

MTSU Chemical Hygiene Plan

1. Basic Rules and Procedures

1.1 General Rules in Laboratory

- 1.1.1 Goggles must be worn at all times that experimentation with hazardous chemicals is being done by or around the wearer.
- 1.1.2 Avoid wearing contacts in the lab if possible.
- 1.1.3 Do not horseplay or behave unsafely in the laboratory.
 - 1.1.1.1 Do not behave in way as to distract or startle other workers.
- 1.1.4 Eating, drinking, smoking, chewing gum, or applying cosmetics in the lab is not permitted. Do not store food or drinks in area where hazardous chemicals are present.
- 1.1.5 Wear clothing that adequately covers and protects the body but does not interfere with movement.
- 1.1.6 Avoid wearing clothes that are highly flammable. It is advisable to wear a laboratory coat over personal clothing.
- 1.1.7 Confine long hair and loose clothing.
- 1.1.8 Only wear shoes that cover the foot completely.
- 1.1.9 Do not use mouth suction for pipetting or starting siphon.
- 1.1.11 Dilute acids by pouring concentrated acids into water.
- 1.1.12 Never mix incompatible chemicals that would cause an explosive reaction.
- 1.1.13 Dispose of chemicals in the proper waste.
- 1.1.14 Be aware of dangers in the lab and take special precautions when handling hazardous chemicals.
- 1.1.15 When handling contaminated disposable needles, place the plastic cover over it before taking it off the syringe.
- 1.1.16 Make sure no flammable solvents are in the surrounding area when lighting a flame.
- 1.1.17 Do not leave a lit burner unattended.

1.1.18 When leaving the laboratory, avoid spreading contamination by removing at least one glove so there is a free hand to open doors.

1.1.19 Clean-up work area and glassware after experimentation is done.

1.1.19.1 Turn off all heating apparatus, gas valves, and water faucets when not in use.

1.1.20 Wash hands and other exposed areas after chemical work is done.

1.2 Laboratory Equipment and Glassware

1.2.1 Handle and store laboratory glassware with care to avoid damage.

1.2.2 Be careful when handling hot glassware and apparatus in the laboratory.

1.2.2.1 Hot glassware looks just like cold glassware.

1.2.3 Do not use damaged glassware.

1.2.4 Broken glassware should be swept-up immediately and disposed of in a broken glass container.

1.2.5 Use special care when working with evacuated glass apparatus.

1.2.5.1 Wrap or shield equipment to contain chemicals or fragments in case of implosion.

1.2.6 Use laboratory equipment for its designed purpose only.

1.2.7 Seek training or read literature before using instrumentation or unfamiliar laboratory equipment.

1.2.8 All laboratory equipment should be inspected on a regular basis and replaced or repaired as necessary.

1.2.9 Ask the instructor, faculty, or staff member in charge of a laboratory space before removing any equipment or chemicals from it.

1.3 Protective Measures in the Lab

1.3.1 Develop and encourage safe habits in the lab.

1.3.2 Avoid unnecessary exposure to harmful chemicals by using engineering controls and personal protective equipment (PPE).

1.3.3 Assume any chemical mixture is as toxic as its most toxic component.

1.3.4 Before using a chemical for the first time, read over the Material Safety Data Sheets (MSDS) of the chemical to determine the dangers of the chemical, routes

of exposure, proper PPE, treatment for exposure, and any other safety information included.

- 1.3.5 In all cases of chemical exposure, neither the Permissible Exposure Limit (PELs) determined by OSHA or the Threshold Limit Values (TLVs) determined by American Conference of Governmental Industrial Hygienists should be exceeded.
- 1.3.6 Laboratory workers should be familiar with symptoms of over exposure to chemicals they use in their experimentation.
- 1.3.7 Be vigilant to unsafe conditions and see that they are corrected when detected.
- 1.3.8 Determine hazards in the laboratory by using safety literature on the topic of standards and codes. Seeking advice from knowledgeable persons is also advised.
- 1.3.9 When working with chemicals that are very hazardous, use proper techniques developed to minimize the danger.
 - 1.3.9.1 When using special techniques, use literature and the advice of more experienced persons to determine how to perform the technique correctly.
- 1.3.10 Never work alone in a laboratory when the procedures being conducted are hazardous.
 - 1.3.10.1 When performing experiments, make sure your presence in the laboratory is known to another individual. It is advisable to have someone check in routinely to determine that you are safe.
- 1.3.11 Be aware of the locations for the safety shower, eyewash station, first aid equipment, fire extinguishers, and exits in the laboratories being worked in.
- 1.3.12 Be familiar with emergency telephone numbers as well as contact information for supervisors and other laboratory workers.
 - 1.3.12.1 MTSU Emergency Dispatch: 911 or (615) 898-2424 non-emergencies
 - 1.3.12.2 Environmental Health & Safety (EHS): (615) 494-7725 or (615) 898-5784
 - 1.3.12.3 Chemistry Hygiene Manager: (615) 898-2946
- 1.3.12 Determine safest practices before starting any procedure and plan for hazards that may arise.

1.4 Chemical Safety Information

1.4.1 Material Safety Data Sheets (MSDS)

1.4.1.1 A MSDS should be given upon receiving a chemical.

1.4.1.2 Before purchasing and using a chemical, the MSDS should be read.

1.4.1.3 MSDS contain 16 sections

1.4.1.3.1 Chemical Product & Company Identification

1.4.1.3.2 Composition, Information on Ingredients

1.4.1.3.3 Hazards Identification

1.4.1.3.4 First Aid Measures

1.4.1.3.5 Fire Fighting Measures

1.4.1.3.6 Accidental Release Measures

1.4.1.3.7 Handling and Storage

1.4.1.3.8 Exposure Controls, Personal Protection

1.4.1.3.9 Physical and Chemical Properties

1.4.1.3.10 Stability and Reactivity

1.4.1.3.11 Toxicological Information

1.4.1.3.12 Ecological Information

1.4.1.3.13 Disposal Considerations

1.4.1.3.14 Transport Information

1.4.1.3.15 Regulatory Information

1.4.1.3.16 Other Information

1.4.1.4 All laboratories are required to have immediate access to MSDS's for every chemical used or stored in the lab.

1.4.1.5 MSDS's can be found in the DSB stockroom or by searching on the manufacturer's website.

1.4.2 NFPA Symbols

1.4.2.1 Blue – health; Red – flammability; Yellow – Instability; White – other information

1.4.2.2 Hazard Level- extreme = 4, serious = 3, moderate = 2, slight = 1, minimal = 0

1.4.2.3 Health

1.4.2.3.1 4 - Life threatening

1.4.2.3.2 3 - Major Injury Likely w/o immediate action

1.4.2.3.3 2 - Temporary or minor injury

1.4.2.3.4 1 - Irritation or minor reversible injury

1.4.2.3.5 0 - No significant risk

1.4.2.4 Flammability

1.4.2.4.1 4 - Very flammable gases or very volatile

1.4.2.4.2 3 - Materials capable of ignition under normal temperature

1.4.2.4.3 2 - Materials ignite under moderate heat

1.4.2.4.4 1 - Materials ignite due to being preheated

1.4.2.4.5 0 - Normally stable

1.4.2.5 Instability

1.4.2.5.1 4 - Readily capable of detonation at normal conditions

1.4.2.5.2 3 - Materials capable of detonation with ignition

1.4.2.5.3 2 - Normally unstable, produces violent chemical reactions

1.4.2.5.4 1 - Normally Stable, unstable at high temp. and pressure

1.4.2.5.5 0 - Stable even under fire conditions

1.4.2.6 Other characteristics


1.4.2.6.1 Ox – Oxidizer

1.4.2.6.2 ~~W~~ - Reacts with water in an unusual or violent way

1.4.2.6.3 COR – Corrosive, strong acid or base

1.4.2.6.4 BIO- Biological hazard

1.4.2.6.5 POI – Poisonous

1.4.2.6.6  - Radioactive

1.4.2.6.7 CYL or CRYO – Cryogenic

1.5 Accidents and Spills

1.5.1 Accidental exposure

1.5.1.1 Eye Contact: Promptly flush eyes with cold water at eye wash for a prolonged period (15 minutes or more) and seek medical attention.

1.5.1.2 Ingestion: Immediately drink large amounts of water and seek medical attention.

1.5.1.3 Skin contact: Promptly flush the affected area with cold water. If symptoms persist after washing, seek medical attention.

1.5.1.4 Inhalation: Quickly move to area away from fumes and seek medical attention.

1.5.1.5 If a hazardous chemical is spilled onto an article of clothing, quickly remove the clothing and clean area of exposure.

1.4.1.5.1 Use safety shower to rinse in cases of larger spills.

1.5.2 Chemical spills

1.5.2.1 Promptly clean up spills while using appropriate PPE and dispose of chemical into proper waste container.

1.5.2.2 In cases of large hazardous chemical spills, reduce spread of chemical if capable, block off area of spill, evacuate the area, and call EHS.

1.6 Gas Cylinder Procedures

1.6.1 Never transport or move a gas cylinder without the protective cap affixed over the valve.

1.6.2 When transporting a gas cylinder to another lab, use carts specifically designed for that purpose.

1.6.3 Never leave the area, until the gas cylinder is strapped down to a stationary object with the appropriate bracket and strap.

- 1.5.3.1 Make sure gas cylinder is strapped tight enough so that there is minimal movement.
- 1.6.4 When changing out a gas cylinder, move empty gas cylinder to designated area. (DSB 207)
- 1.6.5 Remember to order a replacement gas cylinder of the same type of gas when acquiring a new gas cylinder from current supply.
- 1.6.6 Show great caution when handling gas cylinder.
 - 1.5.6.1 It is advisable to seek help when changing out a gas cylinder for the first time.

2. Labeling Procedures

2.1 Chemical Labeling

- 2.1.1 Labels must be attached to all chemical containers, identifying the contents and related hazards.
- 2.1.2 For Large containers, Lab standards require the label to provide information on the chemical name, manufacturer's name, health and physical hazards, and long and short term health effects.
- 2.1.3 Small, temporary containers must provide the chemical name and hazards associated (NFPA symbols).
- 2.1.4 Vials of samples and products should be labeled with enough information to identify the chemical composition of the material.
- 2.1.4 Exemption to labeling procedures is only given to containers that are used for transferring and will be used immediately.

2.2 Waste Labeling

- 2.2.1 For Chemical Waste containers, use hazardous waste labels provided in stockroom.
- 2.2.2 Chemical Waste containers must be labeled with specific information of the content that it contains and the accumulation start date.
 - 2.2.2.1 Liquid wastes should break down into at least four categories: halogenated organics, non-halogenated organics, aqueous metals, and organometallic materials.
 - 2.2.2.1 Solid chemical waste should be placed into waste containers with chemicals that are compatible.

- 2.2.3 Be diligent in labeling waste because disposal of unknown waste can cost exponentially more money.
- 2.2.4 Biological hazardous waste containers and sharps containers should be labeled with the appropriate symbol for biological hazards.
- 2.2.5 Radioactive waste must be labeled with symbols indicating its radioactivity.

2.3 Experiment Labeling

- 2.3.1 All unattended experiments must be labeled with the appropriate document provided by the Hygiene Manager.
- 2.3.2 Information required for an unattended experiment is contact information from the person who is carrying out the experiment, information on the hazards involved, and emergency shutdown procedures, if any are required.

3. Waste Disposal

3.1 Disposal of chemicals and equipment

- 3.1.1 Deposit chemical waste into appropriately labeled receptacles.
 - 3.1.1.1 Labeled amber bottles will be used to dispose of halogenated and non-halogenated organic liquid waste.
 - 3.1.1.2 Labeled clear bottles or carboys will be used for non-halogenated organic liquid waste and aqueous metals waste.
 - 3.1.1.3 Organic solid waste should be disposed of into a labeled glass container.
 - 3.1.1.4 Non-organic solid waste must be deposited into a solid waste container fitted with a bag designed specifically for solid hazardous materials.
- 3.1.2 Deposit disposable used equipment into appropriate receptacles.
 - 3.1.2.1 Puncture resistant containers with a biohazard label must be used for collection of needles.
 - 3.1.2.1 Broken glass equipment or disposable glass equipment must be disposed of into a broken glass bin.
 - 3.1.2.1 Filter paper and chromatography paper must be deposited into a solid waste container if they contain hazardous chemicals.
- 3.1.3 For the disposal of concentrated acids and bases, dilute the chemical to a low concentration and pour down the sink with running water.

- 3.1.4 Fume hoods should not be used as a means for disposal of volatile chemicals.
- 3.1.5 Recycling or chemical decontamination of chemical waste should be used instead of disposal if possible.
- 3.1.6 Use MSDS sheets and other literature to determine the proper procedure for disposing of hazardous chemicals used in an experiment.
- 3.1.7 Before an employee or student ends their laboratory work, chemicals used in experimentation must be discarded or returned to storage.

3.2 Storage of Waste

- 3.2.1 Hazardous chemical waste should be stored in a hood towards the back and out of the way if possible.
 - 3.2.1.1 If there is no hood that can be used, place hazardous chemical waste in a well-ventilated area out of the way of other laboratory activities.
- 3.2.2 A secondary tray must be underneath the chemical waste containers to capture leakage.
- 3.2.3 A waste container must be closed when chemicals are not being deposited in it.
- 3.2.4 Broken glass and sharps containers should be accessible but not in an area of high traffic.
- 3.2.5 When chemical waste containers are full, place the containers in a cabinet with a tray underneath.
 - 3.2.5.1 It is advisable to store the containers in a cabinet underneath a fume hood.
 - 3.2.5.2 For solid waste, close the bag off and acquire a Hazardous Waste label from the stockroom and label the contents in the bag.

3.3 Procedure for Waste Collection and Waste Container Replacement

- 3.3.1 Waste Collection for Chemicals
 - 3.3.1.1 Collection of waste happens twice a year and will be coordinated by the Hygiene Manager for the department.
 - 3.3.1.2 When prompted to, gather a list of chemical waste containers that need to be collected and their location.
- 3.3.2 Collection of sharps and broken glass containers

3.3.2.1 When a sharps container is full, close the container and alert the Hygiene Manager of its location.

3.3.2.2 When a broken glass container is full, close the box off with the extra flap and alert the Hygiene Manager of its location.

3.3.3 Waste container replacement

3.3.3.1 Recycle empty glass containers to be used for chemical waste container and acquire a Hazardous Waste label from the DSB stockroom.

3.3.3.2 Solid waste bags can be found in the DSB stockroom.

3.3.3.3 Broken glass containers and sharps containers can be replaced by notifying Hygiene Manager.

4. Operating Procedures

4.1 Chemical Procurement and Receiving

4.1.1 Before a substance is purchased and received, information on the proper handling, storage, and disposal should be known to those involved.

4.1.2 All chemicals and equipment being purchased will need to be approved by the Department Chair and will be purchased by the Laboratory Manager.

4.1.3 All materials will be received by the laboratory manager or stockroom student workers at a central location (DSB stockroom) and will undergo proper procedure for receiving chemicals and materials.

4.1.3.1 All chemicals will be added to the chemical inventory upon arrival.

4.1.4 Chemical containers will not be accepted without an adequate identifying label, material safety data sheet (MSDS), and packing in accordance with all appropriate regulations.

4.1.5 All chemicals should be dated when they are received and opened.

4.2 Chemical Distribution and Transporting

4.2.1 Chemicals and equipment can be distributed after they have gone through the process of receiving and contain a slip taped to the package showing it has been received.

4.2.2 When chemicals are carried by hand, the container should be placed in an outside container or bucket.

4.2.2.1 Use chemical carriers provided in laboratory, if chemicals in glass containers 1 L or greater need to be transported to other rooms.

- 4.2.3 Large quantities of chemicals should be transported by carts provided and immediately stored in appropriate places.

4.3 Chemical Storage

- 4.3.1 Use proper storage procedures when storing chemicals.
- 4.3.2 Storage area should have proper lighting and be accessible.
- 4.3.3 Store liquid chemicals at eye level or below.
- 4.3.4 Large bottles (2.5L or more) must be stored on the bottom level of a cabinet.
- 4.3.5 Hazardous Chemicals must be segregated by compatibility and hazard classification in a well-identified area with local exhaust ventilation.
- 4.3.6 Flammable and combustible liquids must be stored in yellow cabinets, segregated by secondary trays depending on their compatibility.
- 4.3.7 Inorganic acids and bases must be separated from flammable and combustible materials.
 - 4.3.7.1 Inorganic acids and bases must be stored in a corrosives storage cabinet and segregated by secondary trays.
- 4.3.8 Acid-sensitive materials, such as cyanides and sulfides should be separated from acids or protected from contact with acids.
- 4.3.9 Solid chemicals should be stored on a shelf with a lip or inside a drawer designed for chemical storage.
- 4.3.10 Very volatile chemicals should be kept in an explosion-proof refrigerator or stored in a vented cabinet under a fume hood.
- 4.3.11 Storage of chemicals at the lab bench and in the working space of the fume hoods is inadvisable.
 - 4.3.11.1 Amounts permitted should be limited to those necessary for one operation.
 - 4.3.11.2 The container size should be the minimum convenient.
- 4.3.12 Chemicals in the workplace should be shielded from sunlight and heat as much as possible.
- 4.3.13 Stored chemicals must be examined periodically by the Chemical Hygiene Manager or Laboratory Personnel for replacement, deterioration, and container integrity.

4.3.13.1 The inspection should also include determining damage to the storage facility or cabinet due to chemicals leaking.

4.3.14 Periodic inventories of the chemicals should be conducted by the Chemical Hygiene Manager.

4.3.14.1 Unneeded items or contaminated chemicals should be discarded.

4.3.15.2 Chemicals used up will be taken off the chemical inventory list.

5. Safety Control Measures

5.1 Personal Protective Equipment (PPE) and Engineering Controls

5.1.1 PPE should be worn when engineering controls and procedures cannot protect from exposure.

5.1.2 PPE must be removed after experimentation is complete to avoid spreading contamination.

5.1.3 Types of PPE and their uses:

5.1.3.1 Goggles – protect the eye and area immediately around it. Goggles must be worn at all times that experimentation with hazardous chemicals is being done by or around the wearer. Goggles should enclose around the eyes so that they are not exposed to particles, liquids, and vapors.

5.1.3.2 Gloves – protect hands from exposure to chemicals. Nitrile gloves, vinyl gloves, and latex gloves will not protect from all chemicals, but can protect from large amounts of exposure. Use glove charts to determine which type of gloves are the most resistant to the chemicals being used. Replace gloves periodically or after a spill on the glove. Wash gloves and turn them inside out before disposing of them into a trash can.

5.1.3.3 Face mask – protect from inhaling vapors or particles. There are different kinds of face masks which are specific to the hazard. Most facemasks in the department are for particles only and should not be used to protect from vapors. Special face masks with interchangeable cartridges are used to protect the wearer from chemical vapors.

5.1.3.4 Lab coats – protect clothing and body from chemical exposure. Lab coats are not necessary but are advisable when working with chemicals. Lab coats should be removed when leaving the laboratory.

5.1.3.5 Follow the instructions given in the MSDS for proper PPE needed to reduce exposure.

- 5.1.4 Engineering controls are always the best line of defense against exposure to chemical and physical hazards.
- 5.1.5 Engineering controls should be inspected and maintained so that they meet regulations and manufacturer standards.
- 5.1.6 No modification of engineering controls will be made unless testing indicates that worker protection will continue to be adequate.
- 5.1.7 The most important engineering control in the laboratory is fume hoods and should be used when performing procedures that contain hazardous chemicals.
- 5.1.8 All laboratory workers must follow proper work practices when using the laboratory hoods.
 - 5.1.8.1 Confirm there is adequate hood performance before using the hood.
 - 5.1.8.2 When working with chemicals, the fume hood sash should be pulled down as low as possible without causing obstruction from working.
 - 5.1.8.2.1 It is advisable to have the hood sash pulled down at least halfway.
 - 5.1.8.3 Chemicals should not be stored inside the work area of a fume hood unless they are chemical waste bottles inside secondary containers.
 - 5.1.8.4 If chemicals are stored in cabinets below the fume hood, keep fume hood exhaust on unless the chemicals do not produce vapors.
- 5.1.9 The ventilation system for a fume hood should be inspected every three months. The hood face velocity should be maintained between 75 and 125 ft/min. A record of each inspection should be maintained by the Chemical Hygiene Manager.

5.2 Avoidance of Exposure

- 5.2.1 Develop and encourage safe habits in the laboratory and avoid unnecessary exposure to chemicals by any route.
- 5.2.2 Do no smell, taste, or touch with your bare hand, hazardous chemicals.
- 5.2.3 Inspect work area for spilt chemicals or other hazards, such as broken glass or clutter, and clean up before proceeding with an experiment.
- 5.2.4 Determine what hazards may occur during an experiment and develop a plan to protect yourself from them.
- 5.2.5 Use safer methods and less hazardous chemicals when there is an option.

- 5.2.6 Use well ventilated areas and fume hoods that are properly working when using volatile chemicals.
- 5.2.7 Use several types of PPE to protect all the exposed areas of your body.
 - 5.2.7.1 Make sure to use the correct form of the PPE for the chemicals you are using, such as the correct glove material and the correct respirator.

5.3 Personal Responsibility

- 5.3.1 Read the MSDS of a chemical before purchasing and using a new chemical.
- 5.3.2 Train annually on laboratory safety.
- 5.3.3 Study the Chemical Hygiene Plan and follow the rules it lays out.
- 5.3.4 Plan experiments ahead to avoid hazards.
- 5.3.5 Inspect equipment and glassware to ensure that they are no problems before proceeding with work.
- 5.3.6 Be prepared for emergencies, by knowing the correct procedures during an emergency, your role, and the proper people to contact.
- 5.3.7 Clean the area and equipment used immediately after the laboratory work is done.

6. Emergency Procedures

6.1 Emergency Procedures for Fires

- 6.1.1 Instructor and researcher emergency procedures for a fire:
 - 6.1.1.1 If a fire is too large to be smothered or be put out by a fire extinguisher, emergency procedures must be taken.
 - 6.1.1.2 If a fire is too large to extinguish, evacuate the room and close the doors after everyone is out.
 - 6.1.1.3 Activate the fire alarm system and move everyone outside and far away from the building.
 - 6.1.1.4 The most important thing is to not endanger yourself by trying to extinguish or control a fire that is too large to manage.
- 6.1.2 Student's role is only to follow instruction from the instructor and evacuate the building in an orderly way.

6.2 Emergency Procedures for Gas Leaks

- 6.2.1 If there is a gas leak in a laboratory fume hood, close the fume hood sash, evacuate the room, and call Facilities Services at 898-2414.
- 6.2.2 If there is a gas leak at the laboratory benches, open up all fume hood sashes, evacuate the room, and call Facilities Services at 898-2414.

6.3 Emergency Procedures for Major Injury in Laboratory

- 6.3.1 In case of a major injury in the laboratory, determine the extent of the injury and proceed accordingly.
 - 6.3.1.1 A victim of chemical burns can be treated with first aid laid out by the chemical's MSDS.
 - 6.3.1.2 To treat a victim that inhales toxic fumes, they must be removed to clean air and resuscitated by a person trained in CPR if needed.
- 6.3.2 For any injury caused by toxic or hazardous chemicals, a person should never put themselves in danger to rescue another person. By putting yourself in danger you are adding to the problem. If you are unable to help the individual, call 911 or (615) 898-2424 (MTSU Public Safety) and give as much detail as possible to prepare the emergency workers.
- 6.3.3 For major injuries, only those certified in first aid should treat the victim.

6.4 Emergency Procedures for Major Chemical Spills

- 6.4.1 In the case of major chemical spills, it is important to not endanger yourself by cleaning it up.
- 6.4.2 If a major chemical spill occurs perform the following steps:
 - 6.4.2.1 Evacuate the immediate area where the spill occurred. If it produces toxic fumes, evacuate the laboratory.
 - 6.4.2.2 If there are no toxic fumes, try and contain the area where the spill covers by using absorbents, such as kitty litter, or products designed for the purpose of controlling chemical leaks.
 - 6.4.2.3 Call the Department of Environmental Health and Safety at 898-7725 and inform them of the chemicals that have leaked and the location where the leak occurred.
- 6.4.3 When storing and handling chemicals, show good practice to avoid major chemical spills.

7. Housekeeping, Maintenance, and Inspections

7.1 Housekeeping

- 7.1.1 Keep work area clean and uncluttered, with chemicals and equipment properly labeled and stored.
- 7.1.2 All spills on lab benches or floors should be immediately cleaned and disposed of properly.
 - 7.1.2.1 Large spills will necessitate the implementation of the Emergency Procedures describe in 6.4 of the Chemical Hygiene Plan.
- 7.1.3 Floors and lab benches should be cleaned regularly.
- 7.1.4 Keep areas where experimentation or sample preparation will be done, clear of equipment and chemicals except those necessary for the work currently being performed.
- 7.1.5 All floors, aisles, exits, fire extinguishers, eye washes, showers, electrical disconnects, and other emergency equipment should never be blocked.
- 7.1.6 All apparatus and glassware should be thoroughly cleaned and returned to storage upon completion of work.
- 7.1.7 Labels should be placed face forward.

7.2 Maintenance

- 7.2.1 All laboratory equipment should be inspected on a regular basis and replaced or repaired as necessary.
- 7.2.2 Balances and other sensitive equipment should be calibrated, cleaned, and maintained annually, to ensure longevity and proper functioning.
- 7.2.3 Laboratory fume hoods should receive maintenance when the functioning of the equipment is below manufacturer standards. Regular maintenance to a fume hood can increase the longevity of the equipment.
 - 7.2.3.1 If the fume hood cannot be fixed, no hazardous work should be done within it.
 - 7.2.3.2 Replace or remove unusable fume hood as soon as financially capable.

7.3 Inspections

- 7.3.1 Inspections must be made on all safety equipment, such as eye wash and safety shower stations, before, after, and once during each of the three major semesters (fall, spring, summer).
- 7.3.2 Fume hoods should be informally inspected for proper ventilation before each use and formally inspected every 3 months.
- 7.3.3 Formal housekeeping and chemical hygiene inspections should be held biannually to ensure there is a safe environment. Informal inspections should be made regularly by the faculty and students working within the laboratory.
- 7.3.4 Inspections should be made frequently to ensure that all areas in the Department of Chemistry meet Tennessee State Fire Codes.

8. Information and Training for Faculty and Students

8.1 Hazardous and Other Information

- 8.1.1 Faculty and students should be informed of all hazards that may occur within the laboratory which they will use before they can proceed with their work.
 - 8.1.1.1 If any new hazards arise, they should be notified immediately.
- 8.1.2 The Chemistry Department Chemical Hygiene Plan should be made readily available to faculty and students upon request.
 - 8.1.2.1 Each laboratory needs to have a copy of the hygiene plan at an easily accessible spot in the laboratory.
- 8.1.3 Employees will be given access to the MTSU Employee Safety Handbook found on the Environmental Health and Safety webpage.
- 8.1.4 After formal inspections on equipment or laboratory area, any areas of concern should be communicated to those working in the laboratory.
- 8.1.5 MSDS's must be kept for every chemical within the department and be made available in the stockroom.
 - 8.1.5.1 Within each laboratory, a binder should be kept with the MSDS of every hazardous chemical that can be found in that particular lab.
- 8.1.6 Faculty and students should be kept up to date on current federal and state regulations.

8.2 Laboratory Safety Training

- 8.2.1 Faculty should be given laboratory and chemical safety training by the Department of Environmental Health and Safety annually.
- 8.2.2 Students who are in a laboratory course should be given the safety the rules before they begin their first lab experiment.
 - 8.2.2.1 Additional safety information should be given to the student before each experiment throughout the semester.
- 8.2.3 Undergraduate and graduate students who are working in a laboratory for research must undergo laboratory and chemical safety training annually.
- 8.2.4 Instructors for laboratory courses should be trained regularly and updated when new safety issues arise.
- 8.2.5 Both students and faculty should be trained for emergency situations regularly to ensure that each individual knows their role in an emergency.

9. Medical Program

9.1 Medical Attention

- 9.1.1 All employees and students working with hazardous chemicals in the laboratory will be provided an appropriate opportunity to seek and receive any necessary medical attention.
- 9.1.2 Medical care should be obtained whenever an employee or student develops signs or symptoms associated with over exposure to a hazardous chemical found in the lab.
 - 9.1.2.1 MTSU employees who are injured or suffer an exposure on the job shall contact the supervisor to report the injury/exposure immediately and complete an Accident Report form in the Human Resource Services office. For additional information on submitting claims for on-the-job injuries, employees should contact Human Resource Services at 615-898-2929.
 - 9.1.2.2 Students who are ill or injured or suffer an exposure may obtain certain health care from the Student Health Services. Students may contact Student Health Services at 615-898-2988.
- 9.1.3 Any employee or student that handles toxicologically significant quantities of a chemical on a regular basis should visit Health Services or a physician regularly.

9.2 First Aid

9.2.1 Each laboratory should be stocked with a first aid kit.

10. Records

10.1 Injury/Illness reports and student accident reports should be filled out and retained by the Department, Hygiene Manager, Environmental Health and Safety, and Human Resource Department (if it's related to an employee).

10.2 Records for formal inspections of laboratories and equipment should be maintained by the Hygiene Manager.

10.3 A chemical inventory should be kept and made available.

10.4 Safety training given to employees or students should be recorded and kept by the school or department depending on the source of the training.

10.5 Exposure records for hazardous chemicals and harmful physical agents will be maintained for 30 years per 29 CFR 1910.20.

11. Chemical Hygiene Responsibilities

11.1 Department Chair

11.1.1 The Department Chair must communicate with EHS and other administration to ensure that proper hygiene is being met within the department.

11.1.2 The Department Chair will need to oversee the roles and responsibilities of others within the department and encourage good hygiene.

11.1.3 The Department Chair must ensure that safety training is available to all employees and students, and that they receive the appropriate amount of training per government regulations.

11.1.4 The Department Chair, in coordination with Human Resource Services (for employees) and Office of Judicial Affairs and Mediation Services (for students) should seek disciplinary action against any employee or student that continually shows disregard to the safety rules found in the Chemical Hygiene Plan.

11.1.4 The Department Chair should work with the Safety Committee and Chemical Hygiene Manager to develop a safe environment for all employees and students.

11.2 Safety Committee

11.2.1 The Safety Committee is responsible for helping the Chemical Hygiene Manager and Department Chair to develop a safe environment within the department.

- 11.2.2 The Safety Committee helps to develop the Chemical Hygiene Plan and helps the Chemical Hygiene Manager to implement the rules in the plan.
- 11.2.3 The Safety Committee should keep updated on changes in laboratory regulations and safety protocol.
- 11.2.4 The Safety Committee should meet regularly to discuss safety issues within the department and how to correct these issues.

11.3 Chemical Hygiene Manager

- 11.3.1 The Chemical Hygiene Manager works with the Safety Committee and Department Chair to develop a safe environment within the department.
- 11.3.2 The Chemical Hygiene Manager also works closely with EHS so that the department stays in compliance with government regulations
- 11.3.3 The Chemical Hygiene Manager should develop a Chemical Hygiene Plan and oversee its implementation.
- 11.3.4 The Chemical Hygiene Manager should help train researchers and instructors in laboratory safety.
- 11.3.5 The Chemical Hygiene Manager should make regular inspections on safety equipment and laboratories to ensure they meet requirements.
- 11.3.6 The Chemical Hygiene Manager will help to enforce safety rules from day to day and work with Department Chair if disciplinary action needs to be taken.
- 11.3.7 The Chemical Hygiene Manager will help with other needs in the laboratory, such as waste disposal and distribution of first supplies and PPE.

11.4 Laboratory Instructor

- 11.4.1 Laboratory Instructors should oversee that course safety rules are followed by the students and the interns, as well as themselves.
- 11.4.2 Laboratory Instructors must enforce the rules and discipline students who show no regard for the rules.
 - 11.4.2.1 They should warn the students about the consequences of continuing their behavior.
 - 11.4.2.2 Instructors should take off points from the student's grade or remove them from the lab if they continue to not follow safety rules.
- 11.4.3 Laboratory Instructors must know emergency procedures and follow other procedures in accordance to the Hygiene Plan.

11.4.4 Laboratory Instructors must receive annual training in safety to stay in compliance with OSHA regulations.

11.5 Researchers and Students

11.5.1 Researchers and students must follow proper procedures in the laboratory in accordance with the Chemical Hygiene Plan and course safety rules.

11.5.2 Researchers and students are responsible for their own behavior and personal hygiene within the laboratory.

11.5.3 Researchers and students must inform the Departmental Chair, Hygiene Manager, or a member of the Safety Committee if they observe anything within their laboratory that is unsafe.

11.5.4 They must continue to develop safe habits and seek advice from instructors or advisors when unsure about proper procedures.

11.5.5 Researchers must take annual safety training to stay in compliance with OSHA regulations.

12. References and Recommended Reading

Code of Federal Regulations, 29 CFR part 1910 subpart Z section 1910.1450.

Occupational Exposure to Hazardous Chemicals in Laboratories. Washington, D.C., 1990.

Code of Federal Regulations, 29 CFR CH XVII 7-1-96 Edition. *Occupational Exposure to Hazardous Chemicals in Laboratories.* Washington, D.C., 1996.

National Research Council. *Prudent Practices for Disposal of Chemicals from Laboratories.* National Academy Press, Washington, D.C., 1983.

American Chemical Society. *Safety in Academic Chemistry Laboratories.* Washington, D.C., 1990.