

THE UNIVERSITY OF MICHIGAN-FLINT  
The Environment, Health and Safety Department

**CAMPUS  
CHEMICAL  
HYGIENE  
PLAN**



Revised April 2005

~~Revised July 1999~~

~~November 1998~~

**Emergency Telephone Numbers**

UM-Flint *Public Safety*: Call 911 from any campus telephone or (810) 762-3333  
UM-Flint *Radiation Safety Officer (RSO)*: Call (810) 762-3144 or call Public Safety  
UM-Flint *Environment, Health and Safety Department (EHS)*: Call (810) 766-6763

**THE UNIVERSITY OF MICHIGAN-FLINT**  
Environment, Health and Safety Department

**CAMPUS CHEMICAL HYGIENE PLAN (CHP)**

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**Departmental CHPs**

Biology  
Chemistry  
Physics/Engineering  
Medical Technology  
Nursing  
Physical Therapy

## SCOPE & APPLICABILITY

The University-of Michigan-Flint (UM-Flint) is committed to providing a healthy and safe environment in which to work, teach and learn. As part of this commitment, the Environment, Health and Safety Department has developed this Campus Chemical Hygiene Plan that serves as the written guide for University of Michigan-Flint compliance with the laboratory safety standard and it's Chemical Hygiene Plan (CHP) requirements. All departments at the University engaged in the laboratory use of hazardous chemicals (as defined by this document) are required to comply with this document.

The Chemical Hygiene Plan establishes the basic safety principles for laboratory procedures, equipment and work practices that protect employees from physical and health hazards of hazardous chemicals in laboratories. Where the scope of hazards are not adequately addressed by this general CHP, specific standard operating procedures must be developed, implemented and enforced by the department or primary investigator or laboratory supervisor.

The CHP does not apply in the following circumstances:

1. Work involving chemicals that do not meet the conditions of the definition of laboratory use of hazardous chemicals. In such cases, the employer shall comply with all relevant specific substance standards even if such use occurs in a laboratory type setting.
2. Work involving the laboratory use of hazardous chemicals that does not have the potential for employee exposure.

This document will hereafter be referred to as the **University of Michigan-Flint Campus Chemical Hygiene Plan or CHP**.

## INDIVIDUALS IMPACTED

The CHP applies to all employees engaged in the *laboratory use of hazardous chemicals* as defined in this document. This includes full and part time employees, temporary employees, faculty, staff, and graduate/undergraduate work-study students.

## KEY DEFINITIONS

The following terms are only a few of the key definitions necessary in understanding the scope of the Chemical Hygiene Plan at UM-Flint. In Appendix B of this CHP there is a more comprehensive list of terms and definitions.

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

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

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

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

For the purposes of this document, the term employee means employees engaged in the *laboratory use of hazardous chemicals* as defined in this document. This includes full and part time employees, temporary employees, faculty, staff, and graduate/undergraduate work-study students.

## MICHIGAN LABORATORY SAFETY STANDARD

UM-Flint is required by the Michigan Occupational Safety and Health Administration (MIOSHA) Hazardous Work in Laboratory Standard (the laboratory standard - 408.1024 of the Michigan Compiled Laws) to ensure that the necessary work practices, procedures and policies are implemented to protect all employees working in University owned and operated laboratories from the hazards of chemicals in the work area.

MIOSHA Hazardous Work in Laboratories (adopted by MIOSHA 1/ 1 /92)

The Michigan Occupational Safety and Health Administration (MIOSHA) has determined that laboratories typically differ from industrial operations in the use and handling of hazardous chemicals. A different approach than that found in MIOSHA's substance specific health standards is needed to address this unique work environment. The laboratory standard applies to all laboratories that use hazardous chemicals in accordance with the definitions of laboratory use and laboratory scale provided in this document. Generally, where this standard applies it supersedes the provisions of all other standards in the MIOSHA Right-to-Know Law and the federal Occupational Safety and Health Administration (OSHA) Hazard Communication Standard 29 CFR, part 1910.1200, except the obligation to maintain employee exposures at or below the permissible exposure limits (subpart Z of 1910.1200), prohibition of skin and eye contact where specified by any OSHA/MIOSHA standard and in other instances where the scope of hazards are not adequately addressed by this standard. A copy of the Michigan Hazardous Work In Laboratories standard is attached as Appendix B for your reference.

All occupational health standards that do not deal with a specific chemical substance apply to laboratory operations, as do any occupational standards administered by Michigan Department of Labor. Such non-chemical substance standards that apply to Laboratory operations include all of the following rules:

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1. Ventilation Control - Occupational Health (OH) R 3101 & 3110
2. Ionizing and non ionizing radiation OH R 2410 & 2420.
3. Occupational noise exposure and hearing conservation-R 325.60101
4. Confined Space Entry - OH R 3301 & 3302.
5. General Respiratory Protection OH R 3502.
6. General Workplace requirements OH R 4101, 4201, & 4401.
7. Employee medical records and trade secrets R 325.3451

Copies of all federal and state health and safety rules can be obtained by contacting EHS at 766-6763.

### Permissible Exposure Limit (PEL)

The MIOSHA laboratory safety standard requires employers to ensure that laboratory employees' exposure to MIOSHA regulated substances do not exceed the permissible exposure limits (PEL) specified in MIOSHA occupational health standards.

## **CHEMICAL HYGIENE RESPONSIBILITIES AT UM-FLINT**

Responsibility for chemical hygiene rests at all levels including the campus chemical hygiene officer, department heads, laboratory supervisors, faculty, laboratory employees and work study students. Specific responsibilities are outlined below.

### Campus Chemical Hygiene Officer (CHO)

The Campus Chemical Hygiene Officer has the overall responsibility to support and monitor laboratory safety on the campus. Additionally, the campus CHO is responsible for the following:

1. The Environment, Health and Safety Department Manager, or designee, will act as the overall Campus CHO providing support and administrating the program. Individual departments will assign an individual as a departmental CHO.
2. Work with individual departments, primary investigators, laboratory supervisors, administration and others to develop and implement chemical hygiene policies and practices.
2. Assist departments and laboratory supervisors to develop precautions and adequate laboratory facilities.
3. Research current requirements concerning regulated substances.
4. Continue to improve the overall laboratory safety and chemical hygiene program.
5. Coordinate and conduct exposure monitoring.
6. Work with departmental CHOs to develop and implement an annual laboratory inspection program.
7. Inspect laboratories yearly to identify opportunities for improving the implementation of health and safety policies and procedures. Report areas of concern to the Department Chairperson and Departmental CHO/Laboratory Supervisor.

#### Dean, Directors and Department Heads

Dean, Directors and Department Heads is ultimately responsible for chemical hygiene within the departmental Laboratories. This includes ensuring that the Campus and a departmental CHP is implemented and enforced as well as the department's standard operating procedures are developed and followed by all laboratory employees. In addition, the they are responsible for the following:

1. Designate an individual within the department to carry out the responsibilities of a Department Chemical Hygiene Officer.
2. Support the continuing education in chemical hygiene.

#### Department Chemical Hygiene Officer/Laboratory Supervisors

The Department CHO (typically the Lab Supervisor) is responsible for the following:

1. Coordinate and/or write standard operating procedures (SOPs) for laboratory processes specific to the Chemical Hygiene Plan.

2. Inform employees of the requirements of the MIOSHA Laboratory Standard, its appendixes, and its location in the workplace. A copy of this standard, along with others, are located in the EHS Department, 217 UCEN.
3. Complete and update hazardous chemical inventories annually. Maintain a copy with the posted chemical hygiene plan and forward one copy to the Environment, Health and Safety Department.
4. Manage material safety data sheets (MSDSs) for the department. Obtain material safety data sheets (MSDSs) and ensure they are readily available for employees to review for each hazardous chemical in the laboratories. Provide a copy of MSDSs to EHS.
5. Inform employees of the OSHA permissible exposure limits for the hazardous chemicals listed on inventories and the signs and symptoms associated with exposures to these chemicals.
6. Train employees by:
  - Informing laboratory employees of their rights and responsibilities when working with hazards in their laboratory/work area.
  - Defining the specific methods and operations used in specific laboratories to determine the presence or release of hazardous chemicals.
  - Explaining the physical and health hazards of hazardous chemicals in the laboratory.
  - Recommending protective measures employees can take to protect themselves from exposure to hazardous chemicals.
  - Maintaining employee training records.
7. Inform and coordinate special, high-risk procedures, activities, or operations i.e. use of radioisotopes, Biohazard level 2 or greater with EHS. Provide appropriate training and documentation for employees working with these risks.
8. Where applicable, ensure that personal protective equipment, fire extinguishers, fume hoods, flammable liquid storage cabinets, biological safety cabinets, eye-wash /safety showers, first aid kits and spill cleanup kits are available and in good working order and that appropriate training for use of each item has been provided. Immediately notify the appropriate department/individuals such as Facilities Management of any safety equipment that is not properly functioning.
9. Have the following reference material available: University of Michigan-Flint CHP, Hazard Communication Program, Hazardous Waste Management Guidelines, and the Radiation Safety Manual. Material Data Safety Sheets (MSDSs) must be easily accessible to all employees. Copies of MSDSs are also maintained on file in the EHS Department.
10. Post emergency numbers by all telephones. Ensure that emergency procedures and evacuation maps are posted and remain posted in a conspicuous location in each of the laboratories.
11. Inspect laboratories at least yearly to identify opportunities for improving the implementation of health and safety policies and procedures. Correct any areas of

noncompliance and notify the Department Chairperson and the Environment, Health and Safety Department of **serious** safety concerns or areas of noncompliance.

12. Arrange for exposure monitoring with the Environment, Health and Safety Department if there is reason to believe that levels for a hazardous chemical exceed the action level or in the absence of an action level, the permissible exposure limits.
13. Notify employees of exposure monitoring results in writing within 15 days of receipt (Note: Initial analysis will be sent from EHS to department head and department CHO).

### Employees:

All employees working in UM Flint Laboratories share in the responsibility of maintaining a safe work environment. In addition, all employees are responsible for the following:

1. Become familiar with the chemicals that you are planning to use in your work area **PRIOR** to handling the chemicals. This includes reading MSDSs, department SOPs, the product label and any other relevant information concerning the safe and proper handling, storage, use and disposal of the specific chemical(s) in the laboratory.
2. Ask supervisor for assistance and guidance if health and safety information is not available or is not clearly understood. Report to your supervisor when no MSDS is available for the chemicals that you are handling. Do not work with the chemical until you have reviewed the health and safety information.
3. Follow SOPs as written by laboratory supervisor for processes using hazardous chemicals.
4. Use and maintain personal protective equipment or PPE (e.g., laboratory coats, chemical splash goggles, face shield, respiratory protection, and gloves). Dispose of worn or damaged PPE.

**IMPORTANT NOTE: Only use respiratory protection if you have been trained AND been through a medical evaluation by the University's medical provider. These exams/evaluations are coordinated through EHS. Refer to the UM-Flint respiratory protection guidelines for further details.**

5. Use biological safety cabinets, fume hoods, local exhaust ventilation and other safety equipment when appropriate. Inspect safety equipment prior using the equipment to ensure that it is in good working order. Immediately report deficiencies to laboratory supervisor.

6. Inform supervisor immediately of symptoms of over exposure, accidents, or chemical releases and document incident. Forward documentation to the EHS Department.
7. Attend hazard communication/chemical safety training and all other applicable training sessions.

### The Environment, Health and Safety Department

The EHS department is responsible for administering all EHS programs on campus. Specific to Laboratory Safety, EHS is responsible for the following:

1. Provide general awareness level hazard communication/chemical safety training.
2. Perform exposure monitoring on an "as needed" basis to determine if the permissible exposure limit or action level has been exceeded. Results of the monitoring shall be provided to the laboratory supervisor and the employee within 15 days of receipt of the results.
3. Coordinate and monitor the certification of biological safety cabinets and chemical fume hoods annually.
4. Conduct laboratory safety surveys on a periodic basis. Communicate the results of survey to Laboratory Supervisor, Department CHO, and Department Head/Chairperson.
5. Coordinate employee medical consultations and examinations.
6. Maintain records for exposure monitoring and medical examinations or consultations.
7. Administer the UM-Flint Hazard Communication Program which includes:
  - \* Maintaining MSDSs provided by UM-Flint departments and laboratories.
  - \* Maintaining one copy of each department's and laboratory's chemical inventory;
  - \* Providing new employee general awareness training; and
  - \* Maintaining copies of training records.
8. Administer the UM-Flint Respiratory Protection Program in accordance with MIOSHA's general respiratory protection rule.
9. Coordinate Hazardous Waste Disposal Program.
10. Provide 24-hour emergency response and consultation.
11. Maintain and update general health and safety guidelines for the campus. Maintain copies of or access to health and safety rules and regulations.

# **EMPLOYEE INFORMATION AND TRAINING**

## Employee Training

Employees must have access to safety and health information as well as be provided with adequate training to ensure that they are aware of the hazards of chemicals present in the work area. Such information must be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignment involving new exposure situations. Employees should receive annual refresher information and training coordinated by their department CHO to ensure that they are aware of the risks of exposure to hazardous chemicals.

## Health and Safety Information and Resources

The EHS Department and Laboratory Supervisors will provide the following information to employees during training, orientation, World Wide Web (WWW) posting or some other effective means include:

- The general contents of the MIOSHA Hazardous Work in Laboratories Standard.
- The location and availability of the UM-Flint Campus CHP as well as the employee's departmental plan, standard operating procedures, and MSDSs.
- The permissible exposure limits for OSHA/MIOSHA regulated substances or published exposure limits for other hazardous chemicals where there is no applicable OSHA/MIOSHA standard.
- Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory (available on material safety data sheets or other technical reference material).
- The location and availability of known reference materials on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory, including, but not limited to, MSDSs received from the supplier.
- The Environment, Health and Safety Department is available to assist in researching health and safety related questions and information that may be helpful in planning and preparing safe laboratory activities.

## Method of Employee Training

General Awareness training will be provided by the EHS Department and may take the form of individual instruction, group seminars, audiovisual presentations, handout material, self-study materials with test or any combination of the above. Site-specific training will be provided by the laboratory supervisors or an appropriate departmental designee. Please call the EHS Department at 766-6763 for information about the general hazard communication or general laboratory safety courses.

**General training** provided by the EHS to employees will include the following:

- Methods and observations that may be used to detect the presence or release of a hazardous chemical.
- General physical and health hazards of chemicals in the work area. This must include an awareness that many factors influence whether a given chemical might constitute a hazard (e.g. dose, exposure time, genetic background, developmental state, mixtures of interactions of chemicals, etc.).
- General control measures employees can take to protect themselves from these hazards. Specific procedures to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.
- The UM-Flint chemical hygiene plan, hazard communication program and hazardous waste management program
- Overview of UM-Flint Emergency Response Plan.

**Laboratory-specific training** provided by laboratory supervisors to employed will include the following:

- Site-specific standard operating procedures.
- Specific physical and health hazards of chemicals in the employee's work area (available on material safety data sheets and other department resources).
- Emergency procedures including what to do in the event of a spill, fire, tornado warning, medical emergency, as well as evacuation routes and assembly areas.
- Any other relevant information necessary for the employee to properly and safely perform the work duties that they are required to complete.

## Training Documentation

General training conducted by EHS will be documented and maintained by the EHS Department. Site-specific training must be documented and maintained by the laboratory supervisor and be available to EHS and regulatory officials upon request.

## **MEDICAL CONSULTATIONS AND EXAMINATIONS**

1. Health assessments prior to work assignment for new employees may be performed if and when conditions occur specified in the UM-Flint Health Assessment Program administered by the EHS Department.
2. Departments must provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining licensed DO/MD physician determines to be necessary, under the following circumstances:
  - When an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee must be provided an opportunity to receive an appropriate examination.
  - Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the Permissible Exposure Limit) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements; medical surveillance shall be established for the affected employee as prescribed by the particular standard.
  - Whenever an event takes place in the work area, such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee shall be provided an opportunity for a medical consultation. Such consultations shall be for the purpose of determining the need for a medical examination.
3. The department shall provide the following information to the licensed DO/MD physician:
  - A copy of the employee's position description and duties.
  - The identity of the hazardous chemicals to which the employee may have been exposed.

- A description of the conditions surrounding the exposure, including available quantitative exposure data.
  - A description of the signs and symptoms of exposure that the employee is experiencing, if any.
  - A material safety data sheet (MSDS) for the chemicals suspected of causing the exposure
4. A written opinion from the examining licensed DO/MD physician will be provided to the EHS Department and include the following:
- Any recommendation for further medical follow-up.
  - The results of the medical examination and any associated tests.
  - Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace.
  - A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any related medical condition that may require further examination or treatment. The written opinion of the physician shall not reveal specific findings of diagnoses unrelated to occupational exposure.
  - All medical consultations and examinations and follow-ups necessary must be performed by or under the direct supervision of a licensed physician (DO/MD) and must be provided at no cost to the employee, without loss of pay and at a reasonable time and place.

### Medical Record Retention and Confidentiality

The Environment, Health and Safety Department in conjunction with the designated medical provider, will maintain all records associated with the health assessment program. Records shall be maintained indefinitely. EHS will oversee the transfer of all related records in the event that the UM-Flint designated medical provider changes.

The Environment, Health and Safety Department will treat all medical information and related records resulting from the physical examination with the highest level of confidentiality.

## **RECORD KEEPING**

EHS will retain records of employees who attend the general awareness training.

Individual departments participating in this program will retain records of their department's laboratory specific training for each laboratory employee working in their department.

Completed *101A Employee Accident or Illness Report* forms should be signed by the employee's immediate supervisor and forwarded to the EHS Department within 24 hours. EHS will forward the completed and signed form to UM Risk Management Department.

The amount of time a unit chooses to retain training records is not specified in the Laboratory Standard. It is recommended that such records be retained for at least one year after an employee leaves a position. Ideally, training records should be retained indefinitely.

## **CHP AVAILABILITY & ANNUAL REVIEW**

### Availability

The UM-Flint Campus Chemical Hygiene Plan must be readily available through the employee's department or laboratory supervisor to employees and employee representatives through their supervisor or departmental office. Additional copies of this document are available from the EHS Department.

### Annual Review

The UM-Flint Chemical Hygiene Plan will be reviewed annually from its effective date by the Campus Chemical Hygiene Officer and Department Chemical Hygiene Officers (laboratory supervisors) of the departments required to implement CHP.

The Campus Chemical Hygiene Officer will coordinate and facilitate the annual review meeting.

# University of Michigan-Flint Campus Chemical Hygiene Plan (CHP)

## APPENDIX A

### KEY ELEMENTS FOR DEVELOPING DEPARTMENTAL CHPs

Where it has been determined that a department is subject to UM-Flint requirements for developing and implementing a departmental Chemical Hygiene Plan (CHP) and standard operating procedures, the department shall develop and carry out the provisions of a written departmental chemical hygiene plan consistent with the UM-Flint Campus CHP Guidelines and provide for both of the following:

- (a) **Protecting employees** from health hazards that are associated with hazardous chemicals in that laboratory.
- (b) **Keeping exposures below the limits** specified in the Michigan standard section R 325.70104.

The written **departmental chemical hygiene plan must be readily available** to laboratory employees, employee representatives, and upon request, to the state or federal regulatory agency.

The written **departmental chemical hygiene plan shall include each of the following elements** and shall indicate specific measures that the department and department chemical hygiene officer will take to ensure laboratory employee protection:

- (a) **Standard operating procedures** relevant to safety and health considerations to be followed when laboratory worked involves the use of hazardous chemicals.
- (b) Criteria that the department will use to **determine and implement control measures to reduce exposure to hazardous chemicals**, including engineering controls, the use of personal protective equipment, and hygiene practices. Particular attention should be given to the selection of control measures for chemicals that are known to be particularly hazardous.

- (c) A requirement that laboratory-type hoods and other **protective equipment are functioning properly** and the specific measures that shall be taken to ensure the proper and adequate performance of such equipment.
- (d) Provisions for **employee information and training** consistent with UM-Flint Campus CHP and as prescribed in MIOSHA R 325-70107. Maintain employee training records for department specific training.
- (e) The circumstances under which a particular laboratory operation, procedures, or activity shall require **prior approval** from the department chair, department chemical hygiene officer, radiation safety officer and / or the campus CHO before implementation.
- (f) Provisions for **medical consultation and medical examinations** consistent with the UM-Flint Campus CHP and in accordance with MIOSHA R 325-70108.
- (g) Designation of personnel who are responsible for implementing the chemical hygiene plan, including the **assignment of a department chemical hygiene officer** and, if appropriate, **establishment of a chemical hygiene committee**.
- (h) Provisions for **additional employee protection for work with particularly hazardous substances**, such as carcinogens, reproductive toxins, and substances that have a high degree of acute or chronic toxicity. Specific consideration shall be given to the following provisions, which shall be included where appropriate:
  - (i) The establishment of a designated area or areas that indicate the physical limits of exposure to particularly hazardous substances.
  - (ii) The use of containment devices, such as laboratory-type hoods or glove boxes.
  - (iii) Procedures for the safe removal of contaminated waste.
  - (iv) Decontamination procedures.

Departments shall **review and evaluate the effectiveness of their department chemical hygiene plan at least annually** and update it as necessary.

A copy of the **MIOSHA Hazardous Work in Laboratories Standard is available through UM-Flint EHS Department** for your reference. The state regulatory requirements for a written chemical hygiene plan are outlined in section **R 325-70106 (Rule 6 of the Standard)**.

University of Michigan-Flint  
Campus Chemical Hygiene Plan (CHP)

**APPENDIX B**

MIOSHA Hazardous Work in Laboratories  
(adopted by MIOSHA 1/ 1 /92)

# University of Michigan-Flint Campus Chemical Hygiene Plan (CHP)

## APPENDIX C

### DEFINITIONS

The following definitions have been taken from the Federal Standard 29 CFR 1910.1450 Occupational Exposure to Hazardous Chemicals in Laboratories, commonly known as the laboratory standard. There is an additional explanation of hazardous chemical definitions at the end of this section.

#### Regulatory Definitions

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

"**Assistant Secretary**" means the Assistant Secretary of Labor for Occupational Safety and Health, US. Department of Labor, or designee.

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

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

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

"**Combustible liquid**" means any liquid having a flash point at or above 100°F (37.8° C), but below 200° F (93.3°C), except any mixture having components with flash points of 200°F (93.3 °C), or higher, the total volume of which make up 99 % or more of the total volume of the mixture.

**"Compressed gas"** means:

- (i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70°F (21.1°C); or
- (ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130°F (54.4°C) regardless of the pressure at 70°F (21.1°); or
- (iii) A liquid having a vapor pressure exceeding 40 psi at 100°F (37.8°C) as determined by ASTM D-323-72.

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

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

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

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

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

- (i) **"Aerosol, flammable"** means an aerosol that, when tested by the method described in 16 CFR 1500-45, yields a flame protection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;
- (ii) **"Gas, flammable"** means:
  - (A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13% by volume or less; or
  - (B) (B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12% by volume, regardless of the lower limit.
- (iii) **"Liquid, flammable"** means any liquid having a flash point below 100°F (37.8°C), except any mixture having components with flash points of 100°F) or higher, the total of which make up 99% or more of the total volume of the mixture.
- (iv) **"Solid, flammable"** means a solid, other than a blasting agent or explosive as defined in 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

**"Flash point"** means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

- (i) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24 - 1979 (ASTM D 56-79)) -for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100 deg. F (37.8°C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or
- (ii) Pensky-Martens Closed Tester (See American National Standard Method of Test for Flash point by Pensky-Martens Closed Tester, Z11.7 - 1979 (ASTM D 93-79)) - for liquids with a viscosity equal to or greater than 45 SUS at 100°F (37.8°C), or that contain suspended solids, or that have a tendency to form a surface film under test; or
- (iii) Setaflash Closed Tester (see American National Standard Method of test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)). Organic peroxides, which undergo auto-accelerating thermal decomposition, are excluded from any of the flash point determination methods specified above.

**"Hazardous chemical"** means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes. Appendices A and B of the Hazard Communication Standard (29 CFR 1910.1200) provide further guidance in defining the scope of health hazards and determining whether or not a chemical is to be considered hazardous for purposes of this standard. See section below that further discusses hazardous chemical definitions.

**"Health Hazard"** as defined by MIOSHA is one where there exists statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. Included are:

- allergens
- embryotoxicants
- carcinogens
- toxic or highly toxic agents
- reproductive toxicants
- irritants
- corrosives
- sensitizers
- hepatoxins (liver)
- nephrotoxins (kidneys)
- neurotoxins (nervous system)
- hematopoietic systems agents (blood)
- agents which damage the lungs, skin, eyes or mucous membranes

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

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

**"Laboratory-type hood"** means a device located in a laboratory, enclosure on five sides with a movable sash or fixed partial enclosed on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms. Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

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

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

**"Material safety data sheet (MSDS)"** means written or printed material concerning a hazardous chemical which is prepared in accordance with 29 CFR 1910.1200, paragraph (g).

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

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

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

**"Physical hazard"** means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive. A chemical is a *physical hazard* by MIOSHA definition if there is scientifically valid evidence that it is:

- a flammable or combustible liquid
- a compressed gas

- an organic peroxide
- an explosive
- an oxidizer
- a pyrophoric
- an unstable material (reactive)
- a water reactive material

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

**"Reproductive toxins"** are defined by MIOSHA as any chemical which affects the reproductive capabilities of males or females, including chromosomal damage (mutagenesis) and effects on fetuses (teratogenesis). Information on reproductive effects will be listed on the Material Safety Data Sheet.

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

- (i) It is regulated by OSHA as a carcinogen; or
- (ii) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP)(latest edition); or
- (iii) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for research on Cancer Monographs (IARC)(latest editions); or
- (iv) It is listed in either Group 2A or 2B by IARC or under the category, "it reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:
  - (A) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m(3);
  - (B) After repeated skin application of less than 300 (mg/kg of body weight) per week; or
  - (C) After oral dosages of less than 50 mg/kg of body weight per day.

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

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

# University of Michigan-Flint Campus Chemical Hygiene Plan (CHP)

## **APPENDIX D**

### GENERAL SAFE -LABORATORY WORK PRACTICES

The following safe laboratory work practices have been developed to address the general safety and health considerations when laboratory work involves the use of hazardous chemicals. Where the scope of hazards are not adequately addressed by this general document, laboratory supervisors must develop written standard operating procedures for work area specific operations. Standard operating procedures must be provided to all affected laboratory employees.

# GENERAL LABORATORY SAFETY GUIDELINES

The following guidelines have been established to minimize hazards and to maintain basic safety in the laboratory.

- Laboratory access shall be limited to authorized personnel, students and invited guests. Children are not permitted in laboratory unless under strict supervision. Pets are not allowed in laboratory for any reason.

Absolutely no horseplay allowed.

- Examine the known hazards associated with the materials being used. Never assume all hazards have been identified. Carefully read the label before using an unfamiliar chemical. Review the material safety data sheet (MSDS) for special handling instructions including recommended Personal Protective Equipment (PPE), incompatibility information and storage requirements.
- Be familiar with the location of, and know how to utilize, emergency equipment such as fire alarms, fire extinguishers, safety showers and emergency -eyewash equipment, spin response equipment, personal protective equipment and know the appropriate emergency response procedures.
- Avoid distracting or startling other workers when they are handling hazardous chemicals.
- Use equipment and hazardous chemicals only for their intended purposes and only in those areas designated for their use.
- Always be alert to unsafe conditions and actions and call attention to them so that corrective action can be taken as quickly as possible.
- Wear eye and face protection and any other required PPE as necessary in safely performing your job task(s).
- Always inspect safety equipment for leaks, tears and other damage before handling a hazardous chemical. This includes fume hoods, biological cabinets, gloves, goggles, etc.
- Avoid tasting, smelling, or direct contact with hazardous chemicals.
- Store hazardous chemicals only in designated storage areas such as chemical storage cabinets. Fume hoods must not be used for storing chemicals. Fumehoods are designed as a special work area and must be kept clear of debris and clutter.
- Avoid working alone whenever possible. Let others know that you are in the laboratory and the approximate time that you will be in the laboratory if you must work alone. The University prohibits students working alone in the laboratories.

## Personal Health and Hygiene

The following safe hygiene are recommended have to protect laboratory employees from health risks associated with the use of hazardous chemicals.

- Avoid direct contact with any hazardous chemical. Know the types of protective equipment available and use the proper type for each job.
- Confine long hair, loose clothing and always wear footwear that fully covers the feet.
- Do not mouth pipette. Mechanical pipettes or hand held pipette bulbs must be used.
- Use appropriate safety equipment whenever exposure to gases, vapors or aerosols is suspected and ensure that exhaust facilities are working properly.
- Wash thoroughly with soap and water after handling chemicals, before leaving the laboratory and before eating, drinking, smoking or applying cosmetics. Do not exit a laboratory with contaminated PPE such as gloves.
- Contact lens should not be worn in laboratories.
- Food, drink, smoking or applying cosmetics in University laboratories is prohibited. There shall be no storage or use of these items in laboratories (including in the refrigerators within laboratories).
- Clean, maintain or replace personal protective equipment as necessary.
- Laboratory employees shall be familiar with the symptoms of over exposure for the chemicals with which they work and the precautions necessary to prevent over exposure.

## Good Housekeeping

Maintaining a clean and orderly work area in a laboratory is vital in preventing potentially serious accidents. Slips, trips, falls, spills, and other accidents can occur when an area is cluttered or poorly maintained. Good housekeeping practices must be enforced at all times. Use the following guidelines to maintain an orderly laboratory:

- Keep work areas clean and uncluttered with chemicals and equipment. Clean up work areas upon completion of an operation or at the end of each work day, including floors.
- Dispose of waste as per the University of Michigan-Flint Hazardous Waste Management Program.
- A separate waste receptacle must be designated for non-contaminated glass. Follow guidelines established in your laboratory for the disposal of contaminated glass.

- Clean spills immediately and thoroughly, as per the guidelines established in the Campus Emergency Response Plan and your department Emergency Response Plan. Ensure that a chemical spill kit is available and that employees know how to use it.
- Do not block exits, emergency equipment or controls or use hallways and stairways as storage areas.
- Assure hazardous chemicals are properly segregated into compatible categories.

### Unattended Laboratory Operations

At times, it may be necessary to leave a laboratory operation unattended. If necessary, develop a protocol for potential interruptions in electric power, water, inert gas and other services and provide containment for toxic substances as part of the protocol.

Conspicuously posted warning notice in the vicinity of the experiment if hazardous conditions are present in order to warn other laboratory employees

### General Chemical Handling

The decision to use a hazardous chemical in a laboratory procedure should never be treated lightly. Laboratory employees must ensure that all chemicals are stored, handled and used safely and properly from initial receipt to final disposal.

- Information on proper handling, storage and disposal of hazardous chemicals and access to related material safety data sheets should be available to all laboratory employees prior to the use of the chemical. Employees must take the time to research and understand the specific hazards and precautionary methods associated with a particular material prior to working with the material.
- Always purchase the minimum amount necessary to maintain operations.
- Chemical containers with missing or defaced labels or that violate appropriate packaging regulations must not be accepted or used.
- Chemicals utilized in the laboratory must be appropriate for the laboratory's ventilation system.
- Chemicals should not be stored on high shelves and large bottles should be stored no more than two feet from floor level to the rear of the lower shelves. Try to store chemicals below eye level on secured, lip edged shelves, or in chemical storage cabinets.
- NEVER store chemicals on the floor.
- Chemicals must be segregated by hazard class and compatibility.

- Chemical storage areas should be well ventilated and maintained at a temperature BELOW 80 degrees F.
- Fire fighting equipment and spill cleanup materials must be readily available in the area.
- Chemical storage areas must be labeled as to their contents. This may consist of identifying the hazard classes of the different types of materials present.
- Storage of chemicals at the laboratory bench or other work areas shall be kept to a minimum.
- Any chemical mixture shall be assumed to be as toxic as its most toxic component.
- Substances of unknown toxicity shall be assumed to be toxic.
- Conduct frequent inventories and post results. Outdated materials should be properly disposed of immediately. Continually check for the following conditions:

- Precipitates
- Partial or missing labels
- Cracked or broken caps
- Discolored or striated solutions
- Rusted cans
- Polymerized (hardened) chemicals
- Chemical residues on caps
- Excessive amounts of materials
- Distorted or compromised containers

### Transporting Chemicals

When transporting chemicals outside the Laboratory, precautions must be taken to avoid dropping or spilling chemicals.

- Carry glass containers in specially designed bottle carriers or a leak resistant, unbreakable secondary container.
- When transporting chemicals on a cart, use a cart that is suitable for the load and one that has high edges to contain leaks or spills.
- When possible, transport chemicals in freight elevators to avoid the possibility of exposing people on passenger elevators.

# CHEMICAL SAFETY IN THE LABORATORY

The key to chemical safety and ensuring your health and safety is understanding and following the specific safe work practices recommended for specific classes of hazardous chemicals. The following information is provided as general guidelines for broad classes of hazardous chemicals. Remember to ALWAYS refer to the product label, the MSDS and other technical references to provide you with specific handling and storage instructions. Additionally, employees must reference their departmental CHP and laboratory Standard Operating Procedures for specific guidelines.

## Flammable and Combustible Materials

The National Fire Protection Agency (NFPA) places flammable and combustible liquids in the following classes:

	<u>Flash Point</u>	<u>Boiling Point</u>
	<i>Flammable</i>	
Class IA	< 73°F (22.8°C)	< 100°F (37.8°C)
Class IB	< 73°F (22.8°C)	>=100°F (37.8°C)
Class IC	>=73°F (22.8°C)	
	<i>Combustible</i>	
Class II	>=100°F (37.8°C)	< 140°F (60°C)
Class IIA	>=140°F (60°C)	< 200°F (93°C)
Class IIIB	>=200°F (93°C)	

*Note:* the flash point is defined as the minimum temperature at which a liquid gives off vapor in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

## Handling Flammables & Combustibles:

- Understand that the danger associated with a flammable liquid is the ignitibility of its vapor.
- Eliminate ignition sources such as open flames, hot surfaces, sparks from welding or cutting, operation of electrical equipment, and static electricity prior to working with flammable liquids.
- Do not use an open flame to heat a flammable liquid.
- Remove all flammable liquids before using an open flame.

- Notify other laboratory occupants before using an open flame.
- Store flammable liquids in NFPA approved flammable liquid containers or storage cabinets in an area isolated from ignition sources or in a special storage room designed for flammable materials.
- Ensure there is proper bonding and grounding when it is required, such as when transferring or dispensing a flammable liquid from a large container or drum. Assure bonding and grounding must be checked periodically.
- Be familiar with the **NFPA's flammable hazard rating codes** that are often found on product labels.
  - "4" represents a material that is extremely flammable
  - "3" represents a material with a flash point at or below room temperature
  - "2" represents a material that ignites when moderately heated
  - "1" represents a material that must be preheated before ignition can occur
  - "0" represents a material that is not flammable
- Ensure that appropriate fire extinguishers are located in the laboratory, are free of obstructions and are charged and ready to use. Contact the Department of Public Safety for fire extinguisher training.
- Keep flammable liquids separate from oxidizers and corrosives.
- Store quantities greater than one 5-gallon container or five 1-gallon containers in a flammable liquid storage cabinet. These cabinets are labeled "FLAMMABLE." Check with the laboratory supervisor for appropriate, storage cabinets in your department.
- Highly flammable liquids, Class IA with a flash point less than 73°F (22.8°C) and a boiling point less than 100°F (37.8°C), should be stored in a fire proof refrigerator. **DO NOT PUT FLAMMABLE LIQUIDS IN REGULAR REFRIGERATORS.** When the door is opened it could act as an ignition source.
- Follow the manufacturers recommendations addressing the appropriate selection and use of personal protective equipment when working with these materials.

## Corrosive Materials

Corrosive materials such as acids and bases can react with the skin causing burns similar to thermal burns, and could react with metal causing deterioration of the metal surface.

- Containers and equipment used for storage and processing of corrosive materials should be corrosion resistant.

- Eye protection and rubber gloves should always be used when handling corrosive materials. A face shield, rubber apron, and rubber boots may also be appropriate, depending on the work performed.
- Never add water to acid. Always add acid to water or to the less concentrated solution. When mixing concentrated acids with water, add the acid slowly to water.
- When pouring acid, always use a clean, corrosive resistant catch tray. Place the receiving container in the tray and using a stirring rod along the edge of the dispensing container, slowly pour liquid down the stirring rod into the receiving container.
- Avoid pouring an acid from a container in such a manner that it will drip over the container label.
- Flush the outside of acid bottle with water and dry before and after use.
- Transport corrosive liquids on carts or in a safety bucket designed to catch any possible spills that may occur.
- When returning corrosives back to storage cabinets, make sure containers are tightly sealed and are stored in chemical resistant trays to contain liquid in the event of container breakage or leakage.
- Ensure that all work surfaces are clean and free from spillage remains.
- Proper chemical resistant personal protective equipment should be used when handling corrosives. Wear protective equipment appropriate for the specific task involving the corrosive material. Generally, this includes, at least, resistant gloves and goggles. In some cases, a chemical resistant apron and oversleeves should be worn over the standard lab coat. When pouring there is a risk of splashing; proper face and eye protection should be used, e.g. chemical splash goggles and face shield. Some corrosives present an inhalation hazard and should be handled only in a fume hood.

Contact EHS when it is suspected that the inadvertent formation of shock-sensitive materials in ductwork, piping, or chemicals being stored has occurred.

## Cryogenics

Liquefied gases that condense oxygen from the air create an oxygen rich atmosphere and increase potential for fire if flammable or combustible materials and a source of ignition are present. Pressure is also a hazard due to the large expansion ratio from liquid to gas, causing pressure build up in containers. Many materials become brittle at extremely low temperatures. Brief contact with materials at extremely low temperatures can cause burns similar to thermal burns. Some of the hazards associated with cryogenics are fire, pressure, weakening of materials, and skin or eye burns upon contact with the liquid.

- Equipment should be kept clean, especially when working with liquid or gaseous oxygen.

- Mixtures of gases or fluids should be strictly controlled to prevent formation of flammable or explosive mixtures.
- Always wear safety glasses with side shields or goggles when handling. If there is a chance of a splash or spray, a full face protection shield, an impervious apron or coat, cuffless trousers, and high topped shoes should be worn. Watches, rings, and other jewelry should not be worn. Gloves should be impervious and sufficiently large to be readily thrown off should a cryogen spill. Pot holders could also be used.
- Containers and systems containing cryogen's should have pressure relief mechanisms.
- Containers and systems should be capable of withstanding extreme cold without becoming brittle.
- Since glass ampoules can explode when removed from cryogenic storage if not sealed properly, storage of radioactive, toxic or infectious agents should be placed in plastic cryogenic storage ampoules.

## Compressed Gases

Special systems are needed for handling materials under pressure. Cylinders pose mechanical, physical and/or health hazards, depending on the compressed gas in the cylinder.

- Cylinders with regulators must be individually secured. Only cylinders with valve protection caps securely in place may be safely gang-chained (chained in groups).
- When storing or moving a cylinder, have the valve protection cap securely in place to protect the stem.
- Cylinders must be secured in an upright position at all times. Use suitable racks, straps, chains, or stands to support cylinders against an immovable object, such as a bench or a wall, during use and storage. Do not allow cylinders to fall or lean against one another.
- Never bleed a cylinder completely empty. Leave a slight pressure to keep contaminants out.
- Oil or grease on the high pressure side of an oxygen cylinder can cause an explosion. Do not lubricate an oxygen regulator or use a fuel gas regulator on an oxygen cylinder. Use an oxygen approved regulator.
- Always wear goggles or safety glasses with side shields when handling compressed gases.
- Always use appropriate gauges, fittings, and materials compatible with the particular gas being handled.

- Generally, working with a toxic, corrosive gas will require use and storage of local exhaust ventilation such as a laboratory hood or a gas cabinet designed for that purpose.
- When transporting compressed gases, the appropriate transfer cart should be used; one that is capable of securing the cylinders during transport.

# RADIOLOGICAL MATERIAL HAZARDS

Use of radioactive materials at UM-Flint is strictly controlled. Individuals must go through a stringent approval and authorization process before becoming an "authorized user." Contact UM-Flint Radiation Safety Services (Todd Toulouse) if you plan to use radioactive materials or to report a radiation related emergency. The following is a brief overview for obtaining approval and some general safe work practices that should be followed when working with radioactive materials.

Please refer to the University of Michigan Radiation Safety Manual published by the Radiation Control Services in Ann Arbor and Bulletin No. 100 distributed by Radiation Control Service-UM-Flint. These two documents communicate specific requirements and procedures that must be strictly followed when working with radioactive materials.

## Obtaining Approval to use radioactive materials at UM-Flint

The University of Michigan's Nuclear Regulatory Commission (NRC) License states that the radioactive material may only be used by, or under the supervision of individuals designated by the UM Radiation Policy Committee. In order to receive approval to use radioactive materials at UM-Flint, you must:

1. Notify UM-Flint Radiation Control Service (**Todd Toulouse-Room 556, Murchie Science Building**) in writing indicating your desire to become an "Authorized User." Include in your written request a description of your intended use of radioactive material, a list of the specific isotopes you propose to use, and a list of all individuals who will be working with this material under this authorization.
  - RCS will contact you for additional information and clarification.
  - RCS will forward an RCS-101, Application for Authorization to use Radioactive Material.
2. Complete the RCS-101 and return to:

**Todd Toulouse  
Radiation Control Service-Flint  
Room 556, Murchie Science Building (MSB)**

To expedite the approval Process, DO NOT SEND THE COMPLETED RCS 101 FORM DIRECTLY TO RCS ANN ARBOR. This may delay the approval and authorization process.

3. RCS-Flint will review the application and forward it to a Health Physicist at RCS-Ann Arbor for review. The Health Physicist may suggest revising the application, recommend additional controls, PPE, special uses, or request additional information.

4. Following the completion of the Health Physicist's review, the completed application and supporting documentation will be submitted to the Radiation Policy Committee in Ann Arbor.
5. The Committee generally meets monthly. The Radiation Policy Committee reviews, approves, disapproves, requests additional information, or approves with special added conditions or limitations for each application.

### Safe Laboratory Work Practices for Radioactive Materials

1. All personnel intending to work with radioactive material must attend the Radiation Safety Orientation course and submit to Radiation Safety Service a completed Statement of Training and Experience form.
2. Designated radionuclide work and storage areas must be clearly identified, and all equipment used must be labeled properly with radioactive material warning labels.
3. Contamination surveys must be performed routinely in radioactive material laboratories. Smears, swipes, or swabs counted on the scintillation counter is the recommended survey technique; however an appropriate survey meter may be used. Note: Radiation Control Service will conduct an individual survey on a monthly basis.
4. Radiation survey meters used to detect radioactive contamination should be checked for operational consistency and calibrated on a regular basis.
5. All packages of radioactive material will be sent directly to the UM-Flint Radiation Control Service Officer at:

Todd Toulouse  
Radiation Control Service-Flint  
Murchie Science Building  
303 E. Kearsley Street  
Flint, Michigan 48502-2186

6. All packages will be surveyed, opened, and inspected as soon as possible after receipt by the Radiation Control Officer. The results of the survey shall be documented on the shipping paper/invoice. Todd Toulouse shall maintain copies of the invoices and survey results.
7. A current and accurate inventory of all radionuclides MUST be maintained.
8. Appropriate radiation monitoring dosimeters must be worn by individuals working with gamma, neutron, or high-energy beta emitting radionuclides and x-ray producing devices.
9. Volatile radionuclide work must be performed in a certified 100 feet per minute exhaust hood. Note: that laminar flow hoods and biological safety cabinets should not be used for radionuclide work.

10. Appropriate shielding material must be used for gamma, neutron, and high-energy beta emitting radionuclides; low density material such as Plexiglas or wood for beta emitters or x-rays, and hydrogenous material (water, paraffin, masonite) for neutron emitters.
11. Radioactive material must be used strictly in accordance with form RCS-101 as approved by the Radiation Policy Committee.
12. Individuals under the age of 18 will not normally be permitted to work with radioactive material.
13. High standards of cleanliness and good housekeeping should be maintained in all laboratories.
14. Personal belongings including books (other than those required for the job) should not be brought into the laboratory where they may become contaminated.
15. Eating, drinking, smoking and application of cosmetics is forbidden in any laboratory.
16. Pipetting of radioactive solutions by mouth is forbidden.
17. Rubber or plastic gloves and laboratory coats should be worn whenever working with radioactive material. Gloves should be presumed to be contaminated and either decontaminated or discarded as radioactive waste.
18. Faucets, notebooks, calculators, drawer handles, etc., should not be handled with gloves on.
19. Whenever possible, work with all equipment on easily cleaned trays.
20. Cover all work surfaces with absorbent paper.
21. Active solutions should be kept covered.
22. Before leaving laboratory, wash hands, check hands and shoes with an appropriate survey instrument.
23. If possible, perform a cold run (no radioactive isotopes) on new experimental procedures.
24. Use tongs, forceps, or other handling tools. Note the dramatic dose rate reduction as a function of distance.

## **BIOLOGICAL MATERIAL HAZARDS**

Personnel must be made aware of the potential hazards and the safety precautions necessary for work involving biological agents (bacteria, viruses, fungi).

Personnel must be trained in the usage and operation of biological safety cabinets.

Proper waste handling procedures must be followed. Employees must coordinate the management of waste with the department's laboratory supervisor.

Use of biological materials at or above BioSafety Level 2 at UM-Flint is strictly controlled. Contact your laboratory supervisor and the EHS Department if you plan to use biological materials at or above BioSafety Level 2.

## **ELECTRICAL SAFETY**

Electrical safety is important. It doesn't only include hazards from shock resulting from the interruption of an electric current, but fire and insidious hazards should also be considered. Electrical equipment can act as an ignition source in an environment of hazardous vapors. Also, electrostatic shocks include dust precipitators, air purifiers, clothing, plastic film wrap, and copiers. Insidious hazards can occur as a result of power outages. An example is a safety system powered by electricity that fails as a result of a power outage leading to a dangerous situation.

Electric shock is dangerous and, may lead to any of the following: collapse, unconsciousness, respiratory inhibition, ventricular fibrillation, heart standstill, central nervous system damage, and deep burns all of which may be fatal.

Electrical Safety Procedures:

1. All shorts should be repaired.
2. Power should be disconnected before any work is done.
3. Never work on alive equipment alone.
4. Use tools with nonconductive handles.
5. Treat all devices as if current is alive.
6. Before handling capacitors or working near them be sure to drain them.
7. Enclose all electric contacts & conductors.
8. Mark all high voltage equipment.
9. Use face protection when sparks may occur.
10. Remove all jewelry before working on electricity.
11. Choose cleaning solvents carefully - most are usually toxic or flammable.
12. All electrical wiring should be done by certified electrician. Contact Facilities Mgt. for exceptions.
13. Never handle electricity while wet or sweating.,
14. In high voltage areas consider all floors as conductive.
15. Avoid storing solvents near electrical equipment.
16. Beware of power to control circuits that may still be active after switch is shut off.

17. Make sure all equipment is properly grounded.
18. Pigtails should be connected first and removed last.
19. Frayed wires and plugs should be replaced.
20. Avoid using extension cords.
21. All electrical equipment should be certified by Underwriters' Laboratories, Inc. (UL)
22. Use explosion-proof equipment in laboratories when possible.
23. In hazardous areas, covered wall plugs and fixtures should be covered with UL approved covers.
24. When working on electricity, stand on insulating mat whenever possible.
25. Cathode ray tubes are hazardous if broken.

Laboratory employees and students should not attempt any electrical repairs unless authorized to do so. Contact your supervisor and the Facilities Management Department to report electrical problems or equipment failures.

## **GLASSWARE SAFETY**

Glassware can be hazardous when not handled in a safe and proper manner. Do not physically force or use glassware under extreme pressure conditions.

All broken, cracked, or chipped glassware should be immediately disposed of in a broken glass container located in each laboratory. Only broken glass should be put in broken glass containers. There are appropriate containers for all other refuse including paper products, animal tissue, sharp objects (needles, lancets, etc.), biological waste, and chemical and radioactive contaminated materials. Contact the laboratory supervisor to coordinate the disposal of glassware when a laboratory's broken glassware disposal container is full.

Contact your laboratory supervisor for specific procedures.

# HAZARDOUS WASTE STORAGE & DISPOSAL

For guidelines on the storage and disposal of hazardous wastes from laboratory operations at the University of Michigan-Flint, refer to the University of Michigan-Flint Hazardous Waste Management program. Copies of this document are available from the EHS Department.

Laboratory Supervisors are responsible for coordinating and preparing waste materials for disposal in accordance with the policies and procedures established in the University of Michigan-Flint Hazardous Waste Management Program.

## University of Michigan-Flint Waste Management Policy

1. The University of Michigan-Flint is committed to maintaining a safe workplace environment for employees and members of the campus community visiting the University as well as protecting the environment which we share with the surrounding community.
2. University employees and students are prohibited from disposing of hazardous waste materials in the dumpsters, compactors, down any storm or sanitary drain, on the ground, or arranging for transportation and/or disposal of products with an unauthorized environmental contractor for disposal/recycling.
3. University employees are required to:
  - (a) Report all hazardous material/waste spills to their immediate supervisor,
  - (b) Report all non incidental hazardous material/waste spills to the Department of Public Safety and the Environment, Health and Safety Department,
  - (c) Follow the emergency spill procedures outlined in the UM-Flint Emergency Action Plan, your department's Chemical Hygiene Plan, and as directed in the Hazard Communication training program.
4. Employees who observe activity contrary to the waste management policies of the University must immediately report the activity to the following individuals:
  - Their Immediate Supervisor,
  - The UM-Flint, Environment, Health & Safety Dept., and
  - The UM-Flint, Department of Public Safety
5. Only the Environment, Health and Safety Department, or their designee, can approve the destruction/disposal of hazardous material/waste and authorize the use of an environmental contractor for disposal/recycling of waste materials on the UM-Flint campus.