



OHIO
UNIVERSITY

CHEMICAL HYGIENE PLAN (OSHA Laboratory Standard)

Department Name: _____ Today's date: _____

Department Chemical Hygiene Officer (CHO) _____

Rev. December, 2006

Chemical Hygiene Plan

Table of Contents

<u>Subject</u>	<u>Page</u>
1.0 Purpose	7
2.0 Scope	7
3.0 Definitions	7
4.0 Responsibilities	9
5.0 General Laboratory Procedure	10
5.1 Behavior in the Laboratory	10
5.2 Reduction of Exposure Risk	11
5.3 Prohibited Activities	11
5.4 Lifting Heavy Objects	12
5.5 Housekeeping	12
5.6 General Lighting	12
6.0 Chemical Acquisition, Distribution, and Storage	13
6.1 Acquisition of Chemicals	13
6.2 Inventory	13

6.3	Storage	13
7.0	Hazard Identification	14
8.0	Environmental Monitoring	15
9.0	Maintenance, and Inspections	15
9.1	Maintenance by Lab Personnel	15
9.2	Inspections	16
10.0	Medical Program	17
11.0	Personal Protective Equipment	18
11.1	Eye Protection	19
11.2	Gloves	19
11.3	Foot Wear	19
11.4	Clothing	20
11.5	Hearing Protection	20
11.6	Respirators	21
11.7	Employee Training	21
11.8	Lab Visitors	21

12.0	Emergency Equipment	21
12.1	General	21
12.2	Safety Showers and Eyewashes	21
12.3	Fire Extinguishers	22
12.4	Fire Alarms	23
12.5	Smoke or Heat Detectors	23
12.6	First Aid Kits	23
12.7	Fire Doors	24
12.8	Fire Suppression Systems	24
12.9	Emergency Lighting	24
13.0	Emergency Procedures	24
14.0	Standard Operating Procedure's	25
15.0	Incident Reporting	25
16.0	Record Keeping	25
17.0	Employee Training	26
17.1	Training	26

17.2	Reference Material	26
18.0	Waste Disposal Procedures	27
18.1	Broken Glass	27
18.2	Broken Thermometers	27
18.3	Chemicals	27
19.0	Ventilation	28
19.1	General Guidelines	28
19.2	Maintenance and Inspections	29
19.3	Annual Maintenance	29
19.4	Ventilation Failure	30
20.0	Chemical Handling Procedures	30
20.1	General	30
20.2	Flammable Liquids	30
20.3	Corrosive Chemicals	31
20.4	Reactive Chemicals	32
20.5	Compressed Gases	33

20.6	Carcinogens, Mutagens, Teratogens, and Reproductive Toxins	34
20.7	Toxic Metals	35
21.0	Work With Substances of Moderate to High Chronic Toxicity or High Acute Toxicity	35
21.1	Use of Designated Areas	35
21.2	Operations Requiring Prior Approval	36
22.0	Chemical Hygiene Plan Review	36
23.0	References	37
24.0	Appendices	37
	Appendix A – Chemical Inventory	39
	Appendix B – Department MSDS’s	41
	Appendix C – Web Resources	44
	Appendix D – Individual Researcher’s Health & Safety Procedures	45
	Appendix E – OU lab Self-Audit Checklist	47

**Chemical Hygiene Plan for
(Department Name)**

1.0 PURPOSE

Ohio University wishes to ensure the protection of all laboratory employees from health and safety hazards associated with hazardous chemicals in the laboratory and to comply with the requirements of the OSHA Chemical Hygiene Standard and Ohio Public Employee's Risk Reduction Act. This Chemical Hygiene Plan is written to provide methods and requirements for all laboratory personnel to follow while working in laboratories at Ohio University.

2.0 SCOPE

This Chemical Hygiene Plan (CHP) applies to all laboratory employees working on laboratory scale operations involving laboratory use of hazardous chemicals. Although the CHP deals with chemicals, there are other hazards in laboratories to consider as well, such as physical, radiological, and infectious agents.

3.0 DEFINITIONS

- 3.1 Action Level A concentration designated in 29 CFR part 1910 for a specific substance, calculated as an 8-hour time weighted average, which initiates certain required activities.
- 3.2 Chemical Hygiene Officer (CHO) An employee who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. In departmental plans, CHO refers to the department's chemical hygiene office. The overall campus-wide, CHO will be a member of the Environmental Health and Safety (EHS) staff.
- 3.3 Chemical Hygiene Plan (CHP) A written program developed and implemented which sets forth procedures, equipment, personal protective equipment and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in the laboratory. This plan shall be reviewed and updated at least annually.
- 3.4 Designated Area 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 fume hood.
- 3.5 Employee An employee for the purposes of the CHP is any person who receives compensation for work performed at Ohio University.
- 3.6 Hazardous Chemical 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.

- 3.7 Laboratory 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.
- 3.8 Laboratory Scale Work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person.
- 3.9 Laboratory Use of Hazardous Chemicals Handling or use of such chemicals in which all of the following conditions are met: chemical manipulations are carried out on a laboratory scale; multiple chemical procedures or chemicals are used; the procedures involved are not part of a production process, nor in any way simulate a production process, and; protective laboratory practices and equipment are available and in common use to minimize the potential for employee exposure to hazardous chemicals.
- 3.10 Laboratory Worker An individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.
- 3.11 Reproductive Toxins Chemicals that affect the reproductive capabilities, including chromosomal damage (mutations), and effects on fetuses (teratogenesis).
- 3.12 Select Carcinogen Any substance that meets one of the following criteria:
- 3.12.1 It is regulated by OSHA as a carcinogen; or
- 3.12.2 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 it is listed under Group 1 (carcinogenic to humans) by the International Agency for Research on Cancer Monographs (IARC) (latest editions); or 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:
- 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/m³; or
- After repeated skin application of less than 300 (mg/kg of body weight) per week; or after oral dosages of less than 50 mg/kg of body weight per day.

4.0 RESPONSIBILITIES

- 4.1 Department Chairman The Department Chair has ultimate responsibility for chemical hygiene, the chemical hygiene program, and shall provide continuing support for the overall departmental chemical hygiene plan.

- 4.2 Principal Investigator (Faculty Research Director) The Principal Investigator is responsible for chemical hygiene in the laboratory. The Principal Investigator shall ensure:
- 4.2.1 Laboratory employees know and follow the chemical hygiene rules.
 - 4.2.2 Protective equipment is available, in working order, and used by personnel.
 - 4.2.3 Appropriate training has been provided and records are kept.
 - 4.2.4 Facilities and training for use of any material being ordered are adequate.
 - 4.2.5 Inspections are conducted of emergency equipment, chemical hygiene, and housekeeping.
 - 4.2.6 Adequate health and safety provisions are made for any new initiatives, on a continuing basis with appropriate updates made to the CHP.
- 4.3 Laboratory Worker Each laboratory worker is responsible for planning and conducting all operations in accordance with the departments chemical hygiene plan, and developing good personal chemical hygiene habits.
- 4.4 Chemical Hygiene Officer The Chemical Hygiene Office (CHO) responsible for:
- 4.4.1 The development and implementation of chemical hygiene policies and practices in the laboratories or department.
 - 4.4.2 He/she monitors the procurement, use and disposal of chemicals used in the laboratories.
 - 4.4.3 Conduct and maintain appropriate audits.
 - 4.4.3 Help the director develop precautions and adequate facilities.
 - 4.4.4 Know the current legal requirements concerning regulated substances.
 - 4.4.5 Seek ways to improve the Chemical Hygiene Plan.
 - 4.4.6 Develop and implement the Chemical Hygiene Plan.
 - 4.4.7 The EHS staff member designated as the overall campus CHO will coordinate the institutional effort and serve as a resource to all departments.
- 4.5 Departmental Laboratory Inspection Team These individuals provide laboratory inspections as described in the Chemical Hygiene Plan. The lab self-audit found in Appendix E could be used.
- 4.6 Department of Environmental Health and Safety (EHS). EHS shall be responsible for:
- 4.6.1 Periodic testing and certification of chemical fume hoods.
 - 4.6.2 Overseeing the testing of fire alarm systems and certain fire suppression systems.

- 4.6.3 Overseeing the provision of inspection, testing, and maintenance of fire extinguishers.
- 4.6.4 Technical consultation and assistance with environmental monitoring needs.
- 4.6.5 Management of Respiratory Protection and other campus-wide EHS programs.
- 4.6.6 Management of the institution-wide Chemical Hygiene and Lab Safety effort.

4.7 Facilities Management, Life Safety Shop

- 4.7.1 Shall be responsible for:

- 4.7.1.1 Maintenance of all campus fire equipment and systems.

5.0 GENERAL LABORATORY PROCEDURES

5.1 BEHAVIOR IN THE LABORATORY

- 5.1.1 Employees shall act in a professional manner at all times.
- 5.1.2 Horseplay and practical jokes are not permitted. Do not work alone at a potentially dangerous activity.
- 5.1.3 Laboratory visitors are to be escorted by a laboratory employee and are the responsibility of that employee.
- 5.1.4 Visitors shall observe all safety regulations required in the laboratory.
- 5.1.5 Only well understood reactions should be permitted to run unattended.
- 5.1.6 Lights should be left on and an appropriate sign should be placed on the door if equipment is left running unattended.
- 5.1.7 Provisions for containment of toxic substances in the event of a utility service failure (such as cooling water) for an unattended operation should be established.
- 5.1.8 Employees shall be made aware of the location and proper operation of laboratory safety equipment.
- 5.1.9 The use of radioactive sources and radiation producing equipment is regulated by the Nuclear Regulatory Commission, state governments, and the OHIO University Radiation Safety Program. Policies and Procedures required by the OHIO University Radiation Safety Program must be followed.
- 5.1.10 All requests for using radioactive sources and radiation producing equipment shall be approved through Environmental Health and Safety (EHS) before any radiation source or radiation-producing instrument is brought into the laboratory.
- 5.1.11 Any experiments involving materials covered under the OHIO University Biosafety Program shall follow the Policies and Procedures of the Institutional Biosafety Committee (IBC). These include etiologic agents, infectious materials, potentially infectious clinical materials, oncogenic viruses, invertebrate vectors of human disease, human blood products and other potentially infectious materials,

recombinant DNA products, carcinogens and related materials that are known to cause or may be capable of causing infection or disease in humans. Research with a recombinant DNA-containing plant genome, including nuclear or organelle hereditary material or release of recombinant DNA-derived organisms associated with plants must also follow the Policies and Procedures of the IBC.

5.1.12 Researchers using human blood or other potentially infectious materials must also have a written Bloodborne Pathogens Plan.

5.1.13 Researchers who desire to use any toxins regulated by the "Antiterrorism and Effective Death Penalty Act" (also called the Agent Transfer Law) must contact EHS for procedures (OHIO University is not currently licensed for this).

5.2 Reduction of Exposure Risk

5.2.1 Skin contact with chemicals should be avoided.

5.2.2 Do not smell or taste chemicals.

5.2.3 Never pipette chemicals by mouth.

5.2.4 Use a vacuum or pipette bulb or mechanical pipette.

5.2.5 An apparatus, which may discharge toxic chemicals, must be vented into local exhaust devices.

5.2.6 Choose only those chemicals for which the quality of the available ventilation system is appropriate.

5.2.7 Use of potentially hazardous chemicals should be confined to the fume hoods. Open bench top use could require evaluation of employee exposures for compliance with OSHA Permissible Exposure Limits (PELs).

5.3 Prohibited Activities

5.3.1 Eating, drinking, handling contact lenses, smoking, and cosmetic application are not permitted in the laboratory.

5.3.2 Food may not be stored in a refrigerator that already has chemicals stored in it.

5.3.3 No glassware or utensils, which are used for laboratory operations, shall be used for storage, handling or consumption of food or beverages.

5.3.4 Hands should be washed before and after using the restrooms and before eating.

5.3.5 Long hair and loose clothing shall be restrained to prevent it from becoming entangled in equipment.

5.3.6 Use of open-toed shoes is prohibited. Only substantial, closed-toe shoes may be worn in the laboratory.

5.3.7 Spills and accumulations of chemicals on work surfaces shall be removed as soon as possible using techniques which minimize residual surface contamination.

5.3.8 Do not permit recognized hazards to remain uncorrected. Areas of exposed skin, i.e. forearms, should be washed frequently if there is potential of contact with chemicals.

5.4 LIFTING HEAVY OBJECTS

5.4.1 Lift heavy objects by bending at the knees. Use your legs, not your back. Never attempt to lift any load weighing more than 50 pounds by yourself.

5.4.2 Hold heavy objects close to your body.

5.4.3 Get help in handling objects that weigh more than 50 pounds.

5.4.4 Care should be taken when moving chemicals or other items due to the bump and spill potentials of hazardous chemicals in the laboratory.

5.4.5 Contact EHS if ergonomic assessment is desired.

5.5 HOUSEKEEPING

5.5.1 Lab areas are to be kept clean and uncluttered.

5.5.2 Contaminated glassware is not to be left out.

5.5.3 Spills are to be cleaned up immediately from work areas and floors.

5.5.4 Floors must be maintained dry at all times.

5.5.5 Doorways and walkways shall not be blocked or used for storage.

5.5.6 Access to exits, emergency equipment, and utility controls shall never be blocked.

5.5.7 Experiments and apparatus no longer in use should be cleaned up and dismantled prior to beginning new procedures to avoid clutter.

5.6 GENERAL LIGHTING

5.6.1 Adequate lighting should be provided based on the guidelines set forth in Table 1.

5.6.2 EHS may be contacted to help in the assessment of illumination levels.

1. Microanalytical, critical or delicate operations, close work, etc.	70
2. General analytical, routine analytical, physical testing.	50
3. Engine laboratories, equipment test areas, fume hoods.	80

6.0 CHEMICAL ACQUISITION, DISTRIBUTION, AND STORAGE

6.1 ACQUISITION OF CHEMICALS

6.1.1 All chemicals not on the existing inventory for the laboratory must have approval (*specify person, i.e. a responsible person who would review health effects and unusual use conditions*) prior to purchase.

- 6.1.2 Prior to purchasing approval the following must be considered:
 - 6.1.2.1 Obtain and review the products MSDS or view the MSDS on [ChemWatch](#),
 - 6.1.2.2 Proper storage and handling procedures,
 - 6.1.2.3 Proper disposal procedures,
 - 6.1.2.4 Are facilities adequate to safely handle the material, and
 - 6.1.2.5 Are personnel adequately trained to handle the material?
 - 6.1.2.6 Do the hazards of the chemical, procedure, or material warrant a more significant review by a Laboratory Risk Assessment Team?
- 6.1.3 Before a substance is received, information on proper handling, storage, and disposal should be known to those who will be involved. A Material Safety Data Sheet (MSDS) shall be requested for all hazardous chemicals if the MSDS is not already on file and added to the department chemical inventory and MSDS file.
- 6.1.4 A copy of each new MSDS should be sent to EHS.
- 6.1.5 No container should be accepted without an adequate identifying label. The label should include as a minimum the substance name, an appropriate hazard warning, and manufacturer address.
- 6.1.6 Any new chemicals should be dated on receipt, by the stockroom technician and dated when opened by the user.

6.2 INVENTORY

- 6.2.1 The chemical inventory for the laboratory is located in Appendix A (attach inventory).
- 6.2.2 Any chemical in inventory which is an extremely hazardous substance shall be reported to the EHS Department.
- 6.2.3 Certain toxins with specified LD-50s are regulated under "Antiterrorism and Effective Death Penalty Act" (also called The Agents Transfer Law). See EHS for listed toxins (OHIO University is not currently licensed for this).

6.3 STORAGE

- 6.3.1 Both the storage and working amounts of hazardous chemicals shall be kept to a minimum.
- 6.3.2 All chemical containers must have a legible firmly attached label. The containers shall be dated when received and also when opened.
- 6.3.3 Chemicals shall be stored in containers with which they are chemically compatible.
- 6.3.4 Chemical reagents shall be kept in closed containers when not in use.

- 6.3.5 Periodic inventories (at least annually) shall be conducted by the PI (*or designee*), unneeded items shall be identified, labeled and packed for [hazardous waste pick up](#).
- 6.3.6 All flammable substances must be stored in a flammable materials storage cabinet or refrigerator designed and labeled for that type of storage.
- 6.3.7 Caps should be in place on cylinders not in use. Compressed gas cylinders must be secured at all times.
- 6.3.8 Incompatible chemicals should be segregated by class. Do not store alphabetically.

7.0 HAZARD IDENTIFICATION

- 7.1 All chemical containers must have a legible, firmly attached label showing the contents of the container.
- 7.2 Labels on incoming containers of hazardous chemicals shall not be removed or defaced.
- 7.3 MSDS received with incoming shipments of hazardous chemicals shall be maintained and made readily accessible to laboratory employees.
- 7.4 A hazard review of new materials not previously used in the laboratory shall be completed before actual handling has begun. This review shall be conducted by a Laboratory Risk Assessment Team (*the Laboratory Risk Assessment Team is made up of individuals who must be knowledgeable about the design, operation, and maintenance of the lab activity, material or function and is led by the Principal Investigator. The team should have subject matter experts who are very knowledgeable about details of how the activity is conducted, or how the system is designed, maintained, and operated. The team should also have objective technical personnel. These people know little about the specific activity or system being analyzed, but they are technically knowledgeable and have experience with similar applications.*).
- 7.5 Chemical substances developed in the laboratory shall be assumed to be hazardous in the absence of other information.
- 7.6 If a chemical substance is produced in the laboratory for another user outside of the laboratory, the MSDS and labeling provisions of the OSHA Hazard Communication Standard apply. You must research and write an MSDS to accompany the substance. The Laboratory Chemical Hygiene Officer or designee *shall* ensure these requirements are met.
- 7.7 Contact EHS if trade secrets or use outside the University in commerce are a possibility. Other requirements may apply.

8.0 ENVIRONMENTAL MONITORING

- 8.1 Employee exposures to OSHA regulated substances shall not exceed the permissible exposure limits specified in 29 CFR Part 1910, Subpart Z.
- 8.2 Employee exposures to any substance regulated by an OSHA standard shall be measured when there is reason to believe that exposure levels routinely exceed the action levels (proper use of chemicals in a fumehood would usually preclude this from happening).
- 8.3 The EHS shall be consulted for assistance with environmental monitoring. Cost of lab analysis is the responsibility of the employee's department, unless funds are available through EHS at the time.
- 8.4 Results of personal monitoring shall be made available to the affected employee within five (5) days of receipt of the results by the Chemical Hygiene Officer.
- 8.5 The Chemical Hygiene Officer shall document that he/she reviewed the results with the affected personnel.
- 8.6 Generally, chemicals used inside a properly functioning fume hood should preclude exceeding the PEL. Contact EHS if you have reason to believe that you may be receiving exposure even though the chemical is used within a fume hood.

9.0 MAINTENANCE AND INSPECTIONS

9.1 MAINTENANCE BY LAB PERSONNEL

- 9.1.1 All local exhaust ventilation hoods and other engineering controls shall be functioning properly.
- 9.1.2 Operators of laboratory hoods equipped with audible / visible alarms shall make sure the visible alarm is not in the alarm mode if the audible alarm is silenced.
- 9.1.3 Laboratory hoods equipped with magnehelic gauges shall be evaluated to determine that the static pressure is at a predetermined setting marked of the gauge which indicates that the hood is functioning properly.
- 9.1.4 Improperly functioning equipment, out-of-service equipment and equipment under repair shall be locked and tagged out and not restarted without the approval of the Chemical Hygiene Officer (or designee). Facilities Management should be contacted immediately if repairs are needed.
- 9.1.5 All employees should be trained to properly operate a fume hood and the meaning of all gauges and alarms.

9.2 INSPECTIONS

- 9.2.1 Laboratory Employees

- 9.2.1.1 Laboratory employees will be assigned to conduct the following inspections at the specified intervals: *(Determine intervals, such as monthly for flushing eyewashes and daily for hood static pressure checks or alarm checks)*. Eyewash/safety shower inspection sheets are available from EHS. Laboratory employees should be assigned to check access to eyewash, equipment, update MSDS, or some other item, which requires frequent attention.
- 9.2.1.2 The following personal protective equipment will be inspected before each use *(The inspection details are outlined in Section 11 Personal Protective Equipment)*:
- Safety glasses
 - Gloves
 - Clothing (lab coats, splash aprons, hard hats, etc.)
- 9.2.1.3 The following engineering controls will be inspected before each use *(The inspection details are outlined in Section 19 Ventilation)*:
- 9.2.1.4 Inspect local exhaust ventilation hoods by looking at manometric gauges or alarms to determine if the device is at the appropriate setting which indicates that the hood is functioning properly.
- 9.2.2 Laboratory Inspection Team *(Specify your team by titles or description: staff, technicians, faculty, and employed students. A team or committee approach is optional. This could be a natural outgrowth of a Departmental Safety Committee)*.
- 9.2.2.1 A member of the laboratory inspection team will conduct the following inspections at the specified intervals *(such as once/month): (list them)*
- 9.2.2.2 The following emergency equipment will be inspected monthly *(The inspection details are in Section 12, Emergency Equipment)*:
- Fire extinguishers
 - Eyewashes
 - Safety showers
 - First aid kits
 - Emergency lighting, illuminated exit signs
- 9.2.2.3 The following items will be inspected annually *(in some cases, a more frequent interval may be more appropriate)*. (The inspection details are in Section 12, Emergency Equipment and Section 19, Ventilation.)

*Smoke detectors/fire alarms--- (by F.M. Life Safety Shop in cooperation w/EHS)

*Fire suppression systems--- (by F.M Life Safety Shop in cooperation w/EHS)

9.2.2.4 The following equipment should be inspected annually:

*Local exhaust ventilation hoods---
(by EHS for certification every year, because all hoods have real time flow devices on them)

9.3 EHS will periodically conduct laboratory inspections and generate reports that will be given to the PI and the Department Chair.

10.0 MEDICAL PROGRAM

10.1 Medical surveillance, including medical consultation and follow-up, shall be provided under the following circumstances;

10.1.2 Where exposure monitoring is over the action level, PEL if there is no action level for an OSHA regulated substance which has medical surveillance requirements.

10.1.3 Whenever a laboratory employee develops signs or symptoms that may be associated with a hazardous chemical to which the employee may have been exposed to in the laboratory.

10.1.4 Whenever a spill, leak, or explosion results in the likelihood of a hazardous exposure, as determined by the Chemical Hygiene Officer.

10.1.5 For all employees assigned respiratory protection (see section 11.6 for requirements).

10.2 All medical examinations shall be provided by a licensed physician or under direct supervision of a licensed physician, at no cost to the employee, without loss of pay, and at a reasonable time and place.

10.3 Medical monitoring programs should be arranged with EHS and the Occupational Health Clinic (OHC) at Hudson Health Center.

10.4 First aid kits are available (*specify location*). Additional medical assistance, if required, would be located at Hudson Health Center or O'Bleness Hospital. Emergency medical assistance is available by calling SEOEMS. Emergency phone numbers shall be posted in each lab.

10.5 Where medical consultations or examinations are provided, the examining physician shall be provided with the following information:

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

- 10.5.2 A description of the conditions under which the exposure occurred, including quantitative exposure data if available.
- 10.5.3 A description of the signs and symptoms of exposure that the employee is experiencing, if any.
- 10.6 Medical examinations or consultations provided to employees shall be maintained at Occupational Health Clinic (OHC), Hudson Health Center and available per the requirements of CFR 1910.1020 "Access to employee exposure and medical records." A written opinion from the examining physician shall be provided to the laboratory supervisor or Chemical Hygiene Officer. It shall include:
 - 10.6.1 Recommendations for further medical follow up.
 - 10.6.2 Results of the examination and associated tests.
 - 10.6.3 Any medical condition that places the employee at increased risk of exposure do to a hazardous substance found in the workplace.
 - 10.6.4 A statement that the employee has been informed of the results of the examination or consultation.

10.7 Incidents

- 10.7.1 Injuries, which occur in the laboratory, shall be immediately treated.
- 10.7.2 Injuries requiring first aid may be treated using the first aid kit located (*Provide location*).
- 10.7.3 SEOEMS Ambulance shall be contacted to respond to injuries requiring more extensive treatment.
- 10.7.4 All incidents shall be investigated by the employee's immediate supervisor or designate and reported to EHS on the Employee Incident Investigation form immediately.
- 10.7.5 Lab incidents (without injury) should also be reported and reviewed with EHS.

11.O PERSONAL PROTECTIVE EQUIPMENT

The Laboratory Supervisor (or designee) shall be responsible for the risk assessment and selection of personal protective equipment (PPE) for employees working in their laboratory (Contact EHS for recommendations and technical advise on the need and selection of PPE), acquiring approved equipment, maintaining availability, and establishing cleaning and disposal procedures. Chemical protective clothing must be removed before leaving the work area. The OSHA Personal Protective Equipment Standard requires written PPE assessment, employee training, etc., in addition to the Chemical Hygiene Standard. Call EHS for consultation, if needed.

11.1 EYE PROTECTION

- 11.1.1 Safety glasses must meet the requirements of ANSI Z87.1 (latest edition).
- 11.1.2 Chemical Safety Goggles are required for employees who enter a laboratory and are exposed to an eye hazard.

- 11.1.3 Face shields with safety glasses underneath or chemical splash goggles are required when transferring or pouring acidic or caustic materials.
- 11.1.4 Chemical splash goggles must be worn over the contact lenses.
- 11.1.5 Before each use, eye and face protection is to be inspected for damage, i.e. cracks, scratches, debris. If deficiencies are noted, the equipment should be cleaned, repaired, or replaced before use.

11.2 GLOVES

- 11.2.1 Chemical resistant gloves shall be worn whenever the potential for hazardous skin contact exists. The material safety data sheet for the substance or glove selection charts should be referenced. *(Insert a table to list some general classifications of chemicals and potential activities and suggested glove type. Can get recommendations from EHS).*
- 11.2.2 Standard Operating Procedures should specify glove requirements.
- 11.2.3 Gloves shall be removed before touching other surfaces (doorknobs, faucet handles).
- 11.2.4 Heat resistant gloves shall be used for handling hot objects. Asbestos containing gloves shall not be used.
- 11.2.5 Abrasion resistant gloves (such as leather) should be worn for handling broken glass or for other potentially abrasive situations. They should NOT be worn when handling chemicals.
- 11.2.6 Before each use, gloves are to be inspected for damage and contamination, i.e. tears, punctures, discoloration. If deficiencies are noted, the gloves should be cleaned, repaired, or replaced before use.

11.3 FOOT WEAR

- 11.3.1 No sandals or open-toed shoes are to be worn by employees in the laboratory. The shoe should have a nonskid sole and should have a reasonable heel height.
- 11.3.2 Safety shoes should be worn if there is potential for injury from heavy objects, i.e. handling drums, cylinders.
- 11.3.3 Safety shoes must meet the requirements of ANSI Z41 (latest issue).
- 11.3.4 Before each use, shoes are to be inspected for damage, deterioration, contamination, i.e. tears, punctures, discoloration. If deficiencies are noted, the shoes should be cleaned, repaired, or replaced before use.

11.4 CLOTHING

- 11.4.1 Laboratory coats or other suitable work apparel shall be worn by laboratory employees whenever there is potential for chemical exposure in the work area *(Specify minimum clothing requirements for specific task).*
- 11.4.2 Clothing must be cleaned regularly. If a spill occurs on the clothing, it must be decontaminated before reuse. Lab clothing should not be taken home.

- 11.4.3 The commercial launderer of any contaminated work clothing shall be notified of potentially contaminating substances.
- 11.4.4 Disposable clothing will be worn if working with highly toxic materials, such as carcinogens, mutagens, or teratogens (Disposable clothing should be selected after consultation with EHS).
- 11.4.5 Before each use, clothing is to be inspected for damage, deterioration, contamination, i.e., tears, punctures, and discoloration. If deficiencies are noted, the clothing should be cleaned, repaired, or replaced before use.
- 11.4.6 Shorts are not recommended in the laboratory.

11.5 HEARING PROTECTION

- 11.5.1 At the request of the Chemical Hygiene Officer, or designate, EHS will conduct a noise survey to determine the need for a Hearing Conservation Program in high noise areas.
- 11.5.2 Hearing protection (earmuffs or plugs) is required whenever employees are exposed to 90 dBA or greater as an 8-hour time weighted average (TWA).
- 11.5.3 Hearing protection shall be made available to employees exposed to an 8 hour TWA from 85 dBA to 89 dBA.
- 11.5.4 Hearing protection is to be inspected before each use, for tears and contamination. If deficiencies are noted, the hearing protector should be cleaned, repaired, or replaced before use.
- 11.5.5 Annual audiogram and other requirements of the hearing conservation would apply.

11.6 RESPIRATORS

- 11.6.1 The need for respiratory protection shall be assessed by EHS at the request of the Chemical Hygiene Officer or designate.
- 11.6.2 Respirators are provided for (*specify processes or purpose*). All employees issued respirators for any reason must follow all the requirements set forth in the Respiratory Protection Program.
- 11.6.3 Respirators used for emergency response are to be inspected monthly and after each use as described in the Respiratory Protection Program.
- 11.6.4 Some of the requirements of the respirator protection program include but are not limited to: annual training, medical evaluation, annual fit testing, and maintenance.

11.7 EMPLOYEE TRAINING

- 11.7.1 Employees should not work until they have received instruction on the proper selection, use, and limitations of the Personal Protective equipment (PPE).

11.8 LAB VISITORS

- 11.8.1 All visitors or others entering the lab and subject to lab hazards must wear the safety PPE as employees as necessary.

12.0 EMERGENCY EQUIPMENT

12.1 GENERAL

- 12.1.1 Emergency Equipment is located (*specify location, and include a drawing identifying equipment location or map as an appendix*).
- 12.1.2 Each laboratory employee shall be familiar with the location, application, and correct ways to operate the following equipment.
 - Fire extinguishers
 - Fire alarms
 - Fire doors
 - Smoke detectors
 - Safety showers
 - Eye wash stations
 - First aid kits
 - Flammable storage cabinets
 - Emergency shut-off on equipment
 - Location of emergency telephone numbers and telephones

12.2 SAFETY SHOWERS AND EYEWASHES

- 12.2.1 Safety showers and eyewashes should be within the work area for immediate emergency use.
- 12.2.2 Safety showers and eyewashes should be plumbed, water should be potable, between 60- 95 degrees F., and provide at least 15 minutes of flushing.
- 12.2.3 ANSI Z358.1 (latest issue) provides design and performance requirements.
- 12.2.4 Inspections
 - A. Daily
 - Access to the eyewash should be checked at the beginning of each shift.
 - B. Monthly
 - Adequate eyewash and shower (if applicable) flow should be observed and documented by operating the device. Inspection sheets are available from EHS and should be posted near the eyewash and/or shower. An employee should be assigned this task and given safety shower test equipment.

12.3 FIRE EXTINGUISHERS

- 12.3.1 It is the responsibility of the EHS Department to oversee, and Facilities Management Life Safety Shop to select, maintain, and properly locate the fire extinguisher(s) in each laboratory.
- 12.3.2 Fire extinguishers should be provided within 30 feet of travel and located along normal paths of travel.
- 12.3.3 Access must be maintained and the location should be conspicuously marked in an appropriate manner.
- 12.3.4 The fire extinguisher type and size must be selected for the appropriate hazards.
- 12.3.5 Each laboratory is responsible to notify the chemical hygiene officer and EHS if changes within the laboratory require movement of the extinguisher or the need for a different type of fire extinguisher or if extinguisher is discharged or otherwise needs service.
- 12.3.6 The following items shall be included in fire extinguisher inspections conducted by the Facilities Management Life Safety Shop.
 - Monthly Inspections (conducted by CHO):
 - Extinguisher(s) are in designated locations.
 - Clear unobstructed access is maintained.
 - The pin should be in place and attached with an unbroken wire.
 - The indicator should be on full.
 - There should be no indication of physical damage.
 - Document these inspections.

12.4 FIRE ALARMS

- 12.4.1 Fire protection is the responsibility of EHS.
- 12.4.2 EHS along with the Facilities Management, Life Safety Shop shall ensure that the following items are covered:
 - Periodic Inspections (semi-annual)
 1. Fire alarms should be conspicuously marked.
 2. Fire alarms should be activated to ensure proper operation.
 3. Document Inspections.

12.5 SMOKE OR HEAT DETECTORS

- 12.5.1 Smoke detectors and heat detectors should be installed and selected for the appropriate hazards per building codes, fire codes and fire insurer's requirements.
- 12.5.2 Periodic Inspections by the Facilities Management, Life Safety Shop, shall be conducted according to applicable regulations (once per year).
 - 12.5.2.1 The detection system should be tested to assure proper working order per manufacturer's and/ or fire insurer's instructions.

12.6 FIRST AID KITS

- 12.6.1 First aid kits should be available and maintained for treatment of minor injuries or for short-term emergency treatment before getting medical assistance. Refill as necessary.
- 12.6.2 Inspect periodically (*Specify frequency*).
- 12.6.3 Inventory should be adequately maintained.

12.7 FIRE DOORS

- 12.7.1 Fire doors should be provided as required per building codes, fire codes, and fire insurer's requirements.
- 12.7.2 Horizontal or vertical fire doors shall be checked annually to insure proper operation (contact FM).
- 12.7.3 Fire doors must not be blocked open, and must be able to close properly.
- 12.7.4 Fire doors with heat activated closures should be tested to assure proper working order.
- 12.7.5 Some fire doors have asbestos inside them. Do not damage or penetrate the fire doors.

12.8 FIRE SUPPRESSION SYSTEMS

- 12.8.1 The fire suppression system must be selected based on the hazards.
- 12.8.2 Periodic Inspections shall be conducted by Facilities Management, Life Safety Shop according to specific regulations.
 1. All system components must be checked for physical condition.
 2. The system should be activated and checked as appropriate for the type of system.
 3. The inspections should be documented.

12.9 EMERGENCY LIGHTING

- 12.9.1 Emergency lighting must be adequate to provide lighting for egress during an emergency situation or power failure.
- 12.9.2 Periodic Inspections (Will be performed by Facilities Management, Life Safety Shop)
 1. Emergency lighting must be activated to assure it is operational.
 2. Document inspections.

13.0 EMERGENCY PROCEDURES

- 13.1 Prevention is necessary to ensure that emergencies do not occur. No emergency plan will cover all emergency situations. Preventive measures include: employee training, facility inspection programs, and engineering design of hazardous materials processes. Laboratory risks include accidents or injuries, chemical

releases, release of radioactive or infectious aerosols, fires, explosions or other emergency situations. Therefore, risk assessment of laboratory processes and activities is key to emergency prevention. See the Laboratory Risk Assessment Program or contact EHS for more information.

- 13.2 An emergency response team has not been established for Ohio University. Ohio University is relying upon the local Athens fire authority for any emergency response action. (*In this section specify the emergency procedures for the laboratory*).

*For example: (*see below)*

Chemical Spill	911
Fire	911
Injury	911
Illness	911

*Laboratory personnel, upon experiencing a spill of hazardous material beyond their capability to clean up through normal laboratory activities and use of normal materials utilized in the laboratory, shall contact Emergency 911. Examples of laboratory spills, which may be handled by lab personnel routinely, include, but are not limited to: broken thermometer, countertop spill of a hazardous chemical, breakage of glassware containing small quantities of hazardous chemicals. EHS is available for assistance and consultation.

- 13.3 Large spills may require special training and compliance with the OSHA Hazardous Waste Operations and Emergency Response Standard (HAZWOPER).

14.0 STANDARD OPERATING PROCEDURES

NOTE: Each laboratory should develop standard operating procedures specific to their operations and department. Safe work practices and selection and use of personal protective equipment should be part of the procedures. These procedures will become part of the overall lab plan.

(Insert your departmental or lab SOP's here.)

15.0 INCIDENT REPORTING

- 15.1 All incidents and near misses (significant incidents which could have easily resulted in serious injury), should be reported to the EHS Department immediately on the [employee incident report form](#).

16.0 RECORDKEEPING

- 16.1 All incident, injury, and illness records shall be kept by the EHS Department. The department copy should be kept and accidents reviewed for contributing factors. Each department shall review total accident experience periodically.

17.0 EMPLOYEE TRAINING

17.1 TRAINING

- 17.1.1 All laboratory employees shall be trained on the hazards of chemicals present in their work area.
- 17.1.2 The aim of the training program is 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. The requirements of the OSHA Chemical Hygiene Standard is also required.
- 17.1.3 This training shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present. It shall also be provided prior to assignments involving new exposure situations. The training shall be arranged by the Chemical Hygiene Officer or designee. Orientation training the first week of fall quarter is recommended for new graduate assistants and technicians.

The training should include:

- a. The OSHA Chemical Hygiene Standard.
 - b. Handling hazardous chemical acquisition to disposal.
 - c. Fire training prevention and response.
 - d. Emergency response and evacuation.
 - e. Sample handling procedures.
 - f. Interpretation of a MSDS.
 - g. First aid.
 - h. Engineering controls.
 - i. Personal hygiene.
 - j. Protective clothing.
 - k. Any special hazards or precautions.
 - l. An explanation of department CHP, its location, and where to go for information and, the MSDS book, and [ChemWatch](#).
- 17.1.4 All employees receiving general Chemical Hygiene training must also be trained and oriented by the PI in the individual lab and lab procedures.
 - 17.1.5 Periodic re-training is recommended by EHS.

17.2 REFERENCE MATERIALS

- 17.2.1 Reference materials on the hazards, safe handling, storage and disposal of hazardous chemicals are located (*specify location*).

- 17.2.2 Material safety data sheets (MSDS) shall be maintained by the Chemical Hygiene Officer (or designee) for all hazardous chemicals used in the laboratory at (*Specify storage location*).
- 17.2.3 The written Chemical Hygiene Plan and MSDS shall be available at all times that personnel are working in the laboratory.

18.0 WASTE DISPOSAL PROCEDURES

18.1 BROKEN GLASS

- 18.1.2 Equipment (broken beakers, pipets, etc. that are waste) should be promptly swept up and disposed of in containers labeled "Non-contaminated Waste Glass Only", or "Puncture Hazard". When the container is full tape it shut. Place the labeled box next to, but not in, the regular trash for pickup by custodial or place it in the dumpster yourself. If a chemical is spilled at the same time glass is broken, refer to section 13.0 and section 18.3.

18.2 BROKEN THERMOMETERS (Mercury)

- 18.2.1 Immediately clean up broken glass and spilled mercury from broken thermometers. Do not handle mercury by hand. Special kits are available to clean up mercury (*Indicate location of spill kit*). Enclose thermometer pieces in a sealed jar with a small amount of water over the mercury and follow chemical waste packaging instruction for disposal by EHS. Contact EHS if you are uncomfortable cleaning up a small mercury spill, if a mercury spill kit is not readily available, or if the spill is too large to be cleaned up by yourself.

18.3 CHEMICALS

- 18.3.1 Each person working in the laboratory has a responsibility to see that all wastes are disposed of properly.
- 18.3.2 Waste disposal procedures must be in compliance with City, State, and Federal regulations. All waste containers must be labeled with the contents and the date of accumulation. Follow [OHIO University Waste disposal procedures](#).
- 18.3.3 *The laboratory's waste streams are as follows: (specify waste streams and method of disposal, for example lab trash, non-contaminated glass and sharp, radioactive waste, infectious waste, etc.).*
- 18.3.4 Hoods shall not be used for disposing of volatile chemicals greater than 100 ml.
- 18.3.5 Drains shall not be used for disposal of chemicals unless: (a) it is part of a procedure or process of chemical manipulation, (b) the chemical is water soluble, (c) the chemical is compatible with the sanitary sewer

- constituents and the contents of the drain trap, and (d) it is legal to do so. Once the chemical has been stored as waste it shall not be disposed of in the sanitary sewer.
- 18.3.6 Chemical waste is removed by EHS and EHS is also responsible to ensure regulatory compliance once the waste is removed from the generation site.
 - 18.3.7 Chemical waste generators are responsible for preparing and packaging chemical waste according to the "Waste Packaging Instructions" found in the [Ohio University Hazardous Materials Manual](#).
 - 18.3.8 Container integrity is the responsibility of the generator.
 - 18.3.9 Costs incurred as a result of packaging failure is the responsibility of the generating department.
 - 18.3.10 All wastes given to EHS for disposal must be identified. The cost of determining the identity of "unknowns" lies with the department. All departments are responsible for the proper disposal of any wastes left by faculty or staff that have left OHIO University.
 - 18.3.11 Any person shipping hazardous chemicals from the site of generation must have specific training for safe transportation of those hazardous materials.
 - 18.3.12 Special waste disposal, such as low-level radiation, infectious material, lead, asbestos as other regulated waste should be disposed of per OHIO University procedures and according to applicable regulations. Contact EHS for assistance.

19.0 VENTILATION

19.1 GENERAL GUIDELINES

- 19.1.1 General laboratory ventilation shall provide airflow into the laboratory from non-laboratory areas and out to the exterior of the building (lab under negative pressure) through fumehoods or dedicated exhaust.
- 19.1.2 All laboratory doors must remain closed, except when being used for entrance and egress.
- 19.1.3 Local exhaust ventilation must not be located near doors, windows, air diffusers, fans and other sources of cross drafts.
- 19.1.4 All reactions that produce unpleasant and/or potentially hazardous fumes, vapors, or gases must be run with local exhaust ventilation, i.e. in fume hoods.
- 19.1.5 Reactions with corrosive vapors should be conducted in a hood lined with corrosion resistant material.
- 19.1.6 The sash of the hood is to be lowered to within 6" of the floor of the hood when the hood is in use. It should be lowered to maintain effectiveness of the ventilation system and to provide personnel protection.
- 19.1.7 Installation of local exhaust ventilation must be in accordance with local air emission regulations and Ohio University Facilities

Management requirements. Technical assistance is available from EHS.

- 19.1.8 No devices or ducts are to be self-installed into existing exhaust or HVAC systems without the approval of appropriate OHIO University departments (EHS, University Planning and Implementation, and Facilities Management).
- 19.1.9 Do not install unsafe devices in hoods, such as extension cords of electric switches that are not "explosion proof" by design.
- 19.1.10 Perchloric acid requires the use of a specialized hood, which is able to wash the ductwork and internal hood surfaces down. Contact EHS for assistance.

19.2 MAINTENANCE AND INSPECTIONS

Daily Inspections by Lab Personnel

- 19.2.1 Visually inspect the hood area for storage and other visible blockages.
- 19.2.2 Observe the pressure reading on the magnehelic pressure gauge (or other pressure or flow device).
- 19.2.3 Safe operating pressures should be provided by the ventilation engineer that designed/installed the system.
- 19.2.4 Do not disable alarms of otherwise circumvent safety devices.

Periodic inspections (*are the responsibility of the EHS Dept.*) shall include:

- 19.2.5 The quality and quantity of ventilation shall be evaluated upon installation, periodically, and whenever a change in local ventilation devices is made. Inspections should be recorded.
- 19.2.6 Capture velocity should be measured with a velocity meter. The capture velocity at the face of the hood should be 100 - 125 fpm (unless newer system hoods, with different flow parameters are in use). Face velocity measurements must be taken in accordance with SEFA 1-2002 Laboratory Fume Hoods Recommended Practices.
- 19.2.7 Exhaust hoods should be smoke tested for fume containment per SEFA 1-2002 Laboratory Fume Hoods Recommended Practices.
- 19.2.8 Hoods and their alarms should be checked for proper function.
- 19.2.9 The tests listed above will be conducted annually by EHS or a contractor.
- 19.2.10 Repairs are called in on work order to Facilities Management, with re-testing after repairs or adjustments are made.

19.3 ANNUAL MAINTENANCE (*is the responsibility of Facilities Management and shall include*):

- 19.3.1 Overall maintenance of the local exhaust ventilation.
- 19.3.2 Exhaust fan maintenance. The necessary maintenance (lubrication, belt checking, fan blade deterioration, and speed check) should be recommended by the fan manufacturer.

- 19.3.3 Ductwork. All ductwork should be checked for corrosion, deterioration, and buildup of liquid or solid condensate. Dampers should be lubricated and checked for proper operation.
- 19.3.4 Air cleaning equipment. In line exhaust charcoal or HEPA filters should be monitored for contaminant buildup by the PI or department CHO. Mechanical or absorbent filters not equipped with differential pressure gauges, or audible alarms, should be leak checked. Contact EHS for contamination monitoring prior to any servicing by Facilities Management or others.

19.4 VENTILATION FAILURE

- 19.4.1 Employees should be trained in the following procedures to follow when hood failure occurs, for example:
 - 19.4.1.1 Close down or postpone the experiment if possible.
 - 19.4.1.2 Notify the PI.
 - 19.4.1.3 Notify EHS.
 - 19.4.1.4 Notify Facilities Management to check and repair hood.

20.0 CHEMICAL HANDLING PROCEDURES

20.1 GENERAL

Know as much as possible about the chemical you are handling. Read the label on the container, material safety data sheets, literature in the library, and consult with your peers or EHS staff.

20.2 FLAMMABLE LIQUIDS

20.2.1 HAZARDS

- 20.2.1.1 Vapor can form an ignitable mixture in air.
- 20.2.1.2 Many flammable liquids are solvents and are potentially hazardous by inhalation.
- 20.2.1.3 Skin contact should be avoided, irritation or skin absorption are possible with some chemicals in this group.
- 20.2.1.4 Damage to the eye's range from irritation to severe damage.

20.2.2 STORAGE

- 20.2.2.1 Amounts stored in the laboratory outside a flammable materials cabinet are restricted to the quantity, which will be used in one day. All flammables should be

stored in a flammable materials cabinet when not in use.

20.2.2.2 The amount of flammable liquid used outside of an "approved" cabinet or storage room should be as small as possible. NFPA 30 allows the combined sum of the following quantities to be located in a general work area.

*25 gallons of Class IA liquids in containers.

*120 gallons of Class IB, IC, II or IIIA liquids in containers.

20.2.2.3 Storage Cabinets. Storage cabinets for flammable materials should be designed appropriately and approved for flammable storage. Storage inside the cabinet should not exceed

*60 gallons of Class I or Class II liquids

*or 120 gallons of Class III liquids

No more than three cabinets are permitted in the same fire area unless they are 100 feet apart.

20.2.3 Controls

20.2.3.1 Work in the hood as much as possible.

20.2.3.2 Transfer from drums only when both drum and safety can are grounded and bonded (avoid static sparks).

20.2.3.3 All spills must be cleaned up immediately, with the spill area properly decontaminated.

20.2.3.4 Emergency showers and eyewashes shall be used when skin or eye contact occurs. Get first aid attention immediately.

20.2.4 Examples: Petroleum ether
Isopropyl alcohol
Toluene

20.3 CORROSIVE CHEMICALS

20.3.1 Hazards

20.3.1.1 Contact with the skin, eyes, respiratory, or digestive tract causes severe irritation, tissue damage, or burns.

20.3.2 Storage

- 20.3.2.2 Always store concentrated acids and bases in appropriate drip trays or plastic carrier if used frequently.
- 20.3.2.3 Always transport concentrated acids and bases in a plastic carrier.
- 20.3.2.4 Always store oxidizing acids (nitric, sulfuric, perchloric) away from organic chemicals, paper, wood, or other flammables.
- 20.3.2.5 Drip-tray residue must be removed daily.

20.3.3 Controls

- 20.3.3.1 Wear protective clothing.
- 20.3.3.2 In case of splash: Flush affected area with large amounts of water for at least 15 minutes. Remove contaminated clothing and discard. Seek medical attention.
- 20.3.3.3 Never add water to concentrated mineral acids or bases.

20.3.4 Examples

Acids
Bases

20.4 REACTIVE CHEMICALS

20.4.1 Hazards

- 20.4.1.1 Water sensitive
These materials react violently in the presence of water.
- 20.4.1.2 Pyrophoric materials
These materials will ignite in air at or below room temperature without additional heat, friction, or shock.

20.4.2 Storage

- 20.4.2.1 Water sensitive
Follow label directions
- 20.4.2.2 Pyrophors Store in an atmosphere of inert gas or under kerosene; exclude air.

20.4.3 Controls

- 20.4.3.1 Wear safety equipment.
- 20.4.3.2 Read precautionary label, follow special hazard instructions.
- 20.4.3.3 Use only in a hood.

20.4.4 Examples

20.4.4.1 Water sensitive
Sodium
Potassium
Metal alkyls
Lithium ribbons

20.4.4.2 Pyrophoric Materials
Phosphorus
Metal alkyls

20.5 COMPRESSED GASES

20.5.1 Hazards

20.5.1.1 Compressed gases contain gas under extreme pressure. Sudden release of this energy can cause serious injury and physical damage.

20.5.1.2 Compressed gases may also be flammable, toxic, or corrosive.

20.5.2 Storage

20.5.2.1 Compressed gases must be stored in the upright position with caps in place and secured with a strap, chain, base stand, or rack.

20.5.2.2 Storage of quantities of flammable compressed gases requires segregation of cylinders and specific storage methods (29 CFR 1910.101 (b)).

- separate oxygen from fuel gases
- proper use of regulators and gauges
- properly labeled cylinders
- cylinders must be properly secured during transport and stationary use
- cylinder delivery issues (like left free standing in a hallway) must be established
- static testing of cylinders

20.5.3 Controls

20.5.3.1 Transport only with cap in place on suitable carrier.

20.5.3.2 Use only appropriate fittings and regulators.

20.5.3.3 Each gas type has special fittings.

- 20.5.3.4 Do not permit gases of one type to contaminate another type.
- 20.5.3.5 Use check valves and/or regulators.
- 20.5.3.6 Always open valves slowly and cautiously.
- 20.5.3.7 Do not let cylinder go completely empty.
- 20.5.3.8 Return "empty" cylinders to storage, clearly marked.

20.5.4 Examples

Hydrogen
Argon
Acetylene

20.6 CARCINOGENS, MUTAGENS, TERATOGENS, AND REPRODUCTIVE TOXINS

20.6.1 Exposures

- 20.6.1.1 Exposures can potentially induce carcinogenesis, mutagenesis, and adverse reproductive outcomes.

20.6.2 Storage

- 20.6.2.1 Store these chemicals in the hood.
- 20.6.2.2 Maintain the minimum quantity necessary.

20.6.3 Controls

- 20.6.3.1 Work in a designated and labeled area required by Chemical Hygiene Standard.
- 20.6.3.2 Wear protective clothing.
- 20.6.3.3 Work only with adequate engineering controls, such as hoods, glove boxes, etc.
- 20.6.3.4 Primary research on known carcinogens is regulated by the O.U. IBC. Contact the I.B.C. chair or the Biosafety Office at EHS for requirements. This does not include the occasional or incidental use of common lab carcinogens.

20.6.4 Examples

Benzene
Vinyl chloride

Lead

20.7 TOXIC METALS

20.7.1 Hazards

20.7.1.1 Toxic by inhalation, ingestion, and possible skin absorption.

20.7.2 Storage

20.7.2.1 The minimum quantity necessary should be kept on hand.

20.7.2.2 Store in specially designated area.

20.7.3 Controls

20.7.3.1 Work in the hood as much as possible.

20.7.3.2 Spills should be cleaned up immediately, with the work area properly decontaminated.

20.7.3.3 Designate a specific area (and label) for hazardous work or carcinogen work.

20.7.4 Examples

Lead
Mercury
Cadmium

21.0 WORK WITH SUBSTANCES OF MODERATE TO HIGH CHRONIC TOXICITY OR HIGH ACUTE TOXICITY.

21.1 USE OF DESIGNATED AREAS

21.1.1 A designated area must be established for work with "select carcinogens", reproductive toxins, and substances, which have a high degree of chronic or acute toxicity.

21.1.2 The following procedures must be developed for all work with "select carcinogens", reproductive toxins, and substances of high acute toxicity.

21.1.3 The establishment of a "designated area". This may be an entire laboratory, an area of a laboratory or a device in the laboratory, such as a hood. This area must be clearly marked.

21.1.4 Required approvals for conducting the project. i.e. Work with known carcinogens is regulated by the O.U. I.B.C. Contact the I.B.C. chair or the Biosafety Office at EHS for requirements. Others may be:

Radiation safety committee
Animal care committee

Human subjects committee

- 21.1.5 Control equipment required, glove box, hood, etc.
- 21.1.6 Proper storage procedures.
- 21.1.7 The personal protection required.
- 21.1.8 The procedures for retention of records on amounts of these materials on hand and used, and the names of the workers involved.
- 21.1.9 Procedures for the prevention of spills and accidents, and emergency response.
- 21.1.10 Procedures for decontamination and the disposal of wastes.
- 21.1.11 (*Specify the designated area in your lab and procedures for the laboratory*).
- 21.1.12 A select few toxins are regulated by the "Anti-Terrorism and Effective Death Penalty Act" (also called the Agents Transfer Law), See EHS for list and consultation. O.U is not currently licensed for this.

21.2 OPERATIONS REQUIRING PRIOR APPROVAL

- 21.2.1 Certain laboratory operations are of special concern because of the potential hazards associated with them. In these instances laboratory personnel are instructed to obtain prior approval from (*specify person*) prior to commencing the operation. This is to assure that safeguards are in place and that personnel are adequately trained in the procedure.
- 21.2.2 A departmental proposal review system is established as follows: *List specific activities, procedures, or chemicals requiring prior approval from the department.*
- 21.2.3 All proposals regulated by O.U.Radiation Safety Committee or Institutional Biosafety Committee (IBC) should be submitted as required.
- 21.2.4 All toxins regulated by the "Anti-Terrorism and Effective Death Penalty Act" (Agent Transfer Law). O.U. is not currently licensed for this.

22.0 Chemical Hygiene Plan Review

- 22.1 This Chemical Hygiene Plan shall be reviewed annually by the (Specify person by job title).
- 22.2 If changes are made to the Chemical Hygiene Plan it is the responsibility of the Chemical Hygiene Officer to notify all workers of the change(s).
- 22.3 Record date and results of annual review.

23.0 REFERENCES

Code of Federal Regulations, 29 CFR part 1910 subpart Z.
U.S. Government Printing Office, Washington, DC 20402 (latest edition). (Toxic and Hazardous Substances)

Code of Federal Regulations, 29 CFR part 1910.1450, "Occupational Exposure to Hazardous Chemicals in Laboratories".

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 20402 (latest edition).

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 edition).

Code of Federal Regulations, 29 CFR part 1910.134, "Respiratory Protection".

Code of Federal Regulations, 29 CFR 1910.132 "Personal Protection Equipment General Requirements".

Code of Federal Regulations, 29 CFR part 1910.95, "Occupational Noise Exposure".

Code of Federal Regulations, 29 CFR part 1910.120, "Hazardous Waste Operations and Emergency Response".

Code of Federal Regulations, 29 CFR part 1910.147, "The Control of Hazardous Energy (Lock Out/ Tag Out)".

Code of Federal Regulations, 29 CFR 1910.1200, "Hazard Communication".

Handbook of Laboratory Safety, Keith Farr, (latest edition), CRC Press.

Guidelines for Laboratory Design, DiBeradinis et. al. 1987, John Wiley & Sons.

Committee on Hazardous Substances in the Laboratory, Prudent Practices for Handling Hazardous Chemicals in the Laboratory, National Academy Press, Washington, D.C. 1981.

24.0 APPENDICES

- APPENDIX A Laboratory Chemical Inventory
- APPENDIX B Material Safety Data Sheets (MSDS)
- APPENDIX C Web-Based Resources
- APPENDIX D Individual Researcher's Health & Safety Procedures
- APPENDIX E Lab Safety Self-Audit Checklist (Chuck is developing)

APPENDIX A

LABORATORY CHEMICAL INVENTORY

DEPARTMENT _____

The Inventory Form is provided as an Excel file
Called "ChemInventory"

APPENDIX B

MATERIAL SAFETY DATA SHEETS (MSDS)

DEPARTMENT _____

Department can insert the MSDSs for all their chemicals used here. These should correspond to the chemical inventory in Appendix A.

APPENDIX C

WEB-BASED RESOURCES

Web Resources

O.U Environmental Health & Safety	www-ehs.hudson.ohiou.edu
O.U Office of Research	www.ohiou.edu/~resgrad/index.htm
Ohio EPA Ohio Hazardous Waste Disposal Regulations	www.epa.ohio.gov www.epa.state.oh.us/dhwm/laws.html
OSHA Chem. Hyg. (Lab) Std.	www.osha.gov www.osha.slc.gov/OshStd_data/1910_1450.html
USEPA U.S. Title 40 CFR Environmental Regulations	www.epa.gov www.epa.gov/epacfr40/chapt-I.info
Campus Safety, Health & Environ. Mgmt. Assoc. (CSHEMA)	http://www.safety.utoledo.edu/cshema
American Chemical Society (ACS)	www.acs.org
Where to find MSDS's on the Internet	www.ilpi.com/msds/index.chtml
The Laboratory Safety Workshop	www.labsafety.org
Howard Hughes Medical Institute Lab Safety training on-line	www.practicingsafescience.org
National Association of Chemical Hygiene Offices (NACHO)	www.labsafety.org/nacho.htm

APPENDIX D

INDIVIDUAL RESEARCHER'S HEALTH & SAFETY PROCEDURES

IN THIS APPENDIX, INDIVIDUAL RESEARCHERS SHOULD OUTLINE THEIR OWN LABORATORY RESEARCH FOCUS, HEALTH & SAFETY HAZARDS OR CONCERNS ASSOCIATED WITH THEIR OPERATIONS, AND THE SAFETY PROCEDURES, TRAINING, AND OTHER CONTROLS IN PLACE IN THEIR LABORATORIES.

INSERT EACH RESEARCHERS OUTLINE HERE IN ALPHABETICAL ORDER

APPENDIX E

Self-Audit Checklist