrooms.

Eye Protection

Eye protection is required for all personnel and any visitors whose eyes may be exposed to chemical or physical hazards. Side shields on safety spectacles provide some protection against splashed chemicals or flying particles, but goggles or face shields are necessary when there is a greater than average danger of eye contact. A higher than average risk exists when working with highly **reactive chemicals, concentrated corrosives, or with vacuum or pressurized glassware systems.**

Protective Clothing

Lab coats or other similar clothing protectors are strongly recommended for all laboratory personnel. **Lab coats are required when working with select carcinogens, reproductive toxins, substances which have a high degree of acute toxicity, strong acids and bases,** and any substance on the OSHA PEL list carrying a "skin" notation.

Bare feet, sandals, open-toed shoes cloth shoes, and clogs are not allowed in any laboratory and **are not permitted in any situation where lab coats or gloves are required.**

Gloves

Gloves made of appropriate material are required to protect the hands and arms from thermal burns, cuts, or chemical exposure that may result in absorption through the skin or reaction on the surface of the skin. Gloves are also required when working with particularly hazardous substances where possible transfer from hand to mouth must be avoided.

Gloves should be carefully selected using guides from the manufacturers. General selection guides are available; however, glove resistance to chemicals will vary with the manufacturer, model and thickness. Therefore, review a glove-resistance chart from the manufacturer you intend to buy from, before purchasing gloves. Special gloves (usually orange in color) are needed when handling hot material, such as autoclaved items. Under no circumstances should household ‘oven mitts’ be used for this purpose, or any glove

which is damaged to the point of having holes that expose skin. Special gloves are also needed when handling cryogenic material such as dry ice or liquid nitrogen. These gloves are usually blue in color, and MUST BE DRY to avoid having the gloves adhere to skin once they become cold.

Respiratory Protection

Respiratory protection is generally **not necessary** in the laboratory setting and must not be used as a substitute for adequate engineering controls. Availability of respiratory protection for emergency situations may be required when working with chemicals that are highly toxic and highly volatile or gaseous. If an experimental protocol requires exposure above the action level that cannot be reduced, respiratory protection will be required. All use of respiratory protective equipment is covered under **the WVU Respiratory Protection Program.**

Management of Engineering Controls

The **engineering controls** installed in the laboratory are intended to **minimize employee exposure** to chemical and physical hazards in the workplace. These controls must be maintained in **proper working order** for this goal to be realized.

No modification of engineering controls will occur **unless testing** of the modification indicates that worker protection will continue to be adequate. **Improper function** of engineering controls must be reported to the lab supervisor immediately. The system shall be taken **out of service** until proper repairs have been executed.

Local Exhaust Ventilation

The following procedures shall apply to the use of local exhaust ventilation:

- Openings of local exhaust will be as **close as possible** to the source of the contaminants.
- Local exhaust fans shall be **turned on** when exhaust hoods are being used.
- **After using** local exhaust, operate the fan for an **additional** period of time sufficient to clear residual contaminants from the ductwork.
- The ventilation system shall be **inspected annually** by the Facilities Management (293-HELP, 293-4357).
- Prior to a change in chemicals or procedures, the adequacy of the available ventilation systems shall be determined by the lab supervisor.

Laboratory Hoods

- Laboratory hoods will be inspected on a regular basis by the EH&S Office. Hood face velocity should be 90-120 linear feet per minute. Always check that the hood is functioning before use. If there is doubt about the flow in the hood, call the EH&S Office (293-3792) for measurement of the flow. Work orders for hoods that are not functioning correctly should be submitted to Facilities Management (293-Help, 293-4357) by the CEMR Coordinator of Facilities (293-4091); this is the responsibility of the department or the P.I. of the laboratory.
- Prior to the introduction of new chemicals, the adequacy of hood systems available shall be determined by the lab supervisor.
- **Ductless fume hoods** recirculate exhaust air through filters back into the room. Therefore, they cannot be used for volatile toxic materials and should be posted as "**Not for use with toxic materials**."
- Laboratory procedures involving hazardous chemicals must not be started if there is a possibility that the ventilation system cannot handle the gas or vapor emissions from the procedure.
- General ventilation provides a source of breathing air and a source for make-

up air for local ventilation devices.

- The laboratory ventilation should have a performance level of 10-20 room changes per hour. An inadequate ventilation system can cause an increased risk by creating a false sense of security in the laboratory.
- There should be 2.5 linear feet of hood space for each worker who spends the majority of his or her time working with hazardous chemicals.
- General ventilation in the laboratory must be consistent with the ANSI Standard, Z9.5-1992 "*Laboratory Ventilation"*. Laboratory air must not be re-circulated.

Chemical Storage Cabinets

Storage cabinets for flammable and hazardous chemicals will be **ventilated** as needed. They will be provided with a **spill containment** system appropriate to the chemicals stored in them. *For more information on chemical storage cabinets' selection see Appendix F*.

Biosafety Cabinets, Glove Boxes and Isolation Rooms

The exhaust air from a biosafety cabinet, glove box or isolation room will pass through scrubbers, HEPA filters, or other treatment before release into the regular exhaust system. **Biosafety cabinets** will be certified annually and each time they are moved. This certification is arranged by the department or principal investigator through any of the NSF accredited field certifiers for biological safety cabinets. This list can be found at

http://www.nsf.org/Certified/Biosafety-certifier/Listings.asp

Two vendors that often do this certification for West Virginia University are

ENV Services, Inc. Hatfield, PA 1-800-883-3681

Filtech, Inc., West Homested, PA 412-461-1400

The vendor information is provided for your convenience, and does not constitute an endorsement by West Virginia University of any vendor.

Cold Rooms and Warm Rooms

Temperature control rooms (cold or warm rooms) generally do not have fresh air ventilation. **Do not** use volatile chemicals in them. Also note that liquid nitrogen stored in these rooms can displace oxygen and cause oxygen deficient conditions.

Emergency Equipment

Eye washes will be inspected monthly by the CEMR Safety Office. This will ensure that the eye wash is working, and that the water is clean, should emergency use become necessary. A record of the testing including date and signature of the tester will be attached to the Eye wash. A copy of the inspection will be maintained in the eyewash

inspection folder located in the CEMR Safety Office.

Fire extinguishers are checked **monthly.**

Safety Showers will be inspected on a regular basis by the EH&S Office, and a record of the inspections will be attached to the shower.

First Aid Kit should be checked **quarterly** by the Lab Supervisor**;** *use the checklist in Appendix H*. Make sure that all the lab users are familiar with the content of the first aid kit and their uses; *Refer to the first aid content document in Appendix H*.

- *Do not use any medication if you are or suspect you are allergic to that medication or its content.*
- *Familiarize yourself with the content of the kit for better and faster response in case of emergency.*
- *Add any items in the first aid kit to the checklist if not already there.*
- *First Aid Kit shall be inspected quarterly for content and expiration date by lab supervisor.*
- *Expired items shall be treated as a waste and disposed properly.*
- *For supplies, contact the CEMR Safety Office.*

Standard Operating Procedures for Laboratory Chemicals

Standard Operating Procedures (SOPs) are **generally accepted practices** for use of chemicals in particular situations. These SOPs can be overridden in specific instances when appropriate. It is advisable to document the reasons for such modifications. When SOPs are not available for a specific lab situation, the lab supervisor and principal investigator/director will develop them, in consultation with the references cited at the end of this document.

A. Controlling Chemical Exposure

Each laboratory employee shall **minimize personal and coworker exposure** to the chemicals in the laboratory. General precautions which shall be followed to achieve this goal during the handling and use of all chemicals are as follows:

- A chemical mixture shall be assumed to be **as toxic as its most toxic component**. Possibilities for substitution will be investigated.
- Never taste or smell chemicals in the laboratory.
- Laboratory employees shall be familiar with the **symptoms of exposure** for the chemicals with which they work and the precautions necessary to prevent exposure.
- **Eating, drinking, smoking, application of makeup, and handling of contact lenses are prohibited** in laboratories where chemicals are present. Hands shall be thoroughly washed after working with chemicals. Storage, handling and consumption of food or beverages shall not occur in chemical storage areas, nor refrigerators, nor with glassware or utensils also used for laboratory operations.
- Each employee shall keep the **work area clean and uncluttered**. All chemicals and equipment shall be labeled with appropriate **hazard warnings**. At the completion of each work day or operation, the work area shall be cleaned.
- **Mouth suction** for pipeting or starting a siphon is **prohibited**.
- **Skin contact** with all chemicals shall be **avoided**. Employees shall wash exposed skin prior to leaving the laboratory.
- Additional specific precautions based on the toxicological characteristics of individual chemicals shall be implemented as deemed necessary by the lab supervisor.

B. Laboratory Equipment

The following rules shall apply to the use of laboratory equipment:

- All laboratory equipment shall be used only for its **intended purpose**.
- All glassware will be handled and stored to **minimize breakage**; all broken glassware will be immediately disposed of in a broken glass container.
- All evacuated glass apparatus shall be shielded to contain chemicals and glass fragments should implosion occur.
- **Waste receptacles shall be identified** as such by signs attached to the receptacle.
- All laboratory equipment shall be **inspected** on a periodic basis and replaced or repaired as necessary.

C. Planning for Emergencies

Before work with laboratory chemicals begins, plans for various emergencies will be developed. The circumstances to be covered include fire, chemical spill, and personnel exposure. In addition, the following work practices will be observed:

- **Spill containment** will be established around areas in which more than one liter of liquid is used.
- Workers manipulating chemicals will always be in **easy communication** of other people while handling chemicals.
- **Emergency equipment** will be checked on a daily basis for unusual conditions.

Housekeeping

Housekeeping can have a large impact on the result of inspections by OSHA or EPA. A lab that is clear of slip/trip/fall hazards, has accessible aisles, correctly labeled containers, and cleared benches where materials are kept in workman-like condition makes a favorable first impression that may influence the inspector as they assess compliance in other areas.

1) Formal housekeeping and chemical hygiene inspections by the CHO will be held annually. (Informal inspections by lab personnel should be continual).
2) Hallways and stairways will not be used as storage areas.
3) Access to exits, emergency equipment and utilities, including electrical panels, should never be blocked.
4) Smoking, food, and beverages are prohibited in the laboratory at all times.
5) Good housekeeping procedures shall be conducted daily.
6) Counter tops and work benches shall be maintained clean, neat and orderly.
7) Hoods shall not be utilized for storage purposes.
8) Damaged or Chipped glassware shall not be used. Dispose of broken glass only in approved containers, not the regular trash.
9) Breakable containers shall be transported within a compatible, unbreakable, secondary container.
10) No materials shall be stored within the area eighteen inches below the plane of the laboratory sprinklers. Combustible material such as boxes shall be kept to a minimum in the laboratory.
11) Each lab will have a spill kit to handle small spills of chemicals which are not “highly hazardous”.
12) Lab coats, eye protection, face shields, gloves (including autoclave gloves and cryoprotective gloves), hearing protection, and other protective equipment shall be kept readily available for all lab personnel. Lab coats should not be laundered with household apparel.
13) Label all containers, including waste receptacles, with the contents and its approximate composition. Tops will be of a screw type and be resistant to the chemicals within. Dates will indicate when material was added to the container and the approximate amount added. No manufacturer's label shall be removed or defaced from the original container.
14) Have designated location(s) for safety shower, eye wash, fire equipment, first aid station and emergency telephone.
15) Post warning signs for areas of special or unusual hazards. These include, but are not limited to, acid storage, compressed gases, carcinogens and highly toxic or volatile materials. Carcinogen use area will be labeled with a sign stating "Designated Area."

Other college Policies for Safe Practices in Laboratories

Follow safe and prudent laboratory practices on a daily basis. This is not a short-term activity, but a continual, sincere effort.

The Federal Standard for Chemical Hygiene Plans does not address the use of BIOLOGICAL OR RADIOLOGICAL hazards; however, any hazardous chemicals used in conjunction with a BIOLOGICAL or RADIOLOGICAL substance SHALL be covered under the CHEMICAL HYGIENE PLAN.

NOTE:

Contact WVU's Radiation Safety Office at 293-3413

Contact WVU's Biohazard Safety Committee at 293-4559

All laboratory operations requiring special precautions over and above normal laboratory precautions shall be reviewed by CEMR Safety Officer (293-4124).

The OSHA Lab Standard requires that special consideration be given to use of chemicals or procedures with particular hazards. The definition of **"particularly hazardous chemicals"** is given in the OSHA lab standard. Examples of such chemicals are given in Chapter 3 of *Prudent Practices*. This consideration requires either the development of **special operating procedures or prior approval of the laboratory supervisor** as indicated by a written permit describing the conditions for the work to be done. A copy of the written permit will be submitted to the CEMR safety office prior to the use of such chemicals.

Work with Particularly Hazardous Substances

When laboratory procedures include the use of highly hazardous chemicals, **special precautions** shall be implemented as deemed necessary by the lab supervisor. These precautions will be developed for work with particularly Hazardous Substances (PHS). Per OSHA, Particularly Hazardous Substances (PHS) are **"Select" Carcinogens, Reproductive Toxins, and Highly Acute Toxins**. *See the definition section of this manual.*

For assistance, check the following fact sheets on these materials.

IARC Carcinogens List [PDF]

NTP Known Carcinogens List [PDF]

NTP Reasonably Anticipated Carcinogens List [PDF]

EPA List of Extremely Hazardous Substances

Development of these precautions will consider including the following provisions in the special procedures:

- Establishment of a **designated area** for the use of the high hazard chemicals.
- **Signage and access control** to the work area where the chemical is used.
- Special precautions such as use of **containment devices** such as glove boxes; **isolation** of contaminated equipment; practicing good laboratory **hygiene**; and **prudent transportation** of very toxic chemicals.
- **Planning** for accidents and spills.
- Special **storage and waste disposal** practices.

Prudent Practices provides detailed recommendations for work with particularly hazardous substances.

Pre-approval of Particularly Hazardous Work

A **permit system** shall be utilized for all laboratory activities which do not follow standard or special operating procedures and which thus require preapproval by the laboratory supervisor. These activities include **off-hours work, sole occupancy of lab** and **unattended operations**. The toxicity of the chemicals used, the hazards of the procedures to be done, and the knowledge and experience of the laboratory workers must be considered in deciding which work will be allowed with pre-approval.

Off-Hours Work Procedures: Laboratory personnel are not permitted to work after hours in the lab, except when permit conditions are met.

Working Alone: Work shall not be performed in the laboratory when the only person in the room is the laboratory person performing the work. Under unusual conditions, crosschecks, periodic security guard checks, or other measures may be taken as established by a permit.

Unattended Operations: When laboratory operations are performed which will be unattended by laboratory personnel (continuous operations, overnight reactions, etc.), the following procedures will be employed:

- An appropriate **permit** will be written and posted.
- A **sign** will be posted at all entrances to the laboratory.
- The overhead lights in the laboratory will be left on.
- Precautions shall be made for the **interruption of utility service** during the unattended operation (loss of water pressure, electricity, etc.).
- The person responsible for the operation will return to the laboratory at the conclusion of the operation to assist in the **dismantling** of the apparatus.

Standard Operating Procedures (SOP's) Guidelines

READ AND REVIEW MSDSs AND CONTAINER LABELS BEFORE USING ANY MATERIALS FOR THE FIRST TIME

OSHA does not have specific requirements for SOP content. The following elements shall be considered in SOP development, but supervisors should expand on as appropriate. Lab supervisors are responsible for *editing, or augmenting* these SOP's as necessary given their local usage conditions. If a particular procedure below cannot be feasibly followed, then alternative techniques that offer equivalent protection should be documented herein. While this broad SOP is for PHS as a whole, supervisors should develop SOPs for specific PHS, or classes of related PHS, if necessary for adequate worker safety.

Safety considerations will be included in initial experimental design. The CHP SOP's will be followed for hazardous chemicals used in the laboratory when its use poses a potential hazard to laboratory personnel. All carcinogens, reproductive toxins, highly toxic and toxic gases, unstable compounds that may explode, pyrophoric materials, and highly toxic liquids and solids require development of an SOP even for a single event due to hazards to personnel.

Elements to be addressed when designing experiments or procedures are:

- Material hazards
- Availability of alternative safer materials
- Engineering controls
- Personal protective equipment (PPE) required
- Spill or release potential and possible consequences
- Other special considerations such as extreme reactivity

SOP's may be developed by:

- Process, such as distillation, peptide synthesis
- Each hazardous chemical, such as cyanogen bromide
- Class of hazardous chemicals, such as organic solvents or peroxidizable chemicals
- By any other reasonable approach that addresses the health and safety concerns of the experiment

SOP elements may be addressed in the laboratory notebook as part of the experiment or process description, or using the format provided on the SOP form in Appendix (B). Elements 1 through 10 below should be addressed for each process, class of chemicals, or individual chemical, involving **"particularly hazardous substances"**.

1. Process or Experiment: State the process or type of process that involves the use of hazardous chemicals.
2. Hazardous Chemicals/Class of Hazardous Chemicals: State hazardous chemicals used or hazardous by-products or reaction products produced.

3. Personal Protective Equipment (PPE): State the personal protective equipment selected and required and any hygiene practices.

   Use of PHS shall, whenever feasible, employ the following:

   - **Protective eyewear** such as approved safety glasses, goggles or face shields. The latter should be used when handling corrosives in large quantities (e.g. > 1 gallon).
   - **Lab coats**, particularly when using PHS that are readily absorbed through the skin, or are corrosive to skin tissue.
   - **Lab gloves** which are chemically-resistant to the particular material. Note that some common carcinogens such as dichloromethane and benzene readily permeate common lab gloves such as neoprene and nitrile.
   - All **respirators**, other than dust masks, must be issued and approved by EH&S to meet OSHA requirements.

4. Engineering/Ventilation Controls: Describe any specific engineering controls which are required to prevent employee exposures to hazards such as fume hoods, fume hoods glove boxes, biosafety cabinets, pressure relief valves, leak detection systems, auto-shut off valves, interlocks on equipment, explosion shielding, ultraviolet light shielding, and safety features on equipment.
   - Volatile, or dust/aerosol-producing PHS must be used in a **fume hood, glove box, ducted biosafety cabinet, or EH&S-evaluated snorkel exhaust**. Use on the open bench is prohibited except when it is impractical (i.e. equipment will not fit in hood), in which case other controls (e.g. respirator) must be employed.
   - When used outside of the above containment devices, containers must be sealed. Note that the use of volatile PHS such as formalin, dichloromethane and benzene on an open lab bench, in open containers, would probably result in worker exposures above the OSHA legal/safe limits for such materials.

5. Special Handling Procedures and Storage Requirements: Describe special storage requirements (e.g., special containment devices, etc.). Describe safe methods of transporting chemicals, such as double containment. PHS must be stored in completely-sealed containers. Although hood storage of chemicals is generally discouraged, volatile PHS can be stored in a fume hood if deemed necessary.

6. Spill and Accident Procedures: Describe any special procedures for spills or releases (e.g., neutralizing agents, use fluorescence to detect materials). Indicate how spills or accidental releases should be handled and by whom. Spills of PHS must be completely cleaned up. Spills that cannot be safely and completely handled by lab personnel must be reported to EH&S for assistance.

7. Waste Disposal: Describe any special disposal procedures for these chemicals/processes. Like all chemical wastes, disposal of PHS must be done through EH&S. No PHS, or other chemical wastes can go into the sewer system, trash or be allowed to freely evaporate.

8. Approval Required: Indicate if and when an approval form from the lab supervisor is required.

9. Decontamination: Discuss any specific decontamination procedures for equipment and glassware or areas.

10. Designated Area: Indicate the designated area for work with this chemical or process. A designated area must be established for work with "particularly hazardous substances". The entire laboratory, fume hood, or a portion of the laboratory may be considered as a designated area.

Chemical Procurement

All substances should be received in a central location.

Stockrooms/Storerooms

1.) Rooms specifically designated for chemical storage, handling and/or utilization areas such as preparation rooms, storerooms, waste collection rooms, storage bunkers, or chemical laboratories are **controlled access areas**. They are not to be entered by the general public. These rooms will not be used as meeting areas, lecture halls (except for pre lab lectures which outline procedures and safety precautions before a laboratory class) or public group demonstrations, displays and/or gatherings. (Appropriate lecture demonstration classrooms are available for that purpose). Tour groups are not to enter these areas. Children are not to enter these areas.
2.) Access keys to these areas should be carefully monitored and issued to as small a number of people as possible.
3.) Toxic chemicals will be segregated in a well-identified area with adequate local exhaust ventilation.
4.) Chemicals that are highly toxic or liquid containers that have been opened will be in unbreakable secondary containers.

Distribution

1.) If chemicals are to be hand carried, the chemicals should be placed in another container or a bucket.

2.) Chemicals may be transported on carts. Liquid chemicals should be transported on carts made of non-reactive plastic. These carts should have trays of single piece construction at least 2" deep. These trays will contain any spill that may occur. Liquid bottles will be kept separated or insulated by plastic foam or cardboard that will be placed between the bottles. Liquids should never be transported in basket type carts or in carts whose shelves would allow leakage of spilled liquid.

3.) Do not over fill carts.

4.) Solids may be transported in any type cart, except the oven basket type.

5.) Gas cylinders

- Must be installed and leak tested by lab personnel who are trained to connect the cylinder properly.
- Must be secured in an upright position at all times.
- Must be capped when not in use.
- Must be fully labeled including cylinder content and status (full, empty, or in-service)
- Must be used with a compatible regulator and other auxiliary equipment. Assure all threads match those on the cylinder valve outlet.
- Must be moved in special carts that secure them from falling during transport.

6.) When transporting chemicals to or from a separate outdoor storage facility, there will be appropriate ramps installed to provide proper access. Carts are NEVER to be carried over obstructions.

Storage

1.) Storage of chemicals on bench tops or inside hoods is NOT PERMISSIBLE. Temporary storage is just that --Temporary.
2.) Amounts of materials on hand will be kept to the minimum commensurate with their usage. All chemicals should be dated upon receipt.

Equipment and Glassware

1.) Handle and store laboratory glassware with care. DISCARD BROKEN OR DAMAGED GLASSWARE.
2.) Take extra precautions when using Dewar flasks; shield or wrap them to contain implosions.
3.) Use the laboratory equipment for its intended use only.
4.) Dispose of damaged/unwanted glassware in accordance with associated hazards; sharps and chemical. Glassware Waste Containers shall be available when needed.

Exiting the Laboratory

Wash exposed areas of skin thoroughly before leaving the laboratory. Do not wear lab gloves and coats outside of the laboratory.

Horseplay

Practical jokes or other behaviors that might confuse or distract another laboratory worker are prohibited.

Mouth Suction

Do not use mouth suction for pipetting or starting a siphon.

Personal Apparel

Confine long hair and loose clothing.

Wear closed toed shoes made of a non-woven material with non-slip soles. Do not wear perforated shoes or sandals

Shorts are prohibited; lab workers should wear clothing that covers exposed arms and legs while working in the lab.

Personal Housekeeping

Keep work areas clean and uncluttered. Properly label chemicals and equipment for use and storage. Repair or replace any damaged labels immediately.
Clean up work areas at the end of the operation or day.

Personal Protection

Ensure that appropriate (ANSI approved) eye protection is worn by all persons (including visitors) where chemicals are used or stored. NOTE: Supervisor may help employees choose the appropriate eye protection such as using goggles for liquid hazards, etc. Standard prescription eyeglasses are not sufficient.
Wear appropriate gloves when handling toxic materials. Inspect gloves upon usage. NOTE: Supervisor may help employees choose their gloves based on chemical incompatibilities.
Contact lenses are strongly discouraged, because they absorb fumes and make washing the eye area after chemical exposure difficult.

Planning for Laboratory Operations

Plan appropriate protective procedures, and plan the positioning of all equipment before beginning any operation.

Seek information and advice about the hazards of the chemicals to be used. (read the MSDS)

Unattended Operations

Leave lights on and post a sign on the door announcing an unattended operation.

Provide for containment of toxic substance release in case of equipment or utility failure.

Notify the laboratory supervisor about the unattended operation.

Doors should be posted with emergency numbers.

Use the hood when working with any volatile substance.

Keep hoods closed except when apparatus adjustments are being made.

Be alert to unsafe conditions anywhere in the college and report them to the Chemical Hygiene Officer or designee when detected.

USE OF HOOD:

Use the hood for operations that may result in release of toxic chemical vapors or dust. As a rule of thumb, use a hood or other local ventilation device when working with any appreciably volatile substance with a Threshold Limit Value (TLV) of less than 50 ppm. Confirm adequate hood performance before use; keep hood closed at all times except when adjustments within the hood are being made; keep materials stored in hoods to a minimum and do not allow them to block vents or air flow. Leave the hood "on" when it is not in active use if toxic substances are stored in it or if it is uncertain whether adequate general laboratory ventilation will be maintained when it is "off". Always have a contingency plan in the event of hood failure. Do not store chemicals or wastes in a fume-hood. (See also section on Fume Hood Performance).

AWARENESS:

Be alert to unsafe conditions and see that they are corrected when detected. All visitors should be supervised by laboratory personnel. Unescorted visitors should be asked to leave the area.

WORKING ALONE:

Avoid working alone in a building. Prior approval from the Principal Investigator/Supervisor is required before working alone in a laboratory.

WORKING ALONE IN THE LABORATORY SHOULD BE AVOIDED IF AT ALL POSSIBLE.

Chemical Hazardous Waste Disposal

a. Contact Environmental Health and Safety for Hazardous Waste Management and Disposal Procedures (293-3792), or view the on-line information at http://www.wvu.edu/~ehs/hazwastprog.pdf
b. You may submit Hazardous Waste Pickup Forms at http://fisehs.wvu.edu/haswastdisp.cfm or fill out the form located in the Appendix of this document and mail.
    - Deposit chemical waste in an appropriately labeled receptacle which is labeled with the percentage of each component and with any special precautions to use with that container, e.g., "open only in hood".
    - Do not pour chemicals down any drain;
    - Do not pour any substance down the drain which might interfere with the biological activity of waste water treatment.
    - Do not throw empty containers of chemicals in the regular trash unless they have been rinsed of any contamination. If the chemical is highly hazardous, dispose of empty container in hazardous waste.

Chemical Spills, Releases and Accidents

IN CASE of SPILLS

A written spill and evacuation policy should be established. The lab workers' response will depend on the **size of the spill and its hazards.**

Small Spills

In general, the laboratory shall be held responsible for cleaning up **small** chemical spills (one liter or less) **IF** the material is not "Extremely Hazardous", using the chemical spill kits provided by the EH&S Office. Training video is provided by the EH&S at:
http://www.youtube.com/watch?v=Dtp9vT15qIs

Large Spills

For large spills or spills of highly hazardous material, **evacuate** the area and **notify your supervisor and EH&S office** to report the spill in case the incident happened during the **normal working hours**. In Case the incident happened **after the normal working works, notify your supervisor and the Department of Public Safety (DPS) at 3-4332**. This will allow them to alert the Fire Department to send the Morgantown HAZMAT team. Wait in a safe area for the HAZMAT team to arrive to provide specific information about the spill.

Material used in a chemical spill cleanup shall be disposed of through the Hazardous

Waste Disposal policy (call 293-3792, EH&S). Complete the form in Appendix C for the hazardous waste and submit to the EH&S office.

For small or large spills, complete the **Environmental Health and Safety Spill Response Notification Form** located in Appendix D and return to EH&S Office.

Note that proper emergency response depends upon knowledge of the hazards present in the lab. For this reason, all chemical inventories of the hazardous chemicals in CEMR labs must be updated and provided to the EH&S annually.

Emergency Response

Emergency Phone Numbers

- **Department of Public Safety – 293-4332**
- **UNIVERSITY POLICE (UP) – 293-2677**
- Environmental, Health and Safety (EH&S) – **293-3792**

In a MEDICAL EMERGENCY call 9-911.

Information on lab doors

Emergency contact signs "NFPA-704 Diamond" shall be posted on the doors of all laboratories with hazardous materials with the following information:

Environmental, Health and Safety (EH&S) – **293-3792**
Principal Investigator /Lab Supervisor, Office phone, Home phone and cell-phone numbers.
Chemical Hygiene Officer (CHO), Office phone, Home phone, and cell-phone numbers.
Department Chair, Office phone, Home phone and cell-phone numbers.

Contact information for the Radiation Safety Office, if the laboratory is using radioactive material.

Contact information for the Biohazard Safety Office, if the laboratory is using bio-hazardous material

These signs will be checked periodically for accuracy.

In Case of Fire

Activate the nearest fire alarm and **evacuate the occupants** of the building according to your **Building Evacuation Plan**. From a safe place, call **9-911** and report the fire location then notify your Lab Supervisor. Wait in a safe place to provide specific information to firefighters. Fire extinguishers are available in labs and are inspected monthly. They may be used by trained personnel to fight small fires. Fire extinguisher training is available through the EH&S Office.

Small fire that has just started can sometimes be extinguished with a laboratory fire extinguisher. Only if confident that it can be done successfully, quickly and with only one fire extinguisher. USE ONLY ONE FIRE EXTINGUISHER. Always be between the fire and an exit from the laboratory. Do not underestimate fires, and remember that toxic gases and smoke may present additional hazards.

Remember **R.A.C.E. and P.A.S.S**

- R escue--First, help clear people from the lab.
- A nnounce--Call 911 and activate the fire alarm.
- C ontain the fire by closing doors to the fire room.
- E xtinguish—only after calling 911 and activating the alarm, and only if confident that it can be done successfully and quickly. Always be between the fire and an exit from the laboratory. Do not underestimate fires, and remember that toxic gases and smoke may present additional hazards.

- P ull safety pin from handle.
- A im nozzle at base of fire.
- S queeze the trigger handle.
- S weep from side to side (watch for reflash).

In Case of Personnel Exposures

All employees shall be instructed in the **location and proper usage of emergency showers and eyewashes** by the lab supervisor or Principal Investigator.

ACCIDENTS AND SPILLS:

EYE CONTACT: Flush eyes with water for 15 minutes and seek medical attention.

INGESTION: Drink large amounts of water. DO NOT ENCOURAGE VOMITING. Seek medical attention.

SKIN CONTACT: Flush affected area with water and remove contaminated clothing. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION.

AVOIDANCE OF "ROUTINE" EXPOSURE

.) Do not smell or taste chemicals.

.) Vent apparatus which may discharge chemicals (vacuum pumps, distillation columns, etc.) into local exhaust or hoods.

.) Inspect gloves and glove boxes before use.

.) Do not allow release of toxic substances into cold rooms, since these rooms re-circulate the air.

.) Wash gloves and then hands after chemical usage. Never wear used gloves out of the laboratory.

Medical Consultations and Examinations Availability

All employees who work with hazardous chemicals will have an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

- Whenever an employee develops **symptoms** associated with a hazardous chemical to which the employee may have been exposed in the laboratory.
- Where exposure monitoring reveals an **exposure level routinely above the action level or PEL** for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements.
- Whenever an event takes place in the work area such as a **spill, leak, explosion** or other occurrence resulting in the likelihood of a hazardous exposure.

The College Safety Office will be notified whenever the need for medical consultation or examination occurs, or when there is uncertainty as to whether any of the above criteria have been met.

Arranging for Exams

All medical examinations and consultations will be performed by or under the direct supervision of a licensed physician and will be provided through the **WVU Occupational Health Program**, without loss of pay and at a reasonable time and place. In the event of a life-threatening illness or injury, dial 9-911 and request an ambulance.

The College will provide the examining physician with the following information:

- The **identity** of the hazardous chemical(s) to which the employee may have been exposed.
- A description of the **conditions** under which the exposure occurred including quantitative exposure data, if available.
- A description of the **symptoms** of exposure that the employee is experiencing, if any.

The above information will be collected and **transmitted by the lab supervisor** and will be submitted to the Risk Management Department as well as to the examining physician.

Report

The examining physician will provide to the lab supervisor and College Safety Office a written report including the following:

- Any recommendation for **further medical follow-up**.
- The results of the medical examination and any associated **tests**.
- Any medical condition which may be revealed in the course of the examination which may place the employee at **increased risk** as a result of exposure to a hazardous chemical found in the workplace.
- A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

The written opinion will not reveal specific findings of diagnoses unrelated to occupational exposure.

Recordkeeping

Maintain safety records as required by OSHA at a minimum.

Accident Reports

Accident investigations will be conducted by the lab supervisor with assistance from the CHO, Department Chair, Department Safety Committee, CEMR Safety Committee, CEMR Safety Office and HS&E Office as deemed necessary. Accident reports will be written and retained for 5 years.

Exposure Evaluations

Any records of exposure evaluation carried out by individual departments will be kept within the department and also sent to the CEMR Safety Office. Raw data will be kept for one year and summary data for the term of employment plus 30 years.

Medical Consultation and Examinations

Results of medical consultations and examinations will be kept by the CEMR Safety Office for a length of time specified by the appropriate medical records standard. This time will be at least the term of employment plus 30 years as required by OSHA.

Training

Individual employee training should be recorded kept in the individual's department or college file for five years. Training may be forward to the CHO.

Equipment Inspection

Records of inspections of equipment will be maintained for 5 years. Data on annual fume hood monitoring will be kept in the CEMR Safety Office. Fume hood monitoring data are considered maintenance records and as such the raw data will be kept for one year and summary data for 5 years.

Annual Chemical Hygiene Plan Review

The Principal Investigator (P.I.) and the Chemical Hygiene Officer (CHO) will review the laboratory's Chemical Hygiene Plan (CHP) every January. A statement will be signed by each Principal Investigator, CHO and Department Chair to show that the CHP has been reviewed or updated at that time. This statement will be kept with the CHP and copies will be provided to the departmental CHO. Laboratory supervisors or Principal Investigators are responsible for assigning responsibility for taking corrective action for any deficiency noted.

References

WVU HSC CHP.

National Research Council, **Prudent Practices for Handling and Disposing Hazardous Chemicals in Laboratories**, National Academy Press, Washington, D.C., 1995.

Code of Federal Regulations, 29 CFR part 1910 subpart Z section 1910.1450, **Occupational Exposure to Hazardous Chemicals in Laboratories**, 1990.

Code of Federal Regulations, 29 CFR part 1910 section 1200, Appendices A and B of the H**azard Communication Standard**, 1990.

American Chemical Society, **Safety in Academy Chemistry Laboratories**, 5th ed., Washington, D.C., 1991.

Department of Risk Management, **UVM Fume hood Operation & Safety Guidelines**, and **Chemical Hygiene Plan,** University of Vermont, Burlington, VT, 1991.

West Virginia University Department of Chemistry, **Chemical Hygiene Plan.**

Princeton University **Chemical Hygiene Plan.**

West Virginia University, **Environmental Health and Safety Manual**, 1986, 1989.

Hazardous Chemical Waste Management, West Virginia University Environmental Health and Safety **"A Guide for Laboratory Personnel**", 1986.

Hazard Communication Program Manual, West Virginia University Environmental Health and Safety, 1989.

West Virginia University Medical Monitoring Program, 1989.

http://www.redcross.org/images/pdfs/code/First_Aid_Kit_Contents.pdf

ANSI Z308.1-2003 “American National Standard-Minimum Requirements for Workplace First Aid Kits

Safety in academic chemistry laboratories, The American Chemical Society

Appendix A: Laboratory Information & Check List

CHEMICAL HYGIENE PLAN (CHP)

Lab Information

Room No. _____ Phone No._____

Dept. _____ Bldg _____

Title	Name	Office No.	Office Location	Office Phone No.	Home or Cell Phone No.
P.I.					
Lab Supervisor					
CHO					
Dept. Chair					
Lab Personnel					
Lab Personnel					
Lab Personnel					
Lab Personnel					
Lab Personnel					
Lab Personnel					

Initial Date of CHP Preparation: _____

Annual Review Date: _____

Reviewed By: _____ _____
Lab Supervisor CHO

Approved By: _____
Dept. Chair

The CHP must be reviewed annually and updated as necessary.

Emergency Information Check List

Check mark the availability of the following and provide the date of issue or the date of last update and location.

Subject	Availability	Date Issued or last checked	Location
Emergency Contact list			
Evacuation Procedure			
CHP			
MSDS			
First Aid Kit			
Fire Extinguisher			
Fire Blanket			
Personal Protective Equipment			
Spill Clean-up Kit			
Fire Alarm			
Gas shut off system			
Chemical Inventory			
Waste Inventory			
Eye Wash Fountain			
Safety Wash Station			

Appendix B: Laboratory Specific Chemical Hygiene Procedures

Laboratory Specific Chemical Hygiene Procedures

Room No: _____ Lab Supervisor: _____

Date of last revision to SOP:_____

Standard Operating Procedures for _____

(Hazardous Substances or Particularly Hazardous Substances)

#1	Process:
#2	Hazardous Chemicals/Class of Hazardous Chemicals:
#3	PPE - Personal Protective Equipment:
#4	Engineering/Ventilation Controls:
#5	Special Handling Procedures and Storage Requirements:
#6	Spill and Accident Procedures:
#7	Waste Disposal:

For Particularly Hazardous Substances, complete #8, #9, and #10.

#8	Approval Required:
#9	Decontamination Procedures:
#10	Designated Area:

For more information relevant to completing this form, review thoroughly Chemical Hygiene Plan: Guidelines for SOP Development; Special Handling Procedures for Common PHS; Chemical specific MSDS.

Appendix C: Hazardous Chemical Disposal Form

WEST VIRGINIA UNIVERSITY
ENVIRONMENTAL HEALTH AND SAFETY
HAZARDOUS CHEMICAL DISPOSAL FORM

BUILDING		**DEPARTMENT**	
ROOM NUMBER		**DATE**	
GENERATOR		**PHONE NUMBER**	
CHEMICAL HYGIENE OFFICER (CHO)			

NOTE: Please place an asterisk in the column provided beside those chemicals/materials that are in a reusable condition.

AMOUNT	CHEMICAL (APPROX. % OF EACH)	HAZARD CLASS(ES)	LOCATION (SPECIFIC)	REUSABLE

HAZARD CLASS: F = Flammable CA = Carcinogenic I = Irritant
T = Toxic C = Corrosive R = Reactive
ADDITIONAL INFORMATION:

Retain one copy for your files and forward one copy to:

West Virginia University
Environmental Health and Safety
ATTN: Ron McIntyre
PO Box 6551
Morgantown, WV 26506-6551
Phone: 304-293-3792 ext 1316

Appendix D: West Virginia University Environmental Health and Safety Spill Response Notification Form

West Virginia University Environmental Health and Safety Spill Response Notification Form

Name:	Position:		
Day time phone:	Evening phone:		
Department:	PO Box:		
Date of Incident:	Time of Incident : AM/PM		
Exact location of spill:			
	YES	**NO**	**Comments**
Were materials discharged into drains, sumps, or water courses?			

Source and/or cause of incident:

Type of Material Spilled	Quantity

Additional comments: Once the spill is cleaned up, label the container hazardous waste and date it with the date the material was placed in the container. Fill out a hazardous waste disposal form. Forward the Spill Response Notification Form and Hazardous Waste Disposal Form to Environmental Health and Safety.

Return completed forms to:

Environmental Health and Safety Attention: Hazardous Materials Specialist
PO Box 6551 Morgantown, WV 26506-6551

Telephone: 304-293-3792 Fax: 304-293-7257

Appendix E: OSHA Standard 29 CFR 1910.1450

OSHA Standard 29 CFR 1910.1450

Occupational exposure to hazardous chemicals in laboratories

1910.1450(a)

Scope and application.

1910.1450(a)(1)

This section shall apply to all employers engaged in the laboratory use of hazardous chemicals as defined below.

1910.1450(a)(2)

Where this section applies, it shall supersede, for laboratories, the requirements of all other OSHA health standards in 29 CFR part 1910, subpart Z, except as follows:

1910.1450(a)(2)(i)

For any OSHA health standard, only the requirement to limit employee exposure to the specific permissible exposure limit shall apply for laboratories, unless that particular standard states otherwise or unless the conditions of paragraph (a)(2)(iii) of this section apply.

1910.1450(a)(2)(ii)

Prohibition of eye and skin contact where specified by any OSHA health standard shall be observed.

1910.1450(a)(2)(iii)

Where the action level (or in the absence of an action level, the permissible exposure limit) is routinely exceeded for an OSHA regulated substance with exposure monitoring and medical surveillance requirements paragraphs (d) and (g)(1)(ii) of this section shall apply.

1910.1450(a)(3)

This section shall not apply to:

1910.1450(a)(3)(i)

Uses of hazardous chemicals which do not meet the definition of laboratory use, and in such cases, the employer shall comply with the relevant standard in 29 CFR part 1910, subpart Z, even if such use occurs in a laboratory.

1910.1450(a)(3)(ii)

Laboratory uses of hazardous chemicals which provide no potential for employee exposure. Examples of such conditions might include:

1910.1450(a)(3)(ii)(A)

Procedures using chemically-impregnated test media such as Dip-and-Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip; and

1910.1450(a)(3)(ii)(B)

Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit.

1910.1450(b)

Definitions --

Action level means a concentration designated in 29 CFR part 1910 for a specific substance, calculated as an eight (8)-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

Assistant Secretary means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

Carcinogen (***see select carcinogen***).

Chemical Hygiene Officer means an employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. This definition is not intended to place limitations on the position description or job classification that the designated individual shall hold within the employer's organizational structure.

Chemical Hygiene Plan means a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that (i) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace and (ii) meets the requirements of paragraph (e) of this section.

Combustible liquid means any liquid having a flashpoint at or above 100 deg. F (37.8 deg. C), but below 200 deg. F (93.3 deg. C), except any mixture having components with flashpoints of 200 deg. F (93.3 deg. C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

Compressed gas means:

(i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 deg. F (21.1 deg. C); or

(ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 deg. F (54.4 deg C) regardless of the pressure at 70 deg. F (21.1 deg. C); or

(iii) A liquid having a vapor pressure exceeding 40 psi at 100 deg. F (37.8 C) as determined by ASTM D-323-72.

Designated area means an area which may be used for work with "select carcinogens," reproductive toxins or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood.

Emergency means any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the workplace.

Employee means an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

Explosive means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

Flammable means a chemical that falls into one of the following categories:

(i) ***Aerosol, flammable*** means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame protection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

(ii) ***Gas, flammable*** means:

(A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or

(B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit.

(iii) ***Liquid, flammable*** means any liquid having a flashpoint below 100 deg F (37.8 deg. C), except any mixture having components with flashpoints of 100 deg. C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.

(iv) ***Solid, flammable*** means a solid, other than a blasting agent or explosive as defined in § 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

Flashpoint means the minimum temperature at which a liquid gives off a vapor in

sufficient concentration to ignite when tested as follows:

(i) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24 - 1979 (ASTM D 56-79)) - for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100 deg. F (37.8 deg. C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or

(ii) Pensky-Martens Closed Tester (See American National Standard Method of Test for Flashpoint by Pensky-Martens Closed Tester, Z11.7 - 1979 (ASTM D 93-79)) - for liquids with a viscosity equal to or greater than 45 SUS at 100 deg. F (37.8 deg. C), or that contain suspended solids, or that have a tendency to form a surface film under test; or

(iii) Setaflash Closed Tester (see American National Standard Method of test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)).

Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

Hazardous chemical means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes.

Appendices A and B of the Hazard Communication Standard (29 CFR 1910.1200) provide further guidance in defining the scope of health hazards and determining whether or not a chemical is to be considered hazardous for purposes of this standard.

Laboratory means a facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory scale means work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safety manipulated by one person. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials.

Laboratory-type hood means a device located in a laboratory, enclosure on five sides with a movable sash or fixed partial enclosed on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms.

Walk-in hoods with adjustable sashes meet the above definition provided that the sashes

are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

Laboratory use of hazardous chemicals means handling or use of such chemicals in which all of the following conditions are met:

(i) Chemical manipulations are carried out on a "laboratory scale;"

(ii) Multiple chemical procedures or chemicals are used;

(iii) The procedures involved are not part of a production process, nor in any way simulate a production process; and

(iv) "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

Medical consultation means a consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

Organic peroxide means an organic compound that contains the bivalent -O-O- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

Oxidizer means a chemical other than a blasting agent or explosive as defined in § 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

Physical hazard means a chemical for which there is scientifically valid evidence tat it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer pyrophoric, unstable (reactive) or water-reactive.

Protective laboratory practices and equipment means those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

Reproductive toxins means chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

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

(i) It is regulated by OSHA as a carcinogen; or

(ii) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP)(latest edition); or

(iii) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for research on Cancer Monographs (IARC)(latest editions); or

(iv) It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

(A) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m(3);

(B) After repeated skin application of less than 300 (mg/kg of body weight) per week; or

(C) After oral dosages of less than 50 mg/kg of body weight per day.

Unstable (reactive) means a chemical which is the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

Water-reactive means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

1910.1450(c)

Permissible exposure limits. For laboratory uses of OSHA regulated substances, the employer shall assure that laboratory employees' exposures to such substances do not exceed the permissible exposure limits specified in 29 CFR part 1910, subpart Z.

1910.1450(d)

Employee exposure determination --

1910.1450(d)(1)

Initial monitoring. The employer shall measure the employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL).

1910.1450(d)(2)

Periodic monitoring. If the initial monitoring prescribed by paragraph (d)(1) of this section discloses employee exposure over the action level (or in the absence of an action level, the PEL), the employer shall immediately comply with the exposure monitoring provisions of the relevant standard.

1910.1450(d)(3)

Termination of monitoring. Monitoring may be terminated in accordance with the relevant standard.

1910.1450(d)(4)

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

1910.1450(e)

Chemical hygiene plan -- General. (Appendix A of this section is non-mandatory but provides guidance to assist employers in the development of the Chemical Hygiene Plan).

1910.1450(e)(1)

Where hazardous chemicals as defined by this standard are used in the workplace, the employer shall develop and carry out the provisions of a written Chemical Hygiene Plan which is:

1910.1450(e)(1)(i)

Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory and

1910.1450(e)(1)(ii)

Capable of keeping exposures below the limits specified in paragraph (c) of this section.

1910.1450(e)(2)

The Chemical Hygiene Plan shall be readily available to employees, employee representatives and, upon request, to the Assistant Secretary.

1910.1450(e)(3)

The Chemical Hygiene Plan shall include each of the following elements and shall indicate specific measures that the employer will take to ensure laboratory employee protection;

1910.1450(e)(3)(i)

Standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals;

1910.1450(e)(3)(ii)

Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices; particular attention shall be given to the selection of control measures for chemicals that are known to be extremely hazardous;

1910.1450(e)(3)(iii)

A requirement that fume hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment;

1910.1450(e)(3)(iv)

Provisions for employee information and training as prescribed in paragraph (f) of this section;

1910.1450(e)(3)(v)

The circumstances under which a particular laboratory operation, procedure or activity shall require prior approval from the employer or the employer's designee before implementation;

1910.1450(e)(3)(vi)

Provisions for medical consultation and medical examinations in accordance with paragraph (g) of this section;

1910.1450(e)(3)(vii)

Designation of personnel responsible for implementation of the Chemical Hygiene Plan including the assignment of a Chemical Hygiene Officer, and, if appropriate, establishment of a Chemical Hygiene Committee; and

1910.1450(e)(3)(viii)

Provisions for additional employee protection for work with particularly hazardous substances. These include "select carcinogens," reproductive toxins and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate:

1910.1450(e)(3)(viii)(A)

Establishment of a designated area;

1910.1450(e)(3)(viii)(B)

Use of containment devices such as fume hoods or glove boxes;

1910.1450(e)(3)(viii)(C)

Procedures for safe removal of contaminated waste; and

1910.1450(e)(3)(viii)(D)

Decontamination procedures.

1910.1450(e)(4)

The employer shall review and evaluate the effectiveness of the Chemical Hygiene Plan at least annually and update it as necessary.

1910.1450(f)

Employee information and training.

1910.1450(f)(1)

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

1910.1450(f)(2)

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

1910.1450(f)(3)

Information. Employees shall be informed of:

1910.1450(f)(3)(i)

The contents of this standard and its appendices which shall be made available to employees;

1910.1450(f)(3)(ii)

the location and availability of the employer's Chemical Hygiene Plan;

1910.1450(f)(3)(iii)

The permissible exposure limits for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard;

1910.1450(f)(3)(iv)

Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and

1910.1450(f)(3)(v)

The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Material Safety Data Sheets received from the chemical supplier.

1910.1450(f)(4)

Training.

1910.1450(f)(4)(i)

Employee training shall include:

1910.1450(f)(4)(i)(A)

Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);

1910.1450(f)(4)(i)(B)

The physical and health hazards of chemicals in the work area; and

1910.1450(f)(4)(i)(C)

The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

1910.1450(f)(4)(ii)

The employee shall be trained on the applicable details of the employer's written Chemical Hygiene Plan.

1910.1450(g)

Medical consultation and medical examinations.

1910.1450(g)(1)

The employer shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

1910.1450(g)(1)(i)

Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination.

1910.1450(g)(1)(ii)

Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance shall be established for the affected employee as prescribed by the particular standard.

1910.1450(g)(1)(iii)

Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee shall be provided an opportunity for a medical consultation. Such consultation shall be for the purpose of determining the need for a medical examination.

1910.1450(g)(2)

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

1910.1450(g)(3)

Information provided to the physician. The employer shall provide the following information to the physician:

1910.1450(g)(3)(i)

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

1910.1450(g)(3)(ii)

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

1910.1450(g)(3)(iii)

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

1910.1450(g)(4)

Physician's written opinion.

1910.1450(g)(4)(i)

For examination or consultation required under this standard, the employer shall obtain a written opinion from the examining physician which shall include the following:

1910.1450(g)(4)(i)(A)

Any recommendation for further medical follow-up;

1910.1450(g)(4)(i)(B)

The results of the medical examination and any associated tests;

1910.1450(g)(4)(i)(C)

Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous workplace; and

1910.1450(g)(4)(i)(D)

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

1910.1450(g)(4)(ii)

The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.

1910.1450(h)

Hazard identification.

1910.1450(h)(1)

With respect to labels and material safety data sheets:

1910.1450(h)(1)(i)

Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.

1910.1450(h)(1)(ii)

Employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees.

1910.1450(h)(2)

The following provisions shall apply to chemical substances developed in the laboratory:

1910.1450(h)(2)(i)

If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the employer shall determine if it is a hazardous chemical as defined in paragraph (b) of this section. If the chemical is determined to be hazardous, the employer shall provide appropriate training as required under paragraph (f) of this section.

1910.1450(h)(2)(ii)

If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and shall implement paragraph (e) of this section.

1910.1450(h)(2)(iii)

If the chemical substance is produced for another user outside of the laboratory, the employer shall comply with the Hazard Communication Standard (29 CFR 1910.1200) including the requirements for preparation of material safety data sheets and labeling.

1910.1450(i)

Use of respirators. Where the use of respirators is necessary to maintain exposure below permissible exposure limits, the employer shall provide, at no cost to the employee, the proper respiratory equipment. Respirators shall be selected and used in accordance with the requirements of 29 CFR 1910.134.

1910.1450(j)

Recordkeeping.

1910.1450(j)(1)

The employer shall establish and maintain for each employee an accurate record of any measurements taken to monitor employee exposures and any medical consultation and examinations including tests or written opinions required by this standard.

1910.1450(j)(2)

The employer shall assure that such records are kept, transferred, and made available in accordance with 29 CFR 1910.1020.

Appendix F: Chemical Storage and Handling in Chemical Laboratories

Chemical Storage and Handling in Chemical Laboratories

1. **Labeling:**

All chemicals, whether commercial materials or samples prepared in the laboratory, **must** be labeled. Absence of identification is a violation of the law.

Labels, both your own and the manufacturers', should be protected against spills and fading. An easy-to-use option is a clear polyester tape that is water-resistant and also will stand up to casual exposure to acids, bases, and organic solvents. Adhesive colored dots for color coding can be used to distinguish chemicals.

Labels on commercially available chemicals now must comply with both federal and state law. These laws mandate the appearance of the name of the substance and any common synonyms, as well as information on the toxicity and other hazards associated with the substance.

Additional Information:

For your own benefit, and that of anyone else who may use the chemical storage area in future, you should add to all labels the date on which the material was acquired and the storage location.

Adding the date will allow easy culling of overage substances. Furthermore, as manufacturing and purification processes generally improve with time, the date of purchase is an indication of quality.

Storage location should indicate storage room, the cabinet or set of shelves, and the individual shelf. Thus, a label might bear the notation: 223-C-5, meaning room 223, cabinet C, shelf 5.

2. Secondary Containers:

When requiring secondary containment. That is, they must be placed inside a chemically resistant tub large enough to contain the contents should the bottle break. Polypropylene or polyethylene tubs can be obtained from most lab supply houses; the simple polystyrene tubs available in supermarkets are acceptable for all except corrosive liquids. Multiple containers may be kept in a single tub, provided they are of the same hazard category. Secondary containment capacity must be 110% of the largest container or 10% of the aggregate volume of all containers, whichever is larger.

Secondary containment is available in different materials which provide varying resistance to different chemicals. Use resources such as user knowledge or the information provided below to select the proper material.

- Photo Trays
    - Generally, these provide good resistance for aqueous solutions and some organic solvents. But they may not be a good choice for halogenated solvents.
- Polypropylene and Hi Density Polyethylene Trays
    - These may be affected by some aromatic and halogenated hydrocarbons.
- Stainless Steel and Pyrex Trays
    - Stainless steel and Pyrex trays are resistant to a broader spectrum of chemicals. However they are more costly than plastic trays and aren't available in as many different sizes and configurations.
- Larger Capacity Containers
    - Containers such as Pelletote® boxes are acceptable for larger volumes of liquids. They are resistant to the chemicals stored in them. Pelletote® boxes are constructed of high density polyethylene.

3. General Rules:

Store Compatible materials with each other. It is essential to segregate incompatible substances to prevent dangerous interactions. All newly purchased chemicals should have a label on them identifying their hazard category (e.g. flammable, corrosive, oxidising, toxic etc.). A list of commonly used chemicals that should be segregated is listed below to assist storage.

- Store the minimum stock levels of hazardous chemicals in the laboratory
- Dispose of hazardous chemicals that are no longer required
- Store large breakable containers, particularly of liquids, below shoulder height
- Ensure containers and bottle tops are sealed properly to avoid unnecessary leakage of fumes / vapours
- Never carry a bottle containing chemicals by its top, for example always carry Winchester bottles (2.5 litres) in carriers or baskets that are capable of providing proper support, and support the base of the bottle in use.
- Segregate acids from bases.
- Segregate acids from reactive metals such as sodium, potassium, and magnesium.
- Segregate oxidizing acids from organic acids, and flammable and combustible materials.
- Segregate acids from chemicals that could generate toxic or flammable gases upon contact, such as sodium cyanide, iron sulfide and calcium carbide.
- Store inorganic acids in corrosive or acid storage cabinets. Their interiors and hardware (door hinges and shelf brackets) are corrosion resistant. Corrosive storage cabinets can be located under fume hoods or exist as stand-alone units.

Flammable storage cabinets are not corrosion resistant and shall not be used for acid storage.

- Store acids and bases in sealed, air-impermeable containers with tight-fitting caps as opposed to loose-fitting lids or glass stoppers.
- Do not store aqueous sodium and potassium hydroxide solutions in aluminum drip trays. These will corrode aluminum and compromise its integrity.
- Store nitric and in its own secondary containment trays. Nitric acid can combine with other acids to form nitrogen oxides and nitrosyl halide gases.
- Store combustible organic carboxylic acids such as acetic acid in a flammable storage locker.
- Shelves and racks should have enough clearance to accommodate the largest container that allows it to be removed and returned without tipping. Tipping containers when returning them to shelves, cabinets and refrigerators may cause the contents to drip or leak.

4. Chemical Storage:

a. Solvents and other Flammables:

The proper equipment for storing solvents includes metal safety cans for quantities larger than one gallon, or double-walled metal cabinets approved by the National Fire Prevention Association, in which the solvent containers should be kept when not in use.

- Store flammable and combustible liquids totaling more than 10 gallons in one room or laboratory in an approved flammable storage cabinet, clearly labelled and positioned away from doors or other means of escape from the laboratory. Flammable storage cabinets are designed to protect their contents from fires in the work area. They can be located under fume hoods or exist as stand- alone units. Approved flammable storage cabinets are constructed of steel and are equipped with self-closing doors with a three point latch arrangement. No more than 120 gallons of Class I, Class II, and Class IIIA liquids, combined, may be stored in a flammable storage cabinet. Flammable solvents should not be stored in fume hoods or vented cabinets, since the airflow will fan any fire and may also spread the fire to other parts of the building via the ventilation ducting.

- Ordinary domestic refrigerators and freezers contain electrical components (light bulbs, switches, contacts and motors) that are potential ignition sources which may initiate a fire or an explosion if flammable vapors are present. Therefore, refrigerators and freezers used for storing flammable liquids must be designed, constructed, approved, and labeled for that purpose. NOTE: This applies to aqueous ethanol solutions greater than or equal to 15%.

- Common solvents that require this treatment include: methyl, ethyl, and isopropyl alcohols; acetone and methyl ethyl ketone; methyl, ethyl, and butyl acetates; all ethers; pentane, hexane, heptane, octane, and "light petroleum" or "petroleum ether"; benzene, toluene, and xylene; and carbon disulfide.

b. Peroxidizable substances. Particular attention must be given to substances that form explosive peroxides on prolonged contact with air. All chemicals should be dated when they arrive at the laboratory. Since most peroxidizable materials are solvents and are flammable, they must be kept in a flammables cabinet; a separate one for peroxidizables as opposed to merely flammables is a good idea, but separation by shelf is acceptable. Example: isopropyl ether, divinyl acetylene, vinylidene chloride, potassium metal, sodium amide, tetrahydrofuran, dioxane, diacetylene, methyl acetylene, cumene, methyl isobutyl ketone, ethylene glycol dimethyl ether (glyme), tetralin, cyclohexene, cyclopentene, methylcycloalkanes.

c. *Oxidizing Agents* should be stored away from substances that they may oxidize vigorously. Oxidants include: perchloric acid and perchlorate salts; chlorate salts, hypochlorites such as bleaching powders and "liquid bleach"; liquid bromine; perbromate and bromate salts; chromic acid and its salts; hydrogen peroxide; and potassium permanganate. Concentrated nitric and sulfuric acids also are oxidants; they must be stored together, and away from all other substances.

> **NOTE:** perchloric acid may be used *only* in a specially designed hood, intended to prevent its coming in contact with oxidizable organics or metals with which it forms explosive salts.

d. *Reducing agents* are substances that are especially easily oxidized. Particular care should be taken to keep them separate from oxidizing agents, both in storage and when placed out in the laboratory for student use. The accidental combining of oxidizing and reducing agents by confused students represents a significant fire and explosion hazard. Such materials include: elemental sulfur in any allotropic form; powdered carbon (carbon black, activated carbon, powdered charcoal, graphite powder); sodium and potassium metals; most aldehydes; and all hydrocarbons and most solvents. Paper, sawdust, and wood shavings also are reducing agents.

e. *Acids and Bases* are of concern for two reasons: they are generally corrosive, and their reactions with each other are usually highly exothermic. Hence acids and bases must be stored apart from each other.

Acids commonly encountered in the chemistry laboratory include: hydrochloric, nitric, sulfuric, and acetic acids. Hydrofluoric acid is so corrosive, and produces such vicious burns. Storage problems are minimized if acids are purchased in the smallest practicable containers, rather than in the common 1-gal jugs.

The most common bases are ammonium hydroxide (aqueous ammonia), sodium and potassium hydroxides (typically in pellet form), calcium hydroxide (slaked lime), and sodium carbonate (washing soda). A familiar sight in many stockrooms where acids and

bases are not segregated is the white crust of ammonium salts formed by fumes from ammonium hydroxide combining with acid fumes. This crust is mildly acidic, and over time can degrade labels and both wood and metal storage shelves.

f. *Health Hazards* are substances that pose a health hazard through either acute (immediate) or chronic (long-term) toxicity. Examples of substances that are acutely toxic are sodium cyanide and ammonium molybdate; chronic toxicity is displayed by many organics such as aniline derivatives, chlorinated hydrocarbons, and thiocyanates. Check the MSDS if you are not sure whether a substance belongs in this category. These substances should be stored together, away from materials of other classes.

Establish posted designated areas. A designated area may be a room, a section of a room, a bench top or a containment device (such as a lab hood).

g. *Nonhazardous materials* are those **known** to pose no health risks. Examples are simple salts such as calcium chloride, buffer solutions, indicators, copper metal, and so on. The materials can be kept in a general chemical storage area.

What all of this boils down to is that a laboratory needs **five** chemical storage areas:

1. Sulfuric and nitric acids; perchloric acid, and Chromic acid.
2. Other corrosive acids, such as hydrochloric, acetic, and formic.
3. Corrosive bases: ammonium hydroxide, sodium hydroxide, potassium hydroxide
4. Flammables, in an approved cabinet.
5. General storage, permitting separation of the various hazard categories on separate shelves.

5. Incompatibility of Common Laboratory Chemicals

The improper storage or mixing of chemicals can result in serious accidents and even disasters. Violent reactions could occur due to the storing or mixing incompatible chemicals. The following is a list of some incompatible common laboratory chemicals. Before storing or mixing any chemicals, consult this list or the chemicals' MSDS. This is only a partial list that includes some of the more common academic laboratory chemicals. Please note that the absence of a chemical from the list does not mean that it is necessarily safe to mix it with any other chemical! You should always check with the MSDS if in doubt.

Chemical	Incompatible with
Acetic acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Acetone	Concentrated nitric acid and sulphuric acid mixtures
Alkali and alkaline earth metals	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens
Ammonia (anhydrous)	Mercury(e.g., in manometers), chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid (anhydrous)
Ammonium nitrate	Acids, powered metals, flammable liquids, chlorates, nitrites, sulphur, finely divided organic combustible materials
Aniline	Nitric acid, hydrogen peroxide
Arsenical materials	Any reducing agent
Azides	Acids
Bromine	See chlorine
Calcium oxide	Water
Carbon (activated)	Calcium hypochlorite, all oxidizing agents
Chlorates	Ammonium salts, acids, powered metals, sulphur, finely divided organic or combustible materials
Chromic acid and chromium trioxide	Acetic acid, naphthalene, camphor, glycerol. Alcohol, flammable liquids in general

Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, turpentine
Chlorine dioxide	Ammonia, methane, phosphine, hydrogen sulphide
Copper	Acetylene, hydrogen peroxide
Cumene hydroperoxide	Acids (organic and inorganic)
Cyanides	acids
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens
Fluorine	All other chemicals
Hydrocarbons (such as butane, propane, benzene)	Fluorine, chlorine, bromine, chromic acid, sodium peroxide
Hydrocyanic acid	Nitric acid, alkali
Hydrofluoric acid (anhydrous)	Ammonia (aqueous or anhydrous)
Hydrogen sulphide	Fuming nitric acid, oxidizing gases
Hypochlorites	Acids, activated carbon
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, fulminic acid, ammonia
Nitrates	Acids
Nitric acid	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulphide,

(concentrated)	flammable liquids and gases, copper, brass, any heavy metals
Nitrites	Acids
Nitroparaffins	Inorganic bases, amines
Oxalic acid	Silver, mercury
Oxygen	Oils, grease, hydrogen, flammable liquids, solids, and gases
Perchloric acid	Acetic acid, anhydride, bismuth and its alloys, alcohols, paper, wood, grease, oils
Peroxides, organic	Acids (organic or mineral), avoid friction, store cold
Phosphorus (white)	Air, oxygen, alkalies, reducing agents
Potassium chlorate	Sulphuric and other acids
Potassium perchlorate (see also chlorates)	Sulphuric and other acids
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, sulphuric acid
Selenides	Reducing agents
Silver	Acetylene, oxalic acid, tartaric acid, ammonium compounds, fulminic acid
Sodium	Carbon tetrachloride, carbon dioxide, water
Sodium nitrite	Ammonium nitrate and other ammonium salts
Sodium peroxide	Ethyl and methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural

Sulphides	Acids
Sulphuric acid	Potassium chlorate, potassium perchlorate, potassium permanganate (similar compounds of light metal, such as sodium, lithium)
Tellurides	Reducing agents

Reference: *Safety in academic chemistry laboratories*, The American Chemical Society.

NFPA Chemical Hazard Identification System (Diamond):

National Fire Protection Association (NFPA) diamond symbols that rate the *degree* of health, flammability, reactivity, and special hazards of the chemicals discussed. Hazards are rated from 0 for minimal hazard to 4 for severe hazard.

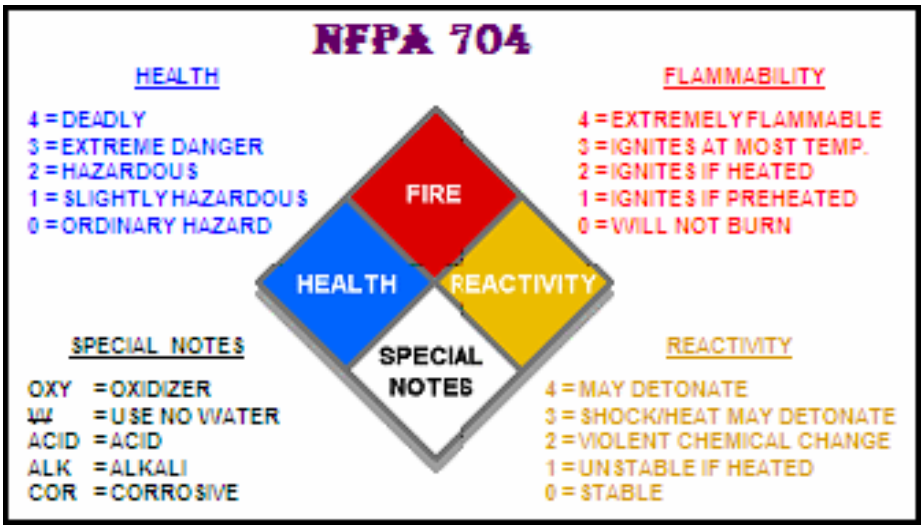
The degree of hazard is often dependent upon the physical state of the chemical as well. For example, a flammable gas will pose a more significant immediate safety threat upon release than a liquid that has the same flash point.

The NFPA Health Hazard rates the effect of short-term exposure to a chemical by physical contact, eye and skin absorption, or inhalation. A highly toxic chemical with a health hazard rating of 4 could be lethal on very short exposure.

The NFPA Flammability Hazard rates the ease with which a chemical will ignite from exposure to a spark, open flame, or high temperature. A flammable or pyrophoric chemical with a flammability rating of 4 could readily ignite at room temperature.

The NFPA Reactivity Hazard rates a chemical's thermal instability, potential for hazardous reaction with water, or sensitivity to friction or shock. A highly unstable chemical, such as an explosive with a reactivity rating of 4, could readily detonate if exposed to localized thermal or mechanical shock at normal temperatures and pressures.

The NFPA Special Hazards include W (to indicate a water reactive chemical that could react violently or explosively upon contact with water) and OX (to indicate an oxidizer that could ignite combustible or flammable material upon contact).



Appendix G: Certificate of Laboratory Training

Training Documentation

The following individuals have reviewed and understood the preceding Chemical Hygiene Plan and lab-specific requirements and safe operating procedures.

Name of Instructor: **Position:**

Personnel Working in Lab	General Lab Safety Training Date	Lab-Specific Safety Training Date

Lab Supervisor Signature: **Date:**

Certificate of Laboratory Training

Department: _____

Date: _____/_____/_____

Employee Trained: _____

Employee Job Title: _____

____ I understand the procedures that I am expected to perform, and am aware of any potential chemical and or equipment hazards involved in working in this laboratory.

____ If I have any questions, I will contact the P.I or Laboratory Manager before any chemicals are handled.

____ I know where the MSDSs for the chemicals in this laboratory are located and understand how to read them.

____ I know the location and how to use of safety materials such as the spill kit, eyewash, safety shower, fume hood, fire extinguisher etc.

____ I understand that my safety depends on the correct use of personal protective equipment such as eye goggles, gloves, lab coats, full shoes etc. I understand how to use and will use this equipment.

____ I will not use equipment that is malfunctioning and will report the malfunction to the laboratory P.I. or Laboratory manager.

____ I understand how the chemicals in this laboratory are to be used, stored and disposed of in accordance with all regulations.

Signature Date

P.I. Signature or Laboratory Manager Signature Date

Appendix H: First Aid Kit

First Aid Kit Inspection Checklist

Bldg: _____ **Room: _____** **Dept: _____**

Lab Supervisor: _____ **Inspection Date: _____** **Inspector Initials: _____**

Features	Item Description	Quantity	Expiration Date	Needed Quantity
Wound & Burn Treatment	First Aid Burn Cream	6		
	Antibiotic Ointment	6		
	Antiseptic Towelette	6		
Bandages	Adhesive Bandage 1" X 3"	50		
	Sterile Pad 3" X 3"	8		
	Sterile Pad 5" X 9"	2		
	Triangular Bandage	1		
	Knuckle Bandage	8		
	Emergency Pressure Dressing	1		
	Roller Bandage 3" X 6yds Non Sterile	2		
Eye Treatment	Eye Wash 1 oz.	1		
	Eye Pad	4		
Instruments/ Misc. Supplies	Cold Pack	2		
	Forceps	1		
	Exam Gloves Synthetic	4		
	Adhesive Tape .5" X 2.5yds	2		
	Scissor	1		
	Pain-A-Rest Tablet Pouch	3		

. Do not use any medication if you are or suspect you are allergic to that medication or its content.

. Familiarize yourself with the content of the kit for better and faster response in case of emergency.

. Add any items in the first aid kit to the checklist if not already there.

. First Aid Kit shall be inspected quarterly for content and expiration date by lab supervisor.

. Expired items shall be treated as a waste and disposed properly.

. For supplies please contact: 304-293-0486 or email mzreiqat@mix.wvu.edu

First Aid Kit Content

Additional items may be added to personalize or customize your kit.

Adhesive Bandages (Assorted Sizes)	Cover and protect open wounds
Elastic bandages	Help keep swelling down
Absorbent Compress 5"x9" dressing	Cover and protect open wounds/heavy duty injuries
Emergency pressure dressing	Cover and protect large deep wound and stop bleeding
Roller Bandage 3" (individually wrapped)	Secure wound dressing in place
Roller Bandage 4" (individually wrapped)	Secure wound dressing in place
Triangular Bandage	Sling or binder/splinting
Gauze (Assorted Sizes)	Stop bleeding
Sterile Gauze Pad 3x3	To control external bleeding
Sterile Gauze Pad 4x4	To control external bleeding
Adhesive Tape (cloth) 1"	To secure bandages or splints, and cover blisters
Antibiotic Ointment packets	Anti-infection
Antiseptic wipe Packets	Wound cleaning/germ killer
Burn Cream	Use to treat burns.
Sting Pad or cream	To alleviate pain and itching associated with insects bites
Blanket (Space Blanket)	Maintain body temperature for shock
CPR Breathing Barrier	A safety device that prevents any contact with the victim
Instant Cold Compress	To control swelling
Gloves (large), disposable, non-latex	Prevent body fluid contact
Hydrocortisone Ointment Packets	External rash treatment
Scissors	Cut tape, cloth, or bandages
Tweezers	Remove splinters, ticks, or dirt from lacerations
Eyewash Saline	Washing out foreign bodies from eyes

Analgesic: Medications approved by the FDA as pain reliever/fever reducer for over-the-counter use.
Antiseptic: A substance that inhibits the growth of microorganisms on human skin.
Compress: A sterile absorbent pad.
Swab: A single-use crushable, hermetically sealed ampoule with an applicator tip used to clean and/or apply a solution.
Towelette: A single-use, sealed, impregnated material used to clean and/or apply a solution.

Be sure to change adhesive bandages at least once a day, and always clean the wound before you apply an adhesive bandage.
First aid kits should be regularly inspected to ensure completeness, condition of contents and expiration dates to maintain compliance with this standard. Any item beyond its marked expiration date should be removed from the kit and replaced.