

**CALIFORNIA STATE UNIVERSITY, SACRAMENTO  
COLLEGE OF ENGINEERING AND COMPUTER SCIENCE  
DEPARTMENT OF MECHANICAL ENGINEERING**

**ME SHOP SAFETY RULES**

**ME 37 LAB**

**SENIOR PROJECT LAB**

## **SHOP RULES and SAFETY**

The following rules are intended to guide students in safe practices in the Mechanical Engineering manufacturing labs. Common sense and attention to what is going on around you is always the best safety practice. Although the labs are well maintained and meet all legal safety requirements, it is always your responsibility to think and act in a safe manner. The rules listed here cover the most common safety issues in the lab but are not all inclusive. If you have any doubts about the safety of a particular machine, process, or activity consult your instructor, lab technician, or the Tech Shop.

Regardless of the rules listed here, if your instructor or the lab technician tells you that you are doing something unsafe you must follow their directions immediately. Failure to comply with shop rules, safety practices, or faculty and staff directions may result in suspension of shop privileges.

### **SHOP RULES**

1. No work may be done in the shop without an instructor or lab technician present.
2. Safety glasses will be worn in the shop at all times.
3. Long pants, shirts and shoes that cover the feet will be worn in the shop at all times.
4. Working drawings must be approved prior to working in the shop.
5. Any personal tools must be safety checked by the instructor or the technician's shop before they may be used in the shop.
6. Students may not enter the tool crib without the instructor's permission.
7. Any problems with machinery or tools must be reported to the instructor or lab technician immediately.
8. At the end of each lab, all tools are to be checked in to the tool crib and all machinery and benches are to be cleaned.
9. Horse play and practical jokes will not be tolerated in the shop.
10. If you are not sure how to do something, ask for help from the instructor or lab technician.
11. Machinery marked 'NOT FOR STUDENT USE' is to be operated by the instructor or lab technician only.
12. A tool request slip must be filled out listing all of the tools acquired from the tool crib.
13. All damage to tools or machinery must be reported immediately to the instructor.
14. Normal tool wear and breakage is expected. However students who break or damage tools through extreme neglect or carelessness will be required to pay for repair or replacement. Students who damage tools through a wilful failure to follow directions or shop rules may lose their shop privileges.

## **SAFETY RULES**

### **GENERAL RULES**

1. If you are not sure you thoroughly understand the job ask for further instruction from the instructor or lab technician, not other students.
2. Work at a speed that is consistent with safety.
3. Report all injuries and obtain treatment immediately.
4. Remove splinters from work benches, tables, bins, etc. before someone is injured.
5. Obey all warning tags and signs. They are posted to point out hazards.
6. When carrying long pieces of equipment such as pipes or ladders, watch both ends or use two people.
7. Long sleeve shirts are required when welding. Short sleeve shirts or long sleeves rolled above the elbow are required when machining.
8. Identify the location of the nearest fire extinguisher. Know about the type of fire upon which it can be used. Know the location of the nearest fire alarm.
9. No smoking in the shop.
10. Know the emergency phone numbers:
  - Campus Security-. x6900
  - Campus Health Center- x6461

### **MACHINE TOOLS**

Machine tools are defined as stationary power driven machines used to shape, cut or form metal. Turning machines, boring machines, milling machines and grinding machines are examples of machine tools..

1. Unless you have been taught to operate a machine, do not use it.
2. Do not operate any machine unless you have the instructor's approval, ask before using it.
3. Do not attempt to make any repairs or adjustments, other than operator controls, to any equipment.
4. Immediately inform your instructor if you suspect something is wrong with the machine you are using.
5. Ensure that all protective guards are in place before starting any machine. Do not start any machine unless you have assured yourself that all of the guards are in place.
6. Do not attempt to defeat or override any protective devices installed on the machine.
7. Do not leave any machine running while unattended. Before leaving a machine you are using (regardless of how long you will be away from it) shut it off and wait for it to stop.
8. Do not take any “short cuts” or chances when operating the machines.
9. Do not wear any jewelry or loose fitting clothing. Long hair must be tucked and covered. Shirt sleeves will be rolled above the elbow.

10. Do not use compressed air to remove chips or shavings from the machines or parts.
11. Do not attempt to clear chips or measure the part while the machine is running.
12. Do not engage in conversations with others while operating machinery.
13. Do not grind any non-ferrous metal.

**PAY ATTENTION TO WHAT YOU ARE DOING AT ALL TIMES!**

### **HAND TOOLS**

1. Use only tools that are in good condition. If a tool is in poor condition, turn it over to your instructor or lab technician.
2. Burred or mushroomed heads on chisels, star drills, hammers, etc. must be dressed before using them.
3. Replace rough, broken or loose tool handles before using them.
4. Equip files with handles before using them.
5. Do not use wrenches with sprung or spread jaws.
6. Be sure the jaws of wrenches are adjusted to fit tightly on the nut, bolt or pipe before putting strain on the wrench. Always pull on the wrench if possible.
7. Use only lead, rawhide, or urethane hammers to strike hardened tools or machine surfaces.
8. Do not use screwdrivers with rounded or broken points, or bent shafts.
9. When using a screwdriver, place the work on a bench or some solid object. NEVER hold the part in your hand.
10. Use tools correctly. Do not use screw drivers as pry bars or chisels. Do not use wrenches as hammers
11. Protect or cover sharp edges of tools with a shield when they are being carried about.

### **POWER TOOLS**

Portable power tools have hazards similar to stationary machine tools. There are additional risks associated with handling the tool. Typical injuries caused by portable hand tools include burns, cuts, and strains. Other sources of injury include electric shock, particles in the eyes, fires, falls, explosions and falling tools.

1. Do not leave cords or hoses lying on the floor where they may be a trip hazard.
2. Do not hang cords or hoses from nails, bolts or sharp objects.
3. Keep cords and hoses away from oil, hot surfaces and chemicals.
4. NEVER use personal power tools in the school shop unless they have been safety checked by the Tech Shop and approved by the instructor.
5. Always wear eye protection when operating a portable power hand tool.
6. Use an appropriate respirator when the use of a power tool may generate airborne dust, powders, etc.

7. Never operate a power tool in the presence of combustible materials or liquids. Sparks from the tool itself, or from contact of the active tool with the work or surrounding area can easily ignite combustibles.
8. Tools which generate excessive dust or debris may not be used in the machine shop area.

### **MATERIAL HANDLING**

Strains, sprains, fractures and bruises are common injuries related to the handling of materials. They are caused primarily by improper lifting techniques, carrying too heavy of a load, incorrect grip, failure to observe foot and hand clearances, and failure to wear protective equipment.

1. Inspect material for splinters, burrs, and rough or sharp edges.
2. Keep your hands free of oil or grease, wipe off any grease or slippery objects before you move them.
3. Keep a firm grip on the object to be moved.
4. If an object is heavy or clumsy get help lifting it. Discuss before hand how the object is to be moved and set down.
5. Be sure the path over which an object is to be moved is clear of obstructions before you start.
6. Always lift with your legs and not your back.
7. Watch pinch points, especially when setting the object down.

### **GENERAL ORDER AND HOUSEKEEPING**

1. Keep all work areas and walk ways clear.
2. Keep tools neatly placed on top of work benches. Tools must not be laid on the floor.
3. Do not block exits, electrical panels, fire extinguishers, or fire alarms.
4. Place all trash in proper receptacles.
5. Place oily rags in the red covered rag receptacle. Do not put any other trash in these containers.
6. Clean your machine and the floor around it. Use brushes and dust pans, do not use your hands to clean up chips.
7. If your work makes a lot of chips, stop and sweep them up from time to time.

### **ELECTRICAL**

Students should not attempt to make any electrical repair or adjustments. Notify your instructor or lab technician of any electrical problem immediately.

1. Report any shocks immediately.
2. Report any unusual noises, smells, smoke, or electrical fires immediately.
3. Any electrical wiring on student projects must be approved by the instructor before electrical power is connected or the device is plugged in.
4. All student projects with electrical components or wiring must have an approved wiring diagram

before any wiring or assembly is allowed. The wiring diagram must indicate all connections, size and type of wire, connector type and size, and identify the electrical character of all components. Power circuits must have calculations that show the adequacy of the wiring.

5. All student projects with electrical power must be provided with overload protection in the form of fuses or circuit breakers and a main power switch.
6. All student projects must conform to the relevant electrical codes.

## **WELDING and CUTTING**

Welding and cutting operations often involve fluxes or other materials containing toxic compounds and metals. If you are not certain that your welding or cutting operation is absolutely safe, check with your instructor or lab technician.

1. Proper equipment and clothing will be worn by welders, helpers and anyone working near the welding stations to protect them from burns, spatter and radiant energy.
2. Keep all combustible materials away from the work area.
3. Do not keep cigarette lighters or matches in your clothing.
4. Do not operate any of the valves or controls until you have been cleared by the instructor or lab technician.
5. Do not weld plated or galvanized material unless absolutely necessary. It is poor engineering practice. If you must weld it, be certain the galvanizing or plating is removed from the weld area at least 1" away from the actual weld, preferably more. Proper ventilation is essential as toxic fumes are released.
6. Do not perform any welding operations unless the ventilation system is on and removing fumes from your weld site. Floor welding must done with the portable ventilation system in place and operating.
7. Do not attempt to pick up any welded parts with your hands even if you are wearing gloves. They are "HOT." Use pliers or tongs to handle your material.
8. Do not use matches or lighters to light the torches.
9. Do not drop the stub ends of welding rods or electrodes on the floor. Use a proper receptacle.
10. Always keep the work area clean and clear of debris. Clean your work area when done.
11. Before welding, identify the location of the nearest extinguisher.
12. Cool all pieces before disposing of them or leaving them unattended. If cooling is prohibitive, write "HOT" on them with chalk before leaving them.

## **HAZARDOUS DECOMPOSITION PRODUCTS PRODUCED DURING WELDING OPERATIONS**

Welding fumes and gases cannot be classified simply. The composition and quantity of both are dependent upon the metal being welded, the process, procedures, and electrodes used. Other

conditions which also influence the composition and quantity of the fumes and gases to which welders may be exposed include: coatings on the metal being welded (such as paint, plating, or galvanizing), the number of welders and the volume of the work area, the quality and amount of ventilation, the position of the welder's head -with respect to the fume plume, as well as the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing activities).

During the welding process the fume and gas decomposition products generated are different in percent and form from the ingredients of the materials being used. Decomposition products of normal operation include those originating from the volatilization, reaction, of oxidation of the welding wire/rod, plus those from the base metal and coating, etc., as noted above.

Reasonably expected fume constituents of the welding process would include:

**Primary oxides of Aluminum, silicon, iron, copper, manganese, magnesium, chromium, titanium, thorium, and zinc. Gaseous reaction products may include carbon monoxide and carbon dioxide. Ozone and nitrogen oxides may be formed by radiation from the arc.**

Short term (acute) overexposure to welding fumes may result in discomfort such as dizziness, nausea, or dryness or irritation of the nose, throat, or eyes. The inhalation of some of these materials has the potential for causing transient or permanent lung damage. Long term (chronic) overexposure to welding fumes can lead to siderosis (iron deposits in lung) and affect pulmonary function.

Arc rays can injure eyes and burn skin.

Heat rays (Infrared radiation from flame or hot metal) can injure eyes.

Electric shock can kill.

Noise can damage hearing.

Exercise all necessary precautions when welding or observing a welding operation.

Material safety data sheets (MSDS's) are available for your review in the Tech Shop Office.

### **SOLVENTS, PAINTS, RESINS, ETC**

All hazardous or inflammable materials brought into the lab by students must be reviewed and approved by the instructor. Students are required to provide MSDS's and a full technical description for any "industrial" materials.

1. No spray painting is permitted in the student shops.

2. All hazardous material must be turned over to the Tech Shop for proper storage. Students *MAY NOT* store hazardous or inflammable materials in lockers or in the lab. Materials found in the shop unattended will be confiscated.
3. Students must obtain proper respirators and other required safety equipment prior to using any materials they bring into the lab.
4. Proper ventilation must be provided.

**THE UNIVERSITY IS NOT RESPONSIBLE FOR ANY UNAUTHORIZED SHOP ACTIVITIES TAKING PLACE OFF CAMPUS. STUDENTS ARE URGED TO FOLLOW PROPER SAFETY PRACTICES WHERE EVER THEY ARE.**