UNIVERSITY OF CALIFORNIA MERCED

GUIDELINES FOR SHOP SAFETY

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Guidelines for Shop Safety

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INTRODUCTION TO SHOP SAFETY

Please read these safety guidelines carefully and follow the rules described.
If you have any questions about the operation of any machine, tool, or process. Ask the area supervisor for instructions **BEFORE USE.**

The first steps in preventing personal injury or machine damage in a shop setting is:

1. Make sure that you are familiar with and know how to correctly and safely operate the equipment you will be using.
2. Be familiar with all processes and associated hazards that a job may entail.
3. Understand the properties and hazards of all materials you will be working with, including personal protective equipment (PPE) needed to complete a job safely.

How do accidents happen?

Accidents are caused by inattention, taking chances, horseplay, bad judgment, fatigue, uncooperativeness, improper clothing, defective tools, etc.

USER RESPONSIBILITIES

1. It is the individual user's responsibility to not engage in any behavior or activity he or she feels is unsafe or that could result in injury to themselves or others.
2. Do not operate equipment or perform any procedures that you are not familiar with. Ask the area supervisor (instructor) for training or guidance so that you may complete your duties safely.
3. Safety is the individual's responsibility. All users of the University of California have the right to stop work if they believe they have not been properly trained to operate any piece of equipment or to perform a procedure safely. This includes the providing of personal protective equipment, besides safety glasses and engineering controls that may be required in order to perform your duties safely.

EMERGENCIES/INJURY PREVENTION

In the event of a medical emergency: Remain calm and begin lifesaving measures as necessary. Call for emergency response (Call 9-911) from campus telephone and cell phone 228-2677.

In case of any injury, no matter how slight, report the incident to the area supervisor (instructor). If campus police or paramedics are required, dial 9-911 or on a cell telephone (209) 228-2677. Seek medical attention at Mercy Medical Center Emergency Room.

For additional assistance call:

Mercy Hospital (Emergency Room) (209) 385-7000
Poison Center (1-800) 876-4766
25-Hour Emergency Response (Clean Harbors Environment) (1-800) OIL-TANK

If any chemical, biological, or radioactive materials are spilled, notify others in the area, close the door and call EH&S (209) 228-7864.

PERSONAL PROTECTION EQUIPMENT

Safety glasses (with side shields), cover goggles, or face shields are required when in any shop area, whether working or not!!

Wear appropriate clothing for the job. Shoes must be worn in all shop areas. Open-toed shoes are not allowed. While operating machines, no shorts or long sleeve shirts.

Do not wear ties, loose clothing, jewelry, gloves, etc. around moving or rotating machinery. Long hair must be tied back or covered to keep it away from moving machinery. Hand protection in the form of suitable gloves should be used for handling hot objects, glass or sharp-edged items.

Remove protective equipment and wash thoroughly after use, especially after contact with solvents or other chemicals.

OPERATIONAL GUIDELINES

Do not operate any equipment unless you are familiar with its operation and have been authorized to operate it. If you have any questions regarding the use of equipment, ask the area supervisor. All machines must be operated with all required guards and shields in place.

No work may be performed using power hand tools unless at least two people are in the shop area and can see each other.

Always check the Material Safety Data Sheets (MSDS), for any specific precautions to be taken while working with the material. Follow all appropriate precautions when working with solvents, paints, adhesives or other chemicals. Use appropriate protective equipment.

Do not work in the shop if tired, sick or in a hurry. No horseplay. Think through the entire job process before starting.

Machines must be shut off when cleaning, repairing, or filling with oil. Follow lock-out procedures while maintenance is being performed.

Prior to operating machine shop equipment **all** requirements must be met, see requirements below.

- Machine shop Supervisor or Instructor (Classroom Instructor for ME-188) must be present while operating machine shop equipment.
- User has completed ME-188 Machine Shop Technology
- User has been signed off to use specific machine(s)
- User is knowledgeable of machining process

Avoid excessive use of compressed air to blow dirt or chips from machinery. Never use compressed air to clean clothing, hair, or aim at another person. Nozzles are not to be modified for additional air flow.

Keep fingers clear of the point of operation of machines by using guards, special tools or devices. Such as, push sticks, hooks, pliers, etc.

Never use a rag near moving machinery.

A hard hammer should not be used to strike a hardened tool or any machine part. Use a soft-faced hammer.

Heavy sanding and painting should only be done in well-ventilated areas or hood for specific operation.

Before starting a machine, always check it for correct setup and always check to see if machine is clear by operating it manually, if possible.

Check the power cords and plugs on portable tools for tears, cracks, and other damage before using them.

Do not drink alcoholic beverages before or during work in the machine shop area. While using Prescription Drugs know their side effects before operating machinery. Do not bring food/snacks into shop workspaces.

HOUSEKEEPING

Practice cleanliness and orderliness in the shop areas. Keep the floor around machines clean, dry and free from trip hazards. Do not allow chips to accumulate.

A brush, hook, or special tool is preferred for removal of chips, shavings, etc. from the work area. Never use your hand to free chips from machinery.

Always store oily rags in an approved metal container.

Always clean up before leaving the machine shop.

TOOL SAFETY

DRILL PRESS SAFETY

1. Run drill at correct RPM for diameter of drill bit and material.
2. Always hold work in a vise or clamp to the drill table.
3. Use a correctly ground drill bit for the material being drilled.
4. Use the proper cutting fluid for the material being drilled.
5. Remove chips with a brush, never by hand!
6. Ease up on drilling pressure as the drill starts to break through the bottom of the material.
7. Don't use a dull or cracked drill. Inspect the drill before using.
8. Don't drill with too much pressure.
9. Always try to support part on parallels or a backing board when drilling thru material.
10. Never place taper shank tools such as large diameter drills or tapered shank reamers in a drill chuck. Only straight shank tools such as standard drills can be clamped in chucks.
11. Always clean drill shank and/or drill sleeve, and, spindle hole before mounting.
12. Remove taper shank tools from spindle or sleeve with a drill drift and hammer.
13. Never try to loosen the drill chuck while the power is on.
14. Lower the drill spindle close to the table when releasing the drill chuck or taper shank drill to reduce the chance of damage in the event they fall onto the table.
15. Never clean the machine while it is in motion!!
16. If the drill binds in a hole, stop the machine and turn the spindle backwards by hand to release the bit.
17. When drilling a deep hole withdraw the drill bit frequently to clear chips.
18. Always remove the drill chuck key or, the drill drift from the spindle immediately after using.
19. Wear safety eye protection (side shields) while drilling.
20. Let the spindle stop of its own accord after turning the power off. Never try to stop the spindle with your hand.
21. After using drill press remove cutting tool from chuck and store in proper place.

LATHE SAFETY

1. Make sure that the chuck, drive-plate, or, faceplate is securely tightened onto the lathe spindle.
2. When removing the chuck, drive-plate, or faceplate do not use machine power.
3. When installing the chuck, drive-plate, or faceplate do not use machine power.
4. Move the tool bit a safe distance from the collet or chuck when inserting or removing work.
5. Do not run the machine faster than the proper cutting speed.
6. In setting up the tool holder place it to the left side of the compound slide to prevent the compound slide from running into the chuck or spindle attachments.
7. Always clamp the tool bit as short as possible in the tool holder to prevent it from breaking or chattering.

8. Always make sure that the tool bit is sharp and has the proper clearance. If any filing is done on work revolving in the lathe, file left handed to prevent slipping into the chuck. Never use a file without a handle.
9. If work is turned between centers, make sure that proper adjustment is made between centers and that the tailstock is locked in place.
10. If work is being turned between centers and expands due to heat generated from cutting, readjust centers to avoid excessive friction.
11. Do not grasp or touch chips or turnings with your fingers, remove them using a blunt instrument or pliers. It is safer to turn off the lathe before clearing chips then to leave it running.
12. Set the tool bit on centerline of work to prevent work from climbing over tool or cutting above center and dragging.
13. Don't cut work completely through when turning between centers.
14. Remove chuck key from chuck immediately after using.
15. Turn chuck or faceplate through by hand before turning on the power to be sure there is no binding or clearance problem.
16. Stop the machine before taking measurements.
17. Before cleaning the lathe remove tools from the tool post and tailstock.

MILLING MACHINE SAFETY

1. Work must be clamped securely in a vise and vise clamped tightly to the table. Or work may be clamped securely to the table.
2. Make sure cutter is rotating in the proper direction before cutting material.
3. Before running machine the spindle should be rotated by hand to make sure it is clear for cutting.
4. Make sure the power is off before changing cutters.
5. Always use the proper cutting fluid for the material being cut.
6. Never run the machine faster than the correct cutting speed.
7. Make sure that the machine is fully stopped before taking any measurements.
8. Always use cutters which are sharp and in good condition.
9. Don't place anything on the milling machine table such as wrenches, hammers, or tools.
10. Always stay at the machine while it is running.
11. Don't take too heavy a cut or use too rapid of a feed.
12. Remove the collet-tightening wrench immediately after using it.
13. If at all feasible rig a guard or shield to prevent chips from hitting other people.
14. Use the milling machine spindle brake to stop the spindle after the power has been turned off.
15. When removing tools from the tool holder put a rag over the cutting tool while removing the tool, never pull an end mill or drill out of the tool holder by hand.
16. Before cleaning the mill remove cutting tools from the spindle to avoid cutting yourself.

GRINDING SAFETY

1. Abrasive wheel machinery shall not be operated without the appropriate guards in place.

2. Tool rests on bench or pedestal grinders shall be set no more than 1/8 inch from the wheel. Adjust tongue guards to no more than 1/4 inch from wheel.
3. Never use a wheel that has been dropped or received a heavy blow, even though there may be no apparent damage. Such wheels may be weakened or unbalanced enough to fly apart on startup.
4. Before operation inspect grinding wheel for any material (nonferrous material) in-bedded in wheel. If grinding wheel has been contaminated with material consult with the instructor before using.
5. Stand to one side when starting machine.
6. Do not grind on side of wheel unless wheel is specifically designed for such use.
7. Do not use excessive pressure while grinding.
8. Do not use any cracked, broken or otherwise defective wheels.
9. Make sure all new wheels are properly mounted and balanced.
10. Keep the grinding wheel dressed. Dressing a small amount frequently is better than having to dress a lot later and will allow the wheel to cut faster, cooler and with a better surface finish. Dressing is cleaning and smoothing the surface of the grinding wheel, use proper too for dressing wheel.
11. Hold work securely while grinding, use the tool rest to support the work when off-hand grinding on bench or pedestal grinders.
12. Do not grind aluminum. Aluminum dust is explosive. Check with shop staff for safety instructions if aluminum must be ground.
13. Wear goggles over safety glasses (with side shields) when grinding on bench or pedestal grinders.
14. If a magnetic chuck is being used, on the surface grinder, make sure it is holding the work securely before starting to grind.

BAND SAW SAFETY

1. The upper guide and guard should be set as close to the work as possible, at least within 1/4 inches.
2. If the band breaks, immediately shut off the power and stand clear until the machine has stopped.
3. Examine the blade before installing to see if it is cracked, do not install a cracked blade.
4. Use the proper pitch blade for the thickness of the material to be cut. There should be at least 2 teeth in the material when cutting aluminum and three teeth when cutting steel.
5. Do not run the band saw at a higher speed than recommended for the material being cut.
6. If the saw stalls in a cut, turn the power off and reverse the blade by hand to free it

TABLE SAW SAFETY

1. Stand to one side, never directly in line with, of work being fed through the saw.
2. Use the proper blade for the material and type of cut. Do not use a rip blade for cross cutting, or, a crosscut blade for rip sawing. Do not use a plywood blade for anything but plywood.

3. Inspect the blade before using it, make sure it is the proper blade and is sharp, and free from cracks, and any build up of material.
4. Never allow your fingers to get near the blade when sawing. Use a push stick to rip narrow pieces of stock. Don't use push stick to remove scrap. For scrap removal, shut off machine and wait until blade stops, then remove scraps.
5. Appropriate guards must be in place at all times. Never remove the guard.
6. If the piece of material you are cutting is large, get someone to assist in tailing-off for you. Never try to do it alone. Tailing off refers to supporting a large work piece by supporting it underneath with your hands.
7. If you are tailing-off for someone else let them guide the work through the saw. You should just support the work without influencing the cut.
8. Never reach over the saw to obtain something from the other side.
9. When shutting off the power, never attempt to stop the saw quickly by shoving anything against the blade. Make sure the saw has stopped before leaving it.
10. Never make any adjustments to the saw while it is running. Turn off the power and make sure the saw is completely stopped before attempting to adjust it.
11. Do not allow material to collect on or around the saw table. Sweep up sawdust and material scraps regularly while working to minimize chances of slipping or stumbling.
12. Make sure that you clean up thoroughly around the saw before leaving the area. If you don't you could be the cause of someone else having an accident.
13. The circular blade of the table saw should be set to 1/8 inch above the work.

POWER HAND SAW SAFETY

1. Do not use the saw in a wet area.
2. Do not run the extension cord across walkways where people might trip over it or where the cord may be run over and damaged.
3. Before using any power tool, inspect it to make sure the cord is not damaged in any way, that the ground pin is intact, and that the blade is sharp and undamaged.
4. Keep your head out of the path of particles thrown out by the blade.
5. Wear eye protection at all times.
6. Disconnect the power cord before cleaning, changing blades, or making any adjustments to the saw.
7. When it is necessary to raise the guard for certain types of cuts, use the guard lever.
8. Never wedge, wire, or otherwise jam the guard to prevent it from working.
9. Wait until the saw stops before lifting it from a cut.
10. Before setting the saw down, make sure the guard is closed, as the blade may still be turning.
11. Don't carry the saw with your fingers on the switch trigger.
12. Don't pull the saw backwards in a cut if you can avoid it.
13. Use the proper blade for the type of cut to be made.
14. Do not use the cord to move or drag the saw.
15. Do not use the power hand saw for cuts if you cannot keep a firm and secure grip on the saw and the material being cut. A handsaw is still the best for some kinds of work and often faster.

DISC AND BELT SANDER SAFETY

1. Do not operate sanders without the guards in place.
2. On the disc sander always use the downward motion side of the disc to sand. Never the upward motion side as this can throw your part upwards with tremendous force.
3. Always attempt to place your work against the rest on the disc and belt sanders.
4. On the horizontal belt sander, always sand, so that the belt motion is away from you.
5. Do not operate machines with torn or ripped belts or disks.
6. Do not sand any material that will give off a dangerous dust. Such materials as asbestos, beryllium or copper beryllium alloys must not be sanded or filed, always refer to the MSDS before sanding any material not common, such as stainless steel, aluminum, mild steel, ECT.

WELDING, BRAZING, AND SOLDERING SAFETY

1. Welders, assistants, and anyone else in the welding area shall wear glasses or shields of recommended shades during welding operations.
2. A screen shall be erected around the welding area to protect other personnel in the shop from injury.
3. Inspect all welding equipment to be used, prior to each use, for possible damage.
4. Avoid handling oxygen bottles with greasy hands, gloves or rags. Fatal explosions have resulted from this cause.
5. Always strap tanks to a welding cart or a fixed object. Never allow a gas cylinder to be free standing. Replace the safety cap on all cylinders when not in use.
6. When arc welding, make sure work and/or work table is properly grounded.
7. Do not arc weld in a wet area.
8. Be alert to possible fire hazards. Move the object to be welded to a safe location, or, remove all flammable materials from the work area.
9. Never weld in the same area where degreasing or other cleaning operations are performed.
10. Keep suitable fire extinguishing equipment nearby and know how to operate it.
11. Shut off the cylinder valves when the job is completed, release pressure from the regulators by opening the torch valves momentarily. And then back out regulator adjusting valves. Never leave the torch unattended with pressure in the hoses.
12. Utilize all protective equipment and clothing. Do not arc weld with any part of the body uncovered, the arc light is actinic light (excessive ultraviolet) and will cause burns similar to severe sunburn.
13. Never weld inside drums or enclosed spaces without adequate ventilation, or the use of airline respirators or self-contained breathing apparatus.
14. Check the ventilation system before starting to weld and periodically thereafter to insure adequate performance. Welding fumes should not be allowed to get into the rest of the shop working areas.

15. Never cut or weld any container that has held explosive or flammable materials. Use prescribed methods for cleaning or flooding.
16. Never use wrenches or tools except those provided or approved by the gas cylinder manufacturer to open valves. Never use a hammer to open or close valves or any other tool that is not proper for opening and closing valves or any other equipment.
17. Abide by any other safety measures required for each particular type of welding.
18. Allow for proper ventilation when brazing or soldering. The fluxes are acidic and toxic.
19. Do not weld on painted, galvanized or greasy, oily metals. Not only can the fumes be toxic, but the welds will be unsatisfactory and will fail in use.

CHEMICAL SAFETY

1. Review the Material Safety Data Sheets (MSDS) before handling any chemical. Wear appropriate gloves for the chemical you are using.
2. Respirators will be provided when necessary. The supervisor will provide the necessary paperwork to receive a respirator and a fit test from EH&S.
3. If you are going to produce chemical waste, please have a container available and appropriate waste tag filled out completely before starting work.
4. Avoid using solvents around hot metal surfaces and flames.
5. Do not smoke or light flames in areas where solvents are used and stored.
6. Clean up any small manageable spills immediately. Report the spill to EH&S at (209) 724-4234. Contact machine shop instructor or area supervisor.
7. Do not work with solvents in confined, unventilated areas.
8. Do not drink alcoholic beverages or take medications containing alcohol before or during working with solvents. Alcohol in the bloodstream sometimes causes synergistic reactions with various solvents that can lead to loss of consciousness and possible death.
9. Report any ill effects and skin disorders to the area supervisor.
10. Remove protective equipment and wash thoroughly after contact with solvents or other chemicals
11. Fumes from paints, solvents, adhesives, and the abrasive cut-off saw can drift into other labs, shops and offices. Work with staff to minimize these problems.
12. Mix resins in small batches.

CNC MACHINES

1. All parts to be secured to the table by vise.
2. Before any machining process is started, no tools in tool holders and a dry run will be performed.
3. During operation coolant must be on tool emerged in coolant.
4. During and after use make sure floors are free from coolant. Wipe floors dry with rags.

CUT OFF SAWS

1. Operator shall wear a face shield during operation.
2. All material is secured by a vise.
3. Do not force the cutting wheel onto the part.
4. Cut metal material only.
5. Use proper ventilation; some material may require a respirator.

COMMENTS:_____

SHOP SAFETY CHECKLIST

Employee: _____ Title: _____

Training Subject	Date	Employee Signature	Date	Supervisor/Trainer
Introduction To Safety				
Drill Press				
Lathe				
Mill				
Grinders				
Band Saw				
Table Saw				
Power hand Saw				
Sanders				
Welding				
Chemical				
CNC Mill				
Cut Off Saw				