

CHEMICAL HYGIENE PLAN
Section 1 Laboratory Safety and General Safety RulesDate of
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EMUDPS-EHS-P040

Revision: 6

Page
Number: 1 of 92**I. PURPOSE**

The purpose of this Chemical Hygiene Plan (CHP) is to protect faculty, staff, teaching assistants and student workers from chemical exposures in laboratories. This plan has been developed to comply with the [Federal Occupational Exposures to Hazardous Chemicals in Laboratories Standard](#) and the [Michigan Hazardous Work in Laboratories Standard](#). This plan also includes Eastern Michigan University's general laboratory safety rules and is designed to provide the minimum requirements for laboratory safety.

II. SCOPE AND APPLICATION

All Eastern Michigan University departments with laboratories are required to comply with the Chemical Hygiene Plan. This plan applies to employees (faculty, staff, lab or teaching assistants and student employees) and other personnel working in laboratories who may be exposed to chemicals during the course of their routine work or in an emergency.

When working with radiological and/or biological materials, the general rules of laboratory safety apply. However, there are specific requirements for using these materials that are not covered in the CHP. Please contact EHS if you need radiological or biological safety information.

III. PROCEDURES

Each department with laboratories shall ensure the requirements of the Chemical Hygiene Plan (CHP) are followed. These requirements include, but are not limited to:

1. Providing a safe work environment and ensuring safety is a priority.
2. Providing hazard communication information training to laboratory employees.
3. Developing written standard operating procedures (SOPs) for each laboratory.

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4. Providing supplemental safety information as required by this CHP.
5. Preparing an emergency response plan for chemical spills, fires, chemical exposures and other emergencies.
6. Enabling anyone within the laboratory to stop work if an unsafe condition or violation of safety rules endangering people or the environment is present.
7. Providing environmental and medical monitoring as required by this CHP.
8. Requiring approval from Environmental Health and Safety (EHS) and a departmental peer review committee prior to beginning operations involving highly hazardous materials or procedures.
9. Requiring employees to be trained on the requirements of the CHP prior to assigning them any work with chemicals.
10. Maintaining written documentation of SOPs, lab specific training records and inspection reports. These records shall be readily available to EHS and/or the Chemical Hygiene Officer (CHO).
11. The Chemical Hygiene Plan cannot be effective without the ability to ensure compliance. The integrity of the CHP is compromised if employees, faculty and/or students violate the standards and no actions are taken by the supervisor, faculty department head and/or dean. Disciplinary action should be taken by faculty in teaching and research labs when students violate the rules and by supervisors and/or department heads when employees and/or faculty violate the rules. Subject to the provisions of the specific collective bargaining agreement for the employee, disciplinary action will depend on the seriousness of the violation, if it is a repeat violation and/or if injuries occurred. The Deans and Human Resources should become involved when there are repeated violations and/or a pattern of non-compliance.
12. EHS, in conjunction with Academic Affairs, shall annually review and update the CHP.

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IV. RESPONSIBILITIES

A. Deans, Directors and Department Heads

1. Provide leadership and the management systems necessary to ensure safe working conditions are maintained in their Colleges, Schools and Departments.
2. Implement the CHP in their Colleges, Schools and Departments.
3. Motivate and assist supervisors with CHP compliance.
4. Provide the necessary resources to maintain a safe work environment.
5. Require faculty and staff to attend applicable training sessions.
6. Ensure graduate assistants and student employees receive appropriate safety training.
7. Enforce disciplinary actions for employees violating safety rules.

B. Supervisors, Managers and Faculty

1. Provide a safe work environment and prioritize safety within the labs.
2. Develop SOPs for each laboratory.
3. Enforce the rules and requirements of the CHP.
4. Ensure appropriate training is provided to all laboratory employees.
5. Provide and maintain required personal protective equipment (PPE) (e.g., gloves, goggles, lab coats, etc).
6. Update chemical inventories at least annually.
7. Ensure environmental and medical monitoring is provided as needed.
8. Conduct safety inspections.
9. Correct safety deficiencies in a timely manner.

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10. Maintain copies of all safety training and laboratory inspection records. These must be readily available for the department head, EHS and/or the CHO.
11. Enforce disciplinary actions for employees and students violating safety rules.

C. Employees

1. Follow the CHP, SOPs and safety rules provided by your department.
2. Attend all required safety training sessions.
3. Keep work areas neat and uncluttered.
4. Prior to working with chemicals or hazardous processes ensure the proper personal protective equipment (PPE), safety equipment and training are readily available.
5. Use all required PPE.
6. Report any defects in PPE and possible safety hazards to your supervisor.
7. Report signs and symptoms of possible exposures, known exposures, accidents and near misses to your supervisor.
8. Participate in required medical monitoring programs.

D. Environmental Health and Safety (EHS)

1. Promote campus laboratory safety.
2. Provide consultation, training, exposure monitoring, and inspections as needed.
3. Develop, maintain and update the CHP.
4. Monitor hazardous waste generation and coordinate chemical disposals.
5. Coordinate general laboratory safety and other training programs.

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6. Primary contact and coordinator for hazardous material emergencies.
7. Liaison with outside regulatory agencies.
8. Maintain records of safety trainings and inspections.

E. Chemical Hygiene Officer (CHO)

1. Ensure Laboratory Supervisors have the necessary resources to maintain compliance with the CHP and that all laboratory staff receive appropriate training.
2. Conduct periodic lab inspections and immediately take steps to abate hazards posing a risk to life or safety upon discovery of the hazard.
3. Assist with the development and implementation of environmental health and safety policies and procedures.
4. Actively enforce all applicable safety procedures, ensure the contents of the CHP are followed and take appropriate action when safety procedures are not followed.

V. COMPLETION AND EXECUTION OF THIS CHEMICAL HYGIENE PLAN

This chemical hygiene plan provides most of the procedures needed to satisfy the state and federal requirements for laboratory safety. It is the responsibility of each department to customize the CHP for the specific procedures conducted in their laboratories. This CHP is not complete without these additions.

It is the laboratory supervisor/manager/faculty's responsibility to ensure and promote safety within the teaching and research laboratories. This requires proper planning, knowledge and communication of the hazards to those working in the laboratory.

The laboratory specific SOPs and training are key elements for a safe laboratory. Documentation is another important element. This includes training documentation and chemical inventories. Proper supervision and addressing safety concerns help to ensure a safe work environment.

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VI. HAZARD COMMUNICATION AND LABORATORY SAFETY STANDARDS

In 1986, Michigan adopted the [Hazard Communication Standard](#) to protect employees from exposure to chemicals. In 2013, the standard was updated to incorporate the requirements of the [Globally Harmonized System](#). In 1992, the Michigan Department of Public Health adopted the [Hazardous Work in Laboratories Standard](#). This standard is commonly referred to as the Laboratory Safety Standard. These standards help protect employees from exposures to hazardous chemicals in their work environment by providing them with information and training. At Eastern Michigan University, these standards are mandatory for laboratories engaging in work with hazardous chemicals and require departments to:

1. Provide a written CHP which is readily accessible to all employees.
2. Provide and document hazard communication training for lab employees.
3. Provide laboratory employees with training on this CHP, including specific hazards present in the laboratories.
4. Provide additional training when working with highly toxic chemicals and when conducting extremely hazardous procedures.
5. Provide training on what to do in an emergency.
6. Maintain chemical exposures below the permissible exposure limits (PELs).
7. Provide environmental monitoring, exposure monitoring, medical surveillance and medical examinations as required by specific regulations and if hazardous and medical chemical exposures are suspected.
8. Maintain exposure monitoring and training records for all employees.
9. Identify hazardous chemicals by properly labeling all chemical containers.
10. Maintain Safety Data Sheet (SDS) location posters in departments and or laboratories where hazardous chemicals are used.
11. Maintain copies of SDSs according to departmental protocol.
12. Maintain a chemical inventory of all hazardous chemicals.
13. Conduct workplace assessments and provide the necessary personal protective equipment for all employees.

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14. Conduct periodic inspections of the laboratories.
15. Enforce the requirements of the CHP.
16. Review and update the SOPs and CHP at least annually.

VII. GENERAL LABORATORY SAFETY RULES

The following are general laboratory safety rules adopted by Eastern Michigan University. These rules are in compliance with state and federal laboratory safety standards and good laboratory practices. These rules must be followed by all faculty, staff and students working in laboratories. A review of specific laboratory processes and procedures should be conducted regularly to address any health and safety concerns which may not be fully addressed by this section of the CHP.

1. Attendance of safety training programs is mandatory.
2. Eating, drinking and application of cosmetics in laboratories and animal rooms is prohibited.
3. Proper eye protection shall be worn at all times.
4. Proper protective clothing shall be worn in laboratories and animal rooms.
5. Emergency showers, eyewashes, drench hoses, exits and fire extinguishers shall be maintained and readily accessible.
6. SDSs and chemical inventories shall be maintained.
7. All chemicals shall be properly labeled and stored.
8. Excess chemical waste shall not be allowed to accumulate.
9. All broken glass and sharps shall be contained and disposed of properly.
10. Compressed gas cylinders shall be secured at all times and cylinder caps shall be in place when cylinders are not in use.
11. All bench top workstations and fume hoods shall be kept clean and clear of any unnecessary equipment and chemicals.
12. Clean-up, disposal and documentation of all incidental chemical spills shall be performed according to this CHP.

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13. All chemical spills greater than one gallon, one pound or any quantity of a highly toxic substance shall be reported immediately to your department head and to EHS. These spills shall not be cleaned up until proper spill cleanup materials, personal protective equipment (PPE) and appropriately trained personnel have arrived. Evacuation of the immediate area may be necessary.
14. All work-related injuries and illnesses shall be reported to your supervisor immediately. An [accident/injury report](#) shall be filed with the HR Benefits Office.
15. All employees must be trained on what to do in the event of an emergency.
16. Laboratory personnel are responsible for ensuring service/maintenance workers and visitors are not exposed to hazardous materials when they are in the laboratory area.
17. All animals shall be handled according to protocols reviewed and approved by the Institution Animal Care and Use Committee (IACUC).
18. Corridors shall not be used as extensions of the laboratory.
19. Children are prohibited in laboratories, unless approved for special programs.
20. Pets are prohibited in laboratories. This prohibition does not include service animals.

VIII. DEPARTMENTAL AND/OR LAB SPECIFIC RULES

Please add any departmental specific rules below.

- 1.
- 2.
- 3.
- 4.
- 5.

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I. PURPOSE

The Eastern Michigan University Hazard Communication Program is designed to achieve compliance with the [Federal Occupational Safety and Health Administration Hazard Communication Standard](#) and the Michigan Department of Labor and Economic Opportunity [MIOSHA General Industry Safety Standard Part 92 Hazard Communication](#). These regulations are designed to protect employees from exposures to hazardous chemicals in the workplace by providing employees with chemical information and training.

II. SCOPE AND APPLICATION

Eastern Michigan University (EMU) employees are to be provided with a workplace free from recognized hazards causing or likely to cause death or serious injury. Employees must be provided with information on workplace hazards and how to protect themselves from these hazards. The University is prohibited from discharging or discriminating against an employee who exercises any of their rights under the [Hazard Communication Standard](#).

All EMU divisions and departments are required to comply with the Hazard Communication Program. This program applies to all employees of the University who may be exposed to hazardous chemicals during the course of their routine work or in a foreseeable emergency. This includes faculty, staff, full and part time employees, temporary employees, administrative personnel, graduate assistants, work study students and student workers.

Personnel working in laboratories must receive additional training according to the requirements of the [Laboratory Safety Standard](#) and the EMU Chemical Hygiene Plan.

III. DEFINITIONS

Article – A manufactured item other than a fluid or particle: (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which under normal conditions of use does not release more than very small quantities (i.e., minute or trace amounts of a hazardous chemical and does not pose a physical hazard or health risk to employees).

Chemical - Any substance or mixture of substances.

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Classification – To identify the relevant data regarding the hazards of a chemical; review those data to ascertain the hazards associated with the chemical; and decide whether the chemical will be classified as hazardous. Classification for health and physical hazards includes the determination of the degree of hazard, where appropriate, by comparing the data with the criteria for health and physical hazards.

Common name – Any designation or identification such as code name, code number, trade name, brand name or generic name used to identify a chemical other than by its chemical name.

Container – Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank or the like that contains a hazardous chemical. Pipes or piping systems and engines, fuel tanks or other operating systems in a vehicle are not considered to be containers.

Hazard category – The division of criteria within each hazard class (i.e., oral acute toxicity includes five (5) hazard categories and flammable liquids include four (4) hazard categories). These categories compare hazard severity within a hazard class and should not be taken as a comparison of hazard categories more generally.

Hazard class – The nature of the physical, environmental or health hazards (e.g., flammable solid, carcinogen, oral acute toxicity, etc.).

Hazard not otherwise classified (HNOC) – An adverse physical or health effect identified through evaluation of scientific evidence during the classification process that does not meet the specified criteria for the physical and health hazard classes defined in this program.

Hazard statement – A statement assigned to a hazard class and category that describes the nature of the hazard(s) of a chemical, including, where appropriate, the degree of hazard.

Hazardous chemical – Any chemical which is classified as a physical, environmental or health hazard (e.g., a simple asphyxiant, combustible dust, pyrophoric gas, or HNOC).

Health hazard – A chemical which is classified as posing one of the following hazardous effects: acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); or aspiration hazard.

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Label – An appropriate group of written, printed or graphic information elements concerning a hazardous chemical that is affixed to, printed on or attached to the immediate container or to the outside packaging of a hazardous chemical.

Label elements – The specified pictogram, hazard statement, signal word and precautionary statement for each hazard class and category.

MIOSHA – Michigan Occupational Safety and Health Administration.

Physical hazard – A chemical that is classified as posing one of the following hazardous effects: explosive; flammable (gases, aerosols, liquids, or solids); oxidizer (liquid, solid or gas); self-reactive; pyrophoric (liquid or solid); self-heating; organic peroxide; corrosive to metal; gas under pressure; or in contact with water emits flammable gas.

Pictogram – A composition that may include a symbol plus other graphic elements, such as a border, background pattern or color that is intended to convey specific information about the hazards of a chemical. Nine pictograms are designated under this standard for application to a hazard category.

Precautionary statement – A phrase that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous chemical or improper storage or handling.

Product identifier – The name or number used for a hazardous chemical on a label or in the Safety Data Sheet (SDS). It provides a unique means by which the user can identify the chemical. The product identifier used shall permit cross-references to be made among the list of hazardous chemicals required in the written hazard communication program, the label and the SDS.

Pyrophoric gas – A chemical in a gaseous state that will ignite spontaneously in air at a temperature of 130 degrees F (54.4 degrees C) or below.

Responsible party – Someone who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary.

Safety data sheet (SDS) – Written or printed material concerning a hazardous chemical that is prepared in accordance with the requirements of the Hazard Communication Standard.

Signal word – A word used to indicate the relative level of severity of a hazard and alert the reader to a potential hazard on the label. The signal words used are “danger” and “warning”. Danger is used for the more severe hazards and warning is used for the less severe hazards.

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Use – To package, handle, react, emit, extract, generate as a byproduct or transfer.

Work area – A room or defined space in a workplace where hazardous chemicals are produced or used, and where employees are present.

Workplace – An establishment, job site or project at one geographical location containing one or more work areas.

IV. RESPONSIBILITIES

A. University Administration

1. Ensure all personnel in their Division are provided their rights under the [Hazard Communication Standard](#) and this Program.
2. Ensure all personnel in their Division receive Hazard Communication Training.

B. Deans, Directors and Department Heads

1. Designate the individual(s) responsible for implementing the Hazard Communication Program in their department.
2. Ensure the employees in their department receive Hazard Communication Training.
3. Ensure employees are provided with and wear/use personal protective and safety equipment when required.
4. Act promptly when unsafe acts and/or conditions are observed or reported.
5. Maintain SDSs for the department, providing Environmental Health and Safety with a copy and posting all required posters.
6. Provide employees with copies of exposure reports.
7. Ensure emergency procedures are available for the hazardous materials used in your department. Contact the [Risk & Emergency Management Office](#) (734.487.0799) for assistance in emergency planning. Include accident/injury reporting to the HR Benefits Office in your procedures.

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C. Faculty and Supervisors

1. Ensure the employees you are responsible for attend the Hazard Communication Training provided by Environmental Health and Safety.
2. Ensure the employees/students you are responsible for are trained on the specific hazards in the work area. Documentation of this training must be maintained.
3. Provide personal protective equipment and engineering controls to minimize chemical exposures.
4. Respond promptly to any unsafe acts and/or conditions observed or reported.

D. Employees

1. Follow the requirements of this program.
2. Wear/Use the personal protective and safety equipment provided.
3. Comply with departmental emergency procedures.
4. Refrain from using any hazardous material and/or equipment without proper authorization.
5. Know and understand the physical and health hazards of chemicals and equipment used.
6. Report all accidents, chemical exposure symptoms, unlabeled containers and malfunctioning or unsafe equipment to the supervisor.

E. Environmental Health and Safety (EHS)

1. Coordinate and implement the Hazard Communication Program including any updates.
2. Periodically review and revise the Hazard Communication Program as necessary.
3. Provide training on the Hazard Communication Program and updates.
4. Provide information on the Hazard Communication Standard and Program to departments and employees.

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5. Conduct site evaluations to determine compliance with the Hazard Communication Program making recommendations as necessary for corrective action.
6. Maintain the central file of safety data sheets (SDSs) and chemical inventories.
7. Liaison with local, state and federal agencies on hazard communication compliance.
8. Coordinate chemical emergency responses which cannot be handled as incidental spills.

F. Physical Plant

1. Label pipe and piping systems containing hazardous materials.

G. HR Benefits Office

1. Document accidents, injuries and chemical exposures.

H. Medical Services Provider(s)

1. Provide medical evaluations as required by the standard and emergency care.
2. Maintain employee medical records and provide them to employees upon request.

I. Purchasing and Stores

1. Forward SDSs with hazardous materials delivered to campus departments.
2. Send all other SDSs to Environmental Health and Safety.

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J. Departments Hiring Outside Contractors

1. Inform contractors of the hazardous chemicals and the labeling systems used in the work area.
2. Provide contractors with information regarding the safety measures required to protect their employees during routine procedures and emergencies.
3. Require contractors to provide the department with SDSs for the hazardous materials being brought to or used in the work area. The department must forward a copy of the SDS to Environmental Health and Safety.

V. PROCEDURES

A. Chemical Hazard Determination

Eastern Michigan University relies on the safety data sheets (SDSs) supplied by the manufacturers/suppliers to comply with the chemical hazard determination requirement of the standard.

B. Labels

1. Labels on Shipped Containers
 - a. The chemical manufacturer, importer or distributor is required to ensure each container of hazardous chemical leaving their worksite is labeled, tagged or marked.
 - b. Labels, tags or markings must include the following information:
 1. Product identifier
 2. Signal word
 3. Hazard statement(s)
 4. Pictogram(s)
 5. Precautionary statement(s)
 6. Name, address and telephone number of the chemical manufacturer important or other responsible party.
 - c. Departments ordering hazardous chemicals are responsible for ensuring all chemical containers received are properly labeled.

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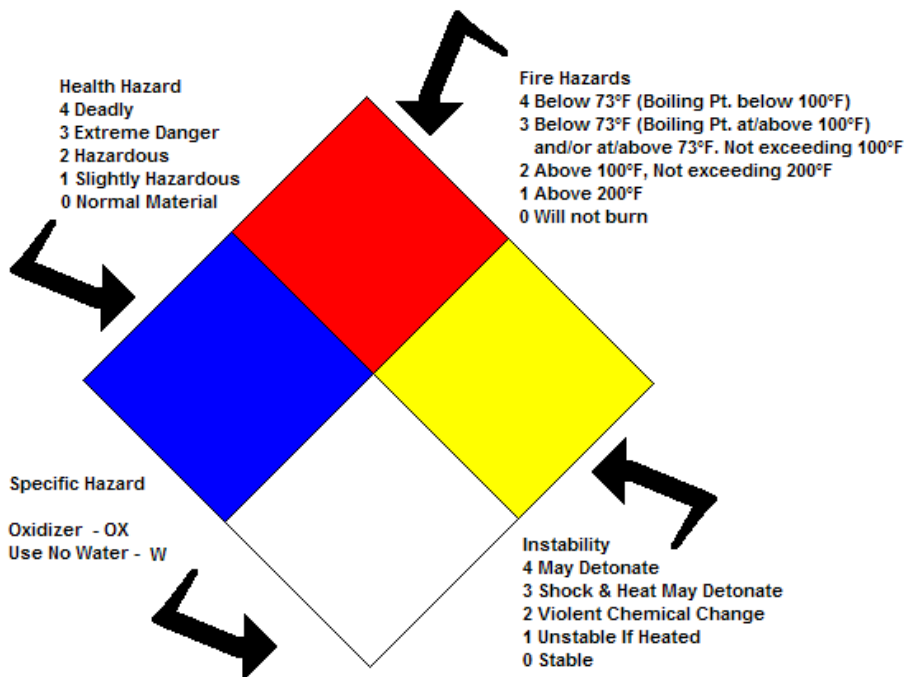
2. Workplace Labels

- a. Each container of hazardous chemicals must be labeled, tagged or marked with either:
 1. The label on the shipped container; or
 2. Product identifier and words, pictures, symbols, or a combination thereof, which provide at least general information regarding the hazards of the chemicals and which in conjunction with other readily available information, will provide employees with the specific physical and health hazards of the chemicals.
- b. Signs, placards or other written materials can be used to label stationary process containers, as long as all the required information listed above is included.
- c. The manufacturers' labels on hazardous chemicals cannot be removed or defaced. The only exception is if the container is empty, has been triple rinsed, if permissible, and is ready for disposal.
- d. Labels, tags and markings must be legible, in English and prominently displayed on the container.
- e. Chemical formulas, chemical abbreviations, chemical structures and generic names (e.g., organic solvents) cannot be used to identify hazardous materials.
- f. Labels shall be updated upon receipt of significant information changes regarding the chemical hazards.
- g. All pipes and piping systems containing hazardous materials shall be labeled according to the labeling system designated by the Physical Plant. Employees working in areas containing pipes with hazardous materials must be trained on the physical and health hazards of these materials.
- h. Each department is responsible for ensuring all secondary containers of chemicals used in their work area are labeled with the product identifier and words, pictures, symbols or combination thereof, to communicate hazards.
- i. All secondary container labels shall be written in permanent ink and shall be replaced if the label is faded or falling off.
- j. An "in-house" labeling system can be used provided all employees have been trained on the labeling system and associated hazards. All employees include custodial and maintenance workers servicing your department. Common labeling systems include the National Fire Protection Association (NFPA) Hazard Communication Diamond and the National Paint and Coatings Association (NPCA) Hazardous Materials Identification System (HMIS).

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NFPA Hazard Communication Diamond


The NFPA Hazard Communication Diamond is a diamond with four colored diamonds inside it, each containing a number or a symbol. See the example below.



The **blue** diamond represents health hazard with the numbers signifying the following: 0 - Normal material; 1 - Slightly hazardous; 2 - Hazardous; 3 - Extremely dangerous and 4 - Deadly.

The **red** diamond represents fire hazard with the numbers signifying the following flash points: 0 - Will not burn; 1 - Above 200°F; 2 - 100°F - 200°F; 3 - 73°F - 100°F and 4 - below 73°F.

The **yellow** diamond represents reactivity with the numbers signifying the following: 0 - stable; 1 - unstable if heated; 2 - violent chemical change; 3 - shock and heat may detonate and 4 - may detonate.

The **white** diamond represents other specific hazards, such as radiation hazard(); oxidizer (OX); acid (ACID); alkali (ALK); corrosive (COR) and water reactive (w).

HMIS Labels

The HMIS coding system also uses blue, red and yellow to identify health, flammability and reactivity hazards, respectively. The following numbering system for hazards is used by HMIS: 0 - minimal; 1 - slight; 2 - moderate; 3 - serious and 4 - severe. The white area on the label is used to identify personal protective equipment required. An A-K identification system is used to specify the personal protective equipment required. A separate chart is available which explains the personal protective equipment code. See below:







HAZARDOUS MATERIALS IDENTIFICATION SYSTEM				
HAZARD INDEX		PERSONAL PROTECTION INDEX		
4 = SEVERE HAZARD	An asterisk(*) or other designation corresponds to additional information on a data sheet or separate chronic effects notification	A	[Eye Protection]	
3 = SERIOUS HAZARD		B	[Eye Protection] + [Hand Protection]	
2 = MODERATE HAZARD		C	[Eye Protection] + [Hand Protection] + [Body Protection]	
1 = SLIGHT HAZARD		D	[Respiratory Protection] + [Hand Protection] + [Body Protection]	
0 = MINIMAL HAZARD	Additional Information	E	[Eye Protection] + [Hand Protection] + [Respiratory Protection]	
PERSONAL PROTECTION EQUIPMENT				
A	n	o	p	
q	r	s	t	
u	w	y	z	
		X Consult your supervisor or S.O.P. for "SPECIAL" handling directions		




HEALTH	
FLAMMABILITY	
REACTIVITY	
PERSONAL PROTECTION	

C. Other Forms of Warning

1. Hazard Communication Standard Pictograms


In 2013, the [Hazard Communication Standard](#) was updated to incorporate pictograms on labels to alert users of the chemical hazards to which they may be exposed. Each pictogram consists of a symbol on a white background framed within a red border and represents a distinct hazard(s). The pictograms are derived from the United Nations Globally Harmonized System of Classification and Labeling of Chemicals ([GHS](#)), [Revision 4](#). The pictograms and hazards they represent are as follows:





SYMBOL	PICTOGRAM	HAZARDS
Corrosion		Skin Corrosion/Burns Eye Damage Corrosive to Metals
Environment		Aquatic Toxicity
Exclamation Mark		Irritant (skin and eye) Skin Sensitizer Acute Toxicity Narcotic Effects Respiratory Tract Irritant Hazardous to Ozone Layer
Exploding Bomb		Explosives Self-Reactives Organic Peroxides
Flame		Flammables Pyrophorics Self-Heating Emits Flammable Gas Self-Reactives Organic Peroxides
Flame Over Circle		Oxidizers






SYMBOL	PICTOGRAM	HAZARDS
Gas Cylinder		Gases Under Pressure
Health Hazard		Carcinogen Mutagenicity Reproductive Toxicity Respiratory Sensitizer Target Organ Toxicity Aspiration Toxicity
Skull and Crossbones		Acute Toxicity (fatal or toxic)




2. Department of Transportation Labels



The Department of Transportation requires labels, placards and shipping papers to verify the presence of hazardous materials in transit. Labels and placards you may see are as follows. The dangerous placard is used when a shipment contains multiple hazard classes.




HAZARD CLASS and DIVISIONS	HAZARD	LABELS & PLACARDS
Class 1 Divisions 1.1 1.2 1.3	Explosives Explosives with mass explosion hazard Explosives without mass explosion hazard Explosives with predominantly a fire hazard	

HAZARD CLASS and DIVISIONS	HAZARD	LABELS & PLACARDS
1.4	Explosives with no significant blast hazard	
1.5	Very insensitive explosives; blasting agents	
1.6	Extremely insensitive detonating articles	
Class 2	Gases	
2.1	Flammable gases	


HAZARD CLASS and DIVISIONS	HAZARD	LABELS & PLACARDS
2.2	Nonflammable gases, nontoxic compressed gases	
2.3	Gases toxic by inhalation	
Class 3	Flammable liquid	
Class 4	Flammable solid, spontaneously combustible and dangerous when wet	
4.1	Flammable solid	
4.2	Spontaneously combustible substances	

HAZARD CLASS and DIVISIONS	HAZARD	LABELS & PLACARDS
4.3	Dangerous when wet materials	
Class 5	Oxidizer, Organic Peroxide	
5.1	Oxidizers	
5.2	Organic peroxides	

HAZARD CLASS and DIVISIONS	HAZARD	LABELS & PLACARDS
Class 6	Poison (Toxic), poison inhalation hazard, infectious substances	
6.1	Toxic materials	
6.2	Infectious substances	

HAZARD CLASS and DIVISIONS	HAZARD	LABELS & PLACARDS
Class 7	Radioactive	
Class 8	Corrosive materials	
Class 9	Miscellaneous hazardous materials	

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HAZARD CLASS and DIVISIONS	HAZARD	LABELS & PLACARDS
Other	Dangerous	

D. Safety Data Sheets

1. Chemical manufacturers and importers are required to obtain or develop a safety data sheet (SDS) for each hazardous chemical they produce or import.
2. The SDS is to be included with the initial shipment of hazardous material and whenever the SDS has been updated.
3. Each SDS must be in English and contain the following 16 sections:
 - a. Section 1 - Identification
 - b. Section 2 - Hazard(s) identification
 - c. Section 3 - Composition/information on ingredients
 - d. Section 4 - First-aid measures
 - e. Section 5 - Fire-fighting measures
 - f. Section 6 - Accidental release measures
 - g. Section 7 - Handling and storage
 - h. Section 8 - Exposure controls/personal protection
 - i. Section 9 - Physical and chemical properties
 - j. Section 10 - Stability and reactivity
 - k. Section 11 - Toxicological information
 - l. Section 12 - Ecological information
 - m. Section 13 - Disposal considerations
 - n. Section 14 - Transport information
 - o. Section 15 - Regulatory information
 - p. Section 16 - Other information including date of preparation or last revision
4. Chemical manufacturers can withhold chemical information (Trade Secrets) provided the required stipulations are met. Contact Environmental Health and Safety for assistance in dealing with Trade Secret Information.

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5. Each EMU department receiving SDSs is required to maintain a copy within the department and send a copy to Environmental Health and Safety.
6. A SDS is required for each hazardous chemical.
7. Departments must ensure the SDSs are readily accessible during each work shift. Electronic access and other alternatives to maintaining paper copies of the SDSs are permitted as long as no barriers to immediate employee access are created. SDSs are available at [MSDSonline](#) using your EMU username and password.
8. The location of SDSs for a department must be communicated to the employees by using the MIOSHA “[SDS\(s\) For This Workplace Are Located At](#)” poster and other methods as appropriate for the laboratory.
9. When an SDS is updated or revised, this information must be communicated to the affected employees by using the MIOSHA “[New or Revised SDS](#)” poster and other methods as appropriate for the laboratory.

E. Chemical Inventory

1. **Each department must maintain a hazardous chemical inventory.** A hazardous chemical is defined as any chemical which is a health or physical hazard.
 - a. Health Hazards include the following:
 - (1) Acute Toxicity
 - (2) Skin Corrosion/Irritation
 - (3) Respiratory or Skin Sensitization
 - (4) Germ Cell Mutagenicity
 - (5) Carcinogenicity
 - (6) Reproductive Toxicity
 - (7) Specific Target Organ Toxicity – Single Exposure
 - (8) Specific Target Organ Toxicity – Repeated Exposure
 - (9) Aspiration
 - (10) Simple Asphyxiants
 - b. Physical Hazards include the following:
 - (1) Explosives
 - (2) Flammable Aerosols
 - (3) Oxidizing Gases

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- (4) Gases Under Pressure
 - (a) Compressed Gases
 - (b) Liquefied Gases
 - (c) Refrigerated Liquefied Gases
 - (d) Dissolved Gases
- (5) Flammable Liquids
- (6) Flammable Solids
- (7) Self-Reactive Chemicals
- (8) Chemicals, which in contact with water, emit flammable gases
- (9) Pyrophoric Liquids (Sodium, Lithium metals)
- (10) Pyrophoric Solids (Potassium hydride, Lithium hydride)
- (11) Pyrophoric Gases (Silane, Phosphine)
- (12) Self-heating Chemicals
- (13) Oxidizing Liquids (Nitric acid, Chromic acid and Sodium)
- (14) Oxidizing Solid (Potassium permanganate, Chromate)
- (15) Organic Peroxides (Many fertilizers)
- (16) Corrosive to Metals
- (17) Combustible Dusts (sugar, flour, grain)

2. The inventory shall include the following:
 - a. Name of the Department
 - b. Name of the individual(s) compiling the inventory
 - c. Contact person(s) phone number
 - d. Building and room number where the chemicals are located
 - e. Date of the original inventory and the most recent revision date
 - f. Name of the chemical/product
 - g. Manufacturer of the chemical/product
 - h. Quantity of the chemical on-site (the largest quantity of chemical stored in that location)
 - i. SDS availability (yes/no). SDSs are available online at [MSDSonline](#) using your EMU username and password.
3. Inventories should be updated at least annually and a copy submitted to Environmental Health and Safety. Laboratories are encouraged to use the [EMU Chemical Inventory Form](#) for their inventories.
4. Departments can also perform their inventories using the [MSDSonline](#) inventory feature. Contact Environmental Health and Safety for additional information.

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F. EXPOSURE TO CHEMICALS

1. Excessive exposure to chemicals may be hazardous to your health. It is the employee's responsibility to understand the potential health hazards chemical exposures may present, including:
 - a. How chemical exposures occur.
 - b. What the acceptable chemical exposure limits are.
 - c. How to prevent overexposure to chemicals.
 - d. How the amount of exposure to a chemical can be determined.
2. Chemicals may enter the body through four routes:
 - a. Absorption through the skin or mucous membranes.
 - b. Inhalation into the lungs.
 - c. Ingestion into the gastrointestinal tract.
 - d. Injection into the body.
3. The [Occupational Safety and Health Administration \(OSHA\)](#) has [established exposure limits](#) for approximately 1000 chemicals. [The State of Michigan has also adopted these limits](#). These limits are called permissible exposure limits (PEL) and are the maximum concentration to which an employee may be exposed averaged over an 8-hour period.
4. The toxic and health effects of many chemicals are unknown, therefore, it is essential to minimize all chemical exposures. To minimize exposures to chemicals:
 - a. Use engineering controls (fume hoods, localized ventilation).
 - b. Use workplace practices (substitution of less toxic products, hand washing).
 - c. Use PPE (gloves, aprons, coats).
 - d. Be familiar with the chemicals and processes used and the necessary safety procedures.
 - e. Understand and recognize the signs and symptoms of exposures.
 - f. If an experiment or process involves hazardous chemicals which cannot be properly contained to prevent exposures, not conducting the process may be the only safe and appropriate alternative.
5. Contact Environmental Health and Safety with any questions or concerns regarding chemical exposures. Instantaneous, 8-hour area/personal and short term environmental monitoring can be arranged by EHS to determine exposure levels.

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G. ENVIRONMENTAL MONITORING

1. Exposure monitoring shall be conducted by Environmental Health and Safety for any substance regulated by a standard which requires monitoring or there is reason to believe that exposure levels routinely exceed the action level or PEL.
2. Employees may request a determination of his or her exposure to a chemical by contacting Environmental Health and Safety.
3. Employees must be notified within fifteen days after receipt of monitoring results. Environmental Health and Safety provides the Department with a monitoring report. It is the Department's responsibility to ensure the employees are provided with these results.
4. Records pertaining to work-related exposure to chemicals or harmful physical agents shall be maintained by Environmental Health and Safety for at least 30 years after an employee's termination of employment.

H. MEDICAL SURVEILLANCE

1. All employees working with chemicals shall be enrolled in the medical surveillance program under any of the following conditions:
 - a. The employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory. Medical examination provided.
 - b. If exposure monitoring reveals an exposure level that is routinely above the action level, or it is above the PEL for a MIOSHA regulated substance for which there are exposure monitoring and medical surveillance requirements. Medical surveillance shall be established for the affected employees.
 - c. When an event occurs (spill, leak, explosion) resulting in a hazardous chemical exposure, the affected employees shall be provided with medical consultation. The consultation determines the need for a medical examination.
2. A written opinion shall be obtained from the examining health care physician for examinations or consultations performed under the medical surveillance program. The opinion shall include all of 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 place the employee at increased risk in the workplace as a result of exposure to a hazardous chemical.

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- d. A statement that the employee has been informed by the physician of the results of the consultation and/or examination and any medical follow-ups or special medical conditions as a result of exposure to a hazardous chemical in the workplace of the consultation and/or examination.
- e. The written opinion shall remain confidential and shall not reveal specific findings or diagnoses unrelated to the occupational exposure.

I. MEDICAL RECORDS

- 1. All employees have the right to examine and obtain a copy of their own medical and chemical exposure records. No one shall have access to this information, except the employee and their physician.
 - a. The health care providers shall maintain all medical records for at least 30 years after termination of employment.
 - b. These records shall include the results of biological monitoring and any blood tests performed for work-related monitoring programs.

J. EMPLOYEE INFORMATION AND TRAINING

- 1. Environmental Health and Safety conducts Safety Awareness and Hazard Communication Trainings providing the required general information for compliance with the [Hazard Communication Standard](#). On-line training is also available.
 - a. Every University employee is required to receive the hazard communication training.
 - b. Personnel working in laboratories must be trained according to the requirements of the laboratory safety standard and the CHP, which incorporates hazard communication training.
- 2. Each Department must provide their employees with effective information and training on the hazardous chemicals in their work area.
 - a. This training must be provided at the time of the initial task assignment and whenever a new chemical hazard is introduced into the work area.
 - b. Employees must be made aware of the hazardous chemicals present and what the specific hazards are.
 - c. Employees must be informed of where the chemical inventory and safety data sheets are maintained for their work area.
 - d. Employees must be trained on the methods and observations used to detect the presence or release of a hazardous chemical. Examples include monitoring conducted for specific chemicals, continuous monitoring devices, visual appearance or odor of hazardous chemicals.

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- e. Employees must be advised of the physical and health hazards of the chemicals in the work area, including permissible exposure limits (PELs).
 - f. Measures employees can take to protect themselves from these hazards, including specific procedures the department has implemented to protect workers from exposure to hazardous chemicals. These measures include engineering controls, administrative work practices, personal protective equipment and emergency procedures.
 - g. Information on any secondary labeling systems used and SDSs must be provided.
3. Copies of the [Michigan Hazard Communication Standard](#) are available from Environmental Health and Safety or the [State of Michigan website](#).
 4. Copies of the EMU [Hazard Communication Program](#) are available from Environmental Health and Safety or at the [EHS website](#).
 5. Each department must document the training provided to workers in their area. Either a sign in sheet or training documentation signature page will suffice.

K. Hazardous Non-Routine Tasks

Occasionally, employees must perform non-routine tasks. A non-routine task is a task which an employee is not normally required to perform (e.g., confined space entry). Prior to employees performing non-routine tasks, they must be provided with information regarding the hazards involved in the task. The information provided must include the specific chemical hazards and protective measures that can be taken to reduce the risks and measures the department has taken to reduce the hazards, including ventilation, respirators, the presence of another employee and emergency procedures.

L. Informing Contractors and Other Non-EMU Employees

1. It is the responsibility of the department hiring/coordinating the work of the contractor to provide the contractor with information regarding the hazardous chemicals present at the work site. The contractor must be provided with the following:
 - a. Information regarding the hazardous chemicals present at the work site. This includes information on the secondary container labeling system and location of SDSs. SDSs are available from [MSDSonline](#).

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- b. Information regarding the precautionary measures necessary to protect the contractor's employees from exposure to the hazards present on the work site. This includes any necessary emergency procedures.
2. The department hiring a contractor must obtain chemical information from the contractor, including SDSs, whenever the work will expose/potentially expose Eastern Michigan University personnel to the chemical(s) used. The department hiring the contractor must keep the SDSs on file and provide a copy to Environmental Health and Safety.

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I. Laboratory Contact Persons

- A. All laboratory doors shall be posted with signs indicating the potential hazards associated with the lab and emergency contact people who are responsible for the activities of the laboratory. [Door signs](#) are available from Environmental Health and Safety.
- B. Departments shall send the Department of Public Safety (DPS) a list of phone numbers for all laboratory contact people. This list shall be updated at least annually and/or as changes in the lab staff are made.
- C. In case of a potential laboratory emergency, when no one associated with the lab is available, contact DPS at 911 so the appropriate laboratory personnel can be contacted.

II. Working Alone In Laboratories

- A. Working alone is unsafe and not recommended.
- B. Hazardous or potentially dangerous operations shall never be performed while working alone.
- C. Working alone after hours shall be strictly forbidden unless someone is within shouting distance and/or someone will be checking in on the laboratory periodically.
- D. When working after hours, weekends or holidays, DPS should be notified when you arrive and when you leave.

III. Eating and Drinking

- A. Eating and drinking in laboratories is prohibited due to the possible ingestion of hazardous materials. Departments should provide and maintain designated areas for food and beverage consumption.
- B. Food and beverages must be stored separately from chemicals, radioactive materials and biological agents.
- C. Faculty and staff offices, unless located in laboratories or in rooms with laboratory facilities, are appropriate areas for food and beverages.

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IV. Personal Hygiene

- A. Never touch one's mouth or face when working in the vicinity of toxic or hazardous chemicals.
- B. Avoid contact with drinking fountain handles, telephones, computers, door knobs, water faucets and other equipment when handling hazardous and toxic chemicals.
- C. Wash hands before leaving the work area.
- D. Laboratory coats should be removed before leaving the laboratory area.

V. Housekeeping

- A. Floors, shelves, lab benches and tables should be free from dirt and general clutter.
- B. Lab benches should be periodically cleaned.
- C. Slip, trip and fall hazards should be eliminated as soon as they are noted. This includes spills, small objects, especially stirring rods and beads and cords running across aisles.
- D. Access to fire extinguishers, safety showers, drench hoses and eye-wash stations shall not be hindered.
- E. All materials shall be kept at least 18 inches below fire sprinkler heads.
- F. Fume hoods shall be kept free of clutter. Hoods shall not be used for storage.
- G. Only equipment and chemicals in use should be in the fume hood.
- H. Books, journals, and personal effects shall never be placed where they may become contaminated by hazardous chemicals.
- I. Infrequently used equipment shall be stored away from work areas. Frequently used equipment shall be appropriately located for stability, accessibility and minimization of bench top and aisle interference.

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VI. Laboratory Specific Training

- A. The faculty, supervisor and/or manager of a laboratory are responsible for ensuring the people working in the laboratory are properly trained.
- B. Training should occur when someone new starts in the laboratory, a new process is added and/or when a change is made to an existing laboratory process or procedure.
- C. Documentation of the laboratory specific training should be maintained in the laboratory Chemical Hygiene Plan (CHP) or other designated location within the laboratory and a copy of the laboratory specific training should be sent to the department head. The [Laboratory Specific Training Checklist](#) is provided to assist with compliance with this requirement.

VII. Laboratory Inspections

- A. Supervisors are responsible for conducting periodic inspections of laboratories.
- B. Environmental Health and Safety strongly recommends quarterly inspections.
- C. The EMU [Laboratory Safety Inspection Checklist](#) is provided to assist with compliance with this requirement.
- D. Inspections should include personal protective equipment (PPE), safety equipment, electrical cords, laboratory equipment and general laboratory conditions.
- E. Inspection checklists shall be maintained by the department/laboratory.

VIII. Pipetting

- A. Pipetting by mouth is strictly forbidden.
- B. Mechanical pipetting aids shall be used at all times.

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IX. Glassware Maintenance

- A. Each department shall develop their own policies regarding washing, storage and use of glassware.
- B. Glassware shall be decontaminated and washed before being stored.
- C. Glassware shall be washed in hot Alconox solution, rinsed several times in hot tap water and then rinsed three times in distilled water.
- D. Dispose of chipped and cracked glassware.
- E. Clean, uncontaminated broken glass shall be disposed of in the yellow buckets labeled as "Uncontaminated Broken Glass".
- F. Chemically contaminated broken glass shall be disposed of in the white buckets labeled as "Hazardous Waste". These buckets must be closed at all times unless adding chemically contaminated broken glass to the container.

X. Electrical Safety

- A. Electrical cords shall be examined before use for frayed or broken insulation and/or loose connections. Cords with defects shall be taken out of service.
- B. All electrical cords shall be properly stored when not in use. Proper storage is needed to avoid tripping and spilling hazards.
- C. Extension cords and outlet extenders are prohibited.
- D. All electrical repairs shall be performed by State of Michigan licensed electricians.
- E. Extension cords that do not have the grounding pin shall be taken out of service.

XI. Prevention of Static Electricity

Static electric charges develop whenever non-conducting liquids are transferred from one container to another, when compressed gases are released rapidly from a cylinder, when steam flows from the end of or through a hose, or whenever two different insulators are contacted and separated repeatedly. To prevent this danger:

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- A. Always ground both container and receiver when transferring large volumes (four or more liters) of flammable liquids or gases.
- B. Do not wear rubber or composition-soled shoes in areas where highly flammable solvents are used.
- C. Ground metal tubing when it is used for flammable compressed gases.
- D. Connect the gas cylinder and the material in the receptacle with metal wire when dispensing a high rate of gas while using rubber or plastic tubing.
- E. Bond the pipes or nozzles through which steam is discharged to the equipment being steamed and ground the entire system.

XII. Laboratory Maintenance

- A. Laboratory maintenance services are provided by the Physical Plant.
- B. Faculty and staff are responsible for notifying the Physical Plant when services are needed. The Physical Plant can be reached at 487-1000 or via the Physical Plant [work order website](#).
- C. All potentially hazardous materials shall be removed from the immediate area where the service personnel will be working. Maintenance and service personnel are not required to work where they may be exposed to hazardous chemicals or materials. Use the EMU [Equipment Decontamination Form](#) to provide decontamination information to repair personnel.
- D. Modification to existing laboratories (i.e., additional sinks, electrical outlets, etc.) requires the submission of a Divisional Funded Project Request Form available in EProcurement on your EMich home page.

XIII. Sink Traps

- A. Sinks shall not be used for hazardous chemical disposal. See [Section 8](#) for waste disposal procedures.
- B. Sink traps shall be kept filled with water at all times to prevent escape of sewer gases into the laboratory. Such gases may be toxic or flammable and may be ignited or cause flash fires.

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XIV. End of Day Procedures

- A. The last person leaving each laboratory shall ensure the lights are out and gas, water, vacuum and air jets are properly secured.

- B. Experiments shall be shut down prior to leaving the laboratory for the day. If it is impossible to shut down a long term experiment, refer to [Section 6](#) for information on running overnight experiments. Consult your department's standard operating procedures (SOPs) at the end of [Section 6](#) for more specific information regarding this procedure.

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I. PURPOSE

Faculty, managers, and supervisors are responsible for the Personal Protection Equipment (PPE) program in their laboratory. This includes enforcement of the program and equipment maintenance. Appropriate disciplinary action must be taken for repeated violation of this program. Each department must provide the necessary PPE for their faculty, staff and student employees.

This section has been designed to address the most common laboratory PPE issues. For additional PPE information please refer to the [EMU PPE program](#) or contact Environmental Health and Safety.

II. RESPONSIBILITIES

A. Deans, Directors and Department Heads

1. Provide the leadership and the management systems necessary to ensure safe working conditions are maintained in their Colleges, Schools and Departments.
2. Ensure the PPE program is implemented in their area.
3. Motivate and assist faculty, managers and supervisors with PPE compliance.
4. Provide the necessary resources for the PPE program.
5. Require faculty and staff to attend all applicable training sessions.
6. Ensure all graduate assistants and student employees receive appropriate PPE and training.
7. Ensure disciplinary actions are taken when violations of the PPE program are egregious and/or repetitive.

B. Faculty, Managers and Supervisors

1. Implement the PPE program in their work area.
2. Conduct and document PPE hazard assessments.
3. Ensure the necessary PPE is provided, used and maintained.
4. Provide and document training on PPE use, maintenance and limitations.

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5. Enforce the rules and requirements of the PPE program, including disciplinary action for repeated and/or egregious non-compliance.
6. Remove defective PPE from service immediately.

C. Employees and Students

1. Attend all required PPE training sessions.
2. Use all required PPE.
3. Report any defects in PPE to your supervisor or instructor.
4. Report signs and symptoms of possible exposures, known exposures, accidents and near misses to your supervisor or instructor.

D. Environmental Health and Safety

1. Provide oversight and guidance on the PPE program.
2. Provide consultation, training, exposure monitoring and inspections as needed.
3. Periodically review and revise the PPE program as necessary.

III. HAZARD ASSESSMENTS

Hazard assessments shall be performed in each laboratory to determine if hazards requiring the use of personal protective equipment are present. Use the [Hazard Assessment Form](#) to conduct your assessments. If potential hazards are present in the laboratory, the following shall be implemented:

- A. Identify each hazard and the source.
- B. Determine which body parts are affected.
- C. Select appropriate personal protective equipment against the hazard.
- D. Train laboratory personnel on the hazards present and when and what PPE should be worn.
- E. Train laboratory personnel on the proper use, including donning, doffing and adjustment of PPE, maintenance and limitations of each PPE device used.

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F. Personal Protective Equipment alone should not be relied upon to completely protect against hazards, but should be used in conjunction with effective engineering controls and workplace practices to minimize hazards in the laboratory.

IV. DOCUMENTATION AND REASSESSMENT

- A. Written documentation of hazard assessments and training must be maintained.
- B. Hazard assessments must include:
 - 1. The name and signature of the person conducting the survey.
 - 2. The date of the survey.
- C. This certification must be kept on file until the work/task/assignment is reevaluated.
- D. Training documentation must include:
 - 1. Documentation of training on all of the items listed in III D and E above.
 - 2. The name and signature of the person conducting the training.
 - 3. The date of the training.
 - 4. Signature of the trainee(s).
- E. When there is a change in procedure, new procedure added, lapse in PPE usage or change in PPE used, a new hazard assessment and updated PPE training is required.

V. EYE PROTECTION

- A. All safety eyewear must meet the [ANSI Z87.1](#) standard for minimum allowable eye protection. All eye protection supplied by Eastern Michigan University Departments must meet this standard.
- B. Safety glasses do not give adequate protection from chemical splashes. If the potential for liquids to be splashed or sprayed is present, safety goggles must be worn. A face shield may also be needed when liquids are under extreme high pressure. A face shield must be used in conjunction with safety goggles and cannot be used alone.
- C. Contact lenses do not provide eye protection and are not recommended in laboratories.

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D. Eye protection is required:

1. When working with or in the vicinity of solvents or corrosive chemicals, or with any chemical that could produce an eye injury.
2. When working near equipment or apparatus under high pressure or vacuum, or when around equipment that could produce projectiles.
3. When near laboratory benches where chemical reactions are being run or when around a radiation hazard.
4. When transporting flammable, corrosive or toxic chemicals.
5. During maintenance activities involving chemicals, hand/power or machine tools, welding, cutting, grinding or abrasive blasting.
6. Chemical goggles are required when corrosive liquids are being manipulated, or where a pressurized apparatus containing a corrosive liquid is in use in the immediate area.
7. Chemical goggles are required when working behind hood doors or blast shields.
8. Eye protection is recommended, but not required, in laboratory areas that do not have a potential for eye injuries. Lab offices, lab desks with no adjacent hazards, microscope areas, and tissue culture labs are examples of areas where eye protection is recommended, but not required.
9. For additional information on eye protective equipment see the [EMU PPE Program](#).

VI. FACE SHIELDS

Face shields are designed to provide protection to the front part of the head, including forehead, cheeks, nose, mouth, and chin and to the neck, where required, from flying particles and sprays of hazardous liquids and to provide filter protection where required.

- A. Face shields shall be worn over suitable basic eye protection devices.
- B. Typical uses for face shields include, but are not limited to, the following:
 1. Woodworking operations where chips and particles fly.

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2. Metal machining causing flying particles.
 3. Buffing, polishing, wire brushing and grinding operations causing flying particles or objects.
 4. Spot welding.
 5. Handling of hot or corrosive materials.
- C. Three basic styles of face shields:
1. Headgear without crown protector.
 2. Headgear with crown protector.
 3. Headgear with crown protector and chin protector.
- D. For additional information on face shields contact Environmental Health and Safety.

VII. HEAD PROTECTION

A. Use of Head Protection

1. Each affected faculty, staff and student shall be provided with, and shall wear, head protection equipment and accessories when they are required to be in areas where a hazard exists from the following:
 - a. Falling or flying objects
 - b. Other harmful contacts or exposures
 - c. Where there is a risk of injury from:
 1. Electric shock
 2. Hair entanglement
 3. Chemicals
 4. Temperature extremes
2. Sanitizing facilities and replacement of needed parts shall be provided when necessary and before head protection equipment is reissued.
3. Physically altered or damaged head protection equipment shall not be worn or reissued.

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4. Faculty, staff and student employees shall not physically alter, and shall guard against damage to the head protection equipment provided.
5. Faculty, staff and student employees shall use the provided head protection equipment in accordance with the instructions and training received.
6. Head protection equipment provided shall meet the applicable ANSI Z-89.1 Standard for head protection equipment.

B. Hair Enclosures

1. A hat, cap, or net shall be used by a person where there is a danger of hair entanglement in moving machinery or equipment, or where there is exposure to means of ignition.
2. Hair enclosures include all of the following:
 - a. Designed to be reasonably comfortable to the wearer;
 - b. Completely enclose all loose hair;
 - c. Be adjustable to accommodate all head sizes.
3. Materials used for hair enclosure shall be all of the following:
 - a. Fast dyed;
 - b. Non-irritating to the skin when subjected to perspiration, and
 - c. Capable of withstanding frequent cleaning.
4. Hair enclosures shall not be reissued.

VIII. FOOT AND TOE PROTECTION

- A. Faculty, supervisors and managers shall ensure each affected person shall wear protective footwear when working in areas where any of the following occur:
 1. Protective footwear will protect affected people from an electrical hazard, such as a static-discharge or electric-shock hazard, that remains after other necessary protective measures have been taken.
 2. There is a danger of foot injuries due to falling or rolling objects.
 3. There is a danger of objects piercing the sole of the shoe.

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4. If a hazard is created from a process, environment, chemical or mechanical irritant which could cause an injury or impairment to the feet by absorption or physical contact, other than from impact, then the affected people shall be provided any of the following:

- a. Boots
- b. Overshoes
- c. Rubbers
- d. Wooden-soled shoes
- e. The equivalent of a - d above

B. Where toe protection other than safety toe footwear is worn, the toe protection shall have an impact value of not less than that required for the safety toe footwear.

C. Protective footwear shall comply with any of the following consensus standards:

- a. [ASTM F-2412](#)
- b. [ASTM F-2413](#)
- c. [ANSI Z-41](#)

D. Safety shoes and boots that are not worn over shoes and that are worn by more than one person shall be maintained, cleaned and sanitized inside and out before being issued to another person.

IX. GLOVES

Gloves provide protection against chemical, radiological and biological agents. Selection of proper gloves for the work task is critical in maintaining protection against hazardous agents. [PPE hazard assessments](#) must be conducted to determine the tasks requiring gloves and the appropriate glove.

A. Hand protection is required when hands are exposed to the following hazards:

- 1. Skin absorption of harmful substances
- 2. Severe cuts or lacerations
- 3. Severe abrasions
- 4. Punctures
- 5. Chemical burns

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6. Thermal burns

7. Harmful temperature extremes

- B. Proper gloves should be worn when working with corrosive liquids, solvents, or other potentially hazardous materials.
- C. Gloves shall be removed prior to answering phones, using computers, opening doors, or any other situation that might cause the spread of hazardous materials.
- D. Gloves shall be removed prior to leaving the laboratory area.
- E. Hand washing is required anytime gloves are removed.
- F. Be careful not to touch other parts of your body or apparel while wearing gloves (e.g., pushing up your glasses, etc.)
- G. Use the [General Glove Information Chart](#) to assist with glove selections.

Environmental Health and Safety can assist employees with the selection of proper gloves.

X. BODY PROTECTION

- A. Faculty, supervisors and managers shall ensure each person required to work under conditions where their clothing becomes wet due to a condition other than the weather or perspiration uses any of the following as appropriate:
 - 1. Aprons
 - 2. Coats
 - 3. Jackets
 - 4. Sleeves
 - 5. Other garments that will keep clothing dry
- B. The material shall be unaffected by the wetting agent.
- C. Laboratory coats are issued to prevent the spread of hazardous and infectious materials outside the laboratory. Also, laboratory coats prevent damage to personal clothing.

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1. University supplied laboratory coats shall not be worn off campus.
2. Contaminated laboratory coats must be taken off before leaving the laboratory area.

XI. HEARING PROTECTION

If in the laboratory setting, a process is conducted with a high noise output, Environmental Health and Safety shall be contacted to conduct a noise survey. From this survey, the following items can be addressed.

- A. Sources of noise output.
- B. Whether the action levels were surpassed.
- C. Types of hearing protection devices needed and when they should be worn.
- D. Who is affected by the noise and whether the employee needs to participate in the hearing conservation program.

XII. RESPIRATORY PROTECTION

Respirators are designed to keep the wearer from inhaling toxic chemicals or other contaminants in the air during accidents, emergencies and when engineering controls are not sufficient to maintain exposures below the PEL. Respirators are the **last line** of defense and are not to be used during the routine laboratory operation. When required, respirators are available to employees at no cost.

Department heads shall make every effort to use engineering and workplace controls to minimize exposures. Respirators shall only be used when engineering controls and workplace practices fail to reduce the exposures below the PEL. Department heads are responsible for ensuring compliance with the [Respiratory Protection Program](#). Their responsibilities include:

- A. Informing Environmental Health and Safety of potential health hazards that may require the use of respirators.
- B. Ensuring employees have received a medical evaluation and training prior to using respirators.
- C. Ensuring employees receive a respirator fit test prior to respirator usage.

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- D. Ensuring employees use and store the respirator in compliance with the [Respiratory Protection Program](#).
- E. Storing respirators in a closed container, shelf or cabinet.
- F. Maintaining respirators (i.e., kept clean and dust-free, and washed when necessary).
- G. Ensuring respirator cartridges are changed on a regular basis according to specifications or use limitations.
- H. Maintaining all training records.
- I. Monitor respirator usage for compliance and report deficiencies to Environmental Health and Safety.

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I. ORDERING CHEMICALS

- A. Check the chemical inventory to verify the chemical is not already available in the department.
- B. Check for special chemical handling procedures.
- C. Determine the minimum amount of chemicals needed to complete the work. **Do not** order extra amounts of chemicals that will not be used in a timely manner. **Disposal costs far outweigh the slight cost savings by ordering large quantities.**
- D. Upon receipt of chemicals, the safety data sheets (SDS) should be sent to Environmental Health and Safety for entry into the online database. A copy of the safety data sheets should be maintained within the lab/department.

II. CHEMICAL STOCKROOMS

- A. Removal of any chemical or apparatus shall be recorded for inventory purposes.
- B. Chemicals shall not be transported from the stockroom unless they are in an appropriate container.
- C. All containers shall be returned to the stockroom, whether they are empty or not, for inventory control purposes.
- D. All materials brought to the stockroom for waste disposal shall be clearly marked with the chemical name and employee responsible for their disposition.
- E. Chemicals that have exceeded their recommended shelf life or are no longer usable due to inadequate quality should be labeled for waste disposal. See [Section 8](#) for specific instructions on waste disposal.

III. GENERAL CHEMICAL STORAGE

- A. All chemical containers in storage must be properly labeled. Ensure all labels are legible and in good condition. Repair or replace damaged or missing labels.
- B. All chemicals should be labeled and dated upon receipt in the laboratory and when opened. This is especially important for peroxide forming chemicals such as ethers, dioxane, isopropanol and tetrahydrofuran.

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- C. Fume hoods **shall not** be used as chemical storage areas.
- D. Chemicals should be stored in cabinets or on shelves, not on the floor. Shelves should be level, stable and located away from direct sun, flame and heat sources.
- E. Chemicals should be stored by class, not alphabetically.
- F. Never store incompatible chemicals together.
- G. Bottle caps should be secure to prevent accidental spills and to minimize odors.
- H. Spill trays should be provided in liquid storage areas.
- I. Large quantities and heavy chemicals shall be stored on lower shelves. Only lightweight or small quantities shall be stored above eye level.
- J. Corrosive materials of any quantity shall never be stored above eye level. Containers should not extend beyond the shelf edge.
- K. Store acids in a dedicated acid cabinet.
- L. Highly toxic or controlled chemicals should be stored in a locked dedicated cabinet.
- M. Wear appropriate PPE, including eye protection, when handling chemicals stored above eye level.
- N. A ladder or step stool shall be available for reaching overhead storage.
- O. Household-type refrigerators and freezers are permitted in laboratories exclusively for storage of non-flammable aqueous solutions or other non-flammable or non-explosive materials. Do not store food or drink in any refrigerator/freezer in a laboratory.

IV. DISTRIBUTION OF FLAMMABLE LIQUIDS

- A. Always ground both the container and receiver when transferring large volumes (four or more liters) of flammable liquids or gases.

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V. TRANSPORTING CHEMICALS ON CAMPUS

- A. Hazardous chemicals shall not be placed in interdepartmental mail.
- B. Solvent carriers shall be used when transporting glass or plastic bottles of hazardous chemicals, concentrated acids, flammable solvents, or other corrosives. These carriers are available through the stockroom.
- C. Proper PPE shall be used when moving chemicals.

VI. SHIPPING OF HAZARDOUS MATERIALS

Hazardous chemicals and materials shall not be shipped using commercial vendors unless prior approval has been granted from Environmental Health and Safety. The Department of Transportation has very specific regulations governing the shipping of hazardous materials. Failure to comply with these regulations could result in severe penalties. Consult Environmental Health and Safety with any questions regarding shipping of hazardous materials.

VII. FACULTY, STAFF, AND STUDENT TRANSPORTATION OF CHEMICALS OUTSIDE THE FACILITY

- A. Faculty, Staff and Student shall not transport any chemical or hazardous material outside the facility unless prior approval has been granted from Environmental Health and Safety.
- B. The Faculty, Staff and Student is responsible for ensuring that The Department of Transportation regulations on shipping chemicals are not violated by transporting chemicals in a private car or on a commercial carrier. Environmental Health and Safety will assist with any questions regarding these regulations.

VIII. HAZARDOUS CHEMICALS

A. BENZENE

Benzene is a colorless to light yellow liquid with an aromatic odor. It is flammable and is a known human carcinogen and a possible reproductive toxin. It can be found either as a liquid or a gas, and has a high evaporation rate. Because of this high evaporation rate, benzene liquid can quickly vaporize to a gas, generating increased concern for respiratory and fire hazards. Michigan adopted the [Benzene](#)

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[Standard](#) in 1989 to minimize exposures to benzene. This standard establishes a 1.0 ppm PEL and a 5 ppm STEL. The standard requires exposure monitoring and enrollment in the medical surveillance program for employees exposed to benzene above the action level. Employees working with benzene should follow these guidelines.

1. Wear proper PPE as determined from the SOP developed for each procedure involving the use of benzene.
2. Minimize over-exposure through the use of engineering controls and workplace practices.
3. If required, participate in the medical surveillance program.

Departments working with benzene should contact Environmental Health and Safety for exposure monitoring of all procedures where benzene is used outside of a fume hood. Areas where exposure monitoring has been conducted and levels are found to be above the PEL or STEL, the area must be posted with the following information:

**DANGER
BENZENE
MAY CAUSE CANCER
HIGHLY FLAMMABLE LIQUID AND VAPOR
DO NOT SMOKE
WEAR RESPIRATORY PROTECTION IN THIS AREA
AUTHORIZED PERSONNEL ONLY**

Receptacles containing benzene shall be labeled as follows:

**DANGER
CONTAINS BENZENE
CANCER HAZARD**

B. CARCINOGENS

It is not possible to obtain a definitive list of known or potential carcinogens due to the numbers of groups testing and classifying chemicals and the wide variety of criteria used in the classifying. However, a select carcinogen has been defined by the Federal government as any chemical that is:

1. Regulated by [OSHA as a carcinogen](#).

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2. Listed under group 1 or in either group 2A or 28 by the [International Agency for Research on Cancer Monographs](#) (IARC).
3. Listed under the category "[known or reasonably anticipated to cause cancer in humans](#)" by the National Toxicology Program (NTP).

The MIOSHA list of select carcinogens includes the following:

4-Nitrobiphenyl
alpha-Naphthylamine
Methyl chloromethyl ether
3, 3' Dichlorobenzidine (and its salts)
bis-Chloromethyl ether
beta-Naphthylamine
benzidine
4-Aminodiphenyl
Ethyleneimine
beta-Propiolactone
2-Acetylaminofluorene
4-Dimethylaminoazo-benezene
N-Nitrosodimethylamine

These rules shall not apply to any of the following:

Solid or liquid mixtures containing less than 0.1% by weight or volume of 4-Nitrobiphenyl, Methyl chloromethyl ether, bis-chloromethyl ether, beta-Naphthylamine, benzidine or 4-Aminodiphenyl; and solid or liquid mixtures containing less than 1.0% by weight or volume of alpha-Naphthylamine, 3, 3'-Dichlorobenzidine (and its salts), Ethyleneimine, beta-Propiolactone, 2-Acetylaminofluorene, 4-Dimethylaminoazobenzene or N-Nitrosodimethylamine.

5. Special handling procedures **must** be used with all select carcinogens.
6. It is **strongly recommended** that laboratory staff avoid the use of chemicals classified as select carcinogens.
7. Permission from Environmental Health and Safety and a departmental peer review group **must** be obtained prior to the use of any select carcinogen.
8. The use of select carcinogens shall be strictly controlled to assure that all measurable exposures to employees and the environment are eliminated.

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9. Select carcinogens must be handled in a manner which minimizes contact with the chemical.
10. A Standard Operating Procedure (SOP) shall be developed by the user for the process being considered.
11. The SOP shall outline the procedures needed to ensure that employees and the environment are not exposed to significant amounts of the chemical.
12. The SOP must be approved by Environmental Health and Safety and a departmental peer review group.
13. Anyone handling open containers of select carcinogens shall do so only in a clearly marked “designated area” with restricted access to unauthorized personnel. This area shall be posted with signs reading “DANGER-CHEMICAL CARCINOGEN”.
14. Use appropriate spill containment procedures when working with carcinogens.
15. Decontaminate work surfaces, equipment and glassware after every activity involving a chemical carcinogen.
16. Proper PPE shall be worn when handling chemical carcinogens.
17. Open transfers of chemical carcinogens shall be done in a fume hood or glove box. All exhaust systems shall be examined before the system is used.
18. Carcinogens shall be segregated from other chemicals and stored in double containers.
19. Label chemical carcinogen containers and the outermost container "DANGER - CHEMICAL CARCINOGEN".
20. Storage cabinets shall be posted with labels reading "DANGER – CHEMICAL CARCINOGEN".

Faculty, Staff and Students with questions about specific select carcinogens and their associated hazards should consult Environmental Health and Safety.

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C. CORROSIVE CHEMICALS

Corrosive chemicals are acids and alkalis known to be corrosive to living tissue. Concentrated acids destroy human tissue. Alkalis penetrate even deeper than acids, particularly when in the eye where the cornea may be destroyed. When working with corrosive chemicals, the following steps shall be followed:

1. Always wear proper PPE, especially eye protection.
2. Acids and alkalis shall always be added to water, **never** add water to acid or alkalis.
3. Add acid to water slowly, as a great deal of heat will be formed.
4. Any accident resulting with the skin shall be treated immediately. Wash affected areas with large amounts of water for at least 15 minutes. Seek immediate medical attention for chemical burns resulting from concentrated solutions.
5. Always separate and store acids, alkalis and other corrosive materials below bench level.
6. Acids shall be stored away from cyanides.
7. Acids and bases shall be stored away from flammable liquids and solvents.
8. Properly labeled storage cabinets shall be used which are below counter level. These chemicals shall not be stored in overhead storage areas.
9. Inspect containers frequently for corrosion.

D. EXPLOSIVE CHEMICALS

Many chemicals when mixed together form highly explosive compounds. Others become highly explosive when allowed to decompose or are exposed to air. Chemicals that are known to be potentially explosive shall be handled with extreme care while wearing proper PPE. When working with these chemicals, the number one priority shall be safe handling techniques to prevent any accidental mishaps.

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E. FLAMMABLE LIQUIDS

A flammable liquid is a liquid that gives off vapors which will ignite when exposed to an ignition source at temperatures below 37.8° C (100° F). A combustible liquid is a liquid which must be heated to temperatures above 37.8° C (100° F) in order to be ignited. OSHA divides flammable liquids into classes 1A, 1B, and 1C and combustible liquids into classes 2, 3A and 3B. See tables below.

FLAMMABLE LIQUIDS ARE DIVIDED INTO THE FOLLOWING THREE CLASSES:			
CLASS	FLASH POINT	BOILING POINT	EXAMPLES
I A	< 73° F (22.8° C)	< 100° F (37.8° C)	Diethyl Ether, Pentane
I B	< 73° F (22.8° C)	≥ 100° F (37.8° C)	Acetone, Ethanol
I C	≥73° F (22.8° C) < 100° F (37.8°)		Styrene, Nonane, Xylenes

Flammable and Combustible liquid charts taken from Section 1-2 of the ANSI / NFPA 30 Standard, August 17, 1990.

COMBUSTIBLE LIQUIDS ARE DIVIDED INTO THE FOLLOWING THREE CLASSES:		
CLASS	FLASH POINT	EXAMPLES
II	≥ 100° F (37.8° C) < 140° F (60° C)	N, N-dimethylformamide
III A	≥140° F (60° C) < 200° F (93.3° C)	Dodecane, Aniline
III B	> 200° F (93.3° C)	Ethylene glycol, Mineral Oil

1. Flammable and combustible liquids shall be kept in appropriate containers and stored in flammable liquid storage cabinets or in vented cabinets at floor level away from any possible heat source.
2. Solvents should be kept in safety cans. Drums and five-gallon containers shall not be allowed in laboratories unless stored in a flammable liquid cabinet and used with smaller safety cans for dispensing.

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3. Flammable solvents requiring refrigeration shall be stored in flammable liquid storage or explosion-proof refrigerators/freezers.
4. Flammable or combustible liquids, including waste, shall not be stored in exits and stairways.
5. Safety cans should be used whenever possible.
6. No more than ten gallons of flammable liquids per laboratory shall be stored outside of a storage cabinet or storage room, except in safety cans.
7. No more than 25 gallons total of flammable liquids shall be stored in safety cans outside of a storage cabinet or storage room in any laboratory room.
8. No more than 60 gallons total of combustible liquids shall be stored outside of a storage cabinet or storage room in any laboratory room.

Maximum allowable container capacity for flammable and combustible liquids					
Container	I A	I B	I C	II	III
Glass	1 pint	1 quart	1 gallon	1 gallon	5 gallons
Metal / Approved Plastic	1 gallon	5 gallons	5 gallons	5 gallons	5 gallons
Safety Can	2 gallons	5 gallons	5 gallons	5 gallons	5 gallons

Container capacity chart taken from Table 4-2-3 of the ANSI/NFPA 30 Standard, August 17, 1990.

EXCEPTION:

Glass containers up to one gallon in size shall be permitted for storage of flammable liquids if the required purity would be adversely affected by storage in a metal or approved plastic container, or if the liquid would cause excessive corrosion or degradation of the metal or approved plastic container.

9. When using flammable liquids:
 - a. Avoid handling flammable liquids around open flame sources.

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- b. Handle only appropriate quantities of flammable liquids at any given time (Refer to chart above for storage limitations).
- c. Flammable liquids shall only be handled in well ventilated areas.
- d. Keep containers, beakers, etc. closed or covered when possible to avoid release of flammable vapor.
- e. Never use an open flame for heating flammable solvents.
- f. Evaporation of large quantities of flammable liquids shall be carried out in a closed system and under reduced pressure.
- g. Vacuum distillation systems shall be properly shielded to protect from imploding glass containers.
- h. Use a steam bath in a hood for concentration of small quantities of flammable mother liquids contained in open beakers. **Do not** use Glascol heaters, hot plates, or water baths heated by hot plates; explosion of heavier-than-air vapors may occur.
- i. Do not fill flasks more than half-full and use boiling chips when heating.

F. FORMALDEHYDE

Formaldehyde is a colorless gas that has a bitter odor. Formalin is an aqueous solution containing 37 to 50 percent formaldehyde. Overexposure to formaldehyde can lead to serious health concerns. In 1993 the [Formaldehyde Standard](#) was adopted by the Michigan Department of Public Health. This standard was established to minimize exposures to formaldehyde and provide a safe work environment. The standard establishes a 0.75 ppm permissible exposure limit (PEL), 2.0 ppm short term exposure limit (STEL) and 0.5 ppm action level. The standard requires exposure monitoring and enrollment in the medical surveillance program for employees exposed above the action level or STEL.

Exposure to formaldehyde can occur through inhalation, ingestion, skin contact or contact with body openings such as the eyes and nose. Faculty, Students and Staff working with formaldehyde should follow these guidelines:

1. Wear proper PPE as determined from the SOP developed for each procedure involving formaldehyde.
2. Minimize exposures through the use of engineering controls and workplace practices.
3. If required, participate in the medical surveillance program.

Departments working with formaldehyde should contact Environmental Health and Safety for exposure monitoring of all procedures where formaldehyde is used

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outside of a fume hood. Areas where exposure monitoring has been conducted and levels are found to be above the PEL or STEL must be posted with the following information:

**DANGER
FORMALDEHYDE
MAY CAUSE CANCER
CAUSES SKIN, EYE AND RESPIRATORY IRRITATION
AUTHORIZED PERSONNEL ONLY**

Receptacles containing formaldehyde shall be labeled as follows:

**DANGER
FORMALDEHYDE-CONTAMINATED [CLOTHING] EQUIPMENT
MAY CAUSE CANCER
CAUSES SKIN, EYE AND RESPIRATORY IRRITATION
DO NOT BREATHE VAPOR
DO NOT GET ON SKIN**

G. OXIDIZING CHEMICALS

An oxidizer is defined as a substance that yields oxygen readily to stimulate the combustion (oxidation) of organic matter. Chlorate (ClO₃), permanganate (MnO₄) and nitrate (NO₃) compounds are some examples of oxidizers.

1. Separate oxidizers from all other chemicals when storing.
2. Oxidizers, cyanides and pyrophoric metals shall be stored away from flammable liquids and solvents.
3. Oxidizers shall be stored below bench level.
4. Small quantities of pyrophoric metals (lithium, sodium, potassium and magnesium) shall be stored under a containing liquid (not H₂O) to avoid contact with air or water. Pyrophoric metals shall not be stored in an area where fire sprinklers are used.
5. Compressed gas cylinders of oxygen must be stored at least 20 feet from flammables or separated by a fire wall.

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H. PERCHLORIC ACID

Perchloric acid is highly volatile and requires special precautions when handling. Contact with combustible materials (wood, paper, grease, oil and most organic compounds) can cause these materials to become extremely flammable and may explode on heating by impact, friction or spontaneous ignition.

1. Use of perchloric acid shall be restricted to specially designed perchloric acid hoods. Currently EMU does not have any perchloric acid hoods.
2. Use of perchloric acid requires the approval of the Environmental Health and Safety and a peer review group.
3. A SOP is required for the use of perchloric acid along with special training on the specific safety hazards that are present with the use of perchloric acid.

I. PEROXIDE FORMING CHEMICALS

Chemicals that decompose into peroxides present a serious hazard. After peroxides form, they may dry in the threads on the container's top or may become concentrated if the chemical is distilled. Dry or concentrated peroxides formed in this manner are **highly explosive**.

1. All [potential peroxide forming chemicals](#) shall be labeled with the date the container was received from the supplier and the date the container was first opened, even if the chemical contains inhibitors to retard peroxide formation.
2. Containers shall be emptied and disposed of within three, six, or twelve months after the date they were first opened. These storage limits shall be used to determine expiration dates of these chemicals.
3. Any peroxide forming chemical shall be used or disposed of prior to the expiration date.

Reference [Section 8](#), Waste Disposal, for more information on disposal of peroxides.

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J. PICRIC ACID

Picric acid (trinitrophenol) is explosive when it is dry. Dry picric acid is more explosive than TNT. Picric acid in at least a 10% water solution is considered flammable but not explosive. Picric acid in less than a 10% solution is considered explosive and should not be handled. Dry picric acid can accumulate on the outer surface of the container or in cap threads. Dry picric acid in cap threads is not always visible and can present a significant friction-sensitive hazard. Extreme caution should be given to containers with metal caps containing any solution of picric acid. Shock-sensitive picrates are formed when picric acid vapors come in contact with metals such as copper, lead or zinc. Contact with concrete floors can also form sensitive calcium picrate salts. Extreme caution should be exercised when encountering bottles of picric acid with the following characteristics:

1. Little or no moisture content within the bottle.
2. A metal cap on the container.
3. Any observable needle-like structures within the container.
4. Any sign of accumulation on the surface of the bottle.

IN ANY OF THESE CASES, CONTACT ENVIRONMENTAL HEALTH AND SAFETY IMMEDIATELY AND DO NOT ATTEMPT TO MOVE THE CONTAINER. IT WILL BE MOVED BY QUALIFIED SAFETY PERSONNEL WITH APPROPRIATE SAFETY EQUIPMENT PRESENT. THIS CONTAINER IS HIGHLY EXPLOSIVE!

K. REACTIVE CHEMICALS

Chemicals or combinations of chemicals that react violently or explosively, releasing a large amount of energy are referred to as reactive. This type of chemical could also produce toxic or flammable vapors. A reactive chemical is classified as one that:

1. Is described as such in the SDS.
2. Is ranked by the NFPA as a 3 or 4 for reactivity, or GHS categories 1 and 2.
3. Is identified by the DOT as an oxidizer, organic peroxide, or a class A, 8 or C explosive.

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4. Fits the EPA definition of a reactive solid in [40 CFR 261.23](#).
5. Fits the [OSHA definition of unstable](#).
6. Readily undergoes violent change without detonating.
7. Reacts violently with water.
8. Generates toxic gases or vapors sufficient to endanger human health or the environment when mixed with water.
9. Is sulfide or cyanide bearing and generates toxic gases or vapors when exposed to pH conditions between 2.0 and 12.5.
10. Is capable of detonation or explosive decomposition or reaction at standard temperature and pressure.
11. Is a chemical in pure state which will vigorously polymerize, decompose, condense or become self-reactive under conditions of shock, pressure or temperature.

All reactive chemicals shall be handled with extreme care and segregated from other chemicals that could cause a violent reaction. Proper PPE must be worn at all times when handling these chemicals.

L. REPRODUCTIVE TOXINS

Reproductive toxins are chemicals which adversely affect the reproductive capability of both men and women and include mutagens and teratogens. To identify all reproductive toxins would be next to impossible, however, the most recent listings of reproductive toxins can be found in [Proposition 65-OEHHA](#).

1. It is **strongly recommended** pregnant women take additional precautions to reduce or eliminate exposure to reproductive toxins. It is also suggested that pregnant women request a change in assignment if they believe they are at risk of exposure to reproductive toxins.
2. Reproductive toxins shall be handled in a manner which minimizes contact with the chemical.
3. Anyone handling open containers of reproductive toxins shall do so only in a clearly marked “designated area” with restricted access to unauthorized personnel. This area shall be posted with signs reading “DANGER –

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REPRODUCTIVE TOXINS”.

4. All operations involving reproductive toxins shall be done in a fume hood, glove box or other closed item.
5. Use appropriate spill containment procedures when working with reproductive toxins.
6. PPE shall be worn when handling reproductive toxins.
7. Faculty, staff, and students shall be advised of potential exposures to reproductive toxins.

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I. DEPARTMENTAL CUSTOMIZATION OF THE CHP

- A. Each department /laboratory must customize this portion of the CHP with laboratory specific standard operating procedures (SOPs). The lab specific SOPs must include the following:
1. Each procedure must have its own SOP. Similar procedures may be grouped together under one SOP.
 2. Each procedure conducted must include the required PPE, emergency controls and workplace practices.
 3. Waste disposal information must be included for all hazardous waste generated by the procedure.
 4. Special approval requirements, if any.
 5. Requirements for peer group review, if any.
 6. To assist with SOP development, please use the [Laboratory Specific Standard Operating Procedures form](#).

II. RUNNING CHEMICAL REACTIONS OR EXPERIMENTS

- A. Personnel working in a laboratory should be familiar with the chemicals, reactions and potential hazards of the chemicals being used by everyone working in the laboratory.
- B. Follow proper handling procedures to avoid overheating, static electricity, open flames, mechanical shock, friction or grinding that may cause a hazard.
- C. Familiarize laboratory staff with any side reactions, intermediates or possible hazardous products.
- D. Decide in advance the order and rate of addition of chemicals or reactants. Allow for initiation periods to avoid a seriously exothermic reaction.
- E. Follow accepted standards from this CHP regarding PPE, housekeeping, handling of hazardous materials and proper use of lab equipment, as well as lab specific SOPs.

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- F. Familiarize laboratory staff with quantity and rate of heat or gases released during reactions and whether this is a possible auto-ignition point.
- G. Familiarize laboratory staff with chemicals and reactions which are unstable to heat, light, water, pressure, air and/or metal. Also, be aware of any chemical decomposition, reactions producing toxic by-products or one that becomes impact sensitive.
- H. Familiarize laboratory staff with any catalysts or inhibitors used and how violent the reaction will be.
- I. Anticipate warning signs of experiments that have gone wrong (e.g., emanating glow, sudden rise in temperature or pressure, darkening or sudden gas production).
- J. Understand the recommended first aid treatment in case of accidental exposure.
- K. Determine how waste products will be handled and properly dispose of them.
- L. Remove any incompatible materials from the vicinity of the reaction.

Experimental intermediates and products are generally novel chemical entities whose toxicities are largely unknown. Therefore, it is essential for all experimental compounds to be handled as potentially hazardous.

III. PLANNING FOR EMERGENCIES

- A. In planning for emergencies the following situations must be considered.
 - 1. Electrical power failure.
 - 2. Cooling system failure.
 - 3. Ventilation system failure.
 - 4. Over pressurization.
 - 5. Water leaks.
 - 6. Air leaks.
 - 7. Fire (Appropriate extinguishing agents should be nearby).

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8. Reaction container breaks.
9. Spills (Reference [Section 8](#) on Chemical Spills).

B. When an emergency occurs, be prepared to:

1. Provide adequate cooling, ventilation, pressure relief and gas purging for the reaction **only**, if this can be done safely.
2. Isolate the reaction vessel and frequently inspect the equipment.
3. Warn others in the working area of the possible hazards.
4. Stay in a safe area and monitor the situation.
5. Immediately report all accidents and unusual occurrences to your supervisor.
6. Evacuate the area if unsafe conditions exist or are suspected.

IV. OVERNIGHT EXPERIMENTS

- A. Efforts shall be made to minimize the need for overnight experiments. When they are unavoidable:
1. The area shall be properly labeled as to the type and nature of the experiment. Procedures, chemicals used and emergency contact names shall be included in this information. The outside laboratory door shall also be labeled with this same information.
 2. Only steam and electrically heated units shall be used on experiments which are left unattended.
 3. Tubing connections to condensers shall be secured at all points to prevent accidental flooding.

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I. PURPOSE

At no time should experiments of questionable safety be conducted. If there is any question regarding the potential hazard of an experiment, please consult Environmental Health and Safety. Unusual hazards include, but are not limited to:

1. Chemicals that are unstable and could explode.
2. Chemicals that are highly reactive with air or water vapor and require special handling techniques.
3. Use of a restricted chemical.
4. Chemicals that are highly toxic and in quantities that could produce a serious health hazard or potentially fatal exposure if accidentally spilled or released.
5. Experiments that require large amounts of flammable liquids or pyrophoric metals.

Questions and concerns should be directed to knowledgeable departmental faculty/staff and/or Environmental Health and Safety.

II. GLASSWARE AND GLASS APPARATUS HANDLING

- A. Glass bottles containing ammonia, nitric acid, or other corrosive chemicals shall be opened with care.
- B. When inserting glass rods or similar objects into a stopper or rubber tubing, the tubing shall be grasped close to the stopper. It is recommended a "Tube-on" (spreader device) be used.
- C. Long glass tubing or apparatus shall be carried vertically, not horizontally, if at all possible.
- D. Inspect glassware for defects prior to each use.
- E. Large beakers and flasks shall be supported on the bottom and picked up by grasping them around the outside, not by the rims or lips.
- F. Clamps shall not be used to pick up flasks or beakers.

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- G. Beakers or flasks of more than a two-liter capacity shall not be heated by direct flame or hotplate.
- H. Extra care shall be given when stoppering a volumetric flask. Hold the top with thumb and forefinger, screwing the cork or stopper downward with the other hand. Support both the neck and the bottom when handling filled or partially filled flasks.
- I. Erlenmeyer flasks shall not be tightly stoppered before chilling in an ice bath or the refrigerator. The slight vacuum formed can be sufficient to break the flask.

III. FUME HOODS

Fume hoods are essential laboratory safety equipment. Fume hoods are designed to remove hazardous air contaminants, contain explosions and fires and provide general ventilation for the laboratory. Training should be provided on the proper use and maintenance of fume hoods to ensure maximum protection.

- A. Fume hoods shall be used for all operations involving toxic vapors, mists, fumes and/or dusts.
- B. Any fume hood which is malfunctioning shall not be used. Stop all reactions and close the sash. Report all malfunctions to Environmental Health and Safety.
- C. Always obey the fume hood alarms. Do not simply press the mute button and continue working. You may expose yourself and others to hazardous chemicals.
- D. Storage of equipment and chemicals in a fume hood is prohibited. Storage interferes with adequate air exchange and removal of contaminated air. Only the materials being used during the process shall be stored in the hood.
- E. Work in a fume hood should be conducted at least six inches back from the hood face. This allows for adequate air flow.
- F. If large equipment is used in the hood, it should be supported one to two inches off of the bench top to allow airflow under the equipment.
- G. A piece of paper or tissue should be placed at the face of the fume hood to indicate air flow into the fume hood.
- H. Fume hood sashes shall be kept lowered to contain projectiles and splashes.

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- I. Fume hoods shall be certified annually to assure proper function. This shall be conducted by Environmental Health and Safety. Records of all fume hood inspections shall be kept and maintained by Environmental Health and Safety.
- J. Condensers, traps or other devices that collect vapors shall be used in fume hoods.
- K. Fume hoods **shall not** be used as storage areas for chemicals.
- L. Fume hoods shall not be used to dispose of waste chemicals by evaporation unless the vapors are recovered for proper waste disposal.
- M. Flammable liquids shall never be stored in a fume hood. This would present a serious fire hazard if a fire erupts in the hood.
- N. Noxious chemicals shall be stored in ventilated cabinets under the fume hood.
- O. Solvent waste bottles may be stored in a fume hood while they are being filled. Waste bottles must be capped when not being filled.

IV. COMPRESSED GAS CYLINDERS

- A. Cylinders shall be restrained at all times by a chain or belt around the middle of the cylinder, never around the neck.
- B. Cylinders not in use must be capped, and when taken out of service, the regulators shall be removed.
- C. Only needed cylinders shall be present in the laboratories. Reserve and empty cylinders shall be taken to a specified storage area.
- D. Cylinder storage areas shall be designed to ensure first in, first out usage.
- E. Cylinder storage areas shall be labeled as to the type of gases present and whether the cylinders are full or empty. Full and empty cylinders shall be stored separately and properly labeled.
- F. Cylinders shall be restrained and used in clean, cool, well ventilated areas, protected from weather and away from direct sunlight.
- G. Cylinders shall never be subjected to temperatures above 125° F or allowed to come in contact with a direct flame.

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- H. Cylinders shall only be moved on properly equipped carts, with all valves closed and the cylinder capped. A cylinder shall never be dragged or rolled.
- I. Cylinders may reach internal pressures of 2200 pounds per square inch. A broken valve will give it jet power, propelling it at high speeds.
- J. All cylinders of flammable gases shall be grounded before opening and during use. Noncombustible gases such as nitrogen and carbon dioxide shall be grounded only if used in an area of high solvent concentrations.
- K. Do not use the color of a cylinder for identifying its contents. Read the label.
- L. Valves are threaded and fitted for specific kinds of cylinders. Do not try to force valves onto another cylinder.
- M. Oxygen and other oxidizing gases shall be restrained at least 20 feet from fuel, gases, and any highly combustible material or kept on opposite sides of a fire wall. Never oil or grease an oxygen fitting or valve because it may ignite.
- N. Open cylinders slowly while standing to the side of the reducing valve. Valve handles that are stuck shut shall not be forced open with a hammer or wrench.
- O. Do not attempt to repair leaks in faulty cylinders or valves. Notify your supervisor if a defective cylinder is found.
- P. Use only pressure tubing and piping in conjunction with a gas cylinder. If there is a potential for liquid being aspirated back into the cylinder when emptied, a trap shall be used between the cylinder and the equipment.
- Q. When the pressure reaches the lowest regulator value, the cylinder shall be marked empty (MT) and recapped for return to the storage room. Always treat empty cylinders as if they are full, as gas is still present.
- R. For additional information regarding compressed gas cylinders, please see the [EMU Compressed Gas Cylinder Handling and Storage Guideline](#).

V. CENTRIFUGES

- A. The centrifuge cover shall not be opened until the rotors have come to a complete stop. Interlocks prevent opening of the cover before the rotors have stopped. A sign stating "Do Not Open Cover Until Rotor has Stopped" shall be posted on centrifuges **not** equipped with interlocks.

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- B. Rotors on ultrahigh speed centrifuges shall be inspected by a manufacturer representative according to the schedule recommended by the manufacturer.
- C. Ultra high speed centrifuges shall be checked before each use. Rotors exhibiting any visible damage shall be locked and/or tagged out until a manufacturer's service representative has cleared the centrifuge for use.
- D. Logs shall be kept for each high speed rotor listing the hours it has been used and the speeds obtained.
- E. The laboratory supervisor is responsible for ensuring rotors are checked and the logs maintained.
- F. Ensure aerosol formation from hazardous organisms is prevented by using plugs, celluloid caps, or by completely containing the sample in screw cap jackets.
- G. Biosafety cabinets shall be used to contain hazardous organisms while centrifuging.
- H. Chipped or cracked tubes shall never be used. A dry run under the proposed experimental conditions shall be done prior to centrifuging infectious materials.
- I. All breakages containing hazardous organisms shall be reported to your supervisor and to Environmental Health and Safety immediately.

VI. REFRIGERATORS AND COLD ROOMS

- A. Chemicals or samples placed in the refrigerator shall be stoppered and identified.
- B. Storage shall be frequently checked to eliminate old and unmarked containers.
- C. Hazardous materials stored in glass shall be placed in an unbreakable container that will hold the sample volume if the glass is broken.
- D. Chemicals or samples placed in Erlenmeyer flasks at room temperature shall not be tightly stoppered before placing in a refrigerator. A slight vacuum can form, enough to break the flask.
- E. Large quantities of dry ice shall not be kept in cold rooms. Dangerous levels of carbon dioxide can accumulate.

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- F. Materials that explosively decompose at room temperature shall only be stored in explosion-proof refrigerators.
- G. Warning signs indicating any special precautions required shall be highly visible and strictly enforced.

VII. DRYING OVENS

- A. Ovens equipped with a sparking-type thermostat shall not be used to evaporate flammable solvents.
- B. Crystals wet with solvent shall never be placed in a hot oven of any design.

VIII. SHAKERS

- A. Proper PPE shall be worn during all shaker operations.
- B. Individual flasks shall be carefully secured in or on racks.
- C. Removable racks or trays shall be tightly locked into place before operating.
- D. Portable shakers shall be secured so they do not walk during operation.
- E. Never attempt to touch or handle any article on the shaker while it is in motion.
- F. Infectious materials may require the use of separate isolation rooms.

IX. VACUUM DESICCATORS

- A. Desiccators under vacuum pressure shall never be exposed to direct sunlight or infrared lamps.
- B. The lid shall always be slid off of the desiccator, never pried off.
- C. The flange shall be kept free of foreign materials.
- D. Vacuum desiccators shall be shielded or contained for possible implosion and flying glass.

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X. VACUUM DISTILLATIONS

- A. Proper PPE shall be worn at all times when working with vacuum distillations.
- B. All equipment and glassware shall be inspected for damage prior to each use.
- C. High vacuum distillations shall always be conducted with adequate shielding, preferably in a hood.
- D. For high vacuum distillations, Erlenmeyer flasks shall not be used as receivers. Only round-bottomed *Pyrex* distillation flasks or standard suction flasks without sidearms are suitable.
- F. If it is necessary to break the vacuum during the distillation, the heat shall also be stopped to prevent excessive rates of distillation when the vacuum is turned back on.
- G. Before disconnecting any part of the apparatus, all vacuums shall be released.
- H. Substances distilled at high temperatures under a vacuum are often explosive and shall be allowed to cool before coming into contact with air.
- I. Traps and positive check valves shall be used in the line when air is removed by means of a water pump. Liquid nitrogen or dry ice/acetone traps shall be used for high vacuum systems.
- J. For low vacuum systems, vessels having a capacity greater than two liters shall be shielded prior to use.
- K. Ordinary, soft glass bottles shall never be used for a vacuum system. Flat-bottomed flasks shall also never be used unless made of heavy-walled *Pyrex* and are cold.

Note: It is a common misconception that danger of collapse exists only with high vacuum systems. However, low vacuum systems produced by a water aspirator or laboratory vacuum line can exert a collapsing force of nearly 90% as great as that caused by a perfect vacuum.

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XI. LABORATORY VACUUM LINES

- A. Proper traps shall be used to protect house vacuum systems and laboratory vacuum pumps from liquids, flammable vapors and pathogenic materials.
- B. Liquid nitrogen or dry ice/acetone traps shall be used during vacuum distillations.
- C. Ethers and other highly volatile liquids shall not be drawn into the house vacuum system.
- D. Water aspirators shall not be used to remove ether as the vapors collect and present an explosion hazard in the city sanitary sewer system.
- E. A suitable trap (bubbling bottle through a germicidal solution) shall be used when working with virulent pathogens. This shall be placed between the lines and the pathogenic material to prevent passage into the fixed system.
- F. Vacuum pumps shall be properly guarded.

XII. AUTOCLAVES

- A. Follow all manufacturer instructions for proper use and maintenance.
- B. Avoid contact with steam. Always wear the appropriate PPE (gloves, goggles and aprons if required).
- C. Before starting the autoclave, ensure the door is securely closed to prevent steam leaks. Periodically inspect the door gaskets.
- D. After sterilization, wait until the chamber pressure has reached atmospheric pressure before opening the door. Open slowly as residual steam may be present in the chamber.
- E. All autoclaves should be spore tested at least monthly to ensure proper temperatures and pressurization are being achieved.
- F. Documentation of spore testing shall be maintained.

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XIII. SEPARATORY FUNNELS

- A. Pressure generated from shaking volatile liquids must be released frequently. Pressure build-up will cause the separatory funnel to explode or cause the stopper to be forced out and the liquid thrown on the worker or nearby hot surfaces where they might ignite.

- B. Separatory funnels should be handled behind a hood window or blast shield.

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I. SPILL CONTROL POLICY

Spills are classified as either hazardous or incidental. A hazardous spill is an emergency of unknown nature, a situation which may be immediately dangerous to life and health, is a threat to personnel and/or the public, threatens the surrounding area or facility, and/or involves a toxic gas leak, or a toxic, corrosive, or reactive hazardous material. **All hazardous spills shall be cleaned up by members of a hazardous clean-up response team.** An incidental spill is an incident in which there is no fire hazard and involves low to moderately toxic materials in small amounts which can be absorbed, neutralized, contained or otherwise controlled by employees in the immediate release area. In general, incidental spills can be cleaned up by the individual who was using, storing, or transporting the material spilled, as long as they are properly trained, use approved spill clean-up kits and PPE. If the individual is not properly trained, another trained individual should be called for the cleanup.

II. HAZARDOUS SPILLS

- A. Evacuate the immediate area.
- B. Close all doors leading into the spill area.
- C. Assist contaminated persons to a safety shower or eyewash station.
- D. Report the spill immediately to your supervisor and to Environmental Health and Safety. Report whether the spill has entered the air, ground, sanitary or storm sewers, or any surface water.
- E. Extinguish all sources of ignition and keep a fire extinguisher in the immediate area if a flammable liquid has been spilled.
- F. Toxic spills that have a LD50<50 mg/kg are considered highly toxic and shall be reported immediately to your supervisor and to Environmental Health and Safety. These types of spills may include suspect carcinogens or reproductive toxins.

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III. INCIDENTAL SPILLS

If you are unsure of the hazardous nature of a spill, or need assistance with selection of PPE, contact Environmental Health and Safety prior to any attempt of cleaning up the spill. Cleanup of incidental spills should only be conducted by those people who have been properly trained and have the appropriate spill clean-up kits and PPE. Training shall be provided by your department or by Environmental Health and Safety.

- A. Assess the hazard.
- B. Wear appropriate PPE. At a minimum, this requires gloves, lab coat and safety glasses/goggles.
- C. Neutralize strong acids and bases.
- D. Contain the spill with appropriate spill clean-up kit.
- F. Clean up the spill with approved clean-up kits located either in the laboratory or in the stockroom.
- G. Temporarily place contaminated clean-up materials containing volatile solvents or chemicals in a fume hood or put them in buckets for disposal.
- H. **ALL** chemical spill clean-up material must be disposed of as hazardous waste.
- I. The person responsible for the clean-up shall write a brief report describing how the spill occurred and the clean-up procedures used. A copy shall be sent to your supervisor and to Environmental Health and Safety.

IV. MERCURY SPILLS

Mercury vapors are highly toxic. All spills of mercury, no matter how small, shall be considered toxic and must be cleaned up by using a mercury spill clean-up kit. These can be obtained from Environmental Health and Safety. All collected mercury must be disposed of as hazardous waste. Mercury spills can be minimized by requiring the use of non-mercury-containing items.

- A. Contain the spill. A piece of stiff paper can be used to draw mercury beads together into a larger bead.
- B. Obtain a spill clean-up kit and collect the spilled mercury.

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- C. The mercury must be disposed of as hazardous waste.
- D. The person responsible for the clean-up shall write a brief report describing how the spill occurred and the clean-up procedures used. A copy shall be sent to your supervisor and to Environmental Health and Safety.

V. HAZARDOUS WASTE DISPOSAL

It is Eastern Michigan University's policy to minimize its impact on the environment through pollution prevention, waste minimization, recycling and reuse. It is also policy to properly dispose of laboratory wastes in accordance with all federal, state and local regulations. EMU [Hazardous Waste Procedures](#) shall be followed. Questions regarding hazardous waste disposal shall be directed to Environmental Health and Safety at 487-0794.

VI. IDENTIFICATION OF HAZARDOUS WASTES

The definition of a hazardous waste is derived from the [Federal Resource Conservation and Recovery Act \(RCRA\)](#) and the [Michigan Hazardous Waste Management Act](#). The following are examples of the most common hazardous wastes.

- A. Any listed hazardous waste ([40 CFR Part 261](#); [Act 451 Part 121](#)).
- B. Halogenated organic compounds (Bromine, Chlorine, Fluorine and Iodine).
- C. Cyclic aromatic organic compounds.
- D. Known human carcinogens.
- E. Known reproductive toxins.
- F. Concentrated chemotherapy drugs or experimental chemotherapy drugs.
- G. Ignitable or flammable compounds or mixtures with a flashpoint of less than 60°C (140°F). Exceptions to this are aqueous solutions containing less than 24% alcohol by volume.
- H. Oxidizers or oxidizing agents, defined as a compound that may cause or enhance the combustion of other materials.
- I. Corrosive compounds (pH ≤2 or ≥ 12.5).

- J. Compounds that react violently with air or water.
- K. Explosives.
- L. Liquids that are not water miscible.

EXAMPLES OF METALS CAUSING SOLUTIONS TO BECOME HAZARDOUS				
Antimony	Cobalt	Iridium	Platinum	Tellurium
Arsenic	Copper	Lead	Rhenium	Thallium
Barium	Gallium	Manganese	Rhodium	Tungsten
Beryllium	Germanium	Mercury	Ruthenium	Vanadium
Cadmium	Hafnium	Nickel	Selenium	Zinc
Chromium	Indium	Osmium	Silver	

VII. LIQUID HAZARDOUS WASTE DISPOSAL

- A. Liquid wastes which are described above as hazardous shall be placed into empty 4-liter (or gallon) plastic bottles for storage and later disposal.
- B. A [Hazardous Waste Label](#) shall be placed on the bottle before any waste is put into it. Labels can be obtained from Environmental Health and Safety.
- C. Each bottle shall be properly labeled as to the type of waste it contains. (e.g., Acetone, Methanol, Xylene, Chloroform, Methylene Chloride, etc).
- D. Record the name and amount of each chemical added to the waste bottle.
- E. When adding new waste to a bottle, check to see that the new waste is compatible with the original contents.
- F. Halogenated and immiscible wastes shall be segregated.
- G. The bottle shall be kept closed at all times, except when adding waste.

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- H. Store partially filled waste bottles where they will not be broken or contaminate the work area.
- I. Waste bottles must be dated when waste is first placed in the jug.
- J. When the bottle is full, complete the rest of the information on the hazardous waste label. Include the percentages of each chemical and the date the bottle became full. The % column must equal 100%.
- K. A bottle is full when the liquid level reaches close to, but not all the way to the top of the bottle. This will prevent the build-up of excessive vapors while ensuring adequate room for expansion.
- L. Transport the bottles in safety containers or on a cart equipped with side rails to your department's designated storage location.
- M. All liquid waste shall be removed from the facility by a licensed hazardous waste contractor.
- N. Contact Environmental Health and Safety for information regarding hazardous waste pick-ups.

VIII. WASTE DISPOSAL OF HIGHLY VOLATILE AND PEROXIDE-FORMING COMPOUNDS

- A. Any highly volatile or peroxide-forming compound that is packaged in a metal can shall be collected as a waste and put into that same type of can.
- B. A small amount of oxidation inhibitor shall be added to prevent the formation of peroxides.
- C. Acidic peroxide-forming compounds shall be neutralized before being placed into a can for disposal.
- D. Cans shall be labeled and handled as described in the Liquid Hazardous Waste Disposal Section.

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IX. SOLID HAZARDOUS WASTE DISPOSAL

- A. Solid hazardous waste shall not be disposed of in the laboratory waste bins or office waste baskets.
- B. Containers with solid hazardous waste shall be labeled with a hazardous waste label, the chemical name, and the name and room number of the person disposing of the waste.
- C. Waste containers shall be taken to the chemical stockroom or designated waste storage location.
- D. Waste is to be removed from the facility only by a licensed hazardous waste contractor.

X. CHEMICAL DESTRUCTION OF HAZARDOUS CHEMICALS

These procedures are not recommended because quality assurance cannot be guaranteed. Many suggested procedures have not been proven, and therefore cannot be recommended as a means of disposal. In addition, the neutralization or detoxification of chemicals as a means of disposal is strictly prohibited unless proper permits are obtained from the state. Eastern Michigan University currently does not possess any of these permits.

XI. DISPOSAL OF EXPERIMENTAL COMPOUNDS

- A. Experimental compounds of unknown toxicity shall be disposed of as hazardous waste.
- B. Label the container with your name, department, and chemical structure.
- C. Under no circumstances shall the unknown compound be disposed of down the drain or in laboratory trash bins.

XII. DRAIN DISPOSAL OF CHEMICALS

- A. Sugars, salts and starches that do not contain any hazardous material may be put down the drain only if they present no possibility of coagulation within the drain.

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B. "Neutral" buffer solutions (pH between 6 and 8) may be put down the drain.

C. DRAIN DISPOSAL OF ALL OTHER CHEMICALS IS PROHIBITED.

XIII. DISPOSAL OF BROKEN GLASS

A. Clean, non-contaminated, broken glass shall be placed in a yellow 5 gallon plastic pail labeled for broken glass. These are provided by Environmental Health and Safety.

B. Contaminated broken glass that cannot be decontaminated shall be placed in a white 5-gallon plastic pail and labeled as contaminated broken glass. This shall then be disposed of with other hazardous waste.

C. Broken glass shall never be placed in regular trash bins.

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I. EMPLOYEE OCCUPATIONAL INJURY/ILLNESS

Any employee who requires medical treatment for a work-related injury must seek treatment at one of the designated clinics found in the [Employee Occupational Injury Report Packet](#). Except in the case of a life-threatening emergency, failure to seek treatment at an EMU designated clinic may delay or cause your claim to be denied.

- A. If the injury/illness is due to a chemical exposure, have someone other than the victim obtain a Safety Data Sheet (SDS) on the suspected chemical(s) and provide this to the medical facility at the time of treatment.
- B. All job related injuries must be reported to your supervisor. Both the employee and the supervisor must fill out the [Employee Occupational Injury Report and Authorization for Treatment Form](#) and send it to the HR Benefits Office at injury_report@emich.edu.

II. FOLLOW-UP EXAMINATIONS

Follow-up medical examinations shall be provided by one of the designated clinics to employees under the following circumstances:

- A. Whenever an employee develops signs or symptoms associated with use of a hazardous chemical.
- B. Where exposure monitoring reveals levels routinely above the Permissible Exposure Limit (PEL).
- C. Whenever a spill, leak, explosion or other occurrence takes place resulting in the likelihood of a hazardous exposure.
- D. Following contact with a potentially infectious material that results from the performance of an employee's duties.

III. MAJOR INJURIES/HEART ATTACK

- A. For major injuries or heart attacks, call 911. Stay with the victim. **If needed, you may begin CPR if you are trained in CPR.** If you start CPR, you must continue care, up to your level of training, and stay with the victim until advanced medical help arrives.

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- B. It is recommended that each department have staff trained to perform CPR. [CPR Classes](#) are available through Environmental Health and Safety. Call 487-0794 to register.

IV. ELECTRICAL SHOCK

Electricity will always take the path of least resistance. If you are part of the circuit, serious injury or death may occur. An ordinary 110-volt current may be fatal if you are effectively grounded.

- A. Do not go near the victim until you have verified that the power source has been turned off.
- B. Call 911 for immediate medical attention.
- C. You may give CPR **only** if needed and you are properly trained.
- D. Never touch an electrical switch, outlet, plug or other electrical equipment when your hands are wet, when you are standing in water, or when you are touching water faucets or other grounded items.

V. PREPARING FOR EMERGENCIES

- A. All laboratory doors shall be posted with [door signs](#) indicating the possible hazards. The signs should list the emergency phone numbers of laboratory supervisors and other emergency contacts. Home and/or cell phone numbers should not be listed on the laboratory signs. It is the department's responsibility to provide the Department of Public Safety with an updated list of home and/or cell phone numbers for all laboratory supervisors and other emergency contacts.
- B. It is recommended that departments and laboratories place phone numbers of emergency contacts and laboratory supervisors next to each phone.
- C. Departments are responsible for training employees on emergency evacuation procedures and routes.
- D. The Emergency Management Department has developed [Building Emergency Response Plans](#) for each building. These plans encompass responsible parties and procedures for dealing with medical, fire, explosion, hazardous materials and severe weather emergencies. A summary of these plans can be found in the EMU [Emergency Response Procedure Guide](#) which should be posted in all laboratories.

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- E. When an emergency announcement has been heard, move immediately to your designated meeting location. Each department has a designated location where personnel are to meet in an emergency.
- F. Familiarize yourself with emergency exits, meeting places and shelter areas. Fire and severe weather drills may be conducted to ensure such familiarity.
- G. Supervisors, with the assistance of Environmental Health and Safety, are responsible for training of personnel, readiness of emergency equipment and orderly execution of the emergency plan in their departments or areas.

VI. FIRE EMERGENCY PROCEDURES

- A. If the fire is small, you may elect to use a fire extinguisher **only** if you have been trained and there would be minimal danger to yourself or others.
- B. If you choose not to use an extinguisher, the fire is unmanageable, or the fire is not extinguished within 30 seconds, pull the closest red fire alarm pull station.
- C. If an alarm is sounded all personnel **must** initiate the emergency evacuation plan immediately.
- D. Call 911 to report the fire, from outside the fire area.
- E. A brief written report of all actions taken shall be given to Environmental Health and Safety and Risk and Emergency Management.

VII. FIRE EXTINGUISHERS

Fires are caused by different sources. Knowledge of the types of fires and the appropriate extinguisher to use is essential for safely extinguishing a fire. **DO NOT attempt to extinguish a fire unless you've received appropriate training and can safely put out the fire.** Using the wrong type of fire extinguisher could cause the fire to spread and may cause serious injury to those trying to put out the fire. The types of fires and recommended extinguishers are listed below.

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TYPES OF FIRES	
CLASS A	Ordinary Combustibles (wood, paper, fabrics, rubber, many plastics)
CLASS B	Flammable Liquids and Gases (gasoline, paint, oils, lacquer, grease, tar, natural and manufactured gases)
CLASS C	Energized Electrical Equipment (wiring, motors, switches, generators, panels, appliances)
CLASS D	Combustible Metals and Combustible Metal Alloys

RECOMMENDED TYPES OF EXTINGUISHERS	
ABC DRY CHEMICAL	Use for Class A, B, or C type fires
CARBON DIOXIDE (CO₂)	Use for Class B or C type fires
HALON 1211	Use for Class A, B, or C type fires
REGULAR DRY CHEMICAL	Use for Class B or C type fires
SUPER - D (SODIUM CHLORIDE)	Use for Class D type fires
WATER	Use for Class A type fires

VIII. Eyewash and Safety Showers

- A. Emergency showers and eyewash stations provide on-the-spot decontamination. They allow workers to flush away hazardous chemicals that can cause injury. Know the chemicals that you are working with. Read the Safety Data Sheets (SDS).
- B. The location of eyewashes and safety showers is determined by a risk assessment of the potential hazards in the area.
- C. When a corrosive chemical comes into contact with eyes or skin, tissue damage begins immediately. The affected area must be irrigated immediately with water uninterrupted for 15 minutes.

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- D. The temperature of the water delivered should be between 60° F and 100° F and is checked annually by Environmental Health and Safety and Physical Plant. Plumbed eyewash stations should be tested and allowed to run long enough to clear the pipes of any sediment or debris that may have accumulated once a week. Identify and keep records of testing and maintenance of eyewash stations with the [weekly eyewash inspection form](#).
- E. The location of all eyewashes and safety showers must be clearly marked with an unobstructed, highly visible sign.
- F. Contact lenses must be removed as soon as possible to ensure that chemicals are not trapped behind the lenses and then the eyes can be completely rinsed of any harmful chemicals. Contact lenses are not recommended in laboratories.
- G. **Medical attention should be sought immediately.** The sooner medical attention can be given, the chances of not sustaining permanent damage or blindness is greatly improved.

CHP HISTORY

REVISION	DATE	CHANGE(S)
0	8/1996	Initial Release
1	12/2017	<p>The entire document to the new header and document control format. In addition, language throughout the entire CHP was changed to emphasize accountability and responsibility within the laboratory and the need for training and documentation of training.</p> <p>Section 1 Updates</p> <p>Policy changed to Procedures. Disciplinary actions were moved from Deans, Directors and Department Head responsibilities to Procedure item 11. Disciplinary actions language updated. Providing and maintaining PPE and disciplinary enforcement added to supervisor, manager and faculty responsibilities. Chemical Hygiene Officer responsibilities added. Added section for Departmental and/or lab specific rules after the general safety rules.</p> <p>Section 2 Update</p> <p>Original language of CHP on Hazard Communication was replaced with the EMU Hazard Communication Program updated to the Globally Harmonized System requirements.</p> <p>Section 3 Updates</p> <p>Deleted smoking reference. Deleted reference to biological safety, deleted chapter 11 in the original CHP and section on cleaning and disinfection of infectious areas. Added Laboratory Specific Training section and checklist. Deleted handling of animals section. Updated the laboratory inspection form.</p>

		<p>Section 4 Updates</p> <p>Added purpose and listed specific responsibilities of deans, directions, department heads, faculty, managers, supervisors, employees, students and EHS. Changed workplace assessment to hazard assessments and updated assessment of PPE hazard assessments. Added face shields, head protection, foot and toe protection and body protection. Added when gloves are required and moved the glove reference table from text to chapter appendix.</p> <p>Section 5 Updates</p> <p>Combined chapters 5 and 8 of the original document. Added guidelines to the general chemical storage requirements. Updated signage changes for benzene, carcinogens and formaldehyde. Deleted chapter 12 references for PELs, carcinogens, peroxides and reproductive toxins were either incorporated into the web reference or added lists to text or tables in appendices.</p> <p>Section 6 Updates</p> <p>Moved customization of CHP to start of section from end of section. Added SOP form.</p> <p>Section 7 Updates</p> <p>Changed title to hazardous procedures and laboratory equipment. Hazardous procedures changed to purpose.</p> <p>Section 8 Updates</p> <p>Previously chapter 9. Deleted section on radioactive spills. Updated disposal of broken glass procedures. Deleted biological waste disposal. Deleted waste code table.</p>
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	12/2018	No updates
2	12/2019	<p>Section 2 Updates</p> <p>Safety Data Sheet Locations Poster</p> <p>Recently Received or Revised Safety Data Sheet Poster</p> <p>Hazardous Waste Label</p>
3	12/2020	<p>Section 3 Update</p> <p>Equipment Decontamination Form</p> <p>Section 4 Updates</p> <p>Hazardous Assessment Form</p> <p>Standard Operating Procedures</p> <p>Personal Protective Equipment Program Link</p> <p>Section 8 Update</p> <p>Hazardous Waste Label</p> <p>Section 9 Update</p> <p>Employee Occupational Injury Report and Authorization for Treatment Form - Link</p>
4	12/2021	<p>Section 9 Update</p> <p>Eyewash Activation Log</p>
5	12/2022	<p>Section 8 Update</p> <p>Hazardous Waste Procedures</p>

6	12/2023	CHP Links throughout document updated and minor edits to text Section 3 Update Laboratory Safety Survey Checklist Section 4 Update Glove Selection Chart