MARQUETTE UNIVERSITY

COLLEGE OF ENGINEERING

CHEMICAL HYGIENE PLAN AND SAFETY MANUAL

Revised: August 8, 2017
By Mike Dollhopf, COE Laboratory Safety Officer

Laboratory Chemical Hygiene Officer

Facility Name and Room Number/s:

Name/Signature: _ _____ Date:_____

Preface

The purpose of this document is to furnish Marquette University College of Engineering students, faculty and staff with safety guidelines. These guidelines apply to both the teaching and research laboratories.

A COPY OF THIS MANUAL MUST BE PRESENT IN EVERY LABORATORY AND A SIGNED COPY OF THE CHEMICAL HYGIENE PLAN CLEARANCE FOUND IN THE APPENDIX MUST BE COMPLETED BY EVERY INDIVIDUAL CONDUCTING RESEARCH IN THE FACILITY.

Please see materials in the APPENDIX for Information including Critical Area of Compliance checklists and Audit Information, Some examples of Standard Operating Procedures for use of various types of chemical classes, Emergency Lab Postings, Chemical Segregation, NFPA label information, Inventory information, Mercury Equipment Exchange Program, First aid guidelines, Safety labels and forms request document and Waste Disposal Sheets

For further information on campus wide Environmental Health and Safety Measures, visit the EH&S website:

http://www.marquette.edu/riskunit/environmental/index.shtml

Before conducting work in COE laboratory facilities, everyone MUST:

1) **Review these hygiene plan materials with the designated Lab Hygiene Officer.**
2) **Sign and keep on file Chemical Hygiene Plan Clearance Form (first APP page)**
3) **Sign New Employee Checklist (last APP page), plus any lab specific SOPs.**

Emergency Telephone Numbers

Marquette Police (Non-emergency)	288-6800
Marquette Police (Emergency) Fire, Police, Ambulance	288-1911
Poison Control Center	1-800-222-1222
Environmental Health and Safety	288-8411

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Chemical Hygiene Plan

Part I – Introduction

Policy

Within this manual, the College of Engineering at Marquette University delineates the means for providing a safe and healthy workplace in compliance with the Occupational Safety and Health act of 1970 including CFR 1910.1450 “Occupational Exposure to Hazardous Chemicals in Laboratories.”

Objective

This document establishes the Chemical Hygiene Plan and Safety Manual for the College of Engineering. Our objective is to describe correct practices, procedures, operations equipment and facilities to be followed by faculty, students, employees, visitors and any personnel working in a laboratory or stockroom to protect them from potential health hazards presented by chemicals used in these areas and to maintain exposures below safe, specified limits

Personnel Covered by the Plan

This Plan and Safety Manual applies to all work conducted in Marquette University owned or leased laboratory space assigned to the College of Engineering.

Disclaimer

The materials contained in the manual have been compiled to provide a basic safety manual for use in the Marquette University College of Engineering. It is intended to serve as a starting point for good practices and does not purport to specify minimum legal standards. No one should assume that all necessary warning and precautionary measures are contained in the document or that other or additional information on measures may not be required.

Acknowledgement

Many portions of this document were drawn from the ACS pamphlet “Safety in Academic Chemistry Laboratories”, the text “Prudent Practices for Handling Hazardous Chemicals in Laboratories”, the MIT “Chemical Hygiene Plan and Safety Manual” and the Dartmouth College “Chemical Hygiene Plan and Safety Manual”.

Part II – Responsibility, Authority

Department Chairpersons

This person has the responsibility and authority to insure that the Plan and Manual is written, updated and implemented. **The individual labs are under direct responsibility of the Principal Investigator and each Principal Investigator is designated and the Chemical Hygiene Officer for their respective laboratories**. The Department Chairpersons also have responsibility for the health and safety of faculty, students, employees, visitors and other personnel conducting work in the assigned laboratories of the Departments.

Laboratory Supervisors

The Supervisor's duties as defined in the Plan are the responsibility of the principal investigator (faculty member) in charge of each laboratory. In addition, supervisors of the undergraduate laboratories have comparable responsibilities.

The primary responsibility of the faculty member is to implement the Plan and ensure compliance with the OSHA Laboratory Standard. The faculty member duties include, among other, the following:

- Instruct all personnel to conduct work in accordance with the Department's Chemical Hygiene Plan;
- Define the location of designated areas for work with particularly hazardous substances and ensure that an inventory of these substances is properly maintained;
- Review and approve standard operating procedures for work involving hazardous substances;
- Define hazardous operations, designating safe practices and specifying protective equipment;

Continued next page

- Ensure that all staff receive instructions and training in safe work practices, use of personal protective equipment and procedures for dealing with accidents involving toxic substances;

- Direct all personnel to obtain protective equipment necessary for the safe performance of their job;

- Monitor the safety performance of personnel with regard to required safety practices and techniques;

- Conduct formal laboratory inspections regularly to monitor compliance with existing laboratory procedures and regulation;

- Formulate procedures for dealing with accidents that may result in the unexpected exposure of personnel or the environment to toxic substances;

- Investigate all accidents and report them to the Chemical Hygiene Officer.

- Report to the Chemical Hygiene Officer incidents that cause (1) personnel to be seriously exposed to hazardous chemicals or materials, or that (2) constitute a danger of environmental contamination;

- Take action to correct work practices and conditions that may result in the release of toxic chemicals;

- Instruct laboratory personnel to properly dispose of unwanted and/or hazardous chemicals and materials;

- Make copies of the approved Chemical Hygiene Plan and Safety Manual available to the support staff;

- Arrange for non-laboratory personnel (e.g. contractors and support personnel) to be informed of potential hazards they may be exposed to when working in the laboratory and provide proper instruction to minimize the risk of harmful exposure to hazardous substances;

Employees, Staff and Research Personnel

Employees, as defined by the Plan, are those staff personnel under the direction of the faculty member. Employees not under the direction of the faculty member, but who are in an area under the direction of the faculty member, are also subject to the Plan and the standard operating procedures in effect in that area. Also subject to the Plan are all "non-employee" personnel including graduate and undergraduate students, postdoctoral associates and visiting scientists.

It is the responsibility of employees and other non-employee personnel to follow the procedures outlined in the Plan and all standard operating procedures developed under that Plan. These include the following:

1. Understand and follow all standard operating procedures;

2. Understand all training received;

3. Understand the function and proper use of all personal protective equipment. Wear personal protective equipment when mandated;

4. Report, in writing to your supervisor, any significant problems arising from the implementation of the standard operating procedures;

5. Report to your supervisor all facts pertaining to every accident that results in exposure to toxic chemicals and any action or condition that may exist that could result in an accident. Report accidents by filling out the appropriate standard accident forms and forward same to your supervisor or responsible faculty member.

Part III - Information and Training

Initial Training

All personnel conducting research using chemicals in the College of Engineering must complete the following steps prior to working in areas where chemicals are in use.

- Read and understand the Department's Chemical Hygiene Plan and Safety Manual and submit a signed and dated copy of the Chemical Hygiene clearance to the Principal Investigator. This form also must be signed by the responsible faculty member.

All personnel whose work will involve the use of hazardous substances must annually attend the Chemical Waste Handling & Emergency Procedures Seminar conducted by Marquette University Environmental Health and Safety. Please contact Marquette University's Environmental Health and Safety department to obtain seminar schedules. A record of personnel who have attended the lecture will be maintained by the Marquette University Environmental Health and Safety Office.

Safety Data Sheets (SDS's)

Safety Data Sheets (SDS's) are valuable sources of information on hazardous substances. All personnel who may be exposed to hazardous substances may request a copy of the "Right to Know Pocket Guide for Laboratory Employees". (Genium Publication Corp. 1990). This is an excellent guide to understanding SDS's as well as delineating safety tips, physical and health hazards, chemical exposure limits, terms and abbreviations on labels and in SDS's.
SDSs should be the first source of information about the hazards associated with a chemical. They are available Online from multiple sources.
Typically, SDSs will contain the following information, usually in separate sections on the sheet:

- name, address, and phone number of manufacturer
- chemical name, synonyms, and Chemical Abstracts (CAS) Number
- physical properties
- a listing of hazardous constituents for mixtures
- health hazard information
- first-aid measures
- fire fighting measures
- handling and storage precautions
- exposure controls/personal protection
- stability and reactivity

Newer SDSs will contain the following additional information:

- toxicological information
- ecological information
- disposal considerations
- transport information
- regulatory information
- other information

Marquette's chemical inventory system CisPro should be used to access SDS's.
http://cispro.mu.edu
In addition a number of companies such as Aldrich provide SDS at their web site.
Other web sites with connections to SDS data sheets

ttp://siri.org/msds/

http://hazard.com/msds/index.php

Part IV - Safety in the Teaching Laboratories

At the beginning of the semester, any lab which conducts experimentation involving use of chemicals will contain a section explaining lab safety. The purpose of the meeting will be to orient those who may be in contact with chemicals as to safety protocols and basic emergency response actions.

A. The teaching staff and students should become familiar with the location and use of safety facilities and supplies.
    1. Location and proper usage of Personal Protective Equipment (PPE).

    2. Safety showers and eye washes are located in the laboratories and in the corridors. Instructors should tell their students to remember the location of the nearest shower and eye wash to their working areas.

    3. Fire extinguishers are to be used in case of a fire. Breaking the seal on the extinguisher indicates that it has been used.

    4. First aid kits. They should be used without hesitation when an accident occurs.

B. Common sense measures should be followed in the laboratories. For example, acids and bases should be washed off the skin as soon as possible after contact; flammable solvents should never be heated in the open over a flame; reactive chemicals should be mixed slowly with caution, etc.

C. If an accident occurs, the "Accidental Injury Report" should completed immediately and given to the laboratory Principal Investigator. A copy of the report is in the Appendix and should be on hand in laboratories.

D. The procedure for obtaining medical treatment for accidents in undergraduate laboratories is as follows:

    If a minor injury has occurred, the Marquette Police Department should be called at # 1911. The accident should be described briefly and a request made to take the injured student to the Student Health Service. Give your location. The Health Service is open from 8:30 a.m. to 4:30 p.m. If injury occurs at some other time, treat it as you would a major injury (see below).

If a major injury has occurred, the Public Safety Department should be called as in the case of a minor injury. The accident should be described briefly and a request should be made to take the student to the emergency room of a hospital. The Public Safety officer will usually take the injured person to Mt. Sinai or Good Samaritan Hospital.

F. An occasional occurrence in the laboratory is the breaking of thermometers with consequent spilling of mercury.

- Contain but do not attempt to clean-up spill
- Leave all contaminated items in the area, minimize spread of mercury contamination
- Seal the area from other work spaces, keep everyone out the contaminated area and post: "Mercury Contaminated Area DO NOT ENTER"
- Shut off internal ventilation system. If possible ventilate the work area to the outside
- Report the spill to Marquette Police at x8-1911, and EH&S at X8-8411

Non-biodegradable chemicals should not be poured into the laboratory sinks. Instead, a bottle will be provided for the students to discard these chemicals. The bottle should be labeled with the name of the chemical and given to the stockroom after it is no longer in use.

UNIVERSAL SPILL RESPONSE KITS, in yellow buckets, are present in most labs and can be used to contain and clean many small chemical spills.

G. Laboratory instructors should familiarize themselves with the chemicals being used in an experiment (e.g. corrosiveness, flammability, reactivity, stability and toxicity).

H. Students should be encouraged to wear appropriate clothing including a protective apron or laboratory coat. Long hair should be confined. Open-toed shoes or sandals should be discouraged.

I. Eating, drinking and smoking are not allowed in the laboratories.

Part V - Medical Consultation and Emergency Procedures
Emergencies and Accidents

In case of an injury or accident, it is prudent practice to call Marquette Police, 8-1911 is used in case of emergencies and 8-6800 is used for non-emergencies.

http://www.marquette.edu/riskunit/environmental/emergency_information.shtml

For minor injuries, students can request help by going to the Student Health Service. For major injuries, minor injuries of non-students or when the Health Service is closed, you should request help in going to the Emergency Room of a hospital. The Marquette Police officer will usually take the injured person to Mt. Sinai or Good Samaritan Hospital.

Fire

In the event that a fire is uncontrollable, in that it cannot be extinguished by a fire Extinguisher, a fire alarm should be sounded. Fire alarms are located near the stairways on all floors. Faculty, students and staff should familiarize themselves with the alarm locations near their offices and laboratories.

Activating the fire alarm will set off a pulsing ringing on all floors of the building. When the fire alarm sounds, the building should be evacuated immediately.

Accidents Involving Chemicals

In the event of a toxic spill, follow procedures described in this document. Locate a chemical spill kit (often in Yellow Spill Kit buckets) and utilize according to instructions, or call Environmental Health and Safety if you are uncertain what procedure to use. Also consult the appropriate SDS and clean-up promptly when feasible.

Every laboratory door is posted with an Emergency Lab Information sheet with the names and phone numbers of personnel to be called in the event of an emergency.

Accident Reports

Accident reports should be filled out describing the nature of all accidents as well as action taken to avoid such accidents in the future. Copies should be sent to the Chemical Hygiene Officer and to the supervisor or faculty member. The Accident Report Form is in the Appendix.

Part VI - Protective Equipment

Personal Protective Equipment (PPE)

Suitable gloves must be worn when handling hazardous/corrosive chemicals. Gloves should be inspected carefully to insure that they are free of holes and tears.
Skin contact with any chemical (obvious exceptions, water, salt, etc.) should be avoided. Glove compatibility and practice guidelines are in the Appendix.

Wearing of laboratory coats or aprons on a regular basis in the laboratory is a sensible way to prevent injury.

Sandals or open toes shoes should never be worn in the laboratory.

Laboratory Hoods

Fume hoods must be used when conducting laboratory experiments with hazardous chemicals. Fume hoods of all sizes are available in the research and instructional laboratories. Obstructions caused by large objects, reagent bottles, etc., can cause turbulence/abnormal air flow patterns, which result in inefficient and dangerous hood operations.

Average face velocity for the 6' and 8' hoods located in the research and advanced chemistry laboratories is 100'/minute. Flows are labeled with a marker, which indicates the maximum safe operating sash height. Safety factors that should be kept in mind when operating within a hood are outlined in "Prudent Practices for Handling Hazardous Chemicals in Laboratories" pp. 199-200. Among these are:

- The hood sash should be maintained in the lowest possible position; this will not only provide optimum fume containment, but the lowered sash may also act, in part, as a safety shield. Keep the sash closed when the hood is not used.

- Keep the hood clean without bottle or equipment clutter.

- An emergency plan should be devised in the event of ventilation (power) failure or other unexpected events (fire/explosion) in the hood.

Fire Extinguishers, Safety Showers, Eyewash Facilities and First Aid

Laboratories are equipped with CO_2 extinguishers as well as several other types. Each laboratory must contain at least one fire extinguisher. The seals should not be broken on the release handle. If the seal is broken, then the fire extinguisher needs immediate re-pressurizing.

- CO_2 extinguishers for Class B (flammable solvents) and Class C fires (electrical. Do not use them in fires involving reactive metals (Na, K, Al, lithium aluminum hydride, etc.).
- Dry Powder extinguishers for Class B & C fires.
- Met-L-X extinguishers for burning reactive metals, metal alloys, hydrides, organometallic compounds (Class D).
- Sand for any type of fire, especially Class D.
- Water extinguishers for Class A fires (wood/paper/trash) only.

The Lab Safety Committee will conduct unannounced laboratory inspections several times each year. These are thorough inspections, which include surveys of safety equipment, fire extinguishers, laboratory housekeeping, hood conditions, chemical and solvent storage, etc.

Part VII – Handling and Disposal of Chemicals

Marquette has a campus wide CisPro Chemical Inventory System. All chemical containers on campus should be labeled with UPC code and included in the inventory, and disposed of through the inventory system when used up.

http://www.marquette.edu/riskunit/environmental/restricted/cispro_chemical_inventory.shtml

The College of _____Chemical Officer (_____) will maintain the labeling system and inventory all items, and perform an annual reconciliation of the inventory for the college. Please Contact _____(_____), immediately upon receiving a new chemical. Always Order the minimum amount reasonable.

Department Guidelines for Disposal of Waste Solvents and Chemicals

All Researchers that handle chemicals and chemical waste are required to annually attend the Waste Handling seminar given by the Environmental Health and Safety department. For more information refer to Marquette's Environmental Health and Safety website:
http://www.marquette.edu/riskunit/environmental/chemical_disposal.shtml

- Waste chemicals must be stored in appropriate, closed containers with labels containing:
  1) Name of researcher
  2) Date that accumulation of waste began
  3) Lab room number
  4) Chemicals in bottle (Do not use abbreviations or figures.)

- If the waste is Hazardous or hazard is unknown, a Red Hazardous Waste sticker should be applied to the container and used for labeling purposes.

- Waste Containers should be stored in a safe location, labeled as the Waste Accumulation site.

- Use the smallest container as is reasonable.

- **Handlers should contact Environmental Health and Safety when a waste container is in need of disposal and fill out a Chemical Waste Disposal sheet. This sheet is provided in the Appendix.**

Sanitary Sewer (sink drain) Disposal of Chemicals

Marquette University is presently working with Veolia and MMSD to obtain a listing of chemicals and neutralization or dilution procedures for common chemicals that can be disposed of in a sanitary sewer. Currently, we are modeling our disposal practices to those used by the University of Wisconsin Madison Safety Department and the listing provided to them by The Madison Metropolitan Sewage District. A copy of the disposal procedures and listing by chemical is on file in the College of _____ Lab SOP and Chemical Safety binder in _____ Room #_____.

When there is any doubt, Collect all material, label, and dispose as hazardous chemical waste.

For potentially hazardous chemicals commonly used in each lab, it is advisable to have specific disposal protocols in place and on file in a safety binder or along with the chemical hygiene plan.

When a protocol is not in place for a particular chemical, or the chemical constituents of a solution is unknown, it must be treated as hazardous and collected and disposed of through Environmental Health and Safety chemical waste collection.

A brief 'Sink Disposal' guideline created by Marquette Environmental Health and Safety department is provided in the Appendix.

Inorganic chemicals and some acids and bases, such as salts, mineral acids, and alkalis, it is preferable to neutralize followed by water dilution before drain disposal. Dilute solutions of inorganic salts may be disposed via drain only if both cation and anion are listed in the 'Sink Disposal' guide in the Appendix.

Water insoluble compounds, lachrymators, amines, mercaptans and other odoriferous materials of those capable of converting to toxins , monomers and highly flammable compounds should <u>never</u> be discharged into laboratory drains. Ethers normally should be disposed of as discussed above (non-halogenated category).

Additional examples of chemicals <u>NOT</u> to be discharged under any circumstances into laboratory drains: mercury and mercury salts, lead compounds, arsenic compounds, chromium compounds, cyanides, nickel salts and complexes, strong oxidizing agents-peroxides and <u>all</u> carcinogens and suspect carcinogens.

Transporting Hazardous Chemicals

Department policy mandates that hazardous chemicals and solvents be carried in approved secondary containers (with handles) made of rubber, metal or plastic. Bottles small enough to be carried in the palm of the hand can be transported by that method. Compressed gas cylinders need to be capped and restrained during transport. Transport of all waste containers is performed by Health and Safety department personnel.

Refer to EH&S website for further information:
http://www.marquette.edu/riskunit/environmental/AcceptingPackagesofHazardousMaterials.shtml

Procedures for Handling Accidental Release and Spills of Hazardous Chemicals including Solvents

Spills must be cleaned up and confined promptly by the person responsible for the spill. If responsibility cannot be determined, then the Chemical Hygiene Officer will take appropriate action and designate a person or persons to help with the clean-up process. Spill control pillows, absorbents, neutralizing agents for acids and bases, as well as pails, brooms, etc. should be present in every lab that utilizes any chemical that requires the specific spill containment. Yellow bucket Universal Spill Kits should be present in all laboratories. If a spill is large or personnel is not comfortable handling cleanup, the Environmental Health and Safety department should be contacted immediately for advice on how to proceed once personnel have been safely removed from the spill location.
Spills of a highly toxic substance require special handling. In this case, the person responsible should not attempt clean-up alone. Assistance from a supervisor and perhaps the Milwaukee Fire Department may be necessary.

Procedures for working with Flammable and Explosive Substances

Flammable Solvents

Heating solvents except water must be carried out in a hood. Use of the hood is recommended for the heating of flammable solvents even when the apparatus is enclosed (reflux, distillation), especially when the quantities are significant. A steam bath, heating mantle, oil bath or similar device should be used, but never a flame.
If the solvent is flammable, be careful to operate the hotplate at the lowest practical temperature and to avoid placing the hot flask in front of the hotplate whence vapors can be drawn inside the device.

Explosive and Flammable Substances

Any work with explosive materials mandates the use of protective equipment, such as face shields (with snap-on throat protector), gloves and safety shields.
Of the explosive materials handled in the Department laboratories, organic peroxides are the most frequently used and are also among the most dangerous because of their extreme sensitivity to shock, friction, heat, light, oxidizing and reducing agents.

Commercially purchased peroxides and other chemicals listed as explosive or flammable are best stored in a flammable storage or suitably modified refrigerator.

Procedures for Handling Chemicals that Pose Hazards Because of Acute Toxicity, Chronic Toxicity or Corrosiveness

All work with these substances must be confined to designated laboratory areas such as a given laboratory, laboratory area or a fume hood. The designated areas must be posted with appropriate warning signs.

The listings for carcinogens, select carcinogens, reproductive toxins as well as that for corrosive substances are in this document.

The following Table lists some of the compounds that may be in current use in _____ laboratories which are considered particularly hazardous:

Hydrochloric Acid	Hydrogen peroxide	Propane Gas
Sulfuric Acid	Potassium Nitrate	Butane
Nitric Acid	Permanganate	Hydrogen Gas
Hydrofluoric Acid	Sodium Nitrate	Chloroform

An excellent guideline for the procedures and precautions to take when working with these substances is given in "Prudent Practices, Chapter I.B., pp. 30-50."

Part VIII - Standard Operating Procedures for Work with Hazardous Substances

Hazardous Substances should have lab specific Standard Operating Procedures in place that describe safe storage and handling methods and are signed by individuals using those chemicals.

The OSHA Laboratory Standard (29CFR 1910.1450) defines a hazardous substance as "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 which act on the hematopoietic systems and agents which damage the lungs, skin, eyes or mucous membranes". Highly flammable and explosive substances also comprise an addition al category of hazardous chemicals. PPE and specific handling methods mentioned in MSDS is required.

Carcinogens

In order to familiarize personnel with the classes of compounds and functional groups that have been correlated with carcinogenic activity, a listing of these types is given in Appendix 4. The select carcinogens are asterisked. These compounds are particularly hazardous and there is evidence from human studies that exposure to such chemicals can cause cancer. The listing that follows was drawn from substances identified as carcinogens or potential carcinogens by OSHA, the International Agency for Research on Cancer and publications by the National Toxicology Program.

Reproductive Toxins

These compounds cause chromosomal damage (mutagens) and have lethal or teratogenic effects. Many toxins exhibit chronic effects causing damage as a result of lengthy exposures with symptoms, which become evident only after long latency periods.
Researchers and their supervisors should evaluate compounds used in their work that have similar structures and determine if they should be handled as reproductive toxins. The periods of greatest susceptibility to embryo toxins are the first 17-55 days of pregnancy. Use with extreme caution and follow handling guidelines specifically.

Corrosive Substances

These materials cause destruction alterations in living tissue at the site of contact. Corrosive chemicals include strong acids, strong and some weak (ammonium hydroxide) bases, dehydrating agents (sulfuric acid, sodium hydroxide phosphorous pentoxide, calcium oxide) and oxidizing agents such as hydrogen peroxide, chlorine, bromine.

Irritants

These substances are non-corrosive, but cause reversible inflammatory effects on tissue at the contact site. A very large number of both organic and inorganic chemicals fall into this class and therefore skin contact with almost all chemicals should be avoided.

Toxic and Highly Toxic Agents

OSHA regulations define toxic and highly toxic agents with median lethal dose (LD_{50}) values in the following ranges:

	Toxic	**Highly Toxic**
Oral LD_{50}	50-500mg/kg	<50mg/kg
Skin Contact LD_{50}	200-1000mg/kg	<200mg/kg
Inhalation LD_{50}	200-2000 ppm/air	<200 ppm/air

Hazardous Substances with Toxic Effects on Specific Organs

Substances included in this category include (a) hepatotoxins (substances that produce liver damage such as nitrosamines and carbon tetrachloride); (b) nephrotoxins (agents causing damage to the kidneys, such as certain halogenated hydrocarbons); (c) neurotoxins (substances that produce their primary toxic effects on the nervous system, such as mercury, acrylamide, and carbon disulfide); (d) agents which act on the hematopoietic system (such as carbon monoxide and cyanides that decrease hemoglobin function and deprive the body tissues of oxygen); (e) agents that damage lung tissue, such as asbestos and silica.

Sensitizers

A sensitizer or allergen is a substance that causes allergic reaction in normal tissue after repeated exposure to the substance. Examples of allergens include diazomethane, chromium, nickel, formaldehyde, isocyanates, arylhydrazines, benylic and allylic halides, and many phenol derivatives.

Flammable and Explosive Substances

A number of highly flammable substances are in use in the College of Engineering. Explosive substances are materials that decompose under conditions of mechanical shock, elevated temperature or chemical action, with the release of large volumes of gases and heat. Examples include acetylene, hydrogen, carbon monoxide and hydrogen sulfide. Acetylene and hydrogen are especially dangerous because of their wide flammability limits, which in turn add greatly to their potential fire and explosion hazards. Hydrogen, Oxygen, and Acetylene gas tanks should be secured and isolated (> 20 feet) from other reactive gases and chemicals.

Procedures for Laboratory Work with Hazardous and Toxic Substances

Some general Standard Operating Procedures for various classes of compounds are present in the Appendix, if a laboratory uses hazardous chemicals, they should have these SOPs read and signed by those using those chemicals.

Please refer to the Appendix for Critical Area of Compliance and Chemical handling and lab safety audit compliance checklists and maintain laboratories and procedures to adhere to all listed items.

A Partial List of Good Laboratory Practices

- All work areas should be maintained in a clean and orderly manner.
- Reagent, solvent clutter on floors and in hoods must be eliminated. Also exit obstructions must be eliminated.
- Researchers are required to label all materials used and be aware of their flammability, reactivity, corrosiveness and toxicity.
- All accidents that require medical attention must be reported.
- Compressed gases must always be secured to avoid being knocked over. Large tanks require belt clamps or chains. Small tanks require a base of a large diameter that clamps on the tank.
- Vacuum pumps should have belt guards. The guards prevent clothing or part of the body form being caught in the pump's moving parts.
- Most refrigerators and freezers in the College of Engineering are for chemicals and should not contain food items. Refrigerators should be clearly marked. Signs should be posted on each unit. A spark from opening and closing the door or from the compressor motor could cause an explosion with these refrigerators and freezers if flammables are stored in them.

- Broken glassware should be discarded as soon as possible if not repairable. Repairable broken glassware should be repaired as soon as possible. Glassware and bottles should not be placed on the floor where someone can trip on them.
- Electric cords and wires should be placed where they cannot be tripped on.
- Toxic chemicals should be disposed of when they will no longer be used.
- Solvents should be stored in cabinets provided for this purpose (painted yellow). When in use, the common solvents should be in cans (painted red or stainless steel).
- Researchers must never work with hazardous substances when alone (outside normal hours). Overnight operations must be designed to prevent accidental release of hazardous chemicals by taking appropriate measures, e.g. automatic water turn off devices, wiring of condenser tubing, arranging for periodic inspection of the experiment, etc. Public Safety should be informed where and when a researcher will be alone in a hazardous lab environment.

General Principles

- Be prepared for any accident or eventuality such as a fire, explosion, power failure, etc. Decide in advance what emergency action to take.
- Determine in advance the potential hazards that may be involved with chemicals to be handled and take appropriate preventative measures.
- Avoid all skin contact with hazardous chemicals and conduct your experiments in the hood to prevent inhalation of such chemicals.
- Always assume new compounds and those of unknown toxicity are hazardous and/or toxic.
- Drinking and eating are permitted only in offices and other non-laboratory areas.
- Horseplay, pranks or other acts of mischief are especially dangerous and are absolutely prohibited.
- Avoid skin contact, ingestion and inhalation of hazardous substances. Wearing of gloves, use of aspirators or pipette bulbs (never mouth suction) for filling pipettes, and washing hands after work are important preventive measures you must take when working with hazardous materials. In addition, to prevent inhalation of toxic vapors, gases, and mists, conduct all experiments in fume hoods as discussed earlier
- Maintain proper chemical storage and segregation methods and avoid incompatible interactions.

APPENDIX Follows

Chemical Hygiene Plan Clearance

I have read and understood the contents of the Chemical Hygiene Plan and Safety Manual and I am familiar with the Safety Protocols and hazards associated with the chemicals in use in my work area.

I understand campus, building, and room specific emergency protocols, including locations/contents/function of fire extinguishers, safety showers, eye washes, and first aid kits.

I have discussed chemical handling protocols and waste disposal with my advisor or lab manager and will annually enroll in the Hazardous Waste Handling & Emergency Procedures training seminar.

I, have discussed hygiene procedures with, _____, and
(Faculty member)
He/she is familiar with the hazards associated with handling the chemicals for use in our laboratory.

_____ _____
Student Date

_____ _____
Faculty Member Date

Marquette University
College of Engineering

ACCIDENTAL INJURY REPORT

Time and Place of Accident_____

NAME of Injured Person_____

Was Injured person a Student? Yes_____ No_____ Course #_____ Lab Section_____Room_____

NAME and Category of Supervisor_____
(Teaching Assistant, Faculty, etc.)

DESCRIBE Accident (include the injured's activity, equipment and/or chemicals used and part of the body injured and by what)

_____
_____
_____
_____
_____

Nature and Extent of Injury_____
_____

Type of First-Aid, by_____

Student Health Center? Yes_____ No_____

Hospital Treatment? Yes_____ No_____ Name of Hospital_____

Principal Cause(s) of Accident and Injury_____
_____
_____
_____

Aggravating Causes_____
_____
_____

What should be done and by whom to prevent a recurrence of this or similar accidents?

_____
_____
_____
_____

Signature of Injured Person_____ Date_____

Report Filed by_____ Date_____

Please give this Report to the Lab Coordinator.

BUILDING	DATE (UPDATE ANNUALLY)	IN CASE OF EMERGENCY	
		FIRE: Pull fire alarm, do not use elevators, evacuate building, stay 500 feet away	
LAB ROOM NUMBER	DEPARTMENT	HAZARDOUS GASES: Inform others to evacuate the area; close doors; call **8-1911**	
		HAZARDOUS MATERIALS SPILL: If in doubt, get out and call **8-1911**	
PRINCIPAL INVESTIGATOR	OFFICE & HOME PHONE NUMBERS	HAZARDOUS MATERIALS SPILL: (small) call MU Safety for assistance (**288-6800**)	
		MAJOR MEDICAL EMERGENCY: If trained, begin first aid; call **8-1911**	
LAB MANAGER OR ALT. CONTACT	OFFICE & HOME PHONE NUMBERS	NATURAL DISASTER: Monitor news broadcast and seek shelter in interior hallways	
		INJURIES: Call **8-1911**, provide dispatch with your location (room number & building)	
EMERGENCY COORDINATOR	OFFICE & HOME PHONE NUMBERS	Student Health Services: **288-7184**	MU Public Safety Department: **288-6800**
		Poison Control Center: **800-222-1222**	Ambulance/Fire/Police/Spill: **8-1911**

Biological Materials				**Radiological Hazard**	**Emergency Equipment**
Type of Agent	Low BSL-1	Medium BSL-2	High BSL-3	☐ IRRADIATOR	☐ SAFETY SHOWER LOCATED WITHIN 10 SECONDS OF TRAVEL
Human Pathogen	☐	☐	☐	☐ SEALED SOURCE	☐ EYE WASH LOCATED WITHIN 10 SECONDS OF TRAVEL
Animal Pathogen	☐	☐	☐	☐ RADIOACTIVE MATERIAL	☐ FIRE EXTINGUISHER LOCATED WITHIN 75 FEET OF TRAVEL
Plant Pathogen	☐	☐	☐	☐ RADIOACTIVE WASTE	☐ FIRST AID KIT LOCATED WITHIN LABORATORY
Not Infectious	☐	NA	NA	☐ LASER	☐ SPILL KIT LOCATED WITHIN LABORATORY
				☐ OTHER:	☐ OTHER:

CHEMICAL HAZARDS (see back for examples)	**RECOMMENDED USE/STORAGE LIMIT**	**TOTAL MATERIALS USED/STORED IN LAB; INCLUDE LOCATION AND CHEMICAL IDENTITY**
COMPRESSED GASES (CLASS 2)		
☐ FLAMMABLE	2 - 5 FOOT CYLINDERS (MAX)	
☐ NON - FLAMMABLE	4 - 5 FOOT CYLINDERS	
☐ POISONOUS	2 - 15 INCH LECTURE BOTTLES (MAX)	
FLAMMABLE LIQUIDS (CLASS 3)	5 GALLONS BENCH/10 GALLONS SAFETY CANS	
FLAMMABLE LIQUIDS (CLASS 3)	60 GALLONS IN STORAGE CABINET	
REACTIVES (CLASS 4)		
☐ FLAMMABLE SOLIDS	1 KILOGRAM	
☐ SPONTANEOUSLY COMBUSTIBLE	2 KILOGRAMS	
☐ DANGEROUS WHEN WET	2 KILOGRAMS	
REDUCERS (CLASS 5)		
☐ OXIDIZERS	5 KILOGRAMS	
☐ ORGANIC PEROXIDES	1 KILOGRAM	
TOXIC (CLASS 6)	2 KILOGRAMS	
CORROSIVE MATERIAL (CLASS 8)		
☐ ACID	5 GALLONS	
☐ BASE	5 GALLONS	

Complete and post next to your laboratory door and provide a copy to Facility Manager.

EXAMPLES OF CHEMICAL HAZARDS FOR EMERGENCY POSTING INFORMATION

COMPRESSED GASES (CLASS 2)

- Flammable: Acetylene, carbon monoxide, ethane, ethylene, hydrogen, methane
- Oxidizing: Oxygen, ozone, oxides of nitrogen, chlorine, fluorine {chlorine and fluorine reacts with flammables similarly to that of oxygen
- Corrosive: Ammonia, hydrogen chloride
- Highly Toxic: Arsine, cyanogen, fluorine, germane, hydrogen cyanide, nitric oxide, phosphine, hydrogen selenide
- Inert: Argon, helium, krypton, neon, nitrogen, xenon
- Pyrophoric: Diborane, dichloroborane, phosphine, silane
- Unstable: Butadiene, ethylene oxide, vinyl chloride, methyl acetylene

FLAMMABLE &, COMBUSTIBLE (CLASS 3)

Flammables:

- Class IA liquids: Flash Point <73°F (23°C) and Boiling Point at or below 100°F (38°C)
- Class IB liquids: Flash Point <73°F (23°C) and Boiling Point at or above 100°F (38°C)
- Class IC liquids: Flash Point at or above 73°F (23°C) and below 100°F (38°C)

Combustibles:

- Class II liquids: Flash points at or above 100°F (38°C) and below 140°F (60°C)
- Class IIIA liquids: Flash point at or about 140°F (60°C) and below 200°F (93°C)
- Class IIIB liquids: Flash point at or above 200°F (93°C)

REACTIVES (CLASS 4)

Flammable solids

- Organic Solids: Camphor, Cellulose Nitrate, Naphthalene
- Inorganic Solids: Decaborane, Lithium Amide, Phosphorus Heptasulfide, Phosphorus sesquisulfide, Potassium Sulfide, Anhydrous Sodium Sulfide, Sulfur
- Combustible Metals: (Except Dusts and Powders) Cesium, Magnesium, Zirconium

Water-reactive material

- Aluminum alkyls, bromine petafluoride, bromine trifluoride, chlorodiethylaluminium, diethylzinc, calcium carbide, calcium metal, lithium hydride, methyldichlorosilane, potassium metal, potassium peroxide, sodium metal, sodium peroxide, sulfuric acid, trichlorosilane, acetyl chloride, sodium hydroxide, chlorosulfonic acid and titanium tetrachloride

Unstable materials

- Acetyl peroxide, dibutyl peroxide, dinitrobenzene, ethyl nitrate, peroxyacetic acid, picric acid, hydrogen peroxide (>52%), hydroxylamine, nitromethane, paranitroaniline, perchloric acid, tertafluoroethylene monomer, acrolein, acrylic acid, hydrazine, methacrylic acid, sodium perchlorate, styrene, vinyl acetate, acetic acid, hydrogen peroxide (35-52%), paraldehyde, tetrahydrofuran

REDUCERS (CLASS 5)

Oxidizers

- Gases: Oxygen, Ozone, Oxides of Nitrogen, Fluorine, Chlorine
- Liquids: Hydrogen Peroxide, Nitric Acid, Perchloric Acid
- Solids: Chlorates, Chromates, Chromium trioxide, Iodine, Nitrates, Nitrites, Perchlorates, Peroxides

Organic Peroxides

- Dibenzoyl peroxide, butanone peroxide, acetyl peroxide, diacetyl peroxide, butyl peroxide
- Organic Peroxides contain a double oxygen or peroxy (-0-0) group. Some are prone to explosive decomposition.

TOXIC (CLASS 6)

Highly toxic material

- Gases: Arsine, cyanogen, diborane, fluorine, germane, hydrogen cyanide, nitric oxide, nitrogen dioxide, ozone, phosphine, hydrogen selenide, stibine.
- Liquids: Acrolein, 2-chloroethanol, hydrazine, hydrocyanic acid, 2-methylaziridine, acrylonitrile, methyl isocyanate, nicotine, tetranitromethane, tetraethylstannane
- Solids: Phenyl mercury, 4-aminopyridine, arsenic pentoxide, arsenic trioxide, calcium cyanide, 2-chloroacetophenone, aflatoxin 8, decaborane(14), mercury II bromide, mercury II chloride, pentachlorophenol, methyl parathion, white phosphorus, sodium azide

Toxic material

- Gases: Boron trichloride, boron trifluoride, chlorine, chlorine trifluoride, hydrogen fluoride, hydrogen sulfide, phosgene, silicon tetrafluoride
- Liquids: Acrylonitrile, allyl alcohol, alpha-chlorotoluene, aniline, l-chloro-2, 3-expoxypropane, ethyl chloroformate, 3-chloropropene, o-cresol, furfuryl alcohol
- Solids: Acrylamide, barium chloride, barium nitrate, benzidine, p-benzoquinone, beryllium chloride, cadmium chloride, cadmium oxide, chloroacetic acid, chlorophenylmercury, chromium (VI) oxide, potassium fluoride, potassium hydroxide, selenium (IV) disulfide, sodium fluoride

CORROSIVE (CLASS 8)

- Acids: Chromic, formic, hydrochloric (>15%), hydrofluoric, nitric, perchloric, sulfuric
- Bases: Ammonium hydroxide, calcium hydroxide, potassium hydroxide, sodium hydroxide, potassium carbonate . Others: Bromine, chlorine, fluorine, iodine, ammonia

Chemical Inventory System Information

MARQUETTE UNIVERSITY
Be The Difference.

Chemical Inventory Reconciliation Process

When a chemical container becomes empty, do not dispose of the container without first removing the Marquette University bar code label.

Marquette University's bar code labels are 2-ply labels called "piggyback labels". The bar code label can be removed from the container by peeling it off the first ply label backing.

Marquette utilizes two types of bar codes. The first type is for incoming chemical containers. The second types is for in-house chemical containers. The yellow bar code label is placed on smaller in-coming containers that cannot accommodate the NFPA label.

In-coming container bar code label

In-house container bar code label

Peel the bar code label from the empty container and place the label on the reconciliation spreadsheet located on a clipboard in the lab.

On a monthly basis, the reconciliation spreadsheets will be collected from the labs. The containers on the spreadsheets will be disposed of in Marquette's chemical inventory database. Adhering to the monthly reconciliation process will simplify the lab's annual reconciliation.

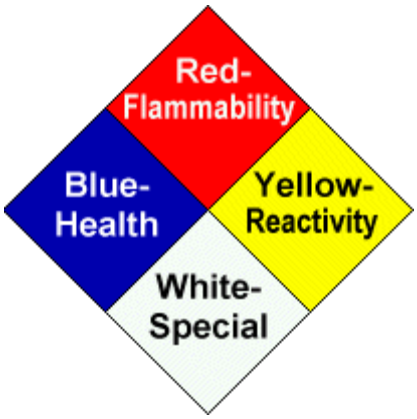
The circular hazard classification storage labels do not need to be removed.

Questions regarding Marquette University's chemical inventory program should be directed to Dennis Daye at (414) 288-8411.

Circular labels do not need to be removed.

Dev 8/09

NFPA Ratings Definitions



HEALTH (Blue)	
4	Materials that on very short exposure could cause death or major residual injury even though prompt medical treatment was given.
3	Materials that on short exposure could cause serious temporary or residual injury even though prompt medical treatment was given.
2	Materials that on intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment was given.
1	Materials that on exposure would cause irritation but only minor residual injury even if no treatment was given.
0	Materials that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible material.
FLAMMABILITY (Red)	
4	Materials that: (a) rapidly or completely vaporize at atmospheric pressure and normal ambient temperatures and burn readily, or (b) are readily dispersed in air and burn readily.
3	Liquids and solids that can be ignited under almost all ambient temperature conditions.
2	Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.
1	Materials that must be preheated before ignition can occur.
0	Materials that will not burn.
REACTIVITY (Yellow)	
4	Materials that in themselves are readily capable of detonation or of explosive decomposition or reaction at normal temperatures and pressures.
3	Materials that: (a) in themselves are capable of detonation or explosive reaction but require a strong initiating source, or (b) must be heated under confinement before initiation, or (c) react explosively with water.
2	Materials that: (a) in themselves are normally unstable and readily undergo violent chemical change but do not detonate, or (b) may react violently with water, or (c) may form potentially explosive mixtures with water.
1	Materials that in themselves are normally stable but which can: (a) become unstable at elevated temperatures, or (b) react with water with some release of energy, but not violently.
0	Materials that in themselves are normally stable, even when exposed to fire, and that do not react with water.
SPECIAL Notice Key (White) **This field designates special information about the material.**	
W	Denotes materials that are water reactive. These compounds undergo rapid energy releases on contact with water.
OX	Denotes materials that are oxidizing agents. These chemicals give up oxygen easily, remove hydrogen from other compounds, or attract negative electrons.

MARQUETTE UNIVERSITY

CISPRO CHEMICAL INVENTORY SYSTEM: CHEMICAL COMPATIBILITY IN STORAGE

Store incompatible chemicals apart from each other. Keep incompatible chemicals apart by cabinet, drawer, shelving unit or shelf. For liquid and high hazard chemicals, secondary containers are effective tools to prevent reactions between incompatible chemicals. When storing reactive chemicals, secondary containment can prevent degradation and reactions that occur during storage. It is best to use secondary containers made of materials that are non-reactive (i.e., polyethylene, polypropylene). Refer to Marquette's Guidelines for Preventing Chemical Incompatibility Hazards.

Hazard Storage Class		Storage Type	Examples
1	Inorganic Acids	Corrosives Cabinet Do not store acids and bases in the same cabinet	Conc. Hydrochloric Acid (37%), Phosphoric Acid Less than concentrated: Sulfuric Acid, Nitric Acid
2	Organic Acids	Corrosives Cabinet	Dichloroacetic Acid, EDTA (ethylenedinitrilo tetraacetic acid), Thimerosal
3	Bases	Corrosives Cabinet Do not store acids and bases in the same cabinet	Ammonium Hydroxide, Calcium Oxide, Potassium Hydroxide, Sodium Hydroxide
4	Oxidizing Inorganic Acids (Special Handling Acids)	Corrosives Cabinet Cabinet labeled "Oxidizing / Special Handling Inorganic Acids" Separate secondary containment for each (& label)	Bromine, Hydrofluoric Acid Concentrated: Nitric Acid (70%) , Perchloric Acid (60%), Sulfuric Acid (96%)
5	Oxidizers	General Storage Cabinet Cabinet labeled "Oxidizers"	Sodium Hypochlorite. The following are generally considered oxidizing substances: Peroxides, Perchlorates, Chlorates, Nitrates, Nitrites and less than concentrated Perchloric Acid.
6	Toxics	Designated Storage Cabinet Cabinet/shelf labeled "Toxics"	Chloroform, Ethidium Bromide, Lead, Mercury Compounds, Potassium Cyanide, Phenol
7	Flammables	Flammable Storage Cabinet Only keep flammables in a flammable cabinet	Acetone, Acetic Acid, Benzene, Ethyl Ether, Formaldehyde, Heptane, Hexane, Isopropyl Alcohol, Methanol, Pentane, Toluene, Xylene
W	Water Reactives	Designated Storage Cabinet Store in a moisture free location	Sulfuric Acid, Sodium Metal, Sodium Hydroxide Sodium Azide, Acetic Anhydride Reacts violently/explosively with water

None	General Storage Cabinet Double check NFPA Ratings to ensure general storage is appropriate

* If there is an asterisk with the hazard storage class number (6*), the chemical is considered to be a particularly hazardous substance.

(Developed: 08/2012)

Chemical Storage Segregation and Marquette Indicator Labels

Table of Incompatible Chemicals

Chemical	Is Incompatible With
Acetic acid	Chromic acid, nitric acid, perchloric acid, peroxides, permanganates
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Acetone	Concentrated nitric acid and sulfuric acid mixtures
Alkali and alkaline earth metals	Water, carbon tetrachloride or other chlorinated hydrocarbons i.e., powdered aluminum or magnesium, carbon dioxide, halogens, calcium, lithium, sodium, potassium
Ammonia (anhydrous)	Mercury (in manometers, for example), chlorine, calcium hypochlorite, iodine, bromine, anhydrous HF
Ammonium nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrites, sulfur, finely divided organic or combustibles
Aniline	Nitric acid, hydrogen peroxide
Arsenical materials	Any reducing agent
Azides	Acids
Bromine	See Chlorine
Calcium oxide	Water
Carbon (activated)	Calcium hypochlorite, all oxidizing agents
Carbon tetrachloride	Sodium
Chlorates	Ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials
Chromic acid and chromium trioxide	Acetic acid, naphthalene, camphor, glycerol, alcohol, flammable liquids in general
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, turpentine
Chlorine dioxide	Ammonia, methane, phosphine, hydrogen sulfide
Copper	Acetylene, hydrogen peroxide
Cumene hydroperoxide	Acids (organic or inorganic)
Cyanides	Acids
Decaborane	Carbon tetrachloride and some other halogenated hydrocarbons
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens
Fluorine	Everything
Hydrocarbons (such as butane, propane)	Fluorine, chlorine, bromine, chromic acid, sodium peroxide
Hydrocyanic acid	Nitric acid, alkali
Hydrofluoric acid (anhydrous)	Ammonia (aqueous or anhydrous)
Hydrogen peroxide	Copper, chromium, iron, most metals or their salts, alcohols, acetone, organic materials, aniline, nitromethane.

Chemical	Is Incompatible With
Hydrogen sulfide	Fuming nitric acid, oxidizing gases
Hypochlorites	Acids, activated carbon
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, fulminic acid, ammonia
Nitrates	Sulfuric acid
Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases, copper, brass, any heavy metals
Nitrites	Acids
Nitroparaffins	Inorganic bases, amines
Oxalic acid	Silver, mercury
Oxygen	Oils, grease, hydrogen, flammable liquids, solids, or gases
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils
Peroxides, organic	Acids (organic or mineral), avoid friction, store cold
Phosphorous (white)	Air, oxygen, alkalis, reducing agents
Potassium	Carbon tetrachloride, carbon dioxide, water
Potassium chlorate	Sulfuric and other acids
Potassium perchlorate (also chlorates)	Sulfuric and other acids
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, sulfuric acid
Selenides	Reducing agents
Silver	Acetylene, oxalic acid, tartaric acid, ammonium compounds, fulminic acid
Sodium	Carbon tetrachloride, carbon dioxide, water
Sodium nitrite	Ammonium nitrate and other ammonium salts
Sodium peroxide	Ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerine, ethylene glycol, ethyl acetate, methyl acetate, furfural
Sulfides	Acids
Sulfuric acid	Potassium chlorate, potassium perchlorate, potassium permanganate (similar compounds of light metals such as sodium, lithium)
Tellurides	Reducing agents

Chemicals that React Explosively with Water

This appendix lists some common laboratory chemicals that react violently with water and that should always be stored and handled so that they do not come into contact with liquid water or water vapor. They are prohibited from landfill disposal, even in a lab pack, because of the characteristic of reactivity. Procedures for decomposing laboratory quantities can be obtained from the Safety Committee Chairman.

Alkali metals
Alkali metal hydrides
Alkali metal amides
Metal alkyls, such as lithium alkyls and aluminum alkyls
Grignard reagents
Halides of nonmetals, such as BCl_3, BF_3, PCl_3, PCl_5, $SiCl_4$, S_2Cl_2
Inorganic acid halides, such as $POCl_3$, $SOCl_2$, $S0_2Cl_2$
Anhydrous metal halides, such as $AlCl_3$, $TiCl_4$, $ZrCl_4$, $SnCl_4$
Phosphorous pentoxide
Calcium carbide
Organic acid halides and anhydrides of low molecular weight

Chemicals that React Explosively with Air

Many members of the following readily oxidized classes of common laboratory chemicals ignite spontaneously in air. Pyrophoric chemicals should be stored in tightly closed containers under an inert atmosphere (or, for some, an inert liquid), and all transfers and manipulations of them must be carried out under an inert atmosphere or liquid. Pyrophoric chemicals cannot be put into a landfill because of the characteristic of reactivity. Suggested disposal procedures can be obtained from the Safety Committee Chairman.

Grignard reagents, RMgX
Metal alkyls and aryls, such as RLi, RNa, R_3Al, R_2Zn
Metal carbonyls, such as $Ni(CO)_4$, $Fe(CO)_5$, $Co_2(CO)_8$
Alkali metals such as Na, K
Metal powders, such as Al, Co, Fe, Mg, Pd, Pt, Ti, Sn, Zn, Zr
Metal hydrides, such as NaH, $LiAlH_4$
Nonmetal hydrides, such as B_2H_6 and other boranes, PH_3, AsH_3
Nonmetal alkyls, such as R_3B, R_3P, R_3As
Phosphorus (white)

Glove Compatibility Guide

GLOVE TYPE:	USE:
Butyl Rubber	**Good** for many organics, ketones, esters; **Poor** for aliphatic, aromatic hydrocarbons, halogenated hydrocarbons, gasoline
Natural Latex	**Not Recommended** due to potential for developing latex sensitivity
Natural Rubber	**Good** for very dilute acids and bases; **Poor** for organics
Neoprene	**Good** for acids and bases, peroxides, fuels, hydrocarbons, alcohols, phenols **Poor** for halogenated and aromatic hydrocarbons
Nitrile	**Good** for wide variety of solvents, oils, greases, some acids and bases
Polyvinyl chloride (vinyl, or PVC)	**Good** for acids and bases, some organics, amines, and peroxides; economical; **Poor** for most organics, petroleum solvents
Polyvinyl alcohol (PVA)	**Good** for aromatic and chlorinated solvents; **Poor** for water-based solutions- *water destroys the gloves!*
Silver Shield™	**Good** for wide variety of toxic and hazardous chemicals; provides the highest level of chemical resistance. Flexible laminate glove; **Poor fit**- comes in small, medium, large
Viton™	**Exceptional** resistance to chlorinated and aromatic solvents; **Good** resistance to cuts and abrasions
4H™	**Good** resistance to many chemicals; better dexterity than Silver ShieldTM

Glove Use Prudent Practice Guide

Select gloves based on the materials being handled, the particular hazard involved and the operation.

- Become familiar with ***permeation*** and ***degradation*** characteristics of the glove material in relation to the material being handled. **Permeation** is a process where the chemical seeps through the glove material. **Degradation** is a reduction in one or more physical properties of a glove material due to contact with a chemical. ***Breakthrough time*** is the time lapse between first contact of the chemical with the glove and the time to detection inside the glove. All gloves are permeable…it's just a matter of time.

- Check the glove manufacturers' selection guide, MSDS or other reputable sources for your glove selection determination.

- Visually inspect gloves for discoloration, punctures and other defects.

- Multiple gloves can be worn together; double gloving can prolong the overall breakthrough time.

- A defective glove or the wrong glove may be worse than no glove if it allows chemicals to permeate and be held in prolonged contact with the skin.

- Wear cut resistant gloves, or better yet, tools, for handling broken glassware or for activities where there is the potential of skin puncture. See *MU Prudent Lab Practice: Glassware Safety* for additional information.

- Wear non-absorbent insulated gloves when working with very hot or very cold materials (e.g., Nomex®, Kevlar®, etc.). Older asbestos gloves are prohibited and must be submitted for proper disposal. When handling cryogenic liquids, the gloves must be loose enough to be tossed off easily. See *MU Prudent Lab Practice: Cryogenic Liquids* for additional information.

- Don't ***cross contaminate*** while wearing gloves or when removing your gloves! Remove gloves before leaving the work area or before handling any uncontaminated objects (e.g., keyboard, doorknobs, telephones, pens, etc.).

- Replace gloves when necessary, depending on frequency of use, wear and tare, and the permeation-degradation characteristics for the substance handled.

- Gloves may *not* be appropriate when working with machinery. Check with your lab / studio safety representative for safe machinery work practices.

- If a disposable glove becomes contaminated, remove and replace with a new glove. Never reuse contaminated disposable gloves.

Glassware Safety and Prudent Practices

- Injury from glassware is one of the leading causes of accident at MU.
- Inspect glassware for cracks and defects before using. Flaws create tensile stress which causes breakage when the glass is subject to thermal stress (rapid change in temperature), bruise (caused by striking a hard surface) or scratch.
- For heating and pressurized operations, ensure that the appropriate glassware is used. Borosilicate glassware (e.g., Pyrex, Kimax) is recommended for all laboratory glassware except for special experiments that use UV, other light sources or extreme temperatures. Check the manufacturer's data sheets for specifications. Keep in mind that vacuum or pressure can change the temperature limits of the glassware.
- Use carriers to transport glass containers of flammable or corrosive substances. Carriers help protect against breakage and limit dispersion of leaking chemicals.
- Leave at least 10 percent of air space in containers with positive closures.
- Never use laboratory glassware to serve food or drinks.
- Perform a hazard assessment and wear appropriate eye and glove protection when working with glassware.

Broken Glass and Glass Disposal:

- Clean all broken glass using a broom and dustpan. Avoid picking up broken glass with your hands; if you do so, **use a cut resistant glove**.
- Dispose of broken glass properly and label the waste container as "Broken Glass" or similar.
- Contaminated glass must be placed in an appropriate durable chemical waste container.
- **See APPENDIX for Sharps and Glassware Disposal Protocol Sheet**

Sharps and Laboratory Glass Disposal

Medical Sharps, infectious materials, and hazardous chemicals are prohibited in normal trash

NEEDLES AND OTHER SHARPS

Sharps: Items designed to cut or puncture skin and sharp items contaminated with human blood and body fluids.

- Needles
- Syringes with needles
- Lancets
- Scalpels and razor blades
- Contaminated broken vials, hematocrit tubes, Pasteur pipettes (contaminated or broken) and laboratory slides

Sharps Container: Closable, puncture resistant, leakproof. Labeled with biohazard emblem or "sharps", "infectious waste", or "biohazard". Meets DNR and OSHA Standards.

Disposal Procedure:

- Collect in a covered sharps container.
- DO NOT overfill containers
- When full, take to a sharps collection area.
- Facilities will not handle sharps containers in most buildings.

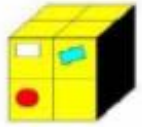
HAZARDOUS GLASS AND PLASTIC

Hazardous Glass and Plastic: Items that can cut if disposed of in normal trash containers.

- Pasteur pipettes
- Other pipettes and tips
- Slides and cover slips
- Broken or fragile glass

Sturdy, Leakproof Container:

- Use plastic liner for cardboard boxes.
- Double box or tape seams to contain waste, use heavy duty tape.
- Limit weight to 20 lbs.
- Use discarded boxes or purchase cardboard or plastic containers
- Containers must be covered (glass items should not be projecting from the container.



Disposal Procedure:

- If contaminated with infectious agents or human blood, decontaminate before placing in leakproof container.
- Empty the item of hazardous chemicals and drain liquids.
- Seal container closed – do not place paper waste in glass containers
- Mark box with the words "Glass for Disposal".
- Facilities will empty marked containers periodically

EMPTY BOTTLES, OTHER GLASS AND PLASTIC

Unbroken Glass and Plastic: Items that present no hazard if disposed of as normal trash.

- Petri dishes (decontaminated)
- Sturdy test and centrifuge tubes
- Empty bottles
- Microtiter plates

Glass Recycle Bucket: Sturdy, plastic container labeled "Glass Waste: Recycle"

Disposal Procedure:

- Remove Marquette bar code from container and place on reconciliation spreadsheet.
- Rinse container with tap water if necessary.
- Ensure that glassware and container are completely empty of chemicals.
- Place in glass waste bucket
- Place large (4 liter) bottles next to wastebasket.
- Facilities will handle glass waste buckets.

Some buildings may have slightly modified disposal procedures. Contact your building manager for details about local procedures.

Marquette University EHS 288-8411

(rev.Feb 2010)

Marquette University

Chemical Waste Inventory Disposal

Dept._____

Date _____ Location/Room# _____ Page _____ of_____

Person(s) doing inventory/Contact Person(s)_____**Phone Ext.**_____

Chemical Name/Description	(S)olid (L)iquid or (G)as	Container Size	Total Quantity Weight/ Volume	Container Type	Number of Containers	Acutely Hazardous "P" or "F" Waste? Yes or No	Comments

03/23/01

Standard Operating Procedures (SOPs)

Chemicals and Operations Requiring SOPs

- Acutely Toxic Materials MUsopacutelytoxics.docx
- Alkali Metals MUsopalkalimetals.docx
- Ammonia MUsopammonia.docx
- Aqua Regia MUsopaquaregia.docx
- Base Bath MUsopbasebath.docx
- Benzene MUsopbenzene.docx
- Biosafety Level 2 MUsopbsl2.docx
- Bromine MUsopbromine.docx
- Chloroform MUsopchloroform.docx
- Chromerge (Chromic Acid Solution) MUsopchromerge.docx
- Compressed Gases MUsopcompressedgases.docx
- Corrosives MUsopcorrosives.docx
- Dangerous When Wet MUsopdangerouswhenwet.docx
- Diethyl Ether MUsopdiethylether.docx
- Dimethyl Sulfoxide MUsopDMSO.docx
- Ethyl Ether MUsoethylether.docx
- Ethidium Bromide MUsopethdiumbromide.docx
- Ethylene Oxide MUsopethyleneoxide.docx
- Fadrozole Hydrochloride MUsopfadrozolehydrochloride.docx
- Flammable and Combustible Liquids MUsopflammablecombustibleliquids.docx
- Flammable Solids MUsopflammablesolids.docx
- Formaldehyde MUsopformalehyde.docx
- Hydrogen Fluoride (HF) MUsophf.docx
- Hydrogen Peroxide MUsophydrogenperoxide.docx
- Lithium Alkyl Compounds MUsoplithiumalkyls.docx
- Liquid Nitrogen MUsopliquidnitrogen.docx
- Isoflurane MUsopisoflurane.docx
- Mercury MUsopmercury.docx
- Methylene Chloride (Dichloromethane) MUsopmethylenechloride.docx
- Nitrate Salts MUsopnitratesalts.docx
- Nitric Acid MUsopnitricacid.docx
- Nitric Oxide MUsopnitricoxide.docx
- Oxidizers MUsopoxidizers.docx
- Paraformaldehyde 4% Solution MUsopparaformaldehyde 4%.docx
- Perfluorodecyltrichlorosilance MUsopperfluorodecyltrichlorosilane.docx
- Piranha Solution(Sulfuric acid/Hydrogen peroxide) MUsoppiranha.docx
- Potassium Cyanide MUsoppotassiumcyanide.docx
- Pyrophorics MUsoppyrophorics.docx
- Sodium Azide MUsopsodiumazide.docx
- Sulfuric Acid MUsopsulfuricacid.docx

Checklist for Audit Compliance Success (Labs)

	General Questions	Y	N	DK	NA
1.0	Are you aware of and in compliance with all items identified on the "Critical Areas of Compliance" for laboratories check sheet?				
2.0	Are you aware of the requirements of the Resource Conservation and Recovery Act (hazardous waste) relative to chemical storage and waste disposal?				
3.0	When you discard a waste, do you know if it is hazardous? If you do not know, do you have someone you can ask?				
4.0	Do you keep chemical (including waste) containers closed in order to eliminate fugitive emissions and evaporative losses?				
5.0	Do you limit purchases of chemical to amounts needed for a project or specific calendar period, rather than buying in bulk?				
6.0	Since many chemicals are hazardous when disposed, have you investigated micro or green chemistry techniques? These serve the same purpose but use micro quantities or less harmful materials.				
7.0	Are all incompatible chemicals and wastes stored separately at the correct temperature and humidity?				
8.0	Do you segregate the following highly reactive materials?				
	a. Oxidizing agents from reducing agents and combustibles?				
	b. Reducing agents from reducible substances?				
	c. Acids from reducing agents?				
9.0	Do you inspect stored chemicals regularly for out-of-date products, leakage, and proper storage?				
10.0	Do you regularly discard chemicals that are no longer used, needed, or expired?				
11.0	Do you keep accurate records of your hazardous waste generation and accumulation?				
12.0	Do you maintain a file of all chemicals use in your area? Do you have access to MSDS sheet for each substance?				
	Resource Conservation and Recovery Act (RCRA) (40 CFR 261, 262, 265)				
1.0	**Storage and labeling**				
	a. Is all hazardous waste stored in either a satellite accumulation area and/or a separate permanent hazardous waste storage area?				
	b. Are all hazardous waste containers labeled with the words "Hazardous Waste"?				
	c. Are containers marked with the accumulation start date? Tip a new label should be applied and a new start date entered when the container is transferred from the satellite accumulation area to hazardous waste storage area.				
	d. Are all hazardous waste storage containers in good condition?				

	e. Are all hazardous waste containers kept closed except when filling or adding waste?				
	f. Are regular inspections made for damage, leaks, etc.?				
	g. Are provisions for segregation of incompatible waste clearly labeled?				
	h. Is proper spill response equipment available? Are employees trained in its use?				
	i. Is emergency response information posted by phones?				
2.0	**Training**				
	a. Do employees receive hazardous waste handlers/management/emergency response training related to their job duties?				
	b. Are training records maintained? *Tip: Training records are maintained by the EH&S department. Training certificates are sent to the individual employees for their records. Training is required on an annual basis.*				
	c. Are job descriptions on file in the EH&S department for all employees who receive training? *Tip: Job descriptions should be sent to the EH&S department.*				
3.0	Have you taken steps to reduce and eliminate the toxicity and amounts of chemicals in your area whenever possible?				
4.0	Have you identified an overstock of unopened, excess, or outdated chemicals?				
5.0	Is all hazardous waste stored in proper containers? *Tip: Containers must be suitable for their contents, including appropriate closures. Liquids should be in screw-capped bottles, carboys, or drums. Solids should be in large-mouth jars, sturdy bags, boxes or drums. Containers must be in good condition and compatible with their contents. Beverage containers, flasks, and containers with cork, rubber, or ground glass stoppers are not appropriate for waste.*				
7.0	Are rusty, crusty, or dusty containers present? *Tip: These containers are considered by the EPA to be inherently waste-like materials. It should be determined whether chemical containers that are rusty, have crystal accumulations, or are dusty can be removed from storage and disposed of properly. If these materials are to be kept they need to be transferred to a new, appropriate container.*				
8.0	Is secondary containment provide where there is the potential for spills to enter the sewer through a drain in the floor or sink? *Tip: A secondary containment system must be implemented in a way that prevents the migration of wastes out of the system and is capable of containing 10% of the total volume or the volume of the largest container whichever is larger.*				

MARQUETTE UNIVERSITY
CRITICAL AREAS OF COMPLIANCE LABORATORIES

Department		**Building and Room #**	
Principal Investigator, Laboratory Manager or Person in Charge			
Date of Evaluation		**Person Completing Evaluation**	

General Laboratory Safety (GS)	Yes	No	NA
1. Phones in the lab are labeled with Public Safety's contact number.	☐	☐	☐
2. Chemical Hygiene Plan is available.	☐	☐	☐
3. Lab has a designated Chemical Hygiene Officer.	☐	☐	☐
4. All personnel have received Lab Specific Training.			
5. Lab has standard operating procedures for Particularly Hazardous Substances.	☐	☐	☐
6. Lab workers have access to MSDS information on all chemicals that they use.	☐	☐	☐
7. There is a procedure in place for lab workers working alone.	☐	☐	☐
8. There is no food or drink in the laboratory.	☐	☐	☐
9. Lab refrigerators are labeled "Not for food and drink".	☐	☐	☐
10. Housekeeping meets safety standards.	☐	☐	☐
Emergency Response/Evacuation (EE)			
1. The "Lab Emergency Information" sheet is completed and posted.	☐	☐	☐
2. Lab occupants are aware of the Emergency Evacuation Coordinator and Fire Marshall.	☐	☐	☐
3. Hallways and stairways to exits are clear and unobstructed.	☐	☐	☐
4. Areas around safety showers, eye wash stations, fire extinguishers, fire blankets and electrical panels are clear.	☐	☐	☐
5. Last inspection of safety showers, eye wash stations, fire extinguishers and fire blankets is indicated on the equipment and is current.	☐	☐	☐
6. Natural gas shut off valves are labeled and Lab personnel are knowledgeable in the location of these valves.	☐	☐	☐
Slips, Trips and Falls (SF)			
1. Aisles are uncluttered without tripping hazards.	☐	☐	☐
2. Mats are positioned appropriately and are in good condition.	☐	☐	☐
3. Walkways are free of water and do not present a slip and fall hazard.	☐	☐	☐
Chemical Storage and Handling (CS)			
1. No flammable solvents, corrosives or reactives are stored above eye level.	☐	☐	☐
2. Shatterproof containers are used for storing/handling flammable liquids.	☐	☐	☐
3. No more than 5 gallons of flammable liquids are stored outside of a safety can or flammable liquid storage cabinet.	☐	☐	☐
4. No more than 10 gallons of flammable liquids are stored in safety cans outside of a flammable liquid storage cabinet.	☐	☐	☐
5. No more than 60 gallons of flammable liquids are stored in a UL approved flammable liquid storage cabinet.	☐	☐	☐
6. No more than 75 total gallons of flammable liquids are stored in a single lab.	☐	☐	☐
7. Proper grounding and bonding should be provided and used in areas where bulk flammable liquids are dispensed between containers.	☐	☐	☐
8. All chemical containers are appropriately labeled.	☐	☐	☐
9. An approved container is used for the disposal of organic solvents.	☐	☐	☐
10. All containers for waste chemicals are labeled "Hazardous Waste", are safety stored and have closed lids.	☐	☐	☐
11. Mercury thermometers and equipment have been eliminated from the lab. (Mercury free lab)	☐	☐	☐
12. Mercury thermometers and equipment have been identified and mercury spill prevention measures are in place.	☐	☐	☐
13. A chemical spill cleanup kit is available to the lab.	☐	☐	☐
14. Peroxide forming reagents are dated when opened.	☐	☐	☐

15. Peroxide forming reagents are disposed of or tested after expiration date.	☐	☐	☐
Compressed Gases (CG)			
1. Gas cylinders are properly secured.	☐	☐	☐
2. Cylinders are labeled with the contents and a completed NFPA diamond.	☐	☐	☐
3. Toxic gas cylinders are used and stored in a vented cabinet or fume hood.	☐	☐	☐
4. Safety caps are used to protect the cylinder valves and are in place when the cylinder is not in use.	☐	☐	☐
5. No Teflon tape on compressed gas cylinder compression fittings.	☐	☐	☐
Sharps and Glassware (SG)	Yes	No	NA
1. Hard plastic sharps containers are used for the collection of sharps (razor blades, scalpel blades, needles and lancets.)	☐	☐	☐
2. Glassware that is to be disposed of is stored inside a puncture resistant, leak-proof container that is marked or labeled.	☐	☐	☐
Personal Protective Equipment (PPE)			
1. Safety glasses or goggles are available.	☐	☐	☐
1a. Safety glasses/goggles are worn.	☐	☐	☐
2. Chemical protective gloves are available.	☐	☐	☐
2a. Reusable gloves are in good condition.	☐	☐	☐
3. Lab coats are available.	☐	☐	☐
3a. Lab coats are worn.	☐	☐	☐
Fume Hoods (FH)			
1. Hoods have a current inspection sticker (must be inspected annually).	☐	☐	☐
2. Hoods are not used to store excessive amounts of chemicals or equipment in the fume hood that could interfere with the airflow.	☐	☐	☐
3. Sash is kept down except when working in hood.	☐	☐	☐
Machine Guarding (MG)			
1. Equipment with moving parts (e.g. a belt driven pump) has safeguards.	☐	☐	☐
Electrical Safety (ES)			
1. Circuit breaker boxes are unobstructed and all breakers are labeled.	☐	☐	☐
2. There are no extension cords being used.	☐	☐	☐
3. Electrical outlets are not overloaded.	☐	☐	☐
4. There is Ground Fault Circuit Interruption (GFCI) protection on outlets near sinks or other water sources.	☐	☐	☐
Are radionuclides present in the lab? (see radionuclide lab safety evaluation)	☐	☐	☐
Are lasers present in the lab? (see laser safety evaluation)	☐	☐	☐
Are biohazards present in the lab? (see biological safety evaluation)	☐	☐	☐

Comments [Indicate Section Initials (i.e. ES) and Item Number]:

MARQUETTE UNIVERSITY- _____Department
Student and TA Laboratory Safety Awareness Checklist

General Laboratory Safety – Informed of Location/Protocol	Yes	No	NA
Phones Located in Hallways- Identify Public Safety's contact number. (x81911)	☐	☐	☐
Public Safety Booklet Location – Lists various emergency situations and procedures (Blue)	☐	☐	☐
Potential for Particularly Hazardous Substances – Review throughout course	☐	☐	☐
MSDS (Material Safety Data Sheets) information all chemicals available on MU link (**cispro.mu.edu**)	☐	☐	☐
Protocol for students working alone after hours– NO HAZARDOUS MATERIALS USED	☐	☐	☐
There is NO food or drink in the laboratory. Note: Lab refrigerators are "Not for food and drink".	☐	☐	☐
Housekeeping requirements for laboratory- BACKPACKS AND COATS BY RACKS ONLY.	☐	☐	☐
Attire Review – Close toed shoes required (no saddles). Loose clothing around open flames.	☐	☐	☐
Emergency Response/Evacuation	Yes	No	NA
Evacuation route from lab to meeting place, _____. Reminder: Students do not leave w/o Permission from MU Police and Instructor.	☐	☐	☐
Aware of the Emergency Evacuation Coordinator and Fire Marshall on Floor during emergency	☐	☐	☐
Show location of safety showers, eye wash stations, fire extinguishers, fire blankets in lab area -General awareness of how to use equipment.	☐	☐	☐
Chemical Storage, Handling, and Disposal	Yes	No	NA
Chemical handling procedures - Review throughout the course	☐	☐	☐
All chemical containers are appropriately labeled.	☐	☐	☐
Location and procedures for disposal of organic solvents when necessary.	☐	☐	☐
Location of **chemical spill cleanup kit** and spill cleanup contact person. Janell Romatowski WLS 106	☐	☐	☐
Compressed Gases	Yes	No	NA
Gas cylinders – proper use and exchange procedure. Reminder Full Cylinders Travel Alone in Elevator	☐	☐	☐
Understand how Cylinders are labeled with the contents and the NFPA diamond.	☐	☐	☐
Disposal Procedures-	Yes	No	NA
Sharps Disposal- RED plastic.	☐	☐	☐
Glassware Disposal - location and what is disposed. – NO Bio-hazardous material.	☐	☐	☐
Plastic waste disposal – - Square Paper Box - location and what is disposed (tips, tubes, anything w/ a point or potential shards) – NO Bio-hazardous material.	☐	☐	☐
Bio-hazardous Material – location and what is disposed	☐	☐	☐
Chemicals – Not all chemicals can go down the drain. Ask first. Satellite accumulation area.	☐	☐	☐
Animals – Location and disposal. Double bagged in black bag in lab freezer until full. Bio-hazards room freezer final destination.	☐	☐	☐
Personal Protective Equipment	Yes	No	NA
Safety glasses or goggles – location and when to use.	☐	☐	☐
Chemical protective gloves -location and when to use. (LATEX ALLERGIES)	☐	☐	☐
Reusable gloves – location and proper use. (Autoclave, Cold gloves, Hot gloves)	☐	☐	☐
Lab coats – location and when to use.	☐	☐	☐
Additional PPE Unique to Lab- UVP glasses, masks.	☐	☐	☐
Fume Hood and Bio-Safety Hood	Yes	No	NA
Location and use. Reminder - Sash is kept down except when working in hood.	☐	☐	☐
UVP light hazardous to skin and eyes.	☐	☐	☐
Decontamination of area	☐	☐	☐
Additional Laboratory Information Specific to <u>THIS</u> Teaching Laboratory	Yes	No	NA

Bio-hazardous Material awareness - Review throughout course	☐	☐	☐
Animal Handling Training - Animal Care	☐	☐	☐
Liquid Nitrogen and Dry Ice - Handling and Transport Procedures (Do Not Ride with in Elevator)	☐	☐	☐
Equipment Hazard Awareness – Flame, Sharps, moving parts, microwaves	☐	☐	☐

COMPLETED CHECK LIST FILED IN LABORATORY'S RED BINDER – COMPLETED FORMS

Student (signature):_____ Date: _____

Instructor (signature):_____ Date: _____

Marquette University Laboratory Safety
Critical Areas of Compliance Criteria

GENERAL LABORATORY SAFETY

1. All phones in the laboratory are labeled with Marquette Police's phone number.

- Non-Emergency (414) 288-6800
- **Emergency** (414) 288-1911

2. Chemical Hygiene Plan is available.

- View the lab's copy of the Chemical Hygiene Plan
- All labs are required to have the CHP in the lab to make it a legal document. It may be copied or downloaded from the MU website.
- Lab occupants are knowledgeable of the location and availability of the lab's Chemical Hygiene Plan.

3. Chemical Hygiene Officer

- The Chemical Hygiene Officer is qualified by training or experience to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan.

4. All personnel have received Lab Specific Training.

- View lab specific training documentation. If no documentation is available, put a no.
- All employees who work in laboratories where chemicals or other hazardous material are used or handled must have specific training on tasks as well as the general lab facility they will be working in. This is part of the Hygiene standard that makes the CHP specific to their lab.

5. Standard Operating Procedures – Particularly Hazardous Substances

- The lab must develop standard operating procedures when the lab performs work that is not covered by the Department's CHP or the lab is using particularly hazardous substances. The particularly hazardous substance inventory and sample SOPs for particularly hazardous substances are located on MU's website.

6. SDS Access

- Interview lab personnel to assess if they know how the MSDS's for the chemicals used in their lab can be obtained.

7. Procedures – Working Alone

- Each lab must have a procedure for accounting for lab workers working alone. The accountability system will depend upon the nature of the hazards in the lab. If a sign in or log book is maintained, Public Safety should be aware of its location in the event that the building needs to be evacuated.
- Experimental work with hazardous substances or operations conducted alone in the lab either beyond normal working hours or on weekends should only be done with a regular check –in schedule with another person within easy call or Public Safety should be notified.

8. Food and Beverages are not stored or used in the lab.

- Look for food and drink, or evidence of food and drink in the lab.
- If soda cans or coffee cups are present, mark "no" on this question.
- Food and drink must be consumed outside of the lab or in a room that is separated from chemicals by floor to ceiling walls and a door that closes.

9. Lab Refrigerators are labeled "Not for food and drink"

- Eating and storage of food is not allowed in the lab. Beakers or other lab equipment should never be used to store or consume food.
- Laboratory-safe refrigerators should be identified by a manufacturer label. Lab safe refrigerators are specifically designed for use with flammables.

10. Housekeeping meets safety standards.

- Excess storage does not exist above cabinets.
- Storage and equipment are appropriate for the lab space.

EMERGENCY RESPONSE/EVACUATION

1. "Lab Emergency Information" sheet is completed and posted.

- If the lab contains 10 gallons or more of flammable liquids, post a flammable solvent label on the door.
- If the lab contains radioactive materials and there is no Radioactive sticker on the door, contact the Radiation Safety Officer.
- If the lab contains BioSafety Level 2 materials and there is no Biohazard sticker on the door, contact the Biological Safety Officer.
- If the lab contains larger amounts of corrosives outside of storage areas, such as acid baths, put a corrosive sticker on the door.
- In general, it is not a good idea to put carcinogen stickers on the main door. This makes the whole room a designated area.
- Experiments involving possible reactions that could result in fire, explosion or flood should not be left unattended overnight. If such experiments are absolutely necessary, notify the Department's Emergency Coordinator and indicate contact information on the Lab Emergency Information sheet.
- Notify the Department's Emergency Coordinator of experiments that mandate continuous ventilation.

2. Lab occupants are aware of the Building's Emergency Evacuation Coordinator and Fire Marshall.

3. Hallways and stairways to exits are clear and unobstructed.

- Inspect for a blocked or obstructed hallways or stairway that would slow an evacuation.
- File cabinets, equipment, flammable liquid storage cabinets and hazardous waste should not be located in hallways or stairways.

4. Areas around safety equipment are clear.

- Assess if the eyewash station/safety shower is accessible for use in case of an eye exposure to chemicals. This includes being able to stand in front of the eyewash, lean over and rinse both eyes.

- Assess if the fire extinguisher can be accessed quickly and that it is visible.
- A minimum 36-inch clear space shall be provided and maintained around all electrical equipment and electrical panels to permit ready and safe operation and maintenance.

5. Documented Safety Equipment Inspections

- Eyewash/Safety Shower weekly log – ensure that the eyewash/safety shower is being flushed once per week by looking at the inspection tag. As per the ANSI standard, eyewash/safety showers must be flushed once per week and these inspections should be documented. The intent is to ensure that there is a flushing fluid supply at the head of the device and to clear the supply line of any sediment build-up that could prevent fluid from being delivered to the head of the device and minimize microbial contamination due to sitting water.
- Eyewash/Safety Shower annual inspection – ensure that the annual inspection for this equipment has been completed by looking at the inspection tag.
- Fire extinguishers – All fire extinguishers are marked with a current inspection tag (annual inspection requirement). All fire extinguishers must have an intact pin.
- Fire blankets – Inspected on a monthly basis.

6. Natural Gas Shutoffs Labeled and Knowledgeable Personnel

- All gas line shut off valves are accessible and labeled.
- Lab personnel are trained where the valves are located and how to verify that the gas supply to all of the lab stations is shut off.
- Lab personnel are aware of the signs of a natural gas leak and the procedures to be followed if a leak is suspected.

SLIPS, TRIPS AND FALLS

1. Aisles are uncluttered without tripping hazards.

- Inspect for electrical cords or hoses across aisles, or any other tripping hazard. Tripping hazards can include permanent as well as temporary items.
- If tripping hazards are taped or covered with a plastic sheath, the hazard has been abated, and a yes can be given.
- Evaluate and note any equipment that is projecting into aisles and posing a struck by hazard.

2. Mats are positioned appropriately and are in good condition.

- Mats should be positioned in areas where moisture on the floors is likely – ice machines, autoclaves and water fountains.
- If water is visible on the floor, evaluate whether an absorbent mat is necessary.
- Mats should not present trip hazards – curled edges, torn.
- Mats should be appropriate for the exposures that they are intended to control.

3. Walkways are free of water and do not present a slip and fall hazard.

- Identify worn tiles or stair treads.
- Identify whether a particular area has been subject to slips and falls.

CHEMICAL STORAGE AND HANDLING

1. **Flammable solvents, corrosives or reactives stored above eye level.**
   - Look for corrosive material no higher than 2 feet above floor level, especially larger volumes (within reason).
   - Flammable liquids should not be stored above refrigerators, freezers or cabinets.

2. **Shatterproof containers are used for storing/handling flammable liquids.**
   - Look for opportunities to educate lab personnel on shatterproof containers.

Safest → → → → Least Safe
Safety Cans Metal Cans Coated Glass Plastic Glass

3. **No more than 5 gallons of flammable liquids are stored outside a safety can or flammable liquids storage cabinet.**
   - The amount of flammable liquids "in use" or in the open should be kept to an absolute minimum. Flammables on bench tops and open shelves will be involved in a fire almost immediately.
   - A fire safety can is used with more than one gallon of flammable liquid (Justrite can – approved, DOT can – not approved).
   - There shall be no glass containers with liquids on the floor.
   - Containers are not stored securely in a stable fashion.

4. **No more than 10 gallons of flammable liquids are stored in safety cans outside of a flammable liquids storage cabinet.**
   - DOT shipping cans are not safety cans.
   - To reduce material handling exposures, 1-2.5 gallon safety cans are preferable.

5. **No more than 60 gallons of flammable liquids are stored in a UL approved flammable liquid storage cabinet.**
   - Flammable liquid storage cabinets should not be stored in hallways.
   - Cabinets should be constructed of approved material or be approved by a recognized testing agency such as UL or FM. Cabinets require a 2" containment sill.
   - Flammable liquid safety cabinets do not need to be vented for fire safety purposes.
   - A flammable liquid warning label shall be attached to cabinets that are used to store flammables.
   - Ideally, the contents of the cabinet should be indicated on the outside of the cabinet (magnet markers).
   - Safety cabinets are not required by federal regulations to have a grounding point.

6. **No more than 75 total gallons of flammable liquids are stored in a single lab.**
   - If limits are exceeded, the lab must re-evaluate its storage and dispensing procedures. Flammable liquids must be dispensed in an approved "inside flammable liquid storage room". Basement storage of flammable and combustible liquids is not recommended.
   - Transferring liquids from larger storage containers to smaller in-use containers shall be conducted in an

area that is provided with adequate ventilation, rated electrical equipment, appropriate bonding and grounding, diking and containment, fire suppression equipment and emergency spill provisions. Pre-planning for transport of all flammable liquids within the building shall be conducted to ensure that the potential for spills is minimized and emergency spill procedures are in place.

7. Proper grounding and bonding should be provided and used in areas where bulk flammable liquids are dispensed between containers.

- When flammable liquids are dispensed, the presence of static electricity can ignite flammable vapors. Most static electricity control measures provide ways for static charges to be dissipated before sparks occur.
- Bonding is connecting two or more conductive objects with a conductor (i.e. copper bonding wire) that equalizes the potential charge between them.
- Grounding is connecting one or more conductive objects directly to earth using ground rods, cold water copper pipes or building steel.
- Connectors for bonding and grounding, such as copper wire and clamps, must provide a good conductive path. To ensure this:
  - Remove all dirt, paint and rust or corrosion from areas where connections are made;
  - Use connectors that are strong enough for the job;
  - Connect metal to metal
- When dispensing flammable liquids, both bonding and grounding are required. Ensure that the receiving container is bonded to the dispensing container before pouring the liquid, and ensure that the dispensing container is grounded.
- Non-metallic containers, such as polyethylene plastic or glass, cannot be grounded. For this reason, NFPA and FM do not recommend that liquids with flashpoints less than 100^{o}F be stored in plastic or glass containers.
- In the labs, transferring flammable liquids from safety cans to smaller in-use containers should be conducted under the lab hood.

8. All chemical containers are appropriately labeled.

- Inspect all containers for labeling. They must contain the name of the chemical and hazard warning. If the chemical is stored in the original manufacturer's container, the manufacturer's warning labels are appropriate.
- Labels that are illegible should be noted.

9. Approved containers are used for the disposal of organic solvents.

- White, square carboys are used for collection of waste solvents suitable for fuel blending. These include non-halogenated flammable solvents such as acetonitrile, ethyl acetate, hexane, methyl alcohol and toluene.
- Yellow, square carboys are to be used for the collection of solvent wastes that must be incinerated. These include halogenated solvents (those containing halogen compounds such as chlorine or fluorine) such as chloroform, methylene chloride and trichloroethylene. This is for both economic and safety reasons. The halogenated wastes, while much less flammable, are generally more toxic than non-halogenated waste materials. The disposal cost of non-halogenated solvents is approximately one third

that of halogenated solvents.

- Partially full carboys should be stored in a flammable solvent cabinet.
- Goggles, gloves and a lab coat should be worn when handling carboys or when adding solvents to carboys.
- Funnels shall not be left in unattended carboys.

10. All containers for waste chemicals are labeled "Hazardous Waste", are safety stored and are capped when not in use.

- Carboy shall be securely capped, except when adding waste to the carboy.
- A flammable liquid/waste analysis tag is attached to the carboy and the tag has been appropriately completed.
- Inspect all waste tags for the chemical name and contents listed, including the amount or concentration. Abbreviations are not acceptable. The tag should also indicate the start date of when material was first added.
- Containers stored in close proximity to sinks or drains must be provided with secondary containment with a capacity of 110% of the largest container.

11. Mercury thermometers have been eliminated from the lab. (Mercury free lab)

- The lab has replaced mercury containing thermometers with red liquid thermometers and electronic devices to measure temperature and pressure. Alternatives include: Enviro-Safe, Easy-Read and Double Safe
- The lab has replaced all mercury containing manometers, switches and controllers.

12. Mercury thermometers and equipment have been identified and mercury spill prevention measures are in place.

- The lab has a mercury spill response plan. The plan identified small spill (less than 5 ml) vs. large spill (greater than 5 ml) responsibilities.
- There is a designated in-house small spill response person equipped with a dedicated mercury vacuum. This individual has been trained.
- The presence of mercury containing equipment must be indicated on the lab's emergency information posting.

13. A chemical spill cleanup kit is available to the lab.

- Ask lab employees to show you the spill kit. If they cannot locate the spill kit, mark "no".
- If later in the inspection, the spill kit is found, mark a yes, but make a comment that the lab workers did not know where the spill kit was.
- Labs can share spill kits as long as everyone has access to it and knows how to use it. It should still be accessible in a reasonable amount of time.
- The recommended kit can be purchased from _____.

14. Peroxide forming reagents are dated when opened.

- Peroxide forming reagents need a date of receipt and a date of opening.
- Ether, Dioxane, THF and isopropyl ether are tracked as peroxide forming chemicals.
- Presence of organic peroxides is indicated on the lab emergency posting.

- Instruct lab workers to test the chemical for formation of peroxides by using basic test protocols for detection and inhibition of peroxides. Materials with peroxide levels in excess of 80 ppm should be treated and disposed.

COMPRESSED GASES

1. **Gas cylinders are properly secured.**
   - Inspect that cylinders with regulators are individually secure to an immovable object with a chain, strap or clamps.
   - Keep only cylinders that are necessary for current work in the lab.
   - Do not store gas cylinders in hallways or public areas.

2. **Cylinders are labeled with the contents and a completed NFPA diamond.**
   - Inspect that cylinders with regulators are individually secure to an immovable object with a chain or strap.
   - The presence of flammable gases, non-flammable gases, oxidizing gases, toxic gases, corrosive gases, cryogenic liquids and irritant gases shall be indicated on the lab's emergency information posting.
   - Record the specific type of gas identified in the lab in the comments section.

3. **Toxic gas cylinders are used and stored in a vented cabinet or fume hood.**
   - Record the specific type of gas in the comments.
   - Examples of poison gases (NFPA health hazard rating of 3 or 4) include ammonia, arsine, carbon monoxide, nitrogen dioxide, phosgene and phosphine
   - Poisonous gases should be in ventilated cabinets or fume hoods. Labs should remove poison gases that are not being used and purchase the smallest amounts possible (lecture cylinders or 4L tanks).

4. **Safety caps are used to protect the cylinder valves and are in place when the cylinder is not in use.**
   - Safety caps are used to protect the cylinder valves and should remain on at all times, except when in use and connected to dispensing equipment.
   - Transport cylinders on a cylinder cart with a safety chain. Never move a gas cylinder unless the cylinder cap is in place.

5. **No Teflon tape on compressed gas cylinder compression fittings.**
   - No Teflon Tape on Connection - Bits of Teflon tape can get blown into the regulator causing a leak, value malfunction or erroneous reading.

SHARPS AND GLASSWARE

1. **Hard plastic sharps containers are used for the collection of sharps (razor blades, scalpel blades, needles and lancets).**
   - Sharps are defined as items designed to cut or puncture skin and sharp items contaminated with human blood and body fluids.

- Collect in an OSHA approved sharps container – closable, puncture resistant, leak proof and labeled.
- Containers should only be ¾ full.

2. Hazardous glass and plastic that is to be disposed of is stored inside a leak-proof container that is marked or labeled.

- Hazardous glass and plastic are defined as times that can injure if disposed of in normal trash containers. Examples include: Pasteur pipettes, other pipettes and tips, uncontaminated slide and cover slips and broken or fragile glass.
- Use a sturdy, leak-proof container with a plastic liner
- Limit weight to 20 lbs.
- Limit bottom size to 12" x 12"
- Unbroken glass and plastic – items that pose no hazard if disposed of as normal trash (Petri dishes (decontaminated), sturdy test and centrifuge tubes, and empty bottles) can be disposed of in the regular lab wastebasket.

PERSONAL PROTECTIVE EQUIPMENT

1. Safety glasses or goggles are available.

- View the selection of eye protection available in the lab. Ensure that it is in good condition, including straps and general cleanliness. If impact goggles are present (direct vented), remove them from the lab during the inspection. Throwing them away is the best option.

1a. Safety glasses/goggles are worn.

- Make sure eye protection is correct for the operations being performed. Eye protection should be used based on the following table:

Operation	**Eye Protection Required**
Entry into laboratory or liquid chemical area when a probability of eye injury exists	Safety Glasses
Handling Corrosive Chemical	Splash Goggles
Handling Injurious Chemical	Splash Goggles
Transferring more than one liter quantities of corrosive chemical	Splash Goggles and Face Shield

- Impact goggles offer adequate protection against flying particles.
- Chemical splash goggles offer the best protection against chemical splashes.
- When face shields are worn, there still needs to be appropriate eye protection underneath.
- Record a score for the number of people wearing proper eye protection while working with chemicals.

2. Chemical protective gloves are available.

- View the gloves that are available to lab employees.
- Reference: Chemrest Data Sheets at bestglove.com
- Chemical protective gloves are:

- Available to all employees
- Changed on a regular basis; never wear gloves that are worn through

♦ Replace latex with non latex alternative whenever possible (Dura-Touch, Microflex)

2a. Reusable gloves are in good condition.

♦ Inspect reusable gloves in the lab. They should be replaced whenever they become discolored or show signs of damage.

3. Lab coats are available.

♦ Lab coats should be:

- Available to all employees
- Laundered at the MU commercial laundry facilities; never at home because of potential contamination.

If a lab does minimal chemical work and does not have any lab coats, ensure that they know how to get lab coats.

FUME HOODS

1. Hoods have a current inspection sticker (must be inspected annually).

♦ Look on the fume hood for an inspection sticker. Adequate face velocity is 100 feet per minute (fpm) with a vertical sash opening of at least 18 inches.

♦ Ideally, fume hoods should have a dedicated circuit breaker and the cabinet should not press up against the electrical cord/outlet. The cord may become damaged.

♦ Ensure that the hood has been inspected within the past year.

♦ Fume hoods that have received the "UNSATISFACTORY" label may not be used for work with chemicals. However, it is acceptable for the hood to be used for extra counter space (not chemical storage).

♦ Lab personnel are aware of how to qualitatively assess for hood function (strip of tissue at edge of sash flutters into the hood).

2. Hoods are not used to store excessive amounts of chemicals or equipment in the fume hood that could interfere with air flow.

♦ Assess housekeeping within the hood.

3. Sash is kept down except when working in hood.

MACHINE GUARDING

1. Equipment with moving parts (i.e. belt driven pump) has safeguards.

♦ Examples of rotating equipment or apparatus that can trap clothing, hair or body parts include: vacuum pumps, centrifuges, mechanical stirrers and rotary evaporators. Other machine guarding exposures include grinding, drilling and cutting equipment in shops.

♦ If lab personnel are unaware of missing guards or guarding requirements of lab equipment, indicate the type of equipment and deficiencies in the comments section.

ELECTRICAL SAFETY

1. Circuit breaker boxes are unobstructed and all breakers are labeled.

- Indicate the location of the lab's electrical panel.
- A minimum 36-inch clear space shall be provided and maintained around all electrical equipment and electrical panels to permit ready and safe operation and maintenance.
- Circuit breakers shall be clearly labeled.

2. There are no extension cords being used.

3. Electrical outlets are not overloaded.

- Multiple cube taps should not be used in a standard outlet. If more than two pieces of low demand equipment must be plugged into a standard outlet, use a fused power strip that will trip if too much power is used.
- Most office and laboratory locations have 20 amp circuit breakers that serve two or more outlets. These breakers can handle most office equipment; however, the widespread use of personal computers and associated hardware can create an electrical overload. To determine your current electrical load, follow these steps:

    1. Check office/laboratory equipment for a manufacturer's rating label that indicates total watts or amps. Take special care to check appliances that use electricity to generate heat.
    2. Convert the watts rating to amps: Amps = Watts □ 120 Volts
    3. Total the amps for each circuit.
    4. If the total equals more than 15 amps per 20 amp circuit, you may be overloading the circuit. Move enough equipment to a different circuit to reduce the circuit load; otherwise, have the Physical Plant inspect the circuit wiring.

4. There is Ground Fault Circuit Interruption (GFCI) protection on outlets near sinks or other water sources.

Make sure that any outlet near a sink or other water source is Ground Fault Circuit Interrupter (GFCI) protected. To properly test GFCI receptacles in the lab:

- Push the "Reset" button located on the GFCI receptacle, first to assure normal GFCI operation.
- Plug a nightlight (with an "ON/OFF" switch) or other product (such as a lamp) into the GFCI receptacle and turn the product "ON."
- Push the "Test" button located on the GFCI receptacle. The nightlight or other product should go "OFF."
- Push the "Reset" button, again. The light or other product should go "ON" again.

If the light or other product remains "ON" when the "Test" button is pushed, the GFCI is not working properly or has been incorrectly installed (miswired). If GFCI is not working properly, contact Facilities who can assess the situation, rewire the GFCI if necessary or replace the device.

MERCURY THERMOMETER EXCHANGE PROGRAM
EXCHANGE REQUEST

Name: Date: _____ _____ _____

Telephone: Email:

Room/Lab Number Where We Can Find You:

Principal Investigator:

Department/Group:

Number of mercury thermometers to be disposed of:

Please dispose of all of your mercury thermometers even if you do not need the same number of replacements. Be sure to check the basement and storage area of your lab to dispose all your mercury thermometers. We will inform you of the proper disposal methods after we receive your exchange request.

I will need the following non-mercury replacements:

No. Thermometers Needed	Temperature Range	Total / Partial Immersion	Application	Item Number

Example:
... 2 *-20 to 150°C* *partial* *specific application* *item number*

We thank you for your support and cooperation!

**** Please Pass Along to Appropriate Laboratory Personnel ****

Send the completed form via campus or postal mail, fax, or email to:

Dennis Daye, Department of Environmental Health and Safety
Marquette University
Zilber Hall, Suite 212
Phone: 414-228-8411 Fax: 414-288-0600 dennis.daye@marquette.edu

ASSIGN THE FOLLOWING TO RESPONSIBLE PEOPLE IN THE ROOM

TASK 1: CONTACT PUBLIC SAFETY AT (414) 288-1911; AND STATE LOCATION.

TASK 2: CLEAR THE AREA (ROOM) WHICH THE VICTIM IS IN.

TASK 3: GO OUT AND WAIT FOR PUBLIC SAFETY OR EMS AND DIRECT THEM TO THE VICTIM.

TASK 4: RETRIEVE EMERGENCY EQUIPMENT AND BRING IT TO THE LOCATION WHERE THE VICTIM IS BEING TREATED.

BASIC QUESTIONS TO ASK UNTIL EMS ARRIVES

1. SIGNS/SYMPTOMS (WHAT'S WRONG?)

2. ALLERGIES (ARE YOU ALLERGIC TO ANYTHING?)

3. MEDICATIONS (ARE YOU TAKING ANY MEDICATIONS?)

4. PAST HISTORY (HAS THIS HAPPENED BEFORE?)

5. LAST ORAL INTAKE (WHEN DID YOU LAST EAT OR DRINK?)

6. EVENTS LEADING TO INJURY (HOW DID YOU GET HURT?)

7. DO YOU HAVE AN KNOWN MEDICAL CONDITIONS THAT I SHOULD BE AWARE OF? (CHECK FOR EMERGENCY MEDICAL BRACLET ON VICTIM.)

8. KEEP VICTIM RESPONSIVE UNTIL EMS ARRIVES.

NOSE BLEEDS

TASK 1: PLACE VICTIM IN A SEATED POSTION WITH THE VICTIM'S HEAD TILTED SLIGHTLY FORWARD.

TASK 2: DO NOT MAKE CONTACT WITH VICTIM'S BLOOD UNLESS USING A BARRIER OR GLOVES.

TASK 3: HAVE THE VICTIM PINCH THE SOFT PARTS OF THE NOSE BETWEEN THE THUMB AND TWO FINGERS WITH STEADY PRESSURE FOR AT LEAST 5 TO 10 MINUTES.

TASK 4: SEEK MEDICAL CARE IF BLEEDING CANNOT BE CONTROLLED OR YOU SUSPECT A BROKEN NOSE.

CARE FOR FAINTING

TASK 1: CHECK FOR RESPONSIVENESS AND BREATHING.

TASK 2: LOOSEN ANY RESTRICTIVE CLOTHING.

TASK 3: IF VICTIM FELL, CHECK FOR INJURIES.

TASK 4: MOST FAINTING EPISODES IN YOUNGER INDIVIDUALS ARE NOT SERIOUS, AND THE VICTIM RECOVERS QUICKLY. SEEK MEDICAL CARE IF: THE VICTIM HAS REPEATED FAINTING EPISODES; DOES NOT BECOME RESPONSIVE; BECOMES UNRESPONSIVE WHILE SITTING OR LYING DOWN; FAINTS FOR NO APPARENT REASON; OR IS ELDERLY.

SEIZURES

TASK 1: PREVENT INJURY BY MOVING AWAY ANY DANGEROUS OBJECTS. TASK

2: LOOSEN ANY RESTRICTIVE CLOTHING.

TASK 3: ROLL THE VICTIM ONTO HIS OR HER SIDE TO THE RECOVERY POSITION.

TASK 4: CALL PUBLIC SAFETY (414) 288-1911 FOR SEIZURES OCCURRING FOR NO KNOWN REASON.

TASK 5: CLEAR AREA AND TURN DOWN LIGHTS (NOT OFF – IF POSSIBLE).

DIABETIC EMERGENCIES

LOW BLOOD GLUCOSE LEVEL (BELOW 100)

1. GIVE SUGAR IF RESPONSIVE (1 TBSP, 1/2 CAN SODA, JUICE, GLUCOSE TABLETS, GLUCOSE GEL)

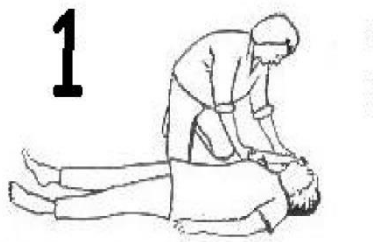
2. IF NO IMPROVEMENT CALL PUBLIC SAFETY (414) 288-1911

HIGH BLOOD GLUCOSE LEVEL (ABOVE 110)

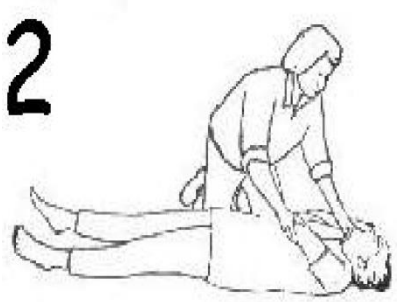
1. **IF UNCERTAIN ABOUT VICTIM HAVING HIGH OR LOW BLOOD GLUCOSE LEVEL, PROVIDE CARE AS FOR LOW GLUCOSE LEVEL.**

2. IF CONDITION DOESN'T IMPROVE CALL PUBLIC SAFETY (414) 288-1911

RECOVERY POSITION

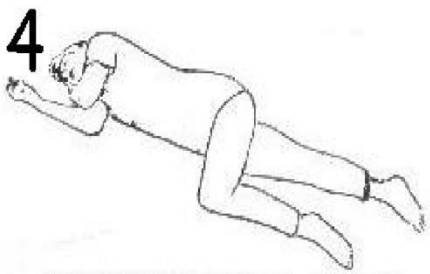


Lay the victim on his back and place the right hand next to the head.



Place the left hand on the right cheek

Hold the left shoulder and left leg and pull the body towards you, rolling the patient onto his side



Rest the patient as shown, and move the head backwards slightly

COE Laboratory or Hazardous Location Working Alone Guidelines

(review Working Alone Guidelines on MU Environmental Health and Safety website for thorough explanations)

Departments should assess and prioritize the working alone hazards that have been identified and evaluate possible means of elimination or control. Contact the Office of Environmental Health & Safety (288-8411) or Marquette Police (288-6800) for additional assistance in evaluating working alone hazards. Marquette University is committed to implementing a method to support the safety and security of students working alone. Each department should conduct a hazard assessment and eliminate or control the hazards of working alone. The hazard assessment should be reviewed on an annual basis or when new situations are introduced or changed.

Department representatives should establish procedures to ensure the safety of students who work alone on campus. These procedures should be designed for the specific needs of a department but take into account those environments that have a particularly high potential to be hazardous.

Minimum Requirements for working alone in lab/hazardous environment:

1. Worker must have a means of communication to gain assistance in an emergency.
2. Arrangements should be made for other individuals to check regularly on the welfare of persons working alone. Either co-worker or **call to MU Public Safety informing them name, location, and estimated departure time.**

It is generally inappropriate for undergraduate students to work alone. Exceptions may be made for low-risk work if the faculty verifies that an individual student fully understands normal and emergency procedures, uses all required protective equipment and that required emergency equipment is available and operating properly.

Marquette University students, including graduate researchers and visitors, should work only under conditions where the availability of emergency aid is compatible with the risk. Whenever doubt exists, the faculty supervisor should review the work assignment and define the emergency aid compatible with the work assignment.

MARQUETTE UNIVERSITY
New Employee/Student Laboratory Specific Training Checklist

Employee (Print and Sign Name) and Date			
Trainer (Print Name) and Date			
General Laboratory Safety – Informed of Location/Protocol	Yes	No	NA
Phones in the lab - Identify Public Safety's contact number. (x81911)	☐	☐	☐
Chemical Hygiene Plan and Safety Plan (White Binder Location)	☐	☐	☐
Lab standard operating procedures (SOP's) for Particularly Hazardous Substances and Procedures.	☐	☐	☐
MSDS information on all chemicals that they use – Location of MSDS link (**www.cispro.mu.edu**)	☐	☐	☐
Protocol for lab workers working alone.	☐	☐	☐
No food or drink in the laboratory. Note:Lab refrigerators are "Not for food and drink".	☐	☐	☐
Housekeeping requirements for laboratory.	☐	☐	☐
Emergency Response			
Lab occupants are aware of the Emergency Evacuation Coordinator and Fire Marshall on Floor.	☐	☐	☐
Aware of Evacuation route from lab to meeting place.	☐	☐	☐
Knows location of safety showers, eye wash stations, fire extinguishers, in lab area	☐	☐	☐
Chemical Storage, Handling, and Disposal			
Chemical Storage locations and segregation system in lab.	☐	☐	☐
All chemical containers are appropriately labeled. Review Labels/Inventory Stickers.	☐	☐	☐
Location and procedures for disposal of organic solvents.	☐	☐	☐
Location of **chemical spill cleanup kit** (if available) and spill cleanup contact person.	☐	☐	☐
Compressed Gases			
Gas cylinders – proper use and exchange procedure. Reminder Full Cylinders Travel Alone in Elevator	☐	☐	☐
Understand how Cylinders are labeled with the contents and the NFPA diamond.	☐	☐	☐
Disposal Procedures-			
Sharps Disposal- location and what is disposed	☐	☐	☐
Glassware Disposal- location and what is disposed	☐	☐	☐
Plastic waste disposal – location and what is disposed	☐	☐	☐
Biohazardous Material – location and what is disposed	☐	☐	☐
Personal Protective Equipment			
Safety glasses or goggles – location and when to use.	☐	☐	☐
Chemical protective gloves -location and when to use. (LATEX ALLERGIES)	☐	☐	☐
Reusable gloves – location and proper use. (Autoclave and Cold gloves)	☐	☐	☐
Lab coats – location and when to use.	☐	☐	☐
Additional PPE Unique to Lab-	☐	☐	☐
Fume Hoods			
Location and use. Reminder - Sash is kept down except when working in hood.	☐	☐	☐
Additional Laboratory Information Specific to <u>THIS</u> Research Laboratory			
Biohazardous Material training/awareness	☐	☐	☐
Lasers training	☐	☐	☐
Autoclave Training - Department Safety Officer	☐	☐	☐
Liquid Nitrogen and Dry Ice - Handling Procedures (Do Not Ride with in Elevator)	☐	☐	☐
List Additional Training -	☐	☐	☐

- **CHEMICAL HYGIENE PLAN CLEARANCE SIGNED**