

**FAMU-FSU COLLEGE OF ENGINEERING
CIVIL & ENVIRONMENTAL ENGINEERING
STUDENT SAFETY MANUAL**

Revised: 8.21.2021

1. Introduction and Overview

All levels of administrative and academic management have a responsibility to promote safety and health. Supervisor and instructors who have direct responsibility for working and teaching environments are responsible for ensuring their employees and students freedom from hazards. Ultimately, the individual worker or student must assume personal responsibility for ensuring health and safety for themselves and fellow employees or classmates. The FSU Director of Environmental Health and Safety and other safety professionals are responsible for overall coordination of the FAMU-FSU safety program.

Supervisors and instructors will carefully review with each employee or student, specific safety rules, policies and applicable procedures. Such are contained within this document and other applicable rules and regulations published by the University. Supervisors will review safe work practices with employees and will take remedial steps to correct deficiencies that jeopardize the health and safety of their employees. Likewise, instructors will promote safe practices in the classroom, laboratory, shop, studio and field.

2. General Guidelines for Laboratory Use

General safety rules apply to all lab spaces, tools, and equipment. The following shop safety rules apply to all teaching laboratory spaces:

1. First, never work alone in any laboratory setting. No student may work in any teaching laboratory without the presence and permission of the instructor.
2. When first entering the lab, do not touch any equipment, chemicals, or other materials in the laboratory area until you are instructed to do so.
3. Perform only those experiments authorized by your instructor. Unauthorized experiments are not allowed. Carefully follow all instructions, both written and oral.
4. Horseplay, practical jokes or other inappropriate and unprofessional behavior in the laboratory setting are forbidden. Avoid distracting or startling any other students/ workers.
5. Take responsibility for your own safety and that of others in the lab. Don't do anything that you feel is unsafe or are unsure about. Be prepared for any test that you will run.

2.A. Safety and Emergency Contacts

Safety questions should be referred to the lab instructor or CEE lab engineer. If they are unavailable or in an emergency situation, contact the building manager or call 911. Contact information is as follows:

- CEE Lab Engineer: Steven Squillacote
 - Phone: 850-410-6280
 - E-mail: ssquillacote@eng.famu.fsu.edu
- Building Manager: Donald Hollett
 - Phone: 850-410-6600
 - E-mail: hollett@eng.famu.fsu.edu

Additional safety information and incident report forms are available from FSU Environmental Health and Safety at www.safety.fsu.edu.

2.B. The Work Area

Review all posted safety signage and instructions upon entering the lab space and before beginning any experiments. Check emergency and exit routes before the beginning of each lab session. Know the location of the nearest first aid kit and eyewash station and how to use an eyewash station in advance of any emergency. In the event of eye contact with any substances in the laboratory, use the eyewash stations to rinse immediately. Rinse at least 15 minutes and notify instructor after finishing.



Your work area should be kept clean and free of clutter. Clean the work area throughout the work period and before leaving the lab for the day. If necessary, clean equipment after use to avoid the possibility of exposing the next person who uses it. Other guidelines for maintaining a safe work area are as follows:

- Clutter is a tripping hazard and can obscure other dangerous situations. Keep personal belongings away from work spaces.
- Clean up all lab spaces after completing experiments and dispose of all used materials properly. Do not dispose of materials by washing down the drain. Place excess and scrap materials (e.g. aggregate, lumber) in appropriate containers.
- Keep your work area well lit. If you cannot see your work, then you cannot see a hazard.
- Keep your area dry. Wet floors and work surfaces can cause slips. Water serves as an excellent electric conductor between the ground, you, and your equipment.
- Keep distractions to a minimum. Cell phones and music headphones should not be used while working in the lab.
- Practice good office safety by not overloading outlets or power strips. Do not daisy chain power strips by plugging the power cord of one strip into an outlet of another strip. Secure all extension cords to avoid trip hazards.
- When operating the overhead crane, hard-hats, gloves, safety shoes, and safety glasses must be worn. Noise produced by power tools can drown out other sounds in the lab or shop, like a person shouting ‘STOP!’ or ‘HELP!’ Stay alert to your surroundings.
- Report all accidents, injuries, fires, spills, and close calls to the lab instructor.

2.C. Fire Safety

Labs typically have a high potential for fires, due to various electrical, chemical, and other factors.

When working in any lab, consider the following factors regarding fire safety:

- Oily rags, dust, and paper are fire hazards. Before working with tools that can produce sparks, make sure that the surrounding area is free from ignitable materials.
- Solvents in any quantity, have a very high potential for flash fires, explosion, rapid spread of fire, and high toxicity of products of combustion. No open flames are allowed when chemicals are present.
- Know the locations of fire alarms and extinguishers. Fire extinguishers shall be the correct

type (e. g., A, B, C, D) for the potential fires which could occur in your shop. Also, know where the fire alarm is located and the proper exit route(s) for your work area.

- To operate a fire extinguisher, use the P A S S Technique
 - Pull the pin at top of the extinguisher
 - Aim at the base of the fire, not the flames
 - Squeeze the lever slowly
 - Sweep from side to side
- Additional information on operating fire extinguishers can be found at:
 - <http://www.fire-extinguisher101.com/using.html>
 - <http://www.fireextinguishertraining.com>
- In case of a lab fire or explosion, ensure your safety first and call emergency responders immediately for help. Evacuate the building safely and pull fire alarms or notify nearby people, if possible. Don't use elevators. Use stairs and locate the nearest exit.

2.C. Clothing and Personal Protective Equipment

Protective Equipment (PPE) includes safety glasses, goggles, face shields, gloves, lab coats, aprons, ear plugs, and respirators. Clothing and personal protective equipment (PPE) protects laboratory users from exposure to dust, chemicals, equipment, and other hazards in the laboratory. The following general guidelines apply to laboratory use:

- Depending on lab activities, appropriate attire is a lab coat or apron, or includes long sleeves and pants or skirt that covers the full length of your legs. Consult your instructor or supervisor regarding appropriate clothing for individual lab sessions and experiments.
- Closed-toes shoes must always be worn in the Machine Shop and teaching laboratories. For experiments requiring heavy lifting or dropping a 15 pound weight from 3 feet, steel-toed shoes are recommended.
- Use personal protective equipment as necessary. Other PPE required in teaching labs includes safety glasses, gloves, hard hats, hearing protection, respiratory protection, special protective clothing, and welding masks. Discuss proper safety equipment with your instructor before beginning any experiments.
- Never wear loose clothing or jewelry that can entangle in power tools. Hand jewelry can serve as a conductor of electricity. Tie back long hair. Do not wear neckties while working

around machinery.

- Dust is produced when working with soils, aggregates, and using most shop tools. When cutting certain materials like plastics or epoxies, fumes can be released. To address these potential hazards, discuss the appropriate controls and respiratory protection with your instructor, supervisor or Safety Department.

3. Material Handling and Chemical Safety

Chemical safety depends on control and knowledge of hazardous materials and basic chemical properties. Potentially dangerous materials are shipped, stored, handled, used and disposed of every day by trained personnel. All of these personnel are aware of the hazards involved with these operations and how to control the hazards. Ask your supervisor or other safety officials if you have any questions about a chemical or hazardous material.

3.A. Chemical Storage

The first step in maintaining chemical safety is proper chemical storage. Follow these basic chemical storage guidelines:

- Chemicals are stored by the hazards they possess. Store flammable and corrosive materials in approved safety cabinets or in a dedicated area. Store highly toxic, radioactive, or controlled substances in a secure, lockable area.
- Flammable materials should be stored in an approved flammable materials cabinet. A maximum of 5 gallons of flammable liquids may be stored outside of a flammable storage cabinet (2 gallons in a non-sprinklered lab). Flammable liquids cannot be stored on floor. Keep all sources of ignition away from flammable materials.
- Store acids and bases separately. Store separately from other hazardous materials and on low shelf areas or in protective cabinets. Never put acids in steel/metal containers.
- Oxidizing materials should be stored separately from flammable and corrosive materials.
- Do not store chemicals in the fume hoods.
- Do not keep chemicals longer than the indicated shelf life. Dispose of peroxide forming chemicals before the expiration date on the container.
- Store compressed gas cylinders in designated storage areas. Avoid storing chemicals on the floor or in high locations.

- Keep all containers securely closed. Inspect containers regularly for leaks or cracks.
- Liquids should be stored using secondary containment devices
- Discard old, unwanted, damaged containers. Contact the CEE lab engineer or the building manager if you need assistance.

3.B. Chemical Handling

A second aspect of chemical safety is observing safe chemical handling. The following safety rules should be followed when handling chemicals in the lab:

- All containers must be labeled clearly and completely. Read MSDS for safety information before using chemicals in the lab. Read and understand warning labels and signs before using any chemical.
- Safely transport, pour, and handle liquid and solid materials. Clean up and report spills promptly.
- Use personal protective equipment as necessary. PPE for chemical handling includes safety glasses, goggles, face shields, gloves, lab coats, aprons, and respirators. Discuss with your instructor what PPE is required before beginning any experiments.
- Eating, drinking, smoking and the application of cosmetics (including lip balm) is forbidden in areas where hazardous chemicals are stored and used. Contact lenses should not be worn when working with volatile materials.
- Do not store food in the same refrigerator with chemicals, biohazards or radioactive materials. Do not taste or ingest anything while in the laboratory.
- Use fume hoods when handling materials.
- Use caution when mixing chemicals; always add acid to water instead of adding water to acid.
- Do not put your hands in your eyes or mouth. Never pipette by mouth. Make sure your hands are washed before leaving the laboratory area.
- If corrosive liquids (acids or bases) touch your skin, flood the area with water immediately and for at least 15 minutes. Notify the instructor or supervisor after finishing.
- Know what waste you're creating prior to carrying out experiments; minimize purchases to minimize storage and waste. Keep records of all waste chemicals on hand and those already picked up for disposal.

- Chemical waste must be disposed of appropriately. In teaching laboratories, do not dispose of any chemicals without specific directions by the instructor.

A spill, leak, release, fire, uncontrolled reaction, explosion, or accidental contact with a hazardous material requires immediate action to prevent injury or property damage. Report any such emergency immediately. The lab instructor or specialist should only respond to incidental chemical releases, or small spills. For large or especially hazardous spills, the instructor should:

- Quickly assess whether there are any injured persons and attend to any person who may have been contaminated.
- Follow the notification, evacuation and emergency medical treatment procedures for your school.
- Evacuate the immediate area until the hazardous release has been characterized and controlled.

4. Machine Shop Use & Tool Safety

Though tools differ in their function, power source, and size general safety rules apply to the use of all tools. The Occupational Safety and Health Administration (OSHA) has established regulations that apply to electrically powered machinery, under Subpart O, Machinery and Machine Guarding, and Subpart P, Hand and Portable- Powered Tools and other Hand- Held Equipment. These regulations are found in the Code of Federal Regulations: 29 CFR1910.211-.247. The American National Standards Institute (ANSI) publishes standards for tool design and safeguarding, including the Safety Standard for Stationary and Fixed Electric Tools. ANSI/UL 987. The following guidelines are drawn from these and other sources on tool safety:

- Always use the right tool for the job. Forcing a small tool to do a big job causes the tool to strain. Strained tools can kickback or break, causing injury.
- Never use tools that you are unfamiliar with. Get proper training from your supervisor, the Safety Department or the tool manufacturer.
- Read the tool manual for proper use procedures and safety precautions.
- Before each use, inspect your tools. Check the alignment of moving parts, breakage of parts, and cracks. Do not use any tools that are defective or not functioning correctly, and report faulty equipment to instructor or supervisor.

- When you are tired, your attention span is reduced. Attention to your work is very important when working in the shop. Make sure you are fit to do the job.
- Disconnect the power source when performing maintenance, cleaning, or changing blades and bits.
- Be wary of dropping tools. Do not rest a tool on the edge of the workstation. Secure tools when working at heights.
- When using both portable and stationary tools, grip the tool and material being worked on firmly. Hold tools only by insulated grasping surfaces. The material being worked on should be well secured.
- Make sure that you are well balanced when operating a tool. Sometimes, a “kickback” from a tool can throw the operator out of balance causing injury.
- Do not work in an awkward position. You may not have complete control of the tool or the material you are working on. Never lock a tool in the ON position if you are working under conditions that may require you to stop the tool quickly.
- Guarding is one of the best ways to minimize a hazard. Make sure that machine guards are in place on large and small equipment. Do not bypass guards or safeties.
- When cutting materials, try to cut along the grain. This will reduce the chance of kickback or shattering of the material.

4.A. Portable Power Tools

Because of the mobility of portable power tools, they can easily come in contact with the operator’s body. In addition, the source of power (electric, compressed air, liquid fuel, or explosive cartridge) is in close proximity to the operator, thus creating additional hazards. Typical injuries caused by portable power tools include burns, cuts, eye injury, and sprains. Sources of injury include electric shock, flying objects and particles, fires, falling tools, and explosion of gases. Here are safety precautions to follow when using power tools:

Powered Hand Saws

The main hazard associated with all saws is being cut by the blade. Protection from a rotating or reciprocating blade can be achieved by following these rules:

- Inspect blades regularly. Make sure blades are sharp. Keep the saw blades clean. Buildup of material on the blade increases blade friction. This increases the chance of kickback. Make

sure that blade guard works properly. Inspect guards frequently to make sure they rotate freely and cover the saw blade when not cutting.

- For circular saws, set the blade depth no more than 1/8 to 1/4 inch greater than the thickness of the material. A circular saw shall be started and stopped outside the work.
- Extra care should be taken at the beginning and end of the sawing stroke to keep the body and cord away from the blade. Do not overload the motor by pushing too hard or cutting a heavy material with an inadequate saw.
- Never cut wet wood. Kickback may occur. Inspect the material to be cut before cutting. Look for nails, staples, or other foreign objects that could bind the blade or fly off during cutting.

Hand Drills

The rotating drill bit can serve as a hazard in many ways: It can break and fly off. It can catch the material being worked on, causing the material to rotate freely and hit something or someone. The drill can slip and the user can be punctured by the bit. To protect from these drill hazards, employ the following when using drills:

- Use the correct bit for the material. There are special bits for metal, wood, masonry, plastic and other materials.
- Make sure that drill bits are sharp. A dull bit causes the user to press harder on the drill and increases the chance of tool slippage or bit breakage.
- Old bits can get metal fatigue. Replace bits according to the manufacturers' guidelines.

Routers

The shaft and bit of a router can turn very fast and cut very quickly. The hazards are similar to drills but can be more severe. The safety rules listed below should be followed when using routers:

- Always start the router with the cutting edge in contact with the material to be cut.
- When the cutting is complete, turn off the router. Do not lift the router until it has come to a stop.
- The base of the router shall always be kept flat on the work surface. If available, use a chip shield to protect from flying objects. Always allow the router to come to full speed before beginning to cut.

Soldering Irons

The main hazards associated with soldering irons include burns and toxic fumes. Follow these safety rules when using soldering irons:

- Resting the iron on wood or metal over wood can cause fires. The use of insulated soldering iron holders reduces the fire hazard and chance of burns from accidental contact. The holders should prevent accidental touching of the iron tip.
- Make sure that there is adequate ventilation to remove soldering fumes. Lead is harmful if ingested. If lead solder is allowed to accumulate on floors and work surface, it can be tracked home. Keep these areas clean.

Glue Guns

- Glue guns can heat glue to very high temperatures. Avoid contact with the tip of the glue gun and the glue itself.

5. Body Safety and Safe Lifting Techniques

The following safe lifting techniques should be employed whenever a task requires lifting or moving materials, especially heavy and/or bulky objects.

Feet

The Feet should be parted, with one foot alongside the object to be lifted and one behind. The feet comfortably spread gives greater stability and the rear foot is in position for the upward thrust of the lift.

Back

Use the sit-down position and keep the back straight, but remember that straight does not mean vertical. A straight back keeps the spine, back muscles and body organs in correct alignment. It minimizes the compression of the abdominal organs that can cause a hernia.

Chin

Tuck in the chin so the neck and head continue the straight back line. Tucking in the chin helps keep the spine straight and firm.

Palms

Gripping with the palm is one of the most important elements of correct lifting. The fingers and the

hand are extended around the object to be lifted - using the full palm. Fingers alone have very little power - the strength of the entire hand is needed.

Arms and Elbows

Draw the load close, with arms and elbows tucked into the sides of the body. When the arms are held away from the body, they lose much of their strength, and because the weight is not fully supported on the spinal-axis; back strain can result.

Body Weight

The body should be positioned so that its weight is centered over the feet. This provides a more powerful line of thrust and ensures better balance. Start the lift with a thrust of the rear foot.

In addition to these steps, it is important not to twist the body when lifting. You should lift the object to the carrying position and tuck your body, including your feet. In repetitive work, your position and the position of the material should be such that you will not have to twist your body.

Team Lifting

If the object is too heavy to be handled by one person, get help. When two or more employees are handling the same object, one employee should be designated to call signals. All the workers on the lift should know who this is and should warn him/her if any one of the crew is about to relax their grip.

When placing objects on a bench or table, first set it on the edge and put it far enough onto the support to be sure it will not fall. Release your grip gradually as you set the object down. Move it into place by pushing with your body and hands from the front of the object. In this way, you will prevent your fingers from getting pinched.

6. Field Safety

Field safety is important in any laboratory, independent study, or co-curricular activity that involves outside work, whether at or away from the College of Engineering campus. Consider the following general guidelines as you plan for safe activities in the field:

- Assess the weather before scheduling field work. Reschedule if dangerous weather is predicted. Be alert to changing conditions and move to safety quickly if necessary.
- Wear proper PPE for the field conditions and weather, including long pants, closed toes shoes

and safety vest. Wear sunscreen and use bug spray, as appropriate. Consider bringing or wearing a hat with brim, sunglasses, rain gear, etc. as appropriate.

- It is easy to become dehydrated, even on cool days. Carry water with you. If you'll be in the sun for an extended time, consider how you can take breaks in the shade (e.g. umbrella, pop-up tent).
- Be aware of surroundings at all times. It is recommended to have one team member assigned to observing potential hazards and alerting the rest of the team. Outdoor hazards include but are not limited to snakes, uneven terrain, and buried debris. Be especially careful around brushy overgrowth, as it often hides such hazards from view.
- When working on roadsides, team members should maintain a safe distance from all roadways and be alert for erratic driver behavior.
- Never travel to a site alone; make sure that someone not on the team has emergency contact info for all team members and is aware of the expected site visit and return time.
- If you are traveling to a remote area, bring a first aid kit with you. Make sure that your vehicle is in good running condition and fully gassed. Make sure cell phones are charged, and bring extra chargers/battery packs.