Marshall University College of Science Model Chemical Hygiene Plan 2004 Revisions

Attached is a revised version of the Marshall University Model Chemical Hygiene Plan. The revision is necessary for compliance with the Occupational Safety and Health Administration (OSHA) Laboratory Standard that requires an annual review. Please remove last year's version but keep all lab specific information that still applies and record the date your plan was reviewed.

Instructions

- **Please read the entire plan.** This information is provided to help you be in compliance with Federal and State laws regarding work in laboratories. The OSHA Lab Standard has not changed but some information has been updated.

- **Add lab specific information.** This is an outline plan that has to be made lab specific for the plan to meet OSHA laws. The following items should be completed or inserted into your plan:

    - Plan identification form (6)
    - Standard operating procedures (Chapter 3)
    - PPE assessment (can be included in SOPs, Chapter 3)
    - Training records (Appendix III)
        - Chemical Hygiene Plan/Lab Safety general awareness training
        - Lab specific training
    - Chemical Inventory (Appendix III)
    - Laboratory signage (Appendix VIII)

Resources

- A checklist is on the next page to assist in assuring compliance.

Chemical Hygiene Plan Annual Review

Background

OSHA's lab standard 29 CFR 1910.1450 requires labs conducting research with hazardous chemicals on a laboratory scale to have written, specific and current chemical hygiene plans. All labs should have a copy of the Model CHP and have filled it out to make it specific for that lab. An annual review is also required to keep the plan current.

- ☐ Binder with model Chemical Hygiene Plan inserted
- ☐ Plan Identification Page (page 6) is filled out and current to within one year
- ☐ Standard Operating Procedures for work involving hazardous chemicals
- ☐ Personal protective equipment for all tasks has been assigned for work involving hazardous chemicals
- ☐ Chapter 10, Special provisions for select carcinogens, reproductive toxins and acutely toxic chemicals, has been reviewed and procedures completed as applicable
- ☐ CHP/Lab Safety Training Program certificates for all workers
- ☐ Lab specific training records, Appendix III
- ☐ Current chemical inventory
- ☐ Laboratory signage, Appendix VII, filled out and on the lab entry door

Marshall University

Chemical Hygiene Plan

Reviewed and approved
By the College of Science
Safety Committee
July 7, 2004

Assignment

Marshall University

CHEMICAL HYGIENE PLAN

For

_____
Principal Investigator/Laboratory Supervisor
(Chemical Hygiene Officer)

_____
Department

_____
Room and Building

_____ _____
C*ampus Phone* A*fter-hours Emergencies Phone*

Location of laboratories (specify all rooms in which hazardous materials are stored).

_____

_____

Authorized Personnel

Laboratory personnel: List all employees and students that use hazardous materials under your jurisdiction. Also indicate Laboratory Supervisor, if applicable, and his/her after-hours emergency telephone number.

Name	Status (e.g. research asst., student)
_____	_____
_____	_____
_____	_____
_____	_____

Name**	Status (e.g. research asst., student)
_____	_____
_____	_____
_____	_____
_____	_____

_____ _ _____

Signature of Principal Investigator/Laboratory Supervisor (Chemical Hygiene Officer) *Date*

_____
Annual Revision Date

_____
Annual Revision Date

_____
Annual Revision Date

_____
Annual Revision Date

NOTE: Maintain the original copy of this form in Laboratory Chemical Hygiene Plan binder.

Chapter 1

INTRODUCTION

Purpose

The purpose of this model Chemical Hygiene Plan is to define work practices and procedures to help ensure that Laboratory Workers at Marshall University College of Science are protected from health and safety hazards associated with the hazardous chemicals with which they work.

Background

The Chemical Hygiene Plan is part of the University's compliance with the regulations promulgated on January 31, 1990 by the U.S. Department of Labor Occupational Safety and Health Administration (OSHA). This standard entitled "Occupational Exposures to Hazardous Chemicals in Laboratories" is hereafter referred to as the Lab Standard. See Appendix I for information on obtaining or viewing a copy of the Lab Standard.

Overview

The Chemical Hygiene Plan must include:

- Standard Operating Procedures
- Criteria to determine and implement specific control measures, such as engineering controls and personal protective equipment
- An ongoing program be developed to ensure that Laboratory chemical hoods and other engineering controls are functioning properly
- Information and training requirements
- Circumstances under which a particular laboratory function will require "prior approval"
- Provisions for medical consultation and medical exams
- Designation of the Principal Investigator/Laboratory Supervisor as the Chemical Hygiene Officer
- Additional precautions for work with select carcinogens, reproductive toxins, and extremely toxic substances

- This model Chemical Hygiene Plan (referred to as the Plan throughout this document) will be reviewed annually by the Institutional Safety Officer and/or the College of Science Safety Committee.

- All Laboratory Workers prior to the commencement of lab duties must read this Chemical Hygiene Plan. In addition to the Plan, the Laboratory Workers must be familiar with and adhere to prudent laboratory safety guidelines developed by their Laboratory Supervisor, MU requirements and other relevant regulatory requirements (e.g. Radiation Safety).

- A written record stating that each Laboratory Worker has reviewed the Chemical Hygiene Plan and related health and safety policies and guides must be kept by the person in charge of the lab. (See Appendix II for an example of a training record form.)

Definitions

Hazardous Chemical-OSHA has defined a hazardous chemical in the *Hazard Communication Standards,* 29 CRF 1910.1200 if it meets any one of the following three conditions

- It is cancer-causing, toxic, corrosive, an irritant, a strong sensitizer, flammable or reactive, and thus poses a threat to the user's health and the environment
- It is specifically listed under the *Occupational Safety and Health Act,* 29 CRF 1910, Subpart Z
- It has an assigned threshold limit value (TLV) by the American Conference of Governmental Hygienists (ACGIH)

Laboratory- OSHA defines a laboratory as "a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis". Finally, Lab workers-the Laboratory Workers referred to in the Lab Standard are employees. OSHA defines an employee as "an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments." An example of a Laboratory Worker would be a University teaching assistant, research assistant or faculty member instructing an academic lab. OSHA would not consider students in an academic laboratory employees. However, as a matter of university policy, the principles outlined in this Chemical Hygiene Plan will apply to students in our laboratories. Also included, will be visiting professors and volunteers that might be working in the lab. Thus, Laboratory Supervisors must ensure that these groups that are in their laboratories are adequately instructed in relation to safe laboratory procedures.

Assistance

If there is any question about where the Lab Standard applies and whom it covers, the College of Science and/or the Institutional Safety Officer, upon request, will make this determination.

Chapter 2

RESPONSIBILITIES

Background
Marshall University is committed to providing a safe and healthful environment for all persons associated with the institution. The university intends to be a role model for the state in its environmental stewardship, health protection and safety standards and its compliance with all laws and regulations relating to the environment, health and safety. Management, faculty, staff, and students are asked to support these goals in all university activities and the University administration will provide the necessary resources to achieve these goals.

A vast array of educational activities and research utilizing hazardous materials is conducted at the university that requires cooperation of all parties involved to ensure that such activities are conducted safely with regard to workers, students, the community, and the environment. The following outlines specific responsibilities associated with laboratory safety and this Chemical Hygiene Plan.

Faculty and Staff in charge of supervising laboratories (referred to as Laboratory Supervisors throughout document) have the following responsibilities for implementing the Chemical Hygiene Plan:

- Inform and train employees concerning chemical safety as required by this Plan. Retain training records and all documentation

- Implement and enforce rules and standards of this plan concerning health and safety for laboratories under the supervisor's jurisdiction and restrict access to the laboratory (see Authorized Access in Chapter 3 "Standard Operating Procedures")

- Serve as the "Chemical Hygiene Officer" for his/her laboratories

- Ensure compliance of Laboratory Workers with this Plan

- Ensure the availability and enforce the proper use of appropriate personal protective equipment and relevant health and safety reference materials

- Remain cognizant of chemicals stored and used in labs and their associated hazards

- Develop an annual inventory of chemicals present in the laboratory not for immediate use (see Appendix III for sample inventory form)

- Conduct monthly internal inspections of labs for health and safety concerns and maintain an inspection log of inspection findings (see Appendix IV for a sample self inspection form)

- Request assistance from the Safety Officer, as needed

- Request allocation of funds from superiors for health and safety improvements as needed, or budget into research grant proposals

Laboratory Worker responsibilities regarding implementation of the Chemical Hygiene Plan:

- Follow all health and safety standards and rules

- Report all hazardous conditions to the Laboratory Supervisor

- Wear or use prescribed protective equipment

- Report any suspected job-related injuries or illnesses to the Laboratory Supervisor and seek treatment immediately

- Refrain from the operation of any equipment or instrumentation without proper instruction and authorization

- Remain aware of the hazards of the chemicals in the lab and how to handle hazardous chemicals safely

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

Deans and Heads of Academic and Administrative Units have the primary responsibility for the health and safety of their staff and students. Specific responsibilities regarding the implementation of the Chemical Hygiene Plan include:

- Collaborate with faculty and staff to adapt the Model Chemical Hygiene Plan to include lab-specific guidelines and to develop strategies to implement the Plan.

- Consider the idea of developing departmental-wide laboratory safety training programs,committees, and shared use facilities.

- Make budget arrangements for health and safety improvements. It is the responsibility of these respective individuals to request the necessary monies in the budget process

The Safety Officer responsibilities include the following:

- Provide technical assistance to Laboratory Supervisors and workers concerning appropriate storage, handling and disposal of hazardous chemicals

- Provide general laboratory safety training upon request

- Conduct exposure assessments and laboratory inspections upon request and on a routine basis

- Provide technical assistance concerning personal protective equipment and laboratory safety equipment; and

- Remain current on rules and regulations concerning chemicals used on campus

Chapter 3

STANDARD OPERATING PROCEDURES

Purpose
The Lab Standard requires operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals. This Plan represents a minimum set of guidelines for MU laboratories handling hazardous chemicals.

Background
The Lab Standard is intentionally vague about SOPs. Individual administrative units, laboratories or research groups are required to develop more detailed procedures as their situations warrant. These procedures must be written, added to the laboratory's Chemical Hygiene Plan, and made available to Laboratory Workers. To assist in the development of SOPs Appendix XI can be used. Acceptable lab safety references such as those listed in the OSHA Lab Standard may be adopted in whole or may be useful in developing additional procedures. In all situations, individual faculty or staff will be responsible for enforcing adequate safety and hygiene measures in laboratories they supervise. If necessary, additional assistance from the Safety Officer is available.

Hierarchy of Defense
To protect workers from exposure to hazardous chemicals there is a hierarchy of defense. Personal Protective Equipment is the last line of defense. It is imperative that all lab personnel know what PPE is appropriate for all operations in the lab, what work practices are to be followed and then understand how the engineering controls work.

The following standard operating procedures apply to all labs at the University:

Personal Protective Equipment

Attire At a minimum, all lab personnel should be wearing a lab coat and safety goggles when there is active work being done with hazardous chemical in the lab. Also, feet should be covered, i.e. no open toed shoes. It is recommended that either long pants or long skirts be worn to protect the legs in the event of a chemical accident. Loose clothing and long hair should be confined. Finally, no jewelry should be worn in the lab while performing experiments.

Gloves The person doing the work should be wearing appropriate gloves. Glove assessments should be done for all chemicals in the lab and if one glove will not work for all chemicals written information needs to be provided to all lab workers. All glove materials are not equally effective in protection from chemical hazards. Consult a chemical resistance chart such as the one found in Appendix V; consult a glove manufacturer for assistance in appropriate selection.

Eye Protection It is Marshall University policy that personnel including students, staff and visitors in laboratories wear appropriate goggles at all times where chemicals are stored or handled. Use the assessment chart to help determine which is appropriate. The wearing of **contact lenses** in labs has been a controversial issue. It is preferred that glasses be worn rather than contact lenses, however, if a worker wishes to wear contact lenses they will be requires to sign the waver located in Appendix XII. This form is to be retained by the Chemical Hygiene Officer, and a copy given to the Safety Officer.

Face Shields Full-face shields must be worn when conducting a procedure where splashing is a potential. Full-face shields with bottom caps to protect under the chin are preferred due to the tendency to raise the chin when a splash occurs.

Respiratory Protection The use of some substances may require respirators. See Chapter 4 for a discussion of "Controlling Chemical Exposures".

HAZARD ASSESSMENT AND PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS FOR GENERAL LABORATORY OPERATIONS

Hazard	Personal Protective Equipment Required		
	Eye	**Face**	**Hand/Skin/ Body**
Any laboratory use of chemicals	Safety goggles at all times		Lab coat, latex or nitrile gloves
Use of corrosive chemicals, strong oxidizing agents, carcinogens, mutagens, etc.	Chemical splash goggles	Full face shield and goggles (for work with over 4 liters of corrosive liquids)	Resistant gloves (See Appendix V for chemical resistance of common glove materials) Impervious lab coat, coveralls, apron, protective suit (for work with over 5 gallons corrosive liquids)
Temperature extremes			Insulated gloves for handling ovens, furnaces, cryogenic bath and other devices over 100° C or below -1° C
Sharp objects (broken glass, insertion of tubes or rods into stoppers)			Heavy cloth barrier or leather gloves

Work Practice and Administrative Controls

Authorized Access The laboratory supervisor must restrict access to laboratories. Children (under age 17) are not allowed in laboratories except as authorized by the laboratory supervisor for an officially sanctioned activity (e.g. class or open house). Pets are also prohibited from laboratories unless they are living assistance animals i.e. seeing eye dogs.

Containers Check the integrity of containers and if damaged or leaking, transfer to an acceptable container or call Hazardous Materials Management for assistance. For disposal, fill out a "Surplus Chemical/Chemical Waste Pick-Up form" a copy of which is located in Appendix XIII and submit to the Safety Officer or to the Chemistry Stock Room, room 455. Observe chemical compatibility; for example, hydrofluoric acid must not be stored in glass and some oxidizers should not be stored in plastic containers. See Appendix VI for more examples.

Broken Glassware Broken glassware cannot be disposed of in the regular garbage. It should be placed in a box with a plastic liner so that no shards can present a hazard when disposing of the entire container. Do not overfill the container; try to keep it under 30 pounds.

Glass Tubing When inserting tubing into stoppers, lubricating tubing as well as wearing gloves or wrapping in a thick cloth will help to protect hands from being cut in the event of the tubing slipping and breaking.

No Smoking This policy exists throughout the University and applies in all laboratories.

Unattended Experiments Frequently, laboratory operations are carried out continuously or overnight. For experiments involving hazardous operations, it is essential to plan for interruptions in utility services such as electricity, water and inert gas. Operations are to be safe and plans made to avoid hazards in case of failure. If necessary, arrangements for routine inspection of the operation are to be made and, in all cases, the laboratory lights should be left on and an appropriate sign posted on the door.

Door View Panel Lab view panel should not be covered.

Working Alone When working alone during evenings, it is required to have a second person present at all times.

Housekeeping Exits, aisles and safety equipment must NOT be obstructed in any way with equipment, furniture, etc. No items must be stored in the corridors.

Food, Drink, Cosmetics Eating, drinking and the application of cosmetics (including lip balm) is forbidden in areas where hazardous chemicals, biohazards and radioactive materials are used. These activities must be in designated, well defined non-chemical

areas that are separated from the lab area by physical barriers such as partitions or filing cabinets. A line on the floor will not be considered adequate separation. Consumables must not be placed in the same refrigerator as chemicals, biohazards or radioactive material.

Horseplay Practical jokes or other inappropriate and unprofessional behavior in the laboratory setting is forbidden. Avoid distracting or startling any other workers.

Equipment Use proper equipment that is in good condition. For example, never use chipped or cracked glassware. Use flammables with only approved equipment such as blenders. Flammables that require cooler temperatures for storage should be put in specific refrigerators. One is referred to as flammable safe and has not exposed ignition sources inside the cabinet, such as lights or switches that could inginte vapors. These are less expensive that the explosion-proof refrigerators and would be adequate in most lab applications. The other type or refrigerator is referred to as explosion-proof. This type may be required in rare circumstances for hazardous locations. Explosion-proof or spark-proof units have no interior or exterior ignition sources and are considerably more expensive.

Vacuum pumps and vacuum lines Vacuum lines leading from an experimental procedure shall always be equipped with traps to prevent contamination of vacuum equipment. Traps shall be evaluated for appropriateness and special safety precautions instituted if needed.

- **Particulates:** determine size range being generated and choose capable filtration
- **Aqueous non-volatile:** in most cases a filter flask at room temperature will prevent liquids from contamination vacuum source
- **Solvent or other volatile liquids:** a cold trap that is large enough and cold enough to condense vapors plus a filter flask large enough to hold all possible liquids that could be aspirated, Avoid using liquid nitrogen if at all possible. Liquid nitrogen should only be used in sealed or evacuated equipment and with extreme caution. Liquid oxygen can form if proper procedures are not followed. For most applications a slurry of dry ice and isopropanol or ethanol can be used.
- **Corrosive, highly reactive or toxic gases:** a sorbent canister or scrubber shall be used that can trap the contaminant.

Disposal of Waste It is important to segregate wastes. To request pick-up of hazardous waste, biohazardous waste or chemicals, call the Safety Officer. Disposal of all laboratory waste must follow the procedures specified by Hazardous Materials Management. To request pick-up of radioactive wastes, contact Radiation Safety at ????.

Hazardous Materials Hazardous materials are not to be used on open laboratory benches.

Mouth Pipetting Mouth pipetting is forbidden.

Mercaptans To avoid false reporting of natural gas leaks, the Physical Plant department should be contacted when mercaptans are used in a laboratory in such a manner that persons outside of the laboratory could smell the mercaptan and suspect a natural gas leak in the building.

Perchloric Acid If perchloric acid is heated above ambient temperature it will give off vapors that can condense and form explosive perchlorates. Hence, when heating perchloric acid above ambient temperature, a specifically designed and dedicated perchloric acid Laboratory chemical hood with a wash down system or a local scrubbing or trapping system must be used.

Personal Hygiene Hands should be washed frequently throughout the day, before leaving the lab, after contact with any hazardous material, and before eating, drinking, smoking and and applying make-up or lip balm.

Personal Use of Chemicals Lab workers are not allowed to remove chemicals from the lab for personal use.

Chemical Spills and Accident Response As a matter of policy, University personnel should handle their own small spills and releases. A spill report, located in Appendix XIV is to be filled out, with one copy retained by the Chemical Hygiene Officer and a copy provided to the Safety Officer. For emergency situations i.e., large spills and leaks, evacuate and call 4357 (HELP) or 9-911 (Campus Police) from a safe location. See Chapter 11, Planning for Emergencies for more information.

Chemical Storage Chemicals should be stored by compatibility, not simply by alphabetical arrangement. Oxidizers should be separated from organics, air/water reactives must be kept dry and cyanides should be stored away from acids. (See Appendix VI for examples of incompatible chemicals).

Volatile toxic substances must be stored in volatile storage cabinets adequate to the purpose. When volatiles must be stored in a cooled atmosphere, explosion-proof refrigerators or similar specially designed equipment must be used.

Chemical Handling The use of poly coated bottles or use of bottle carriers for transporting hazardous chemicals that are in regular glass containers is required. Close caps securely and avoid storing chemical containers above eye level. Pour chemicals carefully, and never add water to concentrated acid. Metal containers and non-conductive containers (e.g., glass or plastic) holding more than five gallons must be grounded when transferring flammable liquids.

Gas Cylinder Handling and Storage Use appropriate hand carts to move cylinders. Cylinders must be secured at all times. Extremely toxic gases (e.g. hydrogen sulfide, chlorine, and arsine) should not be moved through regular exit corridors, particularly during business hours. Always consider cylinders as full and handle them with corresponding care. Cylinders must be stored in well-ventilated areas with their

protective caps screwed on and the cylinder secured (e.g., strapped or chained in an upright position) to reduce the chance of the cylinder being knocked over. Do not store cylinders near heat or high traffic areas. Do not store flammables and oxidizers together. Whenever possible do not store empty and full cylinders together. Clearly mark empty cylinders. Storage of large quantities of cylinders must be done in an approved gas cylinder storage area.

Labeling All chemical containers must be labeled. All labels must be legible, in English and include chemical/product name (chemical formulas alone are not acceptable) and include information related to relevant hazards (See Appendix XI for Hazard Ratings). If the chemical/product is novel, it must be labeled with the initials of the synthesizing chemist, the notebook and page number referencing the synthesis. Unknowns for teaching labs are to be stored in a locked cabinet, clearly labeled with the unknown number, and an unknown key stored in the cabinet, with a second unknown key on file with the safety officer. The cabinet door should be labeled with a Hazmat sticker describing the **most toxic, most flammable, and most reactive chemicals stored.** Labels on incoming containers must not be removed or defaced. Date all **peroxidizable** and other chemicals which may become unstable over time (e.g. picric acid, ethers); test and/or dispose of them when appropriate. Waste chemical containers must be clearly marked "Hazardous Waste" indicating specific name of waste chemical and date when full.

LABORATORY DOOR SIGNAGE Each laboratory door must be legibly marked with the following information:

1. Room number
2. Department
3. Laboratory Supervisor's name
4. Emergency contacts, including names, office location, and office and emergency telephone numbers
5. Special hazards/instructions (e.g. location of large quantities of flammables or the presence of a "local alarm" system)

See Appendix VII for standard laboratory signage.

Engineering Controls

Laboratory Chemical Hood and Other Engineering Controls See Chapter 5, "Laboratory chemical hoods and Other Engineering Controls."

Safety Shower/Eyewashes Safety showers and/or eyewashes are to be within seventy-five feet of labs where corrosive chemicals are used. The Safety Officer or his/her designee is charged with testing the eyewashes and shower units monthly. A log of those checks can be obtained by contacting the Safety Officer.

If operations in the lab require safety procedures greater than what is outlined above please insert or reference the location of lab specific SOPs here. For the SOP template consult Appendix XI.

Chapter 4

CONTROLLING CHEMICAL EXPOSURES

The Lab Standard requires the employer to determine and implement control measures to reduce employee exposure to hazardous chemicals; and particular attention must be given to the selection of control measures for chemicals that are known to be extremely hazardous. There are three major routes of entry for a chemical to enter the body: inhalation, absorption, and ingestion. Three types of controls for prevention of these various routes of entry include engineering controls, personal protective equipment and administrative controls. Each route of entry a chemical can take to enter the body can be controlled in a number of ways, as explained below. If a lab worker has been exposed to a hazardous chemical, the exposure inicident report located in Appendix XV is to be filled out and copies filed with both the Chemical Hygiene Officer and the Safety Officer.

Inhalation Hazards

Inhalation of chemicals is the most common route of entry a chemical can take to enter the body. To avoid inhalation exposures, hazard reduction methods such as substituting a less volatile or a less toxic chemical or substituting a liquid or solid chemical for a gaseous one are the best means of control. If substitution is not practical, engineering controls such as ventilation should be used to lessen the chance of exposure. The use of well-functioning local exhaust ventilation such as Laboratory chemical hoods, biological safety cabinets, vented glove boxes and other local exhaust systems is often required to minimize exposure to hazardous chemicals. Dilution ventilation may be used to reduce exposure to nonhazardous nuisance odors. For extremely toxic chemicals such as those classified as poison gases by State or Federal agencies (e.g., arsine, phosgene) the use of closed systems, vented gas cabinets, fail-safe scrubbing, detection or other stricter controls may be required.

If both substitution and engineering controls are unavailable, the use of personal protective equipment may be required to reduce inhalation exposures. Respiratory protection from dust masks to self-contained breathing apparatus may be utilized to this end. If laboratory employees wear respirators, requirements of the OSHA Respirator Standard (1910.134) must be met and a written respirator program must be implemented. This Standard requires training on the proper use of respirators; medical surveillance to ensure the user is capable of wearing a respirator, and fit testing to ensure that the respirator fits properly. A lab worker or his/her supervisor should contact the Safety Officer in the event that respiratory protection is to be utilized to control exposures to hazardous chemicals.

In addition the following principles should be utilized to reduce the risk of exposure to hazardous chemicals:

- Minimization of exposure time for individual employees

- Restricted access to an area where a hazardous chemical is used; and
- Proper signage on lab doors to indicate special hazards within.

Skin/Eye Contact Hazards

To reduce the risk of a chemical entering the body via skin and eye contact, engineering controls include substitution and appropriate ventilation as described above in Inhalation Hazards. The more obvious means of preventing skin and eye contact is the wearing of personal protective equipment such as eye protection, face shields, gloves, appropriate shoes, lab aprons, lab coats, and other protective equipment as appropriate to the hazard. Since the chemical resistivity of the different types of protective equipment varies significantly, the lab supervisor should consult Appendix V or other references to ascertain that the protective equipment material is resistant to the chemical being protected against. Safety showers/eye wash equipment is required where corrosive chemicals are used. Such equipment should be prominently labeled and not obstructed.

Ingestion Hazards

Ingestion of chemicals is the least common route of entry into the body. However a Laboratory Worker can easily ingest chemicals into the body via contaminated hands if they are not washed prior to eating, smoking or sticking part of the hand or a writing tool that has been in contaminated hands into the mouth. Some controls for preventing this route of exposure include engineering controls like isolating the hazardous substance so minimal contact is required (e.g., use glove box). Also, administrative controls such as forbidding mouth pipetting, encouraging good personal hygiene and designating a well-marked nonchemical area where eating, drinking and the application of cosmetics is permitted. And finally personal protective equipment such as the wearing of gloves can reduce this type of exposure.

Exposure Assessment

At the request of faculty, staff or students, exposure evaluations may be conducted by Occupational Health for any suspected overexposure to substances regulated by OSHA. Records of exposure evaluations will be kept in the Occupational Health and Safety Department and provided to the department and affected employees and any other appropriate authorities at the University. The following list of chemicals require initial monitoring to determine exposures:

- Asbestos
- Vinyl chloride
- Inorganic arsenic
- Lead
- Cadmium
- Benzene

- Cotton dust
- 1,2-Dibromo-3-chloropropane
- Acrylonitrile
- Ethylene oxide
- Formaldehyde
- Methylenedianiline
- 1,3-butadiene
- Methylene chloride

Chapter 5

LABORATORY CHEMICAL HOODS AND OTHER ENGINEERING CONTROLS

Laboratory chemical hood Face Velocities

All Laboratory chemical hoods at Marshall University facilities should have face velocities between 80-150 feet per minute with the sash at a "working height" (approximately 12 inches). As a general rule, Laboratory chemical hoods should not be operated with the sash fully open and should have the sash closed when not being used. An Independent Contractor will conduct a Laboratory chemical hood inspection and certification program for all Laboratory chemical hoods at the college yearly. Laboratory chemical hoods with face velocities within the 80-150 feet per minute range may be used without restriction and will be marked with a Laboratory chemical hood sticker showing face velocity.

Hoods Needing Repairs

Laboratory chemical hoods with face velocities below 80 feet per minute or above 150 linear feet per minute must be marked with a sign indicating that the hood may not be used for chemical manipulations. A work order to repair these hoods is to be processed as soon as possible and the Safety Officer informed. Once the hood has been repaired, it will need to be reevaluated.

Safe Work Practices for Laboratory chemical hoods

When using a Laboratory chemical hood, one must remember that the hood does not provide absolute containment or absolute protection from the materials in the hood. However, for most exposures, a properly designed hood in a properly designed room can provide adequate protection if certain work practices are followed. The work practices listed below are recommended by the American Conference of Governmental Industrial Hygienists in their text: "Industrial Ventilation: A Manual of Recommended Practices."

A chemical Laboratory chemical hood cannot provide complete safety against all events that may occur in the hood, especially for toxic airborne contaminants with an exposure limit in the low part per billion range. For ordinary exposures, however, a properly designed hood in a properly ventilated room can provide adequate protection. Nevertheless, certain work practices are necessary in order for the hood to perform efficiently. The following work practices are required; more stringent practices may be necessary in some circumstances.

1. All operations that may generate air contaminants at levels above the exposure limit must be conducted inside a hood.

2. Keep all apparatus at least 6 inches back from the face of the hood. A stripe on the bench surface is a good reminder.

3. Do not put your head in the hood when contaminants are being generated.

4. Do not use the hood as a waste disposal mechanism except for very small quantities of volatile materials.

5. Excessive storage of chemicals or any apparatus in the hood will impair the performance of the chemical Laboratory chemical hood. Store flammable chemicals in an approved flammable storage safety cabinet. Store corrosive chemicals in a corrosive storage cabinet.

6. Be sure that the switch is in the "on" position whenever the hood is in use and test hood often for airflow (for example using a chemwipe).

7. Using hazardous solids (powders) in hood may not be appropriate.

8. Keep the slots in the hood baffle free of obstruction by apparatus or containers.

9. Minimize foot traffic past the face of the hood.

10. Keep laboratory doors and windows closed.

11. Do not remove hood sash or panels except when necessary for apparatus set-up. Replace sash or panels before operating.

12. Do not place electrical receptacles or other spark sources inside the hood when flammable liquids or gases are present. No permanent electrical receptacles are permitted in the hood.

13. Use an appropriate barricade if there is a chance of explosion or eruption.

14. If hood sash is supposed to be partially closed for operation, the hood should be so labeled and the appropriate closure point clearly indicated.

15. Where perchloric acid is heated above ambient temperature, vapors may condense within the exhaust system to form explosive perchlorates. In such instances, specially designed Laboratory chemical hood exhaust systems must be utilized. These systems will have dedicated exhausts and a water washdown system, and may be used for perchloric acid digestions only.

16. All Laboratory chemical hoods should have spill protection lips (at the front of hood and for cup sinks located in the hood).

Any questions or requests for assistance in evaluation of Laboratory chemical hoods may be directed to the Safety Officer.

Chapter 6

EMPLOYEE INFORMATION AND TRAINING

Background

All individuals who work in laboratories who may be exposed to hazardous chemicals must be apprised of the hazards of chemicals present in their work area. THIS INFORMATION AND TRAINING AS OUTLINED BELOW MUST BE PROVIDED BEFORE INITIAL ASSIGNMENT AND BEFORE NEW EXPOSURE SITUATIONS. Equipment necessary for the safe handling of hazardous substances must also be provided. IT IS THE RESPONSIBILITY OF THE PRINCIPAL INVESTIGATOR TO ENSURE THAT ALL LABORATORY WORKERS HAVE BEEN PROPERLY TRAINED.

Responsibilities

Training **specific** for the particular lab where an employee is assigned is the responsibility of that employee's supervisor. The supervisor must determine the frequency of refresher information and training. Also, special hazardous materials training is mandatory for anyone who will be generating hazardous waste.

Information

Laboratory Workers must be informed of the location and availability of the following:

- "Occupational Exposures to Hazardous Chemicals in Laboratories" (the OSHA Lab Standard - See Appendix I)
- This Chemical Hygiene Plan
- Reference materials on chemical safety (including material safety data sheets)
- Permissible exposure limits for OSHA regulated substances, or if there is no applicable OSHA standard, the recommended exposure limits or threshold limit value may be provided.
- Signs and symptoms associated with exposure to the hazardous chemicals found in the lab.

Training

Laboratory Worker training must include:

- Detection methods that may be used to detect the presence or release of a hazardous chemical. Examples of detection methods include visual appearance, odor, detector papers, and an understanding of chemical monitoring devices

- Physical and health hazards of the chemicals
- Hazardous waste training
- The work practices, personal protective equipment, and emergency procedures to be used to ensure that the employee may protect himself/herself from overexposure to hazardous chemicals
- Medical consultations and examinations

The manufacturer's material safety data sheets (MSDSs) will generally contain much of the above information needed to comply with the information and training requirements of the OSHA Lab Standard. Laboratory Supervisors and employees should understand the relevant MSDSs and/or other comparable literature on the hazardous chemicals that are used or stored in their laboratory. The employee's supervisor must provide additional training for specific lab hazards.

Copies of MSDSs may be obtained from the chemical supplier. Individual departments or laboratories are strongly encouraged to maintain their own files of reference materials.

Please include training certificates and fill out lab specific training records in Appendix II.

Chapter 7

PRIOR APPROVAL

The responsibility for approval of the acquisition and use of toxic chemical agents rests with the Laboratory Supervisor. Some materials including toxic compressed gases, radioactive materials, and certain recombinant DNA and biohazards require prior internal or external approval at various levels. All needed approval must be obtained before the experiments are performed. The necessary form is located in Appendix XVII.

Chapter 8

MEDICAL CONSULTATION

An opportunity for Laboratory Workers to receive medical consultation must be provided under the following circumstances:

- if an employee develops any symptoms thought to arise from chemical overexposure
- after an event such as a major spill, leak or explosion which may have resulted in an overexposure
- the laboratory specific or Institutional Chemical Hygiene Officer identifies an overexposure as the result of an evaluation

Employees or student workers receiving pay that require medical evaluation should follow the same procedure as reporting an accident. If an **employee** is injured and **DOES NOT SEEK MEDICAL ATTENTION** at this time, the procedures in Appendix VIII should be followed and an accident report located in Appendix XVI, should be completed. If the injury is to an unpaid worker, a Propery Damage/Public Injury Report should be completed.

Note: Any medical examination required by this Plan must be provided without cost to the employee, without loss of pay and at a reasonable time and place. Records of any medical examination will be maintained at the medical facility providing service or with appropriate medical personnel at the University.

Chapter 9

CHEMICAL HYGIENE OFFICER

The Laboratory Supervisor shall serve as the "Chemical Hygiene Officer" for her/his laboratories. The designated Chemical Hygiene Officer has the primary responsibility for safety and health within her/his laboratories. The Chemical Hygiene Officer is also responsible for conducting an annual review of the Chemical Hygiene Plan(s) that apply to his/her laboratories.

In teaching laboratories the instructor of record shall serve as the “Chemical Hygiene Officer” for that laboratory section. The designated Chemical Hygiene Officer has the primary responsibility for safety and health within her/his teaching laboratories. They are responsible for insuring all individuals in the laboratory have received proper training via requiring all enrolled students and Teaching Assistants to take the appropriate safety quiz located on the departmental safety website. They will keep these records for the duration of the class, and furnish the Safety Officer or his/her designee a copy to keep as well.

The Safety Officer is designated as the “College of Basic Science Chemical Hygiene Officer”. The College of Basic Science Chemical Hygiene Officer is responsible for coordinating an annual review of the Model Chemical Hygiene Plan and serving as a resource to the individual laboratory Chemical Hygiene Officers.

Chapter 10

SPECIAL PROVISIONS FOR SELECT CARCINOGENS, REPRODUCTIVE TOXINS AND ACUTELY TOXIC CHEMICALS

Provisions shall be made for additional employee protection when work with particularly hazardous substances takes place. These include "select carcinogens," (see Appendix X for a list of select carcinogens) reproductive toxins and substances which have a high degree of acute toxicity. The following provisions must be included:

1. Establishment of a designated area
2. Use of containment devices such as Laboratory chemical hoods or glove boxes
3. Procedures for safe removal of contaminated waste; and
4. Decontamination procedures

In addition to the general safety guidelines mentioned in the first section and throughout the Plan, special precautions are needed when handling genotoxins, reproductive toxins and chemicals with a high degree of acute toxicity. A minimum set of guidelines that should be followed is listed below. The lab supervisor should ensure that these and other precautions designed to minimize risk of exposure to these substances are taken.

- Quantities of these chemicals used and stored in the laboratory must be minimized, as should their concentrations in solution or mixtures.

- Work with genotoxins, reproductive toxins and acutely toxic chemicals must be performed within a certified functioning Laboratory chemical hood, biological safety cabinet, ventilated glove box, sealed system, or other system designed to minimize exposure to these substances. (The exhaust air from the ventilation systems may require scrubbing, or other treatment, before being released into the atmosphere.) In all cases, work with these types of chemicals must be done in such a manner that the OSHA permissible exposure limits or similar standards are not exceeded.

- Certain chemicals are known or suspected to harm fetuses or reproductive health of adults. Some examples of reproductive toxins are: anesthetic gases, arsenic and certain arsenic compounds, benzene, cadmium and certain cadmium compounds, carbon disulfide, ethylene glycol monomethyl and ethyl ethers, ethylene oxide, lead compounds, mercury compounds, toluene, vinyl chloride, xylene, and formamide. The first trimester of pregnancy is a period of high susceptibility. Often a woman does not know that she is pregnant during this period. Individuals of childbearing potential are warned to be especially cautious when working with such reproductive toxins. These individuals must use appropriate protective apparel (especially gloves) to prevent skin contact. Pregnant women and women

intending to become pregnant should seek advice from knowledgeable sources before working with substances that are suspected to be reproductive toxins. These sources include but are not limited to the respective Laboratory Supervisor and Material Safety Data Sheets. Notify supervisors of all incidents of exposure or spills; consult a qualified physician when appropriate.

- Compressed gas cylinders that contain acutely toxic chemicals such as arsine, chlorine, and nitrogen dioxide must be kept in well-ventilated areas.

- The ventilation efficiency of the designated Laboratory chemical hood, glove box or gas cabinet and the operational effectiveness of mechanical and electrical equipment used to contain or manipulate these special substances should be evaluated periodically by the laboratory personnel at intervals determined by the Laboratory Supervisor. The interval of evaluating systems may vary from weekly to annually depending upon the frequency of usage, quantities employed and level of hazard.

- Each laboratory utilizing these substances must designate an area for this purpose and must sign or mark this area with an appropriate hazard warning. The designated area may be an entire laboratory (bio-safety level three or four require that the ENTIRE laboratory be designated), an area of the laboratory or a device such as a Laboratory chemical hood or glove box. The designated area should be marked with a **DANGER, specific agent, AUTHORIZED PERSONNEL ONLY** or comparable warning sign.

- All Laboratory Workers who work in a laboratory which has an area designated for use with genotoxins, reproductive toxins and acutely toxic chemicals must be trained about the deleterious effects of these substances as well as signs and symptoms regarding exposure to these substances, whether or not they actually work with the substance themselves. Training to ensure the safe handling and storage of these substances is required for those who use these materials. This training is the responsibility of the Laboratory Supervisor and must be done prior to the use of any of these materials.

- Laboratory Workers working with these chemicals must have access to appropriate protective equipment and clothing (available at no expense to the workers) and must be trained on how to properly utilize the safety equipment. For example, when working with highly toxic gases, it is often recommended that the workers have available and be trained by Hazardous Materials Management to use self-contained breathing apparatus.

- Detection equipment may be required in laboratories where chemicals (especially poisonous gases) with a high degree of acute toxicity are utilized.

- The designated working area must be thoroughly and appropriately decontaminated and cleaned at regular intervals determined by the Laboratory

Supervisor. The interval may be as short as one day or as long as six months depending upon the frequency of usage and level of hazard.

- Special precautions to avoid release and exposure to highly toxic chemicals, genotoxins and reproductive toxins must be utilized. For instance, volatile substances should be kept cool and contained. Gases should have properly functioning valves, check valves, regulators, containment that can withstand pressure buildup, and appropriate piping. Dispersive solids should be kept in closed containers, used in places with minimum air currents, and appropriate contact materials should be used to avoid static charging.

If this chapter is applicable to your lab please include your lab specific information.

Chapter 11

PLANNING FOR EMERGENCIES

Planning and practicing for emergencies is an essential component of laboratory safety. Workers in labs should have the knowledge necessary to assess their risks from a small spill or release of a chemical or a small trash can fire, if they have received proper training. The most important aspect of this training is being able to differentiate between an incidental situation and an emergency. Practice in emergency procedures and evacuation drills will provide lab workers with the insight they need to make this differentiation

An incidental release is one that does not cause an imminent health or safety hazard to lab workers and does not have to be cleaned up immediately in order to prevent death or serious injury to employees. Lab workers should prepare for and handle their own incidental spills or releases. If an accident does occur please refer to Appendix VIII for appropriate reporting procedures.

The following is a list of life threatening situations. If any of these situations occur the emergency procedures of the following section need to be followed.

1. High concentrations of toxic substances
2. Situation that is life or injury threatening
3. Imminent danger to life and health (IDLH) environments
4. Situation that presents an oxygen deficient atmosphere
5. Condition that poses a fire or explosion hazard
6. A situation that requires immediate attention because of the danger posed to employees in the area

EMERGENCY PROCEDURES FOR SELECTED EMERGENCIES

Fires and Other Life Threatening Situations

The four actions below must be taken by whoever discovers a fire that cannot be put out safely by someone who knows how to use a fire extinguisher or other life threatening situation. Actual emergency conditions may require the procedures to be followed in a different order, depending on the layout of the laboratory, time of day, the number of people present and the location of the emergency relative to doors and alarm stations or telephones.

1. Alert personnel in the immediate vicinity.
   Tell the nature and extent of the emergency.
   Give instructions to sound the alarm, call for assistance.

2. Turn off heat source.

Confine the fire or emergency without endangering yourself.
Shut hood sash if possible.
Close doors to prevent spread of vapors, gases or fire.

3. Evacuate the building or hazardous area.
   Use the evacuation alarm system.
   Follow posted evacuation procedures.
   Assemble at designated meeting point.
   Practice evacuation and assembly in drills.

4. Summon aid from a safe location.
   Call 4357 (HELP) or 9-911.
   Give location and type of emergency.

Physically Disabled Students

In the case of an event occurring where there is/are persons in need of physical assistance who are unable to safely evacuate the area or building, it is the Chemical Hygiene Officer's responsibility to assist these people. The Chemical Hygiene Officer shall insure that the rest of the students evacuate. He/She shall inform a responsible person (faculty member, teaching assistant, graduate student et cetra) that they are staying to assist a disabled student and to notify the authorities of the situation. The faculty member shall remain with the student until all others have evacuated the floor. They will then assist the student to the stairwell and remain until rescue persons arrive.

Clothing Fire and Severe Thermal Burns

Thermal burns from a clothing fire or large splash of hot material can be life threatening if they are deep, extensive or located on critical areas of the body. Severe burns of the hands, feet, face and genital areas are considered critical.

To extinguish a clothing fire:

- Stop the person on fire from running!
- Drop the person to the floor. Standing will allow flames to spread upward to eyes and nose
- Roll the person to snuff out the flames
- Cool the person. Remove smoldering clothing. Use cold water or ice packs to cool burns and minimize injury
- Get medical assistance immediately

Chemical Splash to the Eyes or Skin

The most important emergency measure if chemicals are splashed to the eyes or skin is immediate flushing with water in the emergency eyewash and/or shower. Most splashes need at least 15 minutes of washing. Get medical assistance immediately after flushing.

Please insert any lab specific procedures for emergencies here.

APPENDIX I

OSHA LABORATORY STANDARD

29 CFR 1910.1455

(a) **Scope and application:**

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

(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:

(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.

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

(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.

(3) This section shall not apply to:

(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 2, even if such use occurs in a laboratory.

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

(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

(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.

(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° F (37.8° C), but below 200° F (93.3° C), except any mixture having components with flashpoints of 200° F (93.3° 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° F (21.1° C); or

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

(iii) A liquid having a vapor pressure exceeding 40 psi at 100° 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° F (37.8° C), except any mixture having components with flashpoints of 100° 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° F (37.8° 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° F (37.8° 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 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.

(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.

(d) **Employee exposure determination:**

(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).

(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.

(3) **Termination of monitoring.** Monitoring may be terminated in accordance with the relevant standard.

(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.

(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).

(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:
   (i) Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory and
   (ii) Capable of keeping exposures below the limits specified in paragraph (c) of this section.

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

(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;
   (i) Standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals;
   (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;
   (iii) A requirement that Laboratory chemical hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment;
   (iv) Provisions for employee information and training as prescribed in paragraph (f) of this section;
   (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;

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

(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

(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:

(A) Establishment of a designated area;

(B) Use of containment devices such as Laboratory chemical hoods or glove boxes;

(C) Procedures for safe removal of contaminated waste; and

(D) Decontamination procedures.

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

(f) **Employee information and training.**

(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.

(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.

(3) Information. Employees shall be informed of:

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

(ii) The location and availability of the employer's Chemical Hygiene Plan;

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

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

(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.

(4) Training.

(i) Employee training shall include:

(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.);

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

(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.

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

(g) **Medical consultation and medical examinations.**

(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:

(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.

(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.

(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.

(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.

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

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

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

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

(4) Physician's written opinion.

(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:

(A) Any recommendation for further medical follow-up;

(B) The results of the medical examination and any associated tests;

(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

(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.

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

(h) **Hazard identification.**

(1) With respect to labels and material safety data sheets:

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

(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.

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

(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.

(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.

(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.

(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.

(j) **Recordkeeping.**

(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.

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

(k) **Dates.**

(1) Effective date. This section shall become effective May 1, 1990.

(2) Start-up dates.

(i) Employers shall have developed and implemented a written Chemical Hygiene Plan no later than January 31, 1991.

(ii) Paragraph (a)(2) of this section shall not take effect until the employer has developed and implemented a written Chemical Hygiene Plan.

(l) **Appendices.** The information contained in the appendices is not intended, by itself, to create any additional obligations not otherwise imposed or to detract from any existing obligation.

APPENDIX A TO 1910.1450

National Research Council Recommendations Concerning Chemical Hygiene in Laboratories (Non-Mandatory)

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Foreword

As guidance for each employer's development of an appropriate laboratory Chemical Hygiene Plan, the following non-mandatory recommendations are provided. They were extracted form "Prudent Practices" for Handling Hazardous Chemicals in Laboratories" (referred to below as "Prudent Practices"), which was published in 1981 by the National Research Council and is available from the National Academy Press, 2101 Constitution Ave., NW,. Washington DC 20418.

"Prudent Practices" is cited because of its wide distribution and acceptance and because of its preparation by members of the laboratory community through the sponsorship of the National Research Council. However, none of the recommendations given here will modify any requirements of the laboratory standard. This Appendix merely presents pertinent recommendations from "Prudent Practices", organized into a form convenient for quick reference during operation of a laboratory facility and during development and application of a Chemical Hygiene Plan. Users of this appendix should consult "Prudent Practices" for a more extended presentation and justification for each recommendation.

"Prudent Practices" deal with both safety and chemical hazards while the laboratory standard is concerned primarily with chemical hazards. Therefore, only those recommendations directed primarily toward control of toxic exposures are cited in this appendix, with the term "chemical Hygiene" being substituted for the word "safety". However, since conditions producing or threatening physical injury often pose toxic risks as well, page references concerning major categories of safety hazards in the laboratory are given in section F.

The recommendations from "Prudent Practices" have been paraphrased, combined, or otherwise reorganized, and headings have been added. However, their sense has not been changed.

Corresponding Sections of the Standard and this Appendix

The following table is given for the convenience of those who are developing a Chemical Hygiene Plan which will satisfy the requirements of paragraph (e) of the standard. It indicates those sections of this appendix which are most pertinent to each of the sections of paragraph (e) and related paragraphs.

PARAGRAPH AND TOPIC IN LABORATORY STANDARD	RELEVANT APPENDIX SECTION
(e)(3)(i) Standard operating procedures for handling toxic chemicals.	C, D, E
(e)(3)(ii) Criteria to be used for implementation of measures to reduce exposures.	D
(e)(3)(iii) Laboratory chemical hood performance.	C4b
(e)(3)(iv) Employee information and training (including emergency procedures).	D10, D9
(e)(3)(v) Requirements for prior approval of laboratory activities.	E2b, E4b
(e)(3)(vi) Medical consultation and medical examinations.	D5, E4f
(e)(3)(vii) Chemical hygiene responsibilities.	B
(e)(3)(viii) Special precautions for work with particularly hazardous substances.	E2, E3, E4

In this appendix, those recommendations directed primarily at administrators and supervisors are given in sections A-D. Those recommendations of primary concern to employees who are actually handling laboratory chemicals are given in section E. (Reference to page numbers in "Prudent Practices" are given in parentheses.)

A. **General Principles for Work with Laboratory Chemicals**

In addition to the more detailed recommendations listed below in sections B-E, "Prudent Practices" expresses certain general principles, including the following:

1. **It is prudent to minimize all chemical exposures**. Because few laboratory chemicals are without hazards, general precautions for handling all laboratory chemicals should be adopted, rather than specific guidelines for particular chemicals (2,10). Skin contact with chemicals should be avoided as a cardinal rule (198).

2. **Avoid underestimation of risk**. Even for substances of no known significant hazard, exposure should be minimized; for work with substances which present special hazards, special precautions should be taken (10, 37, 38). One should assume that any mixture will be more toxic than its most toxic component (30, 103) and that all substances of unknown toxicity are toxic (3, 34).

3. **Provide adequate ventilation**. The best way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by use of hoods and other ventilation devices (32, 198).

4. **Institute a chemical hygiene program**. A mandatory chemical hygiene program designed to minimize exposures is needed; it should be a regular, continuing effort, not merely a standby or short-term activity (6,11). Its recommendations should be followed in academic teaching laboratories as well as by full-time Laboratory Workers (13).

5. **Observe the PELs, TLVs**. The Permissible Exposure Limits of OSHA and the Threshold Limit Values of the American Conference of Governmental Industrial Hygienists should not be exceeded (13).

B. **Chemical Hygiene Responsibilities**

Responsibility for chemical hygiene rests at all levels (6, 11, 21) including the:

1. **Chief executive officer**, who has ultimate responsibility for chemical hygiene within the institution and must, with other administrators, provide continuing support for institutional chemical hygiene (7, 11).

2. **Supervisor of the department or other administrative unit**, who is responsible for chemical hygiene in that unit (7).

3. **Chemical hygiene officer(s)**, whose appointment is essential (7) and who must:
   (a) Work with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices (7);
   (b) Monitor procurement, use, and disposal of chemicals used in the lab (8);
   (c) See that appropriate audits are maintained (8);
   (d) Help project directors develop precautions and adequate facilities (10);
   (e) Know the current legal requirements concerning regulated substances (50); and
   (f) Seek ways to improve the chemical hygiene program (8, 11).

4. **Laboratory Supervisor**, who has overall responsibility for chemical hygiene in the laboratory (21) including responsibility to:
   (a) Ensure that workers know and follow the chemical hygiene rules, that protective equipment is available and in working order, and that appropriate training has been provided (21, 22);
   (b) Provide regular, formal chemical hygiene and housekeeping inspections including routine inspections of emergency equipment (21, 171);
   (c) Know the current legal requirements concerning regulated substances (50, 231);

(d) Determine the required levels of protective apparel and equipment (156, 160, 162); and
(e) Ensure that facilities and training for use of any material being ordered are adequate (215).

5. **Project director or director of other specific operation**, who has primary responsibility for chemical hygiene procedures for that operation (7).

6. **Laboratory Worker**, who is responsible for:
(a) Planning and conducting each operation in accordance with the institutional chemical hygiene procedures (7, 21, 22, 230); and
(b) Developing good personal chemical hygiene habits (22).

C. **The Laboratory Facility**

1. **Design**. The laboratory facility should have:
(a) An appropriate general ventilation system (see C4 below) with air intakes and exhausts located so as to avoid intake of contaminated air (194);
(b) Adequate, well-ventilated stockrooms/storerooms (218, 219).
(c) Laboratory hoods and sinks (12, 162);
(d) Other safety equipment including eyewash fountains and drench showers (162, 169); and
(e) Arrangements for waste disposal (12, 240).

2. **Maintenance**. Chemical-hygiene-related equipment (hoods, incinerator, etc.) should undergo continual appraisal and be modified if inadequate (11, 12).

3. **Usage**. The work conducted (10) and its scale (12) must be appropriate to the physical facilities available and, especially, to the quality of ventilation (13).

3. Ventilation
(a) **General laboratory ventilation**. This system should: Provide a source of air for breathing and for input to local ventilation devices (199); it should not be relied on for protection from toxic substances released into the laboratory (198); ensure that laboratory air is continually replaced, preventing increase of air concentrations of toxic substances during the working day (194); direct air flow into the laboratory from non-laboratory areas and out to the exterior of the building (194).
(b) **Hoods**. A laboratory hood with 2.5 linear feet of hood space per person should be provided for every 2 workers if they spend most of their time working with chemicals (199); each hood should have a continuous monitoring device to allow convenient confirmation of adequate hood performance before use (200, 209). If this is not possible, work with substances of unknown toxicity should be avoided (13) or other types of local ventilation devices should be provided (199). See pp. 201-206 for a discussion of hood design, construction, and evaluation.
(c) **Other local ventilation devices**. Ventilated storage cabinets, canopy hoods, snorkels, etc. should be provided as needed (199). Each canopy hood and snorkel should have a separate exhaust duct (207).
(d) **Special ventilation areas**. Exhaust air from glove boxes and isolation rooms should be passed through scrubbers or other treatment before release into the regular exhaust system (208). Cold rooms and warm rooms should have provisions for rapid escape and for escape in the event of electrical failure (209).
(e) **Modifications**. Any alteration of the ventilation system should be made only if thorough testing indicates that worker protection from airborne toxic substances will continue to be adequate (12, 193, 204).

(f) **Performance**. Rate: 4-12 room air changes/hour is normally adequate general ventilation if local exhaust systems such as hoods are used as the primary method of control (194).

(g) **Quality**. General air flow should not be turbulent and should be relatively uniform throughout the laboratory, with no high velocity or static areas (194, 195); airflow into and within the hood should not be excessively turbulent (200); hood face velocity should be adequate (typically 60-100 lfm) (200, 204).

(h) **Evaluation**. Quality and quantity of ventilation should be evaluated on I installation (202), regularly monitored (at least every 3 months) (6, 12, 14, 195), and reevaluated whenever a change in local ventilation devices is made (12, 195, 207). See pp 195-198 for methods of evaluation and for calculation of estimated airborne contaminant concentrations.

D. **Components of the Chemical Hygiene Plan**

1. Basic Rules and Procedures (Recommendations for these are given in section E, below)

2. **Chemical Procurement, Distribution, and Storage**

(a) **Procurement**. Before a substance is received, information on proper handling, storage, and disposal should be known to those who will be involved (215, 216). No container should be accepted without an adequate identifying label (216). Preferably, all substances should be received in a central location (216).

(b) **Stockrooms/storerooms**. Toxic substances should be segregated in a well-identified area with local exhaust ventilation (221). Chemicals which are highly toxic (227) or other chemicals whose containers have been opened should be in unbreakable secondary containers (219). Stored chemicals should be examined periodically (at least annually) for replacement, deterioration, and container integrity (218-19).
Stockrooms/storerooms should not be used as preparation or repackaging areas, should be open during normal working hours, and should be controlled by one person (219).

(c) **Distribution**. When chemicals are hand carried, the container should be placed in an outside container or bucket. Freight-only elevators should be used if possible (223).

(d) **Laboratory storage**. Amounts permitted should be as small as practical. Storage on bench tops and in hoods is inadvisable. Exposure to heat or direct sunlight should be avoided. Periodic inventories should be conducted, with unneeded items being discarded or returned to the storeroom/stockroom (225-6, 229).

3. **Environmental Monitoring**
Regular instrumental monitoring of airborne concentrations is not usually justified or practical in laboratories but may be appropriate when testing or redesigning hoods or other ventilation devices (12) or when a highly toxic substance is stored or used regularly (e.g., 3 times/week) (13).

4. **Housekeeping, Maintenance, and Inspections**

(a) **Cleaning.** Floors should be cleaned regularly (24).

(b) **Inspections.** Formal housekeeping and chemical hygiene inspections should be held at least quarterly (6, 21) for units which have frequent personnel changes and semiannually for others; informal inspections should be continual (21).

(c) **Maintenance.** Eye wash fountains should be inspected at intervals of not less than 3 months (6). Respirators for routine use should be inspected periodically by the Laboratory Supervisor (169). Other safety equipment should be inspected regularly. (e.g., every 3-6 months) (6, 24, 171). Procedures to prevent restarting of out-of-service equipment should be established (25).

(d) **Passageways.** Stairways and hallways should not be used as storage areas (24). Access to exits, emergency equipment, and utility controls should never be blocked (24).

5. **Medical Program**

(a) **Compliance with regulations.** Regular medical surveillance should be established to the extent required by regulations (12).

(b) **Routine surveillance.** Anyone whose work involves regular and frequent handling of toxicologically significant quantities of a chemical should consult a qualified physician to determine on an individual basis whether a regular schedule of medical surveillance is desirable (11, 50).

(c) **First aid.** Personnel trained in first aid should be available during working hours and an emergency room with medical personnel should be nearby (173). See pp. 176-178 for description of some emergency first aid procedures.

6. **Protective Apparel and Equipment.** These should include for each laboratory:

(a) Protective apparel compatible with the required degree of protection for substances being handled (158-161);

(b) An easily accessible drench-type safety shower (162, 169);

(c) An eyewash fountain (162)

(d) A fire extinguisher (162-164);

(e) Respiratory protection (164-9), fire alarm and telephone for emergency use (162) should be available nearby; and

(f) Other items designated by the Laboratory Supervisor (156, 160).

7. **Records**

(a) Accident records should be written and retained (174).

(b) Chemical Hygiene Plan records should document that the facilities and precautions were compatible with current knowledge and regulations (7).

(c) Inventory and usage records for high-risk substances should be kept as specified in sections E3e below.

(d) Medical records should be retained by the institution in accordance with the requirements of state and federal regulations (12).

8. **Signs and Labels.** Prominent signs and labels of the following types should be posted:

(a) Emergency telephone numbers of emergency personnel/facilities, supervisors, and Laboratory Workers (28);

(b) Identity labels, showing contents of containers (including waste r receptacles) and associated hazards (27, 48);

(c) Location signs for safety showers, eyewash stations, other safety and first aid equipment, exits (27) and areas where food and beverage consumption and storage are permitted (24); and

(d) Warnings at areas or equipment where special or unusual hazards exist (27).

9. **Spills and Accidents.**

(a) A written emergency plan should be established and communicated to all personnel; it should include procedures for ventilation failure (200), evacuation, medical care, reporting, and drills (172).

(b) There should be an alarm system to alert people in all parts of the facility including isolation areas such as cold rooms (172).

(c) A spill control policy should be developed and should include consideration of prevention, containment, cleanup, and reporting (175).

(d) All accidents or near accidents should be carefully analyzed with the results distributed to all who might benefit (8, 28).

10. **Information and Training Program.**

(a) **Aim:** To assure that all individuals at risk are adequately informed about the work in the laboratory, its risks, and what to do if an accident occurs (5, 15).

(b) **Emergency and Personal Protection Training:** Every Laboratory Worker should know the location and proper use of available protective apparel and equipment (154, 169).
Some of the full-time personnel of the laboratory should be trained in the proper use of emergency equipment and procedures (6). Such training as well as first aid instruction should be available to (154) and encouraged for (176) everyone who might need it.

(c) **Receiving and stockroom/storeroom personnel** should know about hazards, handling equipment, protective apparel, and relevant regulations (217).

(d) **Frequency of Training:** The training and education program should be a regular, continuing activity - not simply an annual presentation (15).

(e) **Literature/Consultation:** Literature and consulting advice concerning chemical hygiene should be readily available to laboratory personnel, who should be encouraged to use these information resources (14).

11. **Waste Disposal Program.**

(a) **Aim:** To assure that minimal harm to people, other organisms, and the environment will result from the disposal of waste laboratory chemicals (5).

(b) **Content (14, 232, 233, 240):** The waste disposal program should specify how waste is to be collected, segregated, stored, and transported and include consideration of what materials can be incinerated. Transport from the institution must be in accordance with DOT regulations (244).

(c) **Discarding Chemical Stocks:** Unlabeled containers of chemicals and solutions should undergo prompt disposal; if partially used, they should not be opened (24, 27). Before a worker's employment in the laboratory ends, chemicals for which that person was responsible should be discarded or returned to storage (226).

(d) **Frequency of Disposal:** Waste should be removed from laboratories to a central waste storage area at least once per week and from the central waste storage area at regular intervals (14).

(e) **Method of Disposal:** Incineration in an environmentally acceptable manner is the most practical disposal method for combustible laboratory waste (14, 238, 241). Indiscriminate disposal by pouring waste chemicals down the drain (14, 231, 242) or adding them to mixed refuse for landfill burial is unacceptable (14). Hoods should not be used as a means of disposal for volatile chemicals (40, 200). Disposal by recycling (233, 243) or chemical decontamination (40, 230) should be used when possible.

E. Basic Rules and Procedures for Working with Chemicals

The Chemical Hygiene Plan should require that Laboratory Workers know and follow its rules and procedures. In addition to the procedures of the sub programs mentioned above, these should include the rules listed below.

1. **General Rules.** The following should be used for essentially all laboratory work with chemicals:

(a) **Accidents and spills**

- **Eye Contact:** Promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention (33, 172).
- **Ingestion:** Encourage the victim to drink large amounts of water (178).
- **Skin Contact:** Promptly flush the affected area with water (33, 172, 178) and remove any contaminated clothing (172, 178). If symptoms persist after washing, seek medical attention (33).
- Clean-up. Promptly clean up spills, using appropriate protective apparel and equipment and proper disposal (24, 33). See pp. 233-237 for specific clean-up recommendations.

(b) **Avoidance of "routine" exposure:** Develop and encourage safe habits (23); avoid unnecessary exposure to chemicals by any route (23);

- Do not smell or taste chemicals (32). Vent apparatus which may discharge toxic chemicals (vacuum pumps, distillation columns, etc.) into local exhaust devices (199).
- Inspect gloves (157) and test glove boxes (208) before use.
- Do not allow release of toxic substances in cold rooms and warm rooms, since these have contained recirculated atmospheres (209).

(c) **Choice of chemicals:** Use only those chemicals for which the quality of the available ventilation system is appropriate (13).

(e) **Eating, smoking, etc.:**

- Avoid eating, drinking, smoking, gum chewing, or application of cosmetics in areas where laboratory chemicals are present (22, 24, 32, 40); wash hands before conducting these activities (23, 24).
- Avoid storage, handling, or consumption of food or beverages in storage areas, refrigerators, glassware or utensils which are also used for laboratory operations (23, 24, 226).

(e) **Equipment and glassware:** Handle and store laboratory glassware with care to avoid damage; do not use damaged glassware (25). Use extra care with Dewar flasks and other evacuated glass apparatus; shield or wrap them to contain chemicals and fragments should implosion occur (25). Use equipment only for its designed purpose (23, 26).

(f) **Exiting:** Wash areas of exposed skin well before leaving the laboratory (23).

(g) **Horseplay:** Avoid practical jokes or other behavior which might confuse, startle or distract another worker (23).

(h) **Mouth suction:** Do not use mouth suction for pipeting or starting a siphon (23, 32).

(i) **Personal apparel:** Confine long hair and loose clothing (23, 158). Wear shoes at all times in the laboratory but do not wear sandals, perforated shoes, or sneakers (158).

(j) **Personal housekeeping:** Keep the work area clean and uncluttered, with chemicals and equipment being properly labeled and stored; clean up the work area on completion of an operation or at the end of each day (24).

(k) **Personal protection:**

- Assure that appropriate eye protection (154-156) is worn by all persons, including visitors, where chemicals are stored or handled (22, 23, 33, 154).
- Wear appropriate gloves when the potential for contact with toxic materials exists (157); inspect the gloves before each use, wash them before removal, and replace them periodically (157). (A table of resistance to chemicals of common glove materials is given p. 159).
- Use appropriate (164-168) respiratory equipment when air

contaminant concentrations are not sufficiently restricted by engineering controls (164-5), inspecting the respirator before use (169).
- Use any other protective and emergency apparel and equipment as appropriate (22, 157-162).
- Avoid use of contact lenses in the laboratory unless necessary; if they are used, inform supervisor so special precautions can be taken (155).
- Remove laboratory coats immediately on significant contamination (161).

(l) **Planning:** Seek information and advice about hazards (7), plan appropriate protective procedures, and plan positioning of equipment before beginning any new operation (22, 23).

(m) **Unattended operations:** Leave lights on, place an appropriate sign on the door, and provide for containment of toxic substances in the event of failure of a utility service (such as cooling water) to an unattended operation (27, 128).

(n) **Use of hood:** Use the hood for operations which might result in release of toxic chemical vapors or dust (198-9).
- As a rule of thumb, use a hood or other local ventilation device when working with any appreciably volatile substance with a TLV of less than 50 ppm (13).
- Confirm adequate hood performance before use; keep hood closed at all times except when adjustments within the hood are being made (200); keep materials stored in hoods to a minimum and do not allow them to block vents or air flow (200).
- 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" (200).

(o) **Vigilance:** Be alert to unsafe conditions and see that they are corrected when detected (22).

(p) **Waste disposal:** Assure that the plan for each laboratory operation includes plans and training for waste disposal (230).
- Deposit chemical waste in appropriately labeled receptacles and follow all other waste disposal procedures of the Chemical Hygiene Plan (22, 24).
- Do not discharge to the sewer concentrated acids or bases (231); highly toxic, malodorous, or lachrymatory substances (231); or any substances which might interfere with the biological activity of waste water treatment plants, create fire or explosion hazards, cause s tructural damage or obstruct flow (242).

(q) Working alone: Avoid working alone in a building; do not work alone in a laboratory if the procedures being conducted are hazardous (28).

2. **Working with Allergens and Embryotoxins**

(a) **Allergens (examples: diazomethane, isocyanates, bichromates):** Wear suitable gloves to prevent hand contact with allergens or substances of unknown allergenic activity (35).

(b) **Embryotoxins (34-5) (examples: organomercurials, lead compounds, formamide):** If you are a woman of childbearing age, handle these substances only in a hood whose satisfactory performance has been confirmed, using appropriate protective apparel (especially gloves) to prevent skin contact.

Review each use of these materials with the research supervisor and review continuing uses annually or whenever a procedural change is made. Store these substances, properly labeled, in an adequately ventilated area in an unbreakable secondary container. Notify supervisors of all incidents of exposure or spills; consult a qualified physician when appropriate.

3. **Work with Chemicals of Moderate Chronic or High Acute Toxicity**

Examples: diisopropylfluorophosphate (41), hydrofluoric acid (43), hydrogen cyanide (45). Supplemental rules to be followed in addition to those mentioned above (Procedure B of "Prudent Practices", pp. 39-41):

(a) **Aim:** To minimize exposure to these toxic substances by any route using all reasonable precautions (39).

(b) **Applicability:** These precautions are appropriate for substances with moderate chronic or high acute toxicity used in significant quantities (39).

(c) **Location:** Use and store these substances only in areas of restricted access with special warning signs (40, 229).
Always use a hood (previously evaluated to confirm adequate performance with a face velocity of at least 60 linear feet per minute) (40) or other containment device for procedures which may result in the generation of aerosols or vapors containing the substance (39); trap released vapors to revent their discharge with the hood exhaust (40).

(d) **Personal protection:** Always avoid skin contact by use of gloves and long sleeves (and other protective apparel as appropriate) (39). Always wash hands and arms immediately after working with these materials (40).

(e) **Records:** Maintain records of the amounts of these materials on hand, amounts used, and the names of the workers involved (40, 229).

(f) **Prevention of spills and accidents:** Be prepared for accidents and spills (41).
- Assure that at least 2 people are present at all times if a compound in use is highly toxic or of unknown toxicity (39).
- Store breakable containers of these substances in chemically resistant trays; also work and mount apparatus above such trays or cover work and storage surfaces with removable, absorbent, plastic backed paper (40).
- If a major spill occurs outside the hood, evacuate the area; assure that cleanup personnel wear suitable protective apparel and equipment (41).

(g) **Waste:** Thoroughly decontaminate or incinerate contaminated clothing or shoes (41). If possible, chemically decontaminate by chemical conversion (40).
- Store contaminated waste in closed, suitably labeled, impervious containers (for liquids, in glass or plastic bottles half-filled with vermiculite) (40).

4. **Work with Chemicals of High Chronic Toxicity**

(Examples: dimethylmercury and nickel carbonyl (48), benzo-a-pyrene (51), N-nitrosodiethylamine (54), other human carcinogens or substances with high carcinogenic potency in animals (38).)

Further supplemental rules to be followed, in addition to all these mentioned above, for work with substances of known high chronic toxicity (in quantities above a few milligrams to a few grams, depending on the substance) (47). (Procedure A of "Prudent Practices" pp. 47-50).

(a) **Access:** Conduct all transfers and work with these substances in a "controlled area": a restricted access hood, glove box, or portion of a lab, designated for use of highly toxic substances, for which all people with access are aware of the substances being used and necessary precautions (48).

(b) **Approvals:** Prepare a plan for use and disposal of these materials and obtain the approval of the Laboratory Supervisor (48).

(c) **Non-contamination/Decontamination:** Protect vacuum pumps against contamination by scrubbers or HEPA filters and vent them into the hood (49).

Decontaminate vacuum pumps or other contaminated equipment, including glassware, in the hood before removing them from the controlled area (49, 50). Decontaminate the controlled area before normal work is resumed there (50).

(d) **Exiting:** On leaving a controlled area, remove any protective apparel (placing it in an appropriate, labeled container) and thoroughly wash hands, forearms, face, and neck (49).

(e) **Housekeeping:** Use a wet mop or a vacuum cleaner equipped with a HEPA filter instead of dry sweeping if the toxic substance was a dry powder (50).

(f) **Medical surveillance:** If using toxicologically significant quantities of such a substance on a regular basis (e.g., 3 times per week), consult a qualified physician concerning desirability of regular medical surveillance (50).

(g) **Records:** Keep accurate records of the amounts of these substances stored (229) and used, the dates of use, and names of users (48).

(h) Signs and labels: Assure that the controlled area is conspicuously marked with warning and restricted access signs (49) and that all containers of these substances are appropriately labeled with identity and warning labels (48).

(i) **Spills:** Assure that contingency plans, equipment, and materials to minimize exposures of people and property in case of accident are available (233-4).

(j) **Storage:** Store containers of these chemicals only in a ventilated, limited access (48, 227, 229) area in appropriately labeled, unbreakable, chemically resistant, secondary containers (48, 229).

(k) **Glove boxes:** For a negative pressure glove box, ventilation rate must be at least 2 volume changes/hour and pressure at least 0.5 inches of water (48). For a positive pressure glove box, thoroughly check for leaks before each use (49). In either case, trap the exit gases or filter them through a HEPA filter and then release them into the hood (49).

(l) **Waste:** Use chemical decontamination whenever possible; ensure that containers of contaminated waste (including washings from contaminated flasks) are transferred from the controlled area in a secondary container under the supervision of authorized personnel (49, 50, 233).

5. **Animal Work with Chemicals of High Chronic Toxicity**

(a) **Access:** For large scale studies, special facilities with restricted access are preferable (56).

(b) **Administration of the toxic substance:** When possible, administer the substance by injection or gavage instead of in the diet. If administration is in the diet, use a caging system under negative pressure or under laminar air flow directed toward HEPA filters (56).

(c) **Aerosol suppression:** Devise procedures which minimize formation and dispersal of contaminated aerosols, including those from food, urine, and feces (e.g., use HEPA filtered vacuum equipment for cleaning, moisten contaminated bedding before removal from the cage, mix diets in closed containers in a hood) (55, 56).

(d) **Personal protection:** When working in the animal room, wear plastic or rubber gloves, fully buttoned laboratory coat or jumpsuit and, if needed because of incomplete suppression of aerosols, other apparel and equipment (shoe and head coverings, respirator) (56).

(e) **Waste disposal:** Dispose of contaminated animal tissues and excreta by incineration if the available incinerator can convert the contaminant to non-toxic products (238); otherwise, package the waste appropriately for burial in an EPA-approved site (239).

F. **Safety Recommendations**

The above recommendations from "Prudent Practices" do not include those which are directed primarily toward prevention of physical injury rather than toxic exposure. However, failure of precautions against injury will often have the secondary effect of causing toxic exposures. Therefore, we list below page references for recommendations concerning some of the major categories of safety hazards which also have implications for chemical hygiene:

1. Corrosive agents: (35-6)
2. Electrically powered laboratory apparatus: (179-92)
3. Fires, explosions: (26, 57-74, 162-64, 174-5, 219-20, 226-7)
4. Low temperature procedures: (26, 88)
5. Pressurized and vacuum operations (including use of compressed gas cylinders): (27, 75-101)

G. **Material Safety Data Sheets**

Material safety data sheets are presented in "Prudent Practices" for the chemicals listed below. (Asterisks denote that comprehensive material safety data sheets are provided).

*Acetyl peroxide (105)
*Acrolein (106)
*Acrylonitrile
Ammonia (anhydrous)(91)
*Aniline (109)
*Benzene (110)
*Benzo[a]pyrene (112)
*Bis(chloromethyl) ether (113)
Boron trichloride (91)
Boron trifluoride (92)
Bromine (114)
*Tert-butyl hydroperoxide (148)
*Carbon disulfide (116)
Carbon monoxide (92)
*Carbon tetrachloride (118)
*Chlorine (119)
Chlorine trifluoride (94)
*Chloroform (121)
Chloromethane (93)
*Diethyl ether (122)
Diisopropyl fluorophosphate (41)
*Dimethylformamide (123)
*Dimethyl sulfate (125)
*Dioxane (126)
*Ethylene dibromide (128)
*Fluorine (95)
*Formaldehyde (130)
*Hydrazine and salts (132)
Hydrofluoric acid (43)
Hydrogen bromide (98)
Hydrogen chloride (98)
*Hydrogen cyanide (133)
*Hydrogen sulfide (135)
Mercury and compounds (52)

*Methanol (137)
*Morpholine (138)
*Nickel carbonyl (99)
*Nitrobenzene (139)
Nitrogen dioxide (100)
N-nitrosodiethylamine (54)
*Peracetic acid (141)
*Phenol (142)
*Phosgene (143)
*Pyridine (144)
*Sodium azide (145)
*Sodium cyanide (147)
Sulfur dioxide (101)
*Trichloroethylene (149)
*Vinyl chloride (150)

APPENDIX B TO 1910.1450

REFERENCES (NON-MANDATORY)

The following references are provided to assist the employer in the development of a Chemical Hygiene Plan. The materials listed below are offered as non-mandatory guidance. References listed here do not imply specific endorsement of a book, opinion, technique, policy or a specific solution for a safety or health problem. Other references not listed here may better meet the needs of a specific laboratory.

(a) **Materials for the development of the Chemical Hygiene Plan:**

1. American Chemical Society, Safety in Academic Chemistry Laboratories, 4th edition, 1985.
2. Fawcett, H.H. and W.S. Wood, Safety and Accident Prevention in Chemical Operations, 2nd edition, Wiley-Interscience, New York, 1982.
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7. National Research Council, Prudent Practices for Disposal of Chemicals from Laboratories, National Academy Press, Washington, DC, 1983.
8. National Research Council, Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Academy Press, Washington, DC, 1981.
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12. Young, Jay A., Ed., Improving Safety in the Chemical Laboratory, John Wiley & Sons, Inc. New York, 1987.

(b) **Hazardous Substances Information:**

1. American Conference of Governmental Industrial Hygienists, Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes, 6500 Glenway Avenue, Bldg. D-7, Cincinnati, OH 45211-4438.
2. Annual Report on Carcinogens, National Toxicology Program U.S. Department of Health and Human Services, Public Health Service, U.S. Government Printing Office, Washington, DC, (latest edition).
3. Best Company, Best Safety Directory, Vols. I and II, Oldwick, N.J., 1981.
4. Bretherick, L., Handbook of Reactive Chemical Hazards, 2nd edition, Butterworths, London, 1979.
5. Bretherick, L., Hazards in the Chemical Laboratory, 3rd edition, Royal Society of Chemistry, London, 1986.
6. Code of Federal Regulations, 29 CFR part 1910 subpart Z. U.S. Govt. Printing Office, Washington, DC 20402 (latest edition).
7. IARC Monographs on the Evaluation of the Carcinogenic Risk of chemicals to Man, World Health Organization Publications Center, 49 Sheridan Avenue, Albany, New York 12210 (latest editions).
8. NIOSH/OSHA Pocket Guide to Chemical Hazards. NIOSH Pub. No. 85-114, U.S. Government Printing Office, Washington, DC, 1985 (or latest edition).
9. Occupational Health Guidelines, NIOSH/OSHA. NIOSH Pub. No. 81-123 U.S. Government Printing Office, Washington, DC, 1981.

10. Patty, F.A., Industrial Hygiene and Toxicology, John Wiley & Sons, Inc., New York, NY (Five Volumes).
11. Registry of Toxic Effects of Chemical Substances, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, Revised Annually, for sale from Superintendent of documents US. Govt. Printing Office, Washington, DC 20402.
12. The Merck Index: An Encyclopedia of Chemicals and Drugs. Merck and Company Inc. Rahway, N.J., 1976 (or latest edition).
13. Sax, N.I. Dangerous Properties of Industrial Materials, 5th edition, Van Nostrand Reinhold, NY., 1979.
14. Sittig, Marshall, Handbook of Toxic and Hazardous Chemicals, Noyes Publications. Park Ridge, NJ, 1981.

(c) **Information on Ventilation:**

1. American Conference of Governmental Industrial Hygienists Industrial Ventilation (latest edition), 6500 Glenway Avenue, Bldg. D-7, Cincinnati, Ohio 45211-4438.
2. American National Standards Institute, Inc. American National Standards Fundamentals Governing the Design and Operation of Local Exhaust Systems ANSI Z 9.2-1979 American National Standards Institute, N.Y. 1979.
3. Imad, A.P. and Watson, C.L. Ventilation Index: An Easy Way to Decide about Hazardous Liquids, Professional Safety pp 15-18, April 1980.
4. - National Fire Protection Association, Fire Protection for Laboratories Using Chemicals NFPA-45, 1982.
   - Safety Standard for Laboratories in Health Related Institutions, NFPA, 56c, 1980.
   - Fire Protection Guide on Hazardous Materials, 7th edition, 1978.
   - National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.
5. Scientific Apparatus Makers Association (SAMA), Standard for Laboratory Fume Hoods, SAMA LF7-1980, 1101 16th Street, NW., Washington, DC 20036.

(d) **Information on Availability of Referenced Material:**

1. American National Standards Institute (ANSI), 1430 Broadway, New York, NY 10018.
2. American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, PA 19103.

APPENDIX II

LAB SPECIFIC TRAINING CERTIFICATION

The Marshall University Chemical Hygiene Plan requires that Laboratory Supervisors train their employees on the following topics:

- The location and availability of the OSHA Lab Standard, the laboratory's Chemical Hygiene Plan, chemical reference materials (such as material safety data sheets), and permissible exposure limits for applicable chemicals;

- The signs and symptoms associated with exposure to the hazardous chemicals with which employees work;

- Detection methods and observations that may be used to detect the presence or release of a hazardous chemical in the lab (e.g. odor, monitoring equipment, or visual appearance);

- The physical and health hazards of the chemicals with which employees work;

- Work practices, personal protective equipment and emergency procedures to be used to ensure protection from overexposure to the hazardous chemicals with which employees work; and

- How to use personal protective equipment and limitations of personal protective equipment.

In addition to the training provided by the Laboratory Supervisor, it is the employee's responsibility to request information and training when unsure how to handle a hazardous chemical or laboratory procedure and to follow all health and safety rules while working in the lab.

After training has been received from the Laboratory Supervisor related to the above information, please complete this form.

Employee Name	Employee Signature	Lab Supervisor Signature	Date

APPENDIX III

CHEMICAL INVENTORY FORM

Laboratory: _____Laboratory Supervisor: _____

Completed by: _____ Date: _____

Chemical/Trade Name	**CAS #**	**Quantity (e.g. 7 gallons)**

Chemical/Trade Name	CAS #	Quantity (e.g. 7 gallons)

NOTE: Maintain the original copy of this form in laboratory Chemical Hygiene Binder.
*****Make duplicate copies as necessary depending on how large your inventory is.*****

APPENDIX IV

LABORATORY INSPECTION GUIDELINES AND FORM

The following guide has been developed to assist you in your scheduled safety surveillance of laboratories and departments under your auspices as lab supervisor. This guide is by no means all encompassing, however information contained after each item should assist you in determining whether your area may be in full, partial or non-compliance.

Keep in mind that all Federal, State and University rules, recommendations and regulations determine the compliance of our area concerning OSHA, EPA, NIH, CDC, and DOT.

1. Entrances, Exits, Hallways and Stairways - All entrances, exits, hallways and stairways must be clear and unobstructed.

2. Showers/Eye Wash Operative - Any area which deals with corrosive, flammable or otherwise hazardous material is required to have immediate access (within 75 feet)to eyewash and drench shower facilities. Eye wash bottles are not adequate equipment. All showers and eye wash equipment must be in full operational order and unobstructed. Monthly inspections are required.

3. Personal Protective Equipment - Personal Protective Equipment such as goggles, masks, gloves, and cover gowns must be readily available and not worn outside the immediate work areas. Lab coats and appropriate shoes shall be worn to avoid any contact with harmful materials.

4. Fire Extinguisher/Inspection and Location - All fire extinguishers must be inspected annually. Extinguishers must be properly mounted, unobstructed and be properly labeled for the intended use.

5. Pressurized Cylinders - All cylinders must be stored in proper locations. All cylinders must be secured in an upright position and properly restrained to prevent falling. Containers must be labeled for contents and usage. Maximum number of cylinders of a flammable gas shall be not more than 3 (10" x 50") per 500 square feet in an unsprinkled space or not more than 6 (10" x 50") in a sprinkled space of 500 square feet. Liquefied gas cylinders in laboratory work areas shall not exceed 3 cylinders (9" x 30") in a sprinkled space or exceed 2 cylinders (9" x 30") in an unsprinkled space.

6. Room Use Identification - All access doors must be marked when rooms or areas are being used for chemical, biological or radioactive purposes as outlined in the MU Chemical Hygiene Plan. All doors must remain closed and the vision panel must remain unobstructed. Unattended labs shall be locked at all times.

7. UL Electrical Equipment and Cords - Only Underwriters Laboratories approved equipment and cords are authorized for use. Only UL listed multiple outlet strips equipped with 15 AMP circuit breakers are approved.

8. Laboratory chemical hood Operation - Face Velocities should be between 80 and 150 FPM at the working sash height with an optimum level of 100 FPM. The sash should never be higher than 12 inches except **when accessing equipment**. Hoods should not be located in high traffic areas or under air supply vents. The hood must have user spill protection and cup sinks must have spill guards.

9. Biological Safety Cabinets - Certification is required annually or any time the hood is moved or has had maintenance performed. Cabinets must not be located near high traffic areas or air supply ducts.

10. Hazardous Chemicals - All chemicals must be appropriately labeled and shall not be placed near or over floor drains. Flammable liquids must be stored in appropriate containers. There should be no more that 5 gallons of solvents or Class IA or IB flammables out in the lab per 100 sq. ft. No more than 10 gallons should be in specific storage cabinets per 100 sq. ft. For larger storage capacities and long term storage of flammable and solvents and approved storage area should be used.

11. Hazardous Waste Disposal - Hazardous waste training is required for all employees who handle hazardous material. The Office of Hazardous Material Management gives training (HMM). A certification of training must be posted in laboratories. Contact HMM for the time and date of classes.

12. Equipment and Utility Labeling - Refrigerators, ice machines and microwaves must be labeled for intended use. Food, personal medication and hazardous materials shall not be housed in the same refrigerator. All utility and plumbing lines need to be labeled and indicate the product contained; i.e., gas, water, etc.

13. Location of Cut-off Valves/Circuit Breakers - All cut off valves and breakers must be properly labeled.

14. General Safety (Dress, Eating, Smoking, etc.) - Eating, drinking, smoking and applying cosmetics is not permitted in a wet lab. Lab personnel shall not wear loose clothing (e.g. saris, dangling neckties, and overly large or ragged lab coats), skimpy clothing (e.g. shorts and/or halter-tops), torn clothing, or unrestrained long hair. Perforated shoes, sandals, or cloth sneakers are not to be worn in labs.

15. Use of Flame and Heat - No heat generating devices should be left unattended.

16. Ventilation - Airflow in most labs should be “negative” with respect to the corridor. Laboratory doors shall be kept closed when laboratory procedures are in progress. Volatile hazardous materials shall not be used on the open bench top.

17. Housekeeping/Drains Flushed - All unnecessary material, boxes, and containers must be disposed of in the appropriate manner. All drains, including floor drains and cup sinks should be flushed

with water on a weekly basis to eliminate sewer odors. Proper housekeeping must be maintained to provide adequate clearance of sprinkler systems and emergency equipment.

18. Sharps (Glass, Scalpel, Blades, Syringes, Etc.) - All sharps, needles and glass must be disposed of in an approved, labeled container. Glass containers and other potentially sharp objects shall not be disposed of in common office refuse. Containers must not be overfilled and must be labeled and sealed for proper handling and disposal.

19. Emergency lighting - Where necessary, emergency lighting units shall be properly mounted and unobstructed. If emergency lighting exists, it should be checked periodically to ensure it is functional.

20. Emergency Plans/Posted Numbers - All emergency and contingency plans and evacuation routes shall be clearly posted in conspicuous places. A list of emergency numbers and contacts must be kept updated and posted along side the emergency plans.

21. Safety Manuals - Manuals must be current and readily available for all employees.

22. Accidents Reported/Investigated - All accidents must be reported to the immediate supervisor for the completion of the appropriate form. File copies of reported incidents and accidents must be on hand, as well as the action taken to alleviate the safety hazard in the future.

23. Safety Training - This area is designated for lab safety training which is required by law.

Acronyms

CDC	Center for Disease Control
DOT	Department of Transportation
FPM	Feet per Minute
MSDS	Material Safety Data Sheets
OSHA	Occupational Safety and Health Administration
EPA	Environmental Protection Agency
NIH	National Institutes of Health
HMM	Hazardous Materials Management

LABORATORY SELF INSPECTION FORM

Department: _____ Building: _____ Room Number: _____

Department Safety Officer: _____ Inspector: _____

Lab Supervisor: _____ Inspection Date: _____

Chairman: _____ Re-inspection Due: _____

S=Satisfactory; U=Unsatisfactory

Item	S	U	Comment	Corrective Action Taken
1. Entrances, exits, hallways, stairways				
2. Showers/eye wash operative				
3. Personal protective equipment				
4. Fire extinguishers/inspection & location				
5. Pressurized cylinders: storage/usage label				
6. Room use identification/labeling				
7. UL Electrical equipment & cords				
8. Laboratory chemical hood operation				
9. Biological safety cabinets				
Certification				
Use				
10. Hazardous Chemicals				
Labeling				
Storage/amount/location				
Handling				

APPENDIX IV (cont'd)

Laboratory Self Inspection Form

Item	S	U	Comments	Corrective Action Taken
11. Hazardous Waste Disposal				
Training certificate				
Labeling				
Storage				
Disposal				
12. Equipment and utility labeling				
13. Location of cut-off valves/circuit breakers				
14. General safety (dress, eating, smoking, etc.)				
15. Use of flame and heat				
16. Ventilation				
17. Housekeeping/drains flushed				
18. Sharps (glass, scalpel, blades, syringe, etc.)				
19. Emergency lighting				
20. Emergency plan/posted numbers				
21. Safety manuals				
22. Accidents reported/investigated				
23. Safety training: Date: _____				
Subject: _____				

APPENDIX V

GLOVE SELECTION GUIDANCE

Resistant Properties of Selected Materials by Chemical Class

Chemicals	Butyl	CPE	Viton™/ neoprene	Natural rubber	Neoprene	Nitrile + PVC	Nitrile	PE	PVA	PVC	Viton	Butyl/ neoprene
Acids, carboxylic and aliphatic Unsubstituted Polybasic	R	r	r	**	rr rr	** rr	rr rr	NN rr	** n	** rr	**	R
Aldehydes Aliphatic and alicyclic Aromatic and heterocyclic	RR rr	NN	r n	** nn	NN nn	nn n	NN nn	** NN	NN rr	NN N	**	r r
Amides	rr			**	nn		nn	nn			nn	
Amines, aliphatic and alicyclic Primary Secondary Tertiary Polyamine	 ** ** ** **	 ** **	 n n	 NN NN ** NN	 ** nn ** **	 ** nn	 rr ** **		 nn ** **	 ** NN ** NN	 ** nn rr rr	 n
Cyanides					r							
Esters, carboxylic Formates			 n							 n		 n
Acetates	**	**	n	NN	nn	nn	NN	NN	**	NN	n	**

Higher monobasic	nn	nn	**	NN	nn		nn	NN	rr	NN		**
Polybasic			r	r	r		**			rr		r
Aromatic phthalate	rr		r	**	**		**			nn	rr	r
Ethers Aliphatic	** 	rr 	** 	NN 	** 	** 	** 	 	** 	** 	 	**
Halogen compounds Aliphatic, unsubstituted Aliphatic, substituted Aromatic, unsubstituted Polynuclear Vinyl halides	nn ** nn	nn nn	r r	NN NN N NN	NN rr nn	NN n	NN nn nn	NN NN	** **	NN NN N n n	** rr rr rr rr	n n
Heterocyclic compounds Epoxy compounds Furan derivatives	** nn		 nn	**	nn		nn	NN	**	nn NN	NN nn	 n
Hydrazines	**	nn	n	**	**		**		nn	**	**	n
Hydrocarbons Aliphatic and alicyclic Aromatic	N **	r rr	r r	NN NN	** NN	** NN	** **	** NN	** **	NN NN	RR RR	n r

Hydroxyl compounds Aliphatic and alicyclic Primary Secondary Tertiary Polyols Aromatic	RR rr r r **	rr rr	rr r ** r	nn ** ** rr **	** ** rr rr **	nn ** rr rr **	** ** rr rr **	** **	** rr nn	** ** ** ** **	rr rr rr	** r ** r
Inorganic acids	**	**	rr	**	**	**	**	**	n	**	rr	**
Inorganic base	r	r		RR	RR	**	RR	**	n	**	rr	r
Inorganic gases	**	r	n	n	r			**		**	**	**
Inorganic salts**	r		n	**	r	r	r			R		
Isocyanates				NN	n				rr			
Ketones, aliphatic	**	NN	n	NN	NN	N	**	NN	**	NN	NN	**
Nitriles, aliphatic	rr			NN	**			NN	rr	NN	rr	
Nitro compounds Unsubstituted	rr	r		NN	**		nn		**	**	**	
Organo-phosphorous compounds			r									r
Peroxides				r								
Sulfur compounds Thiols			**									n

Legend:

RR, R, rr and r represent positive degrees of resistance.
NN, N, nn and n represent degrees of poor resistance.
Double characters indicate that the rating is based on test data.
Single characters indicate that the rating is based on qualitative data.

Upper-case letters indicate a large body of consistent data.
Lower-case letters indicate either a small quantity of data or inconsistent information.
Asterisks (**) mean that the material varied considerably in its resistance to chemicals within a given class and data for specific chemicals should be used if available.

Butyl - Butyl rubber
PVC - Polyvinyl chloride
PE - Poyyethylene

Nitrile + PVC - Nitrile rubber + polyvinyl chloride

Natural rubber - same
CPE - Chrlorinated polyethylene
Viton - same

PVA - Polyvinyl alcohol

Nitrile - Nitrile rubber
Neoprene - same
Viton™/Neoprene - layered material, 1st material on surface
Butyl/Neoprene - layered material, 1st material on surface

Taken from CRC Handbook of Laboratory Safety, 3rd edition.

Resistance to Chemicals of Common Glove Materials
(E=Excellent, G=Good, F=Fair, P=Poor)

Chemical	Natural Rubber	Neoprene	Nitrile	Vinyl
Acetaldehyde	G	G	E	G
Acetic acid	E	E	E	E
Acetone	G	G	G	F
Acrylonitrile	P	G	-	F
Ammonium hydroxide	G	E	E	E
Aniline	F	G	E	G
Benzaldehyde	F	F	E	G
Benzene	P	F	G	F
Benzyl chloride	F	P	G	P
Bromine	G	G	-	G
Butane	P	E	-	P
Calcium hypochlorite	P	G	G	G
Carbon disulfide	P	P	G	F
Carbon tetrachloride	P	F	G	F
Chlorine	G	G	-	G
Chloroacetone	F	E	-	P
Chloroform	P	F	G	P
Chromic Acid	P	F	F	E
Cyclohexane	F	E	-	P
Dibenzylether	F	G	-	P
Dibutylphthalate	F	G	-	P
Diethanolamine	F	E	-	E
Diethyl ether	F	G	E	P
Dimethyl sulfoxide	-	-	-	-
Ethyl acetate	F	G	G	F
Ethylene dichloride	P	F	G	P
Ethylene glycol	G	G	E	E
Ethylene trichloride	P	P	-	P
Fluorine	G	G	-	G
Formaldehyde	G	E	E	E
Formic acid	G	E	E	E
Glycerol	G	G	E	E
Hexamine	P	E	-	P
Hydrobromic acid (40%)	G	E	-	E
Hydrochloric acid (conc)	G	G	G	E
Hydrofluoric acid (30%)	G	G	G	E
Hydrogen peroxide	G	G	G	E
Iodine	G	G	-	G
Methylamine	G	G	E	E
Methyl cellosolve	F	E	-	P
Methyl chloride	P	E	-	P
Methyl ethyl ketone	F	G	G	P
Methylene chloride	F	F	G	F
Monoethanolamine	F	E	-	E
Morpholine	F	E	-	E
Naphthalene	G	G	E	G
Nitic acid (conc)	P	P	P	G
Perchloric acid	F	G	F	E
Phenol	G	E	-	E
Phosphoric acid	G	E	-	E
Potassium hydroxide	G	G	G	E
Propylene dichloride	P	F	-	P
Sodium hydroxide	G	G	G	E
Sodium hypochlorite	G	P	F	G
Sulfuric acid (conc)	G	G	F	G
Toluene	P	F	G	F
Triichloroethylene	P	F	G	F
Tricresyl phosphate	P	F	-	F
Triethanolamine	F	E	E	E

Trinitrotoluene	P	E	-	P

Aromatic and halogenated hydrocarbons will attack all types of natural and synthetic glove materials. Should swelling occur, the user should change to fresh gloves and allow the swollen gloves to dry and return to normal.

No data on the resistance to dimethyl sulfoxide of natural rubber, neoprene, nitrile rubber, or vinyl materials are available; the manufacturer of the substance recommends the use of butyl rubber gloves.

Taken from Prudent Practices for Handling Hazardous Chemicals in Laboratories, 1981.

APPENDIX VI

EXAMPLES OF INCOMPATIBLE CHEMICALS

From: "Safety in Academic Chemistry Laboratories", American Chemical Society

Chemical	Is 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 and sulfuric acid mixtures
Alkali and alkaline earth metals (such as powdered aluminum or magnesium, calcium, lithium, sodium, potassium)	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens
Ammonia (anhydrous)	Mercury (in manometers, for example), chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid (anhydrous)
Ammonium nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrites, sulfur, 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
Carbon tetrachloride	Sodium
Chlorates	Ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials
Chromic acid and chromium	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 sulfide
Copper	Acetylene, hydrogen peroxide
Cumene hydroperoxide	Acids (organic or 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 peroxide	Copper, chromium, iron, most metals or their salts, alcohols, acetone, organic materials, aniline, nitromethane, combustible materials
Hydrogen sulfide	Fuming nitric acid, oxidizing gases
Hypochlorites	Acids, activated carbon
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, fulminic acid, ammonia
Nitrates	Sulfuric acid
Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases, copper, brass, any heavy metals
Nitrites	Acids
Nitroparaffins	inorganic bases, amines
Oxalic acid	Silver, mercury
Oxygen	Oils, grease, hydrogen: flammable liquids, solids or gases
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils
Peroxides, organic	Acids (organic or mineral), avoid friction, store cold
Phosphorus (white)	Air, oxygen, alkalis, reducing agents
Potassium	Carbon tetrachloride, carbon dioxide, water
Potassium chlorate	Sulfuric and other acids
Potassium perchlorate (see also chlorates)	Sulfuric and other acids
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, sulfuric acid
Selenides	Reducing agents
Silver	Acetylene, oxalic acid, tartartic acid, ammonium compounds, fulminic acid
Sodium	Carbon tetrachloride, carbon dioxide, water
Sodium nitrite	Ammonium nitrate and other ammonium salts
Sodium peroxide	Ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural
Sulfides	Acids
Sulfuric acid	Potassium chlorate, potassium perchlorate, potassium permanganate (similar compounds of light metals, such as sodium, lithium)

Tellurides	Reducing agents

APPENDIX VII

LABORATORY SIGNAGE

IN CASE OF EMERGENCY CALL 4357 (HELP)

Room Number_____ Department_____

Laboratory Supervisor/Principal
Investigator_____

Emergency Contacts for laboratory:

Name	Office Location	Office Phone	Home Phone
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Special Hazards/Instructions:_____

_____

_____

Prepared by:_____

Date Posted:_____

Note: The information in this sign must be updated at least every six months and immediately in the event of any change of emergency contacts or special hazards.

APPENDIX VIII

Accident Reporting Procedures

All accidents must be reported as quickly as possible.

STUDENT OR VISITOR ACCIDENTS

Any faculty or staff member witnessing or being informed of an accident involving a student or a visitor should report the accident using the College's Accident Report (Appendix XVI).

EMPLOYEE ACCIDENTS

Employee accidents should be reported immediately by the employee's supervisor.

If an **employee** is injured and **DOES NOT SEEK MEDICAL ATTENTION** at this time, please complete the Accident Report in Appendix XVI.

PROPERTY DAMAGE ACCIDENTS

Property Damage accidents such as fire, water, wind, theft and other property damage claims are not reported on any one form. After a loss is discovered, the loss should be reported to the Department head.

APPENDIX IX

SUBSTANCES CONSIDERED CARCINOGENIC BY OSHA

Based on National Toxicological Report KNOWN CARCINOGENS, 9th ANNUAL REPORT ON CARCINOGENS 2000

Substances or groups of substances, occupational exposures associated with a technological process, and medical treatments that are known to be Carcinogenic.

Name or Synonym	CAS#
Aflatoxins	1402-68-2
4-Aminobiphenyl (4-Aminodiphenyl)	92-67-1
2-Aminonaphthalene (See 2-Naphthylamine)	91-59-8
Analgesic Mixtures Containing Phenacetin	
Arsenic Compounds, Inorganic (under Arsenic and Certain Arsenic Compounds)	
Asbestos	1332-21-4
Azathioprine	446-86-6
Benzene	71-43-2
Benzidine	92-87-5
Bis(chloromethyl) Ether	542-88-1
Busulfan (See 1,4-Butanediol Dimethylsulfonate)	55-98-1
1,4-Butanediol Dimethylsulfonate (Myleran®, Busulfan)	55-98-1
Chlorambucil	305-03-3
1-(2-Chloroethyl)-3-(4-methylcyclohexyl)-1-nitrosourea (MeCCNU)	13909-09-6
Chloromethyl Methyl Ether	107-30-2
Chromium Hexavalent Compounds (under Chromium and Certain Chromium Compounds)	
Coal Tar (under Soots, Tars, and Mineral Oils)	8007-45-2
Coke Oven Emissions	
Creosote (Coal) (under Soots, Tars and Mineral Oils)	8001-58-9
Creosote (Wood) (under Soots, Tars, and Mineral Oils)	8021-39-4
Cyclophosphamide	50-18-0
Cyclosporin A (Cyclosporine A; Ciclosporin)	59865-13-3
Diethylstilbestrol	56-53-1
Erionite	66733-21-9
Lead Chromate (under Chromium and Certain Chromium Compounds)	7758-97-6
MeCCNU [See 1-(2-Chloroethyl)-3-(4-methylcyclohexyl)-1-nitrosourea]	13909-09-6
Melphalan	148-82-3
Methoxsalen (under Methoxsalen with Ultraviolet A Therapy (PUVA)) [methoxsalen not carcinogenic alone]	298-81-7
Mineral Oils	
Mustard Gas	505-60-2
Myleran® (See 1,4-Butanediol Dimethylsulfonate)	55-98-1
2-Naphthylamine (β-Naphthylamine; 2-Aminonaphthalene)	91-59-8
Piperazine Estrone Sulfate (under Conjugated Estrogens)	7280-37-7
Radon	10043-92-2
Sodium Equilin Sulfate (under Conjugated Estrogens)	16680-47-0
Sodium Estrone Sulfate (under Conjugated Estrogens)	438-67-5
Soots	

Strontium Chromate (under Chromium and Certain Chromium Compounds)	7789-06-2
Tars	
Thiotepa [in 7th ARC as Tris(1-aziridinyl)phosphine Sulfide]	52-24-4
Thorium Dioxide	1314-20-1
Tris(1-aziridinyl)phosphine Sulfide (Thiotepa)	52-24-4
Vinyl Chloride	75-01-4
Zinc Chromate (under Chromium and Certain Chromium Compounds)	13530-65-9

REASONABLY ANTICIPATED TO BE CARCINOGENS

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Name or Synonym	CAS#
Acetaldehyde	75-07-0
2-Acetylaminofluorene	53-96-3
Acrylamide	79-06-1
Acrylonitrile	107-13-1
Adriamycin® (Doxorubicin hydrochloride)	25316-40-9
2-Aminoanthraquinone	117-79-3
o-Aminoazotoluene	93-56-3
1-Amino-2-methylanthraquinone	82-28-0
Amitrole	61-82-5
o-Anisidine Hydrochloride	134-29-2
Aroclor (under Polychlorinated Biphenyls)	
Aroclor® 1254 (under Polychlorinated Biphenyls)	11097-69-1
Aroclor® 1260 (under Polychlorinated Biphenyls)	11096-82-5
Azacitidine (5-Azacytidine)	320-67-2
BCNU [See Bis(chloroethyl) Nitrosourea]	154-93-8
Benz[*a*]anthracene (under Polycyclic Aromatic Hydrocarbons)	56-55-3
Benzo[*b*]fluoranthene (under Polycyclic Aromatic Hydrocarbons)	205-99-2
Benzo[*j*]fluoranthene (under Polycyclic Aromatic Hydrocarbons)	205-82-3
Benzo[*k*]fluoranthene (under Polycyclic Aromatic Hydrocarbons)	207-08-9
Benzo[*a*]pyrene (under Polycyclic Aromatic Hydrocarbons)	50-32-8
Benzotrichloride	98-07-7
Beryllium Aluminum Alloy (under Beryllium & Certain Beryllium Compounds)	12770-50-2
Beryllium Chloride (under Beryllium & Certain Beryllium Compounds)	7787-47-5
Beryllium Fluoride (under Beryllium & Certain Beryllium Compounds)	7787-49-7
Beryllium Hydroxide (under Beryllium & Certain Beryllium Compounds)	13327-32-7
Beryllium Oxide (under Beryllium & Certain Beryllium Compounds)	1304-56-9
Beryllium Phosphate (under Beryllium & Certain Beryllium Compounds)	13598-15-7
Beryllium Sulfate Tetrahydrate (under Beryllium & Certain Beryllium Compounds)	7787-56-6
Beryllium Zinc Silicate (under Beryllium and Certain Beryllium Compounds)	39413-47-3
Beryl Ore (under Beryllium and Certain Beryllium Compounds)	1302-52-9
Bis(chloroethyl) Nitrosourea (BCNU)	154-93-8
Bis(dimethylamino)benzophenone (See Michler's Ketone)	90-94-8
Bis(2-ethylhexyl) Phthalate [See Di(2-ethylhexyl)phthalate]	117-81-7
Bromodichloromethane	75-27-4
1,3-Butadiene	106-99-0
Butylated Hydroxyanisole (BHA)	25013-16-5
Cadmium (under Cadmium & Certain Cadmium Compounds)	7440-43-9
Cadmium Chloride (under Cadmium & Certain Cadmium Compounds)	10108-64-2
Cadmium Oxide (under Cadmium & Certain Cadmium Compounds)	1306-19-0
Cadmium Sulfate (under Cadmium & Certain Cadmium Compounds)	10124-36-4
Cadmium Sulfide (under Cadmium & Certain Cadmium Compounds)	1306-23-6
Carbon Tetrachloride	56-23-5
CCNU [See 1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosourea]	13010-47-4
Ceramic Fibers	
Chlordecone (see Kepone®)	143-50-0
Chlordenic Acid	115-28-6
Chlorinated Paraffins (C_{12}, 60% Chlorine)	108171-26-2
1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosourea (CCNU)	13010-47-4
Chloroform	67-66-3

3-Chloro-2-methylpropene	563-47-3
4-Chloro-*o*-phenylenediamine	95-83-0
p-Chloro-*o*-toluidine	95-69-2
p-Chloro-*o*-toluidine Hydrochloride	3165-93-3
Chlorozotocin	54749-90-5
C.I. Basic Red 9 Monohydrochloride	569-61-9
Cisplatin	15663-27-1
p-Cresidine	120-71-8
Cristobalite [under Silica, Crystalline (Respirable Size)]	14464-46-1
Cupferron	135-20-6
Dacarbazine	4342-03-4
Danthron (1,8-Dihydroxyanthraquinone)	117-10-2
DDT (Dichlorodiphenyltrichloroethane)	50-29-3
Decabromobiphenyl (Under Polybrominated Biphenyls)	13654-09-6
DEHP [See Di(2-ethylhexyl) Phthalate]	117-81-7
DEN (See *N*-Nitrosodiethylamine)	55-18-5
2,4-Diaminoanisole Sulfate	39156-41-7
Diaminodiphenyl Ether (See 4,4'-Oxydianiline)	101-80-4
2,4-Diaminotoluene	95-80-7
Dibenz[*a,h*]acridine (under Polycyclic Aromatic Hydrocarbons)	226-36-8
Dibenz[*a, j*]acridine (under Polycyclic Aromatic Hydrocarbons)	224-42-0
Dibenz[*a,h]*anthracene (under Polycyclic Aromatic Hydrocarbons)	53-70-3
7H-Dibenzo[*c,g*]carbazole (under Polycyclic Aromatic Hydrocarbons)	194-59-2
Dibenzo[*a,e*]pyrene (under Polycyclic Aromatic Hydrocarbons)	192-65-4
Dibenzo[*a,h*]pyrene (under Polycyclic Aromatic Hydrocarbons)	189-64-0
Dibenzo[*a,i*]pyrene (under Polycyclic Aromatic Hydrocarbons)	189-55-9
Dibenzo[*a,l*]pyrene (under Polycyclic Aromatic Hydrocarbons)	191-30-0
1,2-Dibromo-3-chloropropane	96-12-8
1,2-Dibromoethane (Ethylene dibromide; EDB)	106-93-4
1,4-Dichlorobenzene (*p*-Dichlorobenzene)	106-46-7
3,3'-Dichlorobenzidine	91-94-1
3,3'-Dichlorobenzidine Dihydrochloride	612-83-9
Dichlorodiphenyltrichloroethane (See DDT)	50-29-3
1,2-Dichloroethane (Ethylene Dichloride)	107-06-2
Dichloromethane (Methylene Chloride)	75-09-2
1,3-Dichloropropene (Technical Grade)	542-75-6
Diepoxybutane	1464-53-5
N,N-Diethyldithiocarbamic acid 2-chloroallyl ester (See Sulfallate)	95-06-7
Di(2-ethylhexyl) Phthalate [DEHP; Bis(2-ethylhexyl phthalate)]	117-81-7
Diethylnitrosamine (See *N*-Nitrosodiethylamine)	55-18-5
Diethyl Sulfate	64-67-5
Diglycidyl Resorcinol Ether	101-90-6
1,8-Dihydroxyanthraquinone [See Danthron]	117-10-2
3,3'-Dimethoxybenzidine	119-90-4
4-Dimethylaminoazobenzene	60-11-7
3,3'-Dimethylbenzidine	119-93-7
Dimethylcarbamoyl Chloride	79-44-7
1,1-Dimethylhydrazine (UDMH)	57-14-7
Dimethylnitrosamine (See *N*-Nitrosodimethylamine)	62-75-9
Dimethyl Sulfate	77-78-1
Dimethylvinyl Chloride	513-37-1
1,6-Dinitropyrene	42397-64-8
1,8-Dinitropyrene	42397-65-9
1,4-Dioxane	123-91-1
Direct Black 38	1937-37-7
Direct Blue 6	2602-46-2

Disperse Blue 1	2475-45-8
DMN (See *N*-Nitrosodimethylamine)	62-75-9
Doxorubicin hydrochloride (See Adriamycin®)	25316-40-9
ENU [See *N*-Nitroso-*N*-ethylurea (*N*-Ethyl-*N*-nitrosourea)]	759-73-9
Epichlorohydrin	106-89-8
Estradiol-17β (under Estrogens [Not Conjugated])	50-28-2
Estrone (under Estrogens [Not Conjugated])	53-16-7
Ethylestradiol (under Estrogens [Not Conjugated])	57-63-6
Ethyl Acrylate	140-88-5
Ethyl Carbamate (See Urethane)	51-79-6
Ethylene Dibromide [See 1,2-Dibromoethane (EDB)]	106-93-4
Ethylene Dichloride (See 1,2-Dibromoethane)	107-06-2
Ethylene Oxide	75-21-8
Ethylene Thiourea	96-45-7
Ethyl Methanesulfonate	62-50-0
N-Ethyl-*N*-nitrosourea (See *N*-Nitroso-*N*-ethylurea)	759-73-9
FireMaster BP-6 (under Polybrominated Biphenyls)	
FireMaster FF-1 (Hexabromobiphenyl, under Polybrominated Biphenyls)	67774-32-7
Formaldehyde (gas)	50-00-0
Furan	110-00-9
Glasswool	
Glycidol	556-52-5
Hexabromobiphenyl (FireMaster FF-1, under Polybrominated Biphenyls)	67774-32-7
Hexachlorobenzene	118-74-1
α-Hexachlorocyclohexane (under Lindane & Other Hexachlorocyclohexane Isomers)	319-84-6
β-Hexachlorocyclohexane (under Lindane & Other Hexachlorocyclohexane Isomers)	319-85-7
γ-Hexachlorocyclohexane (under Lindane & Other Hexachlorocyclohexane Isomers)	58-89-9
Hexachlorocyclohexane (under Lindane & Other Hexachlorocyclohexane Isomers)	608-73-1
Hexachloroethane	67-72-1
Hexamethylphosphoramide	680-31-9
Hydrazine	302-01-2
Hydrazine Sulfate	10034-93-2
Hydrazobenzene	122-66-7
Indeno[1,2,3-*cd*]pyrene (under Polycyclic Aromatic Hydrocarbons)	193-39-5
Iron Dextran Complex	9004-66-4
Kanechlor® (500 (under Polychlorinated Biphenyls)	37317-41-2
Kepone® (Chlordecone)	143-50-0
Lead Acetate	301-04-2
Lead Phosphate	7446-27-7
Lindane (under Lindane & other Hexachlorocyclohexane Isomers)	58-89-9
MBOCA [See 4,4'-Methylenebis(2-chloraniline)]	101-14-4
Mestranol (under Estrogens [Not Conjugated])	72-33-3
2-Methylazairidine (Propylenimine)	75-55-8
5-Methylchrysene (under Polycyclic Aromatic Hydrocarbons)	3697-24-3
4,4'-Methylenebis(2-chloraniline) (MBOCA)	101-14-4
4,4'-Methylenebis(*N,N*-dimethylbenzenamine)	101-61-1
Methylene Chloride (See Dichloromethane)	75-09-2
4-4'-Methylenedianiline	101-77-9
4-4'-Methylenedianiline Dihydrochloride	13552-44-8
Methyl Methanesulfonate	66-27-3
N-Methyl-*N'*-nitro-*N*-nitrosoguanidine	70-25-7

N-Methyl-*N*-nitrosourea (See *N*-Nitroso-*N*-methylurea)	684-93-5
Metronidazole	443-48-1
Michler's Ketone [4,4'-(Dimethylamino)benzophenone]	90-94-8
Mirex	2385-85-5
Nickel (under Nickel & Certain Nickel Compounds)	7440-02-0
Nickel Acetate (under Nickel & Certain Nickel Compounds)	373-02-4
Nickel Carbonate (under Nickel & Certain Nickel Compounds)	3333-67-3
Nickel Carbonyl (under Nickel & Certain Nickel Compounds)	13463-39-3
Nickel Hydroxide (under Nickel & Certain Nickel Compounds)	12054-48-7
Nickel Hydroxide (under Nickel & Certain Nickel Compounds)	11113-74-9
Nickelocene (under Nickel & Certain Nickel Compounds)	1271-28-9
Nickel Oxide (under Nickel & Certain Nickel Compounds)	1313-99-1
Nickel Subsulfide (under Nickel & Certain Nickel Compounds)	12035-72-2
Nitrilotriacetic Acid	139-13-9
o-Nitroanisole	91-23-6
6-Nitrochrysene	7496-02-8
Nitrofen	1836-75-5
Nitrogen Mustard Hydrochloride	55-86-7
2-Nitropropane	79-46-9
1-Nitropyrene	5522-43-0
4-Nitropyrene	57835-92-4
N-Nitroso-*n*-butyl-*N*-(3-carboxypropyl)amine (under *N*-Nitrosodi-*n*-butylamine)	38252-74-3
N-Nitroso-*n*-butyl-*N*-(4-hydroxybutyl)amine (under *N*-Nitrosodi-*n*-butylamine)	3817-11-6
N-Nitrosodi-*n*-butylamine	924-16-3
N-Nitrosodiethanolamine	1116-54-7
N-Nitrosodiethylamine (Diethylnitrosamine; DEN)	55-18-5
N-Nitrosodimethylamine (Dimethylnitrosamine; DMN)	62-75-9
N-Nitrosodi-*n*-propylamine	621-64-7
N-Nitroso -*N*-ethylurea (*N*-Ethyl-*N*-nitrosourea; ENU)	759-73-9
4-(N-Nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK)	64091-91-4
N-Nitroso-*N*-methylurea (*N*-Methyl-*N*-nitrosourea)	684-93-5
N-Nitrosomethylvinylamine	4549-40-0
N-Nitrosomorpholine	59-89-2
N-Nitrosonornicotine	16543-55-8
N-Nitrosopiperidine	100-75-4
N-Nitrosopyrrolidine	930-55-2
N-Nitrososarcosine	13256-22-9
NNK [See 4-*(N*-Nitrosomethylamino)-1-(3-pyridyl)-1-butanone]	64091-91-4
Norethisterone	68-22-4
Ochratoxin A	303-47-9
Octabromobiphenyl (Under Polybrominated Biphenyls)	61288-13-9
4,4'-Oxydianiline	101-80-4
Oxymetholone	434-07-1
PAHs (See Polycyclic Aromatic Hydrocarbons)	
PBBs (See Polybrominated Biphenyls)	
PCBs (under Polychlorinated Biphenyls)	1336-36-3
Perchloroethylene (See Tetrachloroethylene)	127-18-4
Phenacetin (See also Analgesic Mixtures Containing Phenacetin)	62-44-2
Phenazopyridine Hydrochloride	136-40-3
Phenoxybenzamine Hydrochloride	63-92-3
Phenytoin	57-41-0
Polybrominated Biphenyls (PBBs)	
Polychlorinated Biphenyls (PCBs)	1336-36-3
Polycyclic Aromatic Hydrocarbons (PAHs)	
Procarbazine Hydrochloride	366-70-1

Progesterone	57-83-0
1,3-Propane Sultone	1120-71-4
β-Propiolactone	57-57-8
Propylene Oxide	75-56-9
Propylenimine (See 2-Methylaziridine)	75-55-8
Propylthiouracil	51-52-5
Quartz [under Silica, Crystalline (Respirable Size)]	14808-60-7
Reserpine	50-55-5
Saccharin	81-07-2
Safrole	94-59-7
Selenium Sulfide	7446-34-6
Silica, Crystalline (Respirable Size)	
Streptozotocin	18883-66-4
Sulfallate	95-06-7
2,3,7,8-Tetrachloroddibenzo-*p*-dioxin (TCDD)	1746-01-6
Tetrachloroethylene (Perchloroethylene)	127-18-4
Tetranitromethane	509-14-8
Thioacetamide	62-55-5
Thiourea	62-56-6
Toluene Diisocyanate	26471-62-5
o-Toludine	95-53-4
o-Toluidine Hydrochloride	636-21-5
Toxaphene	8001-35-2
1,1,1-Trichloro-2,2-bis(*p*-chlorophenyl)ethane (See DDT)	50-29-3
2,4,6-Trichlorophenol	88-06-2
1,2,3-Trichloropropane	96-18-4
Tridymite [under Silica, Crystalline (Respirable Size)]	15468-32-3
Tris(2,3-dibromopropyl) Phosphate	126-72-7
UDMH (See 1,1-Dimethylhydrazine)	57-14-7
Urethane (Urethan; Ethyl carbamate)	51-79-6
4-Vinyl-1-cyclohexene Diepoxide	106-87-6

APPENDIX X

HAZARD RATING INFORMATION FOR NFPA FIRE DIAMONDS

This appendix provides hazard rating information for many common chemicals. You may wish to use labels that include the NFPA fire diamond. Use this reference to complete the health, fire, reactivity, and special notice areas in the diamond. An explanation of the hazard rating system is given below.

Health (Blue Diamond)

0	No chemical is without some degree of toxicity.
1	Slightly toxic material. May cause irritation, but only minor residual injury even without treatment. Recognized innocuous materials when used with responsible care.
2	Moderately toxic material. Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment is given.
3	Seriously toxic material. Short term exposure could cause serious temporary or residual injury even though prompt medical treatment is given. Includes known or suspect small animal carcinogens, mutagens or teratogens.
4	Highly toxic material. Very limited exposure could cause death or major injury even though prompt medical treatment is given. Includes known or suspect human carcinogens, mutagens or teratogens.

Flammability (Red Diamond)

0	Materials which will not burn.
1	Slightly combustible. Materials that require considerable preheating before ignition can occur. This rating includes most ordinary combustible materials.
2	Combustible. Materials that must be moderately heated before ignition can occur. Including liquids having a flash point above 100 degrees F, and solids that readily give off flammable vapors.
3	Flammable. Liquids and solids that can be ignited under almost all ambient temperature conditions. Including liquids with a flash point below 73 degrees F and a boiling point above 100 degrees F, solid materials which form coarse dusts that burn rapidly without becoming explosive, materials which burn rapidly by reason of self-contained oxygen (i.e. organic peroxides), and materials which ignite spontaneously when exposed to air.
4	Extremely flammable. Materials which will rapidly vaporize at normal pressure and temperature and will burn readily. Including: gases, cryogenic materials, any liquid or gaseous material having a flash point below 73 degrees F and a boiling point below 100 degrees F, and materials which can form explosive mixtures with air.

Reactivity (Yellow Diamond)

0	Materials which are normally stable, even under fire conditions, and which are not reactive with water.
1	Materials which are normally stable, but which can become unstable at elevated temperatures and pressures, or which may react with water with some release of energy, but not violently.
2	Materials which in themselves are normally unstable and readily undergo violent chemical change, but do not detonate. It includes materials which may react violently with water or which may form potentially explosive mixtures with water.
3	Materials which in themselves are capable of detonation but which require a strong initiating source, or which must be heated first. This rating includes materials which are shock sensitive at elevated temperatures, and which react explosively with water without requiring heat.
4	Materials which in themselves are readily capable of detonation or explosive decomposition at normal temperatures and pressures. Includes materials which are shock sensitive at normal temperatures and pressures.

Special Notice (White Diamond)

OX	Denotes materials that are oxidizing agents. These compounds give up oxygen easily, remove hydrogen from other compounds or attract negative electrons.
~~W~~	Denotes materials that are water reactive. These compounds undergo rapid energy releases on contact with water.

Hazard Rating Information for NFPA Fire Diamonds

Compound	Health	Fire	Reactivity	S/N
Acetal	2	3	0	
Acetaldehyde	2	4	2	
Acetic Acid (glacial)	2	2	2	
Acetic Anhydride	3	2	2	~~W~~
Acetone	1	3	0	
Acetonitrile	2	3	0	
Acetophenone	1	2	0	
Acetyl Chloride	3	3	2	~~W~~
Acetylene	1	4	3	
Acetyl Peroxide	1	2	4	
Acrolein	3	3	2	
Acrolein Dimer	1	2	1	
Acrylic Acid (glacial)	3	2	2	
Acrylonitrile	4	3	2	
Adipic Acid	-	1	0	
Adiponitrile	4	2	0	
Aldol	3	2	1	
Allyl Acetate	1	3	0	
Allyl Alcohol	3	3	0	
Allyl Bromide	3	3	1	
Allyl Chloride	3	3	1	
Aluminum (dust or powder)	0	1	1	
3-Aminopropanol	3	2	0	
Ammonia, Anhydrous	3	1	0	
Ammonium Bromide	2	0	0	
Ammonium Chloride	2	0	0	
Ammonium Fluoride	3	0	0	
Ammonium Nitrate	2	0	3	OX
Ammonium Perchlorate	2	0	4	OX
Ammonium Permanganate	2	0	3	OX
Ammonium Sulfate	3	0	0	
Amyl Acetate	1	3	0	
Amyl Alcohol	1	3	0	
Amylamine	3	3	0	
Amylbenzene	1	2	0	
Amyl Chloride	1	3	0	
Amyl Ether	1	2	0	
Amyl Maleate	0	1	0	
Amyl Nitrate	2	2	0	OX
o-Amyl Phenol	2	1	0	
Amyl Propionate	0	2	0	

Amyl Stearate	0	1	0	
Amyl Toluene	2	2	0	
Aniline	3	2	0	
o-Anisidine	2	1	0	
Anisole	1	2	0	
Antimony Pentafluoride	3	0	1	
Antimony Pentasulfide	3	1	1	
Arsenic Chloride	3	0	0	
Arsenic Trisulfide	3	1	0	
Barium Chlorate	1	0	2	OX
Barium Nitrate	1	0	0	OX
Barium Peroxide	1	0	0	OX
Benzaldehyde	2	2	0	
Benzoic Acid	2	1	-	
Benzol (benzene)	2	3	0	
Benzotrifluoride	4	3	0	
Benzoyl Chloride	3	2	1	~~W~~
Benzyl Acetate	1	1	0	
Benzyl Alcohol	2	1	0	
Benzyl Cyanide	2	1	0	
Benzyl Salicilate	1	1	0	
Beryllium (dust or powder)	4	1	0	
Biphenyl	2	1	0	
Boron Trifluoride	3	0	1	
Bromine	4	0	0	OX
Bromine Trifluoride	4	0	3	OX, ~~W~~
Bromobenzene	2	2	0	
o-Bromotoluene	2	2	0	
Butadiene Monoxide	2	3	2	
Butane	1	4	0	
1-Butene	1	4	0	
Butenediol	1	1	0	
Butyl Acetate	1	3	0	
Butyl Acetoacetate	1	2	0	
Butyl Acrylate	2	2	2	
Butyl Alcohol	1	3	0	
Butylamine	2	3	0	
Butylamine Oleate	3	2	0	
Butylbenzene	2	2	0	
Butyl Benzoate	1	1	0	
Butyl Bromide	2	3	0	
Butyl Chloride	2	3	0	
Butylcyclohexane	0	-	0	
Butyldecalin	1	1	0	

Butyl Formate	2	3	0	
N-Butyl Isocyanate	3	2	2	
Butyl Isovalerate	0	-	-	
Butyl Lactate	1	2	0	
Butyl Methacrylate	2	2	0	
Butyl Naphthalene	1	1	0	
Butyl Nitrate	1	3	3	
Butyl Oxalate	0	1	0	
Butyl Propionate	2	3	0	
Butyl Stearate	1	1	0	
Butyl Trichlorosilane	2	2	0	
Butyraldehyde	2	3	0	
Butyraldol	2	2	0	
Butyraldoxime	2	2	0	
Butyric Acid	2	2	0	
Calcium Carbide	1	4	2	W
Calcium Chlorate	2	0	2	OX
Calcium Cyanide	3	0	0	
Calcium Hypochlorite	2	0	2	OX
Calcium Oxide	1	0	1	
Camphor	0	2	0	
Caproic Acid	2	1	0	
Capryladehyde	2	2	0	
Caprylyl Chloride	3	2	1	
Carbon Disulfide	2	3	0	
Carbon Monoxide	2	4	0	
Carbon Tetrachloride	3	0	0	
Castor Oil	0	1	0	
Chlorine	3	0	0	OX
Chlorine Monoxide	3	4	3	
Chloroacetic Acid	3	1	0	
Chloroacetophenone	2	1	0	
Chlorobenzene	2	3	0	
Chloroform	2	0	0	
Chloropicrin	4	0	3	
Chlorotoluene	2	2	0	
Chromic Acid	3	0	1	OX
Citral	0	2	0	
Cobalt Naphtha	1	2	0	
Coconut Oil	0	1	0	
Cod Liver Oil	0	1	0	
Corn Oil	0	1	0	
Creosote Oil	2	2	0	
o-Cresol	3	2	0	

Crotonaldehyde	3	3	2	
Crotonic Acid	3	2	0	
Crotononitrile	-	1	0	
Cumene	2	3	0	
Cupric Nitrate	1	0	0	OX
Cyanogen	4	4	2	
Cyanogen Bromide	3	0	2	
Cyclobutane	1	4	0	
Cyclohexane	1	3	0	
Cyclohexanol	1	2	0	
Cyclohexanone	1	2	0	
Cyclohexene	1	3	0	
Cyclohexenone	1	3	0	
Cyclohexyl Chloride	2	3	0	
Cyclopentane	1	3	0	
Cyclopentene	1	3	1	
Cyclopentanone	2	3	0	
Cyclopropane	1	4	0	
Decaborane	3	2	1	
Decane	0	2	0	
Decanol	0	2	0	
1-Decene	0	2	0	
Decylamine	2	1	0	
Dehydroacetic Acid	1	1	0	
Denatured Alcohol	0	3	0	
Deuterium	0	4	0	
Diacetone Alcohol	1	2	0	
Diamyl Sulfide	2	2	0	
Dibenzoyl Peroxide	1	4	4	OX
Diborane	3	4	3	~~W~~
Dibutylamine	3	2	0	
Dibutyl Ether	2	3	0	
Dibutyl Oxalate	0	1	0	
Dibutyl Phosphite	3	2	0	
Dibutyl Phthalate	0	1	0	
o-Dichlorobenzene	2	2	0	
1,2-Dichlorobutane	2	2	0	
1,1-Dichloroethene	2	4	2	
1,2-Dichloroethylene	2	3	2	
Dichlorosilane	3	4	2	
Didecyl Ether	0	1	0	
Diesel Fuel Oil No. 1	0	2	0	
Diethylamine	2	3	0	
Diethylene Glycol Dimethyl Ether	1	2	1	

Diethylene Triamine	3	1	0	
Diethyl Fumarate	1	1	0	
Diethyl Ketone	1	3	0	
Diethyl Succinate	1	1	0	
Diethyl Sulfate	3	1	1	
Diethylzinc	0	3	3	W
Dihexylamne	2	1	0	
Diisobutylamine	3	3	0	
Diisobutyl Carbinol	1	2	0	
Diisobutyl Ketone	1	2	0	
Diisooctyl Phthalate	0	1	0	
Diisopropylamine	3	3	0	
Diisopropyl Benzene	0	2	0	
Diketene	2	2	2	
Dimethylamine	3	4	0	
N, N-Dimethylaniline	3	2	0	
2,2-Dimethylbutane	1	3	0	
Dimethyldioxane	2	3	0	
N, N-Dimethylformamide	1	2	0	
Dimethyl Maleate	1	1	0	
2,3-Dimethyloctane	0	2	0	
2,3-Dimethylpentane	0	3	0	
Dimethyl Phthalate	0	1	0	
Dimethyl Sulfate	4	2	0	
Dimethyl Sulfide	2	4	0	
Dimethyl Sulfoxide	1	1	0	
Dinitrobenzene (ortho)	3	1	4	
2,4-Dinitrotoluene	3	1	3	
Dioctyl Ether	0	1	0	
p-Dioxane	2	3	1	
Dioxolane	2	3	2	
Dipentene	0	2	0	
Diphenylamine	3	1	0	
Diphenyl Phthalate	0	1	0	
Dipropylamine	3	3	0	
Divinylbenzene	2	2	2	
Divinyl Ether	2	3	2	
Dodecane	0	2	0	
1-Dodecanethiol	2	1	0	
1-Dodecanol	0	1	0	
Endrin (dry)	2	0	0	
Epichlorohydrin	3	2	1	
Ethane	1	4	0	
Ethanolamine	2	2	0	

Ethoxybenzene	0	2	0	
3-Ethoxypropanal	2	2	0	
Ethyl Acetate	1	3	0	
Ethyl Acrylate	2	3	2	
Ethyl Alcohol	0	3	0	
Ethylamine	3	4	0	
Ethylbenzene	2	3	0	
Ethyl Benzoate	1	1	0	
Ethyl Borate	2	3	0	
Ethyl Bromide	2	1	0	
Ethylbutylamine	3	3	0	
Ethyl Butyl Carbonate	2	2	1	
Ethyl Butyl Ketone	1	2	0	
Ethyl Butyrate	0	3	0	
Ethyl Caprylate	2	2	0	
Ethyl Chloride	2	4	0	
Ethyl Crotonate	2	3	0	
Ethylcyclohexane	1	3	0	
Ethylene	1	4	2	
Ethylenediamine	3	2	0	
Ethylene Dichloride	2	3	0	
Ethylene Glycol	1	1	0	
Ethylene Glycol Dibutyl Ether	1	2	0	
Ethylene Glycol Ethylbutyl Ether	1	2	0	
Ethylene Glycol Monobutyl Ether Acetate	1	2	0	
Ethylene Oxide	2	4	3	
Ethyl Ether	2	4	1	
Ethyl Formate	2	3	0	
Ethyl Isobutyrate	0	3	0	
Ethyl Mercaptan	2	4	0	
4-Ethylmorpholine	2	3	0	
Ethyl Nitrate	2	3	4	
Ethyl Oxalate	0	2	0	
Ethyl Propionate	-	3	0	
Ethyl Silicate	2	2	0	
Fluorine	4	0	3	~~W~~, OX
Formaldehyde (water solution)	2	2	0	
Formamide	2	1	-	
Formic Acid	3	2	0	
Furan	1	4	1	
Furfuryl Alcohol	1	2	1	
Gas, Natural	1	4	0	
Gasoline 56-100 Octane	1	3	0	
Glycerin	1	1	0	

Glycidyl Acrylate	0	2	0	
Heptane	1	3	0	
2-Heptanol	0	2	0	
Heptylene	0	3	0	
Hexadecane	0	1	0	
Hexanal	2	3	1	
Hexane	1	3	0	
3-Hexanone	1	3	0	
1-Hexene	1	3	0	
Hexyl Alcohol	1	2	0	
Hexyl Methacrylate	0	2	0	
Hydrazine (Anhydrous)	3	3	2	
Hydrocyanic Acid-96%	4	4	2	
Hydrogen	0	4	0	
Hydrochloric Acid	3	0	0	
Hydrobromic Acid	3	0	0	
Hydrofluoric Acid	4	0	0	
Hydrogen Peroxide (35% to 52% by weight)	2	0	1	OX
Hydrogen Sulfide	3	4	0	
Hydroquinone	2	1	0	
Isoamyl Acetate	1	3	0	
Isoamyl Alcohol	1	2	0	
Isobutane	1	4	0	
Isobutyl Acetate	1	3	0	
Isobutyl Acrylate	1	3	1	
Isobutyl Alcohol	1	3	0	
Isobutylbenzene	2	2	0	
Isobutyl Chloride	2	3	0	
Isobutyl Methyl Ketone	2	3	0	
Isobutyraldehyde	2	3	1	
Isobutyric Acid	1	2	0	
Isobutyric Anhydride	1	2	1	~~W~~
Isodecaldehyde	0	2	0	
Isodecanoic Acid	0	1	0	
Isohexane	1	3	0	
Isooctane	0	3	0	
Isooctanoic Acid	0	1	0	
Isooctyl Alcohol	0	2	0	
Isopentane	1	4	0	
Isophorone	2	2	0	
Isoprene	2	4	2	
Isopropyl Acetate	1	3	0	
Isopropyl Alcohol	1	3	0	

Isopropyl Chloride	2	4	0	
Isopropyl Ether	2	3	1	
Jet Fuels (JP-4)	1	3	0	
Jet Fuels (JP-5)	0	2	0	
Lanolin	0	1	0	
Lead Arsenates	2	0	0	
Lead Nitrate	1	0	0	OX
Lead Thiocyanate	1	1	1	
Lithium	1	1	2	~~W~~
Lithium Hydride	3	4	2	~~W~~
Lubricating Oil, Mineral	0	1	0	
Magnesium (including all alloys)	0	1	2	~~W~~
Magnesium Nitrate	1	0	0	OX
Magnesium Perchlorate	1	0	0	OX
Maleic Anhydride	3	1	1	
Mercuric Cyanide	3	0	0	
Mesityl Oxide	3	3	0	
Methacrylic Acid	3	2	2	
Methane	1	4	0	
Methyl Acetate	1	3	0	
Methyl Acrylate	2	3	2	
Methylal	2	3	2	
Methyl Alcohol	1	3	0	
Methylamine	3	4	0	
Methyl Amyl Ketone	1	2	0	
Methyl Benzoate	0	2	0	
Methyl Borate	2	3	1	
Methyl Bromide	3	1	0	
Methyl Butyl Ketone	2	3	0	
Methyl Carbonate	2	3	1	
Methyl Cellosolve Acetate	0	2	0	
Methyl Chloride	2	4	0	
Methyl Chloroacetate	2	2	1	
Methylcyclohexane	2	3	0	
Methylcyclohexanone	-	2	0	
Methylcyclopentane	2	3	0	
Methylene Chloride	3	1	1	
Methylene Diisocyanate	1	2	1	~~W~~
Methyl Ether	2	4	1	
Methyl Ethyl Ether	2	4	1	
Methyl Ethyl Ketone	1	3	0	
Methyl Formate	2	4	0	
Methyl Glycol Acetate	1	2	0	
Methyl Hexyl Ketone	0	2	0	

Methylhydrazine	3	3	2	
Methyl Isoamyl Ketone	1	2	0	
Methyl Isobutyl Carbinol	2	2	0	
Methyl Isobutyl Ketone	2	3	0	
Methyl Isocyanate	2	3	3	~~W~~
Methyl Lactate	1	2	0	
Methyl Mercaptan	2	4	0	
Methyl Methacrylate	2	3	2	
Methyl Parathion (solid)	4	1	2	
2-Methyl-1-Pentene	1	3	0	
Methyl Phenylacetate	0	2	0	
1-Methyl Piperazine	2	2	0	
Methyl Propionate	1	3	0	
Methyl Propyl Ketone	2	3	0	
2-Methylpyrazine	2	2	0	
Methylpyrrole	2	3	1	
Methylpyrrolidine	2	3	1	
Methyl Salicylate	1	1	0	
Methyl Stearate	0	1	0	
Methyl Toluene Sulfonate	2	1	0	
Methyl Vinyl Ketone	3	3	2	
Mineral Oil	0	1	0	
Mineral Spirits	0	2	0	
Morpholine	2	3	0	
Mustard Oil	3	2	0	
Naptha	1	3	0	
Napthalene	2	2	0	
Nickel Carbonyl	4	3	3	
Nicotine	4	1	0	
Nitric Acid	3	0	0	OX
p-Nitroaniline	3	1	3	
Nitrobenzene	3	2	0	
Nitrobiphenyl	2	1	0	
Nitrochlorobenzene	3	1	1	
Nitroethane	1	3	3	
Nitrogen (liquified)	3	0	0	
Nitrogen Peroxide	3	0	0	OX
Nitrogen Trioxide	3	0	0	OX
Nitroglycerine	2	2	4	
Nitromethane	1	3	3	
1-Nitropropane	1	3	1	
o-Nitrotoluene	2	1	4	
Nonadecane	0	1	0	
Nonane	0	3	0	

Nonene	0	3	0	
Nonylbenzene	0	1	0	
Octadecane	0	1	0	
Octane	0	3	0	
2-Octanol	1	2	0	
1-Octene	1	3	0	
Oleic Acid	0	1	0	
Olive Oil	0	1	0	
Oxalic Acid	2	1	0	
Oxygen (liquid)	3	0	0	OX
Paraffin Oil	0	1	0	
Paraformaldehyde	2	1	0	
Paraldehyde	2	3	1	
Parathion	4	1	2	
Pentaborane	3	3	2	
Pentachlorophenol (dry)	3	0	0	
Pentane	1	4	0	
Pentanoic acid	2	1	0	
Pentaphen	2	1	0	
1-Pentene	1	4	0	
Perchloric Acid	3	0	3	OX
Perchloroethylene	2	0	0	
Petroleum, Crude	1	3	0	
Petroleum Ether	1	4	0	
Phenol	3	2	0	
Phenylacetaldehyde	1	2	0	
Phenyl Acetate	1	2	0	
Phenylacetic Acid	1	1	0	
o-Phenylenediamine	-	1	0	
Phenylhydrazine	3	2	0	
Phenylpropyl Alcohol	0	1	0	
Phosgene	4	0	0	
Phosphine	3	4	1	
Phosphoric Acid	2	0	0	
Phosphorus Pentasulfide	3	1	2	~~W~~
Phosphorus, Red	0	1	1	
Phosphorus Trichloride	3	0	2	~~W~~
Phosphorus, White or Yellow	3	3	1	
Phosphoryl Chloride	3	0	2	~~W~~
Phthalic Acid	0	1	1	
Phthalic Anhydride	2	1	0	
Picric Acid	2	4	4	
Pine Oil	0	2	0	
Pine Tar	0	2	0	

Piperazine	2	2	0	
Piperidine	2	3	3	
Potassium	3	1	2	~~W~~
Potassium Bromate	1	0	0	OX
Potassium Chlorate	2	0	0	OX
Potassium Cyanide	3	0	0	
Potassium Hydroxide (lye)	3	0	1	
Potassium Nitrate	1	0	0	OX
Potassium Permanganate	1	0	0	OX
Potassium Peroxide	3	0	2	~~W~~, OX
Potassium Persulfate	1	0	0	OX
Potassium Sulfide	2	1	0	
Propane	1	4	0	
Propionic Acid	2	2	0	
Propionyl Chloride	3	3	1	
Propyl Acetate	1	3	0	
Propyl Alcohol	1	3	0	
Propylamine	3	3	0	
Propyl Chloride	2	3	0	
Propylene	1	4	1	
Propylene Dichloride	2	3	0	
Propylene glycol	0	1	0	
Propylene Oxide	2	4	2	
n-Propyl Ether	-	3	0	
Propyl Nitrate	2	4	3	OX
Pyridine	2	3	0	
Pyrrole	2	2	0	
Pyrrolidine	2	3	1	
Quinoline	2	1	0	
Resorcinol	-	1	0	
Rhodinol	0	1	0	
Salicylic Acid	0	1	0	
Silane	1	4	2	
Silver Nitrate	1	0	0	OX
Sodium	3	1	2	~~W~~
Sodium Chlorate	1	0	2	OX
Sodium Chlorite	1	1	2	OX
Sodium Cyanide	3	0	0	
Sodium Fluoride	2	0	0	
Sodium Hydride	3	3	2	~~W~~
Sodium Hydroxide (lye)	3	0	1	
Sodium Nitrate	1	0	0	OX
Sodium Perchlorate	2	0	2	OX
Sodium Peroxide	3	0	2	OX, ~~W~~

Sodium-Potassium Alloys	3	3	2	~~W~~
Sodium Sulfide	2	1	0	
Stannic Chloride	3	0	1	
Stearic Acid	1	1	0	
Stearyl Alcohol	0	-	0	
Stoddard Solvent	0	2	0	
Styrene	2	3	2	
Sulfur	2	1	0	
Sulfur Chloride	2	1	2	~~W~~
Sulfur Dioxide	2	0	0	
Sulfuric Acid	3	0	2	~~W~~
Tannic Acid	0	1	0	
Terephthaloyl Chloride	3	1	0	
Tetrachlorobenzene	0	10	0	
Tetrachloroethylene	2	0	0	
Tetradecanol	0	1	0	
Tetraethylene Glycol	1	1	0	
Tetraethyl Lead, Compounds	3	2	3	
Tetrafluoroethylene	3	4	3	
Tetrahydrofuran	2	3	1	
Tetramethyl Lead, Compounds	3	3	3	
Thionyl Chloride	3	0	2	~~W~~
Thiophene	2	3	0	
Titanium Tetrachloride	3	0	1	
Toluene	2	3	0	
Toluene-2,4-Diisocyanate	3	1	1	
o-Toluidine	3	2	0	
Triamylamine	2	1	0	
Triamylbenzene	0	1	0	
Tributylamine	2	2	0	
Tributyl Phosphate	2	1	0	
Tributylphosphine	0	1	0	
Tributyl Phosphite	2	1	1	
1,1,1-Trichloroethane	2	1	0	
Trichloroethylene	2	1	0	
Trichloroethylsilane	3	3	0	
Trichlorosilane	3	4	2	~~W~~
Triethanolamine	2	1	1	
Triethylamine	2	3	0	
Triethyl Phosphate	0	1	1	
Triisobutyl Borate	3	2	1	
Trimethylamine	2	4	0	
Trimethylchlorosilane	3	3	2	~~W~~
Trinitrobenzene	2	4	4	

Trinitrotoluene (tnt)	2	4	4	
Trioxane	2	2	0	
Triphenylmethane	0	1	0	
Tripropylene	0	3	0	
Tripropylene Glycol	0	1	0	
Turpentine	1	3	0	
2-Undecanol	1	1	0	
Valeraldehyde	1	3	0	
Vanadium Tetrachloride	3	0	2	~~W~~
Vinyl Acetate	2	3	2	
Vinyl Bromide	2	0	1	
Vinyl Butyl Ether	2	3	2	
Vinyl Chloride	2	4	1	
Vinyl Crotonate	2	3	2	
Vinyl Ethyl Alcohol	0	2	0	
Vinyl Ethyl Ether	2	4	2	
Vinyl Fluoride	1	4	2	
Vinylidene Chloride	2	4	2	
Vinylidene fluoride	1	4	2	
Vinyl Methyl Ether	2	4	2	
Vinyl Propionate	2	3	2	
Vinyl Toluene	2	2	1	
o-Xylene	2	3	0	
o-Xylidine	3	1	0	
Zinc (powder or dust)	0	1	1	
Zinc Chlorate	2	0	2	OX
Zirconium Tetrachloride	3	0	1	

APPENDIX XI

Laboratory Specific Standard Operating Procedures

Marshall University

Please fill out and place in Ch. 3 of the Laboratory Safety Manual

Building: _____ Room: _____
Department: _____ PI: _____

Section 1: (check one)

☐ Process ☐ Hazardous Chemical ☐ Hazard Class

Section 2: Describe process, chemical hazard, or hazard class

Section 3: Potential Hazards

Section 4: Personal Protective Equipment

Section 5: Engineering Controls

Section 6: Special Handling and Storage Procedures

Section 7: Spill and Accident Procedures

Section 8: Decontamination Procedures

Section 9: Waste Disposal Procedures

Section 10: MSDS Location

Section 11: Protocol

Borrowed from Michigan State University

Laboratory Specific Standard Operating Procedures

Guidelines for Preparing SOPs

- **Section 1** Check the appropriate box indicating process, chemical hazard, or hazard Class

- **Section 2** Describe process, hazardous chemical, or hazard class
  Process- Describe the process and list all chemicals involved
  Hazardous Chemical- List the chemical name, common name and any other abbreviations
  Hazard class- Describe the hazards associated with a particular group of similar chemicals, list the ones used in the lab

- **Section 3** Potential Hazards
  Describe both physical and health hazards associated with process, hazard, or class

- **Section 4** PPE
  Indicate the level of PPE needed including (but not limited to) gloves, goggles, face shields, aprons, and lab coats

- **Section 5** Engineering Controls
  List the engineering controls used to prevent and reduce exposure
  Example Fume hoods

- **Section 6** Special Handling and Storage Procedures
  Indicate specific areas used for storage, including storage compatibility. List policies regarding access and dating procedures, such as dating peroxide formers

- **Section 7** Spill and Accident Procedures
  List who and how spills will be handled. Indicate where emergency equipment is located and the location of emergency numbers

- **Section 8** Decontamination Procedures
  List procedures including cleaning solutions and solvents that may be used

- **Section 9** Waste Disposal
  Indicate which substances are required to be picked up by hazardous waste. ensure all hazardous waste is appropriately labeled "Hazardous Waste" and has a ticket on it.

- **Section 10** MSDS Location
  Indicate the location of all MSDS and any other chemical or safety manuals In the lab

- **Section 11** Protocol
  List specific procedures for working with this particular process, chemical hazard, or hazard class

APPENDIX XII

USE OF CONTACT LENSES IN CHEMISTRY LABORATORY

SAFETY GOGGLES WITHOUT VENTS ONLY MUST BE WORN AT ALL TIMES IN CHEMISTRY LABORATORIES WHEN WEARING CONTACT LENSES. Such safety goggles prevent liquids or solid particles from being splashed or sprayed into the eyes and they reduce contact with laboratory vapors. Gases and vapors can concentrate under the contact lenses and cause permanent eye damage. It has been shown that soft contact lenses can pose an even greater risk of vapor absorption and possible eye damage than hard contact lenses. In addition to the possible vapor and gas hazards, contact lenses may trap foreign matter in the eye and produce abrasion of the cornea. Contact lens wearers are advised to remove their contact lenses and replace them with conventional eyeglasses before coming to the Chemistry laboratory when possible to avoid the possibility of the aforementioned hazards as well as any unforeseen problems which might occur as a result of wearing contact lenses. The exceptions to this general rule include persons who cannot wear corrective glasses for medical reasons or persons for whom contact lenses are medically required for therapeutic reasons.

RELEASE IN FULL OF ALL CLAIMS

I have read and understand the information set out above pertaining to the potential risks of wearing contact lenses in the Chemistry laboratory.

In consideration of being permitted to participate in the laboratory course, I agree to wear safety goggles at **ALL** times in the laboratory and to notify my Teaching assistant that I am wearing contact lenses each time I enter the laboratory wearing such lenses.

I fully understand that I assume **FULL RESPONSIBILITY** for any injury which might occur as a result of or connected in any way to the fact that I wear contact lenses in the Chemistry Laboratory.

PRINTED NAME: _____

CHEMISTRY COURSE: _____ SECTION NO: _____

ROOM NUMBER: _____ DESK NO: _____

STUDENT SIGNATURE: _____ DATE: _____

WITNESS SIGNATURE: _____ DATE: _____

APPENDIX XIII

Surplus Chemical and Chemical Waste Pick-up

See reverse side of this form for instructions

1. Principal User/Contact:				2. Lab/Dept.:		
3. Building/Room No./Extension:				4. Date:		
5. Waste Location in the Room:						
6. Chemical Identity List ALL chemicals--No Abbreviations List amount of each chemical in Liters (liquids and gases) or Milligrams (solids)	ITEM NO._____			ITEM NO. _____		
7. Total Amount No. of Containers Volume of Liquid						
	_____ Liters			_____ Liters		
8. Form	Liquid	Solid	Compressed Gas	Liquid	Solid	Compressed Gas
9. Source Used/spent solvents, etc. Unused chemicals, opened Unused chemicals, unopened Solid laboratory waste Other - Specify						
10. Special Hazard(s)						

NOTICE: THIS CERTIFICATION MUST BE SIGNED BEFORE WASTE CAN BE PICKED UP.

Certification: I hereby declare that the contents of this consignment are fully and accurately described by proper chemical name and the wastes are properly classified, marked and labeled. I have made a good faith effort to minimize my waste generation.

_____

_____

Principal User Signature

SAFETY OFFICE USE ONLY

EPA Waste Number		
Proposed Disposition		
Disposition Date		
Container Number		

Pick-up Date: _____ Signature: _____

INSTRUCTIONS

All chemical wastes must be properly packaged and labeled with the following information: a) Investigator's name, b) date waste is packaged, c) chemical identities, and d) approximate amounts.

Complete items 1 through 10 of the Surplus Chemical and Chemical Waste Pick-up form using a separate column for each different type of waste. Specific item instructions are given below.

Use additional forms if more than two waste types are included in this pick-up request. Staple forms together and number each form at the top of the page. **If there is an extraordinary number of waste types (e.g. laboratory clean-out material), fill out one copy of this form completely and attach it to an inventory list of the chemicals for pick-up. The inventory list should include the name of each chemical, the number and size of each container, and the amount of chemical in each container. Number the containers with the corresponding number from the inventory list.**

Information must be typed or legibly printed using black or blue ink (do not use pencil or erasable ink).

A Principal User must sign the waste certification.

Submit completed form to the Safety Officer or place in Hazardous Waste Pick Up Forms at Stock Room Science 455. Questions concerning this pick-up request or waste management procedures should be directed to the Chemistry Stock Room Science 455 (ext. 2388). If you have any additional question, please contact the EH&S (ext. 2993) or.

Specific Items

1. Principal User/Contact -- A responsible investigator or user who is knowledgeable of the chemical waste constituents must be listed Stay-in School personnel, Summer interns, and Graduate Students are not authorized to serve as Principal Users or sign chemical waste pick-up requests. A contact person may also be listed in addition to the principal user.

2. Lab / Dept. -- the principal user's Lab and Department.

3. Building/Room No./Extension -- Enter building and room number where waste is located. Also, list a telephone extension where the principal user and/or contact can be reached.

4. Date -- Enter date form is completed.

5. Waste Location in Room -- Enter the physical location within the room where the waste is located.

6. Chemical Identity -- Enter full chemical name and its estimated amount. Estimated amounts must be in liters for liquids and gases, or milligrams for solids. For unknown trace contamination (e.g., potentially contaminated bench paper or glassware) the amount should be listed as trace

   Item No. -- If material is also radioactive, indicate corresponding item number provided on the Surplus Radioactive Material and Radioactive Waste Pick-up form.

7. Total Amount: No. of Containers -- Enter the number and type of containers to be picked up (e.g. 1 box, 2 bags, 3 jugs).

   Volume of Liquid -- If applicable, enter the combined total volume , in Liters, of all liquid waste present in the above stated containers.

8. Form -- Place an "X in the box indicating applicable form of waste (liquid, solid, or compressed gas).

9. Source -- Place an "X" in the box indicating the applicable waste source, or list waste source in the space provided.

10. Special Hazards -- List any special hazardous properties of the waste (e.g. water reactive, shock sensitive, corrosive).

Certification

Marshall University must comply with all Federal and State regulations on handling and disposal of Hazardous wastes. An essential part of the Institute's waste management program is proper identification, classification, labeling, and packaging of waste. There are significant penalties for improper waste disposal and Marshall University is relying on your representation of your waste to determine appropriate treatment and disposal methods under current Federal and State regulations. The certification is essential for compliance with these regulations.

Safety 1/03

APPENDIX XIV Spill Report

MARSHALL UNIVERSITY

SPILL INCIDENT REPORT	
Date Reported:	**Date of Incident:**
Time of Incident:	**All Affected Employees Notified?**
Employee's Name:	**Date of Birth:**
SS#:	**Job Title:**
Telephone (Business):	**(Home):**
Describe spilled substance and methods of decontamination used:	
Describe the job duties you were performing when the incident occurred:	
Describe the circumstances under which the incident occurred:	
ACKNOWLEDGMENT	
I certify that the information contained in this report is accurate and that I will adhere to all corrective actions implemented as a result of this incident.	
Employee Name:	Employee Signature:
Title:	Date: Time:
I certify that I have reviewed the information contained in this report and will take the necessary steps to ensure correction of procedural deficiencies.	
SO Name:	SO Signature: Date: Time:
REPORT FORM RETENTION INFORMATION	
Permanent Retention File:	**Location:**
Date Filed:	**Filed by:**
Attachments?	

APPENDIX XV

MARSHALL UNIVERSITY

EXPOSURE INCIDENT REPORT (Routes and Circumstances of Exposure to hazardous chemicals)	
Employee's Name:	**Time of Incident:**
Date of Incident:	**All Affected Employees Notified?**
Date Reported:	**Employee's DOB?**
Employee's SS#:	**Employee's Job Title:**
Employee's Business Phone	**Employee's Home Phone:**
What chemical(s) were you exposed to?	
Part of Body to which exposure occurred (describe fully):	
Describe the route of exposure:	
Describe methods of first aid used:	
Describe the job duties you were performing when the exposure incident occurred:	

Describe the circumstances under which the exposure incident occurred:
Describe any PPE in use at the time of exposure incident:
Did PPE fail? **If yes, describe how:**

ACKNOWLEDGMENT

I certify that the information contained in this incident report is accurate and that I will adhere to all corrective actions implemented as a result of this incident.

Employee Name: Employee Signature: Date:

I certify that I have reviewed the information contained in this incident report and will take the necessary steps to ensure correction of PPE or procedural deficiences.

SO Name: SO Signature: Date:

REPORT FORM RETENTION INFORMATION

Permanent Retention File:	Location:
Date Filed:	Filed by:
Attachments	

Appendix XVI

ACCIDENT REPORT

In case of ANY chemical contact with the skin or eyes, or chemical ingestion or inhalation we STRONGLY recommend that you seek medical attention. It is also STRONGLY recommended medical attention be sought in the event of ALL cuts, scrapes, bruises and other accidents.
If you are a minor we insist you contact your parent or guardian immediately and notify them of our recommendations and/or seek medical attention immediately.

IMPORTANT NOTICE

LIABILITY POLICY:

Marshall University, as a state agency, cannot assume responsibility for loss of or damage to the personal property of students. Furthermore, the University cannot assume responsibility for personal injury of students.
STUDENT HEALTH:
Student Health Service (SHS) is provided by University Physicians and Surgeons, Inc. an affiliate of the University's Joan C. Edwards School of Medicine. The clinic is located at the Joan C. Edward's School of Medicine's facility and is open from 8:00 a.m. to 5:00 p.m. Monday through Friday. The clinic is closed on Saturday, Sunday, and holidays. STUDENTS SEEKING AFTER HOURS MEDICAL CARE WILL BE FINANCIALLY RESPONSIBLE FOR THE COST. Marshall University recommends that all students carry medical insurance.
For information on health insurance call Student Health Education at 696-4800.
Student Health Service will be provided from the first day to the last day of each fall, spring, and summer class session to students who pay full student activity fees and attend classes scheduled between semesters (intersession). Marshall University students who present current validated activity and identification cards are eligible to use this service.
These policies are listed in The Undergraduate Catalog (2001-2003) on Pages 77 and 81 and These policies are listed in The Graduate Catalog (2000-2002) on Pages 15 and 16.

Time of Incident: _____

Date of Incident: _____

TA of Lab: _____

Faculty Member in Charge: _____

Witnesses: _____

PPE Used: _____

Chemicals/Reagents Involved: _____

Description of Incident:

OVER

Action(s) Taken:

Who Performed Action(s): _____

Name: _____ ID Number _____Signature of Student: _____Prepared By_____

Signature of Preparer_____

RELEASE FROM RESPONSIBILITY WHEN REFUSING RECOMMENDED TREATMENT

This is to certify that I, _____ am refusing the recommendation to seek medical attention. I acknowledge that I have been informed of the risk involved and hereby release Marshall University from all responsibility for any ill effects which may result from this action.

Signed _____ Witness _____