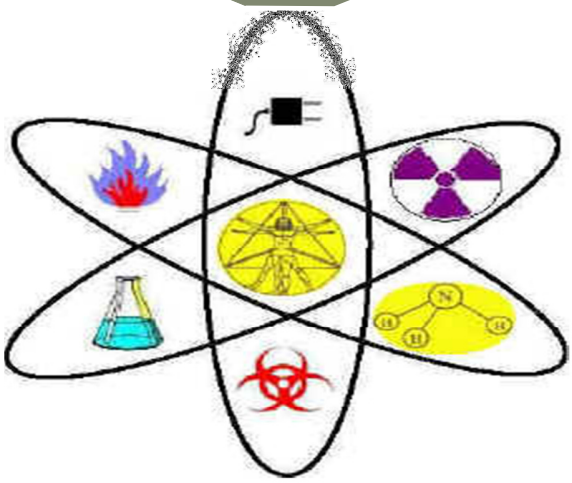
Majmaah University

College of Applied Medical Science

Laboratory & Safety Committees



LABORATORY SAFETY MANUAL

1435H.2014G

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Prepared by

Laboratory and Safety Committees

College of Applied Medical Science

Majmaah University, Al Majmaah-KSA

1435H- 2014G

Forward

By the authority delegated from the College of applied Medical Sciences, Dean and Vice Dean for Quality and Safety is responsible for the safety of all facilities. Under this authority, policies are developed to provide a safe teaching, research, service, housing and recreational environment.

The Laboratory and safety committees (Q&SCs) was established in 1435H and given the responsibility for the management of all safety practices and the administration of the program. The mission of the Quality and safety committee is to support and advance the teaching, learning and research activities of the University through promotion of a safe and healthy campus environment. This is accomplished providing and coordinating programs and services that minimize safety, health, environmental and regulatory risks to the Majmaah University community in a manner consistent with responsible fiscal and environmental stewardship. Inherent in this mission is the charge to provide a safe and healthy environment in which the University's activities can be pursued.

The University adopts all applicable Universal safety laws, rules and regulations in order to carry out its duties and responsibilities. In additions, QSC will reference standards or codes related to safety, which have been adopted and spread by nationally recognized standards-setting organizations. The interpretation of safety codes and standards is the responsibility of the Division of the Laboratory and safety committees.

In order to assure an effective The Laboratory and safety committees program for the Majmaah University, it is imperative that all individuals associated with the University comply fully with the policies and procedures set forth in this manual.

Dr. Nasser bin Ali Al-Jarallah

Dean, College of Applied Medical Sciences (CAMS)

Majmaah University, Al Majmaah, KSA.

Policy Statement

It is the policy of the Majmaah University to provide a safe working and learning environment. The Laboratory Safety Committee has developed this manual as a guidance document to familiarize CAMS faculty, staff, students, volunteers, and visitors with the institution-wide policies and procedures for the safe use of hazardous chemical and other material at the University. When these policies and procedures are followed, the risk of occupational exposures to chemicals and physical hazards as well as the risk of accidental environmental release of hazardous materials is minimized. This Laboratory Safety Manual, produced by Laboratory and safety committees, describes policies and procedures that are required for the safe conduct of experiment and research at the Majmaah University.

EMERGENCY CALL LIST

List	الرقم	البيان
Dean Office	4043000	مكتب العميد
Dean of Student Affairs	4042900	عميد شؤون الطلاب
University OPD	7777	الجامعة العيادات الخارجية
Fire Emergency	2222	طوارئ الحريق
Elevator	4042196	مصعد
Electric	4042222	كهربائي
Security		أمن
Police	999	الشرطة
Civil defense	998	الدفاع المدني
Ambulance	997	الاسعاف
King Khaled Hospital	4320000	مستشفى الملك خالد

1.0 INTRODUCTION

The College of Applied Medical Sciences, Majmaah University Division of Laboratory and safety committees (L&SCs) has developed this manual to assist in the recognition, evaluation, and control of chemical and physical hazards of the laboratory operations. This manual is intended to establish the basic safe operating practices so that investigators, lab technicians, and students may carry out effective teaching and research programs in a safe environment.

The L&SCs provides specific information on hazard assessment, training requirements, exposure monitoring procedures, and accident record keeping and reporting. A lab specific Standard Operative Procedures also available in each laboratory.

This manual is not proposed to be a complete listing of laboratory hazards or safe practices. Because of the diverse nature of work being conducted in laboratories, additional procedures or requirements may be necessary. For example, laboratories working with biological agents, radioisotopes, animals or labs generating chemical, biological or radioactive wastes all must adhere to strict policies and procedures. For information on these and other safety related policies please consult the following resources.

Individuals having questions are urged to call upon LC or Quality and Safety committee for assistance. The methods of waste disposal, emergency response will vary depending on each facility. Please check with each site for specific information and procedures.

2.0 LABORATORY SAFETY PROGRAMS

2.1 Responsibilities of Laboratory Users

The responsibility for the management of laboratory safety and adherence to safe lab practices rests within the department. All personnel, including Faculties, Students, Administrator, Doctors, Supervisors, Staffs and Visitors have a duty to fulfill their obligations with respect to maintaining a healthy and safe work environment.

2.1.1 Responsibility of Laboratory In charge

- Ensure that all personnel working within their unit are provided sufficient information and training to carry out their work safely
- Ensure that all lab personnel are equipped with the required Personal Protective Equipment (PPE).
- Ensure that safety devices are adequate, appropriate and in good working order.
- Ensure that all personnel receive appropriate and adequate information and training to be able to respond to emergency situations.

2.1.2 Responsibility of Laboratory personnel and Students

- Be familiar with the departmental safety instructions, whether written or oral, and to comply with these instructions when conducting laboratory work
- Wear the appropriate personal protective equipment when conducting work with hazardous materials or procedures
- Report all accidents, dangerous incidents or suspected occupational illnesses to their immediate supervisor without delay
- Refrain from manipulating any hazardous materials prior to undergoing appropriate safety training and receiving safety instructions.

2.1.3 Responsibility of Visitors, contractors and non-laboratory Personnel

- Obtain authorization from the lab Incharge prior to entering the lab working area.

- Abide by the instructions of the lab Incharge or designate regarding restricted access and the use of personal protective equipment.

2.2 Safety Standards

To ensure that the laboratory meets accepted safety standards is the second part of the safety program. This includes attention to proper labeling of chemicals, proper earthing of electrical equipment, and provision of means for proper handling and disposal of bio-hazardous materials, including all patient specimens.

2.3 Safety education and training program

College of Applied Medical Sciences, will implement an effective safety and health program for the employees and Students. All staff will be educated to report and manage exposure to infectious and hazardous materials. Training programs will be held to prevent injuries. All staff will report exposure to potentially infectious material to their supervisor so as to initiate action to protect the employee, Students and Researchers patient in the College.

2.4 Laboratory Security

Laboratories must be locked if no one is in the lab. Acute toxins, select agents, controlled substances and radioisotopes must be appropriately secured. Do not hesitate to politely question anyone who does not belong in the area. If asked, it is requested that you decline to answer any questions about the contents or research being performed in the lab or the facility. If there is any concern about lab security or suspicious individuals please contact UPD at 392-2111 or the local responding agency.

2.5 Visitors

- Visitors must be escorted by lab staff
- Must be made aware of any potential hazards they may encounter in the lab.

- Wear the correct personal protective equipment for the hazards present in the lab, no matter if they are visitors or maintenance workers, no matter how long they will be in the lab.
- Abide by laboratory regulations for access and control of hazards.
- Pets are not allowed in labs. Only certified service animals may be allowed into Majmaah University buildings.

2.6 Minors

- Minors under the age of 18 years old must follow the international rules for Minors in the Clinic, Labs, Clinic or Animal Facilities Policy
- Minors are not permitted to work in the laboratory unless they are a registered student or participating in a supervised Majmaah University sponsored "Scholars" program and meet the criteria of University rules.

3.0 GENERAL SAFETY MEASURES IN LABORATORY

Each laboratory at the college of Applied Medical Science is unique, by virtue of the research being performed, the equipment in use, and the physical layout of the lab or utilization of space. Regardless of the characteristics, teaching and research laboratories at the Majmaah University must follow to the basic safety policies outlined in this manual. An annual Laboratory Safety Review is performed by LC to verify compliance with the policies set out in this manual as well as compliance with safety programs related to the type of research conducted and agents used in the lab. If a safety issue is observed the reviewer will offer recommendations to aid the staff in correcting the problems. However, the following laboratory rules are given below!

3.1 Proper Attire for Individuals in Laboratories

- All employees, faculty, students, and visitors must wear appropriate attire in all laboratory areas to eliminate or minimize contact with chemicals, biological hazards, and other hazards.

- Shorts, miniskirts, or any apparel that does not cover the skin above the knee when seated should NOT be worn in the laboratory without appropriate over protection (e.g. a buttoned laboratory coat or closed front gown).
- Open toed shoes, sandals, or shoes made of loosely woven material should not be worn in the laboratory.
- Loose clothing and jewelry that can be caught in equipment or dipped into hazardous solutions should not be worn in the laboratory.
- Gloves should be worn whenever there is a potential exposure of the hands. The gloves should have the necessary resistance to the chemical or hazardous material being used.
- Liquid barrier gloves should be used when handling biological agents or potentially infectious materials. See the guidelines for personal protective equipment for more information.
- Eye protection should be worn during any task where there is potential exposure of the eyes via splashing of material or generation of flying objects. Eye protection may be required for laboratory entry at the discretion of the investigator or department.
- Specialized protective clothing shall be worn when using materials that are extremely hazardous upon contact. EH&S should be consulted. See the guidelines for personal protective equipment for more information.
- Gloves and all other personal protective equipment must never be worn outside of laboratory areas and are forbidden in public corridors, elevators, stairwells, and break rooms.
- Gloves should be removed prior to use of the telephone, keyboard, equipment controls or doors, if these surfaces are considered "clean" or common.

3.2 Safety Equipment

3.2.1 Emergency (Safety) Showers

3.2.1.1 Emergency or safety showers are designed to deliver a gentle flood-type spray of tempered water over a person for a minimum period of 15 minutes to flush chemicals from the body or extinguish clothing fires.

3.2.1.2 Emergency Showers should be accessible to faculty, staff and students handling large uantities of chemicals.

3.2.1.3 Emergency showers are activated by a double pull chain or pull-bar which is located alongside the shower head.

3.2.1.4 An area immediately under the emergency shower head (minimum diameter of 44 inches) must be maintained free of all obstacles at all times. Floor drains are recommended but not required adjacent to emergency showers.

3.2.1.5 Emergency showers are inspected and flow tested annually by University Plumbers.

3.2.1.6 Emergency showers should not be used for any other purpose. Anyone having used an emergency shower to flush chemicals from their body should seek immediate medical attention after providing the recommended 15 minute flush.

3.2.2 Emergency Eyewash Stations

Eyewash stations supply a gentle flood-type spray of tempered water for a minimum of 15 minutes to flush contaminants from the eyes.

3.2.2.1 Emergency eyewash stations should be accessible to all areas where there is increased potential for eye injury, such as due to chemical splash or handling of potentially infectious materials.

3.2.2.2 "Stay-on" control valves are operated by a single motion such as a hand paddle or foot peddle. Eyewash stations must be activated weekly by personnel in the area of responsibility.

3.2.2.3 Eyewash stations can be used for other purposes. This helps with flushing of the lines and creates familiarity with equipment location.

3.2.2.4 Anyone having used an eyewash station to flush chemicals or particles from eyes should seek immediate medical attention after the 15 minute flush.

3.2.3 Eye, Face and Body Spray Hoses

Eye, face and body spray hoses are eye wash stations that also have a retractable or fixed hose that can flush eyes and other affected body parts.

3.2.3.1 Eye, face and body spray hoses should be equipped and maintained in a manner similar to eye wash stations (i.e. tempered water supply, stay-on valve and operation, used for other purposes, weekly integrity check by area staff)

3.2.3.2 Eye, face and body spray hoses should be equipped with dual nozzles to treat both eyes simultaneously when necessary

3.3 Common safety Measures in Laboratory

3.3.2 Conduct yourself in a responsible manner at all times in the laboratory

3.3.3 Before start in Laboratory work follow all written and verbal instructions carefully. If you do not understand a direction or part of a procedure, ASK YOUR CONCERN TEACHER BEFORE PROCEEDING WITH THE ACTIVITY.

3.3.4 Students are never allowing to work in Laboratory alone or without presence of the teacher.

3.3.5 Students are not allowed to touch any equipment, chemicals or other materials in the laboratory area until you are instructed by Teacher or Technician.

3.3.6 Perform only those experiments authorized by your teacher. Carefully follow all instructions, both written and oral.

3.3.7 Unauthorized experiments are not allowed in the Laboratory.

3.3.8 Do not eat food, drink beverages or chew gum in the laboratory and do not use laboratory glassware as containers for food or beverages.

3.3.9 Be prepared for your work in the laboratory. Read all procedures thoroughly before entering the laboratory. Never fool around in the laboratory. Horseplay, practical jokes and pranks are dangerous and strictly prohibited.

3.3.10 Always work in a well-ventilated area and Observe good housekeeping practices. Work area always Keep clean and tidy.

3.3.11 Be alert during the work proceed with caution at all times in the laboratory. If you find any unsafe condition you must be convey immediately to the teacher.

3.3.12 Dispose of all chemical waste according to the universal guideline. Never mix chemicals in sink drains. Sinks are to be used only for water. Check with your teacher for disposal of chemicals and solutions.

3.3.13 Before use equipment must be read carefully Labels and instructions. Set up and use the equipment as directed by your teacher.

3.3.14 Keep hands away from face, eyes, mouth and body while using chemicals or lab equipment's. Wash your hands with soap and water after performing all experiments.

3.3.15 Experiment must be personally monitored at all times. Do not wander around the room, distract other students, startle other students or interfere with the laboratory experiments of others.

3.3.16 Every Student should know the locations and operating procedures of all safety equipment including, First AID KIT (s) and Fire extinguisher. Know where the fire alarm and the exits are located.

3.3.17 Know what to do if there is a fire drill during a laboratory period, containers must be closed, and any electrical equipment turned off.

3.3.18 Any time chemicals, heat or glassware are used, students will wear safety goggles. NO EXCEPTIONS TO THIS RULE!

3.3.19 Contact lenses may be not be worn in the laboratory.

3.3.20 Dress properly during a laboratory activity. Long hair, dangling jewelry and loose or baggy clothing are a hazard in the laboratory. Long hair must be tied back, dangling jewelry and baggy clothing must be secured. Shoes must completely cover the foot. No sandals allowed on lab days.

3.3.21 A lab coat or smock should be worn during laboratory experiments

3.3.22 Report any accident (spill, breakage etc.) or injury (cut, burn etc.) to the teacher immediately, no matter how trivial it seems. DO NOT PANIC.

3.3.23 If you are lab Partner is hurt, immediately (and loudly) yell out the teacher`s Name to get the teacher`s attention. DO NOT PANIC.

3.3.24 If a chemical should splash in your eye(s) or on your skin, immediately flush with running water for at least 20 minutes. Immediately (and loudly) yell out the teacher`s name to get the teacher`s attention.

3.3.25 All chemicals in the laboratory are to be considered dangerous. Avoid handling chemicals with fingers. Always use a tweezers: when making an observation, keep at least 1 foot away from the specimen. DO NOT TASTE OR SMELL ANY CHEMICALS.

3.3.26 Before using the chemicals and reagents must be checked the label twice. Take only as much chemical as you need.

3.3.27 Never return unused chemicals to their original container.

3.3.28 Never remove chemicals or other materials from the laboratory area.

3.3.29 Never handle broken glass with your bare hand. Use a brush and dustpan to clean up broken glass. Place broken glass in the designated glass disposal container.

3.3.30 Examine glassware before each use. Never use chipped, cracked or dirty glassware.

3.3.31 If you do not understand how to use a piece of equipment, ASK THE TEACHER FOR HELP!

3.3.32 Do not immerse hot glassware in cold water. The glassware may shatter.

3.3.33 Do not operate a hot plate by yourself. Take care that hair, clothing and hands are a safe distance from the hot plate at all times. Use of hot plate is only allowed in the presence of the teacher.

3.3.34 Heated glassware remains very hot for a long time. They should be set aside in a designated place to cool and picked up with caution. Use tongs air heat protective gloves if necessary.

3.3.35 Never look in to a container that is being heated.

3.3.36 Do not place hot apparatus directely on the laboratory desk. Always use an insulated pad. Allow plenty of time for hot apparatus to cool before touching it.

3.4 Working Alone in Laboratories

Working alone in any laboratory creates increased risk to the health and safety of laboratory personnel. Such risks include not having access to basic first aid and the possibility of being unable to call emergency assistance.

The Majmaah University College of Applied Medical Sciences, Laboratory and safety committees restricts working alone in the laboratory when conducting experience and research, especially when procedures involve hazardous chemicals. Experiments known to be hazardous should not be undertaken by a worker who is alone in the laboratory."

The following laboratory tasks should never be conducted when alone:

3.4.1 Procedures involving toxic or hazardous chemicals.

3.4.2 Procedures involving high-pressure equipment.

3.4.3 Procedures involving cryogenic materials.

3.4.4 Transferring large quantities of hazardous materials.

3.4.5 Following the guidelines below will aid in protecting the health and safety of laboratory personnel, while minimizing risks associated with working in laboratories during times of limited occupancy, such as evenings, weekends, or holidays.

3.4.6 Laboratory personnel must obtain permission from the principal investigator (PI) or responsible faculty member prior to working in a laboratory during times of limited occupancy.

3.4.7 Principal investigators and responsible faculty should establish specific guidelines and develop notification procedures when working in laboratories during times of limited occupancy.

3.4.8 Laboratory procedures should be discussed, and hazardous operations should be identified prior to permitting lab personnel to work alone.

3.4.9 Laboratory personnel and supervising faculty should establish and maintain a weekly work schedule and minimize the opportunities when laboratory personnel are alone in the lab.

3.4.10 A telephone must be immediately available to the individual working alone. Contact University Police or **Emergency OPD 7777** in the event of an emergency.

3.4.11 Another individual capable of providing on-site assistance in the event of an emergency should be accessible.

3.4.12 It is the responsibility of Principal Investigators, faculty members and laboratory supervisors to ensure procedures for working in laboratories during times of limited occupancy are developed and are followed by personnel working in laboratories under their supervision. Careful consideration must be given when granting permission to work alone on administrative tasks, computer-based activities, cleaning activities or other laboratory-related tasks.

3.5 Preventing odors from dry sink traps

Laboratory workers periodically report unusual odors in their work areas that smell nothing like any of the chemicals used in their labs. Typical odors are described as “sulfur-like” or sewer gas, mercaptan or hydrogen sulfide odors. If the smell is localized and appears to be unrelated to the ventilation system or neighboring labs, it frequently is traced to a dry sink trap, or unused floor drain.

Drain traps normally filled with water to create a seal between the building's sanitary sewer line and the system designed to ventilate the sewer gas. Without the water seal in a drain trap, sewer gas is drawn into the room, particularly when the lab has a fume hood or another type of specialized exhaust system.

3.5.1 Lab personnel can prevent sink traps and floor drains from drying out by running or pouring a quart of water into the drains once per week or month.

3.5.2 In labs where cup sinks or floor drains are no longer used, contact University plumbers topermanently or temporarily seal these drains.

3.5.3 The illegal practice of pouring hazardous chemicals into lab sinks can also contribute to problem odors in labs. Never dispose of lab chemicals down the drain.

3.6 Guidelines for Moving Equipment from Laboratories

There are two types of requests for moving laboratory equipment:

- Equipment going to Surplus Properties because it is not being used or is broken.
- Internal move of equipment within a University building or to another University building.

3.6.1 The Laboratory Incharge or designated contact submits a request for moving of laboratory equipment Laboratory Committee or Head of the Lab. This request must be

submitted for equipment going to Surplus Properties or for an internal move.

3.6.2 After submitting the request, all equipment used to handle or store biological agents or located in a biological laboratory (ex. freezers, incubators, centrifuges, etc.) must be decontaminated with bleach or another EPA-registered disinfectant according to the following guidelines.

Decontamination Guidelines

- Put on appropriate personal protective equipment. At a minimum, gloves and safety glasses should be worn.
- Consult with L&SCs or laboratory SOPs, if necessary.
- Spray an EPA-registered disinfectant on the equipment. In most cases, a 1:10 bleach solution should be used to disinfect biological agents.
- Allow disinfectant to remain on the equipment for the appropriate contact time (15-20 minutes).
- Completely remove (by wiping with a towel) the disinfectant from the equipment.
- Print out a "Decontamination Certification" form. Sign, date, and affix the form to the equipment. The form is attached as the last page of this document.
- It is the responsibility of the Principal Investigator or designated contact to sign the form and affix one form to each piece of equipment.
- Surplus Property should be contacted following the decontamination to remove the equipment.
- L&SCs is **NOT** required to tag equipment that has been used or stored in a laboratory after laboratory personnel have performed the above stated decontamination and certification steps.

IMPORTANT NOTES:

- The Radiation Safety Office must clear any equipment in laboratories using radioactive materials and prior to decontamination by laboratory personnel. Radiation Safety can be reached at Incharge of the particular lab.

- Biological Safety Cabinets – Laboratory personnel are NOT permitted to perform or certify the decontamination of a biological safety cabinet that is being moved. A certified vendor must be contacted to conduct the decontamination process and certify the unit prior to moving.
- Equipment that is **NOT** in a laboratory setting or laboratory building does not require decontamination prior to contacting Surplus Property (Examples – office furniture, computers in an office, etc).
- Once decontaminated by laboratory personnel and a signed certification form is affixed, the laboratory equipment may **NOT** be used.
- L&SCs should be contacted concerning equipment that requires moving from laboratories or research spaces.

Laboratory Equipment Decontamination Certificate

- The following is the procedure for decontaminating equipment prior to Movers removing equipment from a laboratory or relocating equipment between University spaces:
- After submitting the request to Surplus Property, all equipment used to handle or store biological agents or equipment located in a biological laboratory (ex. Freezers, incubators, centrifuges, etc.) must be decontaminated with bleach or another EPA-registered disinfectant.
- Put on appropriate personal protective equipment. At a minimum, gloves and safety glasses should be worn. Consult with L&SCs or laboratory SOPs, if necessary.
- Spray an EPA-registered disinfectant on the equipment. In most cases, a 1:10 bleach solution should be used to disinfect biological agents.
- Allow disinfectant to remain on the equipment for the appropriate contact time (15-20 minutes).
- Completely remove (by wiping with a towel) the disinfectant from the equipment.

- Print out a "Decontamination Certification" form. Sign, date, and affix the form to the equipment.
- Surplus Property should be contacted following the decontamination to remove the equipment.

ONE FORM IS REQUIRED FOR EACH PIECE OF EQUIPMENT.

PLEASE NOTE – It is the responsibility of the Principal Investigator or designated contact to sign the form and affix to the equipment.

L&SCs is **NOT** required to tag equipment that has been used or stored in a laboratory after laboratory personnel have performed the above stated decontamination and certification steps.

INSTRUCTIONS: Please type or print information in the designated blocks.

Name	**Office / Lab Location**	**Phone Number**
Location of Equipment	Description of Equipment	Final Destination of Equipment

I certify that the above listed equipment was decontaminated on the listed date prior to moving / removal by the Majmaah University Movers. I certify that the equipment was not used following the decontamination procedure and posting of this certification form.

Signature	Date

3.7 Disposal of Laboratory Glassware

Broken, used, or unwanted glassware is a common type of waste generated in the laboratory. Improper disposal of glassware can lead to injury of those handling laboratory wastes. All laboratory glassware including empty containers, pipettes, slides, plates, tubes, flasks, and beakers should be properly handled for disposal.

3.7.1 Laboratory Glassware Disposal

3.7.1.1 Broken/used/unwanted laboratory glassware should be disposed in boxes designed for this purpose. These boxes, identified as broken glass boxes, can be obtained from the laboratory or directly from vendors.

3.7.2 Contaminated Glassware

3.7.2.1 Glassware that has been contaminated with biological materials must be decontaminated using an EPA-registered disinfectant prior to being placed into a broken glass box.

3.7.2.2 Any biologically-contaminated glass must be handled as a contaminated sharp (similar to a needle or other sharp). These items must be placed into a sharps container and disposed with biological waste.

3.7.2.3 Glass that has been in contact with chemicals should be handled per the University's Empty Chemical Container Disposal Guidelines prior to being placed in a broken glass box.

3.7.3 Restrictions

The following materials should NEVER be disposed of in a broken glass box:

- Contaminated glassware;

- Sharps, needles, sharps, syringes;
- Mercury-containing materials (thermometers, manometers, etc.);
- Biological materials;
- Chemicals;
- Radioactive materials.

3.7.4 Disposal Preparation

Once the broken glass box is ¾ full, follow the manufacturer's closing instructions and seal the top with tape. Then, the broken glass box can be disposed in the regular trash.

3.8 Mercury Spill Cleanup

Elemental (metallic) mercury is a toxic silver liquid metal that readily vaporizes at temperatures as low as 10°F. Mercury vapor is colorless, odorless, and toxic. Vapor exposure can occur through inhalation or absorption through intact skin.

3.8.1 Mercury Exposure

3.8.1.1 Health effects resulting from prolonged mercury exposure include fatigue, weight loss, anorexia, gum inflammation, and tremors of the hands. Acute health effects resulting from short-term exposure to mercury vapor include symptoms such as cough, chest pain, bronchitis, excessive salivation, and the presence of a metallic taste in the mouth.

3.8.2 Mercury Spill Procedures

3.8.2.1 Laboratories utilizing and storing mercury-containing devices should obtain a mercury spill kit. The following guidelines should be followed when assessing and handling a mercury spill:

3.8.2.2 Large Mercury Spill (>25ml) Procedures

3.8.2.2.1 Large mercury spills should be cleaned up by EH&S personnel.

3.8.2.2.2 Exit the spill area and inform others to leave spill area. Do not walk through the suspected mercury spill area.

3.8.2.2.3 Close any doors to the spill area.

3.8.2.2.4 Contact immediately to the Inchage (during regular business hours)

3.8.2.2.5 Ensure that no other individuals enter the contaminated area until proper cleanup has been conducted.

Small Mercury Spills (<=25ml)

3.8.2.3 Small mercury spills such as those from mercury thermometers can be cleaned up by laboratory personnel, provided the appropriate spill cleanup materials are available. Please contact EH&S if additional assistance is needed.

3.8.2.4 Personal protective equipment including safety glasses, and nitrile gloves must be used when cleaning a mercury spill.

3.8.2.5 Ensure adequate ventilation by opening fume hoods and doors.

3.8.2.6 If necessary, use a flashlight and shine at an angle to locate mercury beads in the spill area. DO NOT WALK THROUGH SPILL AREA UNTIL CLEANUP HAS BEEN PERFORMED.

3.8.2.7 Mercury waste and any other items used in the cleanup process should be collected, placed in a sealable container and/or sealable plastic bag, and disposed of through the University's chemical waste program

3.8.2.8 Amalgamating compounds such as those found in a mercury spill kit can be used to amalgamate and collect mercury beads.

3.8.2.9 Rigid pieces of paper such as index cards can be used to collect mercury.

3.8.2.10 Small plastic pipettes can also be used to collect mercury beads; ensure that pipettes used for cleanup are handled as chemical waste.

3.8.2.11 Broken mercury-devices or glassware (such as the sharp ends of a broken thermometer) should be taped to prevent puncture prior to being placed in a sealable plastic bag.

3.8.2.12 DO NOT use a broom or a regular vacuum to collect mercury. This will result in additional contamination and the spreading of mercury vapors.

3.8.2.13 DO NOT place glass from mercury-containing devices (e.g. thermometers, barometers, etc.) into a broken glass box. All mercury contaminated debris must be disposed of through the University's chemical waste program.

3.8.2.14 If mercury beads are unable to be collected due to inaccessibility (e.g. mercury beads between floor tiles), a slurry consisting of sulfur powder and water should be spread over and into the contaminated area.

3.8.2.15 The slurry oxidizes the mercury metal to mercury sulfide which reduces the potential for mercury vapor release.

3.8.2.16 The slurry should set for approximately 24 hours and can then be cleaned up with soap and water. If excessive pink or brown spotting is noted after the 24-hour contact period, the slurry should be wiped up with all cleanup materials being disposed of through the chemical waste program.

Note: If the mercury spill occurs on a carpeted area, immediately contact L&SCs and exit the spill area until L&SCs arrival. Avoid using mercury containing devices in carpeted areas.

3.9 Mercury Spill Prevention

Mercury spills and the associated wastes are difficult to manage. Mercury spills that contaminate equipment such as incubators and ovens often cannot be completely cleaned due to gross

contamination within the equipment. Often, the entire unit must be disposed of and treated as mercury-contaminated waste. L&SCs recommends using 'mercury free" temperature reading devices to eliminate mercury spills and releases.

3.10 Laboratory Electrical Equipment

Electrically powered laboratory equipment may be used for heating, cooling, mixing, lighting, pumping or analytical instrument operations in the lab. Heating mantles, magnetic stirrers, rheostats, vacuum pumps, X-ray units, lasers and hot plates represent just some of the equipment that can pose an electric shock, explosion or fire hazard if used improperly in the lab. Installation of hardwired equipment must be performed by an electrician.

3.10.1 All electrical equipment must be certified by a nationally recognized testing laboratory to ensure that the equipment is free from reasonably foreseeable risk due to electrical hazards. Electrical equipment must not be modified unless explicitly approved by the manufacturer, or inspected by an electrical inspector before being placed in service.

3.10.2 As a minimum, the electrical inspection must insure that:

3.10.2.1 Equipment is sufficiently enclosed to prevent accidental contact with energized parts.

3.10.2.2 Exposed metal parts are bonded and grounded.

3.10.2.3 Over-current protection is appropriate for intended use.

3.10.2.4 Connections are tight and insulation intact.

Regular Inspections of electrical equipment should be made by a competent person within the laboratory. These visual and physical inspections are to include:

3.10.2.5 Obvious damage or defects in the accessories, connectors, plugs or sockets.

3.10.2.6 Flexible cords are effectively anchored to equipment, plugs and sockets.

3.10.2.7 Damage to flexible cords

3.10.2.7.1 the inner cores of flexible supply cords are not exposed or twisted;

3.10.2.7.2 the external sheaths are not cut, abraded, twisted, or damaged to such an extent that the inner cores are visible.

3.10.3 Warning indicators for maximum load on power strips are intact and legible.

3.10.3.1 Controls are in good working order, i.e. they are secure, aligned and appropriately identified.

3.10.3.1.1 Covers and guards are present and secured.

3.10.3.1.2 Ventilation inlets and exhausts are unobstructed.

3.10.4 If upon routine inspection any of the above flaws are detected, the electrical equipment should be immediately removed from service. Contact the equipment vendor, a qualified electrical repair organization or your Facilities Management representative for repair information.

3.10.5 All electrical outlets, within 6' of water, must be protected by ground fault circuit interrupters (GFCI). Contact Facilities Management to have this protective circuitry installed.

3.10.6 Avoid the use of extension cords. If necessary, they should not be stretched across floors or located in areas where they can be damaged or pose a tripping hazard. Extension cord use should be limited to temporary installations and must be of the proper length and gauge for the intended current (Amps).

3.10.7 All faculty and staff working in the lab should be instructed how to de-energize electrical service to equipment in case of an accident or fire. Lab personnel are not to reset tripped circuit breakers. This must be done by a Building Engineer or electrician. Breakers should identify the circuit they control.

3.10.8 Electrical equipment used in close proximity of flammable liquids and gases must be properly electrically classified. Where possible non-sparking induction motors or air motors should be used should be used to operate vacuum pumps, mechanical shakers, stirring motors and rotary evaporators. Additional electrical safety information is available in the General Safety Section of the CAMS Safety

Instructions Guide.

4.0 Hazard Identification and communication

Laboratories are deal with many type of hazardous material like inflammable liquids/solids, oxidizing materials, toxic materials, corrosive materials, compressed gas etc. Identification of the type of hazard / spill is important to take adequate action. Communication to all the personnel in the area should be done if a flammable, carcinogenic, reactive or toxic hazard is spilled. Also spills/hazards have to be communicated to the supervisor.

4.4 **Identification Marks**

4.4.1 Hazard identification marks or symbol posted at all of the entrances to the lab will identify the categories of potentially hazardous materials that may be found in the lab at any given time and contact persons in case of emergency. Hazard warning stickers identify the potential chemical, biological or physical hazards that may be in the laboratory. These stickers can be added or removed as needed for the changes in the laboratory inventory. The Emergency Call List identifies the individuals to contact in case of an emergency.

4.4.2 Each laboratory entrance must be posted with a room number and emergency notification sign that contains contact names and emergency phone numbers. This sign must also list the significant hazards found in that lab. Laboratory supervisors are required to request the necessary signage from the Department of Environmental Health and Safety, and ensure these signs are conspicuously posted at each lab entrance. See the laboratory Symbols section of this Manual.

4.4.3 Signs warning of severe or unusual hazards such as unstable chemicals, lasers, radioactive and biohazard agents must be posted at lab entrances and on specific equipment or areas housing such hazards.

4.2 Labeling

4.2.1 The manufacturer's label will provide the initial information on the handling of any substance. Directions found on the label must be followed. All bottles and chemical containers must be labeled, including, flasks, beakers, etc. If abbreviations are used, a reference list of the abbreviations must be posted in the lab. Labels are required on all containers in the lab.

4.2.2 proper label must identify the material per the Globally Harmonized System (GHS) requirements. Use a common name in English, the international hazard warning and designated signal word. Avoid formulas and abbreviations known only to the user.

4.2.3 Unlabeled chemicals should be handled as chemical waste. All containers of chemical waste must be labeled with a completed orange "WASTE CHEMICALS" label in accordance with universal guidelines.

4.2.4 Chemicals synthesized or developed in the laboratory must be assumed to be toxic if no data are available. Suitable handling procedures must be prepared and implemented. All containers of chemicals prepared in the laboratory must be marked with the chemical name, primary hazard(s) [if known], the responsible person(s) and the date.

4.3 Chemical Inventories

A complete inventory of all chemicals at the worksite is required to be maintained at all times. An inventory must be carried out and updated at least annually to cross check against the previous inventory, remove out unused or expired chemicals, and check the condition of caps, bottles and labels. This inventory must be available for lab staff, Laboratory Committee review.

4.3 Physical Hazards and Housekeeping

Physical hazards and poor housekeeping practices may put staff and visitors at risk of injury. Lab staff must correct or report any hazards found in the lab. Physical hazards or housekeeping issues observed outside of the lab should be reported to the appropriate maintenance division.

5.0 Handling of Hazards Chemical in Labs

5.1 General Guidelines for handling Hazardous Chemicals

5.1.1 It is possible to handle all chemicals safely, especially in a controlled laboratory environment. Users must understand the potential hazards associated with all chemicals in their lab. Obtain and review Safety Data Sheets (SDS) and hazard labels before using chemicals.

5.1.2 Ensure that necessary supplies and equipment are available for handling small spills. See procedures in following section. Also, know emergency numbers of the University and basic emergency response procedures. A basic chemical spill procedure should be posted in each lab or area where chemicals are handled.

5.1.3 Know the location and proper use of safety equipment such as emergency showers, eye wash stations, and fire alarms. In the event of skin or eye contact with chemicals, immediately remove affected clothing and flush the area of contact with cool water for 15 minutes. Get immediate medical assistance by calling **7777.**

5.1.4 Do not work alone in the laboratory if you are working with chemicals.

5.1.5 Purchase minimum amounts of hazardous materials necessary to accomplish work and dispense only amounts necessary for immediate use.

5.1.6 Use hazardous materials only as directed and for their intended purpose.

5.1.7 Never smell or taste any chemical as a means of identification.

5.1.8 Avoid direct contact with any chemical. Use engineering controls (such as certified fume hoods) and personal protective equipment to avoid exposure.

5.1.9 Smoking, drinking, eating, the storage of foodstuffs, and the application of cosmetics are forbidden in areas where chemicals are in use.

5.1.10 The Laboratory and safety of University recommend that all chemicals be dated upon delivery to the laboratory, and be checked for integrity on an annual basis at a minimum.

5.1.11 Label all secondary containers with a common name or chemical description and other useful hazard information.

5.1.12 Store chemicals in compatible categories, not alphabetically.

5.1.13 DO NOT USE damaged containers or glassware in poor condition.

5.1.14 Never use mouth suction for pipetting or to start a siphon.

5.1.15 Wash hands immediately after working with chemicals.

5.1.16 Only trained personnel are permitted to handle chemicals in the lab.

5.2 GENERAL CHEMICAL SPILL PROCEDURE

5.2.1 Evaluate the Spill

5.2.1.1 Determine the hazards associated with the spilled material. For example, is the material corrosive, flammable, toxic, or reactive?

5.2.1.2 Identify all materials by common or chemical name. c) Estimate how much is spilled.

5.2.1.3 Evaluate the degree of danger to employees, students, or visitors. e) Evaluate the degree of danger to equipment or property.

5.2.1.4 Contain the spill if safe to do so. Utilize absorbent pads and other materials or actions designed to prevent the spilled material from spreading and causing increased damage.

5.2.2 Evacuate the area if the spill cannot be contained, or if the spilled material produces irritating odors, flammable vapors or explosive vapors (extinguish all sparks or shut off all potential ignition sources).

5.2.3 Clean up the spilled material

5.2.3.1 Large spills (> 1 gallon) of toxic, corrosive or flammable materials shall be handled by L&SCs. Immediately call the Emergency Telephone Number Have the following information available:

5.2.3.1.1 Your name and phone number.

5.2.3.1.2 Location of spill.

5.2.3.1.3 Description of what was spilled.

5.2.3.1.4 Any steps you have taken to control the spill.

5.2.3.1.5 Any injuries that have occurred.

5.2.4 Spills of acids, bases, and flammables (less than one gallon) may be cleaned up by laboratory personnel using appropriate neutralizers/absorbents and proper personal protective equipment.

5.2.5 Spills of innocuous material can be cleaned up by laboratory personnel or equipped staff.

5.2.6 Dispose of all contaminated materials through the University Chemical Waste Program.

5.2.7 Employees who have been exposed to hazardous chemicals due to a spill or other uncontrolled situation shall promptly report to the head of Laboratory. A Report of Incident shall be completed by the individual's supervisor.

5.2.8 Consult L&SCs with any questions regarding chemical spills and spill clean-up.

5.3 Toxic Materials

5.3.1 Acutely toxic materials are characterized by prompt (or slightly delayed) health effects, such as burns, allergic reactions, respiratory irritation, and immediate damage to organs such as the skin and eyes.

5.3.2 Any chemical whose properties are unknown should be treated as though it is acutely toxic.

5.3.3 Those materials defined as "poisons or toxic" due to possessing one (or more) of the following toxicological parameters:

5.3.3.1 Oral LD_{50} of 50 mg/Kg or less.

5.3.3.2 Dermal LD_{50} of 200 mg/Kg or less.

5.3.3.3 Inhalation LC_{50} 2 mg/L or 200 ppm or less.

5.3.4 The effects of exposures to chronically toxic materials occur over a longer period of time and are characterized by cumulative damage to organs or organ systems. Chemicals that are defined here as chronic toxins include hepatotoxins (e.g., carbon tetrachloride, vinyl chloride), nephrotoxins (e.g., ethylene glycol), neurotoxins (e.g., acrylamide), agents which act on the hematopoietic system (e.g., benzene), and others affecting specific organs.

5.4 Precautions Specific to Toxic Material

5.4.1 Use and store toxic substances only in designated (or restricted) areas, preferably under a negative pressure with respect to the rest of the building, and in the smallest amounts possible. Post the room or area with appropriate warning signs to restrict entry, as necessary.

5.4.2 Use toxins in a certified chemical fume hood, glove box, or other containment device.

5.4.3 Store toxic chemicals in original containers only. Secondary containers should be avoided for toxic chemicals.

5.4.4 Store and transport toxic chemicals in secondary containment trays;

5.4.5 Dispose of grossly contaminated clothing or shoes as chemical waste.

5.4.6 Protect vacuum pumps against contamination by using scrubbers or suitable filters.

5.4.7 Decontaminate vacuum pumps, glassware or other equipment before removing it from the designated (or restricted) area.

5.4.8 Wet mop or HEPA-vacuum [High Efficiency Particulate Air Filter] to decontaminate surfaces; do not dry sweep.

5.4.9 If using toxicologically-significant quantities (amount depends on the substance) on a regular basis, contact your department's Chemical Hygiene Officer so that, in conjunction with EH&S, a determination on required medical surveillance can be made.

5.5 Carcinogenic And Reproductive Hazards

5.5.1 Carcinogens are substances capable of producing cancer in mammals, listed by the National Toxicology Program (NTP) as a carcinogen (or potential

carcinogen) in its most recent Annual Report on Carcinogens, and/or listed by the International Agency for Research on Cancer (IARC) as a Group 1, 2A or 2B carcinogen. Updated lists are available from L&SCs. Carcinogens currently in common use at the University include bromodeoxyuridine (BrDU), acrylamide, chloroform, methylene chloride, chemotherapy agents, and formaldehyde.

5.5.2 Reproductive toxins are substances that affect either male or female reproductive systems or capabilities and include agents which damage the genetic material (mutagens) or the developing fetus (teratogens). See the University SOP for Reproductive Hazards found in this Manual. Reproductive toxins currently in common use at the University include ethidium bromide and acrolein.

5.6 Flammables and Combustibles

5.6.1 Flammable and combustible materials are those chemicals which generate sufficient vapors to cause a fire when an ignition source is present. The minimum temperature at which a liquid gives off sufficient vapor to allow ignition is the "flashpoint." See the Fire Safety portion of this Manual for specific guidelines on flammable and combustible liquids, metals, and gases.

5.7 CORROSIVES

5.7.1 Corrosive chemicals are those substances that, by direct chemical action, cause visible destruction or irreversible alterations of living tissue or deterioration of metal surfaces. Corrosive liquids and solids are responsible for many injuries in the lab. Corrosive gases are also serious hazards because they can be readily absorbed into the body by skin contact, inhalation, or eye contact.

5.7.2 Categories of corrosive liquids include inorganic acids (e.g., hydrochloric [muriatic], nitric, sulfuric), organic acids (e.g., acetic, butyric, formic), inorganic basic solutions (e.g., ammonia, sodium hydroxide), other inorganics (e.g., bromine, phosphorous trichloride) organic basic solutions (e.g. triethylamine), and other organics (e.g., acetic anhydride, liquified phenol).

5.8 Precautions Specific to Corrosive Chemicals

5.8.1 Eye protection and gloves appropriate for the material to be handled should always be worn when handling corrosive materials. Depending on the type of operation, and quantity of chemicals(s) used, a faceshield and impervious apron/boots may also be appropriate.

5.8.2 An eyewash and/or safety shower must be readily accessible to areas where corrosives are used and stored.

5.8.3 Dehydrating agents such as sulfuric acid, phosphorous pentoxide, and calcium oxide should be mixed with water by slowly adding the agent to water to avoid violent reaction and spattering.

5.8.4 Strong oxidizing agents such as chromic and perchloric acids should be clearly labeled, stored in glass or other inert containers. Corks and rubber stoppers should not be used.

5.8.5 Acids and bases must be stored separately.

5.8.6 To transport strong acids and bases from location to location, use safety rubber bottle carriers or non-breakable PVC-coated bottles.

5.9 Peroxide Forming Chemicals

5.9.1 Peroxide forming chemicals are chemicals which react with oxygen to form peroxides. Peroxides are compounds that can explode with impact, heat or

friction. Peroxide-forming compounds can be divided into three hazard categories based on method of reaction and storage time. A partial list is presented in the Standard Operating Procedures for Peroxide Formers found in this Manual.

5.10 Reactive Chemicals

Reactive chemicals are substances which may undergo a variety of violent reactions with the spontaneous liberation of heat and/or gases in such a rapid fashion that safe dissipation is not possible. This category includes explosives, oxidizers, reducing agents, water/acid/air sensitive and unstable chemicals. These substances are capable of producing toxic gases or explosive mixtures, being explosive themselves, reacting with water violently, or they may contain cyanide or sulfide. The reactivity of individual chemicals in specific chemical classes varies considerably and may be substantially modified by aging or contamination.

5.10.1 Class I Reactive Chemicals are normally unstable and may readily undergo violent change without a detonator.

5.10.2 Pyrophoric chemicals (e.g., phosphorous, metal powders of magnesium, aluminum and zinc) will undergo spontaneous ignition in contact with air. Store in inert environments and prevent contact with air or water.

5.10.3 Polymerizable chemicals (e.g., divinyl benzene and acrylonitrile) will undergo spontaneous polymerization in contact with air. Such materials should be kept cool, and be stored or utilized away from moisture and water.

5.10.4 Chemicals classified as oxidizers (e.g., perchloric and chromic acids) will undergo violent reactions when in contact with organic materials or strong

reducing agents. Hazards can be minimized by using and storing minimal amounts, emphasizing proper storage away from organic and flammable materials, and reducing chemicals.

5.10.5 Class II Reactive Chemicals react violently with water. Examples include chlorosulfonic acid, acetyl halides, phosphorous trioxide and titanium tetrachloride. Obviously, these chemicals should be kept away from water, and handled in chemical fume hoods. Most of these materials are corrosive, as are their decomposition products, so appropriate personal protective equipment must be worn.

5.10.6 Class III Reactive Chemicals decompose violently in water with evolution of heat and flammable gases. Examples include alkali metals, alkaline earth metals, metal hydrides and metal nitrides. While avoiding contact with water, ensure that ventilation is adequate to disperse any evolved flammable gases. As water may accelerate the fire, dry sand should be used to smother the chemicals.

5.10.7 Class IV Reactive Chemicals react rapidly with water, generating acutely toxic gases or vapors. Typical chemicals in this class include alkaline metal phosphides and isocyanates. Use these materials with adequate ventilation and prevent contact with water.

5.10.8 Class V Reactive Chemicals such as metal cyanide salts, organic cyanide compounds, metal sulfide salts, and organic sulfides/mercaptans are acid-sensitive and may produce extremely toxic hydrogen cyanide and hydrogen sulfide gases on contact with acids.

5.10.8.1 The same effect may occur with materials which form acids in the

presence of moisture or liquid water. Provide adequate ventilation to minimize the severe inhalation hazard of hydrogen cyanide and hydrogen sulfide. Do not store in cabinets with acids, oxidizers and other reactive chemicals.

5.10.9 Class VI Reactive Chemicals can detonate or explode if heated above ambient temperature or if exposed to an ignition source. Examples include sodium amide, metal azides, brominated organic compounds, organic perchlorates and ammonium nitrate and chlorate.

5.10.10 Class VII Reactive Chemicals such as organic azides, some metal azides, benzoyl peroxide and peroxidized ethers may detonate or decompose explosively under ambient temperature and pressure, without any external ignition source. Materials in this class should only be handled by experienced and trained individuals, after consulting the SDS and the Department of Environmental Health and Safety.

5.10.11 Class VIII Reactive Chemicals are explosive materials that should be handled by experienced and properly equipped personnel. Class A explosives include TNT, mercury fulminate and diazo-dinitrophenol. Class B include stabilized nitrocellulose and nitroglycerin. Forbidden reactive chemicals include diethylene glycol dinitrate, unstabilized nitroglycerin and unstabilized nitrocellulose.

5.11 Procurement Of Chemicals

All chemicals will be procured through vendors approved by the Majmaah University University Department in the smallest quantity consistent with the intended use. laboratory chemicals, controlled substances, drugs, prescriptions, gases, and biological or

radioactive materials. If chemicals are to be transferred to the University from another individual within the University or if chemicals are to be transferred to the University from another institution, prior approval must be obtained from L&SCs or Incharge of the Laboratory.

5.12 Procurement and use of Radioisotopes

The Laboratory Supervisor must submit all proposed uses of radioisotopes to the Laboratory safety committees for approval. The Radiation Safety Office must approve all purchases and transfers of radioactive materials.

5.13 Distribution and Transport of Chemicals

5.13.1 Always transport chemicals in carry buckets or on a wheeled cart with raised edges to serve as secondary containment.

5.13.2 If no freight elevator is available, chemicals may be transported on a passenger elevator with extreme caution. When possible, isolate the elevator from public use while transporting chemicals.

5.13.3 All chemical containers should be closed when not in use, especially during transport, to reduce the potential for spills and/or vapor releases.

5.13.4 Transport compressed gas cylinders using a hand truck specifically designed for that purpose and use a suitable strap, chain or other restraint during transportation. Compressed gas cylinders must be restrained with suitable racks, straps, chains or stands at all times whether empty or full.

5.13.5 Any chemicals shipped from the University must be:

5.13.5.1 Appropriately packaged, labeled, marked, and documented per Department of Transportation (DOT) or International Air Transport Association (IATA) requirements.

5.13.5.2 All personnel preparing shipments containing chemicals regulated as Dangerous Goods (e.g. dry ice or formalin) must be trained and certified. Contact L&SCs for additional information related to training and certification. Any chemical shipped from the University must be accompanied by a signed and completed Material Transfer Agreement

5.14 Chemical Storage

5.14.1 Before storing any hazardous material, read the label and SDS for more specific instructions on storage and handling.

5.14.2 Each laboratory must maintain a current inventory of chemicals.

5.14.3 Chemical storage rooms and areas must be posted with signage that indicates the significant hazards of stored chemicals.

5.14.4 All chemical containers should be closed during storage to ensure that no vapors are released to the atmosphere. Exemptions must be made for vessels whose contents place the vessel under pressure. Vessels with pressure-relief caps should be utilized in these instances for storage.

5.14.5 As a general rule, avoid storing chemicals on the floor or above eye level.

5.14.6 Chemicals must only be stored in compatible groups. Only segregated chemicals can be stored alphabetically. Incompatible groups of chemicals must not be stored in close proximity to one another.

5.14.6.1 Compatibility Families of Inorganic Chemicals

5.14.6.1.1 Metals, hydrides.

5.14.6.1.2 Halides, sulfates, sulfites, thiosulfates, phosphates, halogens.

5.14.6.1.3 Amides, nitrates, nitrites, azides, nitric acid.

5.14.6.1.4 Hydroxides, oxides, silicates, carbonates.

5.14.6.1.5 Sulfides, selenides, phosphides, carbides, nitrides.

5.14.6.1.6 Chlorates, perchlorates, perchloric acid, hypochlorites, peroxides, hydrogen peroxide.

5.14.6.1.7 Arsenates, cyanides, cyanates.

5.14.6.1.8 Borates, chromates, (per) manganates.

5.14.6.1.9 Acids (except nitric).

5.14.6.1.10 Sulfur, phosphorous, arsenic, phosphorous pentoxide**.**

NOTE: THESE CHEMICALS DESERVE SPECIAL ATTENTION DUE TO THEIR POTENTIAL INSTABILITY.

5.14.6.2 Compatibility Families of Organic Chemicals

5.14.6.2.1 Acids, anhydrides, peracids.

5.14.6.2.2 Alcohols, glycols, amines, amides, imines, imides.

5.14.6.2.3 Hydrocarbons, esters, aldehydes.

5.14.6.2.4 Ethers, ketones, ketenes, halogenated hydrocarbons, ethylene oxide.

5.14.6.2.5 Epoxy compounds, isocyanates.

5.14.6.2.6 Peroxides, hydroperoxides, azides**.**

5.14.6.2.7 Sulfides, nitriles.

5.14.6.2.8 Phenols, cresols.

NOTE: THESE CHEMICALS DESERVE SPECIAL ATTENTION DUE TO THEIR POTENTIAL INSTABILITY.

5.15 Laboratory Fume Hoods

5.15.1 Laboratory fume hoods (aka chemical fume hoods) are engineering controls designed to protect lab personnel from release of airborne

chemical contaminants. A secondary purpose is to protect people and property against small fires and explosions. The primary measure of a fume hood's efficacy is its face velocity, measured in linear feet per minute (lfpm) through the open sash.

5.15.2 All chemical fume hoods should be equipped with a manometer or other hood monitor at the time of new installation, or at the time of renovation for existing chemical fume hoods. This monitor should be used continually to check proper hood function.

5.15.3 Chemical fume hoods are safety backup devices for condensers, traps and other devices that collect vapors and fumes. Never use a fume hood to "dispose" of chemicals by evaporation.

5.15.4 Only apparatus and chemicals essential to the specific procedure or process should be placed in the fume hood. Do not use fume hoods for extended chemical storage.

5.15.5 The work or apparatus inside the fume hood should be placed at least six inches inside the hood. Also, air baffles inside fume hoods must remain clear of obstructions for proper air flow and protection.

5.15.6 Never remove fume hood sashes, and replace cracked or damaged fume hood sashes promptly.

5.15.7 All new fume hoods must be commissioned after installation and before initial use according to ASHRAE 110 testing that verifies all of the fume hood’s control features are functioning properly and the fume hood is capable of containing hazardous chemical emissions.

5.15.8 In the event of power failure or other failure of fume hood function,

stop work, cover or close all chemicals, close the sash, and notify a supervisor.

5.15.9 All chemical fume hoods must be certified annually for proper operational air flow by L&SCs or its designee. PI's or supervisors are responsible to assure that only certified chemical fume hoods are used.

5.16 Chemical Use Areas

5.16.1 The potential for employee exposure to chemicals is greatly reduced by restricting the use of chemicals to a designated area equipped with the proper control devices. This designated area can be a glove box, fume hood, bench or an entire laboratory depending on the manipulations required.

5.17 Fire Safety Equipment

5.17.1 Each laboratory must have access to fire extinguishers capable of extinguishing the type of fire that may be generated by the materials used in the lab.

5.17.2 The Department of Environmental Health and Safety arranges annual fire extinguisher inspections by a qualified professional.

NOTE: See the Fire Safety and General Lab Safety sections of this manual for more information.

5.18 Emergency Showers and Eye Wash Stations

5.18.1 Eye wash stations, drench hoses or emergency showers must be accessible to work areas where the potential for eye or skin exposure to corrosive materials exists.

5.18.2 All lab personnel must be instructed by their supervisor on the location and use of this equipment.

5.18.3 Lab personnel should ensure that access to the eye wash station, drench hose or emergency shower is not restricted or blocked. No electrical appliance should be

permitted within the spray area of an eyewash/safety station.

5.18.4 Eye wash stations should be flushed at least weekly by lab personnel.

5.18.5 Malfunctioning eye wash stations should be reported immediately to building management. This weekly flushing must be documented by lab personnel.

6.0 CHEMICAL EXPOSURE

If an overexposure to chemicals is suspected, report immediately to your supervisor. If emergency medical attention is needed, call 7777. An exposure assessment must be performed by the supervisor. The Laboratory and safety committees can be consulted by the Laboratory Supervisor or Chemical Hygiene Officer in any instance.

6.1 MATERIAL SAFETY DATA SHEETS (MSDS)

6.1.1 Safety data sheets should be obtained and reviewed for each chemical before use in the laboratory. Electronic MSDS are available through the chemical manufacturer website or MSDS manual. If chemicals developed in University laboratories are to be provided to another user outside of the lab, a safety data sheet and label must be prepared. Consult L&SCs prior to transfer of such material

6.2 CHEMICAL HYGIENE TRAINING

6.2.1 The University requires that employees be informed of the presence of hazardous chemicals when assigned to a work area and prior to new exposure situations (i.e., those situations involving new hazardous chemicals and/or new work procedures). Such training is to be provided by the department in conjunction with laboratory supervisors.

6.3 Chemical Waste Disposal

6.3.1 Waste chemicals are picked up from University buildings on a bi-weekly schedule. In the event of a University holiday falling upon a pick-up day, the pick-up will be rescheduled.

6.3.2 Waste should be taken to the collection points on the morning of the scheduled pickup.

6.3.3 All chemicals must be identified and labeled.

6.3.4 An orange Waste Chemicals label should be filled out completely & placed on the bottle.

6.3.5 Labels should include chemical name, quantity, name of person preparing chemical for disposal, department, telephone extension, and date.

6.3.6 Common chemical names should be used on labels. (No formulas or abbreviations)

6.3.7 List all known chemical constituents for each container (Do not label as "solvent waste", "aqueous waste", halogenated/non halogenated waste, etc.) Estimate concentrations.

6.3.8 Labels are obtained from L&SCs or Laboratory Director office.

6.3.9 Waste chemicals destined for disposal should be segregated into compatible groups and packaged in a sturdy cardboard box.

6.3.10 Consult the Material Safety Data Sheet for the materials to determine compatible groupings.

6.3.11 Five-gallon solvent containers in good condition do not need to be over packed.

6.3.12 Drums greater than five-gallon capacity will not be picked up on regularly

scheduled rounds. Arrangements for pick-up of drums can be made by contacting L&SCs.

6.3.13 Packaging should be done to minimize the possibility of breakage or leakage during handling (all bottles should be tightly capped to prevent leakage).

6.3.14 Containers should be placed upright in the box to prevent spilling of the contents.

6.3.15 Bottles should not come in contact with each other, and the space between bottles should be filled with a cushioning material to prevent bottle movement during handling.

6.3.16 Bottles of liquid chemicals should be packed with absorbent materials to contain the material in the event of breakage.

6.3.17 Do not place any chemical waste in biological waste containers (red bags, boxes labeled with biohazard symbol, etc.).

6.3.18 Total weight of the box should not exceed 35 pounds.

6.4 Chemical Waste Collection

6.4.1 Chemical waste should be collected in a container that is compatible with the waste type. Specific container selection should be as follows:

6.4.1.1 Flammable liquids: glass bottles, steel cans, high density plastic.

6.4.1.2 Concentrated acids and bases: 2.5 liter "acid" bottles, no metal containers.

6.4.1.3 Aqueous solutions: glass/sturdy plastic bottles, plastic cans.

6.4.1.4 Trace contaminated solid wastes: double 4-6 mil polyethylene bags.

6.4.1.5 Hydrofluoric acid: plastic container with plastic screw-type cap.

6.4.2 Chemical waste containers should not be overfilled and must have sufficient headspace for expansion during temperature changes (1.5 inches for flat-top containers; 3 inches for tapered containers).

6.4.3 Chemical waste containers must be sealed with a screw-type cap and should only be opened when actively adding chemical waste. A funnel is not an acceptable means of closing a container.

6.4.4 Once chemical waste has been added to the container, the container must be labeled with a completed orange "WASTE CHEMICALS" label.

6.5 Collecting and Commingling Chemical Waste

6.5.1 If different chemical wastes are mixed together in a single container for disposal (commingling), then the same type of chemicals must be mixed together to make a common segregation group (see below). Only compatible chemicals may be mixed together within segregation groups.

6.5.2 Collect these types of chemical wastes separately from each other (examples included);

6.5.2.1 Halogenated -- e.g. chloroform, methylene chloride.

6.5.2.2 Hydrocarbon -- e.g. xylene, ether, hexane, acetone.

6.5.2.3 Nitrogeneous -- e.g. triethylamine, diisopropylamine.

6.5.2.4 Sulfurous -- e.g. dimethylsulfoxide, dimethylsulfate.

6.5.2.5 Corrosive (acid) -- e.g. sulfuric acid, hydrochloric acid

6.5.2.6 Corrosive (basic) -- e.g. sodium hydroxide. potassium hydroxide

6.5.2.7 Aqueous solutions -- e.g. diaminobenzidine, ethidium bromide, heavy metals.

6.5.2.8 Oils -- e.g. motor oil, pump oil.

6.5.2.9 Solid lab wastes such as gels containing acrylamide and ethidium bromide.

Care should be taken not to mix wastes which will react with each other, even if they are within the same compatibility group (e.g. although acids and bases are both corrosives, they should not be mixed in the same container except under controlled conditions by experienced personnel). The following chemical waste labeling procedures should always be adhered to:

- Each container must be labeled with a completed "WASTE CHEMICALS" label once waste is first placed in the container.
- Fill out the label in pencil (due to chemical resistance).
- Include name, room number, phone number, department and date.
- List all components of commingled waste. Do not use formulas, abbreviations, or nomenclature, if feasible. Do not use generic names such as "solvent waste", "halogenated waste", "non-halogenated waste", "aqueous waste", etc.
- Record pH of aqueous wastes (if applicable).
- Do not cover original container labels with University chemical waste label, if possible.
- Laboratories must not accumulate chemical wastes for more than 30 days before placing it in a designated University hazardous waste pick-up area.
- One of the University's high priority goals is to reduce the amount of chemical waste generated. Benefits of waste reduction include increased safety of personnel, reduced environmental contamination, and decreases in expenditures.

6.6 Accidents in the laboratory may be caused by

6.6.1 Chemicals

6.6.1.1 Acid

6.6.1.2 Alkali

6.6.1.3 Poisonous/Toxic Substance

6.6.1.4 Chemical Spills

6.6.2 Biological

6.6.3 Heat & Fire

6.6.4 Electric Shock

6.6.5 Compressed Gases

6.7 Precautions to prevent accident by Hazardous Chemical

6.7.1 The proper storage and use of chemicals is necessary to avoid dangers such as burns, explosions, fires and toxic fumes. Thus knowledge of the properties of the chemicals in use and proper handling procedures greatly reduces dangerous situations.

6.7.2 Bottles of chemicals and solutions should be handled carefully, and a cart should be used to transport a heavy container or multiple numbers of containers from one area to another.

6.7.3 Glass containers of chemicals should be transported in rubber or plastic containers that protect them from breakage and contain the spill if breakage does occur.

6.7.4 Keep bottles of acids and alkalis on the lower shelves of the cupboards. When you take a bottle out make sure your hand is dry and hold the bottle firmly upright. Do not keep acids and alkalis in bottles with ground glass stoppers (they may get stuck).

6.7.5 All bottles containing reagents must be labelled properly. A good practice is to label the container before adding the reagent, thus avoiding the possibility of an unlabeled reagent. The label should bear the name and concentration of reagent, the initial of the individual who made up the reagent and the date on which the reagent was prepared. When appropriate, the expiry date also should be included.

6.7.6 An additional label should be added to designate specific storage instructions, such as the need for refrigeration or special storage related to potential hazard.

6.7.7 A bottle should never be held by its neck, but instead firmly around its body with one or both hands, depending on size of the bottle.

6.7.8 Acids must be diluted through slow addition to water; water should never be added to concentrated acid. Do this in a sink whenever possible. Never pour the water into the sulfuric acid because of the danger of splashing due to the explosive evaporation of water while mixing.

6.7.9 Use small measuring cylinders for measuring acids and alkalis. If more accurate measurement is required, use a pipette with a rubber safety bulb attached. Pipette slowly, watching the level of the liquid.

6.8 First Aid in case of Accident with Chemicals

6.8.1 Accident from Acids like Nitric Acid, Sulphuric Acid, Hydrochloric Acid and Trichloroacetic Acids etc.

6.8.1.1 First AID-

6.8.1.1.1 IN ALL CASES: WASH IMMEDIATELY AND THOROUGHLY WITH RUNNING WATER.

6.8.1.1.2 In case of acid splashes in the eye: Wash the eye immediately with large quantity of water sprayed from a wash bottle or rubber bulb. Squirt the water into the corner of the eye near the nose.

6.8.1.1.3 In case of swallowing of acids drink plain cold water (3-4 glasses) and shift to patient to the casualty.

Accident from Alkali like- Sodium, Potassium, and Ammonium Hydroxide etc

6.8.1.2 First Aid:

6.8.1.2.1 In all cases: Wash immediately with large quantities of water In case of alkali splashes in the eye wash immediately with large quantities of water sprayed from a wash bottle or rubber bulb. Squirt the water into the corner of the eye near the nose.

6.8.1.2.2 In case of swallowing alkalis give him 3 or 4 glasses of ordinary water and shift to the casualty.

6.8.2 Poisoning

6.8.2.1 This can be caused by:

6.8.2.1.1 Inhaling toxic vapours or gases (e.g. chloroform).

6.8.2.1.2 Accidental swallowing while pipetting a poisonous solution.

6.8.2.2 First AID: In all cases: Shift the patient to Casualty/ Clinics immediately for necessary medical attention.

7.0 BIOLOGICAL HAZARDS:

Prevention of laboratory employee and students exposure to infectious agents, such as the hepatitis virus (HCV/HBsAg) and HIV is essential.

7.1 Exposure to infectious agents results from:

7.1.1 Accidental puncture with needles and sharps.

7.1.2 Spraying of infectious material by a syringe or spilling splattering of these materials on bench tops or floors.

7.1.3 Centrifuge accidents.

7.1.4 Cuts or scratches from contaminated glassware. Any unfixed tissue, including blood slides, also must be treated as potentially infectious material.

7.2 Prevention of Accidents with Biological Hazardous Material

All Lab employees will strictly adhere to **Standard Precautions** as under:

7.2.1 Never perform mouth pipetting and never blow out pipettes that contain potentially infectious material.

7.2.2 Do not mix potentially infectious material by bubbling air through the liquid.

7.2.3 Use barrier protection, such as gloves, when drawing blood from a patient and handling all patient specimens, including when removing stoppers from tubes.

7.2.4 Disposable gloves provide adequate barrier protection. Phlebotomists should clean their gloved hands with skin antiseptic hand rub between patients.

7.2.5 Wash hands whenever gloves are changed.

7.2.6 Use facial barrier protection if a significant potential exists for the spattering of blood or body fluids.

7.2.7 Needle should not be recapped, bent or broken by hand. Always use a needle destroyer.

7.2.8 Dispose the needles in puncture proof containers after destroying them.

7.2.9 Dispose all sharps appropriately. Don't overfill a sharp container. All sharps containers to be discarded when 3/4th full. Sharps should not be passed from one worker to another. The person using the equipment should discard it. Rubber Gloves and boots must be worn during clean up and decontamination procedures.

7.2.10 Before centrifuging tubes, inspect them for cracks. Inspect the inside of the trunnion cup for signs of erosion or adhering matter. Ensure that rubber cushions are free from all bits of glass and balancing of the tubes is proper.

7.2.11 Cleaning of working bench is done daily with 1 % sodium hypochloride. Container for discarded tips, tube corks etc. should be filled daily with 1% sodium hypochloride.

7.3 First Aid Measures in case of Accident with Biological Hazardous Material:

IN CASE OF NEEDLE STICK INJURIES OR SKIN EXPOSURE

7.3.1 Do not panic or put finger in the mouth – encourage bleeding by squeezing – wash thoroughly with soap under running water, followed by 70% alcohol (-> Report to the supervisor (Incident Reporting Form)

7.3.2 Blood samples will be taken for assessing basal status and the risk of transmission.

7.3.3 If the index case (patient) is HBsAg Positive, exposed employee's investigations are done and HBV immunoglobin, HBV vaccine (booster), reassurance and counseling are done accordingly.

7.3.4 If the index case is HIV Negative, HIV antibody testing of the exposed person is offered at 0,6,12 and 24 Weeks.

7.3.5 If the index case is HIV Positive exposure code and status code is evaluated and chemoprophylaxis is started within 1-2 hours following exposure. The cut off period for chemoprophylaxis is 72 hrs following exposure. All the routine investigations are to be done while starting chemoprophylaxis. Two or three drug prophylaxis is given depending on the category of exposure (Refer to specific SOPs)

7.3.6 In case of splash to mouth or eyes, rinse thoroughly with plenty of running water- check for and remove contact lenses – Don't use a disinfectant here.

7.4 HEAT & FIRE

7.4.1 Prevention of Accidents with Heat/Fire:

7.4.1.1 Test tubes: Never heat the bottom of a test tube. The liquid inside might sputter. Heat the middle of the tube, shaking gently. The mouth of the tube should be facing away from the worker and any other person, towards an empty space or a sink.

7.4.1.2 Inflammable Liquids: Only small quantities of inflammable liquids such as ether, ethanol, acetone, benzene, toluene and caron disulphide should be kept in the laboratory.

WARNING: Ether will ignite at a distance of several metres from a flame. Never place a bottle of ether on a workbench where there is an open flame (Bunsen burner, spirit lamp, etc.) Carbon disulphide is even more dangenous.

7.4.2 Liquefied Petroleum Gas (LP Gas):

7.4.2.1 When lighting a gas burner, always light the match and hold it to the burner before turning on the gas tap. Turn off the main valves of all gas cylinders every evening. Replace the rubber connecting pipes once a year.

7.4.2.2 Do not use nylon clothes while working as these are easily inflammable. Always use a laboratory apron.

7.4.2.3 Always ensure that electrical wiring and electrical appliances are in good condition.

7.4.3 First Aid Measures in case of burns

They fall into two categories:

Severe burns: affecting large areas of skin, e.g. burns caused when victim is on fire.

Minor burns: affecting a small area of skin, e.g. burns caused by hot glassware or a Bunsen Flame.

7.4.3.1 Severe Burns:

7.4.3.1.1 If the victim is on fire, e.g. if splashed with burning ether or other inflammable solvent. Wash the burned portion thoroughly with clean water.

7.4.3.1.2 Inform the physician on duty immediately.

7.4.3.1.3 Do not remove his clothing. Shift him/her to Casualty.

7.4.4 Minor Burns:

7.4.4.1 Plunge the affected part into cold water or ice-water to soothe the pain.

7.4.4.2 Apply silver sulphadiazine ointment to the burn.

7.4.4.3 If the burn becomes infected or does not heal, refer the patient to a physician.

NOTE: NEVER TEAR OFF THE BLISTERS THAT FORM OVER THE BURNS.

7.5 Fire hazards

The ideal solution to the problem of fire and indeed to all laboratory accidents is prevention. However, all fires cannot be prevented, so provisions must be made for those that do occur.

Type of hazard	Fire class	Recommended extinguisher agents
Ordinary Combustibles Wood, Cloth, Paper	A	Water, Type ABC (Dry Powder)
Flammable Liquids and Gases Any energized electrical equipment, if electricity is turned off at the source, equipments reverts to a class A & B	C	ABC, carbon dioxide
Combinations of hazards Ordinary combustibles and flammable liquids and gases.	A & B	ABC, Foam
Ordinary combustibles and electrical equipment.	A & C	ABC, Carbon dioxide
Flammable liquids and gases and electrical equipment.	B & C	ABC, Carbon dioxide
Ordinary combustibles and flammable liquids and gases and electrical equipment.	A,B & C	ABC, Carbon dioxide, Foam

7.5.1 Various types of fire extinguishers are available for use in various types of fires. Because every area practically can not contain several types of fire

extinguishers, ABC (Dry Powder) fire extinguishers are among the best all purpose extinguishers. Every individual in the laboratory is instructed in the use of these extinguishers and other available firefighting equipment. All fire extinguishers should be tested by qualified personnel at intervals specified by the manufacturer. Each fire extinguisher is labeled based on the type of fire it should be used to extinguish.

7.5.2 In case of fire, immediately inform the fire safety officer and dial extension 333 (Code Red), evacuate the area and follow instructions of fire safety officers.

7.5.3 Fire extinguisher is located near the laboratory door. Every individual has been instructed/trained in the use of fire extinguishing equipments.

7.6 Hazard from compressed gases

Cylinders of compressed gas should be handled with care.

7.6.1 Always transport cylinders with a hand truck to which the cylinder is secured.

7.6.2 Leave the valve cap on a cylinder until the cylinder is ready to use, before which time the cylinder should be secured by a support around the upper one third of its body. Disconnect the regulator, shut off the valve, and replace the cap before the cylinder is completely empty to avoid the possibility of the development of a negative pressure.

7.6.3 Place a sign or label that reads empty on the container.

7.6.4 Cylinders should be chained to a fixed piece of furniture or secured by a strap attached to a wall even when they are empty.

8.0 PERSONAL PROTECTIVE EQUIPMENT

- Describe the location of personal protective equipment
- Demonstrate the aseptic removal of gloves.

8.1 Hand gloves

Any activity that involves direct contact with blood, body fluids and infectious materials to mucous membranes or non-intact skin surface should be anticipated and gloves should be worn. Gloves should be removed as soon as possible after completion of the activity. Hands should be washed each time gloves are removed. Disinfectant/Micro-shield can be used with gloves during sample collection between two different patients.

8.2 Protective clothing like: Aprons, Masks, Lab Coats, Shoe Covers

Lab coats are mandatory for all lab personnel. Apron and masks are to be worn during grossing of surgical specimens. Anytime a lab person is likely to be soiled by the splattering of infectious material, protective clothing is to be worn. These must be removed and discarded properly immediately after use.

8.3 Rubber gloves and boots

Personnel dealing with disinfectants, corrosive chemicals and cleaning of the spill are required to use rubber gloves and boots.

9.0 LIST RECOMMENDED SAFETY AND EMERGENCY EQUIPMENT FOR THE LABORATORY

9.1 Personal Protective Equipment

- **9.1.1** Chemical splash goggles
- **9.1.2** Face shields
- **9.1.3** Lab coat
- **9.1.4** Lab apron
- **9.1.5** Gloves

9.2 Safety and emergency equipment

9.3 Eye wash stations

9.4 Deluge safety showers

9.5 Safety shield with heavy base

9.6 Fire extinguishers

9.7 Sand buckets

9.8 Emergency lights

9.9 Emergency signs and placards

9.10 Fire detection or alarm system with pull stations

9.11 First aid kits

9.12 Spill control kit

9.13 Chemical storage cabinets

9.14 Gallon size carrying buckets for chemical bottles

9.15 Laboratory chemical hood (60-100ft/minute capture velocity, vented outside

9.16 Ground fault interrupter electrical outlets

9.17 Container for broken glass and sharps

9.18 Material safety data sheets (MSDSs)

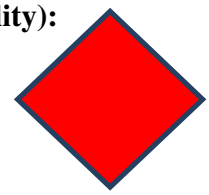
9.19 Emergency action plan for the institution

10.0 National fire protection association hazards labels-704

The National Fire Protection Agency (NFPA), in section 704 of the National Fire Code, specifies a system for identifying the hazards associated with materials. Although the system was developed primarily with the needs of fire protection agencies in mind, it is of value to anyone, including someone working in the Laboratory, which needs to handle potentially hazardous material. This standard presents a simple, readily recognized, and easily understood system of markings that provides an immediate general sense of the hazards of a material and the severity of these hazards as they relate to emergency response. There are categorized four types;

10.1 Types of NFPA Hazards Lebels-704

10.1.1 Red (Flammability):

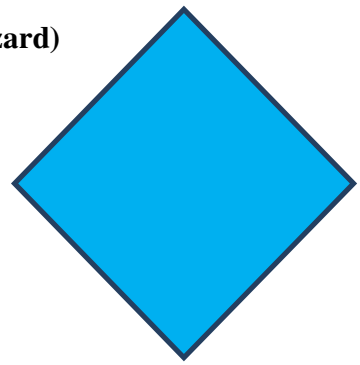


SUSCEPTIBILITY OF MATERIAL TO BURNING

The red section of the diamond provides data on the flammability of the chemical. There are certain conditions under which chemicals may burst into flame, and this section of the diamond explains those circumstances in which a chemical may burn. Within this section is a number between zero and four;

0		**Not Combustible**
1		Combustible if heated, the temperature must be above two hundred degrees Fahrenheit for the substance to burst into flame.
2	caution	Combustible liquid flash point below one hundred and two hundred degrees Fahrenheit (100 to 200ºF).
3	Warning	Combustible liquid flash point between seventy three and one hundred degrees Fahrenheit (70-100ºF).
4	Danger	Flammable gas or extremely flammable liquid temperatures less than seventy three degrees (73ºF) can be sufficient to make it burst into flame.

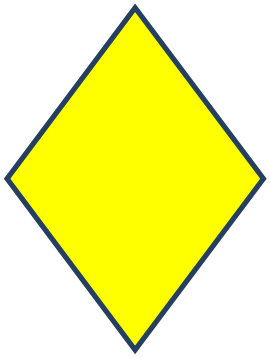
10.1.2 Blue (Health Hazard)



Blue informs people as to the potential health hazard of the chemical and its toxicity in the short-term. Toxicity is measured with the numbers zero through four.

0		No unusual hazards, indicating that the chemical poses no short term health threat. It should be noted, however, that such a chemical could still pose a long term health threat if a person is exposed to it consistently.
1	Caution	May be irritating, the chemical is slightly hazardous.
2	Warning	May be harmful if inhaled or absorbed, means it is hazardous.
3	Warning	Corrosive or toxic, avoid contact or inhalation. The chemical is an extreme danger.
4	Danger	Short term exposure can be deadly. May be fatal on short exposure. Specialized protective equipment required

10.1.3 Yellow Reactivity

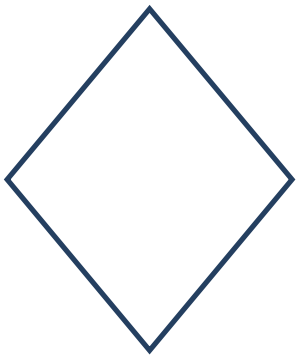


Susceptibility of Material to Burning.

On the NFPA diamond, the yellow section measures reactivity or the likelihood of the material exploding or detonating. Again, the rating is somewhere between zero and four.

0	Stable	Not reactive when mix with Water, indicating that the chemical is stable.
1	Caution	May react if heated or mixed with water but not violently, Means chemical becomes unstable when it is heated.
2	Warning	Unstable or may react violently if mixed with water.
3	Danger	It can detonate under heat or vibration. May be explosive if shocked, heated under confinement, or mixed with water.
4	Danger	It is very likely to detonate, explosive material at room temperature.

10.1.4 White (Spacial Notice key)



The white section of the NFPA diamond is used to identify chemicals that are especially water reactive or that will respond with greater combustion when fuel is added to a fire in which they are involved.

W	An unusually water reactive chemical will be identified with a "w" that has a line drawn through.
OX	An OX will identify those chemicals that can increase a fire's intensity ie. Oxidizing agent.

11 TYPES OF FIRE EXTINGUISHER LABELS

These are four types of of fire extinguisher Class A od ABC, Class B, Class C and Class D. They are colour coded so that it can identify quickly and use the right extinguisher for the right type of fire.

Class A or ABC Extinguisher Fire: Wood, paper, textiles and other ordinary combustibles.

Class B **Extinguisher** Fire: Flammable liquids, oils, soils, solvents, paint, grease etc.

Class C **Extinguisher** Fire: Electrical- live or energized electric wire or equipment.

Class D **Extinguisher** Fire: Consumables metals (Magnesium, titanium, potassium etc.

12 TYPES OF FIRE EXTINGUISHER

12.1 Water extinguisher – Red

For use on Class A fires only, e.g. solids such as wood, plastics. Extinguishes by cooling. Not safe on petrol/oil fires and not to be used near electrical equipment (unless it is a specialised mist extinguisher).

12.2 Dry powder extinguisher - Blue or Red with a Blue strip

May be classified either ABC (containing ammonium phosphate) or BC (containing sodium or potassium phosphate), indicating the type of fire that can be tackled. Can be used on solids such as wood, plastics and liquids such as petrol/paints. Safe to use near electrical appliances. Extinguishes by smothering the flames. Does not cool very well.

12.3 Foam extinguisher - Cream or Red with a cream strip

Can be used on solids such as wood, plastics and liquids such as petrol/paints. Safe to use near electrical appliances. Extinguishes by smothering liquids with film or cooling and smothering solids.

12.4 CO_2 extinguisher - Black or Red with a Black strip

Suitable mostly for liquids only such as petrol/paints (Class B or C fires). Safe to use near electrical appliances. Extinguishes by displacing oxygen. Does not cool and not suitable for solids.

12.5 Metal/Sand dry powder extinguishers

Only for flammable metal (Class D) fires. Work by smothering the fire. You must have a specialised Class D extinguisher if you are working with such materials.

12.6 Fire blanket

Very effective at smothering the fire and denying it oxygen but has to cover entire burning areas. Good for intense but localized areas such as chip fat fires (Class K or kitchen fires).

Extinguisher Type	A Wood Paper & Plastics	B Flammable Liquids	C Flammable Gases	E Energised Electrical Equipment	F Cooking Oils & Fats	LIMITED Indicates that the extinguishant is not the agent of choice for the class of fire, but that it will have limited extinguishing capability. Class D fires (involving combustible metals) use only special purpose extinguishers and seek expert advice.
Powder ABE	Y	Y	Y	Y	N	Special powders are available specifically for various types of metal fires. Seek expert advice.
Carbon Dioxide (CO_2)	LIMITED	LIMITED	N	Y	LIMITED	Generally not suitable for outdoor fires. Suitable only for small fires.
Water	Y	N	N	N	N	Dangerous if used on flammable liquid, live electrical equipment and cooking oil/fat fires.
Foam	Y	Y	N	N	LIMITED	Dangerous if used on electrical fires.
Wet Chemical	Y	N	N	N	Y	Dangerous if used on electrical fires.
Fire Blanket	N	N	N	N	LIMITED	Use blanket to wrap around a human torch. Ensure you replace the blanket with a new one after use.
Fire Hose Reel	Y	N	N	N	N	Ensure you maintain a path of egress between you and the nearest exit.

13 SYMBOLS FOR LABORATORIES AND HAZARDOUS AREAS

All University laboratories and other rooms utilized for the storage of hazardous materials must be marked at each entrance for safe and effective emergency response. The following US DOT placards and descriptions for hazardous materials are referenced in the *US DOT Emergency Response Guidebook* and the Allegheny County Emergency Planning requirements. In most cases only significant hazards or larger quantities of materials require posting. An L&SCs guideline is provided after each description.

An **EXPLOSIVE** is any substance or article, including a device designed to function by explosion (i.e., an extremely rapid release of gas and heat) or which, by chemical reaction within itself, is able to function in a similar manner even if not designed to function by explosion.

Post this placard any time any quantity of explosive material is present.

A FLAMMABLE GAS is any material which is a gas at 20°C (68°F) or less and 101.3 kPa (14.7 psi) of pressure which-

(1) Is ignitable at 101.3 kPa (14.7 psi) when in a mixture of 13 percent or less by volume with air; or

(2) Has a flammable range at 101.3 kPa (14.7 psi) with air of at least 12 percent regardless of the lower limit.

Post this placard if flammable gas exceeds 300 ft^3 at STP in aggregate volume.

OXYGEN, compressed in cylinders.

Post this Placard if more than 2 oxygen cylinders (empty or full) are present.

NON-FLAMMABLE, NONPOISONOUS GAS (including compressed gas, liquefied gas, pressurized cryogenic gas, compressed gas in solution, asphyxiant gas and oxidizing gas) which-

(1) Exerts in the packaging an absolute pressure of 280 kPa (40.6 psia) or greater at 20 °C (68 °F), and

(2) Does not meet the definition of a flammable or poison gas.

Only post this placard on large accumulation sites for such gas.

A **POISON GAS** is poisonous by inhalation, is a gas at 20°C (68°F) or less and a pressure of 101.3 kPa (14.7 psi), and which is known to be so toxic to humans as to pose a hazard to health during transportation; or in the absence of adequate data on human toxicity, is presumed to be toxic to humans because when tested on laboratory animals it has an LC50 value of not more than 5000 ml/m\3\

Post this placard any time any quantity of poison gas is present.

A FLAMMABLE LIQUID means a liquid having a flash point of not more than 60.5°C (141°F).

Post this placard if more than 10 gallons of flammable liquid are stored in the room.

A **FLAMMABLE SOLID** is a

(1) Desensitized explosive, or

(2) Self-reactive material that is thermally unstable and can undergo a strongly exothermic decomposition even without participation of oxygen (air), or

(3) Readily combustible solid which may cause a fire through friction that shows a burning rate faster than 2.2 mm (0.087 inches) per second when tested in accordance with UN Manual of Tests, and are metal powders that can be ignited and react over the whole length of a sample in 10 minutes or less.

Post this placard if more than 2kg of flammable solid is present.

A **SPONTANEOUSLY COMBUSTIBLE** material is

(1) A pyrophoric material: a liquid or solid that, even in small quantities and without an external ignition source, can ignite within five (5) minutes after coming in contact with air, or

(2) A self-heating material: a material that, when in contact with air and without an energy supply, is liable to self-heat. A material of this type which exhibits spontaneous ignition or if the temperature of the sample exceeds 200 °C (392 °F) during a 24-hour test period…

Post this placard any time any quantity of spontaneously combustible material is present.

A **DANGEROUS WHEN WET** material is a material that, by contact with water, is liable to become spontaneously flammable or to give off flammable or toxic gas at a rate greater than 1 liter per kilogram per hour.

Post this placard any time any quantity of dangerous when wet material is present.

An OXIDIZER (**Division 5.1**) is a material that may, generally by yielding oxygen, cause or enhance the combustion of other materials.

Post this placard if more than 5 kg of an oxidizer is present.

An **ORGANIC PEROXIDE** (**Division 5.2**) is any organic compound containing oxygen (O) in the bivalent -O-O- structure and which may be considered a derivative of hydrogen peroxide, where one or more of the hydrogen atoms have been replaced by organic radicals.

Post this placard if more than 2 liters of organic peroxide is present.

A **POISON** is a material, other than a gas, which is known to be so toxic to humans as to afford a hazard to health during transportation, or which, in the absence of adequate data on human toxicity:

(1)Is presumed to be toxic to humans because it falls within any one of the following categories when tested on laboratory animals

(whenever possible, animal test data that has been reported in the chemical literature should be used):

(i) A liquid with an LD50 for acute oral toxicity of not more than 500 mg/kg or a solid with an LD50 for acute oral toxicity
of not more than 200 mg/kg.

(ii) A material with an LD50 for acute dermal toxicity of not more than 1000 mg/kg.

(iii) A dust or mist with an LC50 for acute toxicity on inhalation of not more than 10 mg/L; or (iv) A material with a saturated vapor concentration in air at 20 °C (68 °F) of more than one-fifth of the LC50 for acute toxicity on inhalation of vapors and with an LC50 for acute toxicity on inhalation of vapors of not more than 5000 l/m^3.

A **CORROSIVE** material is a liquid or solid that causes full thickness destruction of human skin at the site of contact, or a liquid that exhibits a corrosion rate on steel or aluminum surfaces exceeding 6.25 mm (0.25 inch) a year at a test temperature of 55°C (130°F).

Post if more than 5 gallons of corrosive material is present.

This **BIOHAZARD** symbol is a general biohazard warning to be used where biological hazards, such as potentially infectious material, human body fluid, unfixed human tissue, human cell lines, viral, bacterial, rickettsial, fungal and parasitic agents, and/or biological waste are utilized.

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