

University of Houston – Downtown



Engineering Technology Laboratory Safety Manual

May 2019

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ET Laboratory Emergency Notification Phone Numbers

A. In the event of any laboratory safety event, notify:

1. ET Laboratory Coordinator 713-221-8694
2. Chief Safety Officer (CSO) - ET Chairperson 713-221-5272
3. ET Office Administrative Secretary 713-221-8089
4. Environmental Health & Safety Manager 713-221-8040

B. In the event of a major laboratory safety event, notify:

1. ET Laboratory Coordinator 713-221-8694
2. ET Chairperson - CSO 713-221-5272
3. Environmental Health & Safety Manager 713-221-8040
4. Facilities Management 713-221-8026
5. UHD Police 713-221-8065
6. Dean of College of Sciences and Technology 713-221-8019
7. Associate V.P. Academic Affairs 713-221-8099
8. President of UHD 713-221-8001

C. In the event of a laboratory safety event after hours, notify:

1. UHD Police 713-221-8065
2. 911 (if injury or danger) 911 (or x9-911)

For non-emergency requests or information, contact the ET Office N738,
Phone: 713-221-8089.

University of Houston-Downtown

Laboratory Safety Manual for ET Labs

January 2013

I. Purpose

Protecting the health and safety of every person on the University of Houston-Downtown (UHD) is of paramount importance, and it is a continuous work in progress. The UHD Laboratory Safety Manual (LSM) constitutes written standard operating procedures designed to ensure laboratory operations are carried out in a manner that protects all persons from harmful exposures associated with hazardous chemicals, microbial, biological and general laboratory hazards, as well as, complying with state and federal regulations. This document has been edited for use in Engineering Technology. Consult the UHD manual for additional information.

II. Objectives

The UHD/ET LSM shall be used in all current and future ET laboratories. The manual will be continuously reviewed and updated as needed and/or required. The safety and well-being of all persons inside UHD/ET laboratories will be accomplished by our dedication to achieving the following goals:

- Provide the necessary facilities, staff and equipment to operate in the safest manner possible.
- Assure that staff, faculty and students receive appropriate training from the Health and Safety Manager for the experiments they are engaged in.
- Reduce or minimize the extent of chemical and hazardous exposure by all laboratory personnel.
- Provide adequate ventilation to all laboratories.
- Ensure that the least amount of required chemicals/hazardous materials are on hand for the specific needs of the department.
- Protect the environment from hazardous chemicals/materials.
- Assure that all risks are properly assessed, and ensure that all experiments comply with all safety guidelines.
- Establish guidelines for safe data collection in the field.
- Ensure all of the above goals are being met by inspecting all laboratories (with the assistance of the Health and Safety Manager) on a periodic basis.

III. Safety Responsibilities

Responsibility for Safety in the laboratory rests with the Health and Safety Manager, Chief Safety Officer (CSO), the Principal Investigator (PI) or Lab Instructor (LI), and the laboratory supervisor. The UHD President has the ultimate responsibility for the Laboratory Safety program within the University and must provide continuing support for institutional laboratory safety.

A. Chief Safety Officer

The Chair of the Department of Engineering Technology shall be the designated Chief Safety Officer (CSO) for all experiments in Engineering Technology. The ET CSO shall provide guidance to the Principal Investigator (PI) or Lab Instructor (LR) on implementing safety plans and for providing technical assistance in developing standard operating procedures related to laboratory safety and emergency response. The CSO is responsible for giving prior approval for any operation which presents a foreseeable hazard to any person.

B. Principal Investigator (PI), Lab Instructor (LI)

The CSO shall designate all faculty involved in research in the lab as Principle Investigators (PIs) and all faculty teaching in the lab as Lab Instructors (LI). All PIs and LI's shall be responsible for implementing a Laboratory Safety Plan for their experiments using the guidelines in this LSM. Supplemental safety information must be added if not covered in this manual. The PI/LI is responsible for the health and safety of all personnel under his/her direction. Specific responsibilities include:

- Reviewing the ET LSM on an annual basis, ensuring it is continuously updated as to current safety procedures.
- Monitoring the purchase, use and disposal of materials used in laboratory procedures.
- Ensuring all personnel and students know and follow the rules of laboratory safety.
- Ensuring engineering controls are operative and personal protective equipment (PPE) is properly selected, used and maintained.
- Reviewing specific hazards for each new lab experiment and providing information to personnel/students concerning safe handling of all materials.
- Filing written reports with the CSO and Environmental Health and Safety (EHS) Office concerning any accident or injury that occurs in the laboratory. (Paperwork should be initiated in the ET office.)
- Ensuring laboratory equipment is properly maintained and in good working order.

C. Employees/Students

All laboratory employees and students are responsible for:

- Knowing and following the proper safety procedures in the LSM.
- Reporting all dangerous/hazardous conditions to the PI/LI.
- Wearing the prescribed personal protective equipment (PPE) when required.
- Reporting any injury, illness or emergency to the PI/LI and/or the ET Office.

- Requesting information or training when unsure of how to handle any lab materials.

IV. Standard Operating Procedures

This portion of the LSM represents an initial minimum set of guidelines for experimentation in UHD/ET laboratories.

A. General Guidelines

Every PI/LI, staff member and student must be aware of the following general guidelines.

- Students working in laboratories must be under the supervision of a PI/LI and only UHD employees, students and approved visitors are allowed in UHD laboratories.
- The safety guidelines *must always* be applied to any experiments being performed.
- There should be training on the location and the appropriate use of fire extinguishers, fire exits, evacuation routes and fire alarm pull stations by the Health and Safety Manager.
- There should be training on the types of personal protective equipment (PPE) available and how to use it appropriately by the Health and Safety Manager.
- Equipment must be in good working order before conducting any experiment.
- Equipment can only be used if the experimenter has appropriate training and may only be used as directed.
- Experiments that can be left safely unattended for any length of time must be properly identified with a posted sign that notifies the reader of the contact person, cell phone number, and any hazards or considerations of the experiment.
- Hazardous materials will be used with caution and only with proof of proper training.
- **If an injury occurs in the lab that requires medical attention, call 911 or x8911 immediately.** All injuries or near misses must be reported to the ET office (N-738) immediately. A report of Safety/Health Hazard and Near Miss form will be completed. Students and visitors will also have to complete a Student/Visitor Accident Report form.

B. Students Working After Hours or Alone

Working in laboratories from 7:00AM to 7:00PM Monday through Saturday is defined as working “during regular hours.” Working in laboratories from 7:00 PM to 7:00 AM is defined as working “after hours.” Research students or students in courses which require after-hours independent work will need to have their faculty member complete the ‘Permission to Work Independently Form’ (see Appendix A). This must be approved prior to beginning work.

- **Policies for Student Independent Research Work in the Laboratory**

A student may use laboratory facilities for independent research only after the PI/LI in charge has reviewed the experimental procedure for any associated problems/hazards and has determined that the student possesses adequate training in proper experimental and emergency procedures. Students must report all accidents, spills, and unsafe conditions to the PI who is responsible for making sure proper paperwork is completed as necessary.

Students must have a completed and approved **Permission to Work Independently After Hours** form prior to working *after hours in a laboratory* (Appendix A). The permission form must be completed and on file in the ET office. The CSO is ultimately responsible for any laboratory activity which presents a foreseeable hazard to employees, students or structures. As such, the CSO may not grant approval for after-hour student work that involves a hazardous or potentially dangerous situation.

- **Policies for Students Enrolled in Laboratory Courses**

Students enrolled in laboratory sections of a course are allowed to perform laboratory procedures alone only when the PI/LI authorizes that this is acceptable. When working in the laboratory during regular hours, students must be under the direction of a qualified person – a PI/LI or Lab Supervisor who is familiar with emergency procedures. Properly directed students can work in a laboratory course outside of the regular laboratory periods (but during regular hours) only with the permission of the Lab Instructor. The Lab Instructor is responsible for ensuring that the students receive sufficient instruction to work safely under these circumstances. Students enrolled in a laboratory course *may not work after-hours unless* authorized by the CSO with an accompanying Permission to Work Independently After Hours form on file in the ET office.

C. Emergency and Safety Equipment - Fire Extinguishers and First Aid Kits

Each laboratory will have available fire extinguishers and first aid kits. Everyone working in a laboratory should know how to properly use the extinguisher. Fire extinguishers shall be mounted in a highly visible and accessible area. Each extinguisher will be checked on an annual basis by the Health and Safety Manager to ensure it is in good working order.

D. Personal Protective Equipment (PPE) and Personal Safety

Personal Protective Equipment (PPE) is any item designed to protect laboratory personnel from exposures and injury. The PI/LI is responsible for the selection, procurement, care and replacement of all department personal protective equipment. Some courses may require that students purchase their own equipment as part of the course requirements. The PI/LI will instruct students on the use of all mandatory PPE for use in a particular laboratory and for particular experiments.

- **Appropriate Clothing**

Closed-toe shoes must be worn in all laboratories. *Sandals or open-toed shoes may not be worn. Long hair must be tied-back.* Employees and students should wear clothing that minimizes exposed skin surfaces.

- **Eye Protection/Hard Hats/Gloves**

The PI/LI will require (when needed) eye protection/hard hats/gloves for all personnel and any visitors present. Before each use, equipment should be checked for integrity. All gloves should be removed prior to touching keyboards, phones, door knobs and other

surfaces *and should not be worn outside of the laboratory*. After glove removal, hands should be washed before leaving the laboratory.

E. Laboratory Behavior

Professional behavior is expected at all times in the laboratory. No unauthorized persons, including children, shall be allowed in the laboratory. No food or drinks are allowed in the laboratory during class activities. All laboratory work areas must be kept clean and clear of obstructions and clutter. Floors must be kept dry and aisles shall remain clear of boxes or other items that could be trip hazards. All laboratory wastes shall be kept in appropriate containers and labeled accordingly. If large amounts of trash require disposal, facilities management should be contacted immediately. Violations will not be tolerated and will result in the removal of the offender from the laboratory.

F. Material Safety Data Sheets (MSDSs)

MSDS sheets should be the first source of information about the hazards associated with any chemical. Manufacturers are required to provide a MSDS for each chemical product they sell. All laboratory personnel will have access to MSDS sheets in their laboratory via the internet or hardcopy if chemicals are used.

G. Hazard Assessments

This rarely applies to ET. If any task involving hazardous materials or physical hazards is performed, the PI/LI must have completed the proper paperwork for the project and it must have been approved. See the UHD Safety document for more details.

V. Chemical Safety in Laboratories

If chemicals are used, the laboratory PI/LI is responsible for the instruction of all laboratory personnel in the safe use.

VI. Electrical Laboratory Equipment

The utilization of electrically powered equipment can pose hazards in the laboratory when not used properly. Problems that are encountered when using any lab equipment should be reported to the laboratory supervisor immediately.

A. General Electrical Safety

The typical laboratory requires a large quantity of electrical power. This increases the likelihood of electrically-related problems and hazards. The following recommendations are basic to a sound electrical safety program in the laboratory.

- All electrical equipment should be properly grounded.
- All electrical equipment shall be UL listed and/or FM approved.

- Sufficient room for work must be present in the area of breaker boxes. All circuit breakers and fuses shall be labeled to indicate whether they are in the “on” or “off” position, and what appliance or room area is served.
- All electrical equipment shall be routinely checked to ensure it is in good working order.
- All power cords shall be routinely checked for cuts or fraying before each use.
- Extension cords shall not be used as a substitute for permanent wiring.
- Electrical cords shall not be suspended over doors or passageways. Cords should not be routed over metal objects such as emergency showers, overhead pipes or metal racks. Do not place cords under carpets, rugs or heavy objects. Do not place cords across pathways where they will become worn from repeated abuse.
- Multi-outlet plugs shall not be used unless they have a built-in circuit breaker. This causes overloading on electrical wiring, which will cause damage and possible overheating.

VII. Construction Safety

A. Epoxy

A variety of thermo-plastics are used for the gluing of instrumentation as well as in some structural applications. Nitrile gloves and safety glasses should be worn at all times when using this material. Also provide adequate ventilation. ALWAYS read labels. In case of contact with skin, wash thoroughly with water and soap. Contact your physician if irritation or rash develops. Consult MSDS for further information.

B. Laboratory Dust

Although Lab Dust is largely seen as a nuisance, significant problems may arise with short and long term exposure. Over the short term, exposure may cause dry eyes, sneezing, and other similar dust-related problems. Over the long term, lung problems can arise such as silicosis, a lung disease linked to the intake of rock dust (silica) into the lungs. The proper way to avoid these hazards is to wear particulate respirator. Always use a floor sweeping compound when floor sweeping.

C. Cement & Grout Mixing

Cement mixing and grouting includes: batching, mixing, pouring, finishing, filling molds, curing, and de-molding. Batching is the weighing or measuring and assembling of the dry ingredients. This is a dusty activity. Mixing is a short but intense process.

Grouting and cement mixing is a messy process. The bagged mix is extremely fine grained and irritating to your eyes, nose, mouth, throat and lungs; you may need to wear a particular respirator. The rocks and sand in aggregate based mixes are also very dusty. Since wet concrete is corrosive take care to avoid touching it or getting it on your skin or in your eyes. Always wear nitrile gloves, goggles, and coveralls. Wet cement and grout are harmful and dangerous to the

environment. There are specific cleanup procedures to prevent concrete and grout from flowing into sinks or drains. Be sure to do all washing outside at waste water collection tubs or create a berm using sandbags to prevent any mix from going into any storm drains. It is illegal and irresponsible to allow discharge into storm drains. Once concrete or grout is completely dry, it is no longer considered hazardous and thrown away as regular trash. Unused materials must never be stored above face height. Hard Hat recommended as per job conditions.

When making smaller batches, you may not necessarily use an entire grout or cement bag, so make sure that you properly open the bag so that it is easily resealed. Make every effort to minimize the dust. Once your pour is complete, you should immediately begin your clean up. It is critical clean up when your mix still in a plastic or at least uncured state so that you can minimize dust in or around the lab. Use water as needed taking note of the previous cautions. Unused materials must be restocked and NEVER stored above face height.

D. Pre-stressing Tendons

The process of pre-stressing (steel cable, rods or “tendons”) requires extreme caution. The tendons are to be examined for defects if they are new or used. Be sure that no one is in the line of force when pre-stressing. Be sure you are using the appropriately sized jack and that the hydraulic lines and fittings are in good condition. Remember to stay out of the line of force when pre-stressing the tendons. Use appropriate lubricants and tools to tighten and loosen the nuts when stressing and un-stressing. Safety glasses required. Steel toed shoes required.

E. Testing Machines & Construction

Most of the testing equipment at the lab requires training in the software and hardware involved. Take care that hands and body parts are never in the direct path of any active component. The computer could malfunction and cause a serious injury. When more than one person is working with a particular machine, one person is in charge and keeps the other employees aware of the machine’s state. Everyone must know where the others are in relation to the danger zones.

One of the leading causes of serious injuries on the job are falls from ladders, scaffolds and platforms, followed closely by material handling injuries and injuries from falling objects, sharp objects and slips and trips (very often caused by dirty and disorganized job sites). Efficiency is greatly increased and the incidence of injuries is greatly reduced, by keeping the site clean and organized on a daily basis.

VIII. Emergency Procedures/Prevention

All laboratory personnel need to know what to do in the event of a chemical/liquid spill or other emergency that may occur in UHD/ET laboratories. The CSO, PI/LI, and the Health & Safety Officer must be notified whenever there is an emergency that poses any health or environmental risk. To prevent accidents, labs should reduce clutter and unnecessary materials in the work areas, eliminate tripping hazards and collect all of the needed equipment before starting work.

Supplies should be stored on sturdy shelves (shelves with lips are preferred) with larger containers stored close to the floor. Containers should be pushed to the back of shelves and unprotected glass containers should never be stored on the floor.

IX. Field Safety Guidelines

Some courses at UHD are field based courses or require field trips. Some research projects are also field based. In these cases it is important that field safety guidelines are followed.

A. Considerations Prior to Leaving

- Learn about potentially hazardous materials/conditions in the areas where field work will take place
- Assemble any needed safety provisions such as first aid kit and first aid manual, medications, allergy treatments, vehicle emergency kits.
- Every faculty and student planning to travel to the field must have completed all necessary travel arrangements in the ET office. All approved drivers should have a valid driver's license and insurance information should be provided in vehicles.
- All vehicles should be equipped with working seat belts and mirrors and any other safety equipment/features required by law.

B. Potential Diseases

Below is a list of possible diseases that can be encountered and how to prevent them.

- Tetanus: puncture wounds, lacerations or burns can create a pathway for exposure to tetanus. Field workers should be sure that their tetanus boosters are up to date and should treat wounds to prevent tetanus.
- Rabies: several species are known to transmit rabies in Texas. If your field work involves risk of being bitten by animals, you should consider getting immunized against rabies before the field work begins. If bitten by an animal, seek medical attention immediately, even if you have been immunized.

X. Training

All students involved in research at UHD will be required to have safety training every semester they are involved in research. Faculty and Staff will be required to complete training specific to their area in accordance with state and federal guidelines. The PI is responsible for ensuring all staff and students are properly trained by the Health and Safety Manager. The training of all staff and students shall be documented as to date, time, location, instructors name and what information was covered and these training records shall be maintained by the Health & Safety Office.

Appendix A: Student Permission to Work Independently After Hours

This form should be filled out by research students or students in some high-impact courses requesting permission to work independently after hours (between 7PM and 7AM).

This form must be *turned in* to the Chief Safety Officer (ET Chair) in the *ET Office at least 10 days before work is performed*. Laboratory activities which could place the student in a potentially hazardous situation will be denied. Experiments that can be easily performed during normal working hours will likely also be denied. In denied cases, the CSO and the PI should work together until the project is modified or until the project can be completed during normal business hours.

Name(s) of student(s) seeking permission to work in the laboratory after regular working hours:

Experiment/Reason student(s) may need to come after hours (give specific lab activities to be performed) _____

Location (room number) _____

As a faculty member, I certify that the above laboratory activity is safe for a student to perform independently and poses no possible danger to the student.

Faculty Signature

Date

As a student, I agree to comply with all the established safety guidelines outlined in the ET Laboratory Safety Manual and any additional safety instructions from my faculty member.

Student(s) Signature

Date

ET Chair Signature (approval)

(Faculty will be notified by email when approved.)

Date